United States Department of Agriculture

Suction Dredging and High Banking Operations for Notices of Intent within the Rogue River-Siskiyou National Forest

Biological Assessment

In Partnership with, and Submitted to NOAA Fisheries

Forest Service | Pacific Northwest Region | Rogue River-Siskiyou National Forest | February 2015

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I. Introduction

Project Name: Suction Dredging and High Banking Operations for Notices of Intent (NOI) on National Forest System (NFS) lands within the Rogue River-Siskiyou National Forest (RRS)

Administrative Unit: Supervisor's Office, RRS, which includes portions of all five Ranger Districts (Gold Beach, High Cascades, Powers, Siskiyou Mountains and Wild Rivers)

ESA Determinations: "May affect, likely to adversely affect" for Oregon Coast (OC) and Southern Oregon/Northern California Coast (SONCC) Coho Salmon and respective designated Coho Salmon critical habitat (CCH). "May affect, likely to adversely affect" for Southern Distinct Population Segment (DPS) Green Sturgeon and Southern DPS Pacific Eulachon

EFH Determinations: "May adversely affect" for Pacific salmon, Pacific Groundfish and coastal pelagic species essential fish habitat (EFH)

Location: Table 1 displays the populations in relation to subbasins and watersheds within the ESA action area.

Table 1. Populations, subbasins and watersheds affected

Population	Subbasin	5th Field Watershed Hydrologicaly Units Code (HUC)
SONCC Coho Salmon		
1. Chetco River	Chetco	Chetco River HUC1710031201
2. Elk River	Sixes	Elk River HUC 1710030603
3. Illinois River	Illinois	Althouse Creek HUC 1710031101
		Briggs Creek HUC 1710031107
		Deer Creek HUC 1710031105
		East Fork Illinois River HUC 1710031103
		Indigo Creek HUC 1710031110
		Josephine Creek- Illinois River HUC 1710031106
		Klondike Creek- Illinois River HUC 1710031108
		Lawson Creek- Illinois River HUC 1710031111
		Silver Creek HUC 1710031109
		Sucker Creek HUC 1710031102
		West Fork Illinois River HUC 1710031104
4. Lower Rogue River	Lower Rogue	Lobster Creek HUC 1710031007
		Rogue River HUC 1710031008
5. Middle Rogue / Applegate Rivers	Applegate	Lower Applegate River HUC 1710030906
	Applegate	Middle Applegate River HUC 1710030904
	Applegate	Upper Applegate River HUC 1710030902
	Lower Rogue	Hellgate Canyon-Rogue River HUC 1710031002
	Lower Rogue	Shasta Costa Creek-Rogue River1710031006
	Lower Rogue	Stair Creek-Rogue River HUC 1710031005
6. Pistol River	Chetco	Pistol River HUC 1710031204
7. Smith River	Smith	North Fork Smith River HUC 1801010101
8. Upper Rogue River	Middle Rogue	Bear Creek HUC 1710030801
	Upper Rogue	Elk Creek HUC 1710030705
		Little Butte Creek HUC 1710030708
9. Winchuck River	Chetco	Winchuck River HUC 1710031202
OC Coho Salmon		
1. Coquille	Coquille	South Fork Coquille River HUC 1710030502
2. Sixes	Sixes	Sixes River HUC 1710030602
Southern DPS Pacific Eulachon and Southern DPS Green Sturgeon		
1. Southern DPS Pacific Eulachon 1. Southern DPS Green Sturgeon	Chetco	Pistol River HUC 1710031204
	Chetco	Chetco River HUC 1710031201
	Chetco	Elk River HUC 1710030603
	Coquille	Lower Coquille River HUC 1710030505
	Lower Rogue	Rogue River HUC 1710031008
	Sixes	Sixes River HUC 1710030602
	Sixes	Elk River HUC 1710030603
	Smith	Lower Smith River HUC 1801010104

A. Potentially affected species, status and habitats assessed

Table 2 describes the potentially affected species, their status, and the habitats assessed.

Table 2. Potentially affected species, ESU, status, and habitats assessed

Species	Status	Assessed
SONCC Coho Salmon	Threatened under the Endangered Species Act	Species and critical habitat
OC Coho Salmon	Threatened under the Endangered Species Act	Species and critical habitat
Southern DPS Green Sturgeon	Threatened under the Endangered Species Act	Species
Southern DPS Pacific Eulachon	Threatened under the Endangered Species Act	Species
Pacific salmon (Coho and Chinook salmon)	Protected under the Magnuson-Stevens Fishery Conservation and Management Act	Essential fish habitat
Pacific Groundfish and Coastal Pelagic species	Protected under the Magnuson-Stevens Fishery Conservation and Management Act	Essential fish habitat

B. Background

Suction dredging and high banking summary. Suction dredging involves vacuuming precious metals from underwater stream sediments using a four-inch (or less) diameter nozzle powered by a gasoline pump that is floated on a barge. Sediments are fed onto a sluice that settles out only the heaviest particles and spills the remainder off the end of the sluice into the stream. This processed sediment is called “tailings”. Stream substrate is typically excavated to a depth of several feet with excavation to bedrock a common practice.

High banking is the practice of exploring for precious metals by excavating and sorting material below the ordinary high water level, located on a gravel bar between the wetted stream and stream bank. Water for high banking operations is not diverted from or disposed/discharged into the nearby stream.

History of gold mining on RRS and Oregon. Gold has been the most sought-after mineral on the RRS, with a prospecting and production history (from both placer and lode deposits) dating back to 1850. Recreational gold panning, suction dredging and high banking are popular activities of both serious miners and recreational hobbyists looking for placer deposits with hopes of discovering one worth developing. This activity is currently concentrated along the Illinois River and some of its tributaries: Josephine, Sucker, Althouse, Briggs, Soldier, and Silver Creeks. Gold mining is likely to continue into the distant future and will likely be on placer deposits located within and adjacent to the many stream courses long known to contain gold-bearing gravels on NFS lands within the RRS.

Between 1850 and 1965, Oregon produced 5.8 million fine ounces of gold and 5.4 million fine ounces of silver, attracting miners from the already crowded and “played-out” gold streams in California. Gold mining was a mainstay of the economies of southwestern and northeastern Oregon, starting settlements, building roads, and generally establishing civilization in these areas. The RRS’s current location played a significant role in this production, being in fact the location where gold was first discovered in Oregon.

Prospecting probably occurred on every stream in southern Oregon, and actual mining of gold-bearing streams was very intensive. 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 ½ ounce of gold for every five-gallon bucket of dirt. These mining methods were employed primarily within the streambed and nearby bench deposits. By the 1860’s, 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.

Since that time, comparatively little mining occurred on the RRS until the advent of the portable, “one-man”, suction dredge in the 1960’s. In the 1970’s and 1980’s suction dredging developed into a popular recreational activity with interest spiking in the early 1980’s when gold prices were high, similar to recent high gold prices. Whereas a decade ago there were only approximately 200 permits issued, in the summer of 2013 the Oregon Department of Environmental Quality (ODEQ) issued more than 1,337 700PM suction dredge general permits (ODSL 2014). The Oregon Division of State Lands (ODSL) issued 414 recreational placer mining general authorizations (GA) permits in 2005 (ODSL 2013) and 1,538 were issued during 2013 (ODSL 2014). Oregon DSL stated that this increase has been fueled by rising gold prices and “according to data collected by Oregon DEQ they are not seeing a disproportionate increase in applicants from other states”, (ODSL 2013). Filed placer mining claims on the RRS, as of May 8, 2013, were approximately 577 (508 of which are located within ¼ mile[1] of CCH). However, the actual number of people dredging the streams on NFS lands within the RRS may be less since some people could maintain claims they do not operate. Between 2009 and 2012, an average of 23.6 and a high of 41 NOI for suction dredging and/or high banking were submitted annually on NFS lands within the RRS. However, these figures may underestimate the number of people actually suction dredging or high banking within the RRS since some operators participating in these activities may not necessarily submit a NOI to the RRS.

Alluvial gold and streams. Most mining claims on the RRS are operated as suction dredge placer operations, taking advantage of naturally occurring gold moving through the stream system; and fine gold particles and small nuggets left over from historic mining. Gold is naturally occurring on the RRS and is originally of a lode nature. However, natural erosive forces expose and disperse this gold and place it in motion through the stream and river systems. Gold is heavy, and it takes a great deal of hydraulic energy in the streams to move it. The intensity of seasonal flooding, and the configuration of individual streams determine the distribution and deposition of gold along and within a stream.

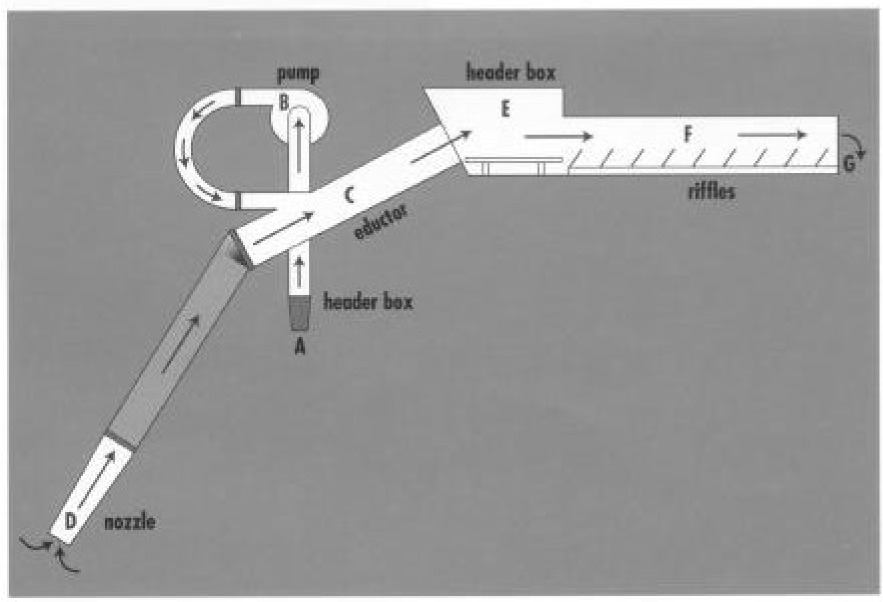
High winter and spring flows transport gold and other streambed materials downstream, depositing and redistributing them as stream channel configuration and hydraulics dictate. Gold, being one of the more dense materials transported by the stream, is the first to drop out when

[1] A quarter mile is a conservative length used to estimate the maximum distance of potential effects to Coho Salmon critical habitat and Coho Salmon individuals as a result of suction dredging and high banking activities. Literature supports a distance of 333 feet or less of possible impact. Effects noted include sediment plumes and actual suction dredge and tailings pile impacts, which are discussed in Chapter V.

stream energy diminishes. This diminished energy occurs as water flow slows (becomes "slack water") where streams either broaden out or deepen, such as when it moves through a large pool. Though not as pronounced, it also occurs directly in eddies behind rocks, bedrock outcrops, vegetation, or logs within or along the stream channel. As the gold drops out it mingles with smaller rocks, gravel, and fine sediment within the streambed, frequently sorting itself deep within the substrate, until it hits a sedimentary hardpan or bedrock. Suction dredge operators understand these dynamics and focus their operations accordingly.

Suction dredging operations. Suction dredges come in many configurations and look similar to the device depicted on the front cover of this BA, while Figure 1 shows the basic components of a suction dredge. Dredges generally use water pumps driven by gasoline-powered engines. The pump creates suction in a flexible intake pipe 2-4 inches in diameter or greater. The suction created in the intake pipe vacuums the streambed sediment, gravel, smaller rocks, and any

Water is sucked through a screened intake (A) by water pump (B). The force of high pressure water into the eductor (C) creates a suction at nozzle (D). Water, sand, gravel, and gold are sucked through the nozzle into the headerbox (E), across the riffles (F)—where gold is trapped—and out the end of the dredge (G). Streambed material is not sucked through the water pump.



included gold into a sluice, or header, box. The sluice box is a device that channels the water, along with the vacuumed material, over small riffles that create numerous little pockets of slow or slack water where the gold drops out and is captured in a grooved board, strip of carpet, or other feature designed to hold it in place. The water, silt, gravel and other lighter material flows through the sluice box and back into the stream. The gravel is usually deposited in a pile at the mouth of the sluice box. The dredge engine, pump, and sluice box are all mounted on a floating platform tethered over the work area.

Dredge operators study the river or stream looking for "dead" or "slack" water where gold is most likely to have dropped out of the moving water column. Testing begins once a likely area is identified. Testing consists of dredging small sample holes down to bedrock or until a hard pack layer is reached. Gold is sought in the sediments, on the bedrock, or within cracks in the bedrock. The size of the sample holes is kept as small as possible: usually only big enough to reach bedrock or the compact sediment layer, moving the least material necessary. This process of systematic testing continues until as many possible profitable pockets of gold are located and removed. Most placer gold is recovered on bedrock or in a hard pack layer deposited by old ground sluicing or hydraulic mining operations.

Figure 1. Basic components of a suction dredge

While dredging, the operator usually tries to leave a “working pool” (an area kept free of rocks down to bedrock) usually large enough for the dredger to work in. The backside of the pool is comprised of cobbles and rocks moved back from the face, and the sides and front of the pool are considered the working face of the hole. As the dredging operation advances, cobbles and rocks are placed to the back of the hole, and all sand and gravel is pumped through the sluice box on the dredge. If large logs or trees are encountered or uncovered, the miner usually removes all the rocks, cobbles, sand, and gravel from around the tree or log. This leaves the tree or log either free- floating, or suspended (within or above the water) since either one or both ends remain embedded.

While dredging, miners work down toward bedrock through various layers of material. The first layer of gravel and rocks in most dredged streams on the RRS is what the miners call the “surface loose” or “flood layer”. This layer is comprised of rocks, gravel, and sand, and is moving during every high water. Generally it does not contain much gold. Sometimes, especially where the gravel bed is not deep, or is in an area that gets “scoured” or washed clean during high water, this may be the only layer present.

If there is a second layer, it is usually some form of a hard-pack or a weak “cement”. This is believed by many to be the legacy of intensive historic hydraulic mining. These tailings are usually concentrated to some degree by the hydraulic action of the stream flow with much of the lighter sand and silt already washed away by seasonal flooding. These sediments often have a concentration of gold which historic mining methods were inefficient at removing, and are exactly what is sought by today’s suction dredging and high banking miners.

Spatial context.

- *State:* The Department of State Lands recently distributed an “Update on the current status placer mining regulation”, August 9, 2013 letter stating that “the greatest (suction dredge) activity is taking place in the southwest and northeast quarters of the state. The two most heavily used rivers are the Rogue and the South Umpqua.” (Figure 2).
- *County:* The proposed action exists within Jackson, Josephine, and Curry counties in Oregon and Siskiyou County in California. California currently has a moratorium on suction dredging and is not issuing permits for this technique. To the extent that State laws for suction dredging or high banking may change and may conflict with conservation measures (CM) proposed by the RRS, the most stringent condition within the State in which the NOI suction dredging operation resides, would be applied.
- *RRS:* Approximately 29 watersheds containing 1,448 miles of CCH (611 miles of CCH on NFS lands within the RRS) is being analyzed in this programmatic BA (Source: 2014 GIS query).
- *Coho Salmon populations:* Two ESUs exist within the ESA action area (Oregon Coast and Southern Oregon Northern California Coast). Within these two ESUs, two OC Coho Salmon populations and nine SONCC Coho Salmon populations reside within the ESA action area.
- *Subbasin:* Nine out of 11 CCH subbasins within the RRS have placer mining claims.
- *Watersheds:* Twenty-two of the 29 watersheds analyzed in this BA had active field placer claims as of 5/8/2013. All 29 are being analyzed in this BA for potential NOI submittal.

Seventy-five percent of the 5/8/2013 field claims are located in the Illinois River subbasin.

- *Claims:* In California, 90% of all miners dredged an area 1-10 square meters and the average miner operated a dredge 5.6 hours per day (CDFG 1997).

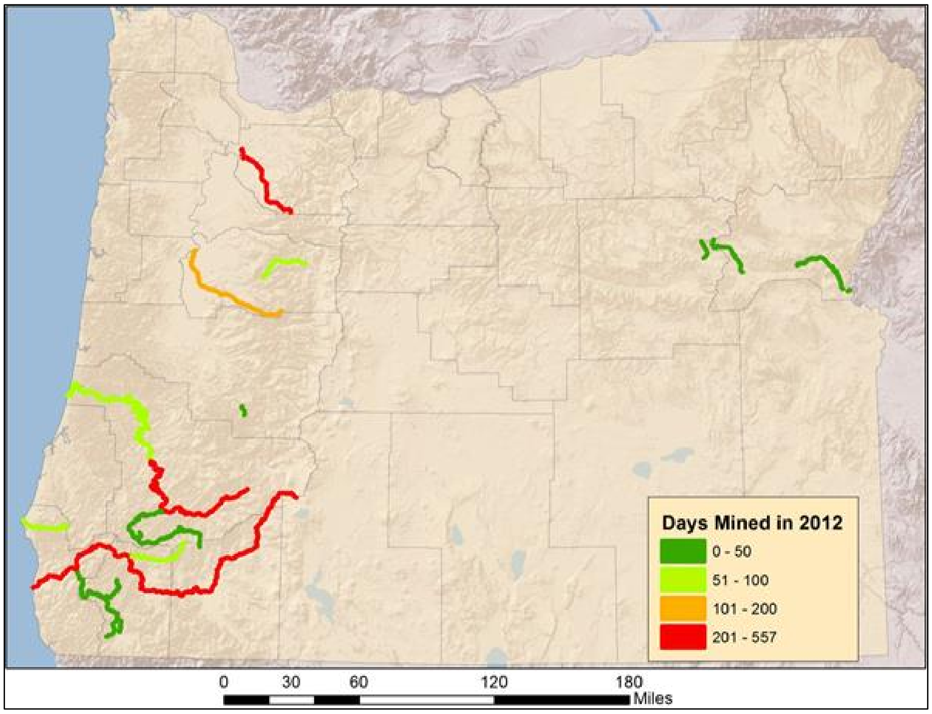


Figure 2. Map of Oregon indicating days mined in 2012 (ODSL 2013)

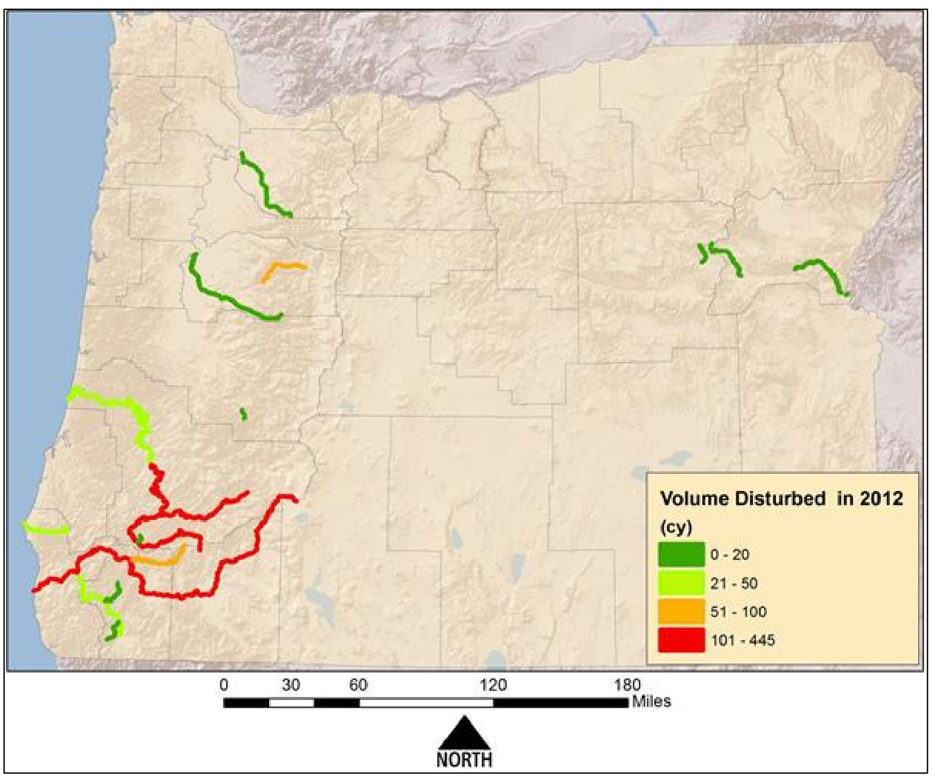


Figure 3. Map of Oregon indicating volume of material disturbed in 2012 (ODSL 2013)

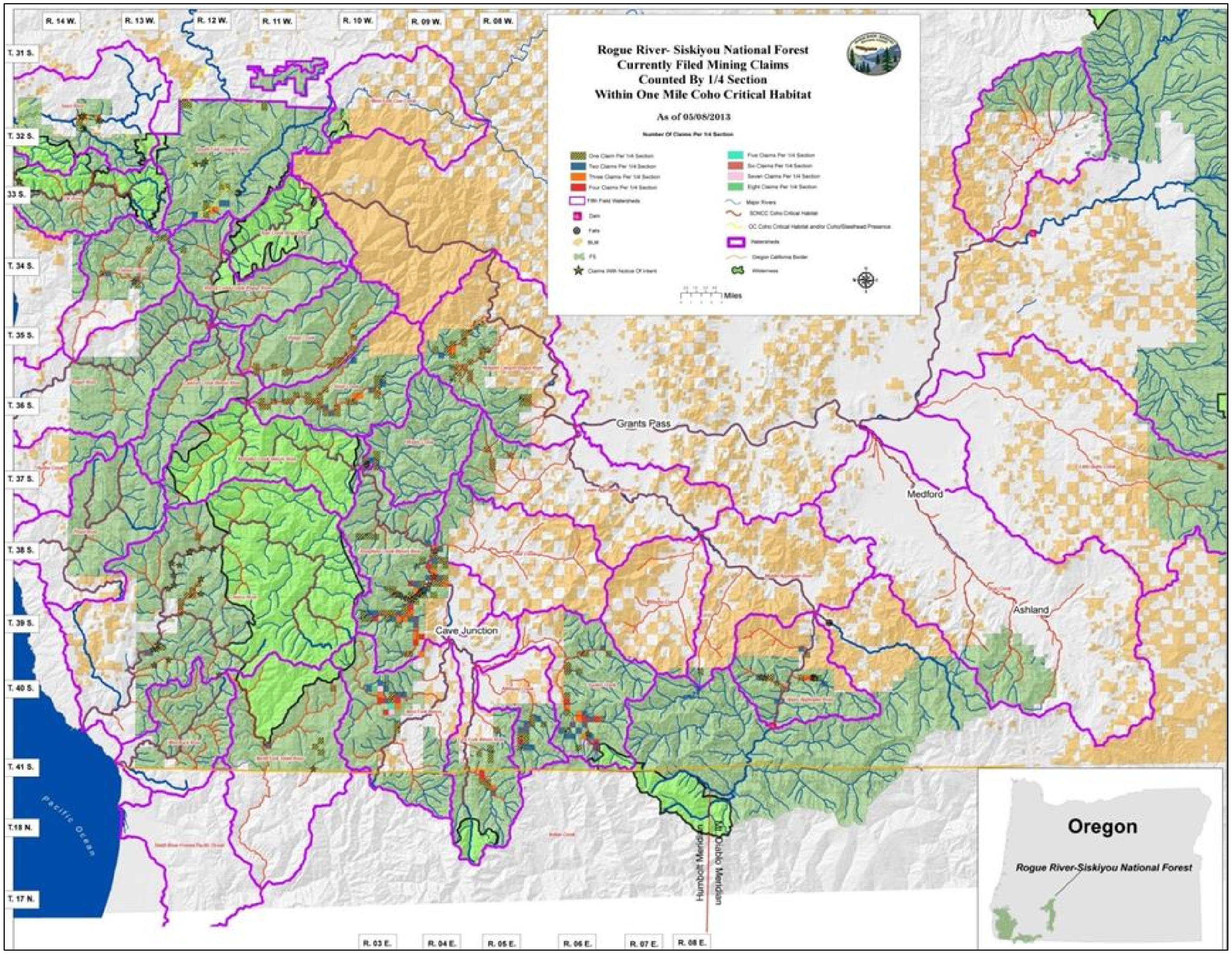


Figure 4. Filed mining claims and NOI within NFS lands on the RRS

C. Description of proposed activities

The proposed action is to ensure that NOI located on NFS lands within the RRS in either CCH, EFH, or habitats with current or historic Coho Salmon occupancy have established operating guidelines for suction dredging and high banking operations. The RRS is requesting a programmatic biological opinion from NMFS for an indeterminate amount of time (no time limit).

The Organic Administration Act of 1897 (16 United States Code (USC) 478, 551) provides the US RRS with the authority to regulate surface uses of NFS lands, including mining (36 Code of Federal Regulations (CFR) §228.2). "These regulations apply to operations hereafter conducted under the United States mining laws of May 10, 1872, as amended (30 USC 22 et seq.) as they affect surface resources on all NFS lands under the jurisdiction of the Secretary of Agriculture to which such laws are applicable…" The General Mining Act of 1872 (30 USC 22-28), as amended, establishes the right of all citizens, or those who declare their intention to become citizens, of the United States to enter lands open to mineral entry to explore, prospect, develop and extract valuable mineral.

A NOI is approved[2] for only the given operating season (i.e., only one operating season). In addition, the proposed action establishes a limit for the number of approved NOI per year per watershed on NFS lands within the RRS as a cap for the maximum amount of fill and removal material. The NOI addressed under this programmatic BA will involve suction dredging and high banking. The activity could also be a limited subset of the two, which could be sampling/testing, but it is still either high banking or dredging, just a smaller amount of it. These activities would occur on NFS lands in the RRS and are located within one-quarter mile of Coho Salmon critical habitat and essential fish habitat.

A NOI submitted to and approved by the RRS will cover operation of only one suction dredge per person at one time during the instream work period. The instream work periods vary according to location, i.e., June 15th- September 15th, July 1st-September 15th or July 15th-September 30th, whichever is applicable for a NOI location on NFS lands within the State of Oregon. The State of California is under a suction dredge moratorium as previously stated. If suction dredging resumes in California, the most current instream work period for California will be in effect. Multiple operators can be submitted under one NOI. 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.

Annual NOI cap. The proposed action contains an annual cap (upper limit) of fill and removal per watershed. It is based on NOI occurring during the 2009-2012 period. The 2009-2012 baseline data was used consistently throughout the BA since it is the best available data and was collected during a period of high suction dredging and high banking activity on the RRS. The high activity level was due to the close proximity of the ESA action area to the California suction dredging closure and the elevated price of gold. It is reasonable to anticipate that future suction dredging and/or high banking miners or their representatives (and possibly individuals not

[2] *Authorize or approve*: These terms are used in this BA solely in the context of ESA consultation for suction dredging and/or high banking mining operations that have Notices of Intent to operate submitted to the RRS, 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.

associated with any claim) could seek similar numbers of NOI to suction dredge and/or high bank within CCH.

During 2009-2012 within CCH, there was an average per year of 18.3 NOI (SONCC Coho Salmon ESU) and 5.3 NOI (OC Coho Salmon ESU) submitted to the RRS. The 2009-2012 NOI yearly average was figured as a minimum NOI yearly average. Therefore, a "maximum effect" approach during the analysis of effects was needed to estimate the highest annual number of NOI per watershed that could possibly occur. Since no available known model or formula is available to derive the "maximum" numbers, the maximum annual cap of NOI per watershed was determined by using 50 percent of the May 8, 2013 active filed claims per watershed as displayed in Table 3. An exception occurs for those watersheds with less than or equal to 10 active filed claims. In that circumstance, a cap of 5 would occur in watersheds with 0 to <10 filed claims, or it would be the actual number, whichever is higher (e.g., 8 filed claims equals a cap of 8 NOI). The annual cap of NOI per watershed on NFS lands in the RRS and number of actively filed claims are displayed in Table 4.

Table 3. Number of NOI permissible per watershed under the programmatic BA

Category	Number of annual NOI permissible per watershed
Watersheds with 0 active filed claims & 0 NOI	Actual number of active filed claims[1] or five, whichever is greater.
Watersheds with relatively small number of active filed claims[1](<10)	Actual number of active filed claims[1] or highest number of NOI within a year occurring between 2009 through 2012 or five, whichever is greater
Watersheds with medium/large number of active filed claims[1] (≥10)	Fifty percent of active filed claims[1] or highest number of NOI plus five within a year occurring between 2009 through 2012, whichever is greater.

[1] Claims that were noted as filed on May 8, 2013.

Table 4. Annual number of permissible NOI per watershed on NFS lands within the RRS

Populations	Subbasin (4th field)	Watershed (5th field)	No. of active filed claims (as of 5/8/2013) 1/4[1] mile from CCH	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 permiss-ible per watershed
SONCC Coho Salmon ESU						
Chetco River	Chetco	Chetco River1710031201	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	1	2 / 0.5	1 (2010, 2011)	5
		Elk River - population total	1	2 / 0.5	1	5
Illinois River	Illinois	Althouse Creek 1710031101	15	0	0	15
		Briggs Creek 1710031107	5	0	0	5
		Deer Creek 1710031105	2	1 / 0.3	1 (2012)	5
		East Fork Illinois River 1710031103	19	0	0	19
		Indigo Creek 1710031110	13	0	0	13
		Josephine Creek-Illinois River 1710031106	130	18 / 4.5	8 (2009)	65
		Klondike Creek-Illinois River 1710031108	0	0	0	1
		Lawson Creek-Illinois River 1710031111	0	0	0	5
		Silver Creek 1710031109	37	1 / 0.3	1 (2011)	19
		Sucker Creek 1710031102	50	2 / 0.5	1 (2010, 2011)	25
		West Fork Illinois River 1710031104	23	0	0	12
		Illinois River - population total	294	22 / 5.5	17	188
Lower Rogue River	Lower Rogue	Lobster Creek 1710031007	7	1 / 0.3	1 (2010)	7
		Rogue River 1710031008	0	0	0	5
		Lower Rogue River - population total	7	1 / 0.3	1	13

Populations	Subbasin (4th field)	Watershed (5th field)	No. of active filed claims (as of 5/8/2013) 1/4[1] mile from CCH	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 permiss-ible per watershed
Middle Rogue / Applegate Rivers	Lower Rogue	Hellgate Canyon-Rogue River 1710031002	29	0	0	15
	Applegate	Lower Applegate River 1710030906	4	0	0	5
	Applegate	Middle Applegate River 1710030904	1	0	0	5
	Lower Rogue	Shasta Costa Creek-Rogue River1710031006	0	0	0	5
	Lower Rogue	Stair Creek-Rogue River 1710031005	0	0	0	5
	Applegate	Upper Applegate River 1710030902	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	0	0	0	5
Pistol River - population total			0	0	0	5
Smith River	Smith	North Fork Smith River 1801010101	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	0	0	0	5
	Upper Rogue	Elk Creek 1710030705	0	0	0	5
		Little Butte Creek 1710030708	1	0	0	5
Upper Rogue River - population total			1	0	0	15
Winchuck River	Chetco	Winchuck River 1710031202	0	0	0	5
Winchuck River - population total			0	**0**	**0**	**5**
SONCC Coho Salmon – population total			**371**	**73 / 18.3**	**34**	**292**
OC Coho Salmon ESU						
Coquille	Coquille	South Fork Coquille River 1710030502	16	12 / 4	3 (2009,2010, 2011, 2012)	8
Coquille River – population total			16	12 / 4	3	8

Populations	Subbasin (4th field)	Watershed (5th field)	No. of active filed claims (as of 5/8/2013) 1/4[1] mile from CCH	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 permiss-ible per watershed
Sixes	Sixes	Sixes River 1710030602	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**

[1] NOI within ¼ mile of Coho Salmon critical habitat - grouped by ESU Coho Salmon populations

II. Programmatic Suction Dredging & High Banking Activity Conservation Measures

The RRS proposes to implement the following programmatic conservation measures (CM) as directed by Section 7 (a) (1) of the ESA to minimize or avoid adverse effects of the proposed suction dredging or high banking activities on Coho Salmon, Coho Salmon designated CH and designated EFH. These measures also include a means to gather monitoring information for an "RRS Annual NOI Suction Dredging and High Banking Operations Report" to NMFS.

The RRS will apply the following listed CM, for every NOI authorized2 under the RRS suction dredging and high banking NOI operations. Programmatic CM listed under "Administration" apply to the management of the suction dredging and high banking NOI operations by the RRS and those listed under "NOI operator" applies to an operator who submits a NOI to the RRS.

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 conservation measures described below.

A. Administration operations

The RRS will review each suction dredging and high banking NOI and ensure the following conservation measures are completed before authorizing the NOI:

1. **Submittal of an NOI to District Ranger**

    a. An 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 within a quarter mile[1] of Coho Salmon designated CH or within a quarter mile[1] of Coho Salmon for those areas without designated CH.

2. **Confirm the absence or presence of ESA-listed Coho Salmon, Coho Salmon designated CH, or Pacific salmon EFH within the NOI location**

    a. The RRS 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 CH or Pacific salmon designated EFH.

    b. The RRS will confirm that all adverse effects to Coho Salmon and their designated CH are within the range of effects considered in this Suction Dredging and High Banking NOI Programmatic BA.

    c. The RRS will confirm that all adverse effects to EFH are within the range of effects considered in this Suction Dredging and High Banking NOI Programmatic BA.

3. **Confirm the suction dredging and/or high banking NOI location is outside of prohibited areas**

a. The RRS 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 2010 Reissued 700-PM general permit requirements, Schedule C, Special Conditions, Best Management Practices, #19, page 8[3].

b. The RRS 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.

4. **Required State and/or Federal Permits**

a. 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**

a. The RRS proposes to only authorize[2] NOI that contain the conservation measures described in the next section, "B. Conservation Measures - NOI operator."

6. **"NOI Action Implementation Report"**

a. The RRS 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 email.

7. **"NOI Action Completion Report"**

a. The RRS 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[4] to the RRS by the NOI operator. The NOI operator and the RRS can share information to complete the report, if needed.

b. The submittal of the NOI Action Completion Report by the RRS 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 new version of the CDFW in-water work schedule for suction dredging operation, whichever State is applicable[5].

c. The NOI operator will provide data for completed actions as stated in the CMs for Record Keeping #40 and #41.

8. **"RRS Annual NOI Suction Dredging and High Banking Operations Report"**

[3] The state of California currently has a moratorium on suction dredging and is not issuing permits for this technique. Should conditions for suction dredging or high banking change and conflict with the conservation measures proposed herein, and existing Oregon or California rules, the most stringent condition within the State in which the NOI suction dredging operation resides would be applied.

[4] 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 (CDFW 2012 Suction Dredge Regulations Section 228 and 228.5 or newest version).

a. The RRS will submit an annual report to NMFS by February 15th each year that describes the RRS's efforts in carrying out the suction dredging and high banking NOI operations. 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 and Chinook salmon habitat use type of each NOI authorized[2] and carried out under the operations;

   iii. Monitoring results from CMs #42 and #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 RRS during normal field work and

   v. The RRS 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 RRS will attend an annual coordination meeting with NMFS by March 31st of each year.

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, RRS Level 1 fish biologist(s), RRS mineral administrator, and NMFS programmatic staff lead.

B. General conservation measures pertaining to NOI operator

The RRS suction dredging and high banking operations will ensure the following conservation measures are implemented during the operating season by the NOI operator:

Operations (pertains to both suction dredging and high banking)

10. **Comply with State permits**

a. NOI operator is expected to comply with Oregon and have a copy of applicable permit and General Authorization in their possession, i.e., National Pollutant Discharge Elimination System (NPDES) 700-PM permit (or Water Pollution Control Facility (WPCF) 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[4].

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 ordinary high water level 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 ordinary high water level 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 2010 Reissued 700-PM general permit requirements, Schedule C, Special Conditions, Best Management Practices, #15, page 7[4].

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.

13. **Protection of vegetation, wood, stream banks[5] and other habitat**

a. Undercutting, eroding, destabilization, or excavation of stream banks is prohibited; ODEQ 2010 Reissued 700-PM general permit requirements, Schedule C, Special Conditions, Best Management Practices, #6, page 6.

b. Removal or disturbance of boulders, rooted vegetation or embedded wood, plants and other habitat structure 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. Rooted vegetation or embedded wood includes living or dead trees or limbs, and shrubs. Rooted vegetation also includes grasses, wildflowers, weeds, and other vegetation that stabilizes the stream banks or provides cover for fish or provides stream shade; ODEQ 2010 Reissued 700-PM general permit requirements, Schedule C, Special Conditions, Best Management Practices, #6, page 6[4].

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

[5] 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.

downstream; ODEQ 2010 Reissued 700-PM general permit requirements, Schedule C, Special Conditions, Best Management Practices, #4, page 6[4].

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**

    a. Operations that affect existing bridge footings, dams, and other structures in or near the stream are not allowed; ODEQ 2010 Reissued 700-PM general permit requirements, Schedule C, Special Conditions, Best Management Practices, #9, page 6[4].

16. **General equipment restrictions**

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

17. **Fill and removal total a combined ≤25 cubic yards annually per NOI**

    a. Dredging and high banking of only 25 cubic yards or less, means a combined total accounting for ≤25 cubic yards of fill <u>and</u> removal per NOI is allowed ; “(3) Threshold. The activity will remove, fill or move less than twenty-five (25) cubic yards of material annually from or within the bed of streams”, ODSL General Fill and Removal Authorization for Recreational Placer Mining within ESH that is Not Designated SSW, 141-089-0825, Eligibility Requirements (3)[4](ODSL 2011).

18. **Avoidance of invasive species transfer**

    a. 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 permit 700 PM, Schedule C, Special Conditions, Best Management Practices, #14, page 7[4].

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 permit, SB 838 amended regulations.[4]

    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 streambanks 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 streambanks 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.

Operations (pertains to 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 (Timing of In-Water Work to Protect Fish and Wildlife Resources, 2008 or newest version); ODEQ 2010 Reissued 700-PM general permit requirements, Schedule C, Special Conditions, Best Management Practices, #2, page 6[4].

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[4].

22. **One suction dredge per person at one time**

a. Operation of only one suction dredge per person is allowed at a time; ODEQ 2010 Reissued 700-PM general permit requirements, Coverage & Eligibility, #4, page 4[4].

b. In some circumstances, a designated person under supervision of the 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 2010 Reissued 700-PM general permit requirements, Coverage & Eligibility, #4, page 4[4].

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 2010 Reissued 700-PM general permit requirements, Schedule C, Special Conditions, Best Management Practices, #17, page 8[4].

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 RRS; ODEQ 2010 Reissued 700-PM general permit requirements, Schedule C, Special Conditions, Best Management Practices, #10A, page 6[4].

b. Equipment used for suction dredging will not release petroleum products; ODEQ 2010 Reissued 700-PM general permit requirements, Schedule C, Special Conditions, Best Management Practices, #10B, page 6[4].

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 2010 Reissued 700-PM general permit requirements, Coverage & Eligibility, #4, page 4[4].

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**

a. 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.

Habitat protection

b. 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).

c. NOI operator will not remove rocks or large wood from the wetted perimeter to the stream bank or remove off site at any time[6] .

d. 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.

e. NOI operator will not divert the flow of a river or stream into the bank.

26. **Minimum suction dredge spacing**

a. NOI operator must maintain a minimum spacing of at least 500 linear feet of stream channel between suction dredging operations; ODSL removal/fill permit, SB 838

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

amended regulations[4]. 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.

27. **Other equipment restrictions**

    a. Motorized wheeled or tracked equipment is prohibited below the ordinary high water mark; ODEQ 2010 Reissued 700-PM general permit requirements, Schedule C, Special Conditions, Best Management Practices, #12, page 7[4].

    b. NOI operator may not leave unattended motorized equipment within the wetted waterway; ODSL removal/fill permit, SB 838 amended regulations[4].

28. **Extent of visible turbidity**

    a. Suction dredging will not create visible turbidity beyond any point more than 300 feet downstream or down current; ODEQ 2010 Reissued 700-PM general permit requirements, Schedule A, #1, page 5[4].

    b. Visible turbidity will not cover the entire wetted perimeter of the stream; ODEQ 2010 Reissued 700-PM general permit requirements, Coverage & Eligibility, #4, page 4[4].

    c. No visible turbidity is allowed at the point of a drinking water intake; ODEQ 2010 Reissued 700-PM general permit requirements, Schedule C, Special Conditions, Best Management Practices, #11, page 7[4].

    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 2010 Reissued 700-PM general permit requirements, Schedule A, #2, page 5[4].

    e. Where more than one piece of mining equipment operates in the same location, turbidity plumes cannot overlap; ODEQ 2010 Reissued 700-PM general permit requirements, Schedule C, Special Conditions, Best Management Practices, #1, page 6[4].

29. **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 (Timing of ODFW In-Water Work to Protect Fish and Wildlife Resources, 2008 or newest version)[4].

    c. Natural pools may not be filled in.

30. **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.

31. **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.

Operations (pertains to high banking only)

32. **Below ordinary high water level**

High banking *below* the ordinary high water level (OHW) will only occur in large-sized streams[7] (excluding medium-sized streams or smaller) with the following specific conservation measures and buffers as depicted in Figure 5 (schematic drawing of high banking operations buffers to maintain water quality and bank stability):

a. 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 ODFW in-water work schedule (Timing of In-Water Work to Protect Fish and Wildlife Resources, 2008 or newest version)[5]

b. A minimum of a *25 foot buffer* will exist between the wetted stream and all excavated work areas (Figure 5). The 25 foot buffer would ensure that high banking does not crowd the adjacent aquatic habitat in large-sized streams[8] 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.

c. 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 5). The 15 foot buffer would ensure that high banking does not impact or compromise the adjacent stream bank in large-sized streams[8] with less of a flood plain since the toe of a stream bank can imply the water's edge.

d. 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 ordinary high water level) (Figure 5).

e. High banking will not occur when Coho and Chinook salmon spawners or redds are present.

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[7] A large-sized stream is classified for this BA as having an ordinary high water width greater than 70 feet (personal communication between Chris Park, RRS Forest Hydrologist and Susan Maiyo, June 12, 2014).

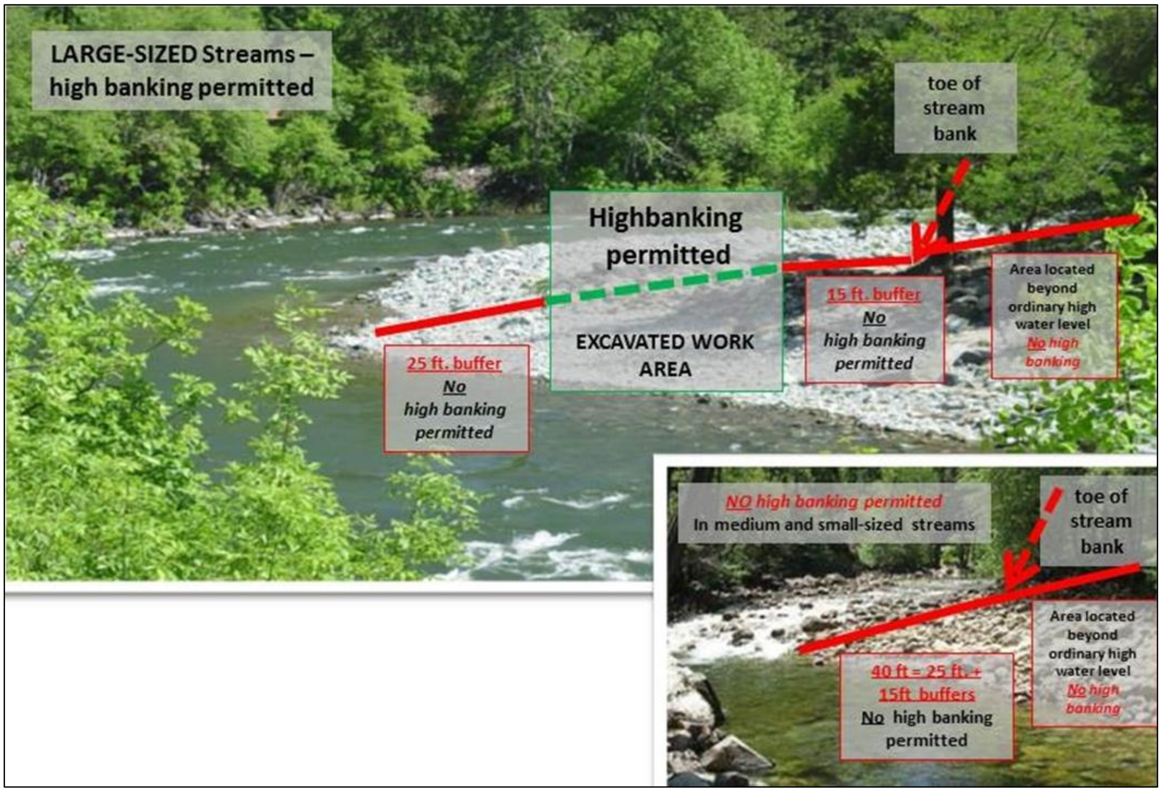

Figure 5. High banking operations: schematic drawing depicting conservation measures #33 b, c and d

33. **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 tailing spread will occur by the end of the in-water work window (Timing of In-Water Work to Protect Fish and Wildlife Resources, 2008 or newest version) established by the ODFW[4].

34. **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.

35. **Riparian vegetation protection**

   a. 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.

36. **Prohibition on water diversion**

   a. Water will not be diverted from streams to enable high banking operations.

37. **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.

38. **Vehicle use of existing fords**

    a. For all operations, the use of existing fords for vehicular access will only occur during the periods set in the ODFW in-water work schedule (Timing of In-Water Work to Protect Fish and Wildlife Resources, 2008 or newest version)[4].

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)

39. **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 RRS to report collected data for the NOI Action Completion Report.

    d. NOI operator will submit NOI Action Completion Report to RRS within *30 days* of completing suction dredging operations.

40. **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 RRS to report collected data for NOI Action Completion Report.

    c. NOI operator will submit a “NOI Action Completion Report” to RRS within 30 days of completing high banking operations.

RRS NOI Monitoring (pertains to both suction dredging and high banking)

41. **The RRS 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.

42. **Monitoring results**

a. Results from monitoring will be reported by the RRS in the RRS Annual NOI Suction Dredging and High Banking Operations Report, CM #8.

Camping - Occupancy (pertains to both suction dredging and high banking)

43. **Woody material**

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

44. **Human waste**

a. 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.

45. **Camp sites**

a. 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**

a. Motorized access will be restricted to existing roads and trails open to other users of NFS lands who are not required to obtain a RRS Special Use Permit, contract or other written authorization.

48. **Riparian areas**

a. 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 RRS 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 operator who submitting a NOI or RRS observes that either 20.a.i. or 20.a.ii. is 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.

III. Description of the Affected Species

A. Fish species under the jurisdiction of the NMFS

Population units can be viewed as a hierarchy of levels of complexity and geographic scope. The highest level in the hierarchy of population units for Coho Salmon on the Oregon coast is the Evolutionarily Significant Unit (ESU) (Waples 1995), developed to help implement the Endangered Species Act (ESA) for salmon. There are two ESUs identified on the Oregon Coast for Coho Salmon, the Oregon Coast ESU and the Southern Oregon/Northern California Coast ESU (Weitkamp et al. 1995). This section examines fish species conditions (listing history and status of listed species in ESA action area) for both of these two ESUs, since a portion of each ESU is in the ESA action area within the RRS.

1. Fish species - Southern Oregon/Northern California Coast Coho Salmon ESU

Listing history. The SONCC Coho Salmon ESU has substantially declined from historic numbers (Weitkamp et al. 1995) and were listed as “threatened” on 6 May 1997 by the National Marine Fisheries Service, then reaffirmed, with protective regulations issued, on 28 June 2005. A final SONCC Coho Salmon recovery plan was completed in 2014 (NMFS 2014).

Location. This ESU includes all naturally spawned populations of Coho Salmon in coastal streams from the Elk River near Cape Blanco, Oregon, to the Mattole River near Punta Gorda, California. This ESU includes small-to-moderate-sized coastal basins, with high quality habitat in the lower reaches of each the three large basins (Rogue, Klamath and Eel). Little habitat is provided by the middle reaches, and the largest amount of habitat is in the upper reaches.

Life history. The life history of the OC and SONCC Coho Salmon are similar except the SONCC ESU contains few estuaries of appreciable size, Klamath Mountains streams generally terminate as flooded river canyons at the ocean. Coho Salmon generally exhibit a relatively predictable 3-year life cycle. Adults typically begin their freshwater spawning migration in the fall, spawn by mid-winter, and then die. The run and spawning times vary between and within populations. Depending on river temperatures, eggs incubate in ‘‘redds’’ (gravel nests excavated by spawning females) for 1.5 to 4 months before hatching as ‘‘alevins’’ (a larval life stage dependent on food stored in a yolk sac). Following yolk sac absorption, alevins emerge from the gravel as young juveniles or “fry’’ and begin actively feeding. Juveniles rear in fresh water for up to 15 months, then migrate to the ocean as ‘‘smolts’’ in the spring. Coho Salmon typically spend 2 growing seasons in the ocean before returning to their natal stream to spawn as 3 year-olds. Some precocious males, called ‘‘jacks,’’ return to spawn after only 6 months at sea (NMFS 2014).

Table 5 depicts the typical SONCC Coho Salmon life cycle timelines (Lestelle 2007). There are a few exceptions to the typical life cycle timelines, such as upstream adult migration. Returning migrating adults in populations at the southern end of the range (both California and southern Oregon) are sometimes stalled in their river entry due to a typical lack of rainfall and sufficient stream flow in the fall and early winter for upstream migration. This can result in delaying spawning, sometimes even delaying spawning into March. Factors controlling variability in maturation timing of Coho Salmon are not well known (Lestelle 2007).

Table 5. Typical SONCC Coho Salmon life-cycle timeline

Life-Cycle Stage	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Adult migration		■	■	■	■	■						
Adult spawning		■	■	■	■	■						
Eggs/fry emerge					■	■	■	■				
Fingerlings/ rearing	■	■	■	■	■	■	■	■	■	■	■	■
Smolt out migration							■	■	■	■		

Note: Shading indicates presence at the life-cycle month stage.

In-water work periods and Coho Salmon life stages. ODFW established in-water work periods to avoid the vulnerable life stages of multiple species of fish including migration, spawning and rearing. Egg incubation through fry emergence from redds is the stage determined to be most vulnerable, the eggs and sac fry being in redds (gravel) and non-mobile. The ODFW in-water work period is outside of the period when eggs and sac fry reside in the gravel as displayed in the ODFW life-cycle timing tables. Table 6 displays the latest ODFW 2008 in-water work period derived from their website (ODFW 2014a). The ODFW life-cycle timing tables for specific waterways within the state of Oregon can be found on their website (ODFW 2014b).

It should be noted that the timing of typical SONCC Coho Salmon life stages can slightly vary within the SONCC ESU. The life stages usually fall outside of the ODFW in-water work period with the exception of juvenile rearing which occupy the area year-round. In two of the waterways on the RRS, the 2003 ODFW life-cycle timing periodicity tables specifically for Rogue River tributaries above Marial and Rogue River tributaries below Marial (ODFW 2014b) depicts an overlap of the SONCC Coho Salmon upstream adult migration timing with the 2008 ODFW in-water work period (ODFW 2014a) end dates (two weeks overlap starting September 1st and six weeks overlap starting August 15th, respectively). The possibility of SONCC Coho Salmon adults being present during the latter part of the in-water period is rare since fall freshets generally occur in October and draw adults upstream in southwest Oregon (Lestelle 2007). All of the waterways have juvenile salmonid rearing occurring during the ODFW in-water work period.

In a few of the waterways on the RRS, the ODFW 2003 life-cycle timing periodicity tables specifically for the Illinois River and its tributaries and Rogue River tributaries above Marial (ODFW 2014b) depict an overlap of the SONCC Coho Salmon out-smolt migration timing with the 2008 ODFW in-water work period (ODFW 2014a) end dates (2 weeks and 4 weeks overlap starting June 15th respectively).

Table 6. ODFW In-water work period for SONCC Coho Salmon waterways within the RRS

Timing of In-water Work to Protect Fish and Wildlife Resources, (ODFW 2008)		**SONCC Coho Salmon waterways on NFS lands within RRS**		
Waterway	**In-water Work Period**	**OC Coho Salmon Population**	**Subbasin**	**Watershed (5th field)**
Applegate River	July 1st – September 15th	Middle Rogue/ Applegate rivers	Applegate	Lower, Middle and Upper Applegate rivers
Chetco River (above Tide Rock)	July 15st – September 30th	Chetco River	Chetco	Chetco River
Elk River (above Hwy 101 bridge)	July 15st – September 30th	Elk River	Sixes	Elk River
Illinois River	June 15th – September 15th	Illinois River	Illinois	Althouse Creek Briggs Creek Deer Creek East Fork Illinois River Indigo Creek Josephine Creek-Illinois River Klondike Creek-Illinois River Lawson Creek-Illinois River Silver Creek Sucker Creek West Fork Illinois River
Smith River[1]	July 15th – September 30th	Smith River	Smith	North Fork Smith River
Pistol River (above County bridge)	July 15st – September 30th	Pistol River	Chetco	Pistol River
Rogue River tributaries (above Marial)	June 15thst – September 15th	Middle Rogue/ Applegate rivers	Lower Rogue	Hellgate Canyon-Rogue River
		Upper Rogue River	Middle Rogue	Bear Creek
		Upper Rogue River	Upper Rogue	Elk Creek Little Butte Creek

Timing of In-water Work to Protect Fish and Wildlife Resources, (ODFW 2008)		SONCC Coho Salmon waterways on NFS lands within RRS		
Waterway	**In-water Work Period**	**OC Coho Salmon Population**	**Subbasin**	**Watershed (5th field)**
Rogue River tributaries (below Marial)	July 15st – September 30th	Lower Rogue River	Lower Rogue	Lobster Creek Rogue River
		Middle Rogue/ Applegate rivers	Lower Rogue	Shasta Costa Creek-Rogue River Stair Creek-Rogue River
Winchuck River (above South Fork)	July 15st – September 30th	Winchuck River	Chetco	Winchuck River

[1] Smith River in Oregon – The instream work period for the North Smith River in Oregon is not delineated on the “OREGON GUIDELINES FOR TIMING OF IN-WATER WORK TO PROTECT FISH AND WILDLIFE RESOURCES” (ODFW 2008). ODFW District Fish Biologist, Todd Confer, stated that the in-water work period for the North Fork Smith River is similar to the Chetco subbasin, July 15th – September 30th, along with a similar life-cycle timeline (personal communication between Todd Confer and Susan Maiyo, May 27, 2014).

Diversity of SONCC Coho Salmon. Although Williams et al. (2006) recognized 43 non-ephemeral populations in the ESU, due to subsequent modifications to the IP-km for several populations this recovery plan considers 40 non-ephemeral populations. 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. This ESU includes the progeny of three artificial propagation programs (NMFS 2012b).

SONCC Coho Salmon populations in the ESA action area. SONCC Coho Salmon populations within the RRS are included in Table 7. Williams et al. (2006) classified populations as dependent or independent based on their historic 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 (FI) and potentially independent (PI). Core population types are independent populations judged most likely to become viable quickest. Non-core population types are independent populations judged to have lesser potential for rapid recovery than the core populations. 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; Williams et al. 2006; NMFS 2012b).

Table 7. SONCC Coho Salmon populations on NFS lands within RRS

Stratum	Population	Population Type
Northern Coastal Basin	Chetco River	Core, Functioning Independent
	Elk River	Core, Functioning Independent
	Lower Rogue River	Non-Core, Potentially Independent
	Pistol River	Core, Functioning Independent
	Winchuck River	Non-Core, Potentially Independent
Interior Rogue River Basin	Illinois River[1]	Core, Functioning Independent
	Middle Rogue/Applegate Rivers	Non-Core, Functioning Independent
	Upper Rogue River	Core, Functioning Independent
Central Coastal Basin	Smith River[1]	Non-Core, Functioning Independent

[1] Populations that also occur partly in California.

Limiting Factors for SONCC Coho Salmon. Threats from natural or man-made factors have worsened in the past 5 years, primarily due to four factors: small population dynamics, climate change, multi-year drought, and poor ocean survival conditions (NMFS 2012b; NMFS 2011a). Limiting factors include:

- Impaired water quality, altered sediment supply, altered hydrologic function (timing of volume of water flow), lack of floodplain and channel structure;
- Impaired estuary/mainstem function and, degraded riparian forest conditions;
- Increased disease/predation/competition, barriers to migration, adverse fishery-related effects and adverse hatchery-related effects.

2. Fish species - Oregon Coast Coho Salmon ESU

Listing history. The Oregon Coast Coho Salmon ESU was listed as threatened on August 10, 1998 (63 FR 42587). This listing was reevaluated and NMFS determined listing OC Coho Salmon was not warranted on January 17, 2006. The listing was once again reevaluated and

NMFS determined a listing of threatened was warranted on February 4, 2008 (73 FR 7816) with final protective regulations issued on February 11, 2008 (73 FR 7816). On April 28, 2009, NMFS announced that it was initiating a status review of OC Coho Salmon. On May 26, 2010, NMFS affirmed the listing of the OC Coho Salmon as Threatened (75 FR 29489). The NMFS issued a final determination to retain the threatened listing for OC Coho Salmon on June 20, 2011 (76 FR 35755).

Location. The OC ESU includes Oregon coastal streams south of the Columbia River and north of Cape Blanco, Oregon. The area covers cities along the coast and inland, including Tillamook, Lincoln City, Newport, Florence, Coos Bay, Powers and Roseburg. There are private forest lands and agricultural lands within the ESU.

Life history. The life history of the OC and SONCC Coho Salmon are similar to each other except that the OC ESU contains estuaries of appreciable size compared to SONCC ESU. Estuaries present in the OC ESU may provide better acclimation habitats for out-migrating smolts.

Most Coho Salmon across the species' geographic range have a three-year life cycle, divided about equally between time spent in fresh and salt water (Sandercock 1991). The typical basic life history for Coho Salmon begins in natal streams when spawners mate and deposit eggs into nests dug in the stream substrate. Spawning typically occurs between mid-autumn and early winter in small tributaries to larger rivers. After spawning, the adults die. Following egg incubation, surviving fry emerge from the substrate in late winter and spring and begin their free swimming life. The emergent fry move quickly to slow velocity, quiescent waters, usually along the stream's margins or into backwaters where velocities are minimal, a consistent behavior across the species range. This affinity for slow velocity areas remains characteristic of juvenile Coho Salmon throughout their freshwater life, unlike most other salmonid species (Lestelle 2007).

Table 8 depicts the typical OC Coho Salmon life cycle timelines (Lestelle, 2007). There are a few exceptions to the typical life cycle timelines, such as upstream adult migration. Returning migrating adults in populations at the southern end of the range (both California and southern Oregon) are sometimes stalled in their river entry due to a typical lack of rainfall and sufficient stream flow in the fall and early winter for upstream migration. This can result in delaying spawning, sometimes even delaying spawning into March. Factors controlling variability in maturation timing of Coho Salmon are not well known (Lestelle 2007).

Table 8. Typical OC Coho Salmon life-cycle timelines

Life-Cycle Stage	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Adult migration		■	■	■	■	■						
Adult spawning		■	■	■	■	■						
Eggs/fry emerge					■	■	■	■				
Fingerlings/ rearing	■	■	■	■	■	■	■	■	■	■	■	■
Smolt out migration							■	■	■	■		

Note: Shading indicates presence at the life-cycle month stage.

In-water work periods and Coho Salmon life stages. ODFW established in-water work periods to avoid the vulnerable life stages of multiple species of fish including migration, spawning and rearing. Egg incubation through fry emergence from redds is the stage determined to be most vulnerable, due to eggs and sac fry being in redds (gravel) and non-mobile. The ODFW timing of the in-water work period is outside of this vulnerable stage as displayed in the ODFW life-cycle timing tables. Below is the latest ODFW 2008 in-water work period (Table 9), derived from their website (ODFW 2014a). The ODFW life-cycle timing tables for specific waterways within the state of Oregon can be found on their website (ODFW 2014b).

It should be noted that the typical OC Coho Salmon life cycle stage timing can slightly vary within the OC ESU. The life stages usually fall outside of the ODFW in-water work period with the exception of juvenile rearing which occupy the area year-round. In a few of the waterways on the RRS, the 2003 ODFW life-cycle timing periodicity tables specifically for Coquille River and its tributaries (ODFW 2014b) depicts an overlap of the OC Coho Salmon upstream adult migration timing with the 2008 ODFW in-water work period end dates (ODFW website 2014a) (two week overlap starting September 1st). The possibility of OC Coho Salmon adults being present during the latter part of the in-water period is rare since fall freshets generally occur in October and draw adults upstream in southwest Oregon (Lestelle 2007). All of the waterways have juvenile salmonid rearing occurring during the ODFW in-water work period.

Table 9. ODFW In-water work period for OC Coho Salmon waterways within the RRS

Timing of In-water Work to Protect Fish and Wildlife Resources, (ODFW 2008)		OC Coho Salmon waterways on NFS lands within RRS		
Waterway	**In-water Work Period**	**OC Coho Salmon Population**	**Subbasin**	**Watershed (5th field)**
Coquille River and tributaries	July 1st – September 15th	Coquille	Coquille	South Fork Coquille River
Sixes River (above Hwy. 101 bridge)	July 15st – September 30th	Sixes	Sixes	Sixes River

Diversity of OC Coho Salmon. OC Salmon populations have improved due to the reduction of commercial fishing, hatchery fish production and recent efforts in several coastal estuaries to restore lost wetlands. However, OC Coho Salmon diversity, considering genetics, life history, and habitat availability is lower than it was historically due to decreases in available freshwater and tidal habitats and restriction of genetic diversity from very low returns over the past 20 years.

OC Coho Salmon populations in the ESA action area. Fifty-six OC Coho Salmon populations within the boundaries of the Oregon Coast ESU were identified in the Population Assessment: Oregon Coast Coho Salmon ESU paper (Lawson et al. 2007). There are two populations of OC Coho Salmon on NFS lands within the RRS (Table 10). Williams et al. (2006) classified fish populations as dependent or independent based on their historic population size. Populations that historically would have had a high likelihood of persisting in isolation from neighboring populations for 100 years are rated as functionally independent (FI) or potentially independent (PI) (McElhany et al. 2000, Lawson et al. 2007).

Table 10. OC Coho Salmon populations on NFS lands within the RRS

Stratum	Population	Population Type
Mid-South Coast	Coquille River	Functionally Independent
	Sixes River	Potentially Independent

Limiting factors for OC Coho Salmon. Limiting factors as described by NMFS (2011b) and Stout et al. (2012) are summarized below:

- Degraded freshwater habitat: floodplain connectivity and function, fish passage connectivity, channel structure and complexity, riparian areas and large wood supply, stream substrate, stream flow, and water quality have been degraded as a result of cumulative impacts of agriculture, forestry, instream mining, dams, road crossings, and dikes, levees, etc.
- Adverse climate, altered past ocean/marine productivity, and current ocean ecosystem conditions have favored competitors and predators and reduced salmon survival rates in freshwater rivers and lakes, estuaries, and marine environments.

3. Fish species - Pacific Eulachon (*Thaleichthys pacificus*) – Southern Distinct Population Segment (DPS)

Listing history. In 1999, NOAA Fisheries was petitioned to list Columbia River eulachon under the ESA. In November 1999, NMFS issued a finding that the petition did not present substantial scientific information indicating the petitioned action may be warranted (64 FR 66601; November 29, 1999).

On November 8, 2007, NMFS received another petition to list southern eulachon under the ESA. The petition sought delineation of a southern eulachon "Distinct Population Segment" (DPS) extending from the U.S.-Canada border south to include populations in Washington, Oregon, and California. In March 2008, NMFS determined that the petition presented substantial scientific and commercial information indicating the petitioned action may be warranted, and initiated a status review.

On March 18, 2010, NMFS listed the Southern DPS of eulachon as threatened under the ESA, 75 FR 13012. NMFS has not issued protective regulations for eulachon.

Location. The southern distinct population segment of eulachon occurs in four salmon recovery domains: Puget Sound, the Willamette and Lower Columbia, Oregon Coast, and Southern Oregon/Northern California Coasts. The ESA-listed population of eulachon includes all naturally-spawned populations that occur in rivers south of the Nass River in British Columbia to the Mad River in California. Core populations for this species include the Fraser River, Columbia River and (historically) the Klamath River. Eulachon leave saltwater to spawn in their natal streams late winter through early summer, and typically spawn at night in the lower reaches of larger rivers fed by snowmelt. Eulachon movements in the ocean are poorly known although the amount of eulachon bycatch in the pink shrimp fishery seems to indicate that the distribution of these organisms overlap in the ocean.

Life history. The best available scientific evidence suggests that adult eulachon are semelparous and enter freshwater and estuarine areas only to spawn, and after spawning the adult fish die (Hay et al., 2002; Gustafson et al., 2010). Eulachon eggs develop at or near the point they were spawned, and larval eulachon typically out-migrate via the same routes that adult spawners took to reach the spawning area. The best available evidence suggests that freshwater and estuarine areas are only used by eulachon for spawning activities (i.e. spawning migration, spawning, egg incubation and larval outmigration).

Eulachon eggs hatch in 20 to 40 days with incubation time dependent on water temperature (Smith and Saalfeld, 1955; Langer et al., 1977). Shortly after hatching, the larvae are carried downstream and dispersed by estuarine, tidal, and ocean currents. Larval eulachon may remain in low salinity, surface waters of estuaries for several weeks or longer (Hay and McCarter, 2000) before entering the ocean. Eulachon typically spend several years in salt water before returning to fresh water as a ‘‘run’’ to spawn from late winter through early summer. Spawning grounds are typically in the lower reaches of larger rivers fed by snowmelt (Hay and McCarter, 2000). In many rivers, spawning is limited to the part of the river that is influenced by tides (Lewis et al., 2002), but some exceptions exist.

Eulachon larvae and juveniles eat a variety of prey items, including phytoplankton, copepods, copepod eggs, mysids, barnacle larvae, and worm larvae (Barraclough, 1967; Barraclough and Fulton, 1967; Robinson et al., 1968a, 1968b). Eulachon adults do not feed during spawning (McHugh, 1939; Hart and McHugh, 1944).

Diversity of Pacific Eulachon. Within the conterminous U.S., most eulachon production originates in the Columbia River Basin and the major and most consistent spawning runs return to the Columbia River mainstem and Cowlitz River (USDC 2013). Adult eulachon have been found at several Washington and Oregon coastal locations, and they were previously common in Oregon’s Umpqua River and the Klamath River in northern California. Runs occasionally occur in many other rivers and streams but often erratically, appearing some years but not in others and only rarely in some river systems (Hay and McCarter 2000, Willson et al. 2006, Gustafson et al. 2010).

Eulachon populations in the ESA action area. Currently the Rogue population of the DPS is considered a spawning population (NMFS 2010). Wilson et al. (2006) also lists the Chetco River as a spawning population. The eulachon inhabit the Rogue River estuary, and have been found in seining activities a few miles above the head of tide (Todd Confer, personal communication). Eulachon use the estuary for rearing, and spawn in the lower few miles of the Rogue River. They are broadcast spawners, and the eggs settle on the substrate. Spawning runs occur in February in the Russian River in California to the south and in January through March in the Columbia River in Oregon to the North (Willson et al 2006). It is likely that the spawning runs in the Rogue River and Chetco River Oregon would occur in closer to February. Larvae hatch out of the eggs based on temperature. But in 6.5˚C-9˚C in the Columbia River system, they hatch after approximately 3 weeks (Willson et al 2006). This temperature range will be similar on the Rogue River as well. For other estuaries in the ESA action area, the status of southern DPS eulachon is either (1) unknown (Winchuck River, Pistol River, Elk River, Sixes River, Coquille River; Gustafson et al. 2010) or (2) rare (Smith River; Gustafson et al. 2010).

Limiting factors. Limiting factors include (Gustafson et al. 2011; Gustafson et al. 2010; NOAA Fisheries

- Changes in ocean conditions due to climate change, particularly in the southern portion of its range where ocean warming trends may be the most pronounced and may alter prey, spawning, and rearing success.
- Climate-induced change to freshwater habitats, dams and water diversions (particularly in the Columbia and Klamath Rivers where hydropower generation and flood control are major activities)
- Bycatch of eulachon in commercial fisheries
- Adverse effects related to dams and water diversions
- Artificial fish passage barriers
- Increased water temperatures, insufficient streamflow
- Altered sediment balances
- Water pollution
- Over-harvest
- Predation

4. Fish species – Green Sturgeon (Acipenser medirostris) – southern DPS

Listing history. After completion of a study of its status (Adams et al., 2002) in 2002, NMFS determined that the Green Sturgeon is comprised of two DPSs that qualify as species under the ESA, but that neither warranted listing as threatened or endangered (68 FR 4433). Uncertainties in the structure and status of both DPSs led NMFS to add them to the Species of Concern List (69 FR 19975).

The "not warranted" determination was challenged in April 2003. NMFS produced an updated status review in February 2005 and proposed that the Southern DPS should be listed as threatened under the ESA. NMFS published a final rule in April 2006 listing the Southern DPS as threatened (71 FR 17757).

In September 2008, NMFS proposed critical habitat for the Southern DPS. In October 2009, NMFS published the final rule to designate critical habitat. In May 2009, NMFS proposed a 4(d) rule to apply ESA take prohibitions to the Southern DPS. NMFS published the final 4(d) rule in June 2010 (75 FR 30714).

Location. This species is found along the west coast of Mexico, the United States, and Canada. Green Sturgeon are the most broadly distributed, wide-ranging, and most marine-oriented species of the sturgeon family. The Green Sturgeon ranges from Mexico to at least Alaska in marine waters, and is observed in bays and estuaries up and down the west coast of North America (Moyle et al., 1995).

The actual historical and current distribution of where this species spawns is unclear as Green Sturgeon make non-spawning movements into coastal lagoons and bays in the late summer to fall, and because their original spawning distribution may have been reduced due to harvest and other anthropogenic effects.

Green Sturgeon are believed to spawn in the Rogue River, Klamath River Basin, and the Sacramento River. Spawning appears to rarely occur in the Umpqua River. Green Sturgeon in the South Fork of the Trinity River were thought extirpated (Moyle, 2002), but juveniles captured at Willow Creek on the Trinity River (Scheiff et al., 2001) suggest that the fish could be coming from either the South Fork or the Trinity River (Adams et al., in press). Green Sturgeon appear to occasionally occupy the Eel River.

Life history. Green Sturgeon are long-lived, slow-growing fish, and are the most marine-oriented of the sturgeon species. Mature males range from 4.5-6.5 feet (1.4-2 m) in "fork length" and do not mature until they are at least 15 years old (Van Eenennaam 2002), while mature females range from 5-7 feet (1.6-2.2 m) fork length and do not mature until they are at least 17 years old. They can weigh up to 350 pounds (160 kg). Maximum ages of adult Green Sturgeon are likely to range from 60-70 years (Moyle, 2002).

Green Sturgeon are believed to spend the majority of their lives in nearshore oceanic waters, bays, and estuaries. Younger Green Sturgeon reside in fresh water, with adults returning to freshwater to spawn when they are about 15 years of age and more than 4 feet (1.3 m) in size. Spawning is believed to occur every 2-5 years (Moyle, 2002). Adults typically migrate into fresh water beginning in late February, and spawning occurs from March-July, with peak activity from April-June (Moyle et al., 1995). Females produce 60,000-140,000 eggs (Moyle et al., 1992). Juvenile Green Sturgeon spend a few years in fresh and estuarine waters before they leave for saltwater. They then disperse widely in the ocean. The only feeding data noted is on adult Green Sturgeon shows that they are eating "benthic" invertebrates including shrimp, mollusks, amphipods, and even small fish (Moyle et al., 1992).

Diversity of Green Sturgeon. Green Sturgeon utilize both freshwater and saltwater habitat. Green Sturgeon spawn in deep pools or "holes" in large, turbulent, freshwater river mainstems (Moyle et al., 1992). Specific spawning habitat preferences are unclear, but eggs likely are broadcast over large cobble substrates, but range from clean sand to bedrock substrates as well (Moyle et al., 1995). It is likely that cold, clean water is important for proper embryonic development. Adults live in oceanic waters, bays, and estuaries when not spawning. Green Sturgeon are known to forage in estuaries and bays ranging from San Francisco Bay to British Columbia.

Green Sturgeon populations in the ESA action area. This DPS includes all Green Sturgeon populations south of the Eel River, California. The Rogue River population of Green Sturgeon is part of the Northern DPS. The Northern DPS is not federally listed, and thus does not require consultation under the Endangered Species Act. Some Southern DPS sturgeon are known to stray into the Rogue River, though their distribution is limited to the tidal influence zone, which is approximately 5 miles downstream of USFS lands. The action area is used by adult and subadult SDPS Green Sturgeon from June until October as habitat for growth, feeding, development to adulthood, and migration (Moser and Lindley 2007). Southern DPS sturgeon do not spawn within the Rogue River. This document will disclose effects to Southern DPS individuals.

Limiting factors. The principal factor in the decline of the Southern DPS is reduction of the spawning area to a limited section of the Sacramento. Other threats to the Southern DPS include:

- insufficient freshwater flow rates in spawning areas,
- contaminants (e.g., pesticides)
- bycatch of Green Sturgeon in fisheries
- potential poaching (e.g., for caviar)
- entrainment by water projects
- influence of exotic species
- small population size
- impassable barriers
- elevated water temperatures

B. Critical habitat

This section examines critical habitat conditions for Coho Salmon in the OC and SONCC ESUs. CCH is defined in Section 3(5)(A) of the ESA as "the specific areas within the geographical area occupied by the species ... on which are found those physical or biological features essential to the conservation of the species and which may require special management considerations or protection." The NMFS has not designated critical habitat for Southern DPS Green Sturgeon or Pacific Eulachon, or issued protective regulations under section 4(d) of the ESA within the ESA action area.

1. Critical habitat - Southern Oregon/Northern California Coast Coho Salmon ESU

Listing history. SONCC Coho Salmon CH was designated (64 FR 24049, May 5, 1999) to include all river reaches accessible to Federally listed Coho Salmon between Cape Blanco, Oregon, and Punta Gorda, California.

Location. Accessible reaches are 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 specific dams or above long-standing, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years). SONCC CH consists of the water, substrate, and adjacent riparian zones of estuarine and riverine reaches (including off-channel habitats). The SONCC Coho Salmon ESU contains significant populations of Coho Salmon including the Elk River, Rogue River, Chetco River, Illinois River, Smith River and Klamath River (Table 11).

Habitat summary. The habitat between the OC and SONCC Coho salmon are similar except the SONCC ESU contains few estuaries of appreciable size and the channels tend to be more confined and steeper due to the nature of the Klamath Mountains. A unique freshwater habitat requirement of Coho Salmon juveniles is their reliance on off channel, alcove, slough, beaver pond or similar slow water habitats during the winter. They exhibit less torpor than other salmonids during cold water periods. Coho Salmon are closely tied to interior and coastal unconfined valley stream habitat. In the SONCC ESU, the interior valleys of the Rogue River and Klamath River are primary habitats. Historic Coho Salmon freshwater habitat, summer and winter, was located in alluvial valleys (Frissell et al., 1986) with wide meander belts (Rosgen 1994) and alluviated canyons (Frissell and Liss 1986) with low terraces and side channels.

Changes during the past 150 years in summer flows and stream temperatures due to land uses has caused Coho Salmon to spawn and rear more successfully in upper stream reaches rather than in historic habitats in lower valley stream reaches.

Coho Salmon freshwater habitat has been greatly altered by agriculture, forestry and urbanization disturbance. Low gradient stream flats were generally the first riparian and stream areas to be developed by early settlers for roads, logging and agriculture. Riparian areas in these unconstrained stream segments were cleared of large trees in the late nineteenth century. Subsequently, these streams often downcut and abandoned much of their historic floodplain. These actions greatly reduced off channel, alcove, slough and beaver-influenced habitats in rivers and streams. These habitat changes affected all salmonid species in coastal Oregon, with Coho Salmon being particularly affected due to their affinity for these low gradient valley bottom stream reaches. Because Coho Salmon are fall spawners, their eggs are vulnerable to bedload shifts and sedimentation of gravel beds. For details of specific habitat indicators by watershed, see Chapter IV. ESA action area and environmental baseline.

Table 11. SONCC Coho Salmon designated critical habitat within NFS lands on the RRS

Subbasin	Population	Watershed	SONCC Coho Salmon Critical Habitat	
			Watershed (miles)[1]	RRS NFS lands within watershed (miles)[2]
Applegate	Middle Rogue/Applegate	Lower Applegate River	81.3	10.1
		Middle Applegate River	43.3	0
		Upper Applegate River	30.2	14.1
Chetco	Chetco River	Chetco River	155.4	106
	Pistol	Pistol	49.6	15.4
	Winchuck	Winchuck	50.4	34.0
Illinois	Illinois River	Althouse Creek	14.2	3.7
		Briggs Creek	0.7	0.7
		Deer Creek	56.4	2.6
		East Fork Illinois River	32.0	12.8
		Indigo Creek	30.3	30.3
		Josephine Creek-Illinois River	49.4	37.7
		Klondike Creek-Illinois River	42.7	42.7
		Lawson Creek- Illinois River	20.8	16.4
		Silver Creek	22.1	22.1
		Sucker Creek	29.8	12.1
		West Fork Illinois River	57.4	25.8
Lower Rogue	Lower Rogue	Lobster Creek	27.0	16.1
		Rogue River	51.8	26.6
Lower Rogue	Middle Rogue/Applegate	Hellgate Canyon-Rogue River	68.4	14.4
		Shasta Costa Creek-Rogue River	22.1	22.1
		Stair Creek-Rogue River	17.3	17.3

Subbasin	Population	Watershed	SONCC Coho Salmon Critical Habitat	
			Watershed (miles)[1]	RRS NFS lands within watershed (miles)[2]
Middle Rogue	Upper Rogue	Bear Creek	86.7	12.1
Sixes	Sixes	Elk River	58.6	36.8
Smith	Smith	North Fork Smith River	55.8	38.7
Upper Rogue	Upper Rogue	Elk Creek	53.7	9.5
		Little Butte Creek	78.0	13.6
		Total	**1,285.4**	**593.7**

[1] Values based on a combination of RRS 2013 SONCC Coho Salmon delineated designated CH and ODFW steelhead presence survey data 2013 GIS map (as a surrogate for historic Coho Salmon habitat) website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[2] Steelhead presence surveys were used to determine historic Coho Salmon habitat since Coho Salmon designated CH was not spatially delineated in the Federal Register (64 FR 24049, May 5, 1999). Values based on GIS data layer entitled RRS 2013 Total Coho Salmon Distribution and field knowledge.

Primary constituent elements. The list of primary constituent elements (PCEs) essential for the conservation of the SONCC Coho Salmon ESU includes spawning sites, food resources, water quality and quantity, and riparian vegetation (64 FR 24050, May 5, 1999) (Table 12). Specifically, the adjacent riparian area is defined as the area adjacent to a stream that provides the following functions: shade, sediment, nutrient or chemical regulation, stream bank stability, and input of large woody debris or organic matter. NOAA Fisheries defines 10 essential habitat features to include substrates, water quality, water quantity, water temperature, water velocity, cover/shelter, food, riparian vegetation, space, and safe passage conditions (64 FR 24059, May 5, 1999).

Table 12. PCEs of critical habitat designated for SONCC Coho Salmon

Primary Constituent Elements		
Site Type	**Site Attribute**	**Species Life History Event**
Spawning and juvenile rearing areas	Cover/shelter Food (juvenile rearing) Riparian vegetation Space Spawning gravel Water quality (temperature) Water quantity Water temperature	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 Fry/parr/smolt growth, development, and seaward migration
Areas for growth and development to adulthood	Ocean areas - Not applicable to RRS actions	

2. Critical habitat - Oregon Coast ESU

Listing history. OC Coho Salmon critical habitat was designated on February 11, 2008 (73 FR 7816).

Location. This ESU has many large and small rivers that support significant populations of Coho Salmon. Rivers on NFS lands within the RRS with significant populations of OC Coho Salmon include the Coquille and Sixes Rivers (Table 13). The lateral extent of OC Coho Salmon designated CH is limited to the ordinary high water mark (i.e., bankfull elevation). The South

Fork Coquille River within the RRS, though occupied by OC Coho Salmon, is exempt from critical habitat designation due to economic benefits of exclusion outweighing the benefits of designation as determined in 50 CFR Parts 223 and 226 (NMFS 2008). OC Coho Salmon designated CH habitat ends at the town of Powers, six miles below the confluence of Coal Creek and the South Fork Coquille River.

Table 13. OC Coho Salmon designated critical habitat within NFS lands on the RRS

Subbasin	Population	Watershed	Coho Salmon Critical Habitat	
			Watershed (miles)[1]	RRS NFS lands within watershed (miles)2
Coquille	Coquille	South Fork Coquille River[1]	96.2	0
Sixes	Sixes	Sixes River	67.5	14.4
		Total	**163.7**	**14.4**

[1] The South Fork Coquille River within the RRS, though occupied by OC Coho Salmon, is exempt from critical habitat designation due to economic benefits of exclusion outweighing the benefits of designation as per the Federal Register (73 FR 7816, February 11, 2008).

Habitat summary. The State of Oregon’s assessment of OC Coho Salmon populations (Nicholas et al. 2005) mapped streams with high intrinsic potential (IP) for rearing by land ownership categories. Intrinsic potential is derived from a part of the Coastal Landscape and Modeling Study (CLAMS) by a group of scientist who examined how salmon-habitat potential was distributed relative to current and future (100 years) landscape characteristics in the Coastal Province of Oregon, USA. The IP to provide high-quality rearing habitat was modeled for juvenile Coho Salmon (*Oncorhynchus kisutch*) and juvenile steelhead (*O. mykiss*) based on stream flow, valley constraint, and stream gradient (Burnett, et al 2007).

Agricultural lands and private industrial forests have by far the highest percentage of land ownership with high intrinsic potential Coho Salmon stream reaches. Federal lands have only about 10% of high intrinsic potential stream reaches within the ESU. Overall, only 20% of Coho Salmon stream miles reside on Federal lands within the ESU. Because of the high percentage of rearing and occurrence of OC Coho Salmon populations located in agricultural and private land ownership, activities in lowland agricultural areas are particularly important to the conservation of OC Coho Salmon.

The OC Coho Salmon assessment summarized that at the scale of the entire ESU, 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. Amounts of large wood in streams are low relative to reference conditions. Amounts of fine sediment were high in 75% of monitoring areas, and were comparable to reference conditions only on public lands.

For details of specific habitat indicators by watershed, see Chapter IV (ESA action area and Environmental Baseline).

Primary constituent elements. NMFS developed a list of primary constituent elements (PCEs) (73 FR 7816, February 11, 2008) that are essential for the conservation of OC Coho Salmon (Table 14). The PCEs are based on the life history of the Coho Salmon and include freshwater spawning sites, freshwater rearing sites, freshwater migration corridors, estuarine areas, nearshore marine areas, and offshore marine areas. PCEs and OC Coho Salmon distribution data were used to delineate the spatial extent of EFH. The lateral extent of this designation is limited to the ordinary high water mark (i.e., bankfull elevation).

Table 14. PCEs of critical habitat designated for OC Coho Salmon

Primary Constituent Elements		
Site Type	**Site Attribute**	**Species Life History Event**
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/par/smolt growth and development
Freshwater migration	Free of artificial obstruction Natural cover Water quality Water quantity	Adult sexual maturation Adult upstream migration Fry/parr/smolt growth, development, and seaward migration
Estuarine areas	Not applicable to RRS actions	
Nearshore marine area	Not applicable to RRS actions	
Offshore marine areas	Not applicable to RRS actions	

C. Essential fish habitat

Overview. This section examines EFH conditions for Coho and Chinook salmon on NFS lands within the RRS. This section also examines EFH conditions for groundfish and coastal pelagic species within estuaries, located off NFS lands within the ESA action area. The final rule for EFH under the Magnuson-Stevens Fishery Conservation and Management Act (16 USC. 1855(b) in accordance with the Sustainable Fisheries Act of 1996 (Public Law 104-267), was published in the Federal Register on January 17, 2002 (67 FR 2343). These rules are pertinent to Coho and Chinook salmon habitat within the Southern Oregon Coastal Basin and Pacific groundfish & coastal pelagics within the estuaries. Essential fish habitat has been defined by NMFS as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." (67 FR 2343, January 17, 2002). This definition includes all waters historically used by anadromous salmonids of commercial value.

Coho and Chinook salmon habitat indicators addressed in this BA that are pertinent to PCEs, described above, also represent aquatic habitat health for EFH. Therefore, EFH miles reflect Coho Salmon critical habitat miles in Table 11and Table 13 except for those miles within the South Fork Coquille River[8]. Miles of Chinook Salmon habitat are generally equal to or less than

[8] The South Fork Coquille River watershed within the RRS, though occupied by OC Coho Salmon, is exempt from critical habitat designation due to economic benefits of exclusion outweighing the benefits of designation as per the Federal Register (73 FR 7816, February 11, 2008). In lieu of Coho Salmon designated CH in this watershed, current and historic miles are used for analysis and equate to EFH miles of 96.2 miles.

Coho Salmon miles and are represented in the Coho Salmon designated CH miles. Chinook Salmon require larger streams for spawning, often low in a watershed. Coho Salmon usually migrate upstream of Chinook Salmon spawning areas to spawn in smaller tributaries. Analysis of effects on Coho Salmon designated critical habitat will also effectively analyze effects on EFH within the watershed.

The Pacific Fishery Management Council (PFMC) described and identified EFH for groundfish (PFMC 2005), coastal pelagic species (PFMC 1998), and Chinook Salmon, Coho Salmon, and Puget Sound pink salmon (PFMC 1999). The ESA action area includes areas designated as EFH for various life-history stages of 25 species of groundfish and coastal pelagics, and two species of Pacific salmon (see below).

Groundfish Species
Leopard shark (*Triakis semifasciata*)
Soupfin shark (*Galeorhinus zyopterus*)
Spiny dogfish (*Squalus acanthias*)
Big skate (*Raja binoculata*)
California skate (*R. inornata*)
Longnose skate (*R. rhina*)
Ratfish (*Hydrolagus colliei*)
Pacific rattail (*Coryphaenoides acrolepsis*)
Lingcod (*Ophiodon elongatus*)
Cabezon (*Scorpaenichthys marmoratus*)
Kelp greenling (*Hexagrammos decagrammus*)
Pacific cod (*Gadus macrocephalus*)
Pacific whiting (Hake) (*Merluccius productus*)
Sablefish (*Anoplopoma fimbria*)
Aurora rockfish (*Sebastes aurora*)
Bank Rockfish (*S. rufus*)
Black rockfish (*S. melanops*)
Blackgill rockfish (*S. melanostomus*)
Blue rockfish (*S. mystinus*)
Bocaccio (*S. paucispinis*)
Brown rockfish (*S. auriculatus*)
Canary rockfish (*S. pinniger*)
Chilipepper (*S. goodei*)
China rockfish (*S. nebulosus*)
Copper rockfish (*S. caurinus*)
Darkblotched rockfish (*S. crameri*)
Grass rockfish (*S. rastrelliger*)
Greenspotted rockfish (*S. chlorostictus*)
Greenstriped rockfish (*S. elongatus*)
Longspine thornyhead (*Sebastolobus altivelis*)
Shortspine thornyhead (*Sebastolobus alascanus*)
Pacific Ocean perch (*S. alutus*)
Quillback rockfish (*S. maliger*)
Redbanded rockfish (*S. babcocki*)
Redstripe rockfish (*S. proriger*)
Rosethorn rockfish (*S . helvomaculatus*)
Rosy rockfish (*S. rosaceus*)
Rougheye rockfish (*S. aleutianus*)
Sharpchin rockfish (*S. zacentrus*)
Shortbelly rockfish (*S. jordani*)
Shortraker rockfish (*S. borealis*)
Silvergray rockfish (*S. brevispinus*)
Speckled rockfish *(S. ovalis*)
Splitnose rockfish (*S. diploproa*)
Stripetail rockfish (*S. saxicola*)
Tiger rockfish (*S. nigrocinctus*)
Vermillion rockfish (*S. miniatus*)
Widow Rockfish (*S. entomelas*)
Yelloweye rockfish (*S. ruberrimus*)
Yellowmouth rockfish (*S. reedi*)
Yellowtail rockfish (*S. flavidus*)
Arrowtooth flounder (*Atheresthes stomias*)
Butter sole (*Isopsetta isolepsis*)
Curlfin sole (*Pleuronichthys decurrens*)
Dover sole (*Microstomus pacificus*)
English sole (*Parophrys vetulus*)
Flathead sole (*Hippoglossoides elassodon*)
Pacific sanddab (*Citharichthys sordidus*)
Petrale sole (*Eopsetta jordani*)
Rex sole (*Glyptocephalus zachirus*)
Rock sole (*Lepidopsetta bilineata*)
Sand sole (*Psettichthys melanostictus*)
Starry flounder (*Platyichthys stellatus*)

Coastal Pelagic Species
Northern anchovy (*Engraulis mordax*)
Pacific sardine (*Sardinops sagax*)
Pacific mackerel (*Scomber japonicus*)
Jack mackerel (*Trachurus symmetricus*)
Market squid (*Loligo opalescens*)

Salmon
Coho salmon (*O. kisutch*)
Chinook salmon (*O. tshawytscha*)

IV. ESA Action Area and Environmental Baseline

A. Description of ESA action area

The ESA action area for this BA includes the areas within NFS lands on the RRS for which NOI are received for suction dredging and high banking activities that occur within the range of SONCC and OC Coho Salmon listed as threatened under the ESA of 1973 as amended, and their respective designated critical habitat (CCH). The ESA action area not only includes the immediate footprint of the suction dredging and high banking and related activities where Coho Salmon or its CCH exists, but any area up to ¼ mile upstream from CCH for which an NOI has been received on NFS land. It also includes any downstream reaches that may be affected indirectly.

The ESA action area, as defined by the Endangered Species Act (ESA), is 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]. Analysis of effects within the ESA action area will determine take of listed species and overall take of the project.

B. Environmental baseline: overview

ESA listed species/habitat and MSA listed habitat

This programmatic BA describes the environmental baseline in terms of the biological requirements for habitat features and processes necessary to support all life stages of ESA/MSA listed species within the ESA action area. The fish species considered in this BA reside in or migrate through the ESA action area. Thus, for this ESA action area, the biological requirements for fish are the habitat characteristics that support: 1) successful spawning; 2) rearing; and 3) successful juvenile and adult migrations.

The quality and quantity of fresh water habitat in much of Oregon has declined dramatically in the last 150 years. Land management activities that have degraded habitat of salmonids include water withdrawals, unscreened water diversions, hydropower development, road construction, timber harvest, stream cleaning of large wood, splash dams, mining, farming, livestock grazing, outdoor recreation, and urbanization (USFS and BLM 1994, Lee et al. 1997, Spence et al. 1996). In many river basins, land management activities have: 1) reduced connectivity (i.e., the flow of energy, organisms, and materials) between streams, riparian areas, floodplains, and uplands; 2) elevated fine sediment yields, filling pools and reducing spawning and rearing habitat; 3) reduced instream and riparian large wood that traps sediment, stabilizes stream banks, and helps form pools; 4) reduced or eliminated vegetative canopy that minimizes temperature fluctuations; 5) caused streams to become straighter, wider, and shallower, which has the tendency to reduce spawning and rearing habitat and increase temperature fluctuations; 6) altered peak flow volume and timing, leading to channel changes and potentially altering fish migration behavior; 7) altered floodplain function, water tables and base flows, resulting in riparian wetland and stream dewatering; and 8) degraded water quality by adding heat, nutrients and toxicants (USFS and BLM 1994; Lee et al. 1997; McIntosh et al. 1994; Spence et al . 1996).

While there has been substantial habitat degradation across all land ownerships, habitat in many BLM and USFS headwater stream segments is generally in better condition than in the largely non-Federal lower portions of tributaries (Lee et al. 1997). Because Federal lands are generally forested and situated in upstream portions of watersheds, BLM and USFS lands now contain much of the highest quality salmon and steelhead habitat remaining in Oregon and Washington.

The current characteristics and conditions of each watershed are used to determine how suction dredging, high banking and related activities could affect it annually and in the long-term. Therefore, the environmental baseline conditions for fish habitat are described at the watershed scale, for use in this analysis. This is accomplished using an existing framework entitled the "Matrix of Pathways and Indicators" (MPI) (Biological Opinion and Conference Opinion, Implementation of Land and Resource Management Plans and Resource Management Plans, March 18, 1997). This matrix is divided into six environmental "pathways" by which actions can affect anadromous salmonids and their habitats. The pathways are: water quality, habitat access, habitat elements, channel condition and dynamics, flow/hydrology, and watershed conditions. Each pathway is further divided into "indicators" that describe the pathways (Table 15). The MPI also includes a pathway named population characteristics.

Table 15. Crosswalk between critical habitat Primary Constituent Elements (PCE) and MPI for ESA-listed salmon species with designated or proposed critical habitat

Primary Constituent Elements (PCE)	MPI Pathways, Indicators that Crosswalk with PCE
Spawning habitat, as defined by water quality, water quantity, substrate	**Pathway:** water quality **Indicators:** temperature, suspended sediment, substrate **Pathway:** flow/hydrology **Indicator:** Change in peak/base flow **Pathway:** habitat elements **Indicator:** substrate/embeddedness
Rearing habitat as defined by adequate water quantity and floodplain connectivity	**Pathway:** channel conditions and dynamics **Indicator:** floodplain connectivity **Pathway:** flow/hydrology **Indicator:** change in peak/base flow
Rearing habitat as defined by adequate water quality and forage	**Pathway:** water quality **Indicator:** temperature, substrate **Pathway:** habitat elements **Indicators:** large wood, pool frequency and quality, off-channel habitat
Rearing habitat as defined by adequate natural cover	**Pathway:** habitat elements **Indicators:** large wood, pool frequency and quality, large pools, off-channel habitat
Migration habitat as defined by habitat free of artificial obstructions, and adequate water quality, water quantity, and natural cover	**Pathway:** habitat access **Indicator:** physical barriers

The columns in the matrix of Table 16 correspond to levels of condition for the MPI indicator in Table 15. There are three condition levels: *"Properly Functioning" (PF), "At Risk" (AR), or "Not Properly Functioning"* (NPF) (NMFS 1996). The general description of fish habitat conditions for all lands (public and private) within the 29 affected watersheds is described in Table 16. Site-specific conditions on a particular stream reach may not be identical to conditions at the watershed scale. The primary data sources are watershed analyses, water quality management plans, stream survey reports and RRS Ranger District data files. The condition category for each indicator is the result of all past and present mining, road construction, logging, water withdrawal, urbanization, agriculture, wildfire, fire suppression, and other actions affecting that indicator.

There are two ESUs within the ESA action area: SONCC and OC Coho Salmon. The baseline conditions are described for the two ESUs separately in this section.

Table 16. Comparison of current habitat conditions to biological requirements within the ESA action area on RRS

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	Streambank	Floodplain	Peak/Base Flows	Drainage Network	Road Density & Loc.	Disturbance history	Riparian Reserves	Disturbance regime
Southern Oregon/Northern California Coast (SONCC) Coho Salmon ESU																			
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
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
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
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

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	Streambank	Floodplain	Peak/Base Flows	Drainage Network	Road Density & Loc.	Disturbance history	Riparian Reserves	Disturbance regime
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
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
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
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
Little Butte Creek 1710030708	25	NPF	AR	PF	NPF	AR	NPF	AR	NPF	NPF	NPF	NPF	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	Streambank	Floodplain	Peak/Base Flows	Drainage Network	Road Density & Loc.	Disturbance history	Riparian Reserves	Disturbance regime
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
Oregon Coast (OC) Coho Salmon ESU																			
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
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

C. Environmental baseline: SONCC Coho Salmon ESU

There are nine populations in the SONCC Coho Salmon ESU within the ESA action area. Distinct SONCC Coho Salmon populations exist either at the subbasin, subbasins (two partially combined) or watershed level. Environmental baselines for the SONCC Coho Salmon distinct populations within the ESA action area are described for each of the following populations:

Population

1. Chetco River
2. Elk River
3. Illinois River
4. Lower Rogue River
5. Middle Rogue/Applegate Rivers
6. Pistol River
7. Smith River
8. Upper Rogue River
9. Winchuck River

The environmental baseline conditions for each of the populations are organized as follows:

Subbasin
Subbasin overview
Subbasin population overview

Watershed
Watershed overview
Watershed population overview
Watershed indicator baseline conditions

1. Chetco River population

Subbasin overview – Chetco

The Chetco subbasin is located entirely within Curry County, just south of the Rogue River subbasin. The subbasin contains the following watersheds: Chetco River, Pistol River, and Winchuck River, Hunter Creek, Cape Ferrelo and Whaleshead Creek-Frontal. The first three watersheds are within the ESA action area (Figure 6).

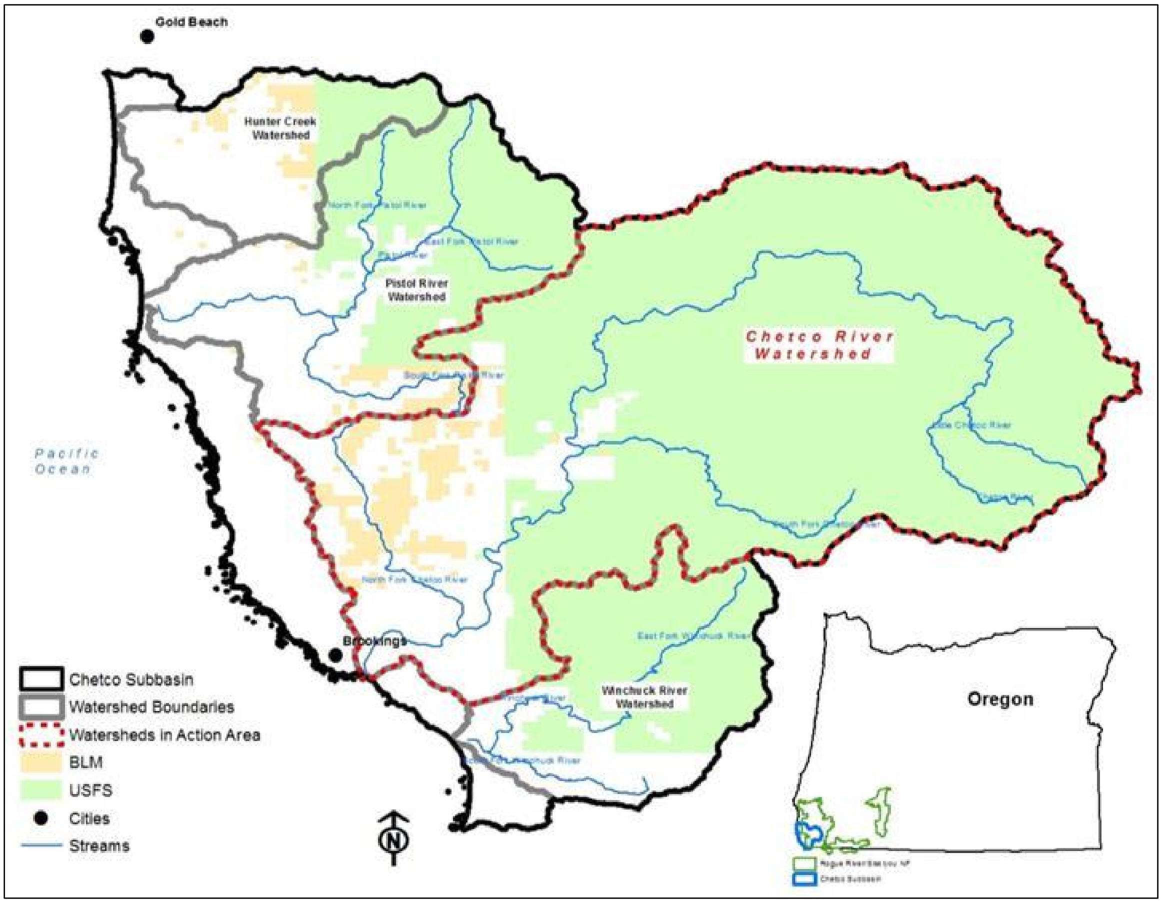

Figure 6. Chetco River subbasin in relation to the Chetco River watershed population within the ESA action area

Subbasin population overview – Chetco

There are three Coho Salmon populations within the ESA action area of the Chetco subbasin:

- Chetco River watershed, Core, Functioning Independent
- Pistol River watershed, Core, Functioning Independent
- Winchuck River watershed, Non-Core, Potentially Independent

The Chetco subbasin within the Southern Oregon Coastal Basin has intermittent Coho Salmon populations. Oregon Department of Fish and Wildlife personnel conducted a random survey for two seasons on reaches throughout the Chetco subbasin (Chetco River, Pistol River and Winchuck River watersheds) and saw few juvenile Coho Salmon (Russ Stauff, ODFW, pers. comm., 2002). These streams exhibit flashy fall and winter flows and are constrained except near ocean tidal areas. Little side channel habitat exists in most streams. Ocean-rearing fall Chinook Salmon migrate farther upstream and more consistently spawn throughout these rivers than Coho Salmon.

Watershed conditions within the ESA action area of the Chetco River population

Watershed conditions are described below for the Chetco River population, located within the Chetco subbasin, Chetco River watershed (Figure 6).

a. Chetco River watershed

Watershed overview – Chetco River

The Chetco River mainstem is 56 miles long with the headwaters and the last 28 miles of the mainstem in the Kalmiopsis Wilderness. The Chetco River watershed drains an area of approximately 352 square miles, emptying into the Pacific Ocean between the towns of Brookings and Harbor Oregon, just north of the California border. Within the wilderness, aquatic and riparian conditions are within the natural range of variability, though the ultramafic geology of this area has created somewhat sparse vegetation conditions and a bedrock setting. Seventy-seven percent of the watershed is USFS, 5 percent is BLM land, and the remaining 18 percent is in private ownership (Table 17). Private land is used for residential purposes primarily in the vicinity of the coast and the lower mainstem, some grazing and small woodland use and industrial forestry (USFS 1996).

Prevalent land uses

- Federal – Timber harvest, recreation, and mining
- Private – Timber harvest, mining, agriculture, and urban development

Table 17. Watershed area and ownership distribution – Chetco River Watershed

Land Ownership	Acres	Ownership (percent)
USFS	174,196	77
Bureau of Land Management (BLM)	10,718	5
State	487	<1
Private	39,759	18
Total	**225,160**	**100**

Anthropomorphic alterations to habitat. Fire suppression has caused the level and continuity of fuels to increase, leaving the watershed susceptible to larger, more intense fires (e.g. Biscuit Fire). Moderate timber harvest and road development on public lands has altered some watershed processes and functions. Commercial gravel extraction, agriculture and municipal uses near Brookings Oregon all have altered aquatic habitat in the lower river on private lands. The upper watershed within the wilderness is in a much different condition than the lower watershed, which has considerable industrial timberlands.

Suction dredging and high banking activity summary. Extensive historical mining took place in the upper Chetco River basin upstream from reaches with high Coho Salmon potential. Historically, the upper Chetco area was mined for gold (both lode and placer) and chromite. Most of the gold mining took place in the late 1800's, with renewed activity during the 1930's depression years. Placer gold was mined on the Little Chetco River as late as the 1890's, and included the use of a hydraulic giant. Placer mining occurred in Gold Basin and on the mainstem Chetco River (including some hydraulic mining) (USFS 1996). Recommendations for suction dredging in the 1996 Chetco River WA state "Inventory roads to upgrade existing culverts and ensure drainage….include mining roads in these inventories and prescribe maintenance and reconstruction measures to be included in mining plans of operations (p.6) (USFS 2006).

There were 14 active filed placer claims as of May 8, 2013. The number of suction dredge NOI received by the RRS averaged 10.5 (44.7% of RRS total) suction dredge NOI during the four-year period 2009-2012 in the watershed on NFS lands located within 1/4 mile of CCH (Table 4 and Figure 7). The NOI and related Coho Salmon habitat type and its potential maximum impact are numerically displayed in Table 18.

The upper segments of the river down to Boulder Creek are within the Kalmiopsis Wilderness and are designated as “Wild”. On October 28, 1988, 44.5 miles of the Chetco River located within the Rogue River-Siskiyou National Forest boundary was designated for inclusion in the National System under the Omnibus Oregon Wild and Scenic Rivers Act of 1988 (Public Law 100-557). On July 26, 2013 the lower 19 miles (outside the wilderness boundary) was withdrawn, for a period of 5 years, from location and entry under the United States mining laws and to leasing under the mineral and geothermal leasing laws while legislation is being considered to make a technical correction to Section 3(a)(69) of the Wild and Scenic Rivers Act (16 U.S.C. 1274(69) by Public Land Order 7819 (78 FR 45269). This order withdrew approximately 5,610 acres subject to valid existing rights. There are 146.1 miles of CCH within the watershed and 42.6 miles of those miles on NFS lands are withdrawn from mineral entry. The IP value and habitat typing for these withdrawn miles are displayed in Table 19. See Appendix A for a summary and locations of suction dredging and high banking mineral withdrawals on the RRS.

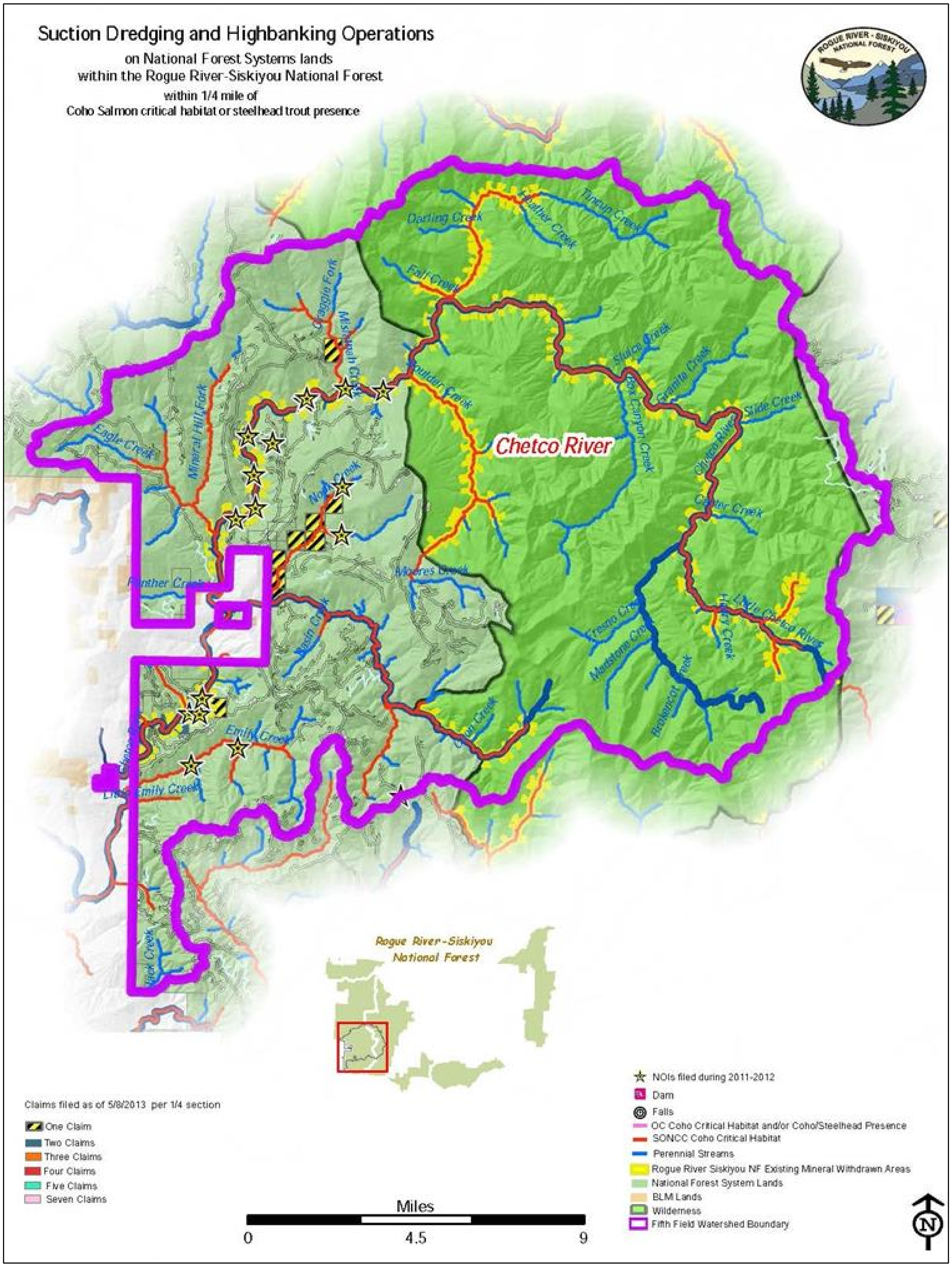

Figure 7. CCH with NOI and mining claims within 1/4 mile of CCH on NFS lands – Chetco River watershed

Table 18. Suction dredging NOI received by RRS (2009-2012) within ¼ mile of CCH – Chetco River watershed

Name/Location			Past NOI Information								Potential Habitat Use Coho Salmon		
							Total Maximum Disturbance[2]						
Stream w/River Mile (constant name)	Location[1] RS & Lat/Long	Name of Claim	NOI Received 2009-2012 (list years)	Number of Operators per claim Number of Operators per claim	Suction Dredge Activities (Y/N)	High Number of Operators per claim Banking Activities (Y/N)	Volume - NOI Listed (cubic yd.)	Volume – Assumed[3] or NOI Listed (cubic yd.)	Area (sq. ft.)	Stream Distance (ft.)	Spawning / Rearing ft.)	Rearing /Migration (ft.)	Migration (ft.)
Chetco River 13.6	T39S., R12W., Sec 30NE N42.1464 W124.1544	Orewash#2	2009, 2010	2	Y	N	10	10	90	6	0	6	0
Chetco River 14.0	T39S., R12W., Sec 20,29 N42.146389 W124.148889	Gold #3	2010, 2011, 2012	6	Y	Y	0	25	225	15	0	15	0
Chetco River 14.4	T39S., R12W., Sec 29NW N42.1522 W124.1477	Orewash#1	2009, 2010	2	Y	N	10	10	90	6	0	6	0
Chetco River 21.4	T38S., R12W., Sec 33NW N42.221944 W124.131389	Gold #5	2010, 2011, 2012	6	Y	Y	0	25	225	15	0	15	0
Chetco River 22.5	T38S., R12W., Sec16SW N42.253889 W124.125556	***	2010, 2011, 2012	6	Y	Y	0	25	225	15	0	15	0
Chetco River 23.5	T38S., R12W., Sec21SE N42.239167 W124.1225	***	2010, 2011, 2012	6	Y	Y	0	25	225	15	0	15	0
Chetco River 25.0	T38S., R12W., Sec 28SW N42.226389 W124.121111	Gold #6	2010, 2011, 2012	6	Y	Y	0	25	225	15	0	15	0
Chetco River 25.5	T38S., R12W., Sec 15 N42.251667 W124.1125	Gold #7	2010, 2011, 2012	6	Y	Y	0	25	225	15	0	15	0
Chetco River 26.0	T38S., R12W., Sec14NW N42.267778 W124.096389	***	2010, 2011, 2012	6	Y	Y	0	25	225	15	0	15	0

Chetco River 27.0	T38S., R9W., Sec 11SW N42.268889 W124.095278	***	2010, 2011, 2012	6	Y	Y	0	25	225	15	0	15	0
Chetco River 28.9	T38S., R12W., Sec 12 N42.273056 W124.075	Gold #8	2010, 2011, 2012	6	y	Y	0	25	225	15	0	15	0
Chetco River 29.5	T38S., R11W., Sec7 N42.272222 W124.055556	***	2010, 2011, 2012	6	Y	Y	0	25	225	15	0	15	0
Emily Creek 2.4	T39S., R12W., Sec32 N42.126111 W124.152778	Gold #4	2010, 2011, 2012	6	Y	Y	0	25	225	15	15	0	0
Nook Creek 1.4	T38S., R12W., Sec 26 NW N42.235 W124.076	Six in a Rowe	2010, 2011	6	N	Y	25	25	225	15	15	0	0
Quail Prairie Creek 3.5	T38S., R12W., Sec. 35 N42.216 W124.076	Four in a Rowe	2010, 2011	6	N	Y	25	25	225	15	15	0	0
		AFFECTED Total within Watershed						345 yd[3]	3,105 ft[2]	207 ft	45 ft	162 ft	0
		BASELINE Total within Watershed						36,923,040 yd[3]	12,307,680 ft[2]	820,512 ft	578,688 ft	241,824 ft	0
		BASELINE Total CCH within Watershed								155.4 mi	109.6 mi	45.8 mi	0.0
		AFFECTED Percent Watershed within CCH						0.001%	0.025%	0.025%	0.008%	0.067%	0.0%

[1] Proposed dredging mile marker starting point.

[2] Standard formula to calculate maximum 25 cubic yards suction dredge area of disturbance = 15 feet (length) X 15 feet (width) X 3 feet (depth). Width and depth is constant when cubic yard is stated differently in NOI.

[3] 25 cubic yards is the standard maximum volume anticipated when not specified in NOI.

Table 19. IP and habitat typing for mineral withdrawn areas – Chetco River watershed

Habitat Typing[1]	Intrinsic Potential[2] (miles)			Total (miles)
	High	Medium	Low	
Spawning/rearing	0.2	17.5	6.1	23.8
Rearing/migration	0.2	18.1	0.5	18.8
Migration only	0	0	0	0
Total	**0.4**	**35.6**	**6.6**	**42.6**

[1] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.
[2] Values based on an intrinsic potential map derived from the NETMAP CLAMS data and also located http://www.fsl.orst.edu/clams/. Category for ranking were derived from the final SONCC Coho Salmon Recovery Plan (NMFS 2014); high =>/= 0.66, moderate = </=0.33 – 0.66 and low = <0.33.

Watershed population overview – Chetco River

Population highlights (NMFS 2014)

- Northern Coastal Stratum
- Core, Functionally Independent Population
- High Extinction Risk
- 4,500 Spawners Required for ESU Viability
- 356 mi2
- 135 IP km (84 IP mi) (8% High)
- Dominant Land Uses are ‘Recreation’ and ‘Agriculture’
- Principal Stresses are ‘Lack of Floodplain and Channel Structure’ and ‘Degraded Riparian Forest Conditions’
- Principal Threats are ‘Channelization/Diking’ and ‘Urban/Residential/Industrial Development’

There are approximately 155.4 miles of CCH within the watershed and 106.0 miles on NFS lands (Figure 7) and Table 4. Chetco River Coho Salmon are still widely distributed in the watershed (USFS 1996) and electrofishing samples by ODFW (2005a) show juveniles in upper mainstem Chetco River reaches in the Kalmiopsis Wilderness. The habitat with the highest intrinsic potential (IP) and historic productivity in the lower river basin and estuary is compromised, resulting in limitation or reduction of Coho Salmon in streams that were formerly population centers (Massingill 2001, Frissell 1992). IP and habitat typing for the watershed is displayed in Table 21. The RRS (1996) confirmed the presence of Coho Salmon in at least some years in Emily Creek and the South Fork including its tributaries Quail Prairie and West Coon Creeks (NMFS 2014).

Table 20. Salmonid species and habitat length - Chetco River population

Water-shed Acres	Anadro-mous Species Present[1]	NFS lands Miles of CCH (miles)[2]	NFS lands Miles of Chinook Habitat (miles)[3]	Water-shed CCH and EFH (miles)[4]	Watershed Potential Miles of Coho Salmon Habitat Type[5]		
					Spawning/ Rearing	Rearing/ Migration	Migration only
67,250	CO, CH, ST	106.0	58.3	155.4	109.6	45.8	0

[1] All, or a portion of, the waterbody supports the following anadromous salmonids: ST- steelhead trout; CO- Coho Salmon; CH - Chinook Salmon.

[2] Steelhead presence surveys were used to determine historic Coho Salmon habitat since CCH was not spatially delineated in the Federal Register 50 CFR Part 226. Values based on GIS data layer entitled RRS 2013 Total Salmon and Steelhead Distribution and field knowledge.

[3] Values based on GIS data layer entitled 2013 RRS Anadromous Salmonid Fish Distribution; Chinook Salmon presence survey layer.

[4] Values based on a combination of RRS 2013 SONCC Coho Salmon delineated CH 19 and ODFW steelhead presence survey data 2013 GIS map (as a surrogate for historic Coho Salmon habitat) website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[5] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

Table 21. Habitat typing and intrinsic potential within CCH – Chetco River watershed

Habitat Typing[1]	Intrinsic Potential[2] (miles)						Total (miles) CCN/IP/HT	
	High IP		Medium IP		Low IP			
	Water-shed	NFS lands	Water-shed	NFS lands	Water-shed	NFS lands	Water-shed	NFS lands
Spawning/rearing	3.1	0.2	89.7	65.6	16.8	9.1	109.6	74.9
Rearing/migration	1.7	0.2	42.3	29.5	1.8	1.8	45.8	31.5
Migration only	0	0	0	0	0	0	0	0
Total	**4.8**	**0.4**	**132.0**	**95.1**	**18.6**	**0.5**	**155.4**	**106.0**

[1] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[2] Values based on an intrinsic potential map derived from the NETMAP CLAMS data and also located http://www.fsl.orst.edu/clams/. Category for ranking were derived from the final SONCC Coho Salmon Recovery Plan (NMFS 2014); high =>/= 0.66, moderate = </=0.33 – 0.66 and low = <0.33.

The ODFW expert panel stated: "The Chetco River Coho Salmon population has a very low abundance, verging on extirpation" (ODFW 2008). It also characterized Chetco River Coho Salmon as greatly diminished from historic levels and relatively scarce. Stream reaches that do harbor Coho Salmon are high-energy alluviated canyons (Frissell 1992) that have low inherent productivity compared to low gradient tributaries, and populations can be lost due to stochastic events. Therefore, overall population productivity for Chetco River Coho Salmon is very low. Based on low productivity and extremely low population levels (ODFW 2008), the Chetco River population of Coho Salmon is currently not viable and at high risk of extinction (NMFS 2014).

Watershed habitat indicators – Chetco River

1) Water quality pathway

Temperature indicator – *Not Properly Functioning*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010) and Chetco River Watershed Analysis (WA) (USFS 1996).

The Chetco River is listed as water quality limited due to summer water temperatures from its confluence with the Pacific Ocean upstream to its headwaters, a distance of 57.1 river miles. Table 22 displays the 303(d) list for water quality limited streams within the watershed on NFS lands. There is some basic disagreement about this determination since the mainstem Chetco River exiting the Kalmiopsis Wilderness exceeds the state water quality standards for temperature. Ultramafic headwater areas, width of mainstem, and natural hydrology are the drivers behind the thermal regime (Risley 1999).

Stream temperatures are warmer than optimum for salmonids. Data on summer stream temperatures on the mainstem have been collected on recording thermometers by ODFW and RRS, from tidewater to above Eagle Creek, at approximately river mile 20.3. The average maximum 7-day temperatures were 74 to 76o Fahrenheit (F) throughout the monitored stream length in 1994 and 1995. A RRS trail crew and a miner independently recorded a temperature of 78o F in August 1992 at approximately river mile 35. The Chetco River leaves the Kalmiopsis Wilderness at the mouth of Boulder Creek, about river mile 30.4. If this river temperature in the Wilderness is representative, it indicates that the Chetco River is naturally much warmer than is considered optimum for salmonids, a result of the ultramafic soils and sparse vegetation. Beyond Granite Creek, river mile 40, the river flows through an open valley bottom with little topographic shading, and its channel is too wide for summer flows to be shaded by vegetation. These factors all contribute to the warm temperatures in the river. Tributaries to the mainstem provide cooler temperatures. Recording thermometers in tributaries Emily Creek, Eagle Creek, and South Fork Chetco recorded peaks of 66 to 68o F in 1995.

Table 22. ODEQ, 2010 303(d) List for Oregon Waterbodies within NFS lands on RRS – Chetco River watershed

Stream Name	Miles on RRS (miles)	River Mile Marker (miles)	Pollutant	Assess-ment	Assess-ment 2	Listing Status
Boulder Creek	9.39	0 to 9.5	Temperature	2010	1/29/2013	Cat 5: Water quality limited, 303(d) list, TMDL needed
Chetco River	43.93	0 to 57.1	Temperature	2004	4/14/2005	Cat 5: Water quality limited, 303(d) list, TMDL needed
Chetco River	43.93	0 to 57.1	Biological Criteria	2010	1/29/2013	Cat 5: Water quality limited, 303(d) list, TMDL needed
Eagle Creek	5.44	0 to 6.8	Temperature	2010	1/29/2013	Cat 5: Water quality limited, 303(d) list, TMDL needed
Emily Creek	7.64	0 to 8.1	Temperature	2010	1/29/2013	Cat 5: Water quality limited, 303(d) list, TMDL needed

Suspended sediment–intergravel/DO/turbidity indicator – *At Risk*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010) and Chetco River WA (USFS 1996).

> Human activities including roads and timber harvest have created sediment inputs and turbidity above expected background levels. No streams within the watershed on NFS lands are listed specifically on the 303(d) list for sediment. However, the Chetco River is listed for biological criteria, possibly as a result of sediment tolerant macroinvertebrate presence (Table 22). The primary mechanisms for sediment delivery to channels are landslides in unstable inner gorges, and debris flows. Areas where these are likely to occur are most susceptible to increased rates and volumes of sediment delivery as a result of human activities. Naturally occurring inner gorge landforms provide sediment and large wood to streams. Naturally occurring landslides provide risks to roads and trails in these areas. Older roads with relatively large fills have triggered debris flows when constructed on steep slopes. Roads with switchbacks are associated with a high incidence of landslides, often caused by uncompacted road fill, drainage diversion, or undercut channels from road drainage erosion. The risk of future debris flows and landslides from these types of roads continues to exist. Roads in the Wilderness used to access mining claims lack design features to prevent erosion.
>
> Fines represent from 21% to 29% of substrate particles in Mislatnah Creek, and up to 25% in Quail and Eagle Creeks. The mainstem South Fork Chetco River had an older stream survey that did not record percent fines but did record dominate/subdominant substrate types. Substrates recorded for the South Fork Chetco were cobble/boulder dominant.

Chemical contamination/nutrients indicator – *Properly Functioning*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010) and Chetco WA (USFS 1996).

Human activities along the mainstem of the river and some tributaries raise the risk of contaminants entering stream systems. The Chetco River is not listed on the 303(d) list for contaminants or excessive nutrients. Downstream on agricultural and residential lands some contamination may occur from agriculture runoff or effluent from septic tanks, lawns and other sources.

2) Habitat access/elements pathway – Chetco River watershed

Physical barriers indicator – *Properly Functioning*. Baseline: Chetco River WA (USFS 1996).

Some culverts on private lands block fish migration from the river to a few small streams. There are no known culverts or human structures on NFS lands within the ESA action area that block passage of Coho Salmon at any life stage from upstream and downstream migration.

Substrate character and embeddedness indicator – *At Risk*. Baseline: Chetco River WA (USFS 1996), Basin Creek Stream Survey Report (SS) (USFS 1993), Blue Slide Creek SS (SRG 1997), Boulder Creek SS (USFS 1993), Craggie Creek SS (SRG 1997), Eagle Creek SS (SRG 1999), Emily Creek SS (SRG 2010), Little Chetco River SS (SRG 2012), Mineral Hill Fork SS (SRG 1999), Mislatnah Creek SS (SRG 2011), Moores Creek SS (USFS 1993), Nook Creek SS (SRG 1999), Panther Creek SS (SRG 1992), Prairie Creek SS (SRG 1992), Quail Prairie Creek SS (SRG 1999), Red Mountain Creek SS (SRG 2002), SF Chetco River SS (USFS 1995), and West Coon Creek SS (SRG 2002).

The mainstem Chetco River is a low-gradient stream within a wide valley for most of its length, meandering between large gravel/cobble bars. Most tributaries are steep-gradient transport streams, which readily flush finer grained substrate (e.g. sand, small gravel). Within the Kalmiopsis Wilderness, substrate embeddedness is not an issue. Downstream of the Wilderness, agriculture uses, timber harvest, and urban development provide a mechanism for sediment delivery and potential increased embeddedness.

Large wood indicator – *At Risk*. Baseline: Chetco WA, Basin Creek SS (USFS 1993), Blue Slide Creek SS (SRG 1997), Boulder Creek SS (USFS 1993), Craggie Creek SS (SRG 1997), Eagle Creek SS (SRG 1999), Emily Creek SS (SRG 2010), Little Chetco River SS (SRG 2012), Mineral Hill Fork SS (SRG 1999), Mislatnah Creek SS (SRG 2011), Moores Creek SS (USFS 1993), Nook Creek SS (SRG 1999), Panther Creek SS (SRG 1992), Prairie Creek SS (SRG 1992), Quail Prairie Creek SS (SRG 1999), Red Mountain Creek SS (SRG 2002), SF Chetco River SS (USFS 1995), and West Coon Creek SS (SRG 2002).

Wood contribution zones and some riparian areas have been affected by human activities in the lower watershed, lowering the large wood input to streams. Due to its wide channel and high winter flows, the mainstem Chetco River does not retain large wood. Tributary streams, particularly those within the Kalmiopsis Wilderness, have large wood quantities near natural levels. Streams flowing through ultramafic soils with sparse vegetation tend to have naturally low amounts of large wood.

Human caused disturbance (e.g. riparian timber harvest, roads) have impacted the age pattern of riparian stands and delivery pathways. Parts of the Chetco mainstem valley floor have not revegetated as expected. These areas do not appear to have been scoured by floods within the last 50 years. This condition may be a result of grazing on the river terraces. Future recruitment of large wood is being limited in these areas. Large wood for the Chetco River and tributaries is low and below the expected range of natural variation in reaches accessible by or near roads.

Pool frequency and quality indicator– *At Risk*. Baseline: Chetco WA, Basin Creek SS (USFS 1993), Blue Slide Creek SS (SRG 1997), Boulder Creek SS (USFS 1993), Craggie Creek SS (SRG 1997), Eagle Creek SS (SRG 1999), Emily Creek SS (SRG 2010), Little Chetco River SS (SRG 2012), Mineral Hill Fork SS (SRG 1999), Mislatnah Creek SS (SRG 2011), Moores Creek SS (USFS 1993), Nook Creek SS (SRG 1999), Panther Creek SS (SRG 1992), Prairie Creek SS (SRG 1992), Quail Prairie Creek SS (SRG 1999), Red Mountain Creek SS (SRG 2002), SF Chetco River SS (USFS 1995), and West Coon Creek SS (SRG 2002).

Increased fine sediment inputs and lack of instream large wood reduce the number and quality of pools. Large wood is the primary causal mechanism in the low gradient streams to create complex and frequent pools. These pools and associated large wood also create off-channel habitat and refuge for salmonids. Due to the confined nature of most of the Chetco River streams, off-channel habitat is rare. Floodplains are generally non-existent, very narrow or inaccessible due to high terraces. Residual pool depths are generally less than three feet in most streams. Most pools are formed by bedrock canyon features and not by large wood complexes.

Table 23 summarizes pool habitat conditions on streams surveyed (using USFS R6 Level II survey protocol) that contain CCH on NFS lands in the watershed

Table 23. Habitat percent and pool summary for surveyed streams – Chetco River watershed

Stream Name	Year Survey-ed	Habitat % Pool	Habitat % Riffle	Habitat % Side Channel	Pools/ Mile	Deep Pools/mile (>3ft)	Avg. Residual Pool Depth (ft)
Basin Creek	1993	14.5	84	1.4	26.6	7.9	2.1
Blue Slide Creek	1997	2.2	96	1.8	9.5	0	1.4
Boulder Creek	1993	22.4	76.3	1.5	20.2	12	2.9
Craggie Creek	1997	9.4	85.3	5.3	27.1	14.6	2.3
Eagle Creek	1999	28.9	70.3	0.8	29.5	21	2.9
Emily Creek	2010	45.9	52.6	1.3	27.8	15.5	2.9
Little Chetco River	2012	42.4	56.8	1.1	34.1	11.5	2.2
Mineral Hill Fork	1999	21	77.6	1.3	28.6	10.4	2.3
Mislatnah Creek	2011	32.9	64	3.1	34.6	12	2.2
Moores Creek	1993	30.8	68.4	0.8	26.8	8.9	2.8
Nook Creek	1999	16.2	82.2	1.6	24.1	3.2	2.1
Panther Creek	1992	9.3	88.3	2.5	10.8	3.6	2.3
Prairie Creek	1992	15.5	84.5	0	45.8	0	1.4
Quail Prairie Creek	1999	20.6	76.9	1.3	24.4	7.4	2.5
Red Mountain Creek	2002	16.6	78	5.5	25.9	7.3	2.2
SF Chetco River	1995	53.8	45.5	2	31.4	16.2	3.4
West Coon Creek	2002	39.3	60.1	0.9	33.4	11.6	2.4

Off-channel habitat indicator – *At Risk.* Baseline: Chetco WA, Basin Creek SS (USFS 1993), Blue Slide Creek SS (SRG 1997), Boulder Creek SS (USFS 1993), Craggie Creek SS (SRG 1997), Eagle Creek SS (SRG 1999), Emily Creek SS (SRG 2010), Little Chetco River SS (SRG 2012), Mineral Hill Fork SS (SRG 1999), Mislatnah Creek SS (SRG 2011), Moores Creek SS (USFS 1993), Nook Creek SS (SRG 1999), Panther Creek SS (SRG 1992), Prairie Creek SS (SRG 1992), Quail Prairie Creek SS (SRG 1999), Red Mountain Creek SS (SRG 2002), SF Chetco River SS (USFS 1995), and West Coon Creek SS (SRG 2002).

Most streams are bedrock confined. Where alluvial areas occur they are highly affected by human actions. Off channel habitat is rare.

Refugia indicator – *At Risk.* Baseline: Chetco WA, Basin Creek SS (USFS 1993), Blue Slide Creek SS (SRG 1997), Boulder Creek SS (USFS 1993), Craggie Creek SS (SRG 1997), Eagle Creek SS (SRG 1999), Emily Creek SS (SRG 2010), Little Chetco River SS (SRG 2012), Mineral Hill Fork SS (SRG 1999), Mislatnah Creek SS (SRG 2011), Moores Creek SS (USFS 1993), Nook Creek SS (SRG 1999), Panther Creek SS (SRG 1992), Prairie Creek SS (SRG 1992), Quail Prairie Creek SS (SRG 1999), Red Mountain Creek SS (SRG 2002), SF Chetco River SS (USFS 1995), and West Coon Creek SS (SRG 2002).

Refugia are primarily present within deep pools and at tributary confluences (thermal refugia) with the mainstem Chetco River. Within tributary streams, complex or deep pools and to a lesser degree off-channel habitat features function as usable refugia for rearing salmonids.

3) Channel condition and dynamics pathway – Chetco River watershed

Bankfull width depth ratio/ channel widening indicator – ***At Risk*****.** Baseline: Chetco WA, Basin Creek SS (USFS 1993), Blue Slide Creek SS (SRG 1997), Boulder Creek SS (USFS 1993), Craggie Creek SS (SRG 1997), Eagle Creek SS (SRG 1999), Emily Creek SS (SRG 2010), Little Chetco River SS (SRG 2012), Mineral Hill Fork SS (SRG 1999), Mislatnah Creek SS (SRG 2011), Moores Creek SS (USFS 1993), Nook Creek SS (SRG 1999), Panther Creek SS (SRG 1992), Prairie Creek SS (SRG 1992), Quail Prairie Creek SS (SRG 1999), Red Mountain Creek SS (SRG 2002), SF Chetco River SS (USFS 1995), and West Coon Creek SS (SRG 2002).

Width / depth ratios and maximum depths are altered by sediment input and human uses along the main river and some tributaries. The lower channel is wide, limiting the capability of riparian vegetation to shade the stream. The valley becomes less confined within the shear zone along the lower mainstem perhaps because of more easily weathered hillslopes, and the channel stores sediment in large terraces. The gradient of the mainstem Chetco also reflects the resistance of the underlying rocks, and the glacial history of the upper watershed.

Streambank condition indicator – ***At Risk*****.** Baseline: Chetco WA, Basin Creek SS (USFS 1993), Blue Slide Creek SS (SRG 1997), Boulder Creek SS (USFS 1993), Craggie Creek SS (SRG 1997), Eagle Creek SS (SRG 1999), Emily Creek SS (SRG 2010), Little Chetco River SS (SRG 2012), Mineral Hill Fork SS (SRG 1999), Mislatnah Creek SS (SRG 2011), Moores Creek SS (USFS 1993), Nook Creek SS (SRG 1999), Panther Creek SS (SRG 1992), Prairie Creek SS (SRG 1992), Quail Prairie Creek SS (SRG 1999), Red Mountain Creek SS (SRG 2002), SF Chetco River SS (USFS 1995), and West Coon Creek SS (SRG 2002).

Streambanks have been altered where valley-bottom roads occur and where timber harvest, gravel mining or agricultural actions have removed vegetation. Many streambanks are well-armored with bedrock or cobbles.

Floodplain connectivity indicator – ***At Risk*****.** Baseline: Chetco WA, Basin Creek SS (USFS 1993), Blue Slide Creek SS (SRG 1997), Boulder Creek SS (USFS 1993), Craggie Creek SS (SRG 1997), Eagle Creek SS (SRG 1999), Emily Creek SS (SRG 2010), Little Chetco River SS (SRG 2012), Mineral Hill Fork SS (SRG 1999), Mislatnah Creek SS (SRG 2011), Moores Creek SS (USFS 1993), Nook Creek SS (SRG 1999), Panther Creek SS (SRG 1992), Prairie Creek SS (SRG 1992), Quail Prairie Creek SS (SRG 1999), Red Mountain Creek SS (SRG 2002), SF Chetco River SS (USFS 1995), and West Coon Creek SS (SRG 2002).

Most streams are hillslope-confined or terrace-confined and urban development has altered some historic floodplains.

4) Flow/hydrology pathway – Chetco River watershed

Change in peak/base flow indicator – ***At Risk*****.** Baseline: Chetco WA (USFS 1996) and Northwest Forest Plan (NFWP) (USFS and BLM 1994).

Peak flows have been altered moderately by vegetation removal. Base flows have been affected less with the watershed dominated by bedrock geology. Since the mid-1990s, riparian management under the NWFP has emphasized maintenance and enhancement of habitat for fish and other aquatic resources. Consequently, riparian habitats are improving on NFS lands, and peakflows/baseflows are within the range of natural variation.

Increase in drainage network indicator – *At Risk*. Baseline: Chetco WA (USFS 1996).

Road development has increased the drainage network in tributaries. Subwatersheds with combined high levels of roading and timber harvest are most likely to have altered flow regimes. These conditions exist downstream of the Kalmiopsis Wilderness, particularly on private land.

5) Watershed conditions pathway – Chetco River watershed

Road density and location indicator – *At Risk*. Baseline: Chetco WA (USFS 1996).

Road density is high on private timberlands and lower on NFS lands. Subwatersheds have steep sideslopes and many roads are near ridges, though midslope roads do occur in many of the drainages.

Disturbance history indicator – *At Risk*. Baseline: Chetco WA (USFS 1996).

Human activities have altered watershed processes and functions in the lower watershed. The upper watershed is pristine. Timber harvest, roads, and mining are primary disturbance activities. Historically, the upper Chetco area was mined for gold (both lode and placer) and chromite. Most of the gold mining took place in the late 1800's, with renewed activity during the 1930's depression years. Emily cabin was built in the late 1800's as placer gold was mined on the Little Chetco River, and included the use of a hydraulic giant. Placer mining occurred in Gold Basin and on the mainstem Chetco River (including some hydraulic mining). In recent years, gold mining has been limited to small placer claims in the mainstem Chetco River and some tributaries (e.g. Little Chetco, SF Chetco, etc.).

Riparian Reserves indicator– *At Risk*. Baseline: Chetco WA (USFS 1996).

Riparian areas have been wholly harvested on private lands. Federal lands have some harvest in riparian areas outside of the Wilderness. Approximately 21% of the riparian zones within 1 site potential tree distance of streams were burned severely enough to kill the forest canopy during the Biscuit Fire. Ultramafic soils are common in some areas of the watershed, particularly in the headwaters. This soil type limits vegetation density and composition, resulting in low stream shading and large wood recruitment.

Disturbance regime indicator – *At Risk*. Baseline: Chetco WA (USFS 1996).

Timber harvest, road development, agricultural actions and homesites have altered flow patterns and vegetation in many drainages outside of the Wilderness. Historic gold mining occurred in many parts of the watershed, with notable claims occurring along the mainstem and in the Little Chetco River drainage. The 2002 Biscuit Fire burned substantial acreage within the watershed, resulting in widespread early seral stage vegetation in some drainages.

2. Elk River population

Subbasin overview – Sixes

The subbasin is located adjacent to the Pacific Ocean and consist of 4 watersheds (Figure 8).The climate in the Sixes subbasin is typical of coastal Oregon with a strong marine influence, high winter precipitation, and moderate year-round temperatures. The subbasin exhibits flashy fall and winter flows, driven primarily by rainfall. Stream habitat is quite variable, ranging from unconfined low gradient alluvial valleys to steep colluvial and bedrock canyons.

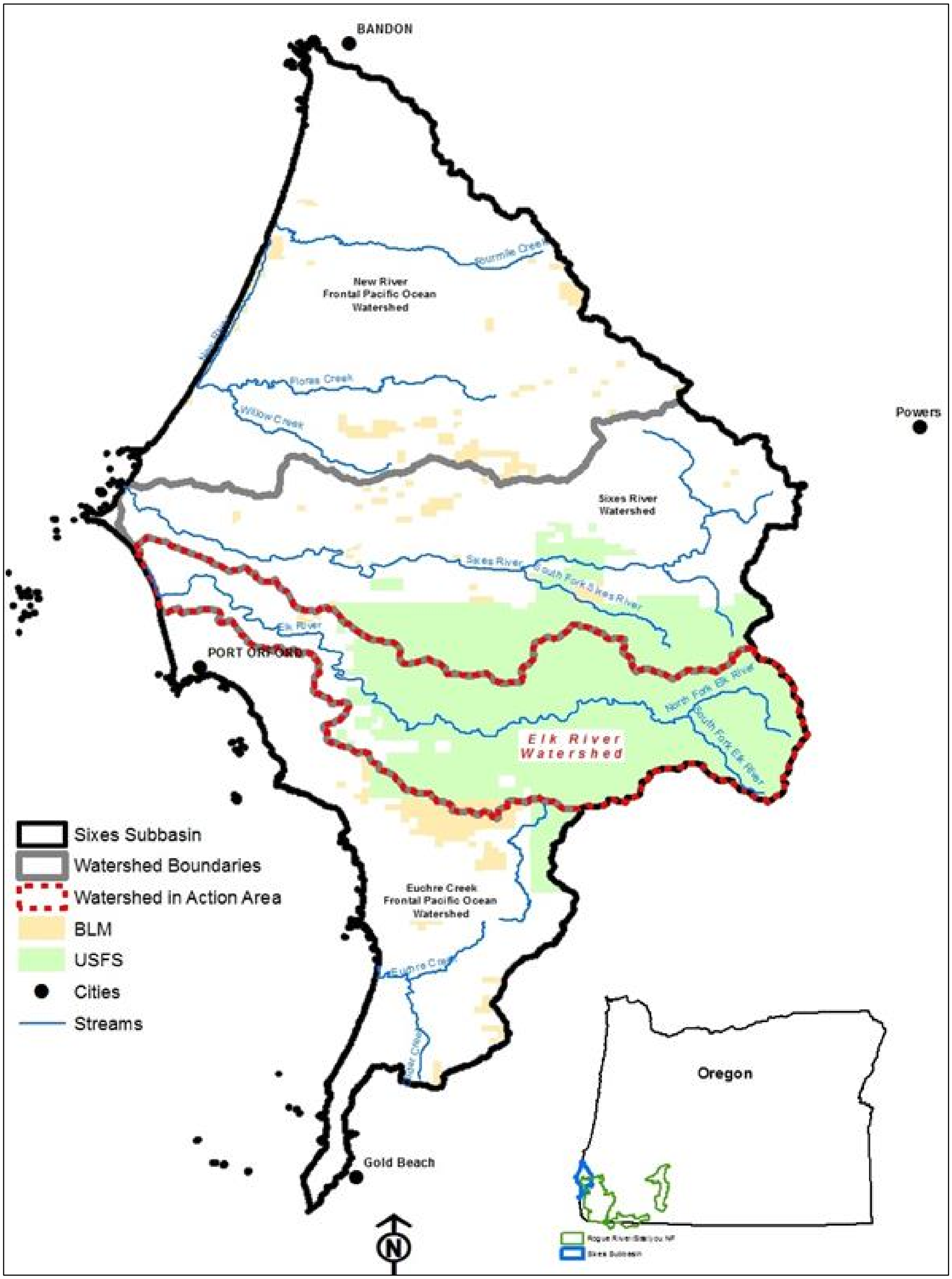

Figure 8. Elk River watershed population in relation to the Sixes subbasin

Subbasin population overview – Sixes

The subbasin contains two separate Coho Salmon ESUs and four watersheds. Within the two Coho Salmon ESUs are four distinct populations within the following watersheds: Sixes River, New River-Frontal Pacific Ocean, Elk River, and Euchre Creek-Frontal Pacific Ocean watersheds.

The Sixes River and New River-Frontal Pacific Ocean watersheds are within the OC Coho Salmon ESU. Elk River and Euchre Creek-Frontal Pacific Ocean watersheds are within the SONCC Coho Salmon ESU. Elk River watershed is the only population within the SONCC ESU of the Sixes subbasin located within the ESA action area. Anadromous fish species include: Chinook Salmon, Coho Salmon, winter steelhead, sea-run cutthroat trout, and Pacific lamprey.

Watersheds within the ESA action area of the Sixes River subbasin

Watershed baseline conditions are described for one 5th field watershed within the ESA action area of the Sixes River subbasin: Elk River watershed (Figure 8).

a. Elk River watershed

Watershed overview - Elk River

The Elk River watershed is located in the Sixes River subbasin within the Southern Oregon Coastal Basin, which has been identified by the RRS in the Pacific Northwest Region as a priority watershed for restoration. The Elk River drainage is valued for its fish, wildlife, clean water, scenery, timber, and recreation. The watershed is representative of an ecosystem with old growth characteristics along the Southern Oregon coast, and includes habitat for associated species such as the northern spotted owl. Elk River flows directly into the Pacific Ocean, which provides unique habitat for anadromous fish and sea going animals such as the marbled murrelet. Coho Salmon within Elk River watershed is listed as threatened under the Endangered Species Act (USFS 2012).

Elevations range between 0 feet at the mouth of the river where it enters the Pacific Ocean to 4,000 feet at the headwaters of both the North and South Forks of the Elk River. Less than five percent of the watershed lies between 2,400 and 4,000 feet in elevation (USFS 1998). The lower ten percent of the watershed is characterized by estuarine marshes, meandering streams, brackish-water streams, marine terraces, and sand dunes (USFS 2012). The ownership distribution in the watershed encompasses: USFS 53%, BLM 5%, State lands <1% and the remaining 42% is in private ownership (Table 24).

Table 24. Watershed area and ownership distribution - Elk River watershed

Land Ownership	Acres	Ownership (percent)
USFS	35,896	53
Bureau of Land Management (BLM)	3,062	5
State	157	<1
Private	28,135	42
Total	**67,250**	**100**

Prevalent land uses

- Federal – wilderness, timber production, recreation, and mining
- Private – timber production, agriculture, grazing, and mining

Anthropomorphic alterations to habitat. Private land in the lower watershed and north of the mainstem were logged beginning in the early 1900's. The RRS began pursuing timber production and road construction in the watershed in earnest following World War II. Roads have been associated with a variety of sediment delivery processes in the watershed, including: cutbank and fillslope failures, and rock fall from steep road cuts. Old side-cast road designs in the watershed have caused numerous fill failures, and debris flows (USFS 1997).

Suction dredging and high banking activity summary. Mining, in some form, is a historic part of the upper and lower segments of this River. Historic mining dating back to the mid 1800's has occurred in the Sixes River watershed. Hydraulic mining occurred at the mouth of Dry Creek and on the South Fork Sixes River. This activity washed a great deal of fine sediment into streams at those locations that moved downstream as bedload, and widened the active stream channels. At present, mining within the watershed occurs primarily through the use of suction dredges in various stream reaches, including the South Fork Sixes and mainstem on NFS lands. There are no recommendations or opportunities for management of suction dredging stated in the Elk River WA (USFS 1997).

There was one active filed placer claim as of 5/8/2013. The number of suction dredge NOI received by the RRS averaged 0.5 (2.1% of RRS total) during the four-year period 2009-201) in the watershed for NFS land located within 1/4 mile of CCH (Table 4 and Figure 9). The NOI and related Coho Salmon habitat type and its potential maximum impact are numerically displayed in Table 25.

The Elk River was designated for inclusion in the National System under the Omnibus Oregon Wild and Scenic Rivers Act of 1988. Mining, in some form, is a historic part of the upper and lower segments of the Elk River. The upper portions of the river (above the juncture of the North Fork and South Fork of the Elk River) are classified as "Wild" in the 1994 River Management Plan. The river is designated as "Recreational" from the juncture of the North Fork and South Fork, downstream to the Forest Boundary. The north side of the river was withdrawn by the designation of the Grassy Knob Wilderness (June 26, 1984, PL 98-328) while the other side remained open to mineral entry. In 1996, the Secretary of Interior withdrew the lower portion of the river from mineral entry and location (PLO 7184), effectively withdrawing the entire river. There is one active mining claim near the lower boundary of NFS lands that has established valid existing rights, meaning that it could be mined. See Appendix A for a summary and locations of suction dredging and high banking mineral withdrawals on the RRS.

There are 58.6 miles of CCH within the watershed and 32.6 miles of those miles are withdrawn from mineral entry on NFS lands. The IP value and habitat typing for these withdrawn miles are displayed in Table 26. See Appendix A for a summary and locations of suction dredging and high banking mineral withdrawals on the RRS.

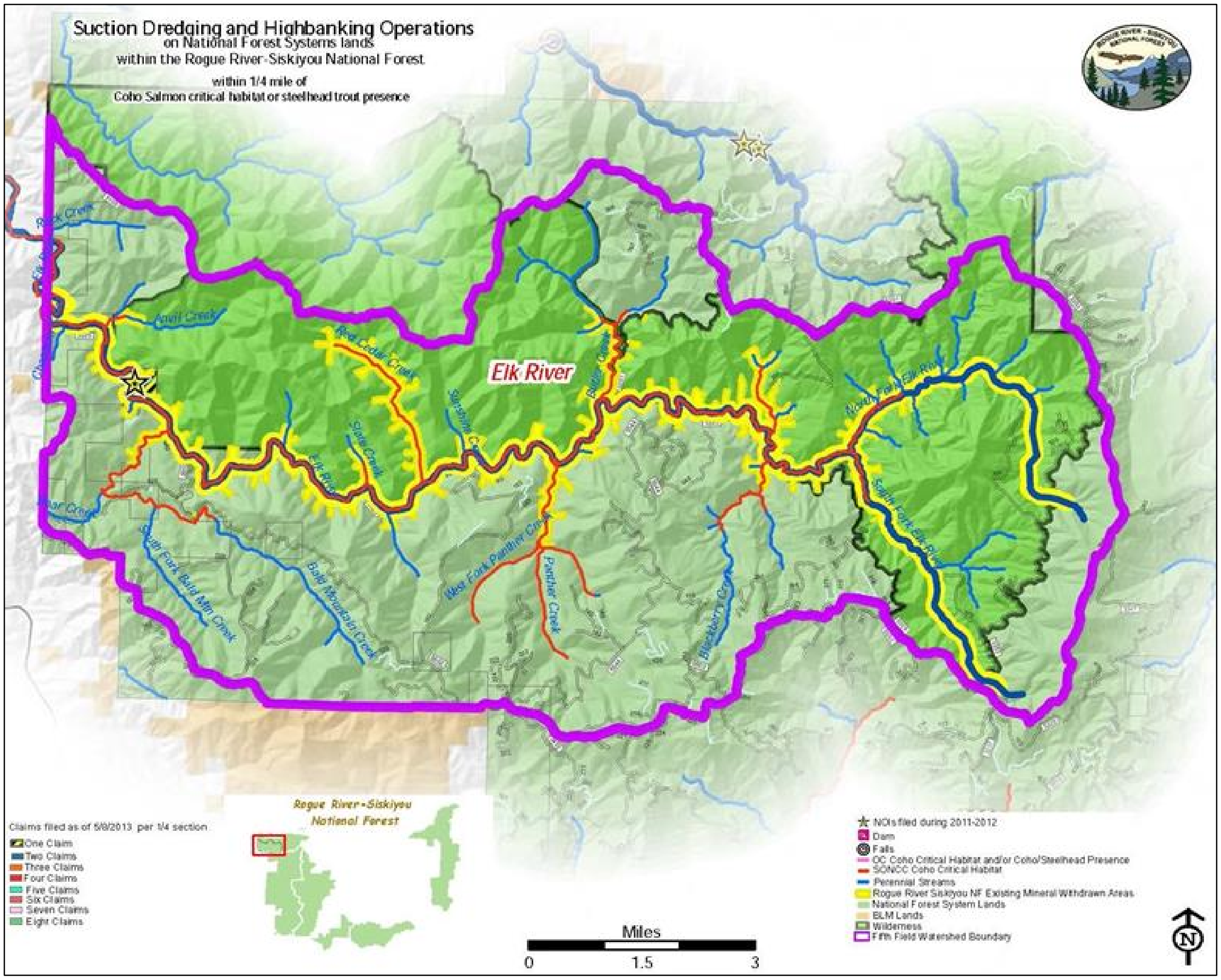

Figure 9. CCH with NOI and mining claims within 1/4 mile of CCH on NFS lands – Elk River watershed

Table 25. Suction dredging NOI received by RRS (2009-2012) within ¼ mile of CCH – Elk River watershed

Name/Location			Past NOI Information								Potential Habitat Use Coho Salmon		
							Total Maximum Disturbance[2]						
Stream w/River Mile (constant name)	Location[1] RS & Lat/Long	Name of Claim	NOI Received 2009-2012 (list years)	Number of Operators per claim Number of Operators per claim	Suction Dredge Activities (Y/N)	High Number of Operators per claim Banking Activities (Y/N)	Volume - NOI Listed (cubic yd.)	Volume – Assumed[3] or NOI Listed (cubic yd.)	Area (sq. ft.)	Stream Distance (ft.)	Spawning / Rearing ft.)	Rearing /Migration (ft.)	Migration (ft.)
Elk River 15.8	T33S., R14W., Sec 8SW N42.728 W124.393	Golden Coast #2	2010, 2011	3	Y	N	0	25	225	15	15	0	0
		AFFECTED Total within Watershed						25 yd³	225 ft²	15 ft	15 ft	0	0
		BASELINE Total within Watershed						13,923,360 yd³	4,641,120 ft²	309,408 ft	237,072 ft	72,336 ft	0
		BASELINE Total CCH within Watershed								58.6 mi	44.9 mi	13.7 mi	0.0
		AFFECTED Percent Watershed within CCH						0.000%	0.005%	0.005%	0.006%	0.000%	0.000%

[1] Proposed dredging mile marker starting point.

[2] Standard formula to calculate maximum 25 cubic yards suction dredge area of disturbance = 15 feet (length) X 15 feet (width) X 3 feet (depth). Width and depth is constant when cubic yard is stated differently in NOI.

[3] 25 cubic yards is the standard maximum volume anticipated when not specified in NOI.

Table 26. IP and habitat typing mineral withdrawn areas – Elk River watershed

Habitat Typing[1]	Intrinsic Potential[2] (miles)			Total (miles)
	High	Medium	Low	
Spawning/rearing	0.6	29.4	2.6	32.6
Rearing/migration	0	0	0	0
Migration only	0	0	0	0
Total	**0.6**	**29.4**	**2.6**	**32.6**

[1] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[2] Values based on an intrinsic potential map derived from the NETMAP CLAMS data and also located http://www.fsl.orst.edu/clams/. Category for ranking were derived from the final SONCC Coho Salmon Recovery Plan (NMFS 2014); high =>/= 0.66, moderate = </=0.33 – 0.66 and low = <0.33.

Watershed population overview – Elk River

Population highlights (NMFS 2014)

- Northern Coastal Stratum
- Core, Functionally Independent Population
- High Extinction Risk
- 2,400 Spawners Required for ESU Viability
- 93 mi2
- 63 IP km (39 IP mi) (23% High)
- Dominant Land Uses are Agriculture and Recreation
- Principal Stresses are ‘Lack of Floodplain and Channel Structure’ and ‘Impaired Water Quality’
- Principal Threats are ‘Agricultural Practices’ and ‘Channelization/Diking’

There are approximately 58.6 miles of CCH within the watershed and 36.8 miles within the RRS (Figure 9 and Table 27). The Elk River is renowned as a premier salmon and steelhead stream and is designated as a National Wild and Scenic River. Anadromous fish species in the Elk River watershed include: Chinook Salmon, Coho Salmon, winter steelhead, sea run cutthroat trout, and Pacific lamprey. Resident fish species include rainbow and coastal cutthroat trout. Historically, Coho Salmon were prevalent in the lower reaches of the watershed, but now persist at significantly depressed levels. Current Coho Salmon distribution is largely confined to four tributaries: North Fork Elk River, Red Cedar Creek, Anvil Creek, and Panther Creek. The RRS completed a Watershed Restoration Action Plan (WRAP) for the watershed in 2012, and has identified the Upper Elk River subwatershed as a priority subwatershed for aquatic restoration. IP on NFS lands consist mostly of medium ranking in the *spawning/rearing* habitat use type (Table 28).

Table 27. Salmonid species and habitat length - Elk River population

Water-shed Acres	Anadro-mous Species Present[1]	NFS lands Miles of CCH (miles)[2]	NFS lands Miles of Chinook Habitat (miles)[3]	Water-shed CCH and EFH (miles)[4]	Watershed Potential Miles of Coho Salmon Habitat Type[5]		
					Spawning/ Rearing	Rearing/ Migration	Migration only
58,398	CO, CH, ST	36.8	26.7	58.6	44.9	13.7	0

[1] All, or a portion of, the waterbody supports the following anadromous salmonids: ST- steelhead trout; CO- Coho Salmon; CH - Chinook Salmon.

[2] Steelhead presence surveys were used to determine historic Coho Salmon habitat since CCH was not spatially delineated in the Federal Register 50 CFR Part 226. Values based on GIS data layer entitled RRS 2013 Total Salmon and Steelhead Distribution and field knowledge.

[3] Values based on GIS data layer entitled 2013 RRS Anadromous Salmonid Fish Distribution; Chinook Salmon presence survey layer.

[4] Values based on a combination of RRS 2013 SONCC Coho Salmon delineated CH 19 and ODFW steelhead presence survey data 2013 GIS map (as a surrogate for historic Coho Salmon habitat) website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[5] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

Table 28. Habitat typing and intrinsic potential within CCH – Elk River watershed

Habitat Typing[1]	Intrinsic Potential[2] (miles)						Total (miles) CCN/IP/HT	
	High IP		Medium IP		Low IP			
	Water-shed	NFS lands	Water-shed	NFS lands	Water-shed	NFS lands	Water-shed	NFS lands
Spawning/rearing	6.5	1.2	34.2	32.2	4.2	3.4	44.9	36.8
Rearing/migration	4.1	0	9.6	0	0	0	13.7	0
Migration only	0	0	0	0	0	0	0	0
Total	**10.6**	**1.2**	**43.8**	**32.2**	**4.2**	**3.4**	**58.6**	**36.8**

[1] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[2] Values based on an intrinsic potential map derived from the NETMAP CLAMS data and also located http://www.fsl.orst.edu/clams/. Category for ranking were derived from the final SONCC Coho Salmon Recovery Plan (NMFS 2014); high =>/= 0.66, moderate = </=0.33 – 0.66 and low = <0.33.

Watershed habitat indicators – Elk River

1) Water quality pathway – Elk River watershed

Temperature indicator – *Not Properly Functioning*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010), Elk River WA (USFS 1998) and Elk River WRAP (USFS 2012).

The Elk River is listed as water quality limited due to summer water temperatures from its confluence with the Pacific Ocean upstream 29.9 river miles (15.7 miles on NFS lands). Bald Mountain Creek is also listed as water quality limited for temperature, from its confluence with the Elk River 2.3 miles upstream. Table 29 displays the 303(d) list for water quality limited stream within the watershed on NFS lands. Tributaries upstream of Anvil Creek located within the NFS lands tend to be well-shaded and cooler than the mainstem Elk River. Downstream agriculture lands and other development have removed stream shade in some locations and the channel is generally wide and shallow. Appendix B displays the 2010 303(d) list for streams within NFS lands on RRS.

Table 29. ODEQ, 2010 303(d) List for Oregon Waterbodies within NFS lands on RRS – Elk River watershed

Stream Name	Miles on RRS (miles)	River Mile Marker (miles)	Pollutant	Assess-ment	Assess-ment 2	Listing Status
Bald Mountain Creek	1.17	0 to 2.3	Temperature	1998	12/1/1998	303(d)
Elk River	15.77	0 to 29.9	Temperature	2004	4/14/2005	Cat 5: Water quality limited, 303(d) list, TMDL needed
Sunshine Creek	1.20	0 to 1.2	Biological Criteria	2010	1/29/2013	Cat 5: Water quality limited, 303(d) list, TMDL needed

Suspended sediment–intergravel/DO/turbidity indicator – *At Risk*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010), Elk River WA (USFS 1998), and Elk River WRAP (USFS 2012).

No streams within the watershed on NFS lands are listed specifically on the 303(d) list for sediment. However, Sunshine Creek is listed for biological criteria, possibly as a result of sediment tolerant macroinvertebrate presence (Table 29). Stream surveys in the Elk River watershed have collected data on streambed substrate in fish-bearing tributaries located on NFS lands. In general, the channels in the Elk River watershed are predominantly cobble to boulder dominated streams with excellent inherent channel stability with both 1) a high degree of resistance to changes in channel dynamics or morphology such as that can be caused by accelerated sediment loads and changes in water yield, and 2) excellent recovery from such changes, when they occur. On average, channel gradient within the Elk River is greater than 2% to less than 4%. These channels tend to transport sediment on downstream, and tend to remain stable even if impacted by disturbance and/or recover well following disturbance. At the middle and upper reaches of the Elk River, "…approximately 20% of the stream reaches have low-gradients and are relatively unconfined. These reaches are long-term sites of sediment deposition." (McHugh 1987).

Chemical contamination/nutrients indicator – *Properly Functioning*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010) and Elk Creek WRAP (USFS 2012).

The Elk River is not on the 303(d) list for contaminants or excessive nutrients. Downstream on agriculture and residential lands some contamination may occur from agriculture runoff or effluent from septic tanks, lawns and other sources.

2) Habitat access/elements pathway – Elk River watershed

Physical barriers indicator – *Properly Functioning*. Baseline: Elk River WA (USFS 1998) and Elk River WRAP (USFS 2012).

There is only one known culvert (Blackberry Creek culvert) that restricts some adult passage and all juvenile passage. NEPA and some of the pre-work have already been completed for the removal of the culvert and installation of a bridge. The Blackberry Creek bridge project is not connected to this action. There are no other known human structures on NFS lands within the ESA action area that block passage of Coho Salmon at any life stage from upstream and downstream migration.

Substrate/embeddedness indicator – *At Risk*. Baseline: Elk River WA (USFS 1998) and Elk River WRAP (USFS 2012).

Streams within the watershed tend to be high-energy systems, with substrates dominated by cobbles and boulders. Embeddedness in these systems tends to be low. However, in lower gradient sections, stream substrate can be dominated by gravel and sand, and these reaches are susceptible to sediment deposition. Anecdotal evidence following the 1996 flood and observations by McHugh during 1987 suggests that at times excessive fine bedload can impact instream habitat conditions (USFS 1998). However, more recent stream surveys (RRS Level II surveys, conducted since 2006) suggest that fine sediment is not a limiting factor to anadromous salmonid production or instream habitat.

Large wood indicator – *At Risk*. Baseline: Elk River WA (USFS 1998) and Elk River WRAP (USFS 2012).

Overall, the Elk River on NFS lands and its major tributaries appear to have sufficient quantities of potential (standing) large wood in the riparian zones. Past logging within riparian areas has limited large wood recruitment and potential large wood recruitment in certain stream reaches. Instream wood was also reduced during stream cleanout projects in the 1970s. Since the mid-1990s, riparian management under the NWFP has emphasized maintenance and enhancement of habitat for fish and other aquatic resources.

Large wood counts for the Elk River and tributaries are low and below the expected range of natural variation in reaches accessible by or near roads. Stream surveys and field observations in mainstem Elk River note low quantity of large wood downstream of the confluence of the North and South Forks. The river is predominately a confined bedrock canyon from the confluence of the forks downstream to the Forest boundary and periodically experiences extremely high and scouring flow during winter storm events. It would be expected here to find low volumes of large wood.

Pool frequency and quality indicator - *At Risk*. Baseline: Elk River WRAP (USFS 2012), Bald Mountain Creek SS (SRG 2012), Blackberry Creek SS (SRG 2012), Butler Creek SS (SRG 2006), EF Panther Creek SS (SRG 2012), Panther Creek SS (SRG 2012), WF Panther Creek SS (SRG 2012), Red Cedar Creek SS (SRG 2006), NF Elk River SS (SRG 2007), and SF Elk River SS (SRG 2007).

The Elk River has an interesting pattern of deep pools interspersed with small boulder rapids. Steep whitewater cascades have larger boulders with numerous waterfalls and plunge pools. In winter, water cascades from steep tributaries and slopes along the Elk River. Large wood is the primary causal mechanism in low gradient streams to create complex and frequent pools. These pools and associated large wood also create off-channel habitat and refuge for salmonids. Most pools in Elk River and its tributaries are formed by bedrock canyon features and not by large wood complexes. Table 30 summarizes pool habitat condition on streams surveyed (using RRS R6 Level II survey protocol) on NFS lands in the watershed.

Table 30. Habitat percent and pool summary for surveyed streams – Elk River watershed

Stream Name	Year Survey-ed	Habitat % Pool	Habitat % Riffle	Habitat % Side Channel	Pools/ Mile	Deep Pools/mile (>3ft)	Avg. Residual Pool Depth (ft)
Bald Mtn. Creek	2012	37.4	62.5	31.4	23.8	3.4	30.9
Blackberry Creek	2011	31.9	66.3	42.1	10.7	2.1	24.8
Butler Creek	2006	49.2	50.4	41.4	15.4	2.7	25.5
EF Panther Creek	2012	18.5	80.6	41.6	4.9	1.9	25.4
Panther Creek	2012	30.4	69.4	33.6	9.7	2.5	32.4
WF Panther Creek	2012	20.9	78.3	28.9	3.7	1.6	22.2
Red Cedar Creek	2006	40.1	59.9	36.7	17.4	2.5	25.6
NF Elk River	2007	40.3	58.5	33.6	12.3	2.3	27.5
SF Elk River	2007	31.7	62.9	20.9	8.9	2.4	43.1

Off-channel habitat: Habitat elements indicator – *At Risk*. Baseline: Elk River WRAP (USFS 2012), Bald Mountain Creek SS (SRG 2012), Blackberry Creek SS (SRG 2012), Butler Creek SS (SRG 2006), EF Panther Creek SS (SRG 2012), Panther Creek SS (SRG 2012), WF Panther Creek SS (SRG 2012), Red Cedar Creek SS (SRG 2006), NF Elk River SS (SRG 2007), and SF Elk River SS (SRG 2007).

Due to the confined nature of most of the Elk River streams, off-channel habitat does not generally occur. Floodplains are generally non-existent, and are very narrow or have inaccessible high terraces.

Refugia indicator – *At Risk*. Baseline: Elk River WRAP (USFS 2012), Bald Mountain Creek SS (SRG 2012), Blackberry Creek SS (SRG 2012), Butler Creek SS (SRG 2006), EF Panther Creek SS (SRG 2012), Panther Creek SS (SRG 2012), WF Panther Creek SS (SRG 2012), Red Cedar Creek SS (SRG 2006), NF Elk River SS (SRG 2007), and SF Elk River SS (SRG 2007).

Refugia are primarily present within deep pools and at tributary confluences (thermal refugia) with the mainstem Elk River. Within tributary streams, complex or deep pools and to a lesser degree off-channel habitat features function as usable refugia for rearing salmonids.

3) Channel condition and dynamics pathway – Elk River watershed

Bankfull width depth ratio/ channel widening indicator – At Risk. Baseline: Elk River WRAP (USFS 2012), Bald Mountain Creek SS (SRG 2012), Blackberry Creek SS (SRG 2012), Butler Creek SS (SRG 2006), EF Panther Creek SS (SRG 2012), Panther Creek SS (SRG 2012), WF Panther Creek SS (SRG 2012), Red Cedar Creek SS (SRG 2006), NF Elk River SS (SRG 2007), and SF Elk River SS (SRG 2007).

The Elk River is a prime example of inherent channel stability, with most stream reaches confined within bedrock canyons or steep side slopes. Floodplains tend to be small or absent in this area with very little off-channel habitat. In contrast, approximately 20% of stream reaches are lower gradient alluvial channels. These lower gradient segments tend to have depositional features with more expansive floodplains, and can provide high quality spawning and rearing habitat for anadromous fish as per Judy McHugh (USFS 1998).

McHugh (1987) observed that timber harvest activity in the Panther Creek and North Fork Elk River drainages resulted in sediment deposition within adjacent and nearby downstream low gradient stream reaches. More recent stream surveys did not document any notable deposition of fine sediment from upland sources. Since the mid-1990s, riparian management under the NWFP has emphasized maintenance and enhancement of habitat for fish and other aquatic resources. Consequently, instream habitat including bankfull width/depth conditions is improving on NFS lands.

Streambank condition indicator – At Risk. Baseline: Elk River WRAP (USFS 2012), Bald Mountain Creek SS (SRG 2012), Blackberry Creek SS (SRG 2012), Butler Creek SS (SRG 2006), EF Panther Creek SS (SRG 2012), Panther Creek SS (SRG 2012), WF Panther Creek SS (SRG 2012), Red Cedar Creek SS (SRG 2006), NF Elk River SS (SRG 2007), and SF Elk River SS (SRG 2007).

Streambanks have been altered where valley bottom roads occur and where timber harvest or hydraulic mining have removed vegetation and soil. Many streambanks are well armored with large boulders and bedrock.

Floodplain connectivity indicator – At Risk. Baseline: Elk River WRAP (USFS 2012), Bald Mountain Creek SS (SRG 2012), Blackberry Creek SS (SRG 2012), Butler Creek SS (SRG 2006), EF Panther Creek SS (SRG 2012), Panther Creek SS (SRG 2012), WF Panther Creek SS (SRG 2012), Red Cedar Creek SS (SRG 2006), NF Elk River SS (SRG 2007), and SF Elk River SS (SRG 2007).

On NFS lands, most streams are hillslope confined or located within naturally incised bedrock canyons. Consequently, floodplains where they occur tend to be small. Roads located within riparian areas have altered historic floodplains.

4) Flow/hydrology pathway – Elk River watershed

Change in peak/base flow indicator – *At Risk*. Baseline: Elk River WRAP (USFS 2012).

Timber harvest within the RRS portion of the Elk River watershed took place principally during the late 1960’s, 1970’s and 1980’s. About 68% of the Elk River watershed is NFS lands and less than 20% of this area has had vegetative management in the way of regeneration harvest, commercial thinning, and select cuts. Most of these plantations have rapidly recovered due to rapid tree growth in the wet coastal forests. Currently peak flows are unaffected from past harvest. Road densities are relatively light in this watershed on public lands at 1.31 miles per square mile, and overall effects on peak and base water flows are low.

Increase in drainage network indicator – *At Risk*. Baseline: Elk River WA (USFS 1998).

The road density (roads per square mile) for the watershed is about 1.31 miles per square mile of roads on NFS lands. The watershed is comprised of steep valley walls and a heavily dissected stream network. Most roads avoid streams and are located near ridgetops. Downstream road densities are probably higher on private industrial timberlands.

5) Watershed conditions pathway – Elk River watershed

Road density and location indicator – *At Risk*. Baseline: Elk River WA (USFS 1998).

The road density in the watershed is about 1.31 miles per square mile on NFS lands. Records of road densities on downstream private lands indicate that road densities are higher in private industrial timber lands. On NFS lands, RRS Road 5325 is located within the drainage bottom of the mainstem Elk River. Most other FS roads are located away from streams along ridgetops.

Disturbance history indicator - *At Risk*. Baseline: Elk River WA (USFS 1998).

As previously mentioned about 53% of the Elk River watershed is NFS and less than 20% of this area has had vegetative management in the way of regeneration harvest, commercial thinning, and or select cuts. Downstream of NFS lands, roughly one-third of the watershed area, it is assumed that most of the forested lands are in early or mid-seral conditions due to timber production on private land. There are scattered residences and small farms in the valley bottom downstream of public lands.

Riparian Reserves indicator – *At Risk*. Baseline: Elk River WA (USFS 1998) and Elk River WRAP (USFS 1998).

Considerable harvest has taken place in riparian areas in the past as approximately 3,406 acres of the total 5,170 acres scheduled for thinning are within Riparian Reserves. Plantations are scattered throughout the entire watershed. Overall riparian conditions are good in the upper watershed on public lands. It is assumed, as previously mentioned, that on private lands much of riparian areas will remain in early and mid-seral conditions to maximize timber production.

Disturbance regime indicator – *At Risk*. Baseline: Elk River WA (USFS 1998) and Elk River WRAP (USFS 1998).

The upper watershed is composed of steep terrain and highly dissected stream networks. Past road construction and timber harvest have caused a few local landslides. Some roads that were causing chronic problems have been closed and decommissioned in the past decade, including recently in the new designated Copper-Salmon wilderness. Generally most roads that remain are stable and do not cause chronic erosion problems. Downstream on private lands it is assumed that some aggravation of unstable areas has occurred. Fires occur infrequently. Large portions of the NFS lands are located within the Grassy Knob and Copper Salmon Wilderness Areas.

3. Illinois River population

Subbasin overview – Illinois

The Illinois River population is located within the Illinois subbasin. The subbasin encompasses 989-square miles that feed the 56-mile long Illinois River, a tributary to the Rogue River. The headwaters drain a small portion of the Siskiyou Wilderness in Del Norte County, California, but primarily flow from the Kalmiopsis Wilderness and the slopes of the Siskiyou Crest in southern Oregon. The majority of the subbasin is within Josephine County. The Illinois River flows into the Rogue River at Agness (Figure 10). Tributaries to the Illinois River include Sucker, Briggs, Althouse, Silver, Klondike, Lawson, Indigo, Josephine and Deer Creeks, in addition to the East and West Forks of the Illinois River before they converge. The subbasin is managed by the RRS in the upper elevations and again in the lower watershed around its confluence with the Rogue River. Private ownership and BLM land is interspersed around the lightly populated Illinois

Valley along Highway 199. Towns in the watershed include Selma, Kerby, Cave Junction, O'Brien, and Takilma Oregon.

Suction dredging and high banking activity summary. Mining has left its footprint on many miles of Illinois River stream channels (USFS 1997, 1999, 2000, BLM 1997, 2004, 2006), although current activity is light when compared to historic levels. Bayley (2003) was not able to find significant correlation between suction dredge activity in the Illinois subbasin and either fish populations or fish habitat, although he did find a significant response between historic hydraulic mining and these parameters. Bayley reported, "the fact that the analysis was able to detect a negative effect of another mining process, hydraulic mining, on native salmonids, is an indication of the long-lasting effect that hydraulic mining has had on the environment, particularly on riparian zones and floodplain sections in geomorphically unconstrained reaches. Historic mining damage to Coho Salmon streams includes disruption of reaches of the mainstem East and West Fork Illinois River (BLM and USFS 2000, BLM 2003).

Potential impacts of mining on Illinois River salmonids threaten the ecological integrity of the area (Bredensteiner et al. 2003). The majority of the occupied low and medium IP in the Illinois River watershed occurs on federal lands, where mining access is permitted under the 1872 Mining Law. Gold mining on federal lands often occurs on 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. Mining and gravel extraction rate an overall high threat score for Illinois River Coho Salmon; high for egg, fry and juveniles and medium for smolts and adults (NMFS 2014). Flood terraces were turned over in search of the precious metal, destroying riparian areas and in some cases unleashing large quantities of sediment downstream (USFS 1999) that persist today in west side tributaries such as Josephine, Sucker and Althouse Creeks as well as mainstem reaches of the Illinois River.

The Illinois River was designated as "Wild and Scenic" by Congress in 1984 (PL 98-494). Mining, in some form, is part of the history of the upper and lower segments of this River. Much of the mineral potential along this river was poorly explored due to the nearly impassable terrain and the inherent lack of access into the heart of what is now the Kalmiopsis Wilderness. The 1985 River Management Plan delineated the Illinois River from Briggs Creek downstream to Nancy Creek as the Wild section. This section of river was automatically withdrawn from mineral appropriation, including ¼ mile of its lower tributaries. Then by recommendation of the River Management Plan, the Secretary of Interior in 1993 withdrew the river from Briggs Creek up to Deer Creek from mineral appropriation.

There are no additional withdrawals on the remaining eight miles of river. About four of the eight miles not withdrawn from mineral appropriation, Nancy Creek to the mouth, are largely privately owned. The other four miles, not withdrawn, runs from the upper Forest Boundary near Sauer Flat, downstream to about Deer Creek. This section of river was not withdrawn from mineral entry because historic mining had already heavily modified the river and surrounding benches, access was good, and mining demand was high. Since the character had already been heavily altered the view then was that withdrawal would accomplish little. This section of river is completely overlain with placer claims, as are most of the Illinois' tributaries in this upper section. One section here was formerly a patented mining claim which was acquired by the RRS through land exchange in the mid 1990's and then subsequently claimed by individuals and by a couple of mining organization/clubs. This stretch of river sees a high amount of suction dredge activity.

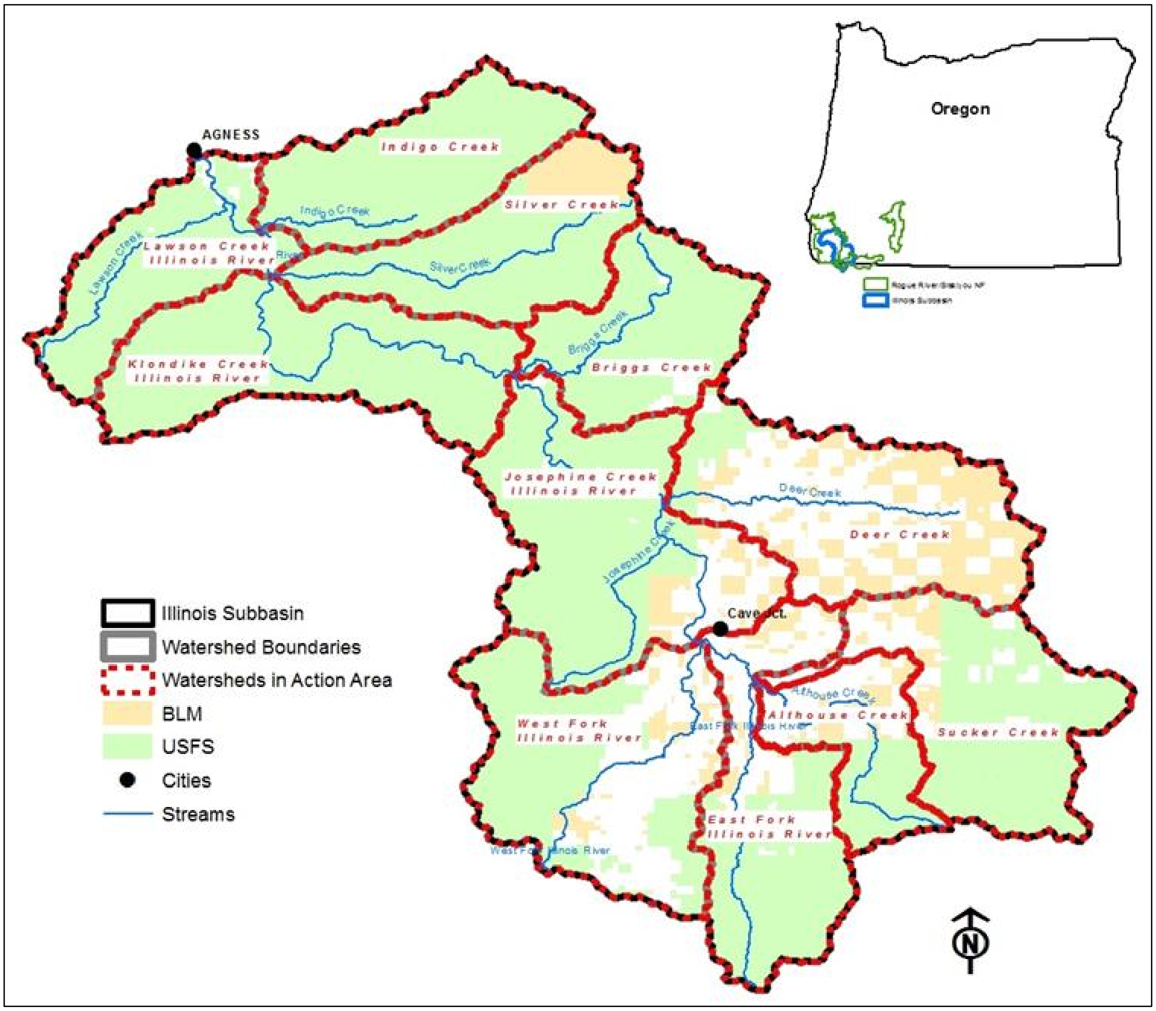

Figure 10. Illinois River population in relation to its watershed(s) within the ESA action area

The EIS for the 1989 Forest Plan categorizes the mineral potential for the Wild section of this river. Two segments of the Wild section of the river are rated at medium mineral potential. They are from about Briggs Creek downstream to about Florence Creek, and then from about Collier Creek downstream to about Grapevine Camp. The remainder of the Wild section is rated as having a low mineral potential. The segment of the Scenic section from the Forest Boundary, near Sauer Flat to about Deer Creek has a high mineral potential and is not withdrawn. The segment from Deer Creek downstream to about Store Gulch has a medium mineral potential and is withdrawn. The mineral potential from about Store Gulch downstream to about Salmon Creek, which is also withdrawn, is rated as high. Then from about Salmon Creek downstream to about Briggs Creek (beginning of the Wild section) the mineral potential is medium and the river segment is also withdrawn. The segment of the river from about Nancy Creek downstream to the mouth is the only Recreational section of this river and has a low mineral potential.

There were 294 active filed placer claims (74.76% of RRS) as of 5/8/2013 within ¼ mile of CCH in the subbasin. There were 5.5 NOI average per year (23.4% average of RRS total) received by the RRS during the four-year period from 2009-2012 (22 total NOI during the period) in the subbasin on NFS lands located within 1/4 mile of CCH (Table 4). See Appendix A for a summary of the suction dredging and high banking mineral withdrawn areas on the RRS.

Subbasin population overview – Illinois River

Population highlights (NMFS 2014)

- There is one Coho Salmon population within the Illinois subbasin: Illinois River
- Independent interior Rogue stratum
- Core, functionally independent population
- High extinction risk
- 11,800 spawners required for ESU viability
- 400 mi2
- 590 IP km (367 IP mi) (47% High)
- Dominant land uses are agriculture and urban/residential/commercial development
- Principal stresses are ‘Altered Hydrologic Function’ and ‘Degraded Riparian Forest Conditions’
- Principal threats are ‘roads’ and ‘dams/diversions’

The Illinois River subbasin is one of the most important subbasins of the Rogue River for naturally produced Coho Salmon with perhaps one-half of the wild Rogue Coho Salmon population residing here (NMFS 2014). There is no hatchery supplementation in the Illinois River watershed as it is managed exclusively for wild fish. Table 31 display salmonid species and habitat length within the ESA action area for the Illinois River population.

Table 31. Salmonid species and habitat length within the ESA action area - Illinois River population

Watershed Name	Watershed Acres	Anadromous Species Present[1]	NFS Lands Miles of CCH (miles)[2]	NFS Lands Miles of Chinook Habitat (miles)[3]	Watershed CCH and EFH (miles)[4]	Watershed Potential Miles of Coho Salmon Habitat Type[5]		
						Spawning/ Rearing	Rearing/ Migration	Migration Only
Althouse Creek	30,243	CO, CH, ST	3.7	0	14.2	14.2	0	0
Briggs Creek	43,758	CO, CH, ST	0.7	0	0.7	0.7	0	0
Deer Creek	72,605	CO, CH, ST	2.6	0	56.4	56.4	0	0
EF Illinois River	57,779	CO, CH, ST	12.8	1.0	32.0	28.8	3.2	0
Indigo Creek	48,984	CO, CH, ST	30.3	0	30.3	30.3	0	0
Josephine Creek-Illinois River	81,746	CO, CH, ST	37.7	20.0	49.4	26.2	23.2	0
Klondike Creek-Illinois River	67,124	CO, CH, ST	42.7	23.8	42.7	18.3	24.4	0
Lawson Creek-Illinois River	41,179	CO, CH, ST	16.4	13.6	20.8	10.7	10.1	0
Silver Creek	51,620	CO, CH, ST	22.1	0.9	22.1	22.1	0	0
Sucker Creek	61,515	CO, CH, ST	12.1	2.6	29.8	29.8	0	0
WF Illinois River	76,996	CO, CH, ST	25.8	4.1	57.4	57.4	0	0
Total			**206.9**	**66**	**355.8**	**294.9**	**60.9**	**0**

[1] All, or a portion of, the waterbody supports the following anadromous salmonids: ST- steelhead trout; CO- Coho Salmon; CH - Chinook Salmon.

[2] Steelhead presence surveys were used to determine historic Coho Salmon habitat since CCH was not spatially delineated in the Federal Register 50 CFR Part 226. Values based on GIS data layer entitled RRS 2013 Total Salmon and Steelhead Distribution and field knowledge.

[3] Values based on GIS data layer entitled 2013 RRS Anadromous Salmonid Fish Distribution; Chinook Salmon presence survey layer.

[4] Values based on a combination of RRS 2013 SONCC Coho Salmon delineated CH 19 and ODFW steelhead presence survey data 2013 GIS map (as a surrogate for historic Coho Salmon habitat) website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[5] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

Although federal ownership covers 81 percent of the Illinois River population, the vast majority of stream reaches on NFS and BLM lands are too steep or otherwise unsuitable for Coho Salmon. Both the NFS and BLM have adopted new timber harvest practices that are less detrimental to salmonid habitat. Forests are now being thinned to meet conservation and recreation objectives (USFS 2007), rather than cleared for timber sales. Aquatic habitat on federal lands in the Illinois River subbasin is recovering in response to these land use changes. Rural residential growth in the watershed has followed a pattern similar to other areas of Josephine and Curry counties, with related increased demand on surface and groundwater (Southwest Oregon Resource Conservation and Development Council (SORC&DC 2003) (NMFS 2014).

ODFW (2005a) surveys from 1998 to 2004 confirmed that Coho Salmon still migrate to Illinois River tributaries in an extensive area, but rearing is concentrated in small patches in upper reaches of Illinois Valley streams, just below federal land. Comparatively high densities of juvenile Coho Salmon have been found in Deer, Sucker, and Althouse Creeks as well as the East and West Forks of the Illinois River. During the 2004 to 2009 run years, on average about 70 percent of sites were occupied by wild adult Coho Salmon with an estimated average of 25 spawners per mile (hatchery or wild origin unstated) (Lewis et al. 2009).

A substantial portion of the western Illinois River subbasin has serpentine soils that naturally support sparse riparian conditions (USFS 2000b) that likely result in warm summer stream temperatures. In most cases, Coho Salmon are naturally absent from steep lower Illinois River tributaries and those that drain the serpentine bedrock area with sparse riparian conditions of the western part of the subbasin (e.g., Rough and Ready and Josephine Creeks). The upper Illinois River subbasin [on private lands] is where tributaries with high IP Coho Salmon habitat exist: the mainstem Illinois River, East Fork Illinois River, West Fork Illinois River, Althouse Creek, Sucker Creek, Briggs Creek, and Deer Creek (Table 32). The population is at high risk of extinction due to its sharply declining productivity (NMFS 2014).

Table 32. Habitat typing and intrinsic potential within CCH - Illinois River population

Watershed	Habitat Typing[1] and Intrinsic Potential[2]																			
	High IP (miles)						Medium IP (miles)						Low IP (miles)						Total CCH/IP/ Habitat Typing	
	Habitat Typing (miles)						Habitat Typing (miles)						Habitat Typing (miles)							
	Spawning/ rearing		Rearing/ migration		Migration		Spawning/ rearing		Rearing/ migration		Migration		Spawning/ rearing		Rearing/ migration		Migration			
	Watershed	NFS lands	Watershed	NFS	Watershed	NFS lands	Watershed	NFS lands	Watershed	NFS lands	Watershed	NFS lands	Watershed	NFS lands	Watershed	NFS lands	Watershed	NFS lands	Watershed	NFS lands
Althouse Creek	6.1	0	0	0	0	0	5.5	1.4	0	0.0	0	0	2.6	2.3	0	0	0	0	14.2	3.7
Briggs Creek	0	0	0	0	0	0	0.4	0.4	0	0	0	0	0.3	0.3	0	0	0	0	0.7	0.7
Deer Creek	37.0	0	0	0	0	0	14.7	2.3	0	0	0	0	4.7	0.3	0	0	0	0	56.4	2.6
East Fork Illinois R	11.9	0.7	3.0	0	0	0	9.0	5.5	0.2	0	0	0	7.9	6.6	0	0	0	0	32.0	12.8
Indigo Creek	0	0	0	0	0	0	25.7	25.7	0	0	0	0	4.6	4.6	0	0	0	0	30.3	30.3
Josephine Creek-Illinois River	0	0	0.7	0	0	0	20.5	15.5	18.7	17.6	0	0	5.7	3.8	3.8	0.8	0	0	49.4	37.7
Klondike Creek- Illinois River	0	0	0	0	0	0	9.9	9.9	23.2	23.2	0	0	8.4	8.4	1.2	1.2	0	0	42.7	42.7
Lawson Creek- Illinois River	0	0	0	0	0	0	4.7	4.4	9.4	5.8	0	0	6.0	5.7	0.7	0.5	0	0	20.8	16.4
Silver Creek	0	0	0	0	0	0	19.5	19.5	0	0	0	0	2.6	2.6	0	0	0	0	22.1	22.1
Sucker Creek	9.2	1.2	0	0	0	0	16.3	7.0	0	0	0	0	4.3	3.9	0	0	0	0	29.8	12.1
WF Illinois River	19.6	1.7	0	0	0	0	30.5	17.6	0	0	0	0	7.3	6.5	0	0	0	0	57.4	25.8
Total	**83.8**	**3.6**	**3.7**	**0**	**0**	**0**	**156.7**	**109.2**	**51.5**	**46.6**	**0**	**0**	**54.4**	**45**	**5.7**	**2.5**	**0**	**0**	**355.8**	**206.9**

[1] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[2] Values based on an intrinsic potential map derived from the NETMAP CLAMS data and also located http://www.fsl.orst.edu/clams/. Category for ranking were derived from the final SONCC Coho Salmon Recovery Plan (NMFS 2014); high =>/= 0.66, moderate = </=0.33 – 0.66 and low = <0.33.

Watersheds within the ESA action area of the Illinois River population

Watershed baseline conditions are described for 11 watersheds within the Illinois River subbasin: Althouse Creek, Briggs Creek, Deer Creek, East Fork Illinois River, Indigo Creek, Josephine Creek-Illinois River, Klondike Creek-Illinois River, Lawson Creek-Illinois River, Silver Creek, Sucker Creek, and West Fork Illinois River watersheds (Figure 10).

a. Althouse Creek watershed

Watershed overview – Althouse Creek

Althouse Creek, a third-order tributary to East Fork Illinois River, is located in the Siskiyou Mountains of southeastern Josephine County, Oregon. 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 near Bridgeview, Oregon. The Althouse Creek watershed is dendritically shaped and splits into two large tributaries, East Fork Althouse Creek and West Fork Althouse Creek, in the upper watershed. The watershed is located within an elevation range of 1,340 feet to 6,318 feet (Althouse Mountain) and receives, depending on elevation, 60 - 80 inches of precipitation per year. Much of this precipitation is generated from storms coming off the Pacific Ocean during the winter months. A significant portion of the watershed is located within the transient snow zone - an area situated within an elevation range (2,500 – 5,000 feet) that can receive moisture as either rain or snow. As a result, rainstorms on snow pack are not uncommon and can amplify a flood event. This was observed during the January 1, 1997 storm that caused wide spread flooding throughout southern Oregon and particularly in the Althouse watershed (SRG 2002).

The lower portion of the Althouse watershed is located on privately-owned land, state-owned land, and BLM. The middle and upper portion of the watershed is located on NFS lands. The ownership distribution in the watershed encompasses: USFS 46%, BLM 16%, State lands 2% and the remaining 36% is in private ownership (Table 33). NFS lands management areas under the NWF plan within the surveyed portion of the watershed include Late Successional Reserves, Matrix, Riparian Reserves, and Special Wildlife Sites.

Table 33. Watershed area and ownership distribution - Althouse Creek watershed

Land Ownership	Acres	Ownership (percent)
USFS	35,896	53
Bureau of Land Management (BLM)	3,062	5
State	157	<1
Private	28,135	42
Total	**67,250**	**100**

Prevalent land uses

- Federal – timber production, mining, dispersed recreation
- Private – timber production, agriculture, tourism, rural residential development, mining

Anthropomorphic alterations to habitat. European settlers cleared floodplains, trapped beavers, drained wetlands, and channelized streams to facilitate rural development and agriculture. Timber harvest and associated road construction began in the late 1800s and increased up to and through the early 1990s.

Suction dredging and high banking activity summary. Althouse Creek was the site of much of the large-scale intensive gold mining in southwestern Oregon with hydraulic mining used as a primary method. The legacy of hydraulic mining on stream channels and valley topography is still evident. Gold mining in the Illinois Valley began in the 1850s. Flood terraces were turned over in search of the precious metal, destroying riparian areas and in some cases unleashing large quantities of sediment downstream (USFS 1999) that persist today in west-side tributaries such as Althouse Creek, as well, as mainstem reaches of the Illinois River. The channel is a high-energy system with cobble substrate. Mining/gravel extraction is rated as a high threat for Illinois River Coho Salmon (NMFS 2014).

There were 23 active filed placer claims (6% of Illinois subbasin), as of 5/8/2013 (Figure 11). There were no NOI received by the RRS during the four-year period from 2009-2012 in the subbasin on NFS land located within 1/4 mile of CCH (Table 4). There are no mineral withdrawn areas within the Althouse Creek watershed (located upstream of Deer Creek tributary; upper extent of mineral withdrawn area on the Illinois River).

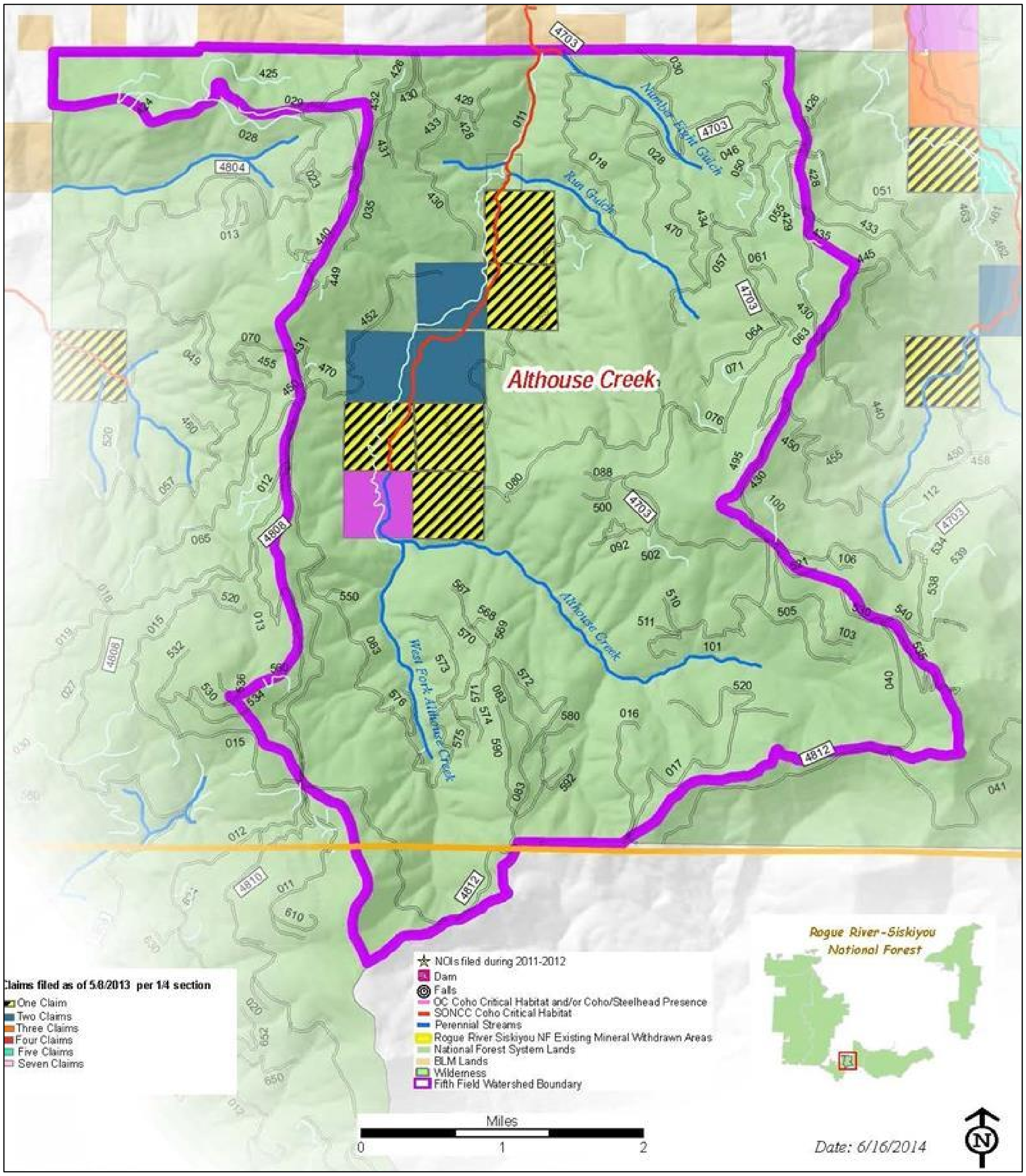

Figure 11. CCH with NOI and mining claims within 1/4 mile of CCH on NFS lands - Althouse Creek

Watershed population overview – Althouse Creek

The Althouse Creek watershed Coho Salmon population is part of the greater Illinois subbasin population. The Althouse Creek watershed supports populations of Coho Salmon and other native fishes. Within this watershed, factors limiting Coho Salmon production 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.

There are about 14.2 miles of CCH in the Althouse Creek watershed, with about 3.7 miles located on NFS lands (Figure 11 and Table 34). All of the high and medium IP CCH is located downstream of the NFS lands on private and BLM lands (Table 35). In a 1989 snorkel survey, Coho Salmon were distributed up to river mile 11 on Althouse Creek (approximately 0.5 miles located on NFS land).

Table 34. Salmonid species and habitat length - Althouse Creek watershed

Water-shed Acres	Anadro-mous Species Present[1]	NFS lands Miles of CCH (miles)[2]	NFS lands Miles of Chinook Habitat (miles)[3]	Water-shed CCH and EFH (miles)[4]	Watershed Potential Miles of Coho Salmon Habitat Type[5]		
					Spawning/ Rearing	Rearing/ Migration	Migration only
30,243	CO, CH, ST	3.7	0	14.2	14.2	0	0

[1] All, or a portion of, the waterbody supports the following anadromous salmonids: ST- steelhead trout; CO- Coho Salmon; CH - Chinook Salmon.

[2] Steelhead presence surveys were used to determine historic Coho Salmon habitat since CCH was not spatially delineated in the Federal Register 50 CFR Part 226. Values based on GIS data layer entitled RRS 2013 Total Salmon and Steelhead Distribution and field knowledge.

[3] Values based on GIS data layer entitled 2013 RRS Anadromous Salmonid Fish Distribution; Chinook Salmon presence survey layer.

[4] Values based on a combination of RRS 2013 SONCC Coho Salmon delineated CH 19 and ODFW steelhead presence survey data 2013 GIS map (as a surrogate for historic Coho Salmon habitat) website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[5] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

Table 35. Habitat typing and intrinsic potential within CCH – Althouse Creek watershed

Habitat Typing[1]	Intrinsic Potential[2] (miles)						Total (miles) CCN/IP/HT	
	High IP		Medium IP		Low IP			
	Water-shed	NFS lands	Water-shed	NFS lands	Water-shed	NFS lands	Water-shed	NFS lands
Spawning/rearing	6.1	0	5.5	0	2.6	0	14.2	0
Rearing/migration	0	0	0	0	0	1.4	0	1.4
Migration only	0	0	0	0	0	2.3	0	2.3
Total	**6.1**	**0**	**5.5**	**0**	**2.6**	**3.7**	**14.2**	**3.7**

[1] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[2] Values based on an intrinsic potential map derived from the NETMAP CLAMS data and also located http://www.fsl.orst.edu/clams/. Category for ranking were derived from the final SONCC Coho Salmon Recovery Plan (NMFS 2014); high =>/= 0.66, moderate = </=0.33 – 0.66 and low = <0.33.

Although Illinois River Coho Salmon population are still well distributed, 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. Many reaches surveyed by ODFW (2005a) in the Illinois River subbasin do not contain juvenile Coho Salmon in some or all years, and densities at locations that always have Coho Salmon vary substantially between years. Sites with the most consistent Coho Salmon presence and greatest density in the Illinois River basin cluster in three patches or small metapopulations: 1) Deer Creek and its tributaries Crooks, Thompson and North Fork Deer Creeks; 2) Upper West Fork Illinois and its tributaries Wood and Elk Creeks; and 3) Upper East Fork Illinois and tributaries Althouse, Sucker, Grayback and Little Grayback, Elder, Page and Dunn Creeks as well as Scotch and Long Gulch (NMFS 2014).

Watershed habitat indicators – Althouse Creek

1) Water quality pathway – Althouse Creek watershed

Temperature indicator – *At Risk*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010), Rogue River Basin TMDL (ODEQ 2008a), final SONCC Coho Salmon Recovery Plan (NMFS 2014), Althouse Creek WA (BLM 2005) and Althouse Creek SS (USFS 2002).

Table 36 displays the 303(d) list for water quality limited streams within the watershed on NFS lands. The stream is not listed for temperature on NFS lands and is heavily shaded by an alder and conifer canopy in this section. The U.S. Environmental Protection Agency (EPA) shares enforcement authority for the Clean Water Act with ODEQ, which has been creating pollution abatement reports known as Total Maximum Daily Load reports or TMDLs. There is an approved TMDL in place for the Illinois subbasin (part of the Rogue River TMDL), which addresses water temperature (ODEQ 2008). Management of the NFS lands within the Althouse Creek watershed is guided by the Siskiyou NF LRMP as amended by the NWFP. The aquatic and riparian standards and guidelines contained within these documents, particularly the Aquatic Conservation Strategy within the NWFP, are designed to provide for recovery and maintenance of cool/cold water thermal regimes within streams on NFS lands. Appendix B displays the 2010 303(d) list for streams within NFS lands on RRS.

Table 36. ODEQ, 2010 303(d) List for Oregon Waterbodies within NFS lands on RRS – Althouse Creek watershed

Stream Name	Miles on RRS (miles)	River Mile Marker (miles)	Pollutant	Assess-ment	Assess-ment 2	Listing Status
Althouse Creek	8.04	0 to 18	Temperature	2010	10/29/2010	Cat 4A: Water quality limited, TMDL approved
Althouse Creek	8.04	0 to 18	Biological Criteria	2010	1/29/2013	Cat 5: Water quality limited, 303(d) list, TMDL needed

Suspended sediment–intergravel DO/turbidity indicator – *Properly Functioning*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010), Water Quality Management Plan Rogue River Basin Illinois River Sub Basin (USFS

1999), final SONCC Coho Salmon Recovery Plan (NMFS 2014), Althouse Creek WA (BLM 2005) and Althouse Creek SS (USFS 2002).

No streams within the watershed on NFS lands are listed specifically on the 303(d) list for sediment. However, Althouse Creek is listed for biological criteria, possibly as a result of sediment tolerant macroinvertebrate presence (Table 36). Sediment input into stream channels on NFS lands has been primarily associated with past timber harvest and road systems. Streams on NFS lands tend to be higher gradient than downstream private land reaches, and stream substrates are dominated by cobbles and gravel. No streams within the watershed have been listed as water quality limited for sedimentation. The SONCC Coho Salmon final recovery plan (NMFS 2014) reported, “extensive reaches of …Althouse Creek have very good fine sediment scores (<12 percent fines), indicating suitable Coho Salmon spawning conditions”.

Chemical contamination/nutrients indicator – *Properly Functioning*. Baseline: draft 2012 Oregon’s 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010), Water Quality Management Plan Rogue River Basin Illinois River Sub Basin (USFS 1999), final SONCC Coho Salmon Recovery Plan (NMFS 2014), Althouse Creek WA (BLM 2005) and Althouse Creek SS (USFS 2002).

The watershed within NFS lands of the RRS is not on the 303(d) list for contaminants or excessive nutrients. The lack of human development within and immediately adjacent to NFS lands within the watershed limits the risk of chemical contamination and nutrient loading within Althouse Creek. Lower Althouse Creek below the ESA action area may experience some nutrient inputs from agricultural development.

2) Habitat access/elements pathway – Althouse Creek watershed

Physical barriers indicator – *Properly Functioning*. Baseline: Althouse Creek WA (BLM 2005) and Althouse Creek SS (USFS 2002).

There is at least one physical barrier to Coho Salmon on NFS lands within the watershed; a natural falls upstream of the Run Gulch confluence. Much of Althouse Creek and its tributaries upstream of this natural barrier is not optimal Coho Salmon habitat because the stream gradient steepens and the channel becomes more incised in a bedrock canyon. Push-up dams and other barriers such as culverts on BLM land have existed downstream outside of the ESA action area.

Substrate/embeddedness indicator – *Properly Functioning*. Baseline: final SONCC Coho Salmon Recovery Plan (NMFS 2014) and Althouse Creek SS (USFS 2002).

As mentioned above, the SONCC Coho Salmon final recovery plan reported, “extensive reaches of …Althouse Creek have very good fine sediment scores (<12 percent fines), indicating suitable Coho Salmon spawning conditions”. Stream reaches on NFS lands tend to be higher gradient than downstream private land stream reaches, and are predominately transport reaches.

Large wood indicator – *Not Properly Functioning*. Baseline: Althouse Creek WA (BLM 2005) and Althouse Creek SS (USFS 2002).

Large wood counts in streams within the Althouse Creek watershed are low and below the expected range of natural variation in reaches accessible by or near roads. The RRS has not placed instream large wood in Althouse Creek.

Pool frequency and quality indicator – *Not Properly Functioning*. Baseline: Althouse Creek WA (BLM 2005) and Althouse Creek SS (USFS 2002).

The lack of large wood within many of the stream reaches on NFS lands contributes to instream habitat conditions that are less complex than optimal. Deep pool (>3 feet) frequency is about one per 500 feet of stream.

Large wood is the primary causal mechanism in low gradient streams to create complex and frequent pools. Large wood also creates off-channel habitat and refuge for juvenile Coho Salmon. Table 37 summarizes pool habitat conditions on streams surveyed (using USFS R6 Level II survey protocol) that contain CCH on NFS lands in the Althouse Creek watershed. The reported values were averaged across all survey dates.

Table 37. Habitat percent and pool summary for surveyed streams – Althouse Creek watershed

Stream Name	Year Survey-ed	Habitat % Pool	Habitat % Riffle	Pools/ Mile	Deep Pools/ mile (>3ft)	Avg. Residual Pool Depth (ft)	Average Bankfull Width (ft)
Althouse Creek[1]	1992, 1997, 2002	17.5	79.8	25.4	10.3	2.3	25.0

[1] Includes areas surveyed upstream of CCH.

Off-channel habitat indicator – *Not Properly Functioning*. Baseline: Althouse Creek WA (BLM 2005) and Althouse Creek SS (USFS 2002).

Stream channels on NFS lands tend to have steeper gradients than valley bottom segments on downstream private and BLM lands. In general, Althouse Creek on NFS lands is moderately entrenched and/or confined by topography. Side channels are not a common feature in Althouse Creek on NFS lands (3%), due to the natural topography, and to a lesser degree because of road development. Downstream of NFS lands, much off-channel habitat has been lost due to agricultural and rural residential development. Althouse Slough, downstream of NFS lands, does potentially function as high value off-channel habitat although its fish use has not been evaluated.

Refugia indicator – *At Risk*. Baseline: Althouse Creek WA (BLM 2005) and Althouse Creek SS (USFS 2002).

Colder water temperatures provide summer rearing refuges for juvenile Coho Salmon. Winter rearing refuges are limited by the lack of deep, complex pools and off-channel habitat.

3) Channel condition and dynamics pathway – Althouse Creek watershed

Off-channel habitat indicator – *Not Properly Functioning*. Baseline: Althouse Creek WA (BLM 2005) and Althouse Creek SS (USFS 2002).

Stream channels on NFS lands tend to have steeper gradients than valley bottom segments on downstream private and BLM lands. In general, Althouse Creek on NFS lands is moderately entrenched and/or confined by topography. Side channels are not a common feature in Althouse Creek on NFS lands (3%), due to the natural topography, and to a lesser degree because of road development. Downstream of NFS lands, much off-channel habitat has been lost due to agricultural and rural residential development. Althouse Slough, downstream of NFS lands, does potentially function as high value off-channel habitat although its fish use has not been evaluated.

Refugia indicator – *At Risk*. Baseline: Althouse Creek WA (BLM 2005) and Althouse Creek SS (USFS 2002).

Colder water temperatures provide summer rearing refuges for juvenile Coho Salmon. Winter rearing refuges are limited by the lack of deep, complex pools and off-channel habitat.

Bankfull width depth ratio/ channel widening indicator - *At Risk*. Baseline: Althouse Creek WA (BLM 2005) and Althouse Creek SS (USFS 2002).

In general, streams within the watershed are confined, even in lower gradient reaches. It is unknown to what extent historic land use (e.g. timber harvest, roads) on NFS lands altered the bankfull channel dimensions within the watershed. Since the mid-1990s, riparian management under the NWFP has emphasized maintenance of habitat for fish and other aquatic resources. Consequently, instream habitat, including bankfull width/depth conditions, is improving on NFS lands. Downstream of NFS lands on private and BLM lands, historic channelization and alteration of floodplains are well documented.

Streambank condition indicator – *Properly Functioning*. Baseline: Althouse Creek SS (USFS 1992, 1997 and 2002).

Data collected during stream surveys on NFS lands during three different years documented stable streambanks along Althouse Creek.

Floodplain connectivity indicator – *At Risk*. Baseline: Althouse Creek WA (BLM 2005), Althouse Creek SS (USFS 2002) and final SONCC Coho Salmon Recovery Plan (NMFS 2014).

There are no prominent low gradient areas with expansive floodplains on NFS lands within the watershed. Streams on NFS lands tend to be moderately to fully confined and constrained by hillslopes or terraces. In lower Althouse Creek, off NFS lands, downstream of the ESA action area and where high intrinsic potential habitat exists, much of the floodplain has been developed and channel incision has occurred.

4) Flow/hydrology pathway – Althouse Creek watershed

Change in peak base flows indicator – *At Risk*. Baseline: Althouse WA (BLM 2005) and final SONCC Coho Salmon Recovery Plan (NMFS 2014).

Timber harvest and roads can affect stream flow by intercepting water and transporting it to stream channels more rapidly than natural processes. Groundwater pumping and diversions in agricultural lands of the Illinois Valley have decreased summer base flows.

Increase in drainage network indicator – *At Risk*. Baseline: Althouse WA (BLM 2005).

The Althouse Creek watershed contains a well-developed road system on NFS lands. These roads were primarily constructed to facilitate timber harvest. In general, road densities are higher on private land than on public land.

5) Watershed condition pathway – Althouse Creek watershed

Road density and location indicator – *At Risk*. Baseline: Althouse WA (BLM 2005).

There is one valley bottom road on NFS lands with a ford crossing Althouse Creek in CCH. Many natural surfaced road systems are built on private lands, which are a major source of erosion and sedimentation into streams. There are approximately 4.5 miles of road per square mile on BLM lands, and 4.4 mi/mi2 across all ownerships.

Disturbance history indicator - *At Risk*. Baseline: Althouse WA (BLM 2005).

Human activities have altered watershed processes and functions throughout the watershed. Timber harvest, fire suppression, noxious weeds, roads, and mining (primarily hydraulic) are the primary disturbance activities.

Riparian Reserves indicator – *At Risk*. Baseline: Althouse WA (BLM 2005) and Althouse Creek SS (USFS 2002).

Many riparian areas have been fully harvested on private lands, and riparian zones consist of narrow bands of alders and cottonwoods. On NFS lands, past timber harvest did occur in some riparian areas. Road construction along streams has also reduced riparian vegetation condition and extent.

Disturbance regime indicator – *At Risk*. Baseline: Althouse WA (BLM 2005).

Timber harvest and road development have altered flow patterns and vegetation in many drainages within the watershed. Significant amounts of historic mining have occurred within the watershed.

b. Briggs Creek watershed

Watershed overview – Briggs Creek

The primary factor limiting within the watershed for Coho Salmon production is migration barriers in the form of natural falls that prevent access to high intrinsic potential habitat upstream in low gradient valley bottom streams above the falls. Coho Salmon have not been documented in the Briggs Creek watershed above the falls despite multiple sampling efforts. Coho and Chinook salmon are present in the lower 0.7 miles below a series of barrier falls. Only this lower-most section of Briggs Creek is classified as CCH. The ownership distribution in the watershed is RRS 95%, and the remaining 5% is in private ownership (Table 38).

Table 38. Watershed area and ownership distribution - Briggs Creek watershed

Land Ownership	Acres	Ownership (percent)
USFS	41,423	95
Private	2,335	5
Total	**67,250**	**100**

Prevalent land uses

- Federal – timber production, mining, dispersed and developed recreation, fish and wildlife habitat
- Private – timber production, mining

Anthropomorphic alterations to habitat. European settlers homesteaded upper Briggs Creek above CCH, trapped beavers, and mined, including hydraulic mining and hard rock chromite mining, in several locations in the Briggs Creek watershed. Timber harvest and associated road construction began in the late 1920s and increased up to and through the early 1990s (USFS 1999).

Suction dredging and high banking activity summary. Channel morphology has changed from historic conditions. Mining in the watershed began in the 1850's and impacted portions of the watershed. After mining activity declined as well as other activities such as road building and timber harvest, much of the landscape has been recovering. Briggs Creek is the most actively dredged watershed within the Illinois subbasin. Areas of most concentrated activities are located in proximity to stream mile 9 and 11.5 of the mainstem; both are greater than 1/4 mile above CCH.

There were eight active filed placer claims (2% of Illinois subbasin) as of 5/8/2013. No suction dredge NOI were received by the RRS during the four-year period from 2009-2012 in the subbasin on NFS land located within ¼ mile of CCH (Table 4 and Figure 12). Suction dredge mining is not allowed within the Illinois River mainstem between Deer Creek and Nancy Creek or within ¼ mile of its tributaries because it was designated a Wild River in 1984 under the Wild and Scenic Rivers Act (equates to 0.2 miles of the total 0.7 CCH miles within the Briggs watershed). There are 0.7 miles of CCH within the watershed and 0.3 miles of those miles are withdrawn from mineral entry. See Appendix A for a summary and locations of suction dredging and high banking mineral withdrawals on the RRS. The IP value and habitat typing for these withdrawn miles are displayed in Table 39.

Table 39. IP and habitat typing mineral withdrawn areas – Briggs Creek watershed

Habitat Typing[1]	Intrinsic Potential[2] (miles)			Total (miles)
	High	Medium	Low	
Spawning/rearing	0	0.3	0	0.3
Rearing/migration	0	0	0	0
Migration only	0	0	0	0
Total	**0**	**0.3**	**0**	**0.3**

[1] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[2] Values based on an intrinsic potential map derived from the NETMAP CLAMS data and also located http://www.fsl.orst.edu/clams/. Category for ranking were derived from the final SONCC Coho Salmon Recovery Plan (NMFS 2014); high =>/= 0.66, moderate = </=0.33 – 0.66 and low = <0.33.

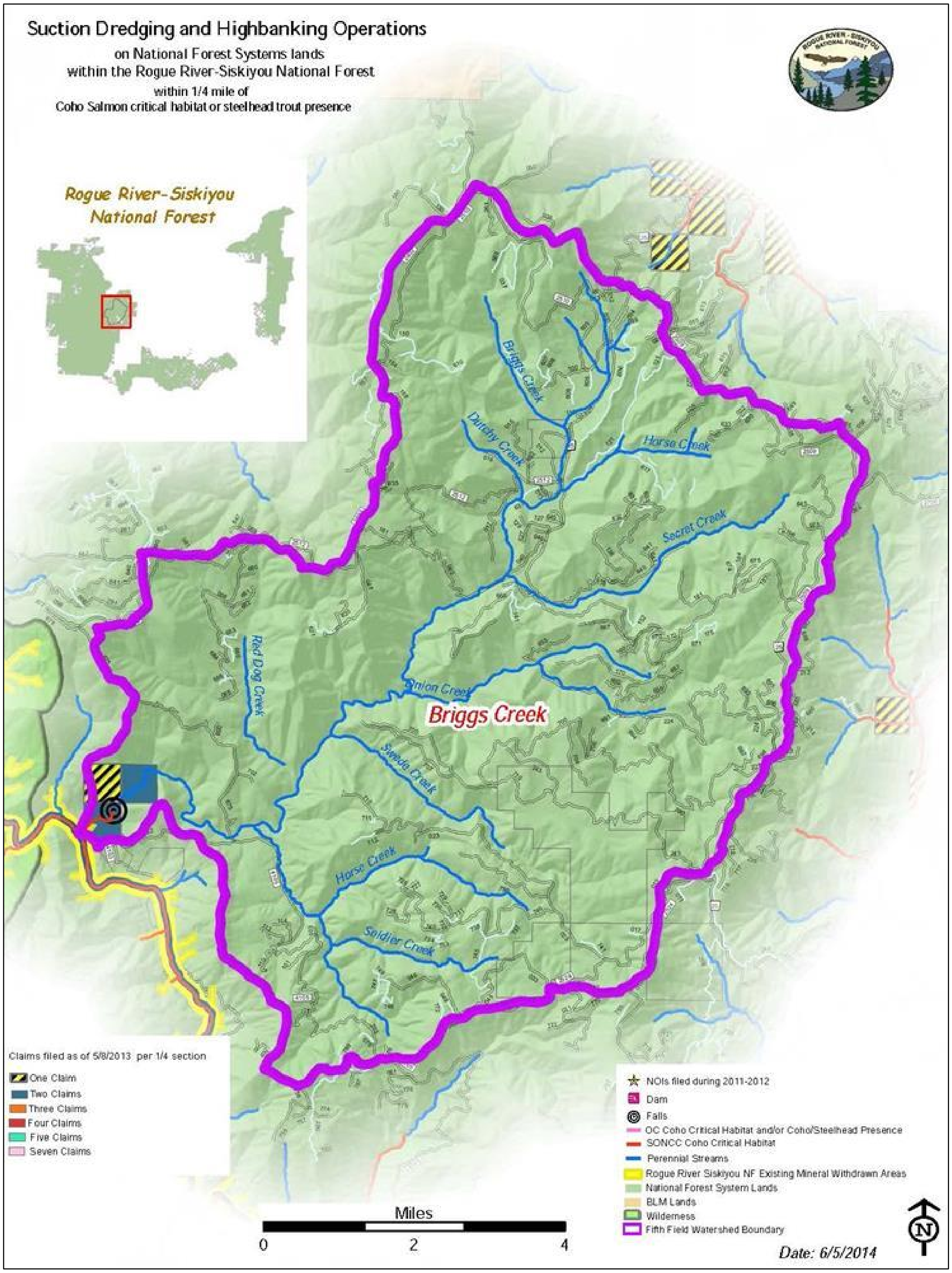

Figure 12. CCH with NOI and mining claims within 1/4 mile of CCH on NFS lands – Briggs Creek watershed

Watershed population overview – Briggs Creek

Briggs Creek watershed Coho Salmon population is part of the greater Illinois subbasin population. There is about 0.7 miles of CCH below the barrier in the Briggs Creek watershed; all located on NFS lands (Figure 12 and Table 40). There is no high intrinsic potential CCH located within the watershed (Table 41) due to steep gradient (average reach gradient of 5%) and bedrock gorge constrained channel.

Table 40. Salmonid species and habitat length - Briggs Creek watershed

Watershed Acres	Anadromous Species Present[1]	NFS lands Miles of CCH (miles)[2]	NFS lands Miles of Chinook Habitat (miles)[3]	Watershed CCH and EFH (miles)[4]	Watershed Potential Miles of Coho Salmon Habitat Type[5]		
					Spawning/ Rearing	Rearing/ Migration	Migration only
43,758	CO, CH, ST	0.4	0	0.7	0.7	0	0

[1] All, or a portion of, the waterbody supports the following anadromous salmonids: ST- steelhead trout; CO- Coho Salmon; CH - Chinook Salmon.

[2] Steelhead presence surveys were used to determine historic Coho Salmon habitat since CCH was not spatially delineated in the Federal Register 50 CFR Part 226. Values based on GIS data layer entitled RRS 2013 Total Salmon and Steelhead Distribution and field knowledge.

[3] Values based on GIS data layer entitled 2013 RRS Anadromous Salmonid Fish Distribution; Chinook Salmon presence survey layer.

[4] Values based on a combination of RRS 2013 SONCC Coho Salmon delineated CH 19 and ODFW steelhead presence survey data 2013 GIS map (as a surrogate for historic Coho Salmon habitat) website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[5] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

Table 41. Habitat typing and intrinsic potential within CCH – Briggs Creek watershed

Habitat Typing[1]	Intrinsic Potential[2] (miles)						Total (miles) CCN/IP/HT	
	High IP		Medium IP		Low IP			
	Watershed	NFS lands	Watershed	NFS lands	Watershed	NFS lands	Watershed	NFS lands
Spawning/rearing	0	0	0.4	0.4	0.3	0.3	0.7	0.7
Rearing/migration	0	0	0	0	0	0	0	0
Migration only	0	0	0	0	0	0	0	0
Total	**0**	**0**	**0.4**	**0.4**	**0.3**	**0.3**	**0.7**	**0.7**

[1] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[2] Values based on an intrinsic potential map derived from the NETMAP CLAMS data and also located http://www.fsl.orst.edu/clams/. Category for ranking were derived from the final SONCC Coho Salmon Recovery Plan (NMFS 2014); high =>/= 0.66, moderate = </=0.33 – 0.66 and low = <0.33.

Watershed habitat indicators – Briggs Creek

1) Water quality pathway – Briggs Creek watershed

Temperature indicator – *Not Properly Functioning*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010), Rogue River TMDL (ODEQ 2008a), Briggs Creek WA (USFS 1999) and Briggs Creek SS (USFS 2003).

There is an approved TMDL in place for the Illinois subbasin, which addresses water temperature (Oregon DEQ 2008). The lower 15.5 miles of Briggs Creek are listed as water quality limited due to elevated summer water temperature (Oregon DEQ 2010) (Table 42). The stream was heavily shaded by an alder and conifer canopy in this section, along with topographic shading. However, the Biscuit Fire of 2002 and Oak Flat Fire of 2010 burned the riparian zone along much of Briggs Creek. Management of the NFS lands within the Briggs Creek watershed is guided by the Siskiyou NF LRMP as amended by the NWFP. The aquatic and riparian standards and guidelines contained within these documents, particularly the Aquatic Conservation Strategy within the NWFP, are designed to provide for recovery and maintenance of cool/cold water thermal regimes within streams on NFS lands. Appendix B displays the 2010 303(d) list for streams within NFS lands on RRS.

Table 42. ODEQ, 2010 303(d) List for Oregon Waterbodies within NFS lands on RRS – Briggs Creek watershed

Stream Name	Miles on RRS (miles)	River Mile Marker (miles)	Pollutant	Assess-ment	Assess-ment 2	Listing Status
Briggs Creek	14.65	0 to 15.5	Temperature	2010	10/29/2010	Cat 4A: Water quality limited, TMDL approved
Soldier Creek	2.48	2 to 4.5	Temperature	2010	10/29/2010	Cat 4A: Water quality limited, TMDL approved
Soldier Creek	2.00	0 to 2	Temperature	2010	12/22/2010	Cat 4A: Water quality limited, TMDL approved

Suspended sediment–intergravel DO/turbidity indicator– *Properly Functioning*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010), Water Quality Management Plan Rogue River Basin Illinois River Sub Basin (USFS 1999), Briggs Creek WA (1999) and Briggs Creek SS (USFS 2003).

No streams on NFS lands of the RRS in the watershed are listed for sediment on the 303(d) list. Intergravel DO is expected to be high in the portion of CCH in Briggs Creek. This section is unroaded and has little human disturbance with the exception of a trail bridge crossing.

Chemical contamination/nutrients indicator– *Properly Functioning*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010), Water Quality Management Plan Rogue River Basin Illinois River Sub Basin (USFS 1999), Briggs Creek WA (USFS 1999) and Briggs Creek SS (USFS 2003).

The watershed within NFS lands of the RRS is not on the 303(d) list for contaminants or excessive nutrients. The lack of human development within and immediately adjacent to NFS lands within the watershed limits the risk of chemical contamination and nutrient loading within Briggs Creek.

2) Habitat access/element pathway – Briggs Creek watershed

Physical barriers indicator – *Properly Functioning*. Baseline: Briggs Creek WA (USFS 1999) and Briggs Creek SS (USFS 2003).

There is at least one physical barrier to Coho Salmon on NFS lands within the watershed; a natural falls located near River km 0.7. Portions of Briggs Creek and its tributaries upstream of this natural barrier are optimal Coho Salmon habitat (particularly in upper Briggs Creek in Briggs Valley) but the steep gradient and bedrock falls near its confluence with the Illinois River prevent Coho Salmon access into the upper watershed. Upper Briggs Creek and tributaries have been surveyed at least 12 different years between the 1970s and 2010s and Coho Salmon have not been detected above the falls.

Substrate/embeddedness indicator – *Properly Functioning*. Baseline: Briggs Creek SS (USFS 2003).

The percentage of fines in pools is very low (none in riffles) in reach one, which is the only reach within CCH.

Large wood indicator – *At Risk*. Baseline: Briggs Creek WA (1999) and Briggs Creek SS (USFS 2003).

Large wood numbers in streams within the Briggs Creek watershed are low and are below the expected range of natural variation in reaches accessible by or near roads. However, much of the riparian area in the Briggs Creek watershed is unroaded and past fires could contribute to instream large wood recruitment to downstream CCH. Also, the RRS has placed instream large wood in Briggs Creek and tributaries above CCH. Where large wood is present, it provides for habitat complexity.

Pool frequency and quality indicator – *Properly Functioning*. Baseline: Briggs Creek SS (USFS 2003).

Pool abundance and depth in Reach 1 is what would be expected in a bedrock confined Rosgen A-channel.

Table 43 summarizes pool habitat conditions on streams surveyed (using USFS R6 Level II survey protocol) that contain CCH on NFS lands in the Briggs Creek watershed.

Table 43. Habitat percent and pool summary for surveyed streams – Briggs Creek watershed

Stream Name	Year Survey-ed	Habitat % Pool	Habitat % Riffle	Pools/ Mile	Deep Pools/ mile (>3ft)	Avg. Residual Pool Depth (ft)	Average Bankfull Width (ft)
Briggs Creek[1]	2003	44	70	17.1	15	4.8	53

[1] Reach 1 only (lowest reach), does not includes areas surveyed upstream of CCH.

Off-channel habitat indicator – *Properly Functioning*. Baseline: Briggs Creek WA (1999) and Briggs Creek SS (USFS 2003).

Briggs Creek is highly entrenched in its lowest reach and confined by topography. Side channels are absent in Briggs Creek CCH due to the natural topography/geomorphology.

Refugia indicator – *Properly Functioning*. Baseline: Briggs Creek WA (1999) and Briggs Creek SS (USFS 2003).

Reach 1 lacks summer or winter refuges due to its geomorphology. Briggs Creek is colder than the Illinois River during the summer months so its mouth may provide some thermal refuge.

3) Channel condition and dynamics pathway – Briggs Creek watershed

Bankfull width depth ratio/ channel widening indicator - *At Risk*. Baseline: Briggs Creek WA (USFS 1999) and Briggs Creek SS (USFS 2003).

With the exception of upper Briggs Creek in Briggs Valley, streams within the watershed are largely confined by hillslope with probably little channel widening. However, historic land use (particularly timber harvest, roads, hydraulic mining) on NFS lands may have altered the bankfull channel dimensions within the watershed. Since the mid-1990s, riparian management under the NWFP has emphasized maintenance of habitat for fish and other aquatic resources. Consequently, instream habitat, including bankfull width/depth conditions, is improving on NFS lands.

Streambank condition indicator - *Properly Functioning*. Baseline: Briggs Creek SS (USFS 1992, 1997 and 2003).

Data collected during stream surveys on NFS lands documented stable streambanks along Reach 1 of Briggs Creek due largely to bedrock inclusions and bedrock gorges.

Floodplain connectivity indicator – *At Risk*. Baseline: Briggs Creek SS (USFS 2003), Briggs Creek WA (USFS 1999) and final SONCC Coho Salmon Recovery Plan (NMFS 2014).

In general, streams on NFS lands tend to be moderately to fully confined and constrained by hillslopes or terraces. There are no prominent low gradient areas with expansive floodplains on NFS lands within the watershed in the vicinity of CCH. Upper Briggs Creek and its tributaries (e.g. Horse Creek) have well-developed floodplains but Coho Salmon cannot access these areas.

4) Flow/hydrology pathway

Change in peak/base flow indicator – *At Risk*. Baseline: Briggs Creek WA (USFS 1999), final SONCC Coho Salmon Recovery Plan (NMFS 2014).

Timber harvest and roads can affect stream flow by intercepting water and transporting it to stream channels more rapidly than natural processes. Recent fires in the Briggs Creek watershed have likely influenced peak flows and infiltration rates. Most forests on NFS lands in this area that have not been burned have recovered hydrologically from previous clear-cutting.

Increase in drainage network indicator – *At Risk*. Baseline: Briggs Creek WA (USFS 1999).

The Briggs Creek watershed on NFS lands contains a well-developed road system. These roads were primarily constructed to facilitate timber harvest.

5) Watershed conditions pathway – Briggs Creek watershed

Road density and location indicator – *At Risk*. Baseline: Briggs Creek WA (USFS 1999).

The average road density on NFS lands is 2.6 miles per square mile. No roads are found in proximity to CCH in Briggs Creek except the road leading to the Briggs Creek trailhead, which enters the Kalmiopsis Wilderness via a trail bridge crossing over Briggs Creek.

Disturbance history indicator - *Properly Functioning*. Baseline: Briggs Creek WA (USFS 1999).

Human activities have altered watershed processes and functions throughout the watershed. However, two fires during the past decade in the watershed have returned the watershed to a normal fire return interval. Timber harvest, noxious weeds, roads, and mining (primarily hydraulic) are historic disturbance activities from which the land has largely recovered on NFS lands.

Riparian Reserves indicator – *At Risk*. Baseline: Briggs Creek WA (USFS 1999), Briggs Creek SS (USFS 2003).

Many riparian zones consist of narrow bands of alders and small conifers. However, in many areas of Briggs Creek, particularly where there is no road access, the Riparian Reserves are stocked with large conifers. On NFS lands, past timber harvest did occur in some riparian areas.

Disturbance regime indicator – *At Risk*. Baseline: Briggs Creek WA (USFS 1999).

Timber harvest and road development have altered flow patterns and vegetation in some drainages within the watershed. Significant amounts of historic mining and fire suppression have occurred within the watershed.

c. Deer Creek watershed

Watershed overview - Deer Creek

The RRS manages a 1.8 mile-long section of Deer Creek near its confluence with the Illinois River. Within this watershed, the primary factors limiting Coho Salmon production are 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 (BLM 1996). The ownership distribution in the watershed encompasses: USFS 11%, BLM 41%, State lands 46% and the remaining 2% is in private ownership (Table 44).

Table 44. Watershed area and ownership distribution - Deer Creek watershed

Land Ownership	Acres	Ownership (percent)
USFS	7,968	11
BLM	29,652	41
State	33,388	46
Private	1,598	2
Total	**72,605**	**100**

Prevalent land uses

- Federal –dispersed and developed recreation including botanizing , limited timber production

- Private – timber production, agriculture, tourism, rural residential development, mining

Anthropomorphic alterations to habitat. European settlers cleared floodplains, trapped beavers, drained wetlands, and channelized streams to facilitate rural development and agriculture. Timber harvest and associated road construction began in the late 1800s and increased up to and through the early 1990s. Deer Creek was the site of much of the agricultural development in the Illinois Valley due to its broad valley and access to water for irrigation. Port Orford-cedar root disease was introduced in recent years. Fire suppression has caused the level and continuity of fuels to increase, leaving the watershed susceptible to larger, more intense fires. Timber harvest has occurred though much of the upper watershed on BLM and private lands (BLM 1997).

Suction dredging and high banking activity summary. There were 5 active filed placer claims (1% of Illinois subbasin) as of 5/8/2013. One suction dredge NOI (5% of Illinois subbasin) was received by the RRS during the four-year period from 2009-2012 in the watershed on NFS land located within 1/4 mile of CCH (Table 4 and Figure 13). The NOI and related Coho Salmon habitat type and its potential maximum impact are numerically displayed in Table 45. Suction dredge mining is not allowed within the Illinois River mainstem between Deer Creek and Nancy Creek or within ¼ mile of its tributaries because it was designated a Wild River in 1984 under the Wild and Scenic Rivers Act. There are 56.4 miles of CCH within the watershed and 0.3 miles of those miles are withdrawn from mineral entry. The IP value and habitat typing for these withdrawn miles are displayed in Table 46. See Appendix A for a summary and locations of suction dredging and high banking mineral withdrawals on the RRS.

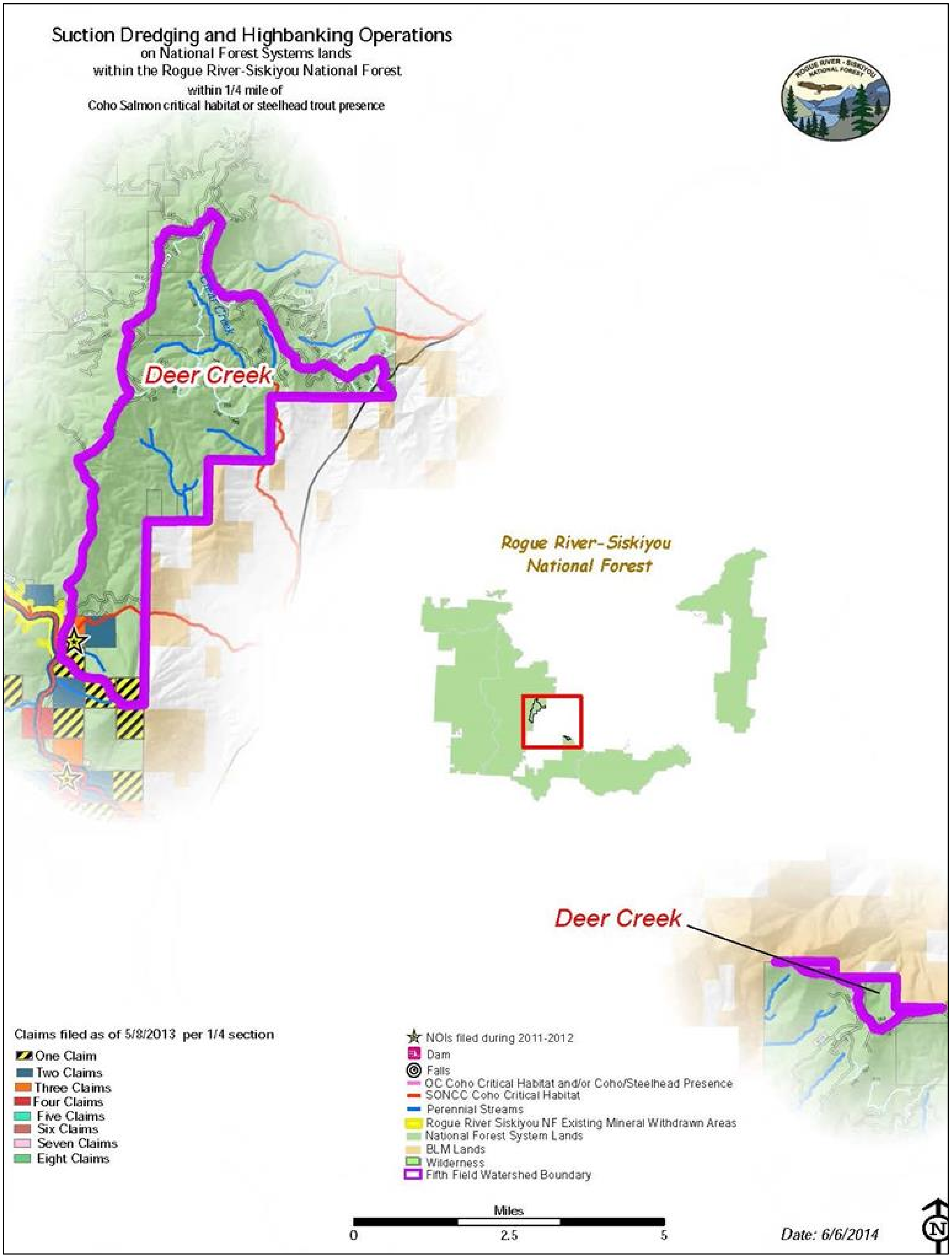

Figure 13. CCH with NOI and mining claims within 1/4 mile of CCH on NFS lands – Deer Creek watershed

Table 45. Suction dredging NOI received by RRS (2009-2012) within ¼ mile of CCH – Deer Creek watershed

Name/Location			Past NOI Information								Potential Habitat Use Coho Salmon		
							Total Maximum Disturbance[2]						
Stream w/River Mile (constant name)	**Location[1] RS & Lat/Long**	**Name of Claim**	**NOI Received 2009-2012 (list years)**	**Number of Operators per claim Number of Operators per claim**	**Suction Dredge Activities (Y/N)**	**High Number of Operators per claim Banking Activities (Y/N)**	**Volume - NOI Listed (cubic yd.)**	**Volume – Assumed[3] or NOI Listed (cubic yd.)**	**Area (sq. ft.)**	**Stream Distance (ft.)**	**Spawning / Rearing ft.)**	**Rearing /Migration (ft.)**	**Migration (ft.)**
Deer Creek 0.4	T38S., R8W., Sec 7SE N42.273 W123.683	Deer Creek #1	2012	1	Y	Y	0	25	225	15	15	0	0
		AFFECTED Total within Watershed						$25\ yd^3$	$225\ ft^2$	15 ft	15 ft	0	0
		BASELINE Total within Watershed						$13{,}400{,}640\ yd^3$	$4{,}466{,}880\ ft^2$	297,792 ft	297,792 ft	0.0	0.0
		BASELINE Total CCH within Watershed								56.4 mi	56.4 mi	0.0	0.0
		AFFECTED Percent Watershed within CCH						0.000%	0.005%	0.005%	0.005%	0.000%	0.000%

[1] Proposed dredging mile marker starting point.

[2] Standard formula to calculate maximum 25 cubic yards suction dredge area of disturbance = 15 feet (length) X 15 feet (width) X 3 feet (depth). Width and depth is constant when cubic yard is stated differently in NOI.

[3] 25 cubic yards is the standard maximum volume anticipated when not specified in NOI.

Table 46. IP and habitat typing mineral withdrawn areas – Deer Creek watershed

Habitat Typing[1]	Intrinsic Potential[2] (miles)			Total (miles)
	High	Medium	Low	
Spawning/rearing	0	0.3	0	0.3
Rearing/migration	0	0	0	0
Migration only	0	0	0	0
Total	**0**	**0.3**	**0**	**0.3**

[1] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[2] Values based on an intrinsic potential map derived from the NETMAP CLAMS data and also located http://www.fsl.orst.edu/clams/. Category for ranking were derived from the final SONCC Coho Salmon Recovery Plan (NMFS 2014); high =>/= 0.66, moderate = </=0.33 – 0.66 and low = <0.33.

Watershed population overview – Deer Creek

The Deer Creek watershed Coho Salmon population is part of the greater Illinois subbasin population. The watershed produces large numbers of Coho Salmon in its middle and upper sections that flow through a broad alluvial valley under largely private ownership. There are about 56.4 miles of CCH in the Deer Creek watershed, with 2.6 miles located on NFS lands (Figure 13 and Table 47). In the ESA action area, CCH is found mostly in lower Deer Creek, although it is likely this section is used primarily as a migration corridor. The CCH in this watershed on NFS lands is typed either low or moderate IP, with the high IP found in streams off of NFS lands in the broad Deer Creek valley. The IP value and habitat typing for these withdrawn miles are displayed in Table 48.

The 2.6 mile-long section on NFS lands is largely bedrock and boulder dominated, with lethal and sublethal stream temperatures for Coho Salmon during summer months. The RRS also manages a small section of Clear Creek, tributary to Deer Creek in this watershed. Clear Creek has low Coho Salmon IP and Coho Salmon have not been detected on NFS lands in this stream, nor noted in recent habitat inventory data.

A substantial portion of the western Illinois River basin has ultramafic geology with serpentine soils that cause sparse riparian conditions and warm stream temperatures (USFS 2000). For this reason, the 2014 final SONCC Coho Salmon recovery plan focuses on the upper Illinois subbasin where there are several streams, including Deer Creek, with extensive high IP Coho Salmon habitat (NMFS 2014). However, there is no high IP habitat on NFS lands within the watershed.

Although Illinois River Coho Salmon are still well distributed, 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. Many reaches surveyed by ODFW (2005a) in the Illinois River subbasin do not contain juvenile Coho Salmon in some or all years, and densities at locations that always have Coho Salmon vary substantially between years. Sites with the most consistent Coho Salmon presence and greatest density in the Illinois River basin cluster in three patches or small metapopulations. One of the three patches is Deer Creek and its tributaries Crooks, Thompson and North Fork Deer Creeks. Although federal ownership covers more than 80% of the Illinois River basin, the vast majority of stream reaches on NFS and BLM lands are too steep or otherwise unsuitable for Coho Salmon (NMFS 2014).

Table 47. Salmonid species and habitat length - Deer Creek watershed

Water-shed Acres	Anadro-mous Species Present[1]	NFS lands Miles of CCH (miles)[2]	NFS lands Miles of Chinook Habitat (miles)[3]	Water-shed CCH and EFH (miles)[4]	Watershed Potential Miles of Coho Salmon Habitat Type[5]		
					Spawning/ Rearing	Rearing/ Migration	Migration only
72,605	CO, CH, ST	2.6	0	56.4	56.4	0	0

[1] All, or a portion of, the waterbody supports the following anadromous salmonids: ST- steelhead trout; CO- Coho Salmon; CH - Chinook Salmon.

[2] Steelhead presence surveys were used to determine historic Coho Salmon habitat since CCH was not spatially delineated in the Federal Register 50 CFR Part 226. Values based on GIS data layer entitled RRS 2013 Total Salmon and Steelhead Distribution and field knowledge.

[3] Values based on GIS data layer entitled 2013 RRS Anadromous Salmonid Fish Distribution; Chinook Salmon presence survey layer.

[4] Values based on a combination of RRS 2013 SONCC Coho Salmon delineated CH 19 and ODFW steelhead presence survey data 2013 GIS map (as a surrogate for historic Coho Salmon habitat) website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[5] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

Table 48. Habitat typing and intrinsic potential within CCH – Deer Creek watershed

Habitat Typing[1]	Intrinsic Potential[2] (miles)						Total (miles) CCN/IP/HT	
	High IP		Medium IP		Low IP			
	Water-shed	NFS lands	Water-shed	NFS lands	Water-shed	NFS lands	Water-shed	NFS lands
Spawning/rearing	37.0	0	14.7	2.3	4.7	0.3	56.4	2.6
Rearing/migration	0	0	0	0	0	0	0	0
Migration only	0	0	0	0	0	0	0	0
Total	**37.0**	**0**	**14.7**	**2.3**	**4.7**	**0.3**	**56.4**	**2.6**

[1] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[2] Values based on an intrinsic potential map derived from the NETMAP CLAMS data and also located http://www.fsl.orst.edu/clams/. Category for ranking were derived from the final SONCC Coho Salmon Recovery Plan (NMFS 2014); high =>/= 0.66, moderate = </=0.33 – 0.66 and low = <0.33.

Watershed habitat indicators – Deer Creek

1) Water quality pathway – Deer Creek watershed

Temperature indicator – *Not Properly Functioning*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010), Rogue River Basin TMDL (ODEQ 2008a), final SONCC Coho Salmon Recovery Plan (NMFS 2014), Illinois River Below Cave Junction WA (USFS 1999), Deer Creek SS (USFS 2008) and NWFP (USFS AND BLM 1994).

There is an approved TMDL in place for the Illinois subbasin, which addresses water temperature. Table 49 displays the 303(d) list for water quality limited streams within the watershed on NFS lands. High temperatures are due to a combination of ultramafic geology in some areas, sparse vegetation, and land use practices including agricultural development and water withdrawals. Summer water temperatures in Deer Creek at its mouth are some of the highest in southwestern Oregon and are lethal to Coho Salmon juveniles. Management of the NFS lands within the Deer Creek watershed is guided by the Siskiyou NF LRMP as amended by the NWFP. The aquatic and riparian standards and guidelines contained within these documents, particularly the Aquatic Conservation Strategy within the NWFP, are designed to provide for recovery and maintenance of cool/cold water thermal regimes within streams on NFS lands. Appendix B displays the 2010 303(d) list for streams within NFS lands on RRS.

Table 49. ODEQ, 2010 303(d) List for Oregon Waterbodies within NFS lands on RRS – Deer Creek watershed

Stream Name	Miles on RRS (miles)	River Mile Marker (miles)	Pollutant	Assess-ment	Assess-ment 2	Listing Status
Anderson Creek	0.01	0 to 3.2	Temperature	2010	10/29/2010	Cat 4A: Water quality limited, TMDL approved
Deer Creek	1.90	0 to 17	Temperature	2010	10/29/2010	Cat 4A: Water quality limited, TMDL approved
Squaw Creek	0.79	0 to 3	Temperature	2010	10/29/2010	Cat 4A: Water quality limited, TMDL approved

Suspended sediment–intergravel DO/turbidity indicator – *Not Properly Functioning*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010), final SONCC Coho Salmon Recovery Plan (NMFS 2014), Illinois River Below Cave Junction WA (USFS 1999) and Deer Creek SS (USFS 2008).

No streams within this watershed have been listed on the 303(d) list as water quality limited for sedimentation. However, Deer Creek runs very turbid during winter storms due to agricultural development, roads, and timber harvest off of NFS lands. Deer Creek on NFS lands has low road density and is largely serpentine geology.

Chemical contamination/nutrients indicator– *Properly Functioning*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010) and Illinois River Below Cave Junction WA (USFS 1999).

The watershed within NFS lands of the RRS is not on the 303(d) list for contaminants or excessive nutrients. Human development including agriculture and rural residential/septic immediately adjacent to NFS lands within the watershed likely delivers nutrients and chemicals to this watershed.

2) Habitat access/element pathway – Deer Creek watershed

Physical barriers indicator – *At Risk*. Baseline: Deer Creek SS (USFS 2008).

There are no known fish barriers in the ESA action area on NFS lands. There are several barriers in Sru Creek, the first tributary upstream from NFS lands.

Substrate/embeddedness indicator – *At Risk*. Baseline: final SONCC Coho Salmon Recovery Plan (NMFS 2014) and Deer Creek SS (USFS 2008).

The final SONCC Coho Salmon Recovery Plan reported, "Extensive reaches of Deer Creek…have very good fine sediment scores (<12 percent fines), indicating suitable Coho Salmon spawning conditions". Deer Creek on NFS lands has <10% surface fines in pools and almost no fines in riffles.

Large wood indicator – *At Risk*. Baseline: Illinois River below Cave Junction WA (USFS 1999), Deer Creek SS (USFS 2008).

Large wood levels in streams within the Deer Creek watershed are low largely due to agricultural and rural residential development within the riparian area. The RRS has not placed instream large wood in Deer Creek due to its high stream energy, flashy nature, and extensive bedrock banks at the mouth. In the upper watershed, when large wood is present, it provides complex habitat.

Pool frequency and quality indicator – *Properly Functioning*. Baseline: Deer Creek SS (USFS 2008).

Many deep pools controlled by bedrock are present in Deer Creek the lower reach on NFS lands. Over 70% of the summer rearing habitat is slow water. Deep pool (>3 feet) frequency is about one per every 500 feet. Table 50 summarizes pool habitat conditions on streams surveyed (using USFS R6 Level II survey protocol) that contain CCH on NFS lands in the Illinois River-Deer Creek watershed.

Table 50. Habitat percent and pool summary for surveyed streams – Deer Creek watershed

Stream Name	Year Survey-ed	Habitat % Pool	Habitat % Riffle	Pools/ Mile	Deep Pools/mile (>3ft)	Avg. Residual Pool Depth (ft)	Average Bankfull Width (ft)
Deer Creek (on NFS lands)	2008	72	28	20.3	10.5	3.5	40

Off-channel habitat indicator – *Properly Functioning*. Baseline: Deer Creek SS (USFS 2008).

Stream channels on NFS lands tend to have steeper gradients than valley bottom segments on private lands. In general, Deer Creek on NFS lands is moderately to completely entrenched and/or confined by topography. Side channels are not a common feature in Deer Creek on NFS lands, due to the natural topography, geology, and geomorphology.

Refugia indicator – *Not Properly Functioning*. Baseline: Deer Creek SS (USFS 2008) and Illinois River Below Cave Junction WA (USFS 1999)

Reach 1 lacks summer or winter refuges due to its geomorphology and high summer stream temperatures. High summer stream temperatures on NFS lands in lower Deer Creek are likely influenced by upstream management practices.

3) Channel condition and dynamic pathway – Deer Creek watershed

Bankfull width depth ratio/ channel widening indicator - *Properly Functioning*. Baseline: Deer Creek SS (USFS 2008).

Deer Creek on NFS lands is largely hillslope confined. In its upper alluvial reaches, it has likely experienced channel widening in some sections alternating with channel narrowing and downcutting in other areas.

Streambank condition indicator – *Properly Functioning*. Baseline: Deer Creek SS (USFS 2008).

Data collected during stream surveys on NFS lands documented stable streambanks along lower Deer Creek.

Floodplain connectivity indicator – *At Risk*. Baseline: Deer Creek SS (USFS 2008) and final SONCC Coho Salmon Recovery Plan (NMFS 2014).

There are no prominent low gradient areas with expansive floodplains on NFS lands within the watershed. Streams on NFS lands, including the mainstem Illinois River, tend to be moderately to fully confined and constrained by hillslopes or terraces. Off of NFS lands where all of the high Coho Salmon IP is located, some areas have well-developed and connected floodplains, while others have downcut.

4) Flow/hydrology pathway – Deer Creek watershed

Change in peak/base flow indicator – *Not Properly Functioning*. Baseline: final SONCC Coho Salmon Recovery Plan (NMFS 2014).

Timber harvest and roads can affect stream flow by intercepting water and transporting it to stream channels more rapidly than natural processes. Groundwater pumping and diversions in agricultural lands of the Illinois Valley have decreased summer base flows, especially in the Deer Creek watershed.

Increase in drainage network indicator – *At Risk*. Baseline: Illinois River below Cave Junction WA (USFS 1999).

On NFS lands, the Deer Creek watershed contains a moderate road system. These roads were primarily constructed for mining access. On private land, in general, road densities are higher than on public land.

1) Watershed condition pathway – Deer Creek watershed

Road density and location indicator – *At Risk*. Baseline: final SONCC Coho Salmon Recovery Plan (NMFS 2014), Illinois River Below Cave Junction WA (USFS 1999).

Most of the NFS lands do not have high road densities as less than average levels of timber harvest have occurred in this watershed due to its serpentine nature. Roading is extensive on private and BLM lands in this watershed.

Disturbance history indicator - *At Risk*. Baseline: Illinois River below Cave Junction WA (USFS 1999).

Human activities have altered watershed processes and functions throughout the watershed. Timber harvest, fire suppression, noxious weeds, roads, and mining (primarily hydraulic and other forms of placer) are the primary disturbance activities.

Riparian Reserves indicator – *At Risk*. Baseline: Illinois River below Cave Junction WA (USFS 1999) and Deer Creek SS (USFS 2008).

Many riparian areas have been fully harvested on private lands in agricultural areas. On NFS lands, Riparian Reserves are largely intact or in a recovery state.

Disturbance regime indicator – *At Risk*. Baseline: Illinois River below Cave Junction WA (USFS 2012).

Mining occurred in some streams in this watershed in the 19th and 20th centuries. Timber harvest and road development is low on NFS lands in this watershed.

d. East Fork Illinois River watershed

Watershed overview - East Fork Illinois River

The East Fork Illinois River watershed supports sizable populations of Coho Salmon and other native fishes. It is one of the highest producers of Coho Salmon in the Illinois subbasin and in the greater Rogue basin. Within this watershed, factors limiting Coho Salmon production 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. Some of these factors are a result of management practices such as timber harvest, road construction, stream cleanout, and historic placer mining. The ownership distribution in the watershed encompasses: USFS 63%, BLM 9% and the remaining 29% is in private ownership (Table 51).

Table 51. Watershed area and ownership distribution - East Fork Illinois River watershed

Land Ownership	Acres	Ownership (percent)
USFS	36,271	63
BLM	5,062	9
Private	16,558	29
Total	**57,935**	**100**

Prevalent land uses

- Federal – timber production, mining, dispersed recreation
- Private – timber production, agriculture, tourism, rural residential development, municipal (Takilma and Cave Junction) and mining

Anthropomorphic alterations to habitat. European settlers cleared floodplains, trapped beavers, drained wetlands, and channelized streams to facilitate rural development and agriculture. Timber harvest and associated road construction began in the late 1800s and increased up to and through the early 1990s. The East Fork Illinois River was the site of much of the large-scale intensive gold mining in southwestern Oregon with hydraulic mining used as a primary method. The legacy of hydraulic mining on stream channels and valley topography is still evident. The RRS is in the process of finalizing a watershed restoration action plan that outlines a recovery strategy to restore aquatic habitats in this watershed.

Suction dredging and high banking activity summary. Mining has left its footprint on many miles of Illinois River stream channels (USFS 1997, 1999, 2000, BLM 1997, 2004, 2006), although current activity is light when compared to historic levels. Mining in the East Fork watershed began in the 1850's and heavily impacted portions of the watershed. Areas such as Allen, Sailor, and Scotch Gulch were intensively mined (Ramp and Peterson 1979). A system of mining ditches was developed to bring water to hydraulic mine operations. After hydraulic mining activity declined in the watershed, much of the landscape began restoring itself.

Historic mining damage to Coho Salmon streams includes disruption of reaches of the mainstem East and West Fork Illinois River (BLM and USFS 2000, BLM 2004). There are no recommendations or opportunities for management of suction dredging stated in the East Fork Illinois River WA (USFS 1999).

There were 22 active filed placer claims (6% of Illinois subbasin) as of 5/8/2013. No suction dredge NOI were received by the RRS during the four-year period from 2009-2012 in the watershed on NFS land located within 1/4 mile of CCH (Table 4 and Figure 14). There are no mineral withdrawn areas within the East Fork Illinois River watershed (located upstream of Deer Creek tributary; upper extent of mineral withdrawn area on the Illinois River).

Watershed population overview – East Fork Illinois River

The East Fork Illinois River Coho Salmon population is part of the greater Illinois subbasin population. There are about 32.0 miles of CCH in the East Fork Illinois River watershed, with about 12.8 miles located on NFS lands (Figure 14 and Table 52). Most of the high intrinsic potential CCH (>0.66, SONCC recovery plan) in this watershed is located downstream of the NFS lands on private lands (Table 53). However, some High IP CCH occurs on NFS lands in the East Fork Illinois and Dunn Creek. Anadromous fish do not access NFS lands in tributaries such as Elder and Little Elder Creeks.

A substantial portion of the western Illinois River basin has ultramafic geology with serpentine soils that cause sparse riparian conditions and warm stream temperatures (USFS 2000). For this reason, the 2014 Final SONCC Coho Salmon recovery plan focused on the upper Illinois basin where the number of tributaries with high IP Coho Salmon habitat is extensive and includes the East Fork Illinois River (NMFS 2014). Although Illinois River Coho Salmon are still well distributed, 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. Many reaches surveyed by ODFW (2005a) in the Illinois River subbasin do not contain juvenile Coho Salmon in some or all years, and densities at locations that always have Coho Salmon vary substantially between years. Although federal ownership covers more than 80% of the Illinois River basin, the vast majority of stream reaches on NFS and BLM lands are too steep or otherwise unsuitable for Coho Salmon (NMFS 2014).

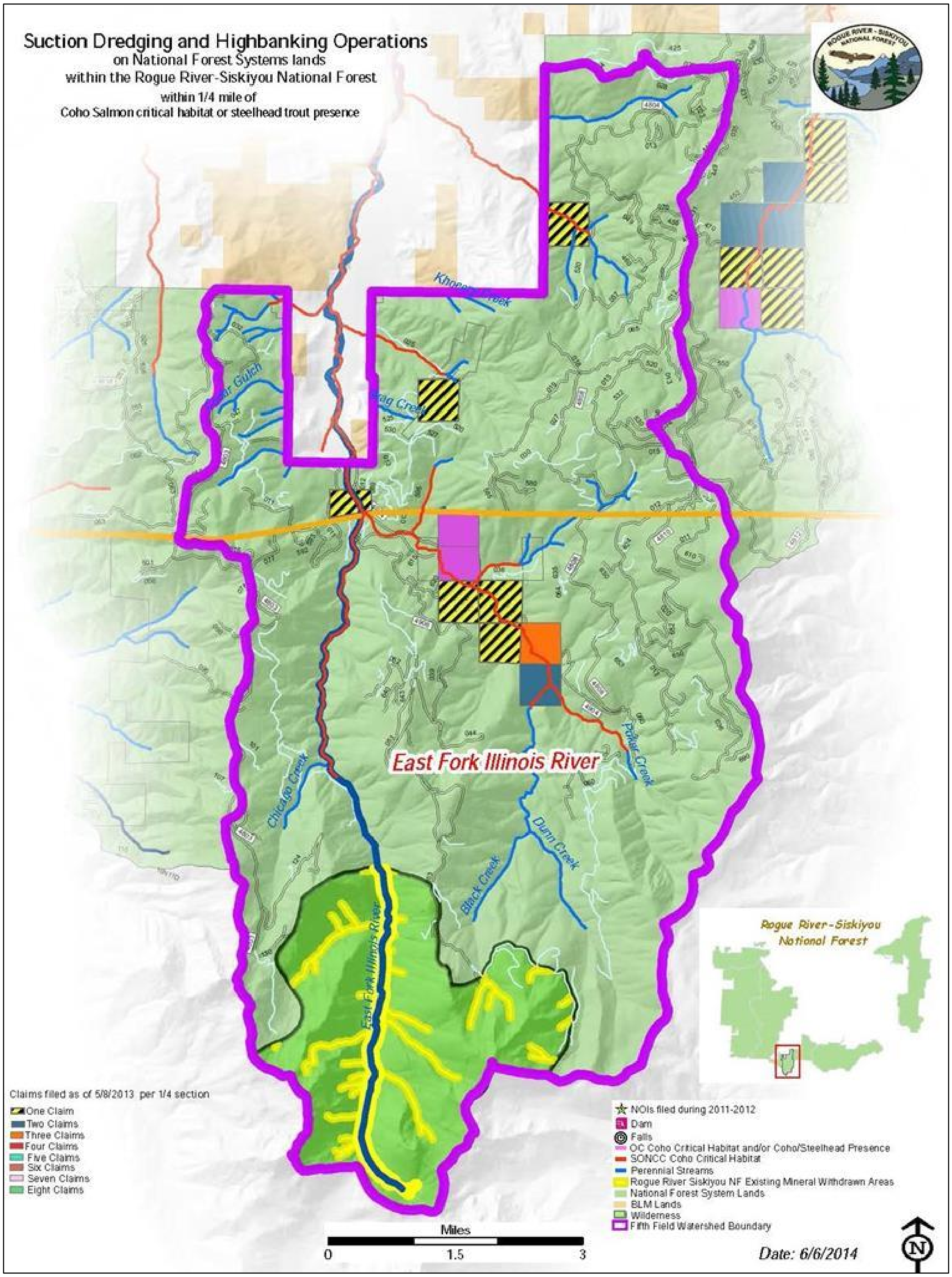

Figure 14. CCH with NOI and mining claims within 1/4 mile of CCH on NFS lands – East Fork Illinois River watershed

Table 52. Salmonid species and habitat length - East Fork Illinois River watershed

Water-shed Acres	Anadro-mous Species Present[1]	NFS lands Miles of CCH (miles)[2]	NFS lands Miles of Chinook Habitat (miles)[3]	Water-shed CCH and EFH (miles)[4]	Watershed Potential Miles of Coho Salmon Habitat Type[5]		
					Spawning/ Rearing	Rearing/ Migration	Migration only
57,779	CO, CH, ST	12.8	1.0	32.0	28.8	3.2	0

[1] All, or a portion of, the waterbody supports the following anadromous salmonids: ST- steelhead trout; CO- Coho Salmon; CH - Chinook Salmon.

[2] Steelhead presence surveys were used to determine historic Coho Salmon habitat since CCH was not spatially delineated in the Federal Register 50 CFR Part 226. Values based on GIS data layer entitled RRS 2013 Total Salmon and Steelhead Distribution and field knowledge.

[3] Values based on GIS data layer entitled 2013 RRS Anadromous Salmonid Fish Distribution; Chinook Salmon presence survey layer.

[4] Values based on a combination of RRS 2013 SONCC Coho Salmon delineated CH 19 and ODFW steelhead presence survey data 2013 GIS map (as a surrogate for historic Coho Salmon habitat) website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[5] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

Table 53. Habitat typing and intrinsic potential within CCH – East Fork Illinois River watershed

Habitat Typing[1]	Intrinsic Potential[2] (miles)						Total (miles) CCN/IP/HT	
	High IP		Medium IP		Low IP			
	Water-shed	NFS lands	Water-shed	NFS lands	Water-shed	NFS lands	Water-shed	NFS lands
Spawning/rearing	11.9	0.7	9.0	5.5	7.9	6.6	28.8	12.8
Rearing/migration	3.0	0	0.2	0	0	0	3.2	0
Migration only	0	0	0	0	0	0	0	0
Total	**14.9**	**0.7**	**9.2**	**5.5**	**7.9**	**6.6**	**32.0**	**12.8**

[1] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[2] Values based on an intrinsic potential map derived from the NETMAP CLAMS data and also located http://www.fsl.orst.edu/clams/. Category for ranking were derived from the final SONCC Coho Salmon Recovery Plan (NMFS 2014); high =>/= 0.66, moderate = </=0.33 – 0.66 and low = <0.33.

Watershed habitat indicators – East Fork Illinois River

1) Water quality pathway – East Fork Illinois River

Temperature indicator – *Not Properly Functioning.* Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010), Rogue River Basin TMDL (ODEQ 2008a), Final SONCC Coho Salmon Recovery Plan (NMFS 2014), East Fork Illinois WRAP (USFS 2014), East Fork Illinois River SS (USFS 1994), North Fork Dunn Creek SS (USFS 1999) and East Fork Illinois River WA (USFS 2000).

The lower 14.4 miles (0.59 miles on NFS lands) of the East Fork Illinois River are listed as water quality limited due to elevated summer water temperature with an approved TMDL and WQMP (ODEQ 2010). No other streams within the watershed on NFS lands are listed. The streams on NFS lands lack shade-providing riparian vegetation in some areas. Streams in this watershed are generally cool when they leave the NFS lands, then warm as they cross the broad alluvial valley. The 7-day average highs for Dunn Creek ranged from 65-71° F during the 1990's. Management of NFS land within the East Fork Illinois River watershed is guided by the Siskiyou NF LRMP as amended by the NWFP. The aquatic and riparian standards and guidelines contained within these documents, particularly the Aquatic Conservation Strategy within the NWFP, are designed to provide for recovery and maintenance of cool/cold water thermal regimes within streams on NFS lands. Appendix B displays the 2010 303(d) list for streams within NFS lands on RRS.

Suspended sediment–intergravel DO/turbidity indicator – *At Risk*. Baseline - Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010), East Fork Illinois WRAP (USFS 2014), East Fork Illinois River WA (USFS 2000), East Fork Illinois River SS (USFS 1994) and North Fork Dunn Creek SS (USFS 1999).

No watershed streams on the RRS are listed for sediment on the 303(d) list. Sediment input into stream channels on NFS lands has been primarily associated with past timber harvest and road systems. Streams on NFS lands tend to be higher gradient than downstream private land reaches, and stream substrates are dominated by cobbles and gravel. No streams within the watershed have been listed as water quality limited for sedimentation. The East Fork Illinois River can run turbid at times during the winter due to agricultural activities and construction run-off in the lower watershed. The RRS has invested heavily in road maintenance in the East Fork Illinois River watershed and will continue to do so to moderate suspended sediment from roads.

Chemical contamination/nutrients indicator– *Properly Functioning*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010) and East Fork Illinois WRAP (USFS 2014).

No watershed streams on the RRS are on the 303(d) list for contaminants or excessive nutrients. The lack of human development within and immediately adjacent to NFS lands within the watershed limits the risk of chemical contamination and nutrient loading within the East Fork Illinois River. The lower East Fork Illinois River below the ESA action area may experience some nutrient and chemical inputs from agricultural development.

1) Habitat access/element pathway – East Fork Illinois River

Physical barriers indicator – *At Risk*. Baseline: East Fork Illinois WRAP (USFS 2014), East Fork Illinois River SS (USFS 1994) and North Fork Dunn Creek SS (USFS 1999).

There are very few physical barriers to Coho Salmon on NFS lands within the watershed that are not natural. One of these barriers is a culvert that may be a potential barrier on North Fork Dunn Creek. Another barrier that limits Coho Salmon passage at some flows is a diversion dam on lower Page Creek. Push-up dams on the mainstem and other barriers such as culverts on private land have existed downstream, outside of the ESA action area.

Substrate character and embeddedness indicator – *At Risk*. Baseline: East Fork Illinois WRAP (USFS 2014), East Fork Illinois River SS (USFS 1994), North Fork Dunn Creek SS (USFS 1999), East Fork Illinois River WA (USFS 2000) and final SONCC Coho Salmon Recovery Plan (NMFS 2014).

The SONCC recovery plan reported, "key reaches of …East Fork Illinois River…have poor scores for fine sediment (<1 mm) in ODFW habitat surveys because spawning gravels have greater than 17 percent fines". Stream habitat surveys on NFS lands in this watershed have not detected high levels of fines.

Large wood indicator – *Not Properly Functioning*. Baseline: East Fork Illinois River WA (USFS 2000), East Fork Illinois WRAP (USFS 2014), East Fork Illinois River SS (USFS 1994) and North Fork Dunn Creek SS (USFS 1999).

Large wood levels in streams within the East Fork Illinois River watershed are low and below the expected range of natural variation in reaches that are accessible by or near roads. The RRS has placed large amounts of instream large wood in Dunn Creek, with some positive habitat responses. Where present, large wood provides habitat complexity, sorts spawning gravels, and promotes lateral channel migration and the creation of off-channel habitats.

Pool frequency and quality indicator – *Not Properly Functioning*. Baseline: East Fork Illinois WRAP (USFS 2014), East Fork Illinois River SS (USFS 1994) and North Fork Dunn Creek SS (USFS 1999).

The lack of large wood within many of the stream reaches on NFS lands within the watershed contributes to instream habitat conditions that are less complex than optimal. Deep pool (>3 feet) frequency across NFS lands in the watershed is about one per every 250 feet. Large wood is the primary causal mechanism in low gradient streams to create complex and frequent pools. Large wood also creates off-channel habitat and refuge for juvenile Coho Salmon. Table 54 summarizes pool habitat conditions on streams surveyed (using USFS R6 Level II survey protocol) that contain CCH on NFS lands in the East Fork Illinois River watershed. The reported values were averaged across all survey dates.

Table 54. Habitat percent and pool summary for surveyed streams – East Fork Illinois River watershed

Stream Name	Year Survey-ed	Habitat % Pool	Habitat % Riffle	Pools/ Mile	Deep Pools/mile (>3ft)	Avg. Residual Pool Depth (ft)	Average Bankfull Width (ft)
Dunn Creek[1]	1993, 2000, 2010	50	45	22	9	2.4	34
North Fork Dunn Creek[1]	1993, 1999	18	77	47	6	1.8	22
Elder Creek[1]	1992, 2000	25	75	28	7	2	14
Little Elder Creek[1]	2000	16	84	51	3	1.6	16
Packers Creek[1]	2001	24	74	66	66	1	11
Page Creek	2001, 2011	30	68	56	55	1.2	15
Poker Creek[1]	1993, 2000, 2010	34	60	43	43	2.4	24
East Fork IllinoisRiver[1]	1994, 2001, 2009	45	55	32	17	2.3	50

[1] Includes areas surveyed upstream of CCH.

Off-channel habitat indicator – At Risk. Baseline: East Fork Illinois WRAP (USFS 2014), East Fork Illinois River SS (USFS 1994), North Fork Dunn Creek SS (USFS 1999) and East Fork Illinois River WA (USFS 2000)

Dunn Creek and sections of the East Fork Illinois River inside the ESA action area have some side channels and off-channel areas. Lower East Fork Illinois River below the ESA action area has multiple side channels used for spawning and potentially juvenile winter rearing.

Refugia indicator – At Risk. Baseline: East Fork Illinois WRAP, East Fork Illinois WA, RRS stream surveys.

Colder water temperatures in ground water channels, tributaries, and upper East Fork Illinois River provide summer rearing refuges for juvenile Coho Salmon. Off-channel habitats and deep, complex pools provide winter rearing refuge.

3) Channel condition and dynamics pathway – East Fork Illinois River

Bankfull width depth ratio/ channel widening indicator - *At Risk*. Baseline: East Fork Illinois WRAP (USFS 2014), East Fork Illinois River SS (USFS 1994), North Fork Dunn Creek SS (USFS 1999) and East Fork Illinois River WA (USFS 2000)

It is unknown to what extent historic land use (e.g. timber harvest, roads) on NFS lands altered the bankfull channel dimensions within the watershed. Since the mid-1990s, riparian management under the NWFP has emphasized maintenance of habitat for fish and other aquatic resources. Consequently, instream habitat, including bankfull width/depth conditions, is improving on NFS lands. Proposed restoration projects on the East Fork Illinois River will address high width/depth ratios while still providing floodplain connection.

Streambank condition indicator – *At Risk*. Baseline: East Fork Illinois WRAP (USFS 2014), East Fork Illinois River SS (USFS 1994), North Fork Dunn Creek SS (USFS 1999) and East Fork Illinois River WA (USFS 2000)

Data collected during stream surveys on NFS lands documented generally stable streambanks along all streams. In instances where stream banks were eroding they were generally providing coarse substrate used for spawning, large wood recruitment, and creation of off-channel habitats.

Floodplain connectivity indicator – *At Risk*. Baseline: East Fork Illinois WRAP (USFS 2014), East Fork Illinois River SS (USFS 1994), North Fork Dunn Creek SS (USFS 1999), East Fork Illinois River WA (USFS 2000) and final SONCC Coho Salmon Recovery Plan (NMFS 2014).

With the exception of the previously mentioned high IP sections, streams on NFS lands tend to be moderately to fully confined and constrained by hillslopes or terraces. In the East Fork Illinois River and Dunn Creek inside the ESA action area, and where high IP habitat exists, moderate floodplain connectivity also exists.

4) Flow/hydrology pathway – East Fork Illinois River

Change in peak/base flow indicator – *At Risk*. Baseline: East Fork Illinois WRAP (USFS 2014), East Fork Illinois River WA (USFS 2000) and final SONCC Coho Salmon Recovery Plan (NMFS 2014).

Timber harvest and roads can affect stream flow by intercepting water and transporting it to stream channels more rapidly than natural processes. Many lands in the East Fork Illinois River watershed used for previous timber harvest have hydrologically recovered. The Longwood Fire on 1987 likely affected peak and base flows in this watershed but it has likely hydrologically recovered at this time. Groundwater pumping and diversions in agricultural lands of the Illinois Valley have decreased summer base flows in lower East Fork Illinois River. The City of Cave Junction has a municipal water withdrawal on the East Fork Illinois River downstream of the ESA action area.

Increase in drainage network indicator – *At Risk*. Baseline: East Fork Illinois WRAP (USFS 2014) and East Fork Illinois River WA (USFS 2000).

On NFS lands, the East Fork Illinois River watershed contains a well-developed road system. These roads were primarily constructed to facilitate timber harvest. On private land, in general, road densities are higher than on public land.

1) Watershed condition pathway – East Fork Illinois River

Road density and location indicator – *At Risk*. Baseline: East Fork Illinois WRAP (USFS 2014) and East Fork Illinois River WA (USFS 2000).

There is one valley bottom road on NFS lands adjacent to the East Fork Illinois River in CCH. The upper East Fork Illinois River is located in an unroaded wilderness. The RRS is currently planning a large road restoration project in the East Fork Illinois River watershed to stormproof, close, or decommission high-risk areas of the road system. Many natural surfaced road systems are built on private lands, which are a major source of erosion and sedimentation into streams.

Disturbance history indicator - *At Risk*. Baseline: East Fork Illinois WRAP (USFS 2014) and East Fork Illinois River WA (USFS 2000).

Human activities have altered watershed processes and functions throughout the watershed. Timber harvest, fire suppression, noxious weeds, roads, and mining (primarily hydraulic) are the primary disturbance activities.

Riparian Reserves indicator – *At Risk*. Baseline: East Fork Illinois WRAP (USFS 2014), East Fork Illinois River SS (USFS 1994), North Fork Dunn Creek SS (USFS 1999), and East Fork Illinois River WA (USFS 2000).

Many riparian areas have been fully harvested on private lands, and consist of narrow bands of alders and cottonwoods. On NFS lands, past timber harvest did occur in some riparian areas, although some streams still possess old growth Riparian Reserves. Road construction along streams has also reduced riparian vegetation condition and extent.

Disturbance regime indicator – *At Risk*. Baseline: East Fork Illinois WA (USFS 2000).

Timber harvest and road development have altered flow patterns and vegetation in many drainages within the watershed. Agricultural development and associated water withdrawals occur downstream of the ESA action area. Much of this area functions as medium and low IP Coho Salmon habitat with only 0.7 miles of high IP habitat off NFS lands. Significant amounts of historic mining have also occurred within the watershed.

e. Indigo Creek watershed

Watershed overview - Indigo Creek

The Indigo Creek watershed has not been documented to support Coho Salmon due to its geomorphology and associated low IP (Indigo WA, USFS 1994). It is an important producer of steelhead to the Illinois system with an escapement of potentially hundreds of wild adult steelhead to the watershed. The 2014 Final SONCC Coho Salmon Recovery Plan reported, “Coho salmon production potential is limited in other areas [outside of the upper Illinois Valley]. Tributaries of the lower Illinois River subbasin, such as, Indigo Creek, are too steep and confined for Coho Salmon to flourish”. Within this watershed, the primary factors limiting Coho Salmon production are natural migration barriers, stream gradients, and channel confinement due to steep canyon walls. The ownership distribution in the watershed encompasses: USFS 98%, BLM 1%, State lands <1% and the remaining <1% is in private ownership (Table 55).

Table 55. Watershed area and ownership distribution - Indigo Creek watershed

Land Ownership	Acres	Ownership (percent)
USFS	48,187	98
BLM	659	1
State	9	<1
Private	130	<1
Total	**48,985**	**100**

Prevalent land uses

- Federal –mining, dispersed recreation
- Private – Not applicable

Anthropomorphic alterations to habitat. Small amounts of timber harvest, including some fire salvage on NFS lands, and associated road construction began in the early 1930s and increased up to and through the early 1990s. Indigo Creek has not been intensively mined and currently the entire watershed is in LSR and relatively inaccessible.

Suction dredging and high banking activity summary. There were 13 active filed placer claims (3% of Illinois subbasin) as of 5/8/2013. There were no suction dredge NOI received by the RRS during the four-year period from 2009-2012 in the watershed on NFS land located within 1/4 mile of CCH (Table 4 and Figure 15). Suction dredge mining is not allowed within ¼ mile of Illinois River tributaries since it was designated a Wild River in 1984 under the Wild and Scenic Rivers Act. There are 30.3 miles of CCH within the watershed and 0.3 miles of those miles are withdrawn from mineral entry. The IP value and habitat typing for these withdrawn miles are displayed in Table 56. See Appendix A for a summary and locations of suction dredging and high banking mineral withdrawals on the RRS.

Table 56. IP and habitat typing mineral withdrawn areas – Indigo Creek watershed

Habitat Typing[1]	Intrinsic Potential[2] (miles)			Total (miles)
	High	Medium	Low	
Spawning/rearing	0	0.3	0	0.3
Rearing/migration	0	0	0	0
Migration only	0	0	0	0
Total	**0**	**0.3**	**0**	**0.3**

[1] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[2] Values based on an intrinsic potential map derived from the NETMAP CLAMS data and also located http://www.fsl.orst.edu/clams/. Category for ranking were derived from the final SONCC Coho Salmon Recovery Plan (NMFS 2014); high =>/= 0.66, moderate = </=0.33 – 0.66 and low = <0.33.

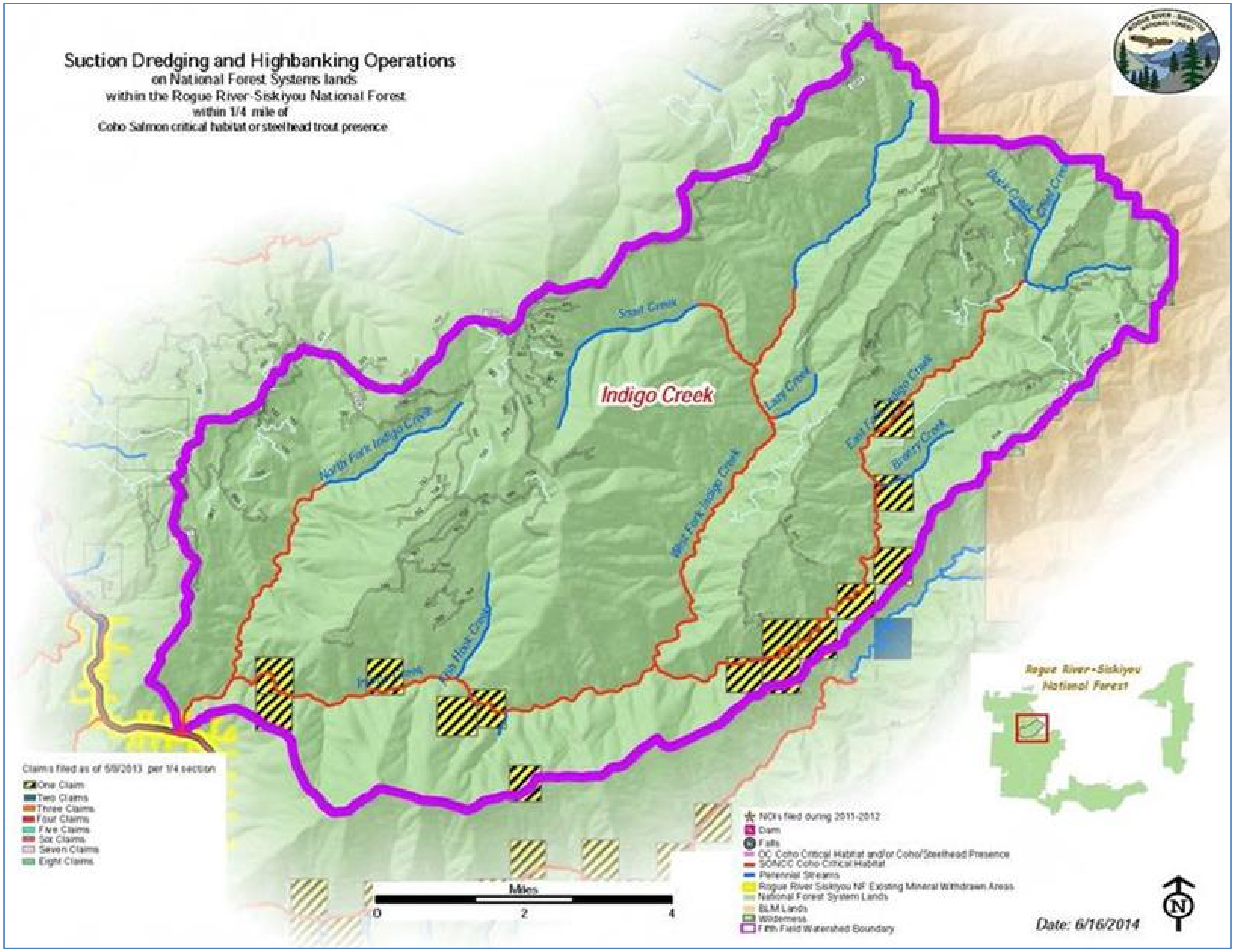

Figure 15. CCH with NOI and mining claims within 1/4 mile of CCH on NFS lands – Indigo Creek watershed

Watershed population overview - Indigo Creek

The Indigo Creek watershed Coho Salmon population is part of the greater Illinois subbasin population. There are about 30.3 miles of CCH in the Indigo Creek watershed; all located on NFS lands (Figure 15 and Table 57). There is no high IP CCH (>0.66, SONCC recovery plan) anywhere in the watershed; most of the watershed is low potential, with a smaller amount of moderate potential (Table 58). Juvenile Coho Salmon have never been detected in Indigo Creek or its tributaries. Tributaries of the lower Illinois River basin such as Silver and Indigo Creeks are major steelhead producers (USFS 1996), but they are too steep and confined for Coho Salmon to flourish (NMFS 2014).

Table 57. Salmonid species and habitat length - Indigo Creek watershed

Watershed Acres	Anadromous Species Present[1]	NFS lands Miles of CCH (miles)[2]	NFS lands Miles of Chinook Habitat (miles)[3]	Watershed CCH and EFH (miles)[4]	Watershed Potential Miles of Coho Salmon Habitat Type[5]		
					Spawning/ Rearing	Rearing/ Migration	Migration only
48,984	CO, CH, ST	30.3	0	30.3	30.3	0	0

[1] All, or a portion of, the waterbody supports the following anadromous salmonids: ST- steelhead trout; CO- Coho Salmon; CH - Chinook Salmon.

[2] Steelhead presence surveys were used to determine historic Coho Salmon habitat since CCH was not spatially delineated in the Federal Register 50 CFR Part 226. Values based on GIS data layer entitled RRS 2013 Total Salmon and Steelhead Distribution and field knowledge.

[3] Values based on GIS data layer entitled 2013 RRS Anadromous Salmonid Fish Distribution; Chinook Salmon presence survey layer.

[4] Values based on a combination of RRS 2013 SONCC Coho Salmon delineated CH 19 and ODFW steelhead presence survey data 2013 GIS map (as a surrogate for historic Coho Salmon habitat) website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[5] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

Table 58. Habitat typing and intrinsic potential within CCH – Indigo Creek watershed

Habitat Typing[1]	Intrinsic Potential[2] (miles)						Total (miles) CCN/IP/HT	
	High IP		Medium IP		Low IP			
	Watershed	NFS lands	Watershed	NFS lands	Watershed	NFS lands	Watershed	NFS lands
Spawning/rearing	0	0	25.7	25.7	4.6	4.6	30.3	30.3
Rearing/migration	0	0	0	0	0	0	0	0
Migration only	0	0	0	0	0	0	0	0
Total	**0**	**0**	**25.7**	**25.7**	**4.6**	**4.6**	**30.3**	**30.3**

[1] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[2] Values based on an intrinsic potential map derived from the NETMAP CLAMS data and also located http://www.fsl.orst.edu/clams/. Category for ranking were derived from the final SONCC Coho Salmon Recovery Plan (NMFS 2014); high =>/= 0.66, moderate = </=0.33 – 0.66 and low = <0.33.

Watershed habitat indicators – Indigo Creek

1) Water quality pathway – Indigo Creek watershed

Temperature indicator – At Risk. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010), Final SONCC Coho Salmon Recovery Plan (NMFS 2014) and Indigo WA (USFS 1998).

The lower 8.2 miles of Indigo Creek are listed as water quality limited due to elevated summer water temperature. However, temperature is likely near historic conditions as there is limited land management to influence water temperature given the large watershed size. There is an approved TMDL in place for the Illinois subbasin, which addresses water temperature (ODEQ 2008).

Table 59 displays the 303(d) list for water quality limited stream within the watershed on NFS lands. Management of the NFS lands within the Indigo Creek watershed is guided by the Siskiyou NF LRMP as amended by the NWFP. The aquatic and riparian standards and guidelines contained within these documents, particularly the Aquatic Conservation Strategy within the NWFP, are designed to provide for recovery and maintenance of cool/cold water thermal regimes within streams on NFS lands. Appendix B displays the 2010 303(d) list for streams within NFS lands on RRS.

Table 59. ODEQ, 2010 303(d) List for Oregon Waterbodies within NFS lands on RRS – Indigo Creek watershed

Stream Name	Miles on RRS (miles)	River Mile Marker (miles)	Pollutant	Assess-ment	Assess-ment 2	Listing Status
Indigo Creek	7.87	0 to 8.2	Temperature	2010	10/29/2010	Cat 4A: Water quality limited, TMDL approved
North Fork Indigo Creek	5.85	0 to 6	Temperature	2010	10/29/2010	Cat 4A: Water quality limited, TMDL approved

Suspended sediment–intergravel DO/turbidity indicator – *Properly Functioning*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010), Final SONCC Coho Salmon Recovery Plan (NMFS 2014), Indigo Creek SS (USFS 1995), West Fork Indigo Creek SS (USFS 1994), East Fork Indigo Creek SS (USFS 1995) and North Fork Indigo Creek SS (USFS 2004).

No streams in the watershed within the RRS are listed for sediment on the 303(d) list. Sediment input into stream channels on NFS lands has been primarily associated with past timber harvest and road systems. Indigo Creek has had little recent timber harvest and much of the watershed is roadless, particularly on NFS lands. Streams on NFS lands tend to be moderate-high gradient and stream substrates are dominated by cobbles and gravel. No streams within the watershed have been listed as water quality limited for sedimentation. Winter turbidity in Indigo Creek is reportedly low and mostly attributed to natural landslides (Indigo WA).

Chemical contamination/nutrients indicator– *Properly Functioning*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010) and final SONCC Coho Salmon Recovery Plan (NMFS 2014).

No streams in the watershed within the RRS are on the 303(d) list for contaminants or excessive nutrients. The lack of human development within the watershed limits the risk of chemical contamination and nutrient loading within Indigo Creek.

2) Habitat access/elements pathway – Indigo Creek watershed

Physical barriers indicator – *Properly Functioning*. Baseline: Indigo Creek WA (USFS 1998), Indigo Creek SS (USFS 1995), West Fork Indigo Creek SS (USFS 1994), East Fork Indigo Creek SS (USFS 1995) and North Fork Indigo Creek SS (USFS 2004).

No human caused fish barriers exist in the ESA action area in the Indigo Creek watershed. Various barrier cascades and falls occur.

Substrate/embeddedness indicator– *Properly Functioning*. Baseline: Indigo Creek SS (USFS 1995), West Fork Indigo Creek SS (USFS 1994), East Fork Indigo Creek SS (USFS 1995) and North Fork Indigo Creek SS (USFS 2004).

As mentioned above, Indigo Creek generally has high water quality and low amounts of fines.

Large wood indicator – *Properly Functioning*. Baseline: Indigo Creek SS (USFS 1995), West Fork Indigo Creek SS (USFS 1994), East Fork Indigo Creek SS (USFS 1995) and North Fork Indigo Creek SS (USFS 2004).

Large wood levels in streams within the Indigo Creek watershed on NFS lands are at the expected range of natural variation due to a general lack of streamside management in this watershed. The Silver Fire of 1987 and Biscuit Fire of 2002 combined to recruit wood into Indigo Creek. In many areas large wood gets moved downstream due to stream energy. In some areas in Indigo Creek, large wood jams have formed, depositing large quantities of coarse sediment upstream. In other areas, landslides have formed landslide lakes. The RRS has not placed instream large wood in Indigo Creek for restoration.

Pool frequency and quality indicator – *Properly Functioning*. Baseline: Indigo Creek SS (USFS 1995), West Fork Indigo Creek SS (USFS 1994), East Fork Indigo Creek SS (USFS 1995) and North Fork Indigo Creek SS (USFS 2004).

Pool frequency and depth is what would be expected in a watershed with this geomorphology and hydrology. Deep pool (>3 feet) frequency in Indigo Creek and its tributaries are about one per every 500 feet. Table 60 summarizes pool habitat conditions on streams surveyed (using RRS R6 Level II survey protocol) that contain CCH on NFS lands in the Indigo Creek watershed. The reported values were averaged across all survey dates where applicable.

Table 60. Habitat percent and pool summary for surveyed streams - Indigo Creek watershed

Stream Name	Year Survey-ed	Habitat % Pool	Habitat % Riffle	Pools/ Mile	Deep Pools/mile (>3ft)	Avg. Residual Pool Depth (ft)	Average Bankfull Width (ft)
Brandy Creek[1]	1991	35	63	62	8	2	20
Breezy Creek[1]	1992	7	93	16	2	1.6	20
Buck Creek[1]	1992	24	74	52	9	2.2	15
Chief Creek[1]	1992	20	80	31	5	1.8	18
East Fork Indigo Creek[1]	1992, 1994	27	71	22	11	2.8	38
Indigo Creek	1995	52	48	21	20	4.1	68
North Fork Indigo Creek[1]	1993, 2004	27	73	27	11	2.5	22
Slim Creek[1]	1991	8	92	19	5	2.6	13
Snail Creek[1]	1991	34	64	41	16	2.5	32
West Fork Indigo Creek[1]	1991, 1994	28	65	24	13	2.7	45

[1] Includes areas surveyed upstream of CCH.

Off-channel habitat indicator – Properly Functioning. Baseline: Indigo Creek WA (USFS 1998), Indigo Creek SS (USFS 1995), West Fork Indigo Creek SS (USFS 1994), East Fork Indigo Creek SS (USFS 1995) and North Fork Indigo Creek SS (USFS 2004).

Stream channels on NFS lands tend to have steeper gradients than valley bottom segments on downstream private and BLM lands. In general, Indigo Creek on NFS lands is moderately entrenched and/or confined by topography. Side channels are not a common feature in Indigo Creek on NFS lands due to the natural topography/geomorphology.

Refugia indicator – Properly Functioning. Baseline: Indigo Creek SS (USFS 1995),West Fork Indigo Creek SS (USFS 1994), East Fork Indigo Creek SS (USFS 1995) and North Fork Indigo Creek SS (USFS 2004).

Stream habitat in Indigo Creek lacks winter refuges due to gradient, stream energy, and channel confinement but streams are in near reference condition for their geomorphology. The mouth of Indigo Creek can serve as a thermal refuge during the hot summer months when the Illinois River exceeds optimal ranges for salmonids.

3) Channel condition and dynamics pathway – Indigo Creek watershed

Bankfull width depth ratio/ channel widening indicator - *Properly Functioning*. Baseline: Indigo Creek SS (USFS 1995), West Fork Indigo Creek SS (USFS 1994), East Fork Indigo Creek SS (USFS 1995), and North Fork Indigo Creek SS (USFS 2004) and NWFP (USFS and BLM 1994).

In general, streams within the watershed are confined, even in lower gradient reaches. Streams on NFS lands are in near reference condition for their geomorphology. Also, since the mid-1990s, riparian management under the NWFP has emphasized maintenance of habitat for fish and other aquatic resources.

Streambank condition indicator – *Properly Functioning*. Baseline: Indigo Creek SS (USFS 1995), West Fork Indigo Creek SS (USFS 1994), East Fork Indigo Creek SS (USFS 1995) and North Fork Indigo Creek SS (USFS 2004).

Data collected during stream surveys on NFS lands in the 1990s documented generally stable streambanks along Indigo Creek and its tributaries. Some side slopes in the watershed are over-steepened and inner gorge landslides are common.

Floodplain connectivity indicator – *Properly Functioning*. Baseline: Indigo Creek WA (USFS 1998), Indigo Creek SS (USFS 1995), West Fork Indigo Creek SS (USFS 1994), East Fork Indigo Creek SS (USFS 1995) and North Fork Indigo Creek SS (USFS 2004).

There are very few prominent low gradient areas with developed floodplains on NFS lands within the watershed. Streams on NFS lands tend to be moderately to fully confined and constrained by hillslopes or terraces.

4) Flow/hydrology pathway – Indigo Creek watershed

Change in peak/base flow indicator – *At Risk*. Baseline: Indigo WA (USFS 1998).

Timber harvest and roads can affect stream flow by intercepting water and transporting it to stream channels more rapidly than natural processes. There is very little management (recent or current) on NFS lands in this watershed. The Biscuit Fire and 1960s-1980s timber harvest likely increased peak flows in smaller drainages within this watershed. However, vegetation has grown back in over much of the burned and harvested areas.

Increase in drainage network indicator – *At Risk*. Baseline: Indigo WA (USFS 1998).

Portions of the upper watershed have a relatively high road density.

5) Watershed condition pathway – Indigo Creek watershed

Road density and location indicator – *Proper Functioning*. Baseline: Indigo WA (USFS 1998).

There are low road densities with very few stream crossings or roads located within Riparian Reserves on NFS lands in this watershed.

Disturbance history indicator - *Properly Functioning*. Baseline: Indigo WA (USFS 1998).

Human activities have had minimal impacts to watershed processes and functions throughout the NFS lands portion of this watershed.

Riparian Reserves indicator – *Properly Functioning*. Baseline: Indigo Creek WA (USFS 1998), Indigo Creek SS (USFS 1995), West Fork Indigo Creek SS (USFS 1994), East Fork Indigo Creek SS (USFS 1995) and North Fork Indigo Creek SS (USFS 2004).

Many riparian areas are comprised of late successional stands.

Disturbance regime indicator – *Properly Functioning*. Baseline: Indigo WA (USFS 1998).

The current disturbance regime in Indigo Creek on NFS lands is near the natural range of variability. There have been 2 large fires within 15 years of each other: Silver in 1987 and Biscuit in 2002, which is typical of the fire recurrence interval in the Siskiyou Mountains.

f. Josephine Creek-Illinois River watershed

Watershed overview - Josephine Creek-Illinois River

The mainstem Illinois River in this watershed serves as a migration corridor for adult and juvenile Coho Salmon that are spawned in the upper Illinois subbasin and Deer Creek. Within this watershed, the primary factors limiting Coho Salmon production are natural serpentine geology, lethal summer water temperatures, lack of instream large wood, lack of complex rearing habitat including side channels and beaver ponds, channelized stream segments, and lack of suitable spawning habitat. The Final SONCC Coho Salmon Recovery Plan (NMFS 2014) reported, "A substantial portion of the western Illinois River subbasin has serpentine soils that naturally support sparse riparian conditions…that likely result in warm stream temperatures. Therefore, streams that flow from this terrain, such as Rough and Ready and Josephine Creeks, are unsuitable for Coho Salmon". The plan expanded that, "In most cases, Coho Salmon are naturally absent from steep lower Illinois River tributaries and those that drain the serpentine bedrock area of the western part of the subbasin (e.g., Rough and Ready and Josephine Creeks)".

The channel is a high-energy system with cobble and some boulder substrate and in an unstable condition. Port Orford-cedar root disease was introduced in recent years. Fire suppression has caused the level and continuity of fuels to increase, leaving the watershed susceptible to larger, more intense fires. Timber harvest has occurred though much of the watershed although ultramafic soils limit tree growth and cause scattered vegetative cover. The ownership distribution in the watershed encompasses: USFS 98%, BLM 1%, State lands <1% and the remaining <1% is in private ownership (Table 61).

Table 61. Watershed area and ownership distribution - Josephine Creek-Illinois River

Land Ownership	Acres	Ownership (percent)
USFS	48,187	98
BLM	659	1
State	9	<1
Private	130	<1
Total	**67,250**	**100**

Prevalent land uses

- Federal –mining, dispersed and developed recreation, and timber production
- Private – timber production, agriculture, tourism, rural residential development and mining

Anthropomorphic alterations to habitat. European settlers cleared floodplains, trapped beavers, drained wetlands, and channelized streams to facilitate rural development and agriculture. Timber harvest and associated road construction began in the late 1800s and increased up to and through the early 1990s.

Suction dredging and high banking activity summary. Mining in the watershed began in the 1850's and heavily impacted portions of the watershed. Josephine Creek was the site for most of the large-scale intensive gold mining in southwestern Oregon. Hydraulic mining, instream dredging, and upland processing of bench gravels were used as primary methods. The legacy of historic mining on stream channels and valley topography is still evident in this watershed. The channel is down-cut and because of the lack of structure and riparian vegetation (hindered by the harsh conditions), has recovered little. While there are 131 claims, less than 10% or about 10 miners operate suction dredges during the summer instream work period (John Nolan, RRS, pers. comm., 2002).

There were 131 active filed placer claims as of 5/8/2013 (Table 4 and Figure 16) There were 4.5 suction dredge NOI per year, on average, received by the RRS during the four-year period from 2009-2012 in the watershed on NFS land located within 1/4 mile of CCH. The 4.5 NOI per year was 82% of all NOI within the Illinois subbasin (4.5 per year in Josephine Creek watershed compared to 5.5 total average per year in the Illinois subbasin). The NOI, related Coho Salmon habitat type and its potential maximum impact are numerically displayed in Table 62.

Suction dredge mining is not allowed within the Illinois River mainstem between Deer Creek and Nancy Creek or within ¼ mile of its tributaries because it was designated a Wild River in 1984 under the Wild and Scenic Rivers Act. There are 49.4 miles of CCH within the watershed and 14.4 miles of those miles are withdrawn from mineral entry. The IP value and habitat typing for these withdrawn miles are displayed in Table 63. See Appendix A for a summary and locations of suction dredging and high banking mineral withdrawals on the RRS.

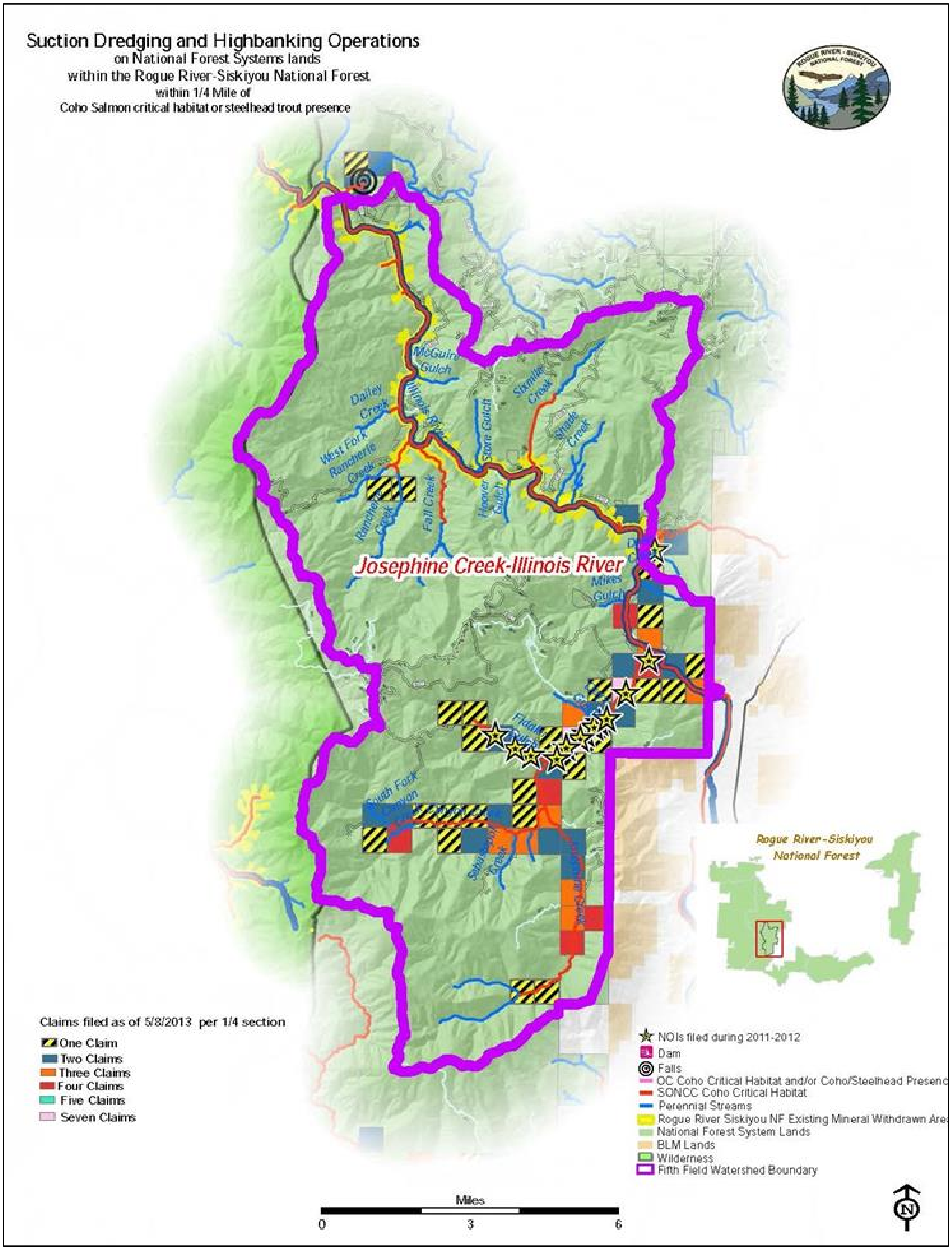

Figure 16. CCH with NOI and mining claims within 1/4 mile of CCH on NFS lands – Josephine Creek-Illinois River watershed

Table 62. Suction dredging NOI received by RRS (2009-2012) within ¼ mile of CCH – Josephine Creek-Illinois River watershed

Name/Location			Past NOI Information								Potential Habitat Use Coho Salmon		
							Total Maximum Disturbance[2]						
Stream w/River Mile (constant name)	Location[1] RS & Lat/Long	Name of Claim	NOI Received 2009-2012 (list years)	Number of Operators per claim Number of Operators per claim	Suction Dredge Activities (Y/N)	High Number of Operators per claim Banking Activities (Y/N)	Volume - NOI Listed (cubic yd.)	Volume – Assumed[3] or NOI Listed (cubic yd.)	Area (sq. ft.)	Stream Distance (ft.)	Spawning / Rearing ft.)	Rearing /Migration (ft.)	Migration (ft.)
Fiddler Gulch 0.5	T39S, R9W., Sec 2NW N42.213 W123.731	***	2011	5	Y	Y	0	25	225	15	15	0	0
Fiddler Gulch 0.7	T38S, R9W., Sec 35SW N42.215 W123.737	***	2011	5	Y	Y	0	25	225	15	15	0	0
Fiddler Gulch 1.3	T38S., R9W., Sec 34SE N42.219 W123.745	Key	2012	4	Y	Y	0	25	225	15	15	0	0
Josephine Creek 0.2	T38S., R8W., Sec 30 N42.241 W123.685	Nama	2011	2	Y	N	0	25	225	15	15	0	0
Josephine Creek 1.1	T38S., R8W., Sec 30SW N42.231 W123.694	Governor Davis	2010	5	Y	Y	0	25	225	15	15	0	0
Josephine Creek 1.6	T38S., R9W., Sec 36 N42.2189 W123.7098	BB3	2009, 2011	3	Y	N	0	25	225	15	15	0	0
Josephine Creek 1.6	T38S., R9W., Sec36NW N42.223611 W123.701389	Gold Bar	2010	1	Y	N	0	25	225	15	15	0	0
Josephine Creek 1.7	T38S., R9W., Sec36NW N42.2225 W123.704167	Last Shot	2011, 2012	2	N	Y	300	300	2700	180	180	0	0
Josephine Creek 1.9	T38S., R9W., Sec 36 SE N42. 2214 W123.7061	BB1	2009, 2011	3	Y	N	0	25	225	15	15	0	0
Josephine Creek 2.3	T38S., R9W., Sec 36SW N42.218 W123.712	Alta 2	2012	1	Y	N	0	25	225	15	15	0	0
Josephine Creek 2.4	T38S., R9W., Sec 36 N42.218 W123.711	BB2	2009, 2011	3	Y	N	0	25	225	15	15	0	0

Josephine Creek 2.4	T38S., R9W., Sec36SW N42.215278 W123.717222	Sunshine Mine	2011	3	Y	N	45	45	405	27	27	0	0
Josephine Creek 2.6	T38S., R9W., Sec36SW N42.215278 W123.717222	Lonestar	2011	2	Y	N	0	25	225	15	15	0	0
Josephine Creek 3.1	T39S., R9W., Sec2NE N42.212 W123.721	Enterprise	2012	4	Y	N	0	25	225	15	15	0	0
		AFFECTED Total within Watershed						645 yd^3	5,805 ft^2	387 ft	387 ft	0	0
		BASELINE Total within Watershed						11,737,440 yd^3	3,912,480 ft^2	260,832 ft	138,336 ft	122,496 ft	0
		BASELINE Total CCH within Watershed								49.4 mi	26.2 mi	23.2 mi	0.0
		AFFECTED Percent Watershed within CCH						0.005%	0.148%	0.148%	0.280%	0.000%	0.000%

[1] Proposed dredging mile marker starting point.

[2] Standard formula to calculate maximum 25 cubic yards suction dredge area of disturbance = 15 feet (length) X 15 feet (width) X 3 feet (depth). Width and depth is constant when cubic yard is stated differently in NOI.

[3] 25 cubic yards is the standard maximum volume anticipated when not specified in NOI.

Table 63. IP and habitat typing mineral withdrawn areas – Josephine Creek–Illinois River watershed

Habitat Typing[1]	Intrinsic Potential[2] (miles)			Total (miles)
	High	Medium	Low	
Spawning/rearing	0	0	0	0
Rearing/migration	0	13.7	0.7	14.4
Migration only	0	0	0	0
Total	**0**	**13.7**	**0.7**	**14.4**

[1] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[2] Values based on an intrinsic potential map derived from the NETMAP CLAMS data and also located http://www.fsl.orst.edu/clams/. Category for ranking were derived from the final SONCC Coho Salmon Recovery Plan (NMFS 2014); high =>/= 0.66, moderate = </=0.33 – 0.66 and low = <0.33.

Watershed population overview – Josephine Creek-Illinois River

The Josephine Creek-Illinois River watershed Coho Salmon population is part of the greater Illinois subbasin population. There are about 49.4 miles of CCH in the Josephine Creek-Illinois River watershed, with about 37.7 miles located on NFS lands (Figure 16 and Table 64). CCH is found in Rancherie, Fall, Six Mile, Canyon, and Josephine creeks and the Illinois River, although some of these streams have lethal temperatures during summer rearing and have too much scour for successful winter spawning. Almost the entire CCH in this watershed is low [and medium IP] (<0.33, final recovery plan), with only small inclusions of high IP found in streams off of NFS lands (Table 65) (NMFS 2014). Coho Salmon juveniles have not been detected in Josephine Creek and its tributaries such as Days Gulch and Canyon Creek in multiple snorkel censuses between the 1980s and 2010s.

Table 64. Salmonid species and habitat length - Josephine Creek-Illinois River watershed

Water-shed Acres	Anadro-mous Species Present[1]	NFS lands Miles of CCH (miles)[2]	NFS lands Miles of Chinook Habitat (miles)[3]	Water-shed CCH and EFH (miles)[4]	Watershed Potential Miles of Coho Salmon Habitat Type[5]		
					Spawning/ Rearing	Rearing/ Migration	Migration only
81,746	CO, CH, ST	37.7	20.0	49.4	26.2	23.2	0

[1] All, or a portion of, the waterbody supports the following anadromous salmonids: ST- steelhead trout; CO- Coho Salmon; CH - Chinook Salmon.

[2] Steelhead presence surveys were used to determine historic Coho Salmon habitat since CCH was not spatially delineated in the Federal Register 50 CFR Part 226. Values based on GIS data layer entitled RRS 2013 Total Salmon and Steelhead Distribution and field knowledge.

[3] Values based on GIS data layer entitled 2013 RRS Anadromous Salmonid Fish Distribution; Chinook Salmon presence survey layer.

[4] Values based on a combination of RRS 2013 SONCC Coho Salmon delineated CH 19 and ODFW steelhead presence survey data 2013 GIS map (as a surrogate for historic Coho Salmon habitat) website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[5] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

Table 65. Habitat typing and intrinsic potential within CCH – Josephine Creek-Illinois River watershed

Habitat Typing[1]	Intrinsic Potential[2] (miles)						Total (miles) CCN/IP/HT	
	High IP		Medium IP		Low IP			
	Water-shed	NFS lands	Water-shed	NFS lands	Water-shed	NFS lands	Water-shed	NFS lands
Spawning/rearing	0	0	20.5	15.5	5.7	3.8	26.2	19.3
Rearing/migration	0.7	0	18.7	17.6	3.8	0.8	23.2	18.4
Migration only	0	0	0	0	0	0	0	0
Total	**0.7**	**0**	**39.2**	**33.1**	**9.5**	**4.6**	**49.4**	**37.7**

[1] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[2] Values based on an intrinsic potential map derived from the NETMAP CLAMS data and also located http://www.fsl.orst.edu/clams/. Category for ranking were derived from the final SONCC Coho Salmon Recovery Plan (NMFS 2014); high =>/= 0.66, moderate = </=0.33 – 0.66 and low = <0.33.

Watershed habitat indicators – Josephine Creek- Illinois River

1) Water quality pathway – Josephine Creek-Illinois River watershed

Temperature indicator – *Not Properly Functioning*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010), Rogue River Basin TMDL (ODEQ 2008), final SONCC Coho Salmon Recovery Plan (NMFS 2014), Middle Illinois WA (USFS1999), Josephine Creek SS (USFS 1998), Canyon Creek SS (USFS 1998), South Fork Canyon Creek SS (USFS 1998) and NWFP (USFS and BLM 1994).

There is an approved TMDL in place for the Illinois subbasin, which addresses water temperature (Oregon DEQ 2008). All of the major water bodies are 303(d) listed for temperature. Table 66 displays the 303(d) list for water quality limited stream within the watershed on NFS lands. High temperatures are due to a combination of the ultramafic geology, sparse vegetation, and land use practices. Summer water temperatures in this watershed are some of the highest in southwestern Oregon and are lethal to Coho Salmon juveniles. Management of the NFS lands within the Josephine Creek-Illinois River watershed is guided by the Siskiyou NF LRMP as amended by the NWFP. The aquatic and riparian standards and guidelines contained within these documents, particularly the Aquatic Conservation Strategy within the NWFP, are designed to provide for recovery and maintenance of cool/cold water thermal regimes within streams on NFS lands. Appendix B displays the 2010 303(d) list for streams within NFS lands on RRS.

Table 66. ODEQ, 2010 303(d) List for Oregon Waterbodies within NFS lands on RRS – Josephine Creek-Illinois River watershed

Stream Name	Miles on RRS (miles)	River Mile Marker (miles)	Pollutant	Assess-ment	Assess-ment 2	Listing Status
Canyon Creek	5.86	0 to 5.9	Temperature	2010	10/29/2010	Cat 4A: Water quality limited, TMDL approved
Fall Creek	4.76	0 to 4.8	Temperature	2010	10/29/2010	Cat 4A: Water quality limited, TMDL approved
Illinois River	17.48	0 to 56.1	Temperature	2010	10/29/2010	Cat 4A: Water quality limited, TMDL approved
Josephine Creek	12.29	0 to 12.4	Temperature	2010	10/29/2010	Cat 4A: Water quality limited, TMDL approved
Little Sixmile Creek	1.21	0 to 1.2	Temperature	2010	10/29/2010	Cat 4A: Water quality limited, TMDL approved
Rancherie Creek	4.85	0 to 5.2	Temperature	2010	10/29/2010	Cat 4A: Water quality limited, TMDL approved
Sixmile Creek	5.17	0 to 5.2	Temperature	2010	10/29/2010	Cat 4A: Water quality limited, TMDL approved
South Fork Canyon Creek	2.36	0 to 2.4	Temperature	2010	10/29/2010	Cat 4A: Water quality limited, TMDL approved

Suspended sediment–intergravel DO/turbidity indicator – *At Risk*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010), final SONCC Coho Salmon Recovery Plan (NMFS 2014), Middle Illinois WA (USFS 1999), Josephine Creek SS (USFS 1998), Canyon Creek SS (USFS 1998) and South Fork Canyon Creek SS (USFS 1998).

No streams in the watershed within the RRS are listed for sediment on the 303(d) list. Within tributary streams, water clarity is high even during winter run-off events due to the shallow soils and ultramafic geology. Within the Illinois River, water clarity is most commonly affected by agricultural use on private lands and winter turbidity levels can be high. Sediment input into stream channels on NFS lands has been primarily associated with past timber harvest and road systems. No streams within the watershed have been listed as water quality limited for sedimentation.

Chemical contamination/nutrients indicator – *Properly Functioning*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010)

No streams in the watershed within the RRS are on the 303(d) list for contaminants or excessive nutrients. Human development including agriculture and rural residential/septic immediately adjacent to NFS lands within the watershed may deliver nutrients and chemicals to this watershed.

2) Habitat access/elements pathway – Josephine Creek-Illinois River watershed

Physical barriers indicator – At Risk. Baseline: Middle Illinois WA (USFS1999), Josephine Creek SS (USFS 1998), Canyon Creek SS (USFS 1998) South Fork Canyon Creek SS (USFS 1998), Rancherie Creek SS (USFS 1992), West Fork Rancherie Creek SS (USFS1992) and Fiddler Gulch SS (USFS 1998).

There are four fish barrier culverts in the watershed, one in a CCH reach of Josephine Creek. Illinois River falls, located upstream of McCaleb Ranch, was a partial barrier to Coho and Chinook salmon until 1961, when the Oregon State Commission funded construction of a vertical slot fish ladder around the falls. Rancherie Creek has an impassable falls 0.25 miles above the confluence of West Fork Rancherie Creek. West Fork Rancherie Creek has a series of impassable falls and chutes one mile above its confluence. Fiddler Gulch has an impassable falls 1.9 miles above its confluence.

Substrate/embeddedness indicator – At Risk. Baseline: Middle Illinois WA (USFS1999), Josephine Creek SS (USFS 1998), Canyon Creek SS (USFS 1998) South Fork Canyon Creek SS (USFS 1998), Rancherie Creek SS (USFS 1992), West Fork Rancherie Creek SS (USFS1992) and Fiddler Gulch SS (USFS 1998).

Sediment has embedded cobbles and gravels in some locations although fine sediment is generally low in the ESA action area due to high stream energy and serpentine geology.

Large wood indicator – At Risk. Baseline: Josephine Creek SS (USFS 1998), Canyon Creek SS (USFS 1998) South Fork Canyon Creek SS (USFS 1998), Rancherie Creek SS (USFS 1992), West Fork Rancherie Creek SS (USFS1992) and Fiddler Gulch SS (USFS 1998).

Large wood levels in streams within the Josephine Creek-Illinois River watershed are low although probably close to the expected range of natural variation due to the ultramafic geology. The RRS has not placed instream large wood in Josephine Creek due to its high stream energy, flashy nature, and extensive bedrock banks. In this watershed, even when large wood is present it does not provide much habitat complexity.

Pool frequency and quality indicator – At Risk. Baseline: Middle Illinois WA (USFS1999), Josephine Creek SS (USFS 1998), Canyon Creek SS (USFS 1998) South Fork Canyon Creek SS (USFS 1998), Rancherie Creek SS (USFS 1992), West Fork Rancherie Creek SS (USFS1992) and Fiddler Gulch SS (USFS 1998).

Many deep pools controlled by bedrock are present in the Illinois River and Josephine Creek in this watershed. Deep pool (>3 feet) frequency is about one per every 500 feet. Table 67 summarizes pool habitat conditions on streams surveyed (using USFS R6 Level II survey protocol) that contain CCH on NFS lands in the Illinois River-Josephine Creek-Illinois River watershed.

Table 67. Habitat percent and pool summary for surveyed streams – Josephine Creek-Illinois River watershed

Stream Name	Year Survey-ed	Habitat % Pool	Habitat % Riffle	Pools/ Mile	Deep Pools/mile (>3ft)	Avg. Residual Pool Depth (ft)	Average Bankfull Width (ft)
Josephine Creek[1]	1998	45	55	25	15	5 est.	50
Rancherie Creek	1992	20	80	13	8	2.8	16.5
Canyon Creek	1998	35	65	26	28	3	24
South Fork Canyon Creek	1998	18	82	34	5	2.1	16

[1] Includes areas surveyed upstream of CCH.

Off-channel habitat indicator – *Not Properly Functioning*. Baseline: Middle Illinois WA (USFS1999), Josephine Creek SS (USFS 1998), Canyon Creek SS (USFS 1998) South Fork Canyon Creek SS (USFS 1998), Rancherie Creek SS (USFS 1992), West Fork Rancherie Creek SS (USFS1992) and Fiddler Gulch SS (USFS 1998).

Stream channels on NFS lands tend to have steeper gradients than valley bottom segments on private lands. In general, Josephine Creek on NFS lands is moderately to completely entrenched and/or confined by topography. Side channels are not a common feature in Josephine Creek on NFS lands due to the natural topography, geology, and geomorphology.

Refugia indicator – *At Risk*. Baseline: Middle Illinois WA (USFS1999), Josephine Creek SS (USFS 1998), Canyon Creek SS (USFS 1998) South Fork Canyon Creek SS (USFS 1998), Rancherie Creek SS (USFS 1992), West Fork Rancherie Creek SS (USFS1992) and Fiddler Gulch SS (USFS 1998).

Colder water summer rearing refuges for juvenile Coho Salmon are largely absent in this watershed. Small numbers of Coho Salmon juveniles have been found in lower Six Mile, Fall, and Rancherie Creeks, which could be considered summer thermal refuges.

3) Channel condition and dynamics pathway – Josephine Creek-Illinois River watershed

Bankfull width depth ratio/ channel widening indicator - *At Risk*. Baseline: Josephine Creek SS (USFS 1998), Canyon Creek SS (USFS 1998) South Fork Canyon Creek SS (USFS 1998), Rancherie Creek SS (USFS 1992), West Fork Rancherie Creek SS (USFS1992), Fiddler Gulch SS (USFS 1998) and NWFP (USFS and BLM 1994).

In general, streams within the watershed are confined, even in lower gradient reaches. It is unknown to what extent historic land use (e.g. placer mining, roads) on NFS lands altered the bankfull channel dimensions within the watershed. Since the mid-1990s, riparian management under the NWFP has emphasized maintenance of habitat for fish and other aquatic resources. Consequently, instream habitat is improving on NFS lands.

Streambank condition indicator – *Properly Functioning*. Baseline: Josephine Creek SS (USFS 1998), Canyon Creek SS (USFS 1998) South Fork Canyon Creek SS (USFS 1998), Rancherie Creek SS (USFS 1992), West Fork Rancherie Creek SS (USFS1992) and Fiddler Gulch SS (USFS 1998).

Data collected during stream surveys on NFS lands (1992, 1993, 1998) documented stable streambanks along Josephine Creek and many tributaries.

Floodplain connectivity indicator – *At Risk*. Baseline: Josephine Creek SS (USFS 1998), Canyon Creek SS (USFS 1998) South Fork Canyon Creek SS (USFS 1998), Rancherie Creek SS (USFS 1992), West Fork Rancherie Creek SS (USFS1992) and Fiddler Gulch SS (USFS 1998).

There are no prominent low gradient areas with expansive floodplains on NFS lands within the watershed. Streams on NFS lands, including the mainstem Illinois River, tend to be moderately to fully confined and constrained by hillslopes or terraces.

4) Flow/hydrology pathway – Josephine Creek-Illinois River watershed

Change in peak/base flow indicator – *At Risk*. Baseline: Middle Illinois WA (USFS1999) and final SONCC Coho Salmon Recovery Plan (NMFS 2014).

Timber harvest and roads can affect stream flow by intercepting water and transporting it to stream channels more rapidly than natural processes. Groundwater pumping and diversions in agricultural lands of the Illinois Valley have decreased summer base flows. The Biscuit Fire likely increased peak flows in this watershed by removing vegetation. Many subwatersheds are naturally flashy due to the preponderance of ultramafic geology and shallow soil profiles

Increase in drainage network indicator – *At Risk*. Baseline: Middle Illinois WA (USFS1999).

Josephine Creek-Illinois River watershed within NFS lands contains a moderate road system. These roads were primarily constructed for mining access. On private land, in general, road densities are higher than on public land.

5) Watershed conditions pathway – Josephine Creek-Illinois River watershed

Road density and location indicator – *At Risk*. Baseline: Middle Illinois WA (USFS1999).

Most of the NFS lands do not have high road densities as less than average levels of timber harvest have occurred in this watershed. However, many roads are located in the valley bottom and some have fords.

Disturbance history indicator - *At Risk*. Baseline: Middle Illinois WA (USFS1999).

Human activities have altered watershed processes and functions throughout the watershed. Timber harvest, fire suppression, noxious weeds, roads, and mining (primarily hydraulic and other forms of placer) are the primary disturbance activities.

Riparian Reserves indicator – *At Risk*. Baseline: Middle Illinois WA (USFS 1999), Josephine Creek SS (USFS 1998), Canyon Creek SS (USFS 1998) South Fork Canyon Creek SS (USFS 1998), Rancherie Creek SS (USFS 1992), West Fork Rancherie Creek SS (USFS1992) and Fiddler Gulch SS (USFS 1998).

Many riparian areas have been fully harvested on private lands in agricultural areas. On NFS lands, placer mining occurred in some riparian areas, influencing Riparian Reserves. Approximately 28% of the riparian zones within 1 Site Potential Tree (SPT) of streams were burned severely enough to kill the forest canopy during the 2002 Biscuit fire.

Disturbance regime indicator – *At Risk*. Baseline: Middle Illinois WA (USFS 1999).

Mining occurred in many streams in this watershed for decades in the 19th century. Timber harvest and road development is scattered on NFS lands in this watershed except for some historic mining roads near streams.

g. Klondike Creek-Illinois River watershed

Watershed overview – Klondike Creek-Illinois River

The Illinois River is a federally designated Wild and Scenic River in this watershed and joins the Rogue River approximately 10 river miles upstream of Agness, Oregon. Approximately 97% of the watershed is located within the Kalmiopsis Wilderness Area (congressionally designated as wilderness in 1964), entirely on public land managed by the Rogue River–Siskiyou National Forest, Wild Rivers Ranger District. Tributaries to the Illinois River located within the wilderness consist of Collier Creek, Klondike Creek, Yukon Creek, Florence Creek and Pine Creek. Tributaries outside of the wilderness are Panther Creek and Labrador Creek.

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 with 100% USFS ownership (Table 68). Elevations within the watershed range from approximately 650 feet to 4,858 feet atop Gold Basin Butte. The watershed area is situated in the rain zone (sea level to 2,500 feet) and transient snow zone (2,500 feet – 5,000 feet). Rain-on-snow events in the transient snow zone often result in significant runoff and flooding. Mild wet winters and dry hot summers characterize the climate of the watershed. Annual precipitation amounts range from 70 inches to 100 inches and are largely delivered during the months of October through April (Middle Illinois River WA 1999).

Table 68. Watershed area and ownership distribution - Klondike Creek-Illinois River watershed

Land Ownership	Acres	Ownership (percent)
USFS	67,124	100
Total	**67,124**	**100**

Prevalent land uses

- Federal – 97% wilderness
- Private – no private land

Anthropomorphic alterations to habitat. Ten miles of road in the upper watershed were built along the east side of the watershed to facilitate timber management.

Suction dredging and high banking activity summary. The Klondike Creek watershed within the Illinois River subbasin on NFS lands had no actively filed claims (as of 5/8/2013). There were no suction dredge NOI received by the RRS during the four-year period from 2009-2012 in the watershed on NFS land located within 1/4 mile of CCH (Table 4 and Figure 17).

Suction dredge mining is not allowed within the Illinois River mainstem between Deer Creek and Nancy Creek or within ¼ mile of its tributaries since it was designated a Wild River in 1984 under the Wild and Scenic Rivers Act. Panther Creek is a tributary within the watershed that is located outside of the wilderness. It is accessible only via foot travel (non-vehicular) at the Briggs

Creek trailhead (an approximate 1.5 mile hike). The IP value and habitat typing for these withdrawn miles (40.9 miles of total 42.7 CCH miles within the watershed) are displayed in Table 69. See Appendix A for a summary and locations of suction dredging and high banking mineral withdrawals on the RRS.

Table 69. IP and habitat typing mineral withdrawn areas – Klondike Creek-Illinois River watershed

	Intrinsic Potential (miles)[2]			
Habitat Typing[1]	**High**	**Medium**	**Low**	**Total (miles)**
Spawning/rearing	0	9.0	7.5	16.5
Rearing/migration	0	23.2	1.2	24.4
Migration only	0	0	0	0
Total	**0**	**32.2**	**8.7**	**40.9**

[1] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[2] Values based on an intrinsic potential map derived from the NETMAP CLAMS data and also located http://www.fsl.orst.edu/clams/. Category for ranking were derived from the final SONCC Coho Salmon Recovery Plan (NMFS 2014); high =>/= 0.66, moderate = </=0.33 – 0.66 and low = <0.33.

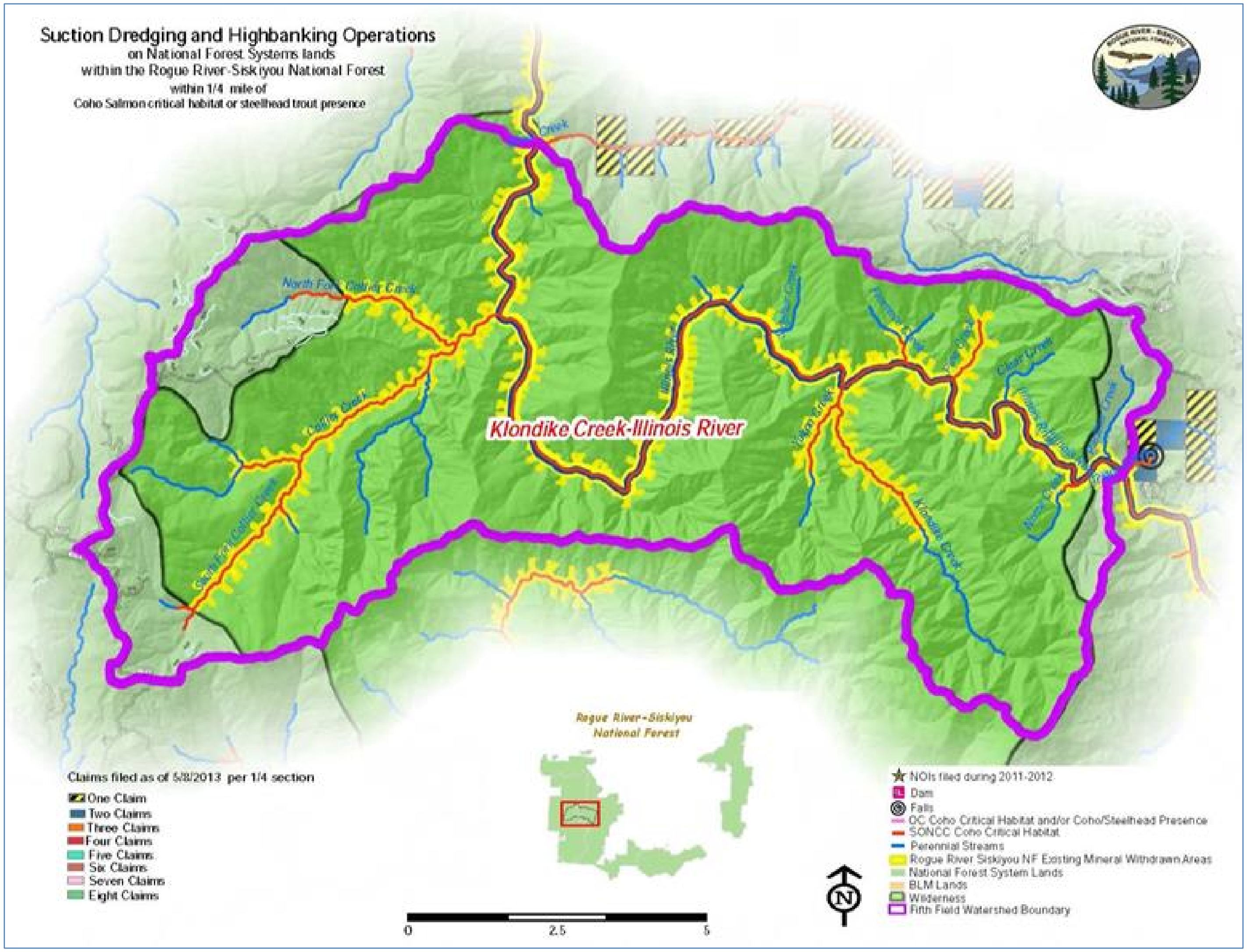

Figure 17. CCH with NOI and mining claims within 1/4 mile of CCH on NFS lands – Klondike Creek-Illinois River watershed

Watershed population overview – Klondike Creek-Illinois River

The Klondike Creek-Illinois River watershed Coho Salmon population is part of the greater Illinois subbasin population (Table 70). Only medium and low IP are located within this watershed due to its steep gradient and limited floodplain (Table 71).

Table 70. Salmonid species and habitat length - Klondike Creek-Illinois River watershed

Water-shed Acres	Anadro-mous Species Present[1]	NFS lands Miles of CCH (miles)[2]	NFS lands Miles of Chinook Habitat (miles)[3]	Water-shed CCH and EFH (miles)[4]	Watershed Potential Miles of Coho Salmon Habitat Type[5]		
					Spawning/ Rearing	Rearing/ Migration	Migration only
67,124	CO, CH, ST, CT	42.7	23.8	42.7	18.3	24.4	0

[1] All, or a portion of, the waterbody supports the following anadromous salmonids: ST- steelhead trout; CO- Coho Salmon; CH - Chinook Salmon.

[2] Steelhead presence surveys were used to determine historic Coho Salmon habitat since CCH was not spatially delineated in the Federal Register 50 CFR Part 226. Values based on GIS data layer entitled RRS 2013 Total Salmon and Steelhead Distribution and field knowledge.

[3] Values based on GIS data layer entitled 2013 RRS Anadromous Salmonid Fish Distribution; Chinook Salmon presence survey layer.

[4] Values based on a combination of RRS 2013 SONCC Coho Salmon delineated CH 19 and ODFW steelhead presence survey data 2013 GIS map (as a surrogate for historic Coho Salmon habitat) website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[5] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

Table 71. Habitat typing and intrinsic potential within CCH – Klondike Creek-Illinois River watershed

Habitat Typing[1]	Intrinsic Potential[2] (miles)						Total (miles) CCN/IP/HT	
	High IP		Medium IP		Low IP			
	Water-shed	NFS lands	Water-shed	NFS lands	Water-shed	NFS lands	Water-shed	NFS lands
Spawning/rearing	0	0	9.9	9.9	8.4	8.4	18.3	18.3
Rearing/migration	0	0	23.2	23.2	1.2	1.2	24.4	24.4
Migration only	0	0	0	0	0	0	0	0
Total	**0**	**0**	**33.1**	**33.1**	**9.6**	**9.6**	**42.7**	**42.7**

[1] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[2] Values based on an intrinsic potential map derived from the NETMAP CLAMS data and also located http://www.fsl.orst.edu/clams/. Category for ranking were derived from the final SONCC Coho Salmon Recovery Plan (NMFS 2014); high =>/= 0.66, moderate = </=0.33 – 0.66 and low = <0.33.

Watershed habitat indicators - Kondike Creek-Illinois River

Note: All the streams within the watershed are in the Kalmiopsis wilderness except for Labrador Creek (no fish), upper reaches of South and North Fork Collier Creek, and Panther Creek. No stream survey has been conducted for Panther creek. The creek is only accessible by trail. It appears via topographical and satellite maps that the channel is narrow, steep, and confined upstream from the 1 mile withdrawn area.

1) Water quality pathway- Kondike Creek-Illinois River watershed

Temperature indicator – Properly Functioning. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010), Rogue River Basin TMDL (ODEQ 2008), and Kalmiopsis WA (USFS 1995)

There .is an approved TMDL in place for the Illinois subbasin, which addresses water temperature (Oregon DEQ 2008). Most of the major streams are listed for temperature.

Table 72 displays the 303(d) list for water quality limited stream within the watershed on NFS lands. The Biscuit fire did not consume a high proportion of the riparian vegetation providing stream shade. Appendix B displays the 2010 303(d) list for streams within NFS lands on RRS.

Table 72. ODEQ, 2010 303(d) List for Oregon Waterbodies within NFS lands on RRS –Klondike Creek-Illinois River watershed

Stream Name	Miles on RRS (miles)	River Mile Marker (miles)	Pollutant	Assess-ment	Assess-ment 2	Listing Status
Collier Creek	4.46	0 to 4.5	Temperature	2010	10/29/2010	Cat 4A: Water quality limited, TMDL approved
Illinois River	22.61	0 to 56.1	Temperature	2010	10/29/2010	Cat 4A: Water quality limited, TMDL approved
Klondike Creek	7.28	0 to 7.4	Temperature	2010	10/29/2010	Cat 4A: Water quality limited, TMDL approved
Panther Creek	2.59	0 to 2.6	Temperature	2010	10/29/2010	Cat 4A: Water quality limited, TMDL approved

Suspended sediment–intergravel DO/turbidity indicator– *Properly Functioning*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010) and Kalmiopsis WA (USFS 1995).

No streams in the watershed within the RRS are listed for sediment on the 303(d) list. Active landslides today are most common in inner gorge areas, where ground-water from high elevation become concentrated above steep slopes adjacent to major streams along the lower reaches of small tributaries. These disturbances have been frequent in the Kalmiopsis Wilderness.

Chemical contamination/nutrients indicator – *Properly Functioning*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010) and Kalmiopsis WA (USFS 1995).

No streams in the watershed within the RRS are on the 303(d) list for contaminants or excessive nutrients. The Klondike Creek watershed is located almost entirely within the Kalmiopsis Wilderness Area (congressionally designated as wilderness in 1964). The Illinois River is a federally designated Wild and Scenic River. The lack of human development within the watershed limits the risk of chemical contamination and nutrient loading.

2) Habitat access/elements pathway- Klondike Creek-Illinois River watershed

Physical barriers indicator – *Properly Functioning*. Baseline; Kalmiopsis WA (USFS 1995), Klondike Creek SS (USFS 1993, SRG 2010) and Yukon Creek SS (USFS 1993, SRG 2010).

There are no known human barriers. A 10-foot bedrock waterfall is the upstream limit of fish distribution in Yukon Creek (T37S, R10W, S8NWSW).

Substrate/embeddedness indicator - *Properly Functioning*. Baseline; 2002 Biscuit Fish BA (USFS 2003), Kalmiopsis WA (USFS 1995), Klondike Creek SS (USFS 1993, SRG 2010) and Yukon Creek SS (USFS 1993, SRG 2010).

Cobble and boulder substrate were most common in Klondike Creek and gravel and cobble substrate were most common in Yukon Creek. Yukon Creek appeared to contain a moderate amount of suitable spawning habitat for anadromous fish, whereas Klondike Creek, being cobble and boulder dominated, lacked large spawning beds in the main channel.

Large wood indicators – *Properly Functioning*. Baseline: Kalmiopsis WA (USFS 1995), Klondike Creek SS (USFS 1993, SRG 2010) and Yukon Creek SS (USFS 1993, SRG 2010).

Large wood material was not abundant in the Klondike/Yukon system or the other tributaries with the exception of reach 2 (mile 1.1 to 2.1) of Yukon Creek, which contained a moderate amount of small class large wood. The lack of instream wood material was largely attributed to the rocky bedrock mafic geology present in the riparian area. This combined with a frequent fire recurrence may contribute to a low number of riparian trees that become large enough to classify as medium or large class instream LWM.

Pool frequency and quality indicator – *Properly Functioning*.

Pool frequency in Klondike Creek was 24.2, 15.0, and 42 pools/mile in reaches 1 to 3 Yukon Creek had a pool frequency of 46.5 and 55.3 pools/mile in reaches 1 to 2.

Large pools indicator - *Properly Functioning*.

Pools that exceeded 3 feet in depth (residual depth) occurred with a deep pool frequency of 9.1, 2.7, and 10.8 in Klondike Creek for reaches 1 to 3. The deep pool frequency for reaches 1 to 2 of Yukon Creek was 7.9 and 8.7 pools/mile. Deepest pool was 6.3 feet.

Off-channel habitat indicator – *Properly Functioning*.

Mile 0.33 to 1.87 (reach 2) of Klondike Creek, located in a wide alluviated canyon, contained a large amount of side channel habitat (14% of total habitat area), of which a portion was identified as potential summer rearing and winter refuge habitat for coho salmon. Gradient varied from 4% to 8%.

Refugia indicator – *Properly Functioning*. Baseline: Kalmiopsis WA (USFS 1995), Klondike Creek SS (USFS 1993, SRG 2010) and Yukon Creek SS (USFS 1993, SRG 2010).

The most common aquatic habitats observed in the Klondike and Yukon Creeks were rapids, mid channel scour pools, plunge pools, and side channels. In Yukon Creek the most common aquatic habitats observed were rapids, mid channel scour pools, and plunge pools. Other habitats observed in both streams included lateral scour pools, bedrock trench pools, waterfalls, low gradient riffles, and steep gradient cascades.

3) Channel condition and dynamics pathway- Kondike Creek-Illinois River watershed

Bankfull width depth ratio/channel widening indicator– *Properly Functioning*. Baseline: Kalmiopsis WA (USFS 1995), Klondike Creek SS (USFS 1993, SRG 2010) and Yukon Creek SS (USFS 1993, SRG 2010).

In general, streams within the watershed are confined, even in lower gradient reaches. Streams are in near reference condition for their geomorphology.

Streambank condition indicator - *Properly Functioning*. Baseline: Kalmiopsis WA (USFS 1995), Klondike Creek SS (USFS 1993, SRG 2010) and Yukon Creek SS (USFS 1993, SRG 2010).

The inner canyon and stream banks were generally stable. Reach 2 of Klondike Creek contained the greatest amount of stream bank erosion (5.4% of total reach length) in the form of cutbanks and inner canyon landslides.

Floodplain connectivity indicator – *Properly Functioning*. Baseline: Kalmiopsis WA (USFS 1995), Klondike Creek SS (USFS 1993, SRG 2010) and Yukon Creek SS (USFS 1993, SRG 2010).

There are very few prominent low gradient areas with developed floodplains. Streams tend to be moderately to fully confined and constrained by hillslopes or terraces.

4) Flow/hydrology pathway -- Kondike Creek-Illinois River watershed

Change in peak/base flow indicator – *Properly Functioning*. Baseline: USFS records and 2002 Biscuit Fish BA (USFS 2003).

With the exception of the primitive roads, the Kalmiopsis Wilderness is a place where the forces of nature determine the landscape, waterflows, landslides, and fish habitat. There is very little management, if any, (recent or current) in areas outside of the wilderness. The Biscuit Fire likely increased peak flows in this watershed. However vegetation has grown back in over much of the burn area.

Increase in drainage network indicator – *Properly Functioning*. Baseline: Kalmiopsis WA (USFS 1995)

There are minimal roads in this watershed (0.1 miles of road per square mile). The mainstem is naturally flashy and response time to rain events is probably less than historic due to human uses upstream.

5) Watershed conditions pathway- Kondike Creek-Illinois River watershed

Road density and location indicator – *Properly Functioning*. Baseline: Kalmiopsis WA (USFS 1995)

There is approximately 0.1 miles of road per square mile. The primitive roads have become part of the trail system. Most roads are located on ridge tops or mid-slope. There are two stream crossings two miles above CCH. There is no evidence that the few roads still remaining had a permanent effect on water flow, landslides, or fish.

Disturbance history indicator – *Properly Functioning*. Baseline: USFS records and 2002 Biscuit Fish BA (USFS 2003).

Natural processes such as climate, fire recurrence, mafic geology, and flooding, and not human management activities, are directly responsible for channel and canyon morphology, riparian composition and structure, and types of aquatic habitats.

Riparian Reserves indicator – *Properly Functioning*. Baseline: Kalmiopsis WA (USFS 1995).

The forested riparian portion of the Kalmiopsis Wilderness watershed has a mixture of conifers and hardwoods with a ground cover of shrubs and forbs. Plant communities of the Kalmiopsis Wilderness watersheds are a patchwork of different age classes. A majority of the landscape in the Wilderness has been burned over the past 80 years by wildfires of varying sizes, creating the patchwork mosaic. The riparian vegetation consisted of small diameter hardwoods and conifers such as red alder, bigleaf maple, myrtle, tanoak, canyon live oak, madrone, Douglas-fir, and Port-Orford-cedar. Portions of Reach 1 of Klondike Creek and Reach 1 of Yukon Creek contained a mid to late seral forest of scattered large and mature class Douglas-fir and Port-Orford-cedar. A portion of the riparian vegetation in Reach 2 and Reach 3 of Klondike Creek and Reach 2 of Yukon Creek was severely burned in the 2002 Biscuit fire. As a result, these areas of the riparian habitat were in a pioneer and early successional stage

Disturbance regime indicator – *Properly Functioning*. Baseline: USFS records and 2002 Biscuit Fish BA (USFS 2003).

The current disturbance regime is near the natural range of variability.

h. Lawson Creek watershed

Watershed overview – Lawson Creek

Lawson Creek, a northeast flowing third-order tributary to Illinois River, is located in the Siskiyou Mountains of central Curry County. 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. The Lawson Creek watershed contains approximately 4 percent of the watershed area of the Illinois River. Lawson Creek is located within an elevation range between 155 feet and 4,131 feet and may receive in excess of 115 inches of precipitation a year.

The majority of the Lawson Creek watershed is located on public land. The ownership distribution in the watershed encompasses: USFS 94%, State lands <1% and the remaining 5% is in private ownership (Table 73). The small percentage of private land in the watershed is concentrated near the mouth and at a small parcel a few miles upstream. The public portion of the watershed is located on NFS lands. Management of the public portion of the watershed spans an array of strategies ranging from wild river status at <1%, matrix at 17%, to late successional reserve at 45% (Lawson Creek watershed Analysis, 1997). The 2002 Biscuit Fire burned through the Lawson Creek watershed (Siskiyou Research Group 2003).

Table 73. Watershed area and ownership distribution - Lawson Creek-Illinois River

Land Ownership	Acres	Ownership (percent)
USFS	38,563	94
State	376	1
Private	2,241	5
Total	**67,250**	**100**

Prevalent land uses

- Federal – recreation, fishing, and timber harvest
- Private – residential, and industrial timber lands

Anthropomorphic alterations to habitat. Settlers cleared forests in small patches for agriculture and grazing of livestock in the mid-19th century. Considerable burning was done by aboriginal peoples and early settlers, which ceased around the turn of the century. Timber harvest has occurred on both private and public lands and road development is extensive on the north side of the river in some subwatersheds. Lawson Creek is a Key Watershed and no roads exist near the stream. Much of the public lands are now in the late Successional Reserve allocation under the NWFP (USFS and BLM 1994).

Suction dredging and high banking activity summary. The Lawson Creek watershed within the Illinois River subbasin on NFS lands had no active filed claims (as of 5/8/2013). There were no suction dredge NOI received by the RRS during the four-year period from 2009-2012 in the watershed on NFS land located within 1/4 mile of CCH (Table 4 and Figure 18).

Suction dredge mining is mineral withdrawn from the Kalmiopsis wilderness/watershed boundary on the Illinois River and within ¼ mile of its tributaries starting at the Silver Creek tributary to downstream from the Nancy Creek tributary. The IP value and habitat typing for these withdrawn miles (12.3 miles of the total 20.8 CCH within the watershed) are displayed in Table 74. See Appendix A for a summary and locations of suction dredging and high banking mineral withdrawals on the RRS.

Table 74. IP and habitat typing mineral withdrawn areas – Lawson Creek-Illinois River watershed

	Intrinsic Potential[2] (miles)			
Habitat Typing[1]	**High**	**Medium**	**Low**	**Total (miles)**
Spawning/rearing	0	0	0	0
Rearing/migration	0	5.8	5.7	11.5
Migration only	0	0	0.5	0.5
Total	**0**	**5.8**	**6.2**	**12.0**

[1] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[2] Values based on an intrinsic potential map derived from the NETMAP CLAMS data and also located http://www.fsl.orst.edu/clams/. Category for ranking were derived from the final SONCC Coho Salmon Recovery Plan (NMFS 2014); high =>/= 0.66, moderate = </=0.33 – 0.66 and low = <0.33.

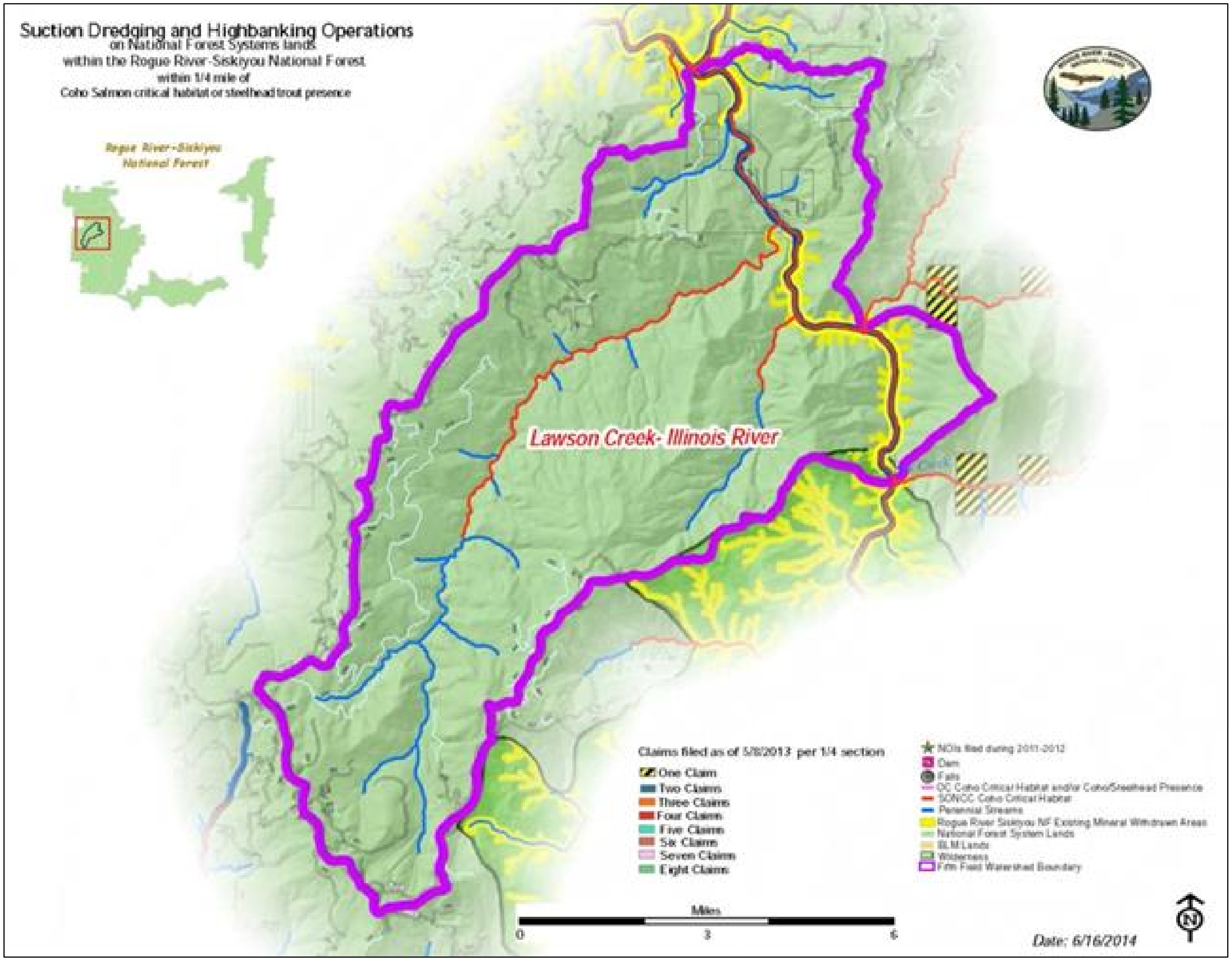

Figure 18. CCH with NOI and mining claims within 1/4 mile of CCH on NFS lands – Lawson Creek-Illinois River watershed

Watershed population overview – Lawson Creek

The Lawson Creek watershed Coho Salmon population is part of the greater Illinois subbasin population. Steelhead/rainbow trout, cutthroat trout, and sculpin were the fish species identified during a 2003 snorkel survey. No Chinook or Coho Salmon were observed. There are about 20.8 miles of CCH in the Lawson Creek watershed; 16.4 miles are located on NFS lands (Table 75).

Fish density is variable throughout the stream. The lower reach had the lowest fish density, likely a function of warm water and lack of turbulent water. Halfway up, the stream had the highest fish density. Abundant cover, cooler water, and increased aeration of the water in the cascades are possible reasons for the substantial jump in fish density in this reach as compared to the lower reach. Eighteen steelhead redds were noted in the surveyed section. The upstream limit to anadromy is higher up in the watershed where steep cascades / waterfalls are located. Suitable spawning habitat appears to be the main factor limiting Coho Salmon use of the anadromous portion of Lawson Creek, rivaled only by the warm water of the lower reaches (SRG 2003). The watershed has no high IP due to its steep gradient and confined, limited floodplain (Table 76).

Table 75. Salmonid species and habitat length - Lawson Creek–Illinois River watershed

Water-shed Acres	Anadro-mous Species Present[1]	NFS lands Miles of CCH (miles)[2]	NFS lands Miles of Chinook Habitat (miles)[3]	Water-shed CCH and EFH (miles)[4]	Watershed Potential Miles of Coho Salmon Habitat Type[5]		
					Spawning/ Rearing	Rearing/ Migration	Migration only
41,179	CO, CH, ST	16.4	13.6	20.8	10.7	10.1	0

[1] All, or a portion of, the waterbody supports the following anadromous salmonids: ST- steelhead trout; CO- Coho Salmon; CH - Chinook Salmon.

[2] Steelhead presence surveys were used to determine historic Coho Salmon habitat since CCH was not spatially delineated in the Federal Register 50 CFR Part 226. Values based on GIS data layer entitled RRS 2013 Total Salmon and Steelhead Distribution and field knowledge.

[3] Values based on GIS data layer entitled 2013 RRS Anadromous Salmonid Fish Distribution; Chinook Salmon presence survey layer.

[4] Values based on a combination of RRS 2013 SONCC Coho Salmon delineated CH 19 and ODFW steelhead presence survey data 2013 GIS map (as a surrogate for historic Coho Salmon habitat) website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[5] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

Table 76. Habitat typing and intrinsic potential within CCH – Lawson Creek-Illinois River watershed

Habitat Typing[1]	Intrinsic Potential[2] (miles)						Total (miles) CCN/IP/HT	
	High IP		Medium IP		Low IP			
	Water-shed	NFS lands	Water-shed	NFS lands	Water-shed	NFS lands	Water-shed	NFS lands
Spawning/rearing	0	0	4.7	4.4	6.0	5.7	10.7	10.1
Rearing/migration	0	0	9.4	5.8	0.7	0.5	10.1	6.3
Migration only	0	0	0	0	0	0	0	0
Total	**0**	**0**	**14.1**	**10.2**	**6.7**	**6.2**	**20.8**	**16.4**

[1] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[2] Values based on an intrinsic potential map derived from the NETMAP CLAMS data and also located http://www.fsl.orst.edu/clams/. Category for ranking were derived from the final SONCC Coho Salmon Recovery Plan (NMFS 2014); high =>/= 0.66, moderate = </=0.33 – 0.66 and low = <0.33.

Watershed habitat indicators – Lawson Creek

1) Water quality pathway – Lawson Creek watershed

Temperature indicator – *At Risk*. Baseline: Lawson WA (USFS 1997), Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010) and Rogue River TMDL (ODEQ 2008).

There is an approved TMDL in place for the Illinois subbasin, which addresses water temperature (Oregon DEQ 2008). The mainstem Illinois River is warm during the summer months and reaches the high 70 degree F range. The river is listed as water quality limited 303(d) for summer water temperature from river mile 0 to 11.1. Lawson Creek and other smaller tributaries have cool water habitats. Table 77 displays the 303(d) list for water quality limited stream within the watershed on NFS lands. Appendix B displays the 2010 303(d) list for streams within NFS lands on RRS.

Table 77. ODEQ, 2010 303(d) List for Oregon Waterbodies within NFS lands on RRS – Lawson Creek-Illinois River watershed

Stream Name	Miles on RRS (miles)	River Mile Marker (miles)	Pollutant	Assess-ment	Assess-ment 2	Listing Status
Illinois River	6.33	0 to 56.1	Temperature	2010	10/29/2010	Cat 4A: Water quality limited, TMDL approved
Lawson Creek	10.63	0 to 11.1	Temperature	2010	10/29/2010	Cat 4A: Water quality limited, TMDL approved

Suspended sediment–intergravel/DO/turbidity indicator - At Risk. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010) and Lawson WA (USFS 1997).

No streams in the watershed within the RRS are listed for sediment on the 303(d) list. Past logging, road construction and upstream valley settlement have all affected turbidity in the mainstem. The mainstem of the Illinois River has tremendous flushing power during high flows. The turbidity levels in the Illinois River are probably above historic levels due to agriculture uses and urbanization.

Chemical contamination/nutrients indicator – At Risk. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010) and Lawson WA (USFS 1997).

No streams in the watershed within the RRS are on the 303(d) list for contaminants or excessive nutrients. Several thousand people live upstream in the Illinois River valley. Storm drains and agriculture runoff contribute to some contaminants reaching waterways. Local drainages are functioning properly with few or no contaminants.

2) Habitat access/habitat pathway – Lawson Creek watershed

Physical barriers indicator – *Properly Functioning*. Baseline: Lawson WA (USFS 1997), Lawson Creek (SRG 2003) and Horse Sign Creek SS (USFS 1990).

There are no known human-caused fish barriers within the mainstem Illinois River or tributaries in this watershed.

Substrate/embeddedness indicator – *Properly Functioning*. Baseline: Lawson WA (USFS 1997), Lawson Creek (SRG 2003) and Horse Sign Creek SS (USFS 1990).

The mainstem riverbeds of the Illinois River and Lawson Creek turn over during the typical high precipitation periods of winter. Substrate components are coarse in the main river and in Lawson Creek with little embeddedness apparent.

Large wood indicator – *Properly Functioning*. Baseline: Lawson WA (USFS 1997), Lawson Creek (SRG 2003) and Horse Sign Creek SS (USFS 1990).

The mainstem of Illinois River and Lawson Creek rarely holds large wood through the winter in this section. Few roads are located near tributaries streams and wood cleanout has not been widespread.

Pool frequency and quality indicator - *Properly Functioning*. Baseline: Lawson WA (USFS 1997), Lawson Creek (SRG 2003) and Horse Sign Creek SS (USFS 1990).

The mainstem of Illinois River and Lawson Creek is probably within the natural range of variability for pools and tributaries have expected numbers of pools.

Off-channel habitat indicator – *Properly Functioning*. Baseline: Lawson WA (USFS 1997), Lawson Creek (SRG 2003) and Horse Sign Creek SS (USFS 1990).

Off-channel habitat is rare in this constrained stream valley and in tributaries.

Refugia indicator - Properly Functioning. Baseline: Lawson WA (USFS 1997), Lawson Creek (SRG 2003) and Horse Sign Creek SS (USFS 1990).

Off channel habitat is rare; refugia for fish is principally associated with large boulders, substrate interstices habitats and cooler water at tributary confluences.

3) Channel condition and dynamics pathway – Lawson Creek watershed

Bankfull width depth ratio/channel widening indicator- ***Properly Functioning***. Baseline: Lawson WA (USFS 1997), Lawson Creek (SRG 2003) and Horse Sign Creek SS (USFS 1990).

The mainstem Illinois River is probably within the natural range of variability because of bedrock controls and valley sidewalls. Constrained stream valleys of the tributaries are within the expected range of width and depth in tributaries.

Streambank condition indicator – *At Risk*. Baseline: Lawson WA (USFS 1997), Lawson Creek (SRG 2003) and Horse Sign Creek SS (USFS 1990).

Streambanks have been altered locally in the mainstem Illinois River to accommodate agriculture and residences. Tributaries are in good shape with little road access to stream channels.

Floodplain connectivity indicator- *Properly Functioning*. Baseline: Lawson WA (USFS 1997), Lawson Creek (SRG 2003) and Horse Sign Creek SS (USFS 1990).

The constrained stream valley has few developed floodplains.

4) Flow/hydrology pathway – Lawson Creek watershed

Change in peak/base flow indicator – *At Risk*. Baseline: Lawson WA (USFS 1997).

Timber harvest and road construction have affected peak flows in some tributaries. During the 1964 historic flood, flows from the Illinois River were estimated to be almost on par with the mainstem Rogue River though this subbasin represents only about 20% of the total acres. Agriculture use of water has lowered base flows in the main river.

Increase in drainage network indicator – *At Risk*. Baseline: Lawson WA (USFS 1997).

Most effects are detectable on tributaries where stream flow response to high rainfall may be altered somewhat. The mainstem is naturally flashy and response time to rain events is probably less than historic due to human uses upstream.

5) Watershed conditions pathway – Lawson Creek watershed

Road density and location indicator – *At Risk*. Baseline: Lawson WA (USFS 1997).

Road densities are moderate in Lawson Creek and only a valley bottom road along the Illinois River to Oak Flat is present in the watershed.

Disturbance history indicator – *At Risk*. Baseline: Lawson WA (USFS 1997).

Timber harvest and road development have altered erosion processes in some of the tributaries. Many roads have been decommissioned in Lawson Creek.

Riparian Reserves indicator – *At Risk*. Baseline: Lawson WA (USFS 1997).

Riparian areas have been harvested locally in some tributaries where access is present. Riparian areas along the main river have been modified for more than 100 years. The Wild and Scenic River designation in the Illinois River has caused more scrutiny of vegetation management along the river.

Disturbance regime indicator – *At Risk*. Baseline: Lawson WA (USFS 1997).

Future effects of floods and fire events are exacerbated by the past timber harvest, road development and fire prevention.

i. Silver Creek watershed

Watershed overview - Silver Creek

The Silver Creek watershed only supports the occasional stray Coho Salmon due to its geomorphology and associated low IP. It is an important producer of steelhead to the Illinois system with an escapement of hundreds of wild adult steelhead to the watershed. The 2014 Final SONCC Coho Salmon Recovery Plan reported, “Coho salmon production potential is limited in other areas [outside of the upper Illinois Valley]. Tributaries of the lower Illinois River subbasin, such as Silver, Lawson, and Indigo Creeks, are too steep and confined for Coho Salmon to flourish. High IP Coho Salmon habitat occurs on a bench in the upper North Fork of Silver Creek but Coho Salmon access to that reach is blocked by a series of culverts; natural falls downstream are additional potential impediments to passage.” Within this watershed, the primary factors limiting Coho Salmon production are natural migration barriers, stream gradients, and channel confinement due to steep canyon walls. The ownership distribution in the watershed encompasses: USFS 83%, BLM 16% and the remaining <1% is in private ownership (Table 78).

Table 78. Watershed area and ownership distribution - Silver Creek watershed

Land Ownership	Acres	Ownership (percent)
USFS	43,000	83
State	8,490	16
Private	131	<1
Total	**51,621**	**100**

Prevalent land uses

- Federal – timber production, mining, and dispersed recreation
- Private – timber production, and mining

Anthropomorphic alterations to habitat. Limited timber harvest, including some fire salvage on NFS lands, and associated road construction began in the late 1800s and increased up to and through the early 1990s.

Suction dredging and high banking activity summary. Silver Creek was a historic gold mining stream with the Old Glory Mine being one of the more productive sites. Hydraulic mining was used in some portions of the Sucker Creek watershed as a primary mining method. A private parcel on Silver Creek upstream of Silver Creek Falls is still mined intensively. An area of Silver Creek on NFS lands operated by Winn Curtis has been dredged repeatedly in recent years. Suction dredging occurs on the mainstem above the North Fork.

There were 40 active filed placer claims (10% of Illinois subbasin) as of 5/8/2013. There was one suction dredge NOI (5% of Illinois subbasin) received by the RRS during the four-year period from 2009-2012 in the watershed on NFS land located within 1/4 mile of CCH (Table 4 and Figure 19). The NOI and related Coho Salmon habitat use type and its potential maximum impact are numerically displayed in (Table 79).

Suction dredge mining is not allowed within the Illinois River mainstem between Deer Creek and Nancy Creek or within ¼ mile of its tributaries because it was designated a Wild River in 1984 under the Wild and Scenic Rivers Act. The IP value and habitat typing for these withdrawn miles (14.4 miles of the total 22.1 CCH miles within the watershed) are displayed in Table 80. There are no recommendations or opportunities for management of suction dredging stated in the Silver Creek WA (USFS 1995). See Appendix A for a summary and locations of suction dredging and high banking mineral withdrawals on the RRS.

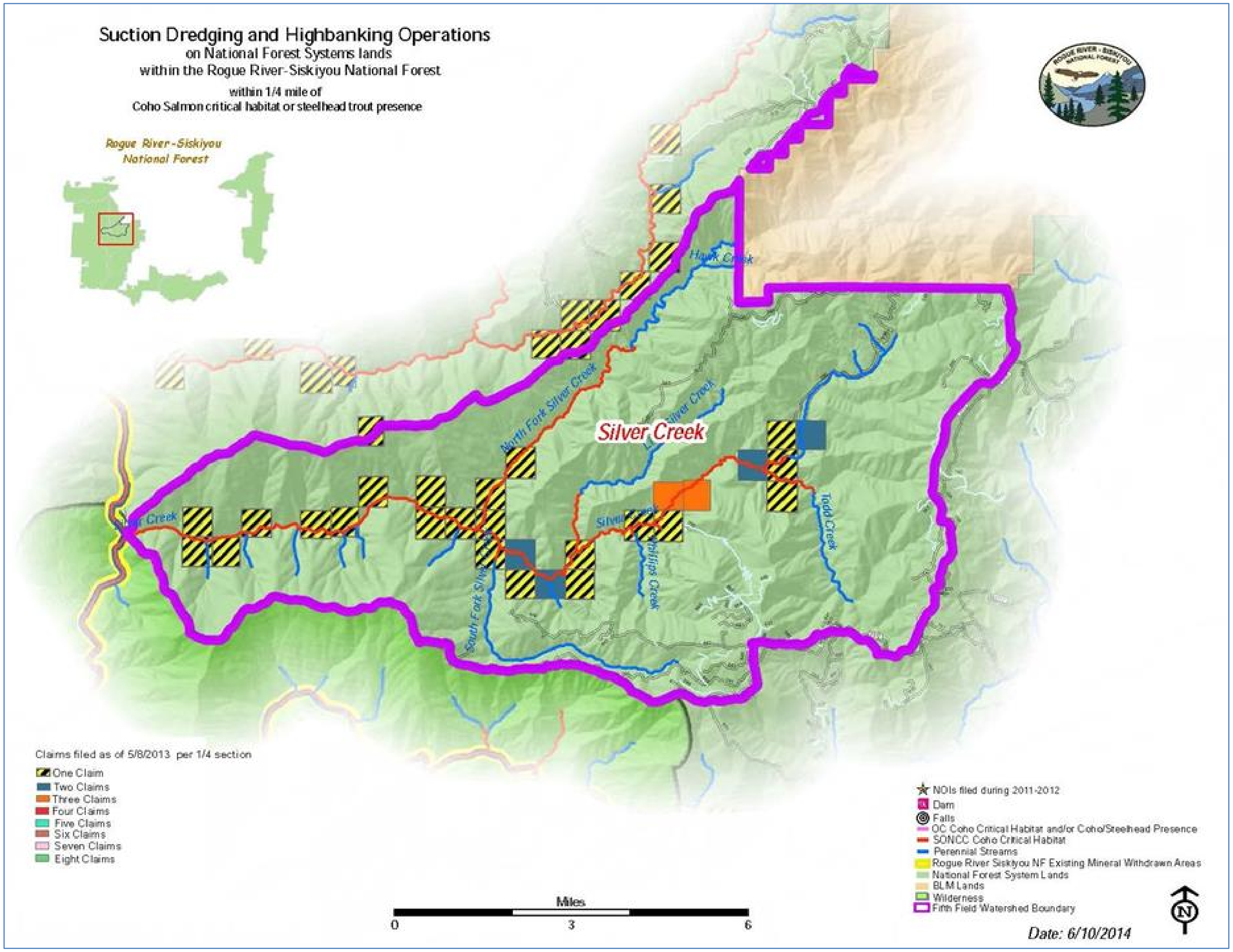

Figure 19. CCH with NOI and mining claims within 1/4 mile of CCH on NFS lands – Silver Creek watershed

Table 79. Suction dredging NOI received by RRS (2009-2012) within ¼ mile of CCH – Silver Creek watershed

Name/Location			Past NOI Information								Potential Habitat Use Coho Salmon		
							Total Maximum Disturbance[2]						
Stream w/River Mile (constant name)	Location[1] RS & Lat/Long	Name of Claim	NOI Received 2009-2012 (list years)	Number of Operators per claim Number of Operators per claim	Suction Dredge Activities (Y/N)	High Number of Operators per claim Banking Activities (Y/N)	Volume - NOI Listed (cubic yd.)	Volume – Assumed[3] or NOI Listed (cubic yd.)	Area (sq. ft.)	Stream Distance (ft.)	Spawning / Rearing ft.)	Rearing /Migration (ft.)	Migration (ft.)
North Fork Silver 7.8	T35S., R9W., Sec 18SW N42.524 W123.808	Three Dogs Mining	2011	4	Y	N	0	25	225	15	15	0	0
		AFFECTED Total within Watershed						25 yd^3	225 ft^2	15 ft	15 ft	0	0
		BASELINE Total within Watershed						5,250,960 yd^3	1,750,320 ft^2	116,688 ft	116,688 ft	0	0
		BASELINE Total CCH within Watershed								22.1 mi	22.1 mi	0.0	0.0
		AFFECTED Percent Watershed within CCH						0.000%	0.013%	0.013%	0.013%	0.000%	0.000%

[1] Proposed dredging mile marker starting point.

[2] Standard formula to calculate maximum 25 cubic yards suction dredge area of disturbance = 15 feet (length) X 15 feet (width) X 3 feet (depth). Width and depth is constant when cubic yard is stated differently in NOI.

[3] 25 cubic yards is the standard maximum volume anticipated when not specified in NOI.

Table 80. IP and habitat typing mineral withdrawn areas – Silver Creek watershed

Habitat Typing[1]	Intrinsic Potential[2] (miles) High	Medium	Low	Total (miles)
Spawning/rearing	0	0.3	0	0.3
Rearing/migration	0	0	0	0
Migration only	0	0	0	0
Total	**0**	**0.3**	**0**	**0.3**

[1] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[2] Values based on an intrinsic potential map derived from the NETMAP CLAMS data and also located http://www.fsl.orst.edu/clams/. Category for ranking were derived from the final SONCC Coho Salmon Recovery Plan (NMFS 2014); high =>/= 0.66, moderate = </=0.33 – 0.66 and low = <0.33.

Watershed population overview – Silver Creek

The Silver Creek watershed Coho Salmon population is part of the greater Illinois subbasin population. There are about 22.1 miles of CCH in the Silver Creek watershed and it is entirely located on NFS lands (Figure 19 and Table 81). There is no high IP CCH (>0.66, SONCC recovery plan) anywhere in the watershed; most of the watershed is medium potential, with a smaller amount of low potential. A few juvenile Coho Salmon have been detected by ODFW near the Silver Creek/North Fork Silver Creek confluence, but most snorkel surveys over the past 20 years in Silver Creek have not detected any Coho Salmon (Table 82). Coho Salmon production potential in other areas is limited for several reasons. Tributaries of the lower Illinois River basin such as Silver and Indigo Creeks are major steelhead producers (USFS 1996), but they are too steep and confined for Coho Salmon to flourish (NMFS 2014). High IP Coho Salmon habitat occurs on a bench in the upper North Fork of Silver Creek but Coho Salmon access to that reach is blocked (BLM 2004a) by a series of culverts. Natural falls downstream are additional potential impediments to passage (NMFS 2014).

Table 81. Salmonid species and habitat length - Silver Creek watershed

Watershed Acres	Anadromous Species Present[1]	NFS lands Miles of CCH (miles)[2]	NFS lands Miles of Chinook Habitat (miles)[3]	Watershed CCH and EFH (miles)[4]	Watershed Potential Miles of Coho Salmon Habitat Type[5] Spawning/ Rearing	Rearing/ Migration	Migration only
51,620	CO, CH, ST	22.1	0.9	22.1	22.1	0	0

[1] All, or a portion of, the waterbody supports the following anadromous salmonids: ST- steelhead trout; CO- Coho Salmon; CH - Chinook Salmon.

[2] Steelhead presence surveys were used to determine historic Coho Salmon habitat since CCH was not spatially delineated in the Federal Register 50 CFR Part 226. Values based on GIS data layer entitled RRS 2013 Total Salmon and Steelhead Distribution and field knowledge.

[3] Values based on GIS data layer entitled 2013 RRS Anadromous Salmonid Fish Distribution; Chinook Salmon presence survey layer.

[4] Values based on a combination of RRS 2013 SONCC Coho Salmon delineated CH 19 and ODFW steelhead presence survey data 2013 GIS map (as a surrogate for historic Coho Salmon habitat) website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[5] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

Table 82. Habitat typing and intrinsic potential within CCH – Silver Creek watershed

	Intrinsic Potential[2] (miles)						Total (miles) CCN/IP/HT	
	High IP		Medium IP		Low IP			
Habitat Typing[1]	Water-shed	NFS lands	Water-shed	NFS lands	Water-shed	NFS lands	Water-shed	NFS lands
Spawning/rearing	0	0	19.5	19.5	2.6	2.6	22.1	22.1
Rearing/migration	0	0	0	0	0	0	0	0
Migration only	0	0	0	0	0	0	0	0
Total	**0**	**0**	**19.5**	**19.5**	**2.6**	**2.6**	**22.1**	**22.1**

[1] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[2] Values based on an intrinsic potential map derived from the NETMAP CLAMS data and also located http://www.fsl.orst.edu/clams/. Category for ranking were derived from the final SONCC Coho Salmon Recovery Plan (NMFS 2014); high =>/= 0.66, moderate = </=0.33 – 0.66 and low = <0.33.

Watershed habitat indicators – Silver Creek

1) Water quality pathway – Silver Creek watershed

Temperature indicator – *At Risk*. Baseline: Oregon’s 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010), Rogue River Basin TMDL (ODEQ 2008), final SONCC Coho Salmon Recovery Plan (NMFS 2014), Silver Creek SS (SRG 2003), North Fork Silver Creek SS (USFS 1993), Little Silver Creek SS (USFS 1991) and NWFP (USFS AND BLM 1994).

There is an approved TMDL in place for the Illinois subbasin, which addresses water temperature (Oregon DEQ 2008). The lower 10.9 miles (10.68 miles on NFS lands) of Silver Creek are listed as water quality limited due to elevated summer water temperature. However, temperature is likely near historic conditions as there is limited land management to influence water temperature given the large watershed size. Riparian vegetation that shades Silver Creek has been removed in the private inholding above Silver Creek falls. The stream goes subsurface there, which likely ameliorates any temperature increases. Management of the NFS lands within the Silver Creek watershed is guided by the Siskiyou NF LRMP as amended by the NWFP. The aquatic and riparian standards and guidelines contained within these documents, particularly the Aquatic Conservation Strategy within the NWFP, are designed to provide for recovery and maintenance of cool/cold water thermal regimes within streams on NFS lands. Table 83 displays the 303(d) list for water quality limited stream within the watershed on NFS lands. Appendix B displays the 2010 303(d) list for streams within NFS lands on RRS.

Table 83. ODEQ, 2010 303(d) List for Oregon Waterbodies within NFS lands on RRS – Silver Creek watershed

Stream Name	Miles on RRS (miles)	River Mile Marker (miles)	Pollutant	Assess-ment	Assess-ment 2	Listing Status
North Fork Silver Creek	6.80	0 to 7	Temperature	2010	10/29/2010	Cat 4A: Water quality limited, TMDL approved
Silver Creek	10.68	0 to 10.9	Temperature	2010	10/29/2010	Cat 4A: Water quality limited, TMDL approved
South Fork Silver Creek	6.98	0 to 7	Temperature	2010	10/29/2010	Cat 4A: Water quality limited, TMDL approved

Suspended sediment–intergravel DO/turbidity indicator – *At Risk*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010), final SONCC Coho Salmon Recovery Plan (NMFS 2014), Silver Creek SS (SRG 2003), North Fork Silver Creek SS (USFS 1993) and Little Silver Creek SS (USFS 1991).

No streams in the watershed within the RRS are for sediment on the 303(d) list. Sediment input into stream channels on NFS lands has been primarily associated with past timber harvest and road systems. Silver Creek has had little recent timber harvest and much of the watershed is roadless, particularly on NFS lands. Streams on NFS lands tend to be moderate-high gradient and stream substrates are dominated by cobbles and gravel. No streams within the watershed have been listed as water quality limited for sedimentation. Large amounts of fine sediment were observed in Silver Creek below Silver Creek Falls during a 2012 habitat field reconnaissance; the source has not been determined.

Chemical contamination/nutrients indicator – *Properly Functioning*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010) and Silver WA (USFS 1995).

No streams in the watershed within the RRS are on the 303(d) list for contaminants or excessive nutrients. The lack of human development within the watershed limits the risk of chemical contamination and nutrient loading within Silver Creek.

2) Habitat access/elements pathway – Silver Creek watershed

Physical barriers indicator – *Properly Functioning*. Baseline: Silver Creek SS (SRG 2003), North Fork Silver Creek SS (USFS 1993) and Little Silver Creek SS (USFS 1991).

No human caused fish barriers exist in the ESA action area in the Silver Creek watershed. Silver Creek Falls, located at river mile 13.7, is 100 feet high and a total barrier to fish.

Substrate/embeddedness indicator – *Properly Functioning*. Baseline: Silver Creek SS (SRG 2003), North Fork Silver Creek SS (USFS 1993) and Little Silver Creek SS (USFS 1991).

As mentioned above, Silver Creek generally has high water quality and low amounts of fines, with the exception of a 2012 survey below Silver Creek Falls. The substrate consists of primarily cobble/boulder and because of the confined channel and gradient, is a high-energy stream.

Large wood indicator – *Properly Functioning*. Baseline: Silver Creek SS (SRG 2003), North Fork Silver Creek SS (USFS 1993) and Little Silver Creek SS (USFS 1991).

Large wood levels in streams within the Silver Creek watershed on NFS lands are at the expected range of natural variation due to general lack of streamside management in this watershed. The Silver Fire of 1987 and Biscuit Fire of 2002 combined to recruit wood into Silver Creek. In many areas large wood gets moved downstream due to stream energy. In some areas in Silver Creek, large wood jams have formed, depositing large quantities of coarse sediment upstream. The RRS has not placed instream large wood in Silver Creek.

Pool frequency and quality indicator – *Properly Functioning*. Baseline: Silver Creek SS (SRG 2003), North Fork Silver Creek SS (USFS 1993) and Little Silver Creek SS (USFS 1991).

Pool frequency and depth is what would be expected in a watershed with this geomorphology and hydrology. Deep pool (>3 feet) frequency in Silver Creek is about one per every 500 feet. Table 84 summarizes pool habitat conditions on streams surveyed (using USFS R6 Level II survey protocol) that contain CCH on NFS lands in the Silver Creek watershed. The reported values were averaged across all survey dates where applicable.

Table 84. Habitat percent and pool summary for surveyed streams – Silver Creek watershed

Stream Name	Year Survey-ed	Habitat % Pool	Habitat % Riffle	Pools/ Mile	Deep Pools/mile (>3ft)	Avg. Residual Pool Depth (ft)	Average Bankfull Width (ft)
Silver Creek[1]	1991, 1992, 1993, 1994, 1996, 2003	25.1	73.5	17.3	10.7	3.1	49.5
Little Silver Creek[1]	1991	15.4	83.2	19.6	3.4	1.1	27.5
Todd Creek[1]	1991	45.9	53.6	15.3	9.3	3.9	34.5
Little Todd Creek[1]	1994	21.8	67.3	87.5	12.5	1.2	24.2
Phillips Creek[1]	1994	36.9	62.4	59.4	11.8	2.3	24.1

[1] Includes areas surveyed upstream of CCH.

Off-channel habitat indicator – *Properly Functioning*. Baseline: Silver Creek SS (SRG 2003), North Fork Silver Creek SS (USFS 1993) and Little Silver Creek SS (USFS 1991).

Stream channels on NFS lands tend to have steeper gradients than valley bottom segments on downstream private and BLM lands. In general, Silver Creek on NFS lands is moderately entrenched and/or confined by topography. Side channels are not a common feature in Silver Creek on NFS lands due to the natural topography/geomorphology.

Refugia indicator – *Properly Functioning*. Baseline: Silver Creek SS (SRG 2003), North Fork Silver Creek SS (USFS 1993) and Little Silver Creek SS (USFS 1991).

Stream habitat lacks winter refuges due to gradient, stream energy, and channel confinement but streams are in near reference condition for their geomorphology.

3) Channel condition and dynamics pathway – Silver Creek watershed

Bankfull width depth ratio/ channel widening indicator - *Properly Functioning*. Baseline: Silver Creek SS (SRG 2003), North Fork Silver Creek SS (USFS 1993), Little Silver Creek SS (USFS 1991) and NWFP (USFS and BLM 1994).

In general, streams within the watershed are confined, even in lower gradient reaches. Streams on NFS lands are in near reference condition for their geomorphology. Also, since the mid-1990s, riparian management under the NWFP has emphasized maintenance of habitat for fish and other aquatic resources.

Streambank condition indicator – *Properly Functioning*. Baseline: Silver Creek SS (SRG 2003), North Fork Silver Creek SS (USFS 1993) and Little Silver Creek SS (USFS 1991).

Data collected during stream surveys on NFS lands in the 1990s documented generally stable streambanks along Silver Creek. Some side slopes in the watershed are over-steepened and inner gorge landslides are common. The channels are confined and defined by steep walled canyons.

Floodplain connectivity indicator – *Properly Functioning*. Baseline: Silver Creek SS (SRG 2003), North Fork Silver Creek SS (USFS 1993) and Little Silver Creek SS (USFS 1991).

There are very few prominent low gradient areas with developed floodplains on NFS lands within the watershed. Streams on NFS lands tend to be moderately to fully confined and constrained by hillslopes or terraces.

4) Flow/hydrology pathway – Silver Creek watershed

Change in peak/base flow indicator – Properly Functioning. Baseline: Biscuit BA (USFS 2003).

Timber harvest and roads can affect stream flow by intercepting water and transporting it to stream channels more rapidly than natural processes. There is very little management (recent or current) on NFS lands in this watershed. The Biscuit Fire likely increased peak flows in this watershed. However vegetation has grown back in over much of the burn area.

Increase in drainage network indicator – At Risk. Baseline: Silver Creek WA (USFS 1995).

Portions of the upper watershed have a relatively high road density.

5) Watershed conditions pathway – Silver Creek watershed

Road density and location indicator – *At Risk*. Baseline: Silver Creek WA (USFS 1995).

There are low road densities with very few stream crossings or areas in Riparian Reserves on NFS lands in this watershed.

Disturbance history indicator - *Properly Functioning*. Baseline: Silver Creek WA (USFS 1995).

Human activities have had minimal impacts to watershed processes and functions throughout the NFS lands portion of this watershed.

Riparian Reserves indicator – *Properly Functioning*. Baseline: Biscuit BA (USFS 2003)

The Biscuit Fire burned many riparian areas. Approximately 40% of the riparian zones within 1 SPT of streams were burned severely enough to kill the forest canopy during the fire.

Disturbance regime indicator – *Properly Functioning*. Baseline: Silver Creek WA (USFS 1995).

The current disturbance regime in Silver Creek on NFS lands is near the natural range of variability.

j. Sucker Creek watershed

Watershed overview - Sucker Creek

The Sucker Creek watershed supports substantial populations of Coho Salmon and other native fishes. It is one of the highest producers of Coho Salmon in the Illinois subbasin and in the greater Rogue basin. Within this watershed, factors limiting Coho Salmon production 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. Some of these factors are a result of management practices such as timber harvest, road construction, stream cleanout, and historic placer mining (see below). The ownership distribution in the watershed encompasses: USFS 72%, BLM 9%, State lands <1% and the remaining 18% is in private ownership (Table 85).

Table 85. Watershed area and ownership distribution - Sucker Creek

Land Ownership	Acres	Ownership (percent)
USFS	44,123	72
BLM	5,753	9
State	33	<1
National Park Service	456	1
Private	11,150	18
Total	**61,515**	**100**

Prevalent land uses

- Federal – timber production, mining, and dispersed and developed recreation
- Private – timber production, agriculture, tourism, rural residential development, and mining including aggregate

Anthropomorphic alterations to habitat. European settlers cleared floodplains, trapped beavers, drained wetlands, and channelized streams to facilitate rural development and agriculture. Timber harvest and associated road construction began in the late 1800s and increased up to and through the early 1990s. Sucker Creek was the site of much of the large-scale intensive gold mining in southwestern Oregon with hydraulic mining used as a primary method. Other methods of placer mining diverted and channelized streams along their valley bottoms. The legacy of mining on stream channels and valley topography is still evident and has been the focus of recent watershed restoration work in Sucker Creek.

Suction dredging and high banking activity summary. Gold mining in the Illinois Valley began in the 1850s. Flood terraces were turned over in search of the precious metal, destroying riparian areas and in some cases unleashing large quantities of sediment downstream (USFS 1999) that persist today in west side tributaries such as Josephine, Sucker and Althouse Creeks as well as mainstem reaches of the Illinois River. Mining/gravel extraction rates a high threat score for Illinois River Coho Salmon (NMFS 2014).

There are recommendations and opportunities for management of suction dredging stated in the Sucker-Grayback Creek WA: "Discourage activities under mining operation plans that reduce structure and channel roughness. Mitigate mining operations by increasing structure and channel roughness where appropriate. Perform site analysis and reclamation where recent mining has altered channel form making some sites vulnerable to accelerated bank erosion at high stream flow" (USFS 1995).

There were 50 active filed placer claims (12.6% of the filed claims within the Illinois subbasin) as of 5/8/2013. On average, 0.5 NOI (9.0% of Illinois subbasin and 2.1% of RRS average total) were received by the RRS during the four-year period from 2009-2012 in the watershed on NFS land located within 1/4 mile of CCH (Table 4 and Figure 20). The NOI and related Coho Salmon habitat use type and its potential maximum impact are numerically displayed in Table 86. There are no mineral withdrawn areas within the Sucker Creek watersheds (located upstream of Deer Creek tributary; upper extent of mineral withdrawn area on the Illinois River).

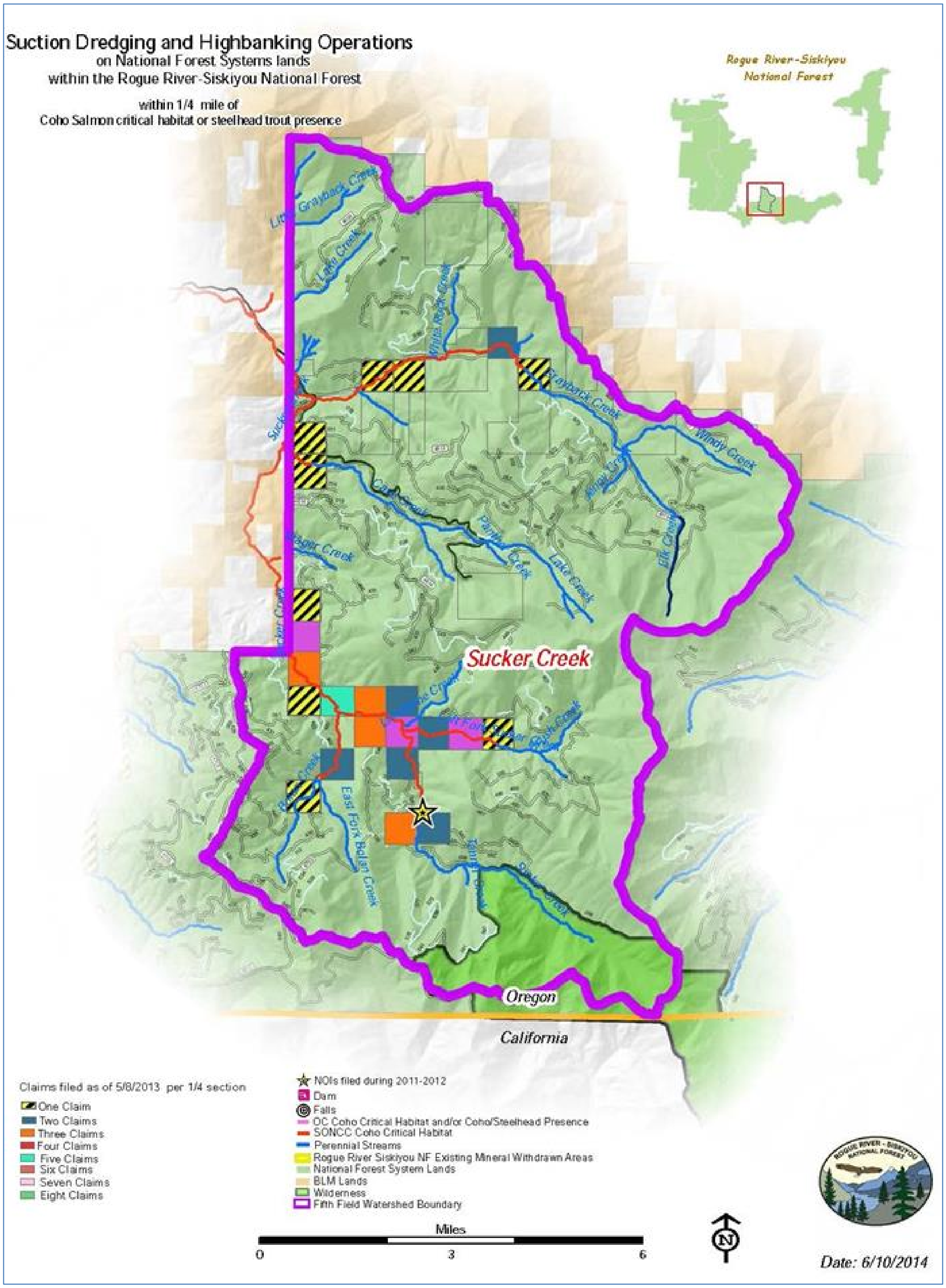

Figure 20. CCH with NOI and mining claims within 1/4 mile of CCH on NFS lands – Sucker Creek watershed

Table 86. Suction dredging NOI received by RRS (2009-2012) within ¼ mile of CCH – Sucker Creek watershed

Name/Location			Past NOI Information								Potential Habitat Use Coho Salmon		
							Total Maximum Disturbance[2]						
Stream w/River Mile (constant name)	Location[1] RS & Lat/Long	Name of Claim	NOI Received 2009-2012 (list years)	Number of Operators per claim Number of Operators per claim	Suction Dredge Activities (Y/N)	High Number of Operators per claim Banking Activities (Y/N)	Volume - NOI Listed (cubic yd.)	Volume – Assumed[3] or NOI Listed (cubic yd.)	Area (sq. ft.)	Stream Distance (ft.)	Spawning / Rearing ft.)	Rearing /Migration (ft.)	Migration (ft.)
Sucker Creek 20.5	T40s., R6w., Sec 33NW N42.046 W123.424	Warm Water II	2010, 2011	3	Y	N	0	25	225	15	15	0	0
		AFFECTED Total within Watershed						25 yd^3	225 yd^2	15 ft	15 ft	0	0
		BASELINE Total within Watershed						11,880,000 yd^3	3,960,000 ft^2	264,000 ft	157,344 ft	0	0
		BASELINE Total CCH within Watershed								29.8 mi	29.8 mi	0.0	0.0
		AFFECTED Percent Watershed within CCH						0.000%	0.006%	0.006%	0.010%	0.000%	0.000%

[1] Proposed dredging mile marker starting point.

[2] Standard formula to calculate maximum 25 cubic yards suction dredge area of disturbance = 15 feet (length) X 15 feet (width) X 3 feet (depth). Width and depth is constant when cubic yard is stated differently in NOI.

[3] 25 cubic yards is the standard maximum volume anticipated when not specified in NOI.

Watershed population overview – Sucker Creek

The Sucker Creek watershed Coho Salmon population is part of the greater Illinois subbasin population. There are about 29.8 miles of CCH in the Sucker Creek watershed, with about12.1 miles located on NFS lands (Figure 20 and Table 87). Most of the high IP CCH (>0.66, SONCC recovery plan) in this watershed is located downstream of the NFS lands on private lands. However, some high IP CCH occurs on NFS lands in lower Grayback Creek and in Sucker Creek between the Grayback and Cave Creek confluences (Table 88). These areas have been the focus of recent floodplain and channel restoration projects implemented by the RRS and local watershed council (USFS 2011).

Although Illinois River Coho Salmon are still well distributed, 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. Many reaches surveyed by ODFW (2005a) in the Illinois River basin do not contain juvenile Coho Salmon in some or all years, and densities at locations that generally have Coho Salmon vary substantially between years. ODFW (2005a) surveys from 1998 to 2004 confirmed that Coho Salmon still migrate to Illinois tributaries in an extensive area, but rearing is concentrated in small patches in upper reaches of Illinois Valley streams, just below Federal land. Comparatively high densities of juvenile Coho Salmon have been found in Deer, Sucker, and Althouse Creeks as well as the upper East Fork and West Fork Illinois River (NMFS 2014).

Table 87. Salmonid species and habitat length - Sucker Creek watershed

Water-shed Acres	Anadro-mous Species Present[1]	NFS lands Miles of CCH (miles)[2]	NFS lands Miles of Chinook Habitat (miles)[3]	Water-shed CCH and EFH (miles)[4]	Watershed Potential Miles of Coho Salmon Habitat Type[5]		
					Spawning/ Rearing	Rearing/ Migration	Migration only
61,515	CO, CH, ST	12.1	2.6	29.8	29.8	0	0

[1] All, or a portion of, the waterbody supports the following anadromous salmonids: ST- steelhead trout; CO- Coho Salmon; CH - Chinook Salmon.

[2] Steelhead presence surveys were used to determine historic Coho Salmon habitat since CCH was not spatially delineated in the Federal Register 50 CFR Part 226. Values based on GIS data layer entitled RRS 2013 Total Salmon and Steelhead Distribution and field knowledge.

[3] Values based on GIS data layer entitled 2013 RRS Anadromous Salmonid Fish Distribution; Chinook Salmon presence survey layer.

[4] Values based on a combination of RRS 2013 SONCC Coho Salmon delineated CH 19 and ODFW steelhead presence survey data 2013 GIS map (as a surrogate for historic Coho Salmon habitat) website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[5] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

Table 88. Habitat typing and intrinsic potential within CCH – Sucker Creek watershed

Habitat Typing[1]	Intrinsic Potential[2] (miles)						Total (miles) CCN/IP/HT	
	High IP		Medium IP		Low IP			
	Water-shed	NFS lands	Water-shed	NFS lands	Water-shed	NFS lands	Water-shed	NFS lands
Spawning/rearing	9.2	1.2	16.3	7.0	4.3	3.9	29.8	12.1
Rearing/migration	0	0	0	0	0	0	0	0
Migration only	0	0	0	0	0	0	0	0
Total	**9.2**	**1.2**	**16.3**	**7.0**	**4.3**	**3.9**	**29.8**	**12.1**

[1] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[2] Values based on an intrinsic potential map derived from the NETMAP CLAMS data and also located http://www.fsl.orst.edu/clams/. Category for ranking were derived from the final SONCC Coho Salmon Recovery Plan (NMFS 2014); high =>/= 0.66, moderate = </=0.33 – 0.66 and low = <0.33.

Watershed habitat indicators – Sucker Creek

1) Water quality pathway – Sucker Creek watershed

Temperature indicator - *At Risk*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010), Rogue River Basin TMDL (ODEQ 2008), Illinois River Subbasin WQMP (USFS and ODEQ 1999), Sucker Creek WRAP (USFS 2011) and NWFP (USFS and BLM 1994).

The lower 26 miles of Sucker Creek (10.84 miles on NFS lands) are listed as water quality limited due to elevated summer water temperature with an approved TMDL and WQMP, which addresses water temperature. The stream is listed for temperature on NFS lands and lacks shade-providing riparian vegetation in some areas. One of the areas where stream temperature increased the most rapidly was between Cave and Grayback Creek confluences. Left Fork Sucker, Cave, Bolan, and Grayback Creeks also contain CCH on NFS lands and are not listed for temperature because they are attaining standards (ODEQ 2010). Management of the NFS lands within the Sucker Creek watershed is guided by the Siskiyou NF LRMP as amended by the NWFP. The aquatic and riparian standards and guidelines contained within these documents, particularly the Aquatic Conservation Strategy within the NWFP, are designed to provide for recovery and maintenance of cool/cold water thermal regimes within streams on NFS lands. Appendix B displays the 2010 303(d) list for streams within NFS lands on RRS.

Suspended sediment–intergravel DO/turbidity indicator – *At Risk*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010), Illinois River Subbasin WQMP (USFS and ODEQ 1999), Sucker WA (USFS 2007) and Sucker Creek WRAP (USFS 2011).

No streams in the watershed within the RRS are listed for sediment on the 303(d) list. Sediment input into stream channels on NFS lands has been primarily associated with past timber harvest and road systems. Streams on NFS lands tend to be higher gradient than downstream private land reaches, and stream substrates are dominated by cobbles and gravel. No streams within the watershed have been listed as water quality limited for sedimentation. Grayback Creek can run turbid at times during the winter due to suspended granitic sand that comprises the upper portions of point bars in the channel. The RRS has invested heavily in road maintenance in the Sucker Creek watershed and continues to do so to moderate suspended sediment from roads.

Chemical contamination/nutrients indicator – *Properly Functioning*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010) and Illinois River Subbasin WQMP (USFS and ODEQ 1999).

No streams in the watershed within the RRS are on the 303(d) list for contaminants or excessive nutrients. The lack of human development within and immediately adjacent to NFS lands within the watershed limits the risk of chemical contamination and nutrient loading within Sucker Creek. Lower Sucker Creek below the ESA action area may experience some nutrient and chemical inputs from agricultural development including viticulture.

2) Habitat access/elements pathway – Sucker Creek watershed

Physical barriers indicator – *At Risk*. Baseline: Sucker WRAP (USFS 2011).

There are very few physical barriers to Coho Salmon on NFS lands within the watershed that are not natural. One of these barriers is a culvert on a small tributary to Grayback Creek and there is not much suitable habitat upstream from the culvert. Push-up dams and other barriers such as culverts on private land have existed downstream outside of the ESA action area.

Substrate/embeddedness indicator – *At Risk*. Baseline: final SONCC Coho Salmon Recovery Plan (NMFS 2014).

The SONCC recovery plan reported, "key reaches of …Sucker Creek…have poor scores for fine sediment (<1 mm) in ODFW habitat surveys because spawning gravels have greater than 17 percent fines". However, the plan also stated, "Extensive reaches of … lower Sucker Creek have very good fine sediment scores (<12 percent fines), indicating suitable Coho Salmon spawning conditions."

Grayback Creek tends to have the highest levels of sand and embedded gravels due to its decomposed granitic geology and historic management practices.

Large wood indicator – *Not Properly Functioning*. Baseline: Sucker Creek WRAP (USFS 2011).

Large wood levels in streams within the Sucker Creek watershed are low and below the expected range of natural variation in reaches accessible by or near roads. The RRS has placed large amounts of instream large wood in Sucker and lower Grayback Creeks, with tremendous habitat responses. Where present, large wood provides complex habitat, sorts spawning gravel, and promotes lateral channel migration and the creation of off-channel habitats.

Pool frequency and quality indicator – *Not Properly Functioning*. Baseline: Sucker Creek WRAP (USFS 2011), Sucker Creek SS (USFS 1997, 2007), Grayback Creek SS (USFS 1992, 1993, 1997, 2005, 2007), Cave Creek SS (USFS 2000), Bolan Creek SS (USFS 1998) and Left Fork Sucker Creek SS (USFS 1992, 1997, 1998).

The lack of large wood within many of the stream reaches on NFS lands within the watershed contributes to instream habitat conditions that are less complex than optimal. Deep pool (>3 feet) frequency across NFS lands in the watershed is about one per every 750 feet. Large wood is the primary causal mechanism in low gradient streams to create complex and frequent pools. Large wood also creates off-channel habitat and refuge for juvenile Coho Salmon. Table 89 summarizes pool habitat conditions on streams surveyed (using USFS R6 Level II survey protocol) that contain CCH on NFS lands in the Sucker Creek watershed. The reported values were averaged across all survey dates.

Table 89. Habitat percent and pool summary for surveyed streams – Sucker Creek watershed

Stream Name	Year Survey-ed	Habitat % Pool	Habitat % Riffle	Pools/ Mile	Deep Pools/mile (>3ft)	Avg. Residual Pool Depth (ft)	Average Bankfull Width (ft)
Sucker Creek[1]	1997, 2007	21.6	75.2	16.2	10.1	2.6	52.1
Grayback Creek[1]	1992, 1993, 1997, 2005, 2007	14.7	82.1	21.5	7.2	2.1	33.4
Cave Creek[1]	2000	13.6	84.8	35.8	8.5	1.7	15.6
Bolan Creek[1]	1998	15.4	83	28.1	7.4	2.2	17.5
Left Fork Sucker Creek[1]	1992, 1997, 1998	10.0	87.7	25.5	6.8	2.0	22.2

[1] Values based on a combination of RRS 2013 SONCC Coho Salmon delineated CH **Error! Bookmark not defined.** and DFW steelhead presence survey data 2013 GIS map (as a surrogate for historic Coho Salmon habitat) website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

Off-channel habitat indicator – *At Risk*. Baseline: Sucker Creek WRAP (USFS 2011), Sucker Creek SS (USFS 1997, 2007), Grayback Creek SS (USFS 1992, 1993, 1997, 2005, 2007), Cave Creek SS (USFS 2000), Bolan Creek SS (USFS 1998) and Left Fork Sucker Creek SS (USFS 1992, 1997, 1998).

Lower Grayback Creek and Middle Sucker Creek inside the ESA action area have multiple side channels and off-channel areas, due partially to habitat restoration projects by the RRS and Illinois Valley Watershed Council. Much of the Coho Salmon spawning in middle Sucker Creek occurs in constructed and natural side channels. Lower Sucker Creek below the ESA action area has multiple side channels and ground water channels that are many degrees colder than the mainstem of Sucker Creek during the summer months. These areas are used for juvenile Coho Salmon summer rearing but many are At Risk of floodplain development because they are not defined as streams.

Refugia indicator – *At Risk*. Baseline: Sucker Creek WRAP (USFS 2011), Sucker Creek SS (USFS 1997, 2007), Grayback Creek SS (USFS 1992, 1993, 1997, 2005, 2007), Cave Creek SS (USFS 2000), Bolan Creek SS (USFS 1998) and Left Fork Sucker Creek SS (USFS 1992, 1997, 1998).

Colder water temperatures in ground water channels, tributaries, and upper Sucker Creek provide summer rearing refuges for juvenile Coho Salmon. Constructed and natural off-channel habitats and deep, complex pools provide winter rearing refuge.

3) Channel condition and dynamics pathway – Sucker Creek watershed

Bankfull width depth ratio/ channel widening indicator - *At Risk*. Baseline: Sucker Creek WRAP (USFS 2011), Sucker Creek SS (USFS 1997, 2007), Grayback Creek SS (USFS 1992, 1993, 1997, 2005, 2007), Cave Creek SS (USFS 2000), Bolan Creek SS (USFS 1998), Left Fork Sucker Creek SS (USFS 1992, 1997, 1998) and NWFP (USFS and BLM 1994).

It is unknown to what extent historic land use (e.g. timber harvest, roads) on NFS lands altered the bankfull channel dimensions within the watershed. Since the mid-1990s, riparian management under the NWFP has emphasized maintenance of habitat for fish and other aquatic resources. Consequently, instream habitat, including bankfull width/depth conditions, is improving on NFS lands. Restoration projects on NFS lands in middle Sucker Creek have addressed high width/depth ratios while still providing floodplain connection.

Streambank condition indicator – *Properly Functioning*. Baseline: Sucker Creek WRAP (USFS 2011), Sucker Creek SS (USFS 1997, 2007), Grayback Creek SS (USFS 1992, 1993, 1997, 2005, 2007), Cave Creek SS (USFS 2000), Bolan Creek SS (USFS 1998) and Left Fork Sucker Creek SS (USFS 1992, 1997, 1998).

Data collected during stream surveys on NFS lands documented generally stable streambanks along Sucker and Grayback Creeks. In instances where stream banks were eroding they were generally providing coarse substrate used for spawning, large wood recruitment, and creation of off-channel habitats.

Floodplain connectivity indicator – *Properly Functioning*. Baseline: Sucker Creek WRAP (USFS 2011), Sucker Creek SS (USFS 1997, 2007), Grayback Creek SS (USFS 1992, 1993, 1997, 2005, 2007), Cave Creek SS (USFS 2000), Bolan Creek SS (USFS 1998) and Left Fork Sucker Creek SS (USFS 1992, 1997, 1998).

With the exception of lower Grayback and middle Sucker Creek, streams on NFS lands tend to be moderately to fully confined and constrained by hillslopes or terraces. In middle Sucker Creek and lower Grayback Creek inside the ESA action area and where high intrinsic potential habitat exists, high floodplain connectivity exists.

4) Flow/hydrology pathway – Sucker Creek watershed

Change in peak/base flow indicator – *At Risk*. Baseline: Sucker-Grayback WA (USFS 2007) and Sucker WRAP (USFS 2011).

Timber harvest and roads can affect stream flow by intercepting water and transporting it to stream channels more rapidly than natural processes. Many lands in the Sucker Creek watershed used for previous timber harvest have hydrologically recovered. Groundwater pumping and diversions in agricultural lands of the Illinois Valley have decreased summer base flows in lower Sucker Creek.

Increase in drainage network indicator – *At Risk*. Baseline: Sucker-Grayback WA (USFS 2007) and Sucker WRAP (USFS 2011).

On NFS lands, the Sucker Creek watershed contains a well-developed road system. These roads were primarily constructed to facilitate timber harvest. On private land, in general, road densities are higher than on public land.

5) Watershed conditions pathway – Sucker Creek watershed

Road density and location indicator – *At Risk*. Baseline: Sucker-Grayback WA (USFS 2007) and Sucker WRAP (USFS 2011).

There is one valley bottom road on NFS lands in Middle Sucker Creek in CCH. The valley bottom in high IP CCH in lower Grayback Creek does not interact with the stream or floodplain for much of its length. The RRS is currently planning a large road restoration project (2015) in the Sucker Creek watershed to stormproof, close, or decommission high-risk areas of the road system. Many natural surfaced road systems are built on private lands, which are a major source of erosion and sedimentation into streams.

Disturbance history indicator - *At Risk*. Baseline: Sucker-Grayback WA (USFS 2007).

Human activities have altered watershed processes and functions throughout the watershed. Timber harvest, fire suppression, noxious weeds, roads, and mining (primarily hydraulic) are the primary disturbance activities. There have been some recent riparian disturbances such as floodplain mining near Cedar Gulch in Middle Sucker Creek and channel and floodplain restoration projects, but in general, the NWFP has reduced the amount of disturbance in the ESA action area.

Riparian Reserves indicator – *At Risk*. Baseline: Sucker-Grayback WA (USFS 2007) and Sucker WRAP (USFS 2011).

Many riparian areas have been fully harvested on private lands, and riparian zones consist of narrow bands of alders and cottonwoods. On NFS lands, past timber harvest did occur in some riparian areas, although some streams still possess old growth Riparian Reserves. Road construction along streams has also reduced riparian vegetation condition and extent.

Disturbance regime indicator – *At Risk*. Baseline: Sucker-Grayback WA (USFS 2007).

Timber harvest and road development have altered flow patterns and vegetation in many drainages within the watershed. Agricultural development and associated water withdrawals occur downstream of the ESA action area, although much of this area still functions as important high IP Coho Salmon habitat. Significant amounts of historic mining have also occurred within the watershed.

k. West Fork Illinois River watershed

Watershed overview - West Fork Illinois River

The West Fork of the Illinois River joins the East Fork near Cave Junction at an elevation of 1280 feet. Rough and Ready Creek subwatershed has its highest elevation at Josephine Mountain at 4764 feet. The highest elevation in the Whiskey Creek subwatershed is on its divide with Rough and Ready, at 3925 feet. The highest elevation for the main stem of the West Fork of the Illinois River is relatively low, with the divide near 3680 feet (about 1 1/2 miles west of the low pass at Randolph-Collier tunnel on Highway 199). In contrast, Elk Creek subwatershed originates in the Siskiyou Mountains at approximately 5280 feet at Little Sanger Peak.

The headwater drainages of the West Fork watershed are generally managed by the RRS, while the lower reaches are a mix of federal, state, and predominantly private ownership. One exception is Rough and Ready Creek, which is federally managed from its headwaters to its confluence with the West Fork, with few private inholdings. The western one-third of the watershed is part of a Rare II Roadless Area. The floodplain of the lower West Fork has been developed, with residences, RV parks and other tourist-oriented establishments between the highway and the river. The flat alluvial deposits between Rough and Ready Creek and the river are the focus of industrial development for the Illinois Valley (airport and mill). The ownership distribution in the watershed encompasses: USFS 49%, BLM 8%, State lands <1% and the remaining 42% is in private ownership (Table 90).

Table 90. Watershed area and ownership distribution - West Fork Illinois River watershed

Land Ownership	Acres	Ownership (percent)
USFS	37,483	49
BLM	5,969	8
State	904	1
Private	32,654	42
Total	**77,011**	**100**

Prevalent land uses

- Federal – timber production, mining, dispersed recreation
- Private – timber production, agriculture, tourism, rural residential development, municipal (O'Brien, Cave Junction), mining

Anthropomorphic alterations to habitat. European settlers cleared floodplains, trapped beavers, drained wetlands, mined and channelized streams to facilitate rural development and agriculture. Timber harvest and associated road construction began in the late 1800s and increased up to and through the early 1990s.

Suction dredging and high banking activity summary. The West Fork Illinois River was 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, although current activity is light when compared to historic levels. Historic mining damage to Coho Salmon streams includes disruption of reaches of the mainstem East and West Fork Illinois River (BLM and USFS 2000, BLM 2004, NMFS 2014). Placer mining claims potentially accessible to suction dredging are located on Rough and Ready Creek. Meandering and braided channels are evident all across the Rough and Ready alluvial fan. The channel is a high-energy system with cobble and boulder substrates.

There were 23 active filed placer claims (7.8% of Illinois subbasin) as of 5/8/2013. No suction dredge NOI were received by the RRS during the four-year period from 2009-2012 in the watershed on NFS land located within 1/4 mile of CCH (Table 4 and Figure 21). There are no mineral withdrawn areas within the watershed (located upstream of Deer Creek tributary; upper extent of mineral withdrawn area on the Illinois River).

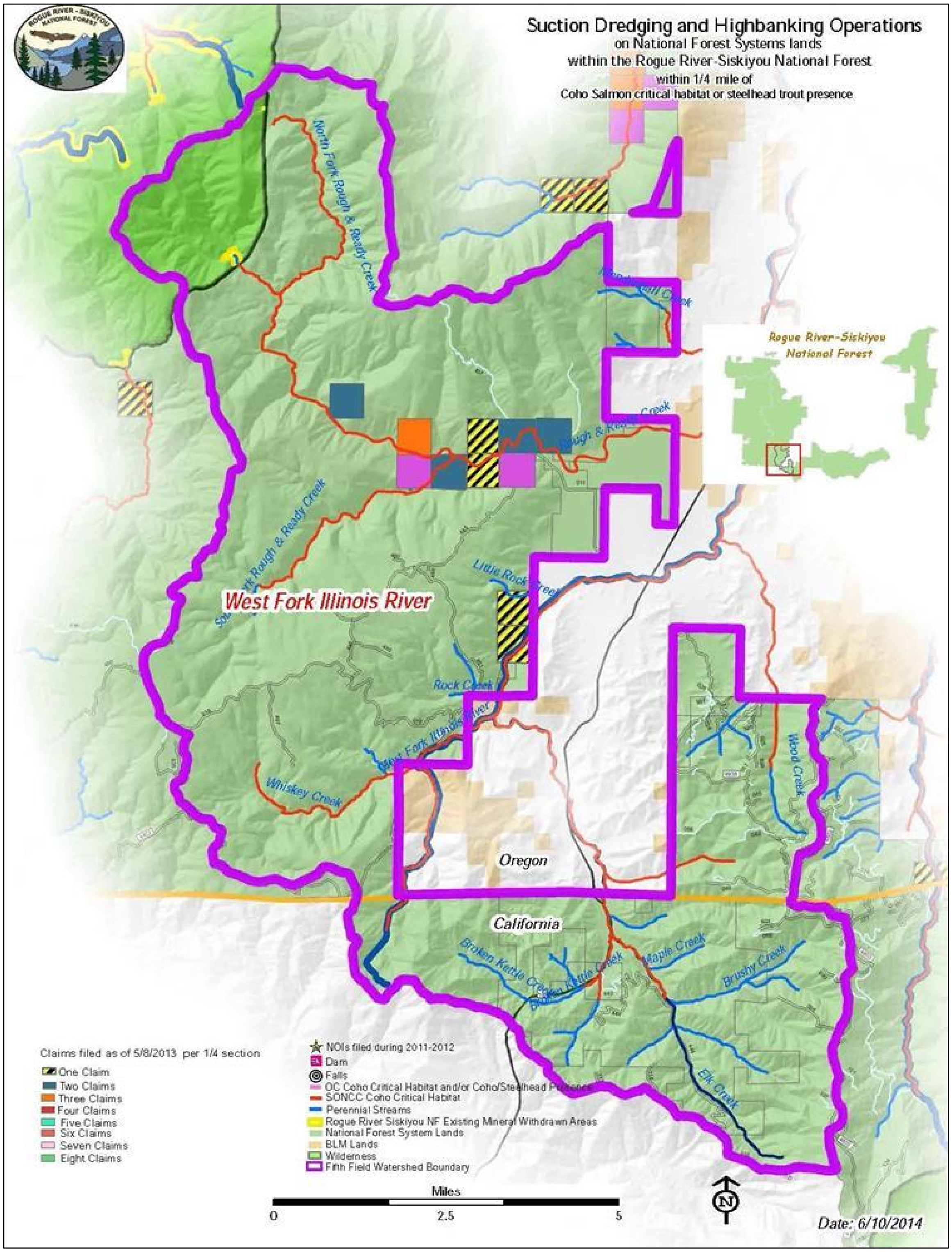

Figure 21. CCH with NOI and mining claims within 1/4 mile of CCH on NFS lands – West Fork Illinois River watershed

Watershed population overview – West Fork Illinois River

The West Fork Illinois River watershed Coho Salmon population is part of the greater Illinois subbasin population. There are about 57.4 miles of CCH in the West Fork Illinois River watershed, with about 25.8 miles located on NFS lands (Figure 21 and Table 91). Most of the high IP CCH (>0.66, SONCC recovery plan) in this watershed is located downstream of the NFS lands on private lands. However, some high IP CCH occurs on NFS lands in Broken Kettle and Wood Creeks (Table 92).

A substantial portion of the western Illinois River basin has ultramafic geology with serpentine soils that cause sparse riparian conditions and warm stream temperatures (USFS 2000). For this reason, the 2014 final SONCC Coho Salmon Recovery Plan focuses on the upper Illinois basin where the number of tributaries with high IP Coho Salmon habitat is extensive, and includes the West Fork Illinois River (NMFS 2014).

The West Fork Illinois River watershed supports a sizable population of Coho Salmon and other native fishes. Portions of the watershed have serpentine geology and these areas are generally not used heavily by Coho Salmon due to high summer temperatures and general lack of habitat. The final SONCC Coho Salmon Recovery Plan (2014) reported, "A substantial portion of the western Illinois River subbasin has serpentine soils that naturally support sparse riparian conditions…that likely result in warm stream temperatures. Therefore, streams that flow from this terrain, such as Rough and Ready and Josephine Creeks, are unsuitable for Coho Salmon". The plan expanded that, "In most cases, Coho Salmon are naturally absent from steep lower Illinois River tributaries and those that drain the serpentine bedrock area of the western part of the subbasin (e.g., Rough and Ready and Josephine Creeks)". Portions of the watershed that are not serpentine geology, such as Elk Creek, are strong areas for Coho Salmon production, with very high juvenile densities.

Within this watershed, factors limiting Coho Salmon production 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. Some of these factors are a result of management practices such as timber harvest, road construction, stream cleanout, and historic placer mining.

Table 91. Salmonid species and habitat length - West Fork Illinois River watershed

Water-shed Acres	Anadro-mous Species Present[1]	NFS lands Miles of CCH (miles)[2]	NFS lands Miles of Chinook Habitat (miles)[3]	Water-shed CCH and EFH (miles)[4]	Watershed Potential Miles of Coho Salmon Habitat Type[5]		
					Spawning/ Rearing	Rearing/ Migration	Migration only
76,996	CO, CH, ST	25.8	4.1	57.4	57.4	0	0

[1] All, or a portion of, the waterbody supports the following anadromous salmonids: ST- steelhead trout; CO- Coho Salmon; CH - Chinook Salmon.

[2] Steelhead presence surveys were used to determine historic Coho Salmon habitat since CCH was not spatially delineated in the Federal Register 50 CFR Part 226. Values based on GIS data layer entitled RRS 2013 Total Salmon and Steelhead Distribution and field knowledge.

[3] Values based on GIS data layer entitled 2013 RRS Anadromous Salmonid Fish Distribution; Chinook Salmon presence survey layer.

[4] Values based on a combination of RRS 2013 SONCC Coho Salmon delineated CH 19 and ODFW steelhead presence survey data 2013 GIS map (as a surrogate for historic Coho Salmon habitat) website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[5] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

Table 92. Habitat typing and intrinsic potential within CCH – West Fork Illinois River watershed

Habitat Typing[1]	Intrinsic Potential[2] (miles)						Total (miles) CCN/IP/HT	
	High IP		Medium IP		Low IP			
	Water-shed	NFS lands	Water-shed	NFS lands	Water-shed	NFS lands	Water-shed	NFS lands
Spawning/rearing	19.6	1.7	30.5	17.6	7.3	6.5	57.4	25.8
Rearing/migration	0	0	0	0	0	0	0	0
Migration only	0	0	0	0	0	0	0	0
Total	**19.6**	**1.7**	**30.5**	**17.6**	**7.3**	**6.5**	**57.4**	**25.8**

[1] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[2] Values based on an intrinsic potential map derived from the NETMAP CLAMS data and also located http://www.fsl.orst.edu/clams/. Category for ranking were derived from the final SONCC Coho Salmon Recovery Plan (NMFS 2014); high =>/= 0.66, moderate = </=0.33 – 0.66 and low = <0.33.

Watershed habitat indicators – West Fork Illinois River

1) Water quality pathway – West Fork Illinois River watershed

Temperature indicator – *Not Properly Functioning*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010), Illinois River Subbasin WQMP (USFS and ODEQ 1999), West Fork Illinois WA (USFS 1997, 2004) and NWFP (USFS and BLM 1994).

The lower 14.7 miles of the West Fork Illinois River and several tributaries are listed as water quality limited due to elevated summer water temperature with an approved TMDL and WQMP (ODEQ 2010). Table 93 displays the 303(d) list for water quality limited stream within the watershed on NFS lands. The stream is listed for temperature on NFS lands and lacks shade-providing riparian vegetation in some areas. Streams in this watershed are generally cool when they leave the NFS lands, then warm as they cross the broad alluvial valley. Water is diverted for agricultural use throughout the watershed. The abundance of shallow, rocky soils, rock outcrops, and the lack of disturbance on the serpentine soils in the watershed contribute to exceptional water clarity. Streams with serpentine geology in this watershed, such as Rough and Ready Creek, tend to be warmer than others.

Management of the NFS lands within the West Fork Illinois River watershed is guided by the Siskiyou NF LRMP as amended by the NWFP. The aquatic and riparian standards and guidelines contained within these documents, particularly the Aquatic Conservation Strategy within the NWFP, are designed to provide for recovery and maintenance of cool/cold water thermal regimes within streams on NFS lands. Appendix B displays the 2010 303(d) list for streams within NFS lands on RRS.

Table 93. ODEQ, 2010 303(d) List for Oregon Waterbodies within NFS lands on RRS – West Fork Illinois River watershed

Stream Name	Miles on RRS (miles)	River Mile Marker (miles)	Pollutant	Assess-ment	Assess-ment 2	Listing Status
Rough & Ready Creek	3.80	0 to 6.1	Temperature	2010	10/29/2010	Cat 4A: Water quality limited, TMDL approved
South Fork Rough & Ready Creek	6.23	0 to 6.3	Temperature	2010	10/29/2010	Cat 4A: Water quality limited, TMDL approved
West Fork Illinois River	2.10	0 to 17.3	Biological Criteria	2010	1/29/2013	Cat 5: Water quality limited, 303(d) list, TMDL needed
West Fork Illinois River	1.80	0 to 14.7	Temperature	2010	10/29/2010	Cat 4A: Water quality limited, TMDL approved
West Fork Illinois River	0.03	14.7 to 17	Temperature	2010	12/22/2010	Cat 4A: Water quality limited, TMDL approved
Whiskey Creek	3.85	0 to 4.2	Temperature	2010	10/29/2010	Cat 4A: Water quality limited, TMDL approved

Suspended sediment–intergravel DO/turbidity indicator – *At Risk*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010), Illinois River Subbasin WQMP (USFS AND ODEQ 1999) and West Fork Illinois WA (USFS 1997, 2004).

No streams within the watershed on NFS lands are listed specifically on the 303(d) list for sediment. However, the West Fork Illinois River is listed for biological criteria, possibly as a result of sediment tolerant macroinvertebrate presence (Table 93). Sediment input into stream channels on NFS lands has been primarily associated with past timber harvest and road systems. Streams on NFS lands tend to be higher gradient than downstream private land reaches, and stream substrates are dominated by cobbles and gravel. The West Fork Illinois River can run turbid at times during the winter, though not as turbid as the East Fork Illinois River, due to the West Fork's serpentine influence.

Chemical contamination/nutrients indicator – *Properly Functioning*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010), and West Fork Illinois WA (USFS 1997, 2004).

No streams within the West Fork Illinois River watershed are listed for chemical contaminants or excessive nutrients. The lack of human development within and immediately adjacent to NFS lands within the watershed limits the risk of chemical contamination and nutrient loading within the West Fork Illinois River. The lower West Fork Illinois River below the ESA action area may experience some nutrient and chemical inputs from agricultural development, although there is less agriculture in the West Fork Illinois than the East Fork Illinois and other portions of the Illinois Valley.

2) Habitat access/elements pathway – West Fork Illinois River watershed

Physical barriers indicator – *At Risk*. Baseline: West Fork Illinois WA (USFS 1997, 2004).

There are very few physical barriers to Coho Salmon on NFS lands within the watershed that are not natural. One of these barriers is a culvert on Broken Kettle Creek at the Hwy 199 crossing. Another barrier that may limit Coho Salmon passage at some flows are Seats and Wing Farren dams on Rough and Ready Creek. Rough and Ready Creek is not optimal Coho Salmon habitat due to its serpentine geology. Other barriers such as culverts on private land have existed downstream outside of the ESA action area.

Substrate/embeddedness indicator – *At Risk*. Baseline: final SONCC Coho Salmon Recovery Plan (NMFS 2014).

The SONCC recovery plan reported, "key reaches of …West Fork Illinois River…have poor scores for fine sediment (<1 mm) in ODFW habitat surveys because spawning gravels have greater than 17 percent fines." Stream habitat surveys on some streams on NFS lands in this watershed (e.g. West Fork Wood Creek) have detected high levels of fines.

Large wood indicator – *Not Properly Functioning*. Baseline: Broken Kettle Creek SS (USFS 2001, 2007 2012), Trib. to Broken Kettle Creek SS (2007, 2012), Mendenhall Creek SS (USFS 2001), Parker Creek SS (USFS 2001), Rough and Ready Creek SS (USFS 1991), South Fork Rough and Ready Creek SS (USFS 1991), North Fork Rough and Ready Creek SS (USFS 1994), Trib. to North Fork Rough and Ready Creek SS (USFS 1994), Whiskey Creek SS (USFS 2000), Wood Creek SS (USFS1997), West Fork Wood Creek SS (USFS 2008), West Fork Illinois River SS (USFS 2000), and Trapper Gulch SS (USFS 1992, 2000).

Large wood levels in streams within the West Fork Illinois River watershed are low and below the expected range of natural variation in reaches accessible by or near roads. The RRS has placed instream large wood in Broken Kettle Creek, with some substantial habitat responses. Where present, large wood provides for complex habitat, sorts spawning gravel, and promotes lateral channel migration and the creation of off-channel habitats.

Pool frequency and quality indicator – *Not Properly Functioning*. Baseline: Broken Kettle Creek SS (USFS 2001, 2007 2012), Trib. to Broken Kettle Creek SS (2007, 2012), Mendenhall Creek SS (USFS 2001), Parker Creek SS (USFS 2001), Rough and Ready Creek SS (USFS 1991), South Fork Rough and Ready Creek SS (USFS 1991), North Fork Rough and Ready Creek SS (USFS 1994), Trib. to North Fork Rough and Ready Creek SS (USFS 1994), Whiskey Creek SS (USFS 2000), Wood Creek SS (USFS1997), West Fork Wood Creek SS (USFS 2008), West Fork Illinois River SS (USFS 2000), and Trapper Gulch SS (USFS 1992, 2000).

The lack of large wood within many of the stream reaches on NFS lands within the watershed contributes to instream habitat conditions that are less complex than optimal. Deep pool (>3 feet) frequency across NFS lands in the watershed is about one per every 1,000 feet. Large wood is the primary causal mechanism in low gradient streams to create complex and frequent pools. Large wood also creates off-channel habitat and refuge for juvenile Coho Salmon. Table 94 summarizes pool habitat conditions on streams surveyed (using USFS R6 Level II survey protocol) that contain CCH on NFS lands within the watershed. The reported values were averaged across all survey dates where applicable.

Table 94. Habitat percent and pool summary for surveyed streams – West Fork Illinois River watershed

Stream Name	Year Survey-ed	Habitat % Pool	Habitat % Riffle	Pools/ Mile	Deep Pools/mile (>3ft)	Avg. Residual Pool Depth (ft)	Average Bankfull Width (ft)
Broken Kettle Creek[1]	2001, 2007 2012	61	38	55	9	1.8	21
Trib. to Broken Kettle Creek[1]	2007, 2012	51	48	84	2	1.4	12
Mendenhall Creek[1]	2001	42	58	60	2	1.3	12
Parker Creek[1]	2001	31	65	67	1.4	1.2	9
Rough and Ready Creek[1]	1991	15	76	6	3.3	3.8	144
South Fork Rough and Ready Creek[1]	1991	20	79	23	7.3	2.4	36
North Fork Rough and Ready Creek[1]	1994	12	87	5	5	3	53
Trib. to North Fork Rough and Ready Creek[1]	1994	4	96	2	2	4	37
Whiskey Creek[1]	2000	16	82	24	6	2.2	25
Wood Creek[1]	1997	30	70	49	0	1.3	15
West Fork Wood Creek[1]	2008	78	16	44	0	1.1	8
West Fork Illinois River	2000	34	65	19	5	2.5	38
Trapper Gulch	1992, 2000	27	69	26	2	1.6	20

[1] Includes areas surveyed upstream of CCH.

Off-channel habitat indicator – ***At Risk*****.** Baseline: West Fork Illinois WA (USFS 1997, 2004), Broken Kettle Creek SS (USFS 2001, 2007 2012), tributary to Broken Kettle Creek SS (2007, 2012), Mendenhall Creek SS (USFS 2001), Parker Creek SS (USFS 2001), Rough and Ready Creek SS (USFS 1991), South Fork Rough and Ready Creek SS (USFS 1991), North

Fork Rough and Ready Creek SS (USFS 1994), Trib. to North Fork Rough and Ready Creek SS (USFS 1994), Whiskey Creek SS (USFS 2000), Wood Creek SS (USFS1997), West Fork Wood Creek SS (USFS 2008), West Fork Illinois River SS (USFS 2000), and Trapper Gulch SS (USFS 1992, 2000).

Most CCH areas on NFS lands inside the ESA action area have few side channels and off-channel areas due to geomorphology. Lower West Fork Illinois River below the ESA action area has multiple side channels used for spawning and potentially juvenile winter rearing.

Refugia indicator – *At Risk*. Baseline: West Fork Illinois WA (USFS 1997, 2004), Broken Kettle Creek SS (USFS 2001, 2007 2012), Tributary to Broken Kettle Creek SS (2007, 2012), Mendenhall Creek SS (USFS 2001), Parker Creek SS (USFS 2001), Rough and Ready Creek SS (USFS 1991), South Fork Rough and Ready Creek SS (USFS 1991), North Fork Rough and Ready Creek SS (USFS 1994), Trib. to North Fork Rough and Ready Creek SS (USFS 1994), Whiskey Creek SS (USFS 2000), Wood Creek SS (USFS1997), West Fork Wood Creek SS (USFS 2008), West Fork Illinois River SS (USFS 2000), and Trapper Gulch SS (USFS 1992, 2000).

Colder water temperatures in ground water channels and tributaries can provide summer rearing refuges for juvenile Coho Salmon. Broken Kettle Creek on NFS lands is a key cold water thermal refuge compared with much of the rest of the West Fork Illinois watershed. Off-channel habitats and deep, complex pools provide winter rearing refuge.

3) Channel condition and dynamics pathway – West Fork Illinois River watershed

Bankfull width depth ratio/ channel widening indicator - *At Risk*. Baseline: West Fork Illinois River WA (USFS 1997, 2004) and NWFP (USFS and BLM 1994).

It is unknown to what extent historic land use (e.g. timber harvest, roads) on NFS lands altered the bankfull channel dimensions within the watershed. Since the mid-1990s, riparian management under the NWFP has emphasized maintenance of habitat for fish and other aquatic resources. Consequently, instream habitat, including bankfull width/depth conditions, are improving on NFS lands.

Streambank condition indicator – *At Risk*. Baseline: West Fork Illinois WA (USFS 1997, 2004), Broken Kettle Creek SS (USFS 2001, 2007 2012), Tributary to Broken Kettle Creek SS (2007, 2012), Mendenhall Creek SS (USFS 2001), Parker Creek SS (USFS 2001), Rough and Ready Creek SS (USFS 1991), South Fork Rough and Ready Creek SS (USFS 1991), North Fork Rough and Ready Creek SS (USFS 1994), Trib. to North Fork Rough and Ready Creek SS (USFS 1994), Whiskey Creek SS (USFS 2000), Wood Creek SS (USFS1997), West Fork Wood Creek SS (USFS 2008), West Fork Illinois River SS (USFS 2000), and Trapper Gulch SS (USFS 1992, 2000).

Data collected during stream surveys on NFS lands documented generally stable streambanks along all streams. In areas downstream of NFS lands excessive streambank erosion has been documented in some areas.

Floodplain connectivity indicator – *At Risk*. Baseline: West Fork Illinois WA (USFS 1997, 2004), Broken Kettle Creek SS (USFS 2001, 2007 2012), Tributary to Broken Kettle Creek SS (2007, 2012), Mendenhall Creek SS (USFS 2001), Parker Creek SS (USFS 2001), Rough and Ready Creek SS (USFS 1991), South Fork Rough and Ready Creek SS (USFS 1991), North Fork Rough and Ready Creek SS (USFS 1994), Trib. to North Fork Rough and Ready Creek SS (USFS 1994), Whiskey Creek SS (USFS 2000), Wood Creek SS (USFS1997), West Fork Wood Creek SS (USFS 2008), West Fork Illinois River SS (USFS 2000), and Trapper Gulch SS (USFS 1992, 2000).

With the exception of the previously mentioned high IP sections, streams on NFS lands tend to be moderately to fully confined and constrained by hillslopes or terraces. In Broken Kettle and Wood Creeks inside the ESA action area and where high IP habitat exists, high floodplain connectivity exists.

4) Flow/hydrology pathway – West Fork Illinois River watershed

Change in peak/base flow indicator – *At Risk*. Baseline: West Fork Illinois River WA (USFS 1997, 2004).

Timber harvest and roads can affect stream flow by intercepting water and transporting it to stream channels more rapidly than natural processes. Many lands in the West Fork Illinois River watershed used for previous timber harvest have hydrologically recovered. Groundwater pumping and diversions in agricultural lands of the Illinois Valley have decreased summer base flows in lower West Fork Illinois River. Several diversions are present on Rough and Ready Creek and this depletes flow from the mainstem West Fork below this point.

Increase in drainage network indicator – *At Risk*. Baseline: West Fork Illinois River WA (USFS 1997, 2004).

On NFS lands, the West Fork Illinois River watershed contains a well-developed road system. These roads were primarily constructed to facilitate timber harvest. On private land, in general, road densities are higher than on public land.

1) Watershed conditions pathway – West Fork Illinois watershed

Road density and location indicator – *At Risk*. Baseline: West Fork Illinois River WA (USFS 1997, 2004).

Hwy 199 limits channel migration and floodplain development along a key high IP CCH reach of Broken Kettle Creek. Many natural surfaced road systems are built on private lands, which are a major source of erosion and sedimentation into streams. Several valley bottom roads occur in the Rough and Ready Creek floodplain.

Disturbance history indicator - *At Risk*. Baseline: West Fork Illinois River WA (USFS 1997, 2004).

Human activities have altered watershed processes and functions throughout the watershed. Timber harvest, fire suppression, noxious weeds, roads, and mining (primarily hydraulic) are the primary disturbance activities. There have been no recent riparian disturbances in this watershed on NFS lands.

Riparian Reserves indicator – *At Risk*. Baseline: West Fork Illinois River WA (USFS 1997, 2004).

Many riparian areas have been fully harvested on private lands, and riparian zones consist of narrow bands of alders and cottonwoods. On NFS lands, past timber harvest did occur in some riparian areas, although some streams still possess old growth Riparian Reserves. Road construction along streams has also reduced riparian vegetation condition and extent.

Disturbance regime indicator – *At Risk*. Baseline: West Fork Illinois River WA (USFS 1997, 2004).

Timber harvest and road development have altered flow patterns and vegetation in many drainages within the watershed. Agricultural development and associated water withdrawals occur downstream of the ESA action area, although much of this area (particularly the Broken Kettle and Elk Creek subwatershed and Wood Creek) still functions as important Coho Salmon habitat. Some historic mining has also occurred within the watershed.

4. Lower Rogue River population

Subbasin overview – Lower Rogue

The Lower Rogue subbasin is a watershed that covers a 906-square mile area and empties into the Pacific Ocean at Gold Beach, Oregon. The Middle Rogue, Applegate and Illinois subbasins all drain into the Lower Rogue. A popular white water rafting destination, the Wild and Scenic section of the Lower Rogue River is located here and includes part of the Wild Rogue Wilderness area. An 84.5-mile section of the Lower Rogue, from the mouth of the Applegate River downstream to the Lobster Creek bridge¬, was one of the original eight rivers designated in the 1968 National Wild and Scenic Rivers Act. The subbasin covers portions of Josephine and Curry Counties, with miniscule portions of the watershed in Coos County.

The land within the subbasin is remote and difficult to access. The area between Galice and Marial, and continuing downstream to Gold Beach, is accessed primarily by a network of RRS and BLM roads. The BLM manages the majority of the upstream portions of the subbasin and the RRS manages the majority of the land downstream to Lobster Creek. Private ownership dominates the lower approximately 10 miles up from the mouth of the river at Gold Beach, Oregon (Figure 22).

The Rogue River was administratively withdrawn from mineral entry on September 10, 1958 by Public Land Order (PLO) 1726. The withdrawal extends to 1 mile on either side of the river for the protection and preservation of scenic and recreation areas adjacent to the river and its tributaries. This currently includes the entire river from the Forest boundary, near Marial, to the Forest Boundary near the Lobster Creek bridge.

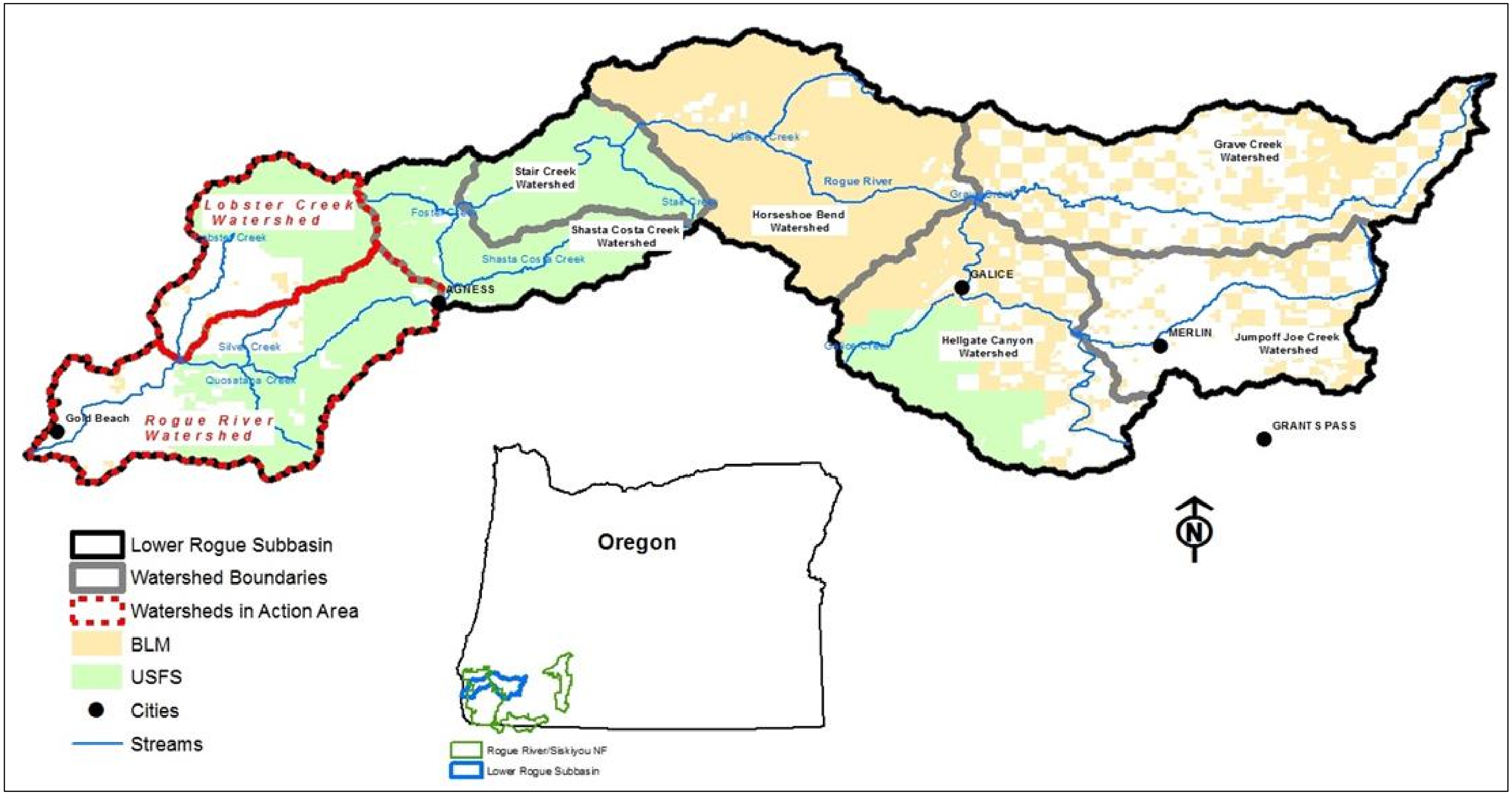

Figure 22. Lower Rogue River subbasin population in relation to its watersheds within the ESA action area

Subbasin population overview - Lower Rogue River

Population highlights (NMFS 2014)

- There is one Coho Salmon population within the Lower Rogue subbasin: Lower Rogue
- Northern Stratum
- Lowest of four Rogue River Coho Salmon populations in the ESU
- Non-Core, Potentially Independent Population
- High Extinction Risk
- 320 Spawners Required for ESU Viability
- 198 mi2
- 81 IP km (50 IP mi) (24% High)
- Dominant Land Uses are Timber Harvest and Agriculture
- Principal Stresses are 'Lack of Floodplain and Channel Structure' and 'Impaired Water Quality'
- Principal Threats are 'Roads' and 'Urban/Residential/Industrial Development'

Except for a notable few subwatershed tributaries, Quosatana Creek (Key watershed) and Lobster Creek (Key watershed), Coho Salmon distribution is relegated to the very lower portion of the smaller tributaries and they are occasionally observed in these tributaries (RRS stream surveys, 1985 to present and Todd Confer, personal communication with Angie Dillingham, 2002). The unconfined alluvial valley segment habitat types typically associated with Coho Salmon are not present and the estuary in the lower Rogue River is relatively short (approximately five miles in length) and narrow. The mainstem Rogue River is a migration corridor for upstream migrating adult fish during the fall and for smolts migrating to the ocean in the spring. Few Coho Salmon appear to spawn and rear in the Lower Rogue subbasin tributaries (Lobster Creek and Quosatana Creek) and there is no record of juvenile Coho Salmon observed rearing within the main river channel. Smaller facing tributaries are typically of high gradient and confined by bedrock canyon walls except for the lower mile or less. Foster, Quosatana and Shasta Costa Creek have two to three miles of low gradient (<3%) habitat below natural barriers to salmon. Coho Salmon have never been observed spawning in the main river channel within the ESA action area (RRS surveys and Todd Confer, ODFW, pers. comm., 2002).

Watersheds within the ESA action area of the Lower Rogue River subbasin

Watershed baseline conditions are described for two watersheds within the ESA action area of the Lower Rogue River subbasin: Lobster Creek and Rogue River. The other watersheds within the Lower Rogue River subbasin are included in the Middle Rogue/Applegate population: Hellgate Canyon-Rogue River, Shasta Costa Creek-Rogue River, Stair Creek-Rogue River, Figure 22.

a. Lobster Creek watershed

Watershed overview – Lobster Creek

The Lobster Creek watershed is located in the Klamath Mountains Province in southwestern Oregon. Lobster Creek drains into the Rogue River approximately ten miles from the Pacific Ocean. The watershed has 44,253 acres, 62 percent of which is on the Gold Beach Ranger District, RRS. The remaining 38 percent is divided among the Bureau of Land Management, the

State of Oregon, Curry County, private timber companies, and other private landowners (Table 95). The Lobster Creek watershed is part of the Klamath Mountains geologic province and includes a mixture of igneous, metamorphic, and sedimentary formations. Ground slopes are low to moderate, averaging 30 to 50 percent in the southern half of the watershed and 40 to 70 percent in the northern half. Elevations range from approximately 40 feet near the confluence with the Rogue River to over 3800 feet near Iron Mountain.

Table 95. Watershed area and ownership distribution - Lobster Creek watershed

Land Ownership	Acres	Ownership (percent)
USFS	37,483	49
BLM	5,969	8
State	904	1
Private	32,654	42
Total	**77,011**	**100**

Prevalent land uses

- Federal – timber production, mining, recreation
- Private – timber production

Anthropomorphic alterations to habitat. Timber harvest has occurred throughout the watershed. Much of the NFS lands in the watershed are now managed as Late Successional Reserves. On private land downstream of NFS lands, along the mainstem of Lobster Creek and its tributaries, recent and historic timber harvest is readily evident.

Suction dredging and high banking activity summary. The discovery of gold along the southwest Oregon coast in the 1850's precipitated the settlement of the lower Rogue River and the surrounding area. Evidence of intensive mineral explorations can be observed in Bonanza Basin, in the headwaters of the watershed, on Ophir Mountain, and at the confluence of Boulder Creek and the South Fork of Lobster Creek. Mining methods in the watershed have included stream placer, ground sluicing, panning and to a limited extent, hydraulic mining.

There were nine active filed placer claims as of 5/8/2013. One suction dredge NOI was received by the RRS during the four-year period from 2009-2012 in the watershed on NFS land located within 1/4 mile of CCH (Table 4and Figure 23). The NOI and related Coho Salmon habitat use type, and its potential maximum impact are numerically displayed in Table 96. The Rogue River was administratively withdrawn from mineral entry on September 10, 1958 by Public Land Order (PLO) 1726. The withdrawal extends to 1 mile on either side of the river for the protection and preservation of scenic and recreation areas adjacent to the river and its tributaries. The IP value and habitat typing for these withdrawn miles on Lobster Creek (0.4 miles out of a total of 27.0 CCH miles within the watershed) are displayed in Table 97. See Appendix A for a summary and locations of suction dredging and high banking mineral withdrawals on the RRS.

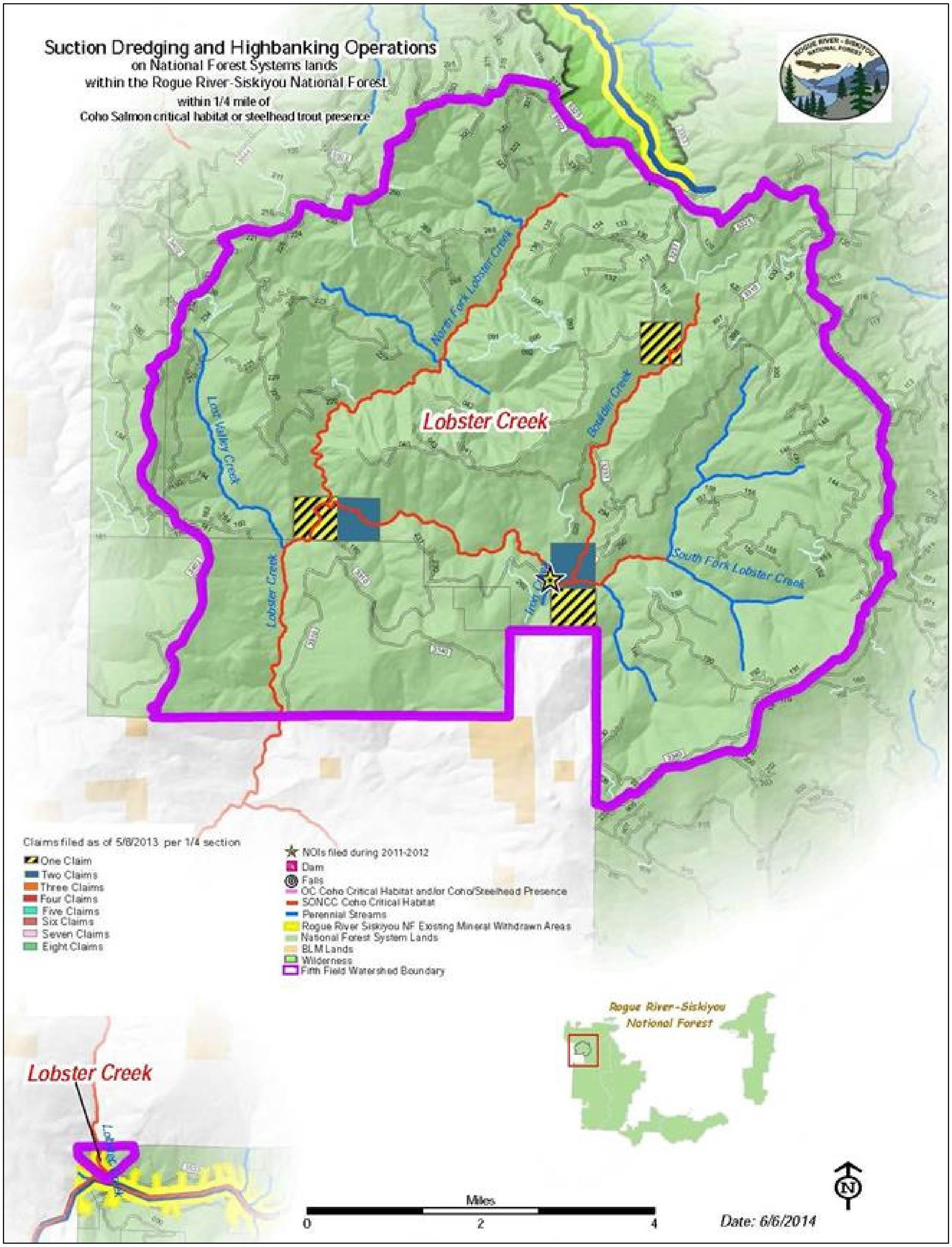

Figure 23. CCH with NOI and mining claims within 1/4 mile of CCH on NFS lands – Lobster Creek watershed

Table 96. Suction dredging NOI received by RRS (2009-2012) within ¼ mile of CCH – Lobster Creek watershed

Name/Location			Past NOI Information								Potential Habitat Use Coho Salmon		
							Total Maximum Disturbance[2]						
Stream w/River Mile (constant name)	Location[1] RS & Lat/Long	Name of Claim	NOI Received 2009-2012 (list years)	Number of Operators per claim Number of Operators per claim	Suction Dredge Activities (Y/N)	High Number of Operators per claim Banking Activities (Y/N)	Volume - NOI Listed (cubic yd.)	Volume – Assumed[3] or NOI Listed (cubic yd.)	Area (sq. ft.)	Stream Distance (ft.)	Spawning / Rearing ft.)	Rearing /Migration (ft.)	Migration (ft.)
South Fork Lobster 3.8	T35S., R13W., Sec 25NE N42.605 W124.196	Old Diggins	2010	6	Y	Y	0	25	225	15	15	0	0
		AFFECTED Total within Watershed						25 yd^3	225 ft^2	15	15	0	0
		BASELINE Total within Watershed						6,415,200 yd^3	2,138,400 ft^2	142,560 ft	142,560 ft	0	0
		BASELINE Total CCH within Watershed								27.0 mi	27.0 mi	0.0	0.0
		AFFECTED Percent Watershed within CCH						0.000%	0.011%	0.011%	0.011%	0.000%	0.000%

[1] Proposed dredging mile marker starting point.

[2] Standard formula to calculate maximum 25 cubic yards suction dredge area of disturbance = 15 feet (length) X 15 feet (width) X 3 feet (depth). Width and depth is constant when cubic yard is stated differently in NOI.

[3] 25 cubic yards is the standard maximum volume anticipated when not specified in NOI.

Table 97. IP and habitat typing for mineral withdrawn areas – Lobster Creek watershed

Habitat Typing[1]	Intrinsic Potential[2] (miles)			Total (miles)
	High	Medium	Low	
Spawning/rearing	0	0.4	0	0.4
Rearing/migration	0	0	0	0
Migration only	0	0	0	0
Total	**0**	**0.4**	**0**	**0.4**

[1] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[2] Values based on an intrinsic potential map derived from the NETMAP CLAMS data and also located http://www.fsl.orst.edu/clams/. Category for ranking were derived from the final SONCC Coho Salmon Recovery Plan (NMFS 2014); high =>/= 0.66, moderate = </=0.33 – 0.66 and low = <0.33.

Watershed population overview – Lobster Creek

The Lobster Creek watershed Coho Salmon population is part of the greater Lower Rogue subbasin population. There are 27.0 miles of CCH within the watershed and 16.1 miles on NFS lands (Figure 23 and Table 98). Fish use in Lobster Creek centers around three critical reaches where anadromous species both spawn and rear in high densities. The first reach is a 2.3 mile segment of the mainstem near Deadline and Fall Creeks. This reach is especially important for Chinook Salmon spawning and rearing. The second critical reach is the North Fork Lobster Creek from its mouth to a point 5.0 miles upstream. This reach is inaccessible to salmon, but has the highest densities of steelhead and cutthroat trout in the watershed. The third critical reach is the 2.2 miles of the South Fork near Iron and Boulder Creeks. This is the only reach where Coho Salmon rear. Many Chinook Salmon and Steelhead Trout also use this reach. The watershed consists only of low and medium IP and the *spawning/rearing* habitat use type Table 99.

Table 98. Salmonid species and habitat length - Lobster Creek watershed

Water-shed Acres	Anadro-mous Species Present[1]	NFS lands Miles of CCH (miles)[2]	NFS lands Miles of Chinook Habitat (miles)[3]	Water-shed CCH and EFH (miles)[4]	Watershed Potential Miles of Coho Salmon Habitat Type[5]		
					Spawning/ Rearing	Rearing/ Migration	Migration only
44,317	CO, CH, ST	16.1	9.5	27.0	27.0	0	0

[1] All, or a portion of, the waterbody supports the following anadromous salmonids: ST- steelhead trout; CO- Coho Salmon; CH - Chinook Salmon.

[2] Steelhead presence surveys were used to determine historic Coho Salmon habitat since CCH was not spatially delineated in the Federal Register 50 CFR Part 226. Values based on GIS data layer entitled RRS 2013 Total Salmon and Steelhead Distribution and field knowledge.

[3] Values based on GIS data layer entitled 2013 RRS Anadromous Salmonid Fish Distribution; Chinook Salmon presence survey layer.

[4] Values based on a combination of RRS 2013 SONCC Coho Salmon delineated CH 19 and ODFW steelhead presence survey data 2013 GIS map (as a surrogate for historic Coho Salmon habitat) website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[5] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

Table 99. Habitat typing and intrinsic potential within CCH – Lobster Creek watershed

Habitat Typing[1]	Intrinsic Potential[2] (miles)						Total (miles) CCN/IP/HT	
	High IP		Medium IP		Low IP			
	Water-shed	NFS lands	Water-shed	NFS lands	Water-shed	NFS lands	Water-shed	NFS lands
Spawning/rearing	0	0	21.2	12.5	5.8	3.6	27.0	16.1
Rearing/migration	0	0	0	0	0	0	0	0
Migration only	0	0	0	0	0	0	0	0
Total	**0**	**0**	**21.2**	**12.5**	**5.8**	**3.6**	**27.0**	**16.1**

[1] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[2] Values based on an intrinsic potential map derived from the NETMAP CLAMS data and also located http://www.fsl.orst.edu/clams/. Category for ranking were derived from the final SONCC Coho Salmon Recovery Plan (NMFS 2014); high =>/= 0.66, moderate = </=0.33 – 0.66 and low = <0.33.

Watershed habitat indicators – Lobster Creek

1) Water quality pathway – Lobster Creek watershed

Temperature indicator – *At Risk*. Baseline: Oregon’s 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010), Lobster Creek Watershed TMDL and WQMP (ODEQ 2002) and Lobster Creek WA (USFS 1999).

Lobster Creek is recognized as temperature impaired and has its own completed TMDL and a Water Quality Management Plan. The Lobster Creek TMDL and Water Quality Management Plan were developed to abate temperature problems in this major Lower Rogue River tributary. The TMDL used a shade model to gauge needs for recovery of riparian zones, but also acknowledged that sediment contributions play a role in channel changes and increased water temperature. Lobster Creek is listed as water quality limited due to summer water temperatures from the mouth (confluence with the Lower Rogue) upstream for a distance of 9.7 river miles. Table 100 displays the 303(d) list for water quality limited streams within the watershed on NFS lands.

Summer stream temperatures have been monitored by the RRS in Lobster Creek and its tributaries since 1990. The Lower Rogue Watershed Council, as part of the Lobster Creek Whole-Basin Restoration Project, began monitoring additional sites in 1997. The 7-day average maximum stream temperatures exceed the present Environmental Protection Agency (EPA) and Oregon Department of Environmental Quality (DEQ) standard of 64° F for streams with cool-water fish species. These data indicate that the major heating occurs in the South Fork of Lobster Creek between the Road 3310 bridge and the mouth of the South Fork. This heating reach has a broad, shallow channel within a rocky, sparsely vegetated inner gorge. Lobster Creek continues heating until it reaches Deadline Creek, and then cools from there to the mouth. Oregon Department of Fish & Wildlife (ODFW) reports that many subsurface springs in the mainstem offset solar heating in this segment. Appendix B displays the 2010 303(d) list for streams within NFS lands on RRS.

Table 100. ODEQ, 2010 303(d) List for Oregon Waterbodies within NFS lands on RRS – Lobster Creek watershed

Stream Name	Miles on RRS (miles)	River Mile Marker (miles)	Pollutant	Assess-ment	Assess-ment 2	Listing Status
Lobster Creek	1.05	0 to 9.7	Temperature	2002	8/1/2002	TMDL approved
North Fork Lobster Creek	3.18	0 to 3.3	Temperature	2002	8/1/2002	TMDL approved
South Fork Lobster Creek	3.63	0 to 3.7	Temperature	2002	8/1/2002	TMDL approved

Suspended sediment–intergravel/DO/turbidity indicator – *At Risk*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010), Lobster Creek Watershed TMDL and WQMP (ODEQ 2002) and Lobster Creek WA (USFS 1999).

No streams in the watershed within the RRS are listed for sediment on the 303(d) list. Lobster Creek, like most streams in the area, has little turbidity except during winter storm events. The stream does not seem to have greater or longer lasting turbidity than other streams. Anecdotal observations indicate that human activities have not had lasting effects on turbidity in the basin. Miners occasionally use suction dredges in the Lobster Creek and South Fork Lobster Creek stream channels. The amount of turbidity generated by these dredges depends on the particle size of the material they are moving. The bed material in Lobster Creek contains relatively few fines, and minor turbidity has been observed for a short distance below these operations.

Chemical contamination/nutrients indicator – *Properly Functioning*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010) and Lobster Creek WA (USFS 1999).

Lobster Creek is not on the 303(d) list for contaminants or excessive nutrients. The lack of human development within watershed limits the risk of chemical contamination and nutrient loading within the watershed.

2*) Habitat access/elements pathway – Lobster Creek watershed*

Physical barriers indicator – *Properly Functioning*. Baseline: Lobster Creek WA (USFS 1999), Lobster Creek SS (SRG 2004), NF Lobster Creek SS (SRG 2002), and SF Lobster Creek SS (SRG 1996).

There are no known culverts or human structures on NFS lands within the ESA action area that block passage of Coho Salmon at any life stage from upstream and downstream migration.

Substrate/embeddedness indicator – *At Risk*. Baseline: Lobster Creek WA (USFS 1999), Lobster Creek SS (SRG 2004), NF Lobster Creek SS (SRG 2002), and SF Lobster Creek SS (SRG 1996).

Stream surveys in the Lobster Creek watershed have collected data on streambed substrate in fish bearing tributaries located on NFS lands. Fines represent from 2% to 16% of substrate particles in the North Fork and South Fork Lobster Creek, and up to 22% in the mainstem of Lobster Creek. The ODFW recommended benchmark value for substrate in the SW Oregon is less than 15% fines (ODFW 2000).

Large wood indicator – *At Risk*. Baseline: Lobster Creek WA (USFS 1999), Lobster Creek SS (SRG 2004), NF Lobster Creek SS (SRG 2002), and SF Lobster Creek SS (SRG 1996).

Large wood levels in Lobster Creek and tributary streams are low and below the expected range of natural variation in reaches accessible by or near roads. Abundance of large wood is low in the mainstem as well as throughout the watershed. The 1996 South Fork Lobster Creek survey detected 0 to 9 pieces of large wood (36 inches diameter by 50 feet) and 1.6 to 12.7 medium pieces (24 inches by 50 feet) per mile in each of the 10 reaches composing the mainstem. Mainstem Lobster Creek is *Not Properly Functioning* with less than two key pieces of large wood per mile. Past actions including stream cleanout have removed some large wood. This practice ceased about forty years ago. Riparian forest management in some reaches has reduced large wood recruitment. Large wood densities within the South Fork Lobster Creek are variable, though it is generally below desired quantities. Within the North Fork Lobster Creek, large wood is moderately abundant and is found both as scattered pieces and in larger wood jams. Some large wood placement has occurred in several streams, including: Lobster Creek, South Fork Lobster Creek, and Deadline Creek.

Pool frequency and quality indicator – *At Risk*. Baseline: Lobster Creek WA (USFS 1999), Lobster Creek SS (SRG 2004), NF Lobster Creek SS (SRG 2002), and SF Lobster Creek SS (SRG 1996).

The pool to riffle ratio (pool:riffle) in the mainstem Lobster is quite good. A desirable standard is 40:60. All but one of the 10 reaches of the mainstem exceeds this ratio. Pools in the mainstem have long tail-outs. However, there are few per mile (5 to 25 for the 10 reaches.) Coupled with the scarcity of large wood to partition the pools, fish habitat in Lobster Creek is less complex than optimal. Large wood is the primary causal mechanism in low gradient streams to create complex and frequent pools. These pools and associated large wood also create off-channel habitat and refuge for salmonids. Table 101 summarizes pool habitat condition on streams surveyed (using USFS R6 Level II survey protocol) on NFS lands in the watershed.

Table 101. Habitat percent and pool summary for surveyed streams – Lobster Creek watershed

Stream Name	Year Survey-ed	Habitat % Pool	Habitat % Riffle	Pools/ Mile	Deep Pools/mile (>3ft)	Avg. Residual Pool Depth (ft)	Average Bankfull Width (ft)
Lobster Creek	2004	63.1	36.2	10.1	10.0	5.2	59.2
NF Lobster Creek	2002	28.8	69.9	22.5	10.3	2.7	33.5
SF Lobster Creek	1996	10.9	88.3	15.1	10.6	3.4	53.0

Off-channel habitat indicator – *At Risk*. Baseline: Lobster Creek SS (SRG 2004), NF Lobster Creek SS (SRG 2002), and SF Lobster Creek SS (SRG 1996).

Due to the confined nature of most of the Lobster Creek streams, off-channel habitat does not occur. Floodplains are generally non-existent, or are very narrow with inaccessible high terraces.

Refugia indicator – *At Risk*. Baseline: Lobster Creek WA (USFS 1999), Lobster Creek SS (SRG 2004), NF Lobster Creek SS (SRG 2002), and SF Lobster Creek SS (SRG 1996).

The lack of quality pools, associated large wood and lack of off-channel habitat has created a dearth of refuge for salmonids.

3) Channel condition and dynamics pathway – Lobster Creek watershed

Bankfull width depth ratio/ channel widening indicator - *Properly Functioning*. Baseline: Lobster Creek WA (USFS 1999), Lobster Creek SS (SRG 2004), NF Lobster Creek SS (SRG 2002), and SF Lobster Creek SS (SRG 1996).

In most reaches, stream channels within the watershed are controlled laterally by natural topography and geology. The mainstem is low gradient (0.5-1.0%) along its entire length (~10 miles), and exhibits variable channel morphology, ranging from entrenched bedrock and boulder controlled reaches to wide valley segments with point bars, side channels, and regular pool/riffle sequences.

Streambank condition indicator – *At Risk*. Baseline: Lobster Creek WA (USFS 1999), Lobster Creek SS (SRG 2004), NF Lobster Creek SS (SRG 2002), and SF Lobster Creek SS (SRG 1996).

Erosion processes in the watershed are primarily landslides, though the watershed has fewer and smaller landslides than other neighboring watersheds such as Quosatana Creek and Lawson Creek. Further, the watershed does not have extensive inner gorge landslides, although there are some present along the lower South Fork.

Floodplain connectivity indicator – *At Risk*. Baseline: Lobster Creek WA (USFS 1999), Lobster Creek SS (SRG 2004), NF Lobster Creek SS (SRG 2002), and SF Lobster Creek SS (SRG 1996).

On NFS lands, most streams are hillslope confined or located within naturally incised bedrock canyons. Consequently, floodplains where they occur tend to be small. Roads located within riparian areas have altered historic floodplain overview.

4) Flow/hydrology pathway – Lobster Creek watershed

Change in peak/base flow indicator – *At Risk*. Baseline: Lobster Creek WA (USFS 1999) and NWFP (USFS and BLM 1994).

The primary human influences to hydrologic processes are effects of roads and vegetation removal on peak flows. Factors such as geology, soil depth, slope, and drainage configuration influence the potential for flow effects. Streams draining managed areas in the watershed have not been evaluated in the field, in comparison to less managed areas, to determine if their channels show evidence of altered flows. Since the mid-1990s, riparian management under the NWFP has emphasized maintenance and enhancement of habitat for fish and other aquatic resources. Consequently, instream conditions including change in peak/base flow conditions are improving on NFS lands.

Increase in drainage network indicator – *At Risk*. Baseline: Lobster Creek WA (USFS 1999).

Road development has increased the drainage network in tributaries. Subwatersheds with combined high levels of roading and timber harvest are most likely to have altered hydrology. These conditions are more prevalent downstream of NFS lands on private timber land.

5) Watershed conditions pathway – Lobster Creek watershed

Road density and location indicator – *At Risk*. Baseline: Lobster Creek WA (USFS 1999).

Road density is high on private timberlands, less on NFS lands. Subwatersheds have steep sideslopes and many roads are near ridges, though midslope roads do occur in many of the drainages.

Disturbance history indicator - *At Risk*. Baseline: Lobster Creek WA (USFS 1999).

Human activities have altered watershed processes and functions in the watershed. Timber harvest, roads, and to a lesser degree mining are primary disturbance activities.

Riparian Reserves indicator – *At Risk*. Baseline: Lobster Creek WA (USFS 1999).

Considerable harvest has taken place in riparian areas in the past as approximately 1,803 acres of the total 2,947 acres scheduled for thinning in the watershed on NFS lands are within Riparian Reserves. Plantations are scattered throughout the upper Lobster Creek watershed. Overall riparian conditions are good in the upper watershed on NFS lands. It is assumed, as previously mentioned, that on private lands much of the riparian areas will remain in early and mid-seral conditions to maximize timber production.

Disturbance regime indicator – *At Risk*. Baseline: Lobster Creek WA (USFS 1999).

Timber harvest and road development have altered flow patterns and vegetation in many drainages within the watershed. Historic gold mining operations occurred within the watershed, primarily in the South Fork Lobster Creek and Boulder Creek. The flood event of 1996, which was estimated as a 10 to 25 year recurrence interval event, had little effect on landslides, sediment delivery to streams, or fish habitat in the Lobster Creek watershed.

b. Rogue River watershed

Watershed overview - Rogue River

The Rogue River watershed includes the Rogue River from the mouth of the Illinois River, but not including the Illinois River, to the Pacific Ocean. All streams entering the Rogue River between these two points and the lands drained by those streams are included in this watershed except the Lobster Creek watershed. Lobster Creek is a separate fifth field watershed. The land ownership within the watershed is 53% USFS, 45% private, 2% BLM and <1 State (Table 102).

Table 102. Watershed Area and Ownership Distribution – Rogue River watershed

Land Ownership	Acres	Ownership (percent)
USFS	43,758	53
BLM	2,039	2
State	12	<1
Private	36,790	45
Total	**82,599**	**100**

Prevalent land uses

- Federal – recreation, fishing, and timber harvest
- Private – residential and some small scale agriculture and industrial timber lands

Anthropomorphic alterations to habitat. Land use within the basin is primarily forestry. No major urban areas, industrial centers, or agricultural operations are present in the lower Rogue basin. Settlers cleared forests in small patches for agriculture and grazing of livestock in the mid-19th century. Considerable burning was done by aboriginal peoples and early settlers, which ceased around the turn of the century. Timber harvest has occurred on both private and public lands and road development is locally extensive in some subwatersheds. Much of the public lands are now late Successional reserve allocation under the NWFP (USFS and BLM 1994). Quosatana Creek is a Key (sub) watershed with no roads near the stream.

The main channel of the Rogue River has been a popular recreational area for many decades and considerable recreation use occurs on the bars near campgrounds and accessible areas. There are anecdotal reports that near the end of the 19th century R.D. Hume documented clearing large wood from the estuary in the lower Rogue to facilitate netting of fish for his hatchery. This action would have taken place in the lower approximate 5 miles of the river (USFS 2000). This is the only river segment within the ESA action area where an appreciable amount of Coho Salmon over-wintering habitat may have been present historically due to the geomorphology of the river channels.

Suction dredging and high banking activity summary. The Rogue River watershed within the Lower Rogue subbasin on NFS lands had no active filed claims as of 5/8/2013. There were no suction dredge NOI received by the RRS during the four-year period from 2009-2012 in the watershed on NFS land located within ¼ mile of CCH (Table 4 and Figure 24).

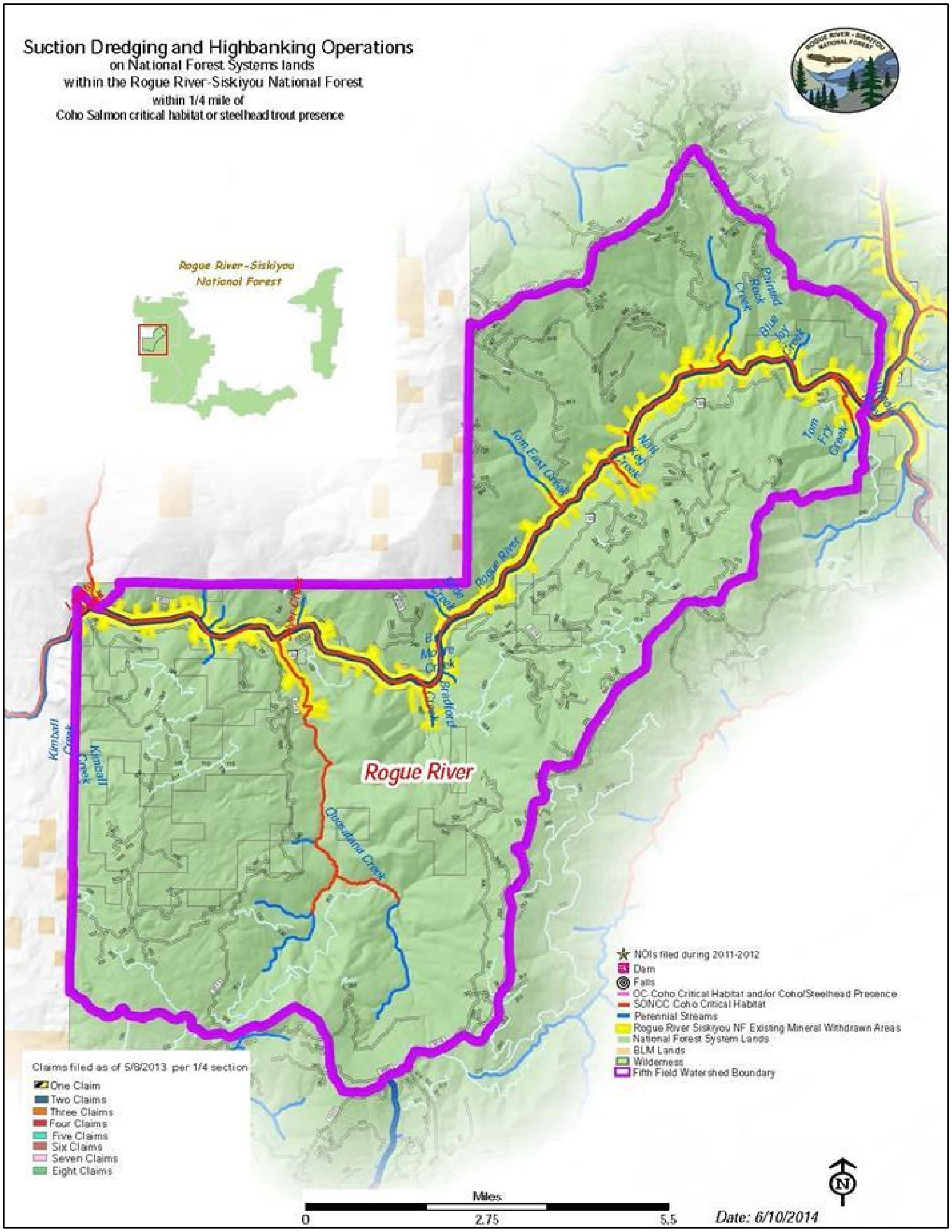

Figure 24. CCH with NOI and mining claims within 1/4 mile of CCH on NFS lands – Rogue River watershed

The Rogue River was administratively withdrawn from mineral entry on September 10, 1958 by Public Land Order (PLO) 1726. The withdrawal extends to 1 mile on either side of the river for the protection and preservation of scenic and recreation areas adjacent to the river and its tributaries. There are 51.8 miles of CCH within the watershed and 19.3 miles of those miles are withdrawn from mineral entry. The IP value and habitat use typing for these withdrawn miles are displayed in Table 103. See Appendix A for a summary and locations of suction dredging and high banking mineral withdrawals on the RRS.

Table 103. IP and habitat typing for mineral withdrawn areas – Rogue River watershed

Habitat Typing[1]	Intrinsic Potential[2] (miles)			Total (miles)
	High	Medium	Low	
Spawning/rearing	0.2	0.4	1.4	2.0
Rearing/migration	0	0	0	0
Migration only	0.6	16.2	0.5	17.3
Total	**0.8**	**16.6**	**1.9**	**19.3**

[1] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[2] Values based on an intrinsic potential map derived from the NETMAP CLAMS data and also located http://www.fsl.orst.edu/clams/. Category for ranking were derived from the final SONCC Coho Salmon Recovery Plan (NMFS 2014); high =>/= 0.66, moderate = </=0.33 – 0.66 and low = <0.33.

Watershed population overview - Rogue River

The Rogue River watershed Coho Salmon population is part of the greater Lower Rogue subbasin population. There are approximately 51.8 miles of CCH within the watershed and 26.6 miles on NFS lands (Figure 24 and Table 104). The Rogue River below Agness is an important migration habitat for large populations of Coho Salmon, fall Chinook Salmon, spring Chinook Salmon, winter steelhead trout, summer steelhead trout, resident and anadromous cutthroat trout. The estuary is important rearing and smolting habitat for all anadromous species.

Lobster (river mile 11) and Quosatana (river mile 13) Creeks are the largest tributaries to the Rogue River below Agness. They provide most of the salmon and trout spawning and rearing habitat downstream of Agness. Other than Lobster and Quosatana Creeks, the remaining tributaries to the Rogue River below Agness are short, steep and provide limited fish habitat. Jim Hunt, Kimball and Silver Creeks provide limited Chinook, steelhead, and possibly Coho Salmon habitat. Bradford, Wake-Up Rilea, Nail Keg, Tom East and Painted Rock Creeks provide short segments of steep habitat for resident trout. Tom Fry Creek provides a short segment of Chinook and possibly Coho Salmon habitat at its very mouth, and more extensive steelhead, anadromous cutthroat and resident trout habitat. These small tributaries provide cool water to the mainstem Rogue River, which is important to juvenile fish during summer. The mouths of these tributaries also provide backwater habitat during high winter flows, where fish can escape powerful storm flows in the mainstem.

A highly visible element of mainstem fish habitat is the extensive boat use. Boaters are drawn to the lower Rogue River for its celebrated fishery, scenic beauty and whitewater reputation. They bring a wide variety of watercraft and dominant uses change with the seasons.

The population of adult spawners in the Rogue River was calculated for the years 1990 through 1996 based on mark and recapture seining at Huntley Park, river mile (RM) 8. During that time, Coho Salmon adults averaged 3,401 individuals, with a low of 174 in 1993 and a high of 5,386 in

1996 (Nickelson, 1998). The same report estimates that a total of 5,400 adult spawners are needed to fully seed the best habitat. Because of the lack of classic Coho Salmon habitat features, lower Rogue Coho Salmon spawners are believed to be strays from the upper Rogue River or Illinois River groups and not remnants of a discrete lower Rogue River population (USFS 1999). Most of the IP ranking within the watershed is medium and consists of the *spawning/rearing* and *migration only* habitat use types (Table 105).

Table 104. Salmonid species and habitat length - Rogue River watershed

Water-shed Acres	Anadro-mous Species Present[1]	NFS lands Miles of CCH (miles)[2]	NFS lands Miles of Chinook Habitat (miles)[3]	Water-shed CCH and EFH (miles)[4]	Watershed Potential Miles of Coho Salmon Habitat Type[5]		
					Spawning/ Rearing	Rearing/ Migration	Migration only
82,599	CO, CH, ST	26.6	22.3	51.8	24.4	0	27.4

[1] All, or a portion of, the waterbody supports the following anadromous salmonids: ST- steelhead trout; CO- Coho Salmon; CH - Chinook Salmon.

[2] Steelhead presence surveys were used to determine historic Coho Salmon habitat since CCH was not spatially delineated in the Federal Register 50 CFR Part 226. Values based on GIS data layer entitled RRS 2013 Total Salmon and Steelhead Distribution and field knowledge.

[3] Values based on GIS data layer entitled 2013 RRS Anadromous Salmonid Fish Distribution; Chinook Salmon presence survey layer.

[4] Values based on a combination of RRS 2013 SONCC Coho Salmon delineated CH 19 and ODFW steelhead presence survey data 2013 GIS map (as a surrogate for historic Coho Salmon habitat) website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[5] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

Table 105. Habitat use typing and intrinsic potential within CCH – Rogue River watershed

Habitat Typing[1]	Intrinsic Potential[2] (miles)						Total (miles) CCN/IP/HT	
	High IP		Medium IP		Low IP			
	Water-shed	NFS lands	Water-shed	NFS lands	Water-shed	NFS lands	Water-shed	NFS lands
Spawning/rearing	5.5	1.3	13.2	5.8	5.7	2.2	24.4	9.3
Rearing/migration	0	0	0	0	0	0	0	0
Migration only	4.3	0.6	22.6	16.2	0.5	0.5	27.4	17.3
Total	**9.8**	**1.9**	**35.8**	**22.0**	**6.2**	**2.7**	**51.8**	**26.6**

[1] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[2] Values based on an intrinsic potential map derived from the NETMAP CLAMS data and also located http://www.fsl.orst.edu/clams/. Category for ranking were derived from the final SONCC Coho Salmon Recovery Plan (NMFS 2014); high =>/= 0.66, moderate = </=0.33 – 0.66 and low = <0.33.

Watershed habitat indicators – Rogue River

1) Water quality pathway – Rogue River watershed

Temperature indicator – *At Risk*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010), Rogue River Basin TMDL and WQMP (ODEQ 2008) and Rogue River below Agness WA (USFS 2000).

The mainstem Lower Rogue River and its tributary Quosatana Creek are listed as temperature impaired on the Oregon 303(d) impaired water body list. There is an approved TMDL in place for the Lower Rogue subbasin, which addresses water temperature (ODEQ 2008). Table 106 displays the 303(d) list for water quality limited stream within the watershed on NFS lands. The mainstem Rogue is warm during the summer months and reaches the high 70° F range. The benchmark of 64° F. for a large river channel such as the Rogue River is unrealistic and does not take into account solar radiation in a large river channel in southwest Oregon. The Chetco River flowing from the Kalmiopsis Wilderness some miles south of this point exceeds 70° F during the summer (RRS temperature records). Lost Creek Dam and Applegate Dam water releases may actually cool the main river channel from pre-dam conditions and the main Rogue River may actually be slightly cooler than historic temperatures during the summer months. The Oregon Water Quality Index Report for 1986 to 1995 rated ESA action area water quality as 'good'. Appendix B displays the 2010 303(d) list for streams within NFS lands on RRS.

Table 106. ODEQ, 2010 303(d) List for Oregon Waterbodies within NFS lands on RRS – Rogue River watershed

Stream Name	Miles on RRS (miles)	River Mile Marker (miles)	Pollutant	Assess-ment	Assess-ment 2	Listing Status
Lobster Creek	0.55	0 to 4.3	Biological Criteria	2010	1/29/2013	Cat 5: Water quality limited, 303(d) list, TMDL needed
North Fork Lobster Creek	7.85	0 to 8.1	Temperature	2010	10/29/2010	Cat 4A: Water quality limited, TMDL approved
South Fork Lobster Creek	16.01	0 to 124.8	Temperature	2010	10/29/2010	Cat 4A: Water quality limited, TMDL approved

Suspended sediment–intergravel DO/turbidity indicator- *At Risk*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010) and Rogue River below Agness WA (USFS 2000).

No streams in the watershed within the RRS are listed for sediment on the 303(d) list. Jim Hunt Creek within NFS lands is listed for biological criteria, possibly as a result of sediment tolerant macroinvertebrate presence (Table 106). Past logging and road construction has some lasting effects on turbidity. Urbanization and agriculture uses have added suspended fines to the river system. The turbidity levels are probably above historic levels due to releases from Lost Creek Dam and general disturbance throughout the river basin.

Chemical contamination/nutrients indicator – *At Risk*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010) and Rogue River below Agness WA (USFS 2000).

No streams in the watershed within the RRS are on the 303(d) list for contaminants or excessive nutrients. More than one hundred fifty-thousand people live within the Rogue River basin and storm drains from the many municipalities plus agriculture runoff contribute to some contaminants reaching waterways. Elevated nutrient levels and contaminants have influenced this indicator. Compared to other rivers in the Northwest and certainly with other large rivers in the United States, this river is only moderately impaired (Jon Brazier, retired RRS Hydrologist, pers. comm., 2001).

2) Habitat access/access pathway – Rogue River watershed

Physical barriers indicator – *At Risk*. Baseline: Rogue River below Agness WA (USFS 2000) and Quosatana Creek SS (SRG 1992, 1999).

There are no known fish barriers within the mainstem Rogue River in this watershed. A few culverts associated with the Agness Road and within some of the tributaries inhibit Coho Salmon migration. Many of these block only a few hundred feet of potential habitat that may or not be used by Coho Salmon if available.

Substrate/embeddedness indicator – *At Risk*. Baseline: Rogue River below Agness WA (USFS 2000) and Quosatana Creek SS (SRG 1992, 1999).

The mainstem Rogue River riverbed turns over during the typical high precipitation periods of winter. Some tributaries show periodic signs of local embeddedness, which often changes during winter storm events.

Large wood indicator – *At Risk*. Baseline: Rogue River below Agness WA (USFS 2000) and Quosatana Creek SS (SRG 1992, 1999).

The mainstem river rarely holds large wood through the winter except for local backwater and off-channel areas in the lower 5 miles of the river. Where roads are located near tributaries, some wood cleanout occurred up until the early 1980's. R.D. Hume apparently snagged wood from the lower few miles over 100 years ago. Most of the river channel is probably within the natural range of variability.

Pool frequency and quality indicator - *At Risk*. Baseline: Rogue River below Agness WA (USFS 2000) and Quosatana Creek SS (SRG 1992, 1999).

The mainstem Rogue River is probably within the natural range of variability for pools. Some tributaries may have local pool filling from land management activities in the subwatershed or drainage.

Off-channel habitat indicator – *Properly Functioning*. Baseline: Rogue River below Agness WA (USFS 2000) and Quosatana Creek SS (SRG 1992, 1999).

Off-channel habitat is rare in this constrained stream valley and in tributaries.

Refugia indicator – *Properly Functioning*. Baseline: Rogue River below Agness WA (USFS 2000) and Quosatana Creek SS (SRG 1992, 1999).

Off-channel habitat is rare. Refugia for fish is principally associated with large boulders, substrate interstices habitats and cooler water at tributary confluences.

3) Channel condition and dynamics pathway – Rogue River watershed

Average width/ maximum depth ratio indicator- *Properly Functioning*. Baseline: Rogue River below Agness WA (USFS 2000) and Quosatana Creek SS (SRG 1992, 1999).

The mainstem Rogue River is probably within the natural range of variability because of bedrock controls and valley sidewalls. Constrained stream valleys are within the expected range of width/depth ratios in tributaries.

Streambank condition indicator - *At Risk*. Baseline: Rogue River below Agness WA (USFS 2000) and Quosatana Creek SS (SRG 1992, 1999).

Streambanks have been altered locally in the mainstem Rogue River to accommodate agriculture and residences. Dredging and riprap have altered the lower river near the town of Gold Beach.

Floodplain connectivity indicator -*Properly Functioning*. Baseline: Rogue River below Agness WA (USFS 2000) and Quosatana Creek SS (SRG 1992, 1999).

Constrained stream valleys result in few developed floodplains.

4) Flow/hydrology pathway – Rogue River watershed

Change in peak/base flow indicator – *At Risk*. Baseline: Rogue River below Agness WA (USFS 2000).

Timber harvest and road construction have affected peak flows in some tributaries. The flow changes affected by Lost Creek and Applegate Dam water releases have altered main river flows during all seasons. These projects have somewhat offset the effects of water withdrawals from the river and tributaries upstream.

Increase in drainage network indicator – *At Risk*. Baseline: Rogue River below Agness WA (USFS 2000).

Most effects are detectable on tributaries where stream flow response to high rainfall may be altered somewhat.

5) Watershed conditions pathway – Rogue River watershed

Road density and location indicator – *At Risk*. Baseline: Rogue River below Agness WA (USFS 2000).

Road densities are high locally in some tributary drainages. There are few valley bottom roads near fish streams in the steep topography. The Agness Road is an exception, as it is parallel to the main Rogue River.

Disturbance history indicator – *At Risk*. Baseline: Rogue River below Agness WA (USFS 2000).

Timber harvest and road development have altered erosion processes in some tributaries.

Riparian Reserves indicator – *At Risk*. Baseline: Rogue River below Agness WA (USFS 2000).

Riparian zones have been harvested locally in most tributaries where access is present. Riparian areas along the main river have been modified for more than 100 years. The Wild and Scenic River designation has caused more scrutiny of vegetation management along the river.

Disturbance regime indicator – *At Risk*. Baseline: Rogue River below Agness WA (USFS 2000).

Future effects of floods and fire events are exacerbated by the past timber harvest, road development and fire prevention.

5. Middle Rogue/Applegate Rivers population

Subbasin overview – Middle Rogue & Applegate

The Middle Rogue/Applegate Rivers population is located within three subbasins: Applegate, Lower Rogue and Middle Rogue (Figure 25). Portions of these subbasins are lumped together in this BA section since they share the Middle Rogue/Applegate Rivers Coho Salmon population within the ESA action area. The following watersheds are located in the ESA action area within each subbasin:

- The Applegate River subbasin has three of its four watersheds - Lower, Middle and Upper Applegate rivers, within the population of the ESA action area.
- The Lower Rogue subbasin has three of its five watersheds – Hellgate Canyon-Rogue River, Shasta Costa Creek-Rogue River, and Stair Creek-Rogue River, within the population ESA action area.
- There are no watersheds in the ESA action area within the Middle Rogue subbasin.

Applegate subbasin. The Applegate subbasin is the 770 square-mile watershed of the 51-mile long Applegate River, a tributary to the Rogue River. The headwaters of the Applegate River are in the Red Buttes Wilderness on the Siskiyou Crest just south of the Oregon border in Siskiyou County, California. As it flows towards its confluence with the Rogue, the Applegate passes through Jackson and Josephine Counties in Oregon. It empties into the Rogue River west of Grants Pass at the beginning of the Wild and Scenic Rivers section of the Lower Rogue. The river is impounded behind Applegate Dam just inside the Oregon border, creating Applegate Reservoir, which was built for flood control in 1980, and today is used largely for recreation.

Much of the land in the upper reaches of the watershed is steep mountainous terrain managed by the RRS. The mid elevations are primarily Medford District BLM lands and private timber lands, and the banks of the river are primarily rural private properties and small farms. The USFS, BLM, timber and private properties make up 35%, 35% 10% and 20% of the watershed, respectively.

Lower Rogue subbasin (described in more detail in the Lower Rogue River subbasin population section). The Lower Rogue subbasin is a watershed that covers a 906 square-mile area and empties into the Pacific Ocean at Gold Beach. The Middle Rogue, Applegate and Illinois subbasins all drain into the Lower Rogue. The land within the subbasin is remote and difficult to access. The BLM manages the majority of the upstream portions of the subbasin and the RRS manages the majority of the land downstream to Lobster Creek. Private ownership dominates the lower approximately 10 miles up from the mouth of the river at Gold Beach, Oregon.

Middle Rogue subbasin. This subbasin consists primarily of BLM lands and private, and is not located within the ESA action area. See the Upper Rogue River Population subbasin overview for a summary.

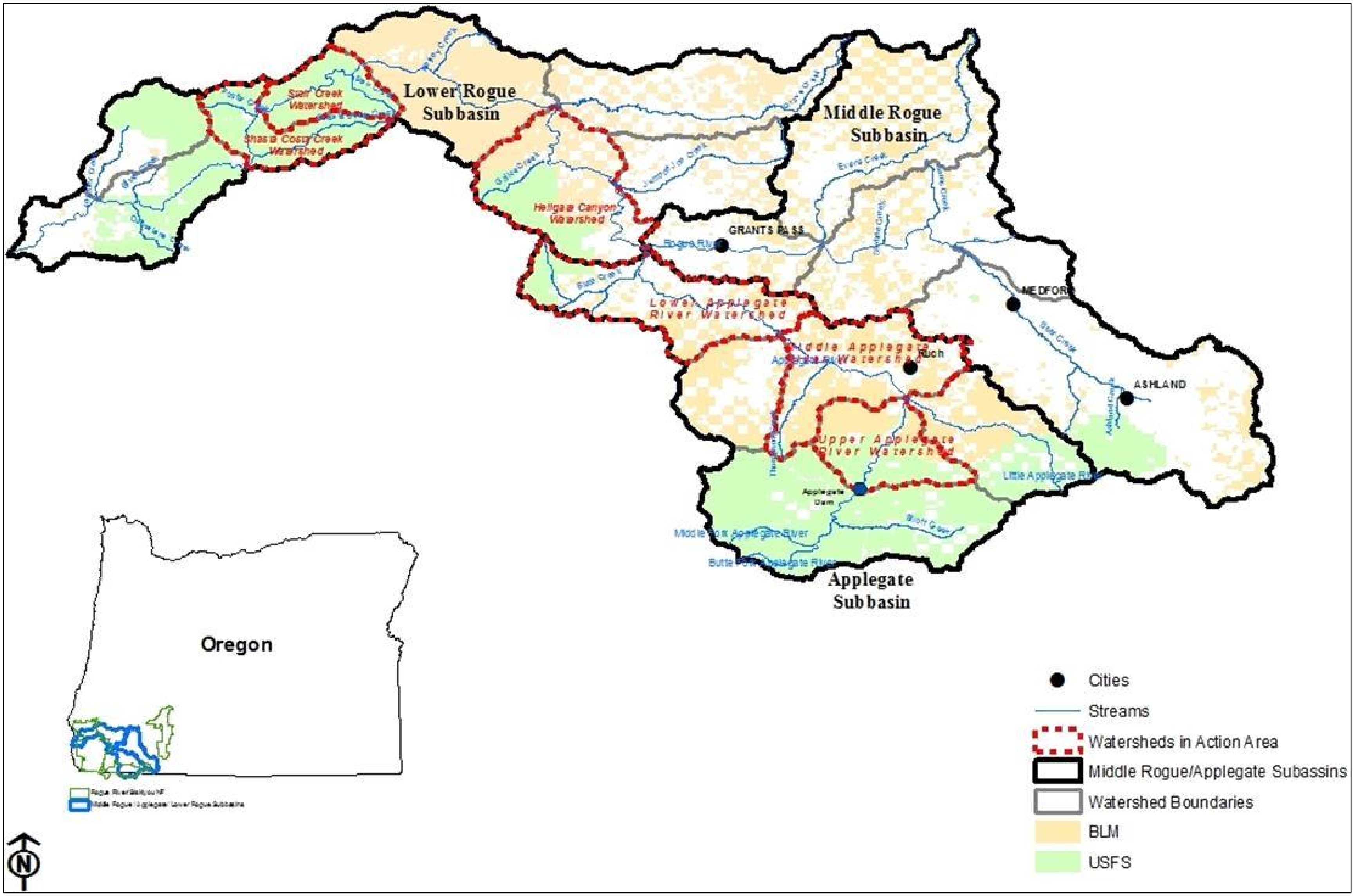

Figure 25. Middle Rogue/Applegate Rivers population in relation to its watersheds within the ESA action area

Subbasin population overview - Middle Rogue/Applegate Rivers

Population highlights (NMFS 2014)

- Population is located in a mixture of the watersheds within the Middle Rogue, Applegate, and Lower Rogue subbasins
- Interior Rogue Stratum
- Non-Core, Functionally Independent Population
- High Extinction Risk
- 2700 Spawners Required 5 for ESU Viability
- 1,561 mi2
- 683 IP km (424 IP mi) (45% High)
- Dominant Land Uses are Agriculture and Urban/Residential/Commercial Development
- Principal Stresses are ‘Degraded Riparian Forest Conditions’ and ‘Altered Hydrologic Function’
- Principal Threats are ‘Dams/Diversions’ and ‘Urban/Residential/Industrial Development’

Williams et al. (2008) estimated 758.6 km [471.4 miles] of high IP Coho Salmon habitat in the Middle Rogue-Applegate, with Applegate Dam blocking 20% of the habitat, leaving 603.9 km [375.2 miles] below the dam. Coho Salmon juvenile dive observations in the Middle Rogue and the Applegate River watershed from 1998-2004 (ODFW 2005a) confirm that the species still migrates to tributaries in a widespread area. High IP habitat farther downstream is substantially dewatered, too warm or has channels too simplified for Coho Salmon rearing (NMFS 2014).

Coho Salmon are naturally absent from many steep lower Middle Rogue tributaries from Mule Creek to Agness. Foster and Shasta Costa Creeks in the lower Middle Rogue have Coho Salmon and recovery potential (USFS 2000). Based on restricted distribution, very low abundance, apparent chronic negative population growth and likely reduction in genetic diversity, the Middle Rogue-Applegate population of Coho Salmon is currently not viable and at high risk of extirpation (NMFS 2014).

Watersheds within the ESA action area of Middle Rogue/Applegate Rivers population

Watershed conditions are described below for six watersheds within Middle Rogue/Applegate Rivers population: Hellgate Canyon-Rogue River, Lower Applegate River, Middle Applegate River, Stair Creek-Rogue River, Shasta Costa-Rogue River and Upper Applegate River watersheds.

a. Hellgate Canyon-Rogue River watershed

Watershed overview – Hellgate Canyon-Rogue River

The Hellgate Canyon-Rogue River watershed contains 93,369 acres (146 mi2) with five sixth-field subwatersheds (Bailey Creek, Galice Creek, Pickett Creek, Stratton Creek, and Taylor Creek). Taylor Creek is the sole Key Watershed in the Hellgate Canyon-Rogue River watershed. Key watersheds are designated in the NWFP (USFS and BLM 1994a) as “crucial to at-risk fish species and stocks (Tier 1) and provide high quality water (Tier 2).” The ownership distribution in the watershed encompasses: USFS 32%, BLM 41%, State lands 1% and the remaining 26% is in private ownership (Table 107).

Primary activities affecting water quality in the Hellgate Canyon-Rogue River watershed are riparian vegetation removal, residential and agricultural development, roads, channel widening, and water withdrawals (ODEQ 2002). There is a checkerboard pattern of ownership in the eastern half of the watershed, with larger contiguous areas of ownership in the northwestern portion of the analysis area. Major land uses in the eastern half include rural development and agriculture. Early European inhabitation resulted in logging of the surrounding hills and agricultural development of the valley bottoms. The watershed has historically experienced low-severity fires.

Table 107. Watershed area and ownership distribution – Hellgate Canyon-Rogue River watershed

Land Ownership	Acres	Ownership (percent)
USFS	29,507	32
BLM	38,205	41
State	1,253	1
Private	24,405	26
Total	**93,369**	**100**

Prevalent land uses

- Federal – timber production, mining, and recreation
- Private – timber production, mining, recreation, and rural residential

Anthropomorphic alterations to habitat. Timber harvest began in the late 1800's and increased up to and through the 1980's. The primary recreational attraction within the watershed is the Rogue River, which offers high quality fishing and whitewater opportunities.

Suction dredging and high banking activity summary. Gold was discovered in Galice Creek in 1852. There was some historic mining on Taylor Creek but it had little or no effect on the stream channel. Most of the channel changes have occurred from the building of the Taylor Creek Road that constricted the channel and removal of large wood (USFS 2002). Additional and persistent mineral exploration and development has continued in most of the subwatersheds since that time. Most of this mineral work has been restricted to the gold-bearing placer gravels adjacent to the Galice and Taylor Creek drainages.

There were 35 active filed placer claims, as of 5/8/2013 within the Hellgate Canyon-Rogue River watershed. There were no suction dredge NOI received by the RRS during the four-year period from 2009-2012 in the watershed on NFS land located within 1/4 mile of CCH (Table 4 and Figure 26). There are no mineral withdrawn areas in the watershed.

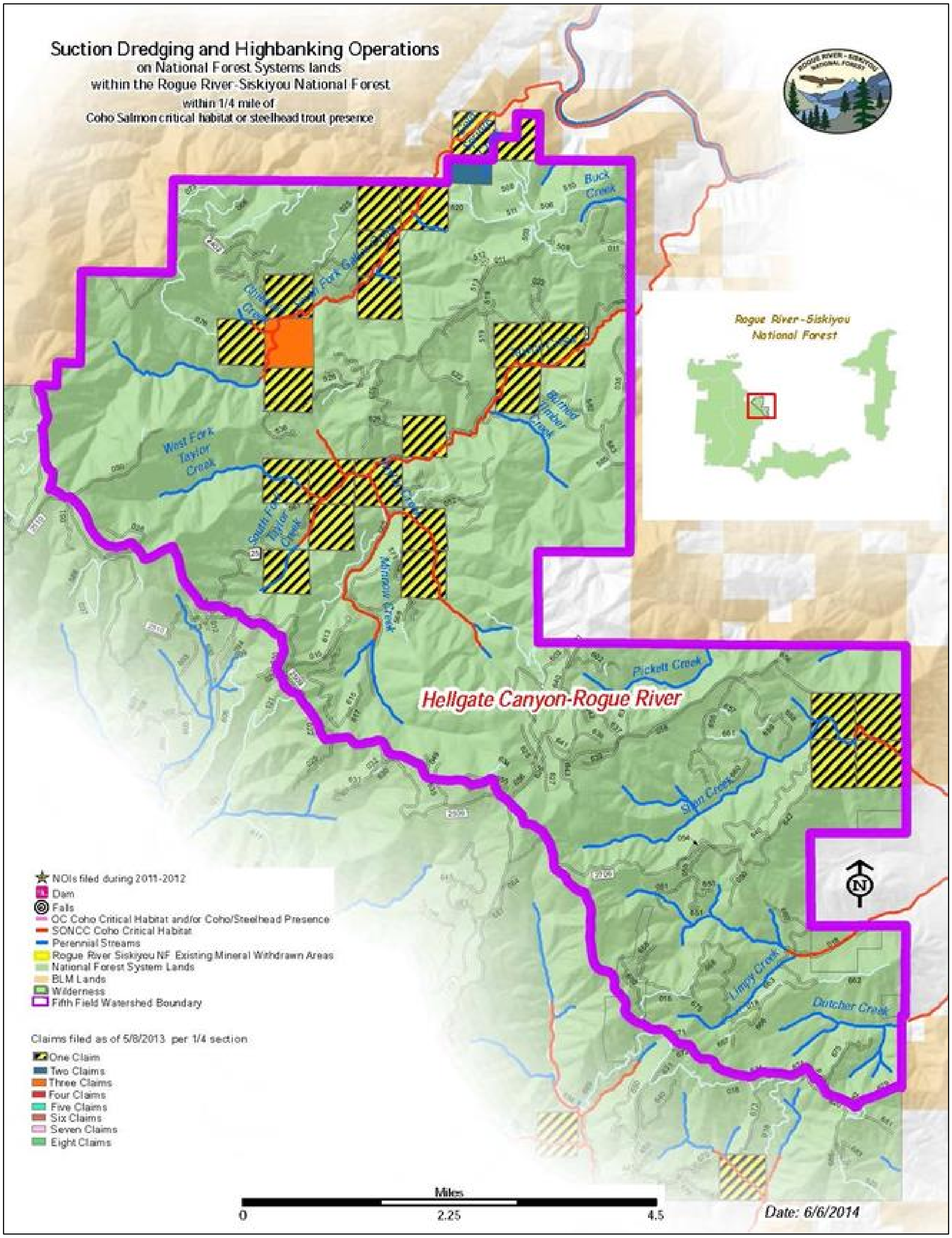

Figure 26. CCH with NOI and mining claims within 1/4 mile of CCH on NFS lands – Hellgate Canyon-Rogue River watershed

Watershed population overview – Hellgate Canyon-Rogue River

The Hellgate Canyon-Rogue River watershed Coho Salmon population is part of the greater Middle Rogue/Applegate population. The watershed includes the Rogue River and tributaries from the Applegate River/Rogue River confluence downstream to Grave Creek. The watershed contains 68.4 miles of CCH (Table 108). Notable tributaries on NFS lands include: Dutcher Creek, Limpy Creek, Shan Creek, Taylor Creek, and South Fork Galice Creek. All of these drainages support anadromous fish populations. Fish habitat improvement work has been implemented within the watershed, particularly within the Taylor Creek subwatershed, and more recently off of NFS lands in Limpy and Pickett Creeks. Typical of streams within Klamath Mountain Province, the lower reaches of most subwatersheds are wider alluvial valleys, with the individual drainages becoming more confined and steeper as you move upstream. Fish habitat has been degraded considerably from its natural (pre-European) condition due to land management. The watershed consists entirely of *spawning/rearing* and *migration only* habitat use types, mostly within medium IP (Table 109).

Table 108. Species and habitat length - Hellgate Canyon-Rogue River watershed

Water-shed Acres	Anadro-mous Species Present[1]	NFS lands Miles of CCH (miles)[2]	NFS lands Miles of Chinook Habitat (miles)[3]	Water-shed CCH and EFH (miles)[4]	Watershed Potential Miles of Coho Salmon Habitat Type[5]		
					Spawning/ Rearing	Rearing/ Migration	Migration only
93,369	CO, CH, ST	14.4	0.4	68.4	38.8	0	29.6

[1] All, or a portion of, the waterbody supports the following anadromous salmonids: ST- steelhead trout; CO- Coho Salmon; CH - Chinook Salmon.

[2] Steelhead presence surveys were used to determine historic Coho Salmon habitat since CCH was not spatially delineated in the Federal Register 50 CFR Part 226. Values based on GIS data layer entitled RRS 2013 Total Salmon and Steelhead Distribution and field knowledge.

[3] Values based on GIS data layer entitled 2013 RRS Anadromous Salmonid Fish Distribution; Chinook Salmon presence survey layer.

[4] Values based on a combination of RRS 2013 SONCC Coho Salmon delineated CH 19 and ODFW steelhead presence survey data 2013 GIS map (as a surrogate for historic Coho Salmon habitat) website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[5] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

Table 109. Habitat typing and intrinsic potential within CCH – Hellgate Canyon-Rogue River watershed

Habitat Typing[1]	Intrinsic Potential[2] (miles)						Total (miles) CCN/IP/HT	
	High IP		Medium IP		Low IP			
	Water-shed	NFS lands	Water-shed	NFS lands	Water-shed	NFS lands	Water-shed	NFS lands
Spawning/rearing	8.9	0.9	21.3	9.6	8.6	3.9	38.8	14.4
Rearing/migration	0	0	0	0	0	0	0	0
Migration only	0.6	0	28.1	0	0.9	0	29.6	0
Total	**9.5**	**0.9**	**49.4**	**9.6**	**9.5**	**3.9**	**68.4**	**14.4**

[1] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[2] Values based on an intrinsic potential map derived from the NETMAP CLAMS data and also located http://www.fsl.orst.edu/clams/. Category for ranking were derived from the final SONCC Coho Salmon Recovery Plan (NMFS 2014); high =>/= 0.66, moderate = </=0.33 – 0.66 and low = <0.33.

Watershed habitat indicators – Hellgate Canyon-Rogue River

1) Water quality pathway - Hellgate Canyon-Rogue River watershed

Temperature indicator – At Risk. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010) and Upper Rogue River above Galice WA (USFS 1995).

No streams within the watershed are listed for temperature. Elevated stream temperatures are a recognized condition within many streams in the watershed. On NFS lands, riparian vegetation provides on average about 60% shading to streams.

Suspended sediment–intergravel/DO/turbidity indicator – At Risk. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010) and Upper Rogue River above Galice WA (USFS 1995).

Sediment input into stream channels on NFS lands has been primarily associated with past timber harvest and road systems. Streams on NFS lands tend to be higher gradient than downstream private land reaches, and stream substrates are dominated by cobbles and gravel. No streams within the watershed have been listed as water quality limited for sedimentation.

Chemical contamination/nutrients indicator – Properly Functioning. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010) and Upper Rogue River above Galice WA (USFS 1995).

No streams within the watershed are listed for chemical contaminants or excessive nutrients. The lack of human development within and immediately adjacent to NFS lands within the watershed limits the risk of chemical contamination and nutrient loading.

2) Habitat access/elements pathway – Hellgate Canyon-Rogue River watershed

Physical barriers indicator – At Risk. Baseline: Upper Rogue River above Galice WA (USFS 1995).

There is a culvert on Limpy Creek that is recognized as a barrier to juvenile fish. No other human made barriers exist on NFS lands within the watershed.

Substrate/embeddedness indicator – At Risk. Baseline: Upper Rogue River above Galice WA (USFS 1995), Limpy Creek SS (SRG 2010), Shan Creek SS (SRG 2011), Dutcher Creek SS (SRG 2010), South Fork Galice Creek SS (SRG 2011), South Fork Taylor Creek SS (USFS 1998), Taylor Creek SS (USFS 1998), West Fork Taylor Creek SS (USFS 1998).

RRS stream surveys in Taylor, South Fork Galice, Shan, Limpy, and Dutcher Creeks found streambeds dominated by cobble and gravel, with limited amounts of deposition and embeddedness. Stream reaches on NFS lands tend to be higher gradient than downstream private land stream reaches, and are predominately transport reaches. Within Taylor Creek, there is some sediment storage behind woody debris jams. This condition adds to the habitat complexity in an otherwise low sediment system.

Large wood indicator – Not Properly Functioning. Baseline: Upper Rogue River above Galice WA (USFS 1995), Burned Timber Creek SS (USFS 1998), China Creek SS (USFS 1998), Dutcher Creek SS (SRG 2010), Limpy Creek SS (SRG 2010), Lone Tree Creek SS (USFS 1998), Minnow Creek SS (USFS 1998), Shan Creek SS (SRG 2011), South Fork

Galice Creek SS (SRG 2011), South Fork Taylor Creek SS (USFS 1998), Taylor Creek SS (USFS 1998), West Fork Taylor Creek SS (USFS 1998).

Current large wood quantities within most stream reaches are low, and in some locations are found only where stream restoration projects have introduced it. Valley bottom roads reduce the future large wood supply within certain reaches, most notably at Taylor Creek (Forest Road 25).

Pool frequency and quality indicator – Not Properly Functioning. Baseline: Upper Rogue River above Galice WA (USFS 1995), Burned Timber Creek SS (USFS 1998), China Creek SS (USFS 1998), Dutcher Creek SS (USFS 2010), Limpy Creek SS (SRG 2010), Lone Tree Creek SS (USFS 1998), Minnow Creek SS (USFS 1998), Shan Creek SS (SRG 2011), South Fork Galice Creek SS (SRG 2011), South Fork Taylor Creek SS (USFS 1998), Taylor Creek SS (USFS 1998), West Fork Taylor Creek (USFS 1998).

The dearth of large wood within many of the stream reaches on NFS lands within the watershed contributes to instream habitat conditions that are less complex than optimal. Large wood is the primary causal mechanism in low gradient streams to create complex and frequent pools. These pools and large wood also create off-channel habitat and refuge for salmonids. Table 110 summarizes pool habitat conditions on streams surveyed (using USFS R6 Level II survey protocol) on NFS lands in the watershed.

Table 110. Habitat percent and pool summary for surveyed streams – Hellgate Canyon-Rogue River watershed

Stream Name[1]	Year Survey-ed	Habitat % Pool	Habitat % Riffle	Pools/ Mile	Deep Pools/mile (>3ft)	Avg. Residual Pool Depth (ft)	Average Bankfull Width (ft)
Burned Timber Creek	1998	22.7	75.4	52.5	5.9	1.8	15.4
China Creek	1998	1998	70.2	75.8	1.0	1.0	7.7
Dutcher Creek	2010	33.7	65.8	64.4	0	0.9	11.3
Limpy Creek	2010	35.5	61.7	75.8	4.8	1.6	17.6
Lone Tree Creek	1998	10.6	89.4	68.4	0	0.9	7.2
Minnow Creek	1998	14.0	84.8	39.4	1.8	1.5	14.1
Shan Creek	2011	21.7	75.6	39.5	2.5	1.5	20.7
South Fork Galice Creek	2011	22.8	75.9	37.9	6.2	1.8	26.8
South Fork Taylor Creek	1998	17.2	82.8	49.5	0	1.2	12.7
Taylor Creek	1998	36.7	63.1	32.6	12.4	2.2	24.7
WF Taylor Creek	1998	30.6	68.1	48.3	6.9	1.8	19.5

[1] Includes areas surveyed upstream of CCH.

Off-channel habitat indicator – *At Risk*. Baseline: Upper Rogue River above Galice WA (USFS 1995), Burned Timber Creek SS (USFS 1998), China Creek SS (USFS 1998), Dutcher Creek SS (USFS 2010), Limpy Creek SS (SRG 2010), Lone Tree Creek SS (USFS 1998), Minnow Creek SS (USFS 1998), Shan Creek SS (SRG 2011), South Fork Galice Creek SS (SRG 2011), South Fork Taylor Creek SS (USFS 1998), Taylor Creek SS (USFS 1998), West Fork Taylor Creek (USFS 1998).

Stream channels on NFS lands tend to have steeper gradients than valley bottom segments on downstream private land. In general, streams on NFS lands are moderately entrenched and/or confined by topography. Side channels are not a common feature in any fish bearing streams on NFS lands, due to the natural topography, and to a lesser degree because of road development.

Refugia indicator – *At Risk*. Baseline: Upper Rogue River above Galice WA (USFS 1995), Burned Timber Creek SS (USFS 1998), China Creek SS (USFS 1998), Dutcher Creek SS (USFS 2010), Limpy Creek SS (SRG 2010), Lone Tree Creek SS (USFS 1998), Minnow Creek SS (USFS 1998), Shan Creek SS (SRG 2011), South Fork Galice Creek SS (SRG 2011), South Fork Taylor Creek SS (USFS 1998), Taylor Creek SS (USFS 1998), West Fork Taylor Creek (USFS 1998).

Due to its headwater location, habitats on NFS lands may represent some of the best habitat within the watershed. Therefore, accessible stream reaches on NFS lands may function as refugia for other portions of the watershed.

3) Channel condition and dynamics pathway – Hellgate Canyon-Rogue River watershed

Bankfull width depth ratio/ channel widening indicator - *At Risk*. Baseline: Upper Rogue River above Galice WA (USFS 1995), Burned Timber Creek SS (USFS 1998), China Creek SS (USFS 1998), Dutcher Creek SS (USFS 2010), Limpy Creek SS (SRG 2010), Lone Tree Creek SS (USFS 1998), Minnow Creek SS (USFS 1998), Shan Creek SS (SRG 2011), South Fork Galice Creek SS (SRG 2011), South Fork Taylor Creek SS (USFS 1998), Taylor Creek SS (USFS 1998), West Fork Taylor Creek (USFS 1998) and NWFP (USFS and BLM 1994) .

Along Taylor Creek, channel width has been reduced in some places by road placement (FSR 25), to well over 50 percent of the stream's historic width in places. Negative aspects associated with this condition are increased stream velocities that may alter sediment and large wood transport processes that maintain habitat complexity. Historic hydraulic mining activity in the Galice Creek drainage altered channel dimensions. Since the mid-1990s, riparian management under the NWFP has emphasized maintenance of habitat for fish and other aquatic resources. Consequently, instream habitat, including bankfull width/depth conditions, are improving on NFS lands. Downstream of NFS lands on private land, historic channelization and alteration of floodplains are well documented.

Streambank condition indicator – *At Risk*. Baseline: Burned Timber Creek SS (USFS 1998), China Creek SS (USFS 1998), Dutcher Creek SS (USFS 2010), Limpy Creek SS (SRG 2010), Lone Tree Creek SS (USFS 1998), Minnow Creek SS (USFS 1998), Shan Creek SS (SRG 2011), South Fork Galice Creek SS (SRG 2011), South Fork Taylor Creek SS (USFS 1998), Taylor Creek SS (USFS 1998), West Fork Taylor Creek (USFS 1998).

Data collected during stream surveys on NFS lands since the mid-1990s documented stable streambanks along all surveyed streams.

Floodplain connectivity indicator – *At Risk*. Baseline: Upper Rogue River above Galice WA (USFS 1995), Burned Timber Creek SS (USFS 1998), China Creek SS (USFS 1998), Dutcher Creek SS (USFS 2010), Limpy Creek SS (SRG 2010), Lone Tree Creek SS (USFS 1998), Minnow Creek SS (USFS 1998), Shan Creek SS (SRG 2011), South Fork Galice Creek SS (SRG 2011), South Fork Taylor Creek SS (USFS 1998), Taylor Creek SS (USFS 1998), West Fork Taylor Creek (USFS 1998).

There are no prominent low gradient areas with expansive floodplains on NFS lands within the watershed. Streams tend to be moderately confined to confined and constrained by hillslopes or terraces. Forest Road 25 constricts Taylor Creek. This road system has appreciably reduced the width of the active floodplain, and likely limited the development of off-channel habitats.

4) Flow/hydrology pathway – Hellgate Canyon-Rogue River watershed

Change in peak/base flow indicator – At Risk. Baseline: Upper Rogue River above Galice WA (USFS 1995).

Past federal management of this watershed has had effects on summer and winter stream flows. Timber harvest has occurred throughout the watershed on both public and private lands. The road systems that facilitated this harvest have altered natural flow patterns. However, it is unknown to what extent this management history has altered stream flows.

Increase in drainage network indicator – At Risk. Baseline: Upper Rogue River above Galice WA (USFS 1995).

On NFS lands, the major drainages (South Fork Galice Creek, Taylor Creek, Pickett Creek, Shan Creek, Limpy Creek, and Dutcher Creek) contain appreciable road systems. These roads were primarily constructed to facilitate timber harvest. On private land, particularly industrial timber land, road densities are higher than on public land.

5) Watershed conditions pathway – Hellgate Canyon-Rogue River watershed

Road density and location indicator – *At Risk*. Baseline: Upper Rogue River above Galice WA (USFS 1995).

Several of the drainages on NFS lands have road corridors within the valley bottoms, most notably Taylor Creek and Galice Creek. This road location has caused straightening and steepening of the associated stream courses.

Disturbance history indicator - *At Risk*. Baseline: Upper Rogue River above Galice WA (USFS 1995).

Human activities have altered watershed processes and functions throughout the watershed. Timber harvest, roads, and mining are the primary disturbance activities.

Riparian Reserves indicator – *At Risk*. Baseline: Upper Rogue River above Galice WA (USFS 1995) and NWFP (USFS and BLM 1994).

On NFS lands, past timber harvest did occur in some riparian areas. Road construction along streams has also reduced riparian vegetation condition and extent. Since the mid-1990s, Riparian Reserves on NFS lands have been managed in accordance to the NWFP. As a result, the condition of riparian habitats on NFS lands is improving.

Disturbance regime indicator – *At Risk*. Baseline: Upper Rogue River above Galice WA (USFS 1995).

Timber harvest and road development have altered flow patterns and vegetation in many drainages within the watershed. Widespread historic mining has occurred within the watershed.

b. Lower Applegate River watershed

Watershed overview – Lower Applegate River

The Lower Applegate River watershed (90,605 acres) is located in the Klamath Mountains Physiographic Province in Southwestern Oregon within the Applegate River 4th field subbasin, which is 491,520 acres in size. Annual average precipitation is approximately 50 inches. The Lower Applegate 5th Field watershed has no priority subwatersheds. A segment of Slate Creek and its tributaries, Waters, and Butcherknife Creeks are located within the Lower Applegate River watershed on NFS lands. The ownership distribution in the watershed encompasses: USFS 14%, BLM 30%, State lands <1% and the remaining 56% is in private ownership (Table 111).

Table 111. Watershed area and ownership distribution - Lower Applegate River watershed

Land Ownership	Acres	Ownership (percent)
USFS	12,411	14
BLM	26,862	30
State	187	<1
Private	51,145	56
Total	**90,605**	**100**

Prevalent land uses

- Federal – timber production, mining, and recreation
- Private – timber production, agriculture, rural residential development, and mining

Anthropomorphic alterations to habitat. European settlers cleared floodplains, trapped beavers, drained wetlands, and channelized streams to facilitate rural development and agriculture. Timber harvest began in the late 1800’s and increased up to and through the 1980’s. Small-scale mining (e.g. prospecting) within the watershed began around 1850. One notable large private inholding in the RRS within the watershed is the Buckeye mine (Copper), which was patented in 1918. This land is now owned by Josephine County and is managed as NFS lands for timber production.

Suction dredging and high banking activity summary. There were four active filed placer claims as of 5/8/2013 within the Lower Applegate River watershed. No suction dredge NOI were received by the RRS during the four-year period from 2009-2012 in the watershed on NFS land located within ¼ mile of CCH (Table 4 and Figure 27). There are no mineral withdrawn areas within the watershed.

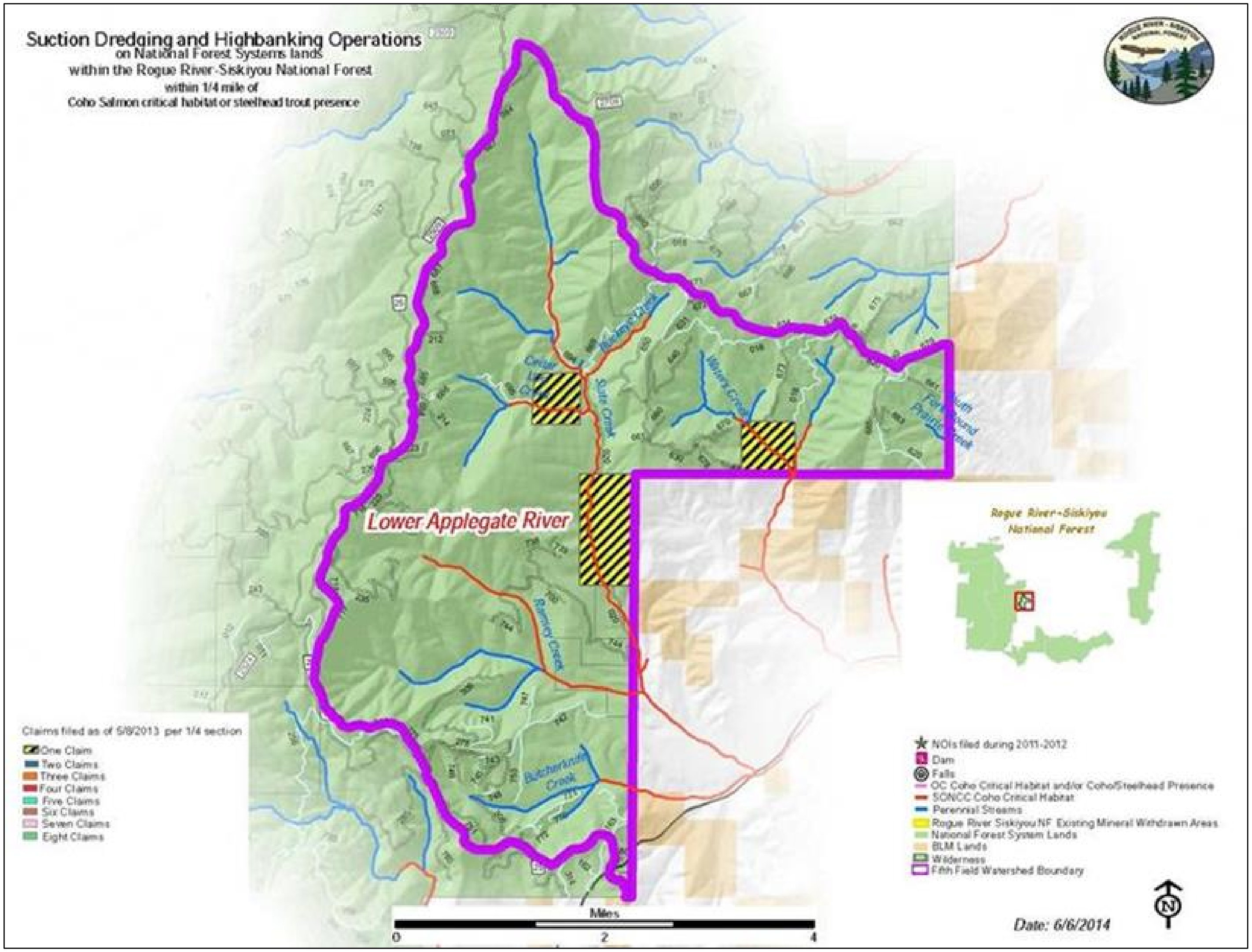

Figure 27. CCH with NOI and mining claims within 1/4 mile of CCH on NFS lands – Lower Applegate River watershed

Watershed population overview – Lower Applegate River

The Lower Applegate River watershed Coho Salmon population is part of the greater Middle Rogue/Applegate subbasins population. There are approximately 81.3 miles of CCH within the watershed and 10.1 miles on NFS lands (Figure 27 and Table 112). Within the watershed, factors limiting salmonid production include: low summer stream flows, high water temperatures, erosion, lack of instream large wood, lack of complex rearing habitat, channelized stream segments, and migration barriers. The watershed consists primarily of high and medium IP within the *spawning/rearing* habitat use type, mostly located off NFS lands (Table 113).

Table 112. Salmonid species and habitat length – Lower Applegate River watershed

Water-shed Acres	Anadro-mous Species Present[1]	NFS lands Miles of CCH (miles)[2]	NFS lands Miles of Chinook Habitat (miles)[3]	Water-shed CCH and EFH (miles)[4]	Watershed Potential Miles of Coho Salmon Habitat Type[5]		
					Spawning/ Rearing	Rearing/ Migration	Migration only
90,604	CO, CH, ST	10.1	0.8	81.3	81.3	0	0

[1] All, or a portion of, the waterbody supports the following anadromous salmonids: ST- steelhead trout; CO- Coho Salmon; CH - Chinook Salmon.

[2] Steelhead presence surveys were used to determine historic Coho Salmon habitat since CCH was not spatially delineated in the Federal Register 50 CFR Part 226. Values based on GIS data layer entitled RRS 2013 Total Salmon and Steelhead Distribution and field knowledge.

[3] Values based on GIS data layer entitled 2013 RRS Anadromous Salmonid Fish Distribution; Chinook Salmon presence survey layer.

[4] Values based on a combination of RRS 2013 SONCC Coho Salmon delineated CH 19 and ODFW steelhead presence survey data 2013 GIS map (as a surrogate for historic Coho Salmon habitat) website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[5] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

Table 113. Habitat typing and intrinsic potential within CCH – Lower Applegate River watershed

Habitat Typing[1]	Intrinsic Potential[2] (miles)						Total (miles) CCN/IP/HT	
	High IP		Medium IP		Low IP			
	Water-shed	NFS lands	Water-shed	NFS lands	Water-shed	NFS lands	Water-shed	NFS lands
Spawning/rearing	29.8	0	34.9	4.6	16.6	5.5	81.3	10.1
Rearing/migration	0	0	0	0	0	0	0	0
Migration only	0	0	0	0	0	0	0	0
Total	**29.8**	**0**	**34.9**	**4.6**	**16.6**	**5.5**	**81.3**	**10.1**

[1] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[2] Values based on an intrinsic potential map derived from the NETMAP CLAMS data and also located http://www.fsl.orst.edu/clams/. Category for ranking were derived from the final SONCC Coho Salmon Recovery Plan (NMFS 2014); high =>/= 0.66, moderate = </=0.33 – 0.66 and low = <0.33.

Watershed habitat indicators – Lower Applegate River

1) Water quality pathway - Lower Applegate River watershed

Temperature indicator – *Not Properly Functioning*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010), Applegate Subbasin TMDL and WQMP (ODEQ 2004), Cheney/Slate WA (BLM 1996) and NWFP (USFS and BLM 1994).

Waters Creek on NFS lands (1.89 miles; mile marker 2.4 to 4.3 miles) is listed as water quality limited due to elevated summer water temperature. No other streams are listed on NFS lands. There is an approved TMDL and Water Quality Management Plan in place for the Applegate subbasin, which addresses water temperature. Management of the NFS lands within the Lower Applegate River watershed is guided by the RRS LRMP and the NWFP. The aquatic and riparian standards and guidelines contained within these documents, particularly the Aquatic Conservation Strategy within the NWFP, are designed to provide for recovery and maintenance of cool/cold water thermal regimes within streams on NFS lands. Appendix B displays the 2010 303(d) list for streams within NFS lands on RRS.

Suspended sediment–intergravel/DO/turbidity indicator – *At Risk*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010), Applegate Subbasin TMDL and WQMP (ODEQ 2004) and Cheney/Slate WA (BLM 1996).

No streams in the watershed within the RRS are listed for sediment on the 303(d) list. Sediment input into stream channels on NFS lands has been primarily associated with past timber harvest and road systems. Streams on NFS lands tend to be higher gradient than downstream private land reaches, and stream substrates are dominated by cobbles and gravel.

Chemical contamination/nutrients indicator – *Properly Functioning*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010), Applegate Subbasin TMDL and WQMP (ODEQ 2004) and Cheney/Slate WA (BLM 1996).

No streams in the watershed within the RRS are on the 303(d) list for contaminants or excessive nutrients. The lack of human development within and immediately adjacent to NFS lands within the watershed limits the risk of chemical contamination and nutrient loading within the Butcherknife, Slate, and Waters Creeks drainages.

2) Habitat access/elements pathway - Lower Applegate River watershed

Physical barriers indicator – *At Risk*. Baseline: Butcherknife Creek SS (USFS 1993, 1999), Slate Creek SS (USFS 1991, 1999), Waters Creek SS (1992, 2001) and Ramsey Creek SS (USFS 1999).

There are no physical barriers to fish on NFS lands within the watershed. There is a culvert on RRS Road 2200 that may slow upstream movement of Coho Salmon. However, it has been retrofitted with baffles and is not considered a fish barrier.

Substrate/embeddedness indicator – *At Risk*. Baseline: Butcherknife Creek SS (USFS 1993, 1999), Slate Creek SS (USFS 1991, 1999), Waters Creek SS (1992, 2001), Cedar Log Creek SS (USFS 1991, 1999) and Ramsey Creek SS (USFS 1999).

Stream surveys in Slate, Ramsey, Cedar Log, Butcherknife, and Waters Creeks found streambeds dominated by cobble and gravel, with limited amounts of deposition and embeddedness. Stream reaches on NFS lands tend to be higher gradient than downstream private land stream reaches, and are predominately transport reaches.

Large wood indicator – *Not Properly Functioning*. Baseline: Cheney/Slate WA (BLM 1996), Butcherknife Creek SS (USFS 1993, 1999), Slate Creek SS (USFS 1991, 1999), Waters Creek SS (1992, 2001), Cedar Log Creek SS (USFS 1991, 1999) and Ramsey Creek SS (USFS 1999).

Large wood levels in streams within the Lower Applegate River watershed are low and below the expected range of natural variation in reaches accessible by or near roads. Large wood structures (mainly V weirs) have been placed in Slate Creek and Waters Creek on NFS lands, and where present comprise the majority of instream wood. Additionally, some large wood placement has occurred within the Cheney Creek drainage on both BLM and private lands. Where present, large wood provides for habitat complexity.

Pool frequency and quality indicator –*Not Properly Functioning*. Baseline: Butcherknife Creek SS (USFS 1993, 1999), Slate Creek SS (USFS 1991, 1999), Waters Creek SS (1992, 2001), Cedar Log Creek SS (USFS 1991, 1999) and Ramsey Creek SS (USFS 1999).

The dearth of large wood within many of the stream reaches on NFS lands within the watershed contributes to instream habitat conditions that are less complex than optimal. Large wood is the primary causal mechanism in low gradient streams to create complex and frequent pools. These pools and large wood also create off-channel habitat and refuge for salmonids. Table 114 summarizes pool habitat conditions on streams surveyed (using USFS R6 Level II survey protocol) on NFS lands in the watershed.

Table 114. Habitat percent and pool summary for surveyed streams – Lower Applegate River watershed

Stream Name	Year Survey-ed	Habitat % Pool	Habitat % Riffle	Pools/ Mile	Deep Pools/mile (>3ft)	Avg. Residual Pool Depth (ft)	Average Bankfull Width (ft)
Butcherknife Creek	1999	29.2	70.2	72.7	0	0.8	8.8
Cedar Log Creek	1999	17.7	80.0	56.8	0	1.4	12.8
Ramsey Creek	1999	14.7	84.3	26.7	1.4	1.5	16.3
Slate Creek	1999	27.5	70.2	44.1	2.8	1.7	21.5
Waters Creek	1999	26.5	72.5	58.4	0.7	1.1	10.3

Off-channel habitat indicator – *At Risk*. Baseline: Cheney/Slate WA (BLM 1996), Butcherknife Creek SS (USFS 1993, 1999), Slate Creek SS (USFS 1991, 1999), Waters Creek SS (1992, 2001), Cedar Log Creek SS (USFS 1991, 1999) and Ramsey Creek SS (USFS 1999).

Stream channels on NFS lands tend to have steeper gradients than valley bottom segments on downstream private land. In general, streams on NFS lands are moderately entrenched and/or confined by topography. Side channels are not a common feature in any fish bearing streams on NFS lands, due to the natural topography, and to a lesser degree because of road development.

Refugia indicator – *At Risk*. Baseline: Cheney/Slate WA (BLM 1996), Butcherknife Creek SS (USFS 1993, 1999), Slate Creek SS (USFS 1991, 1999), Waters Creek SS (1992, 2001), Cedar Log Creek SS (USFS 1991, 1999) and Ramsey Creek SS (USFS 1999).

Due to its headwater location, habitats on NFS lands may represent some of the best habitat within the watershed. Therefore, accessible stream reaches on NFS lands may function as refugia for other portions of the watershed.

3) Channel condition and dynamics pathway - Lower Applegate River watershed

Bankfull width depth ratio/ channel widening indicator - *At Risk*. Baseline: Cheney/Slate WA (BLM 1996), Butcherknife Creek SS (USFS 1993, 1999), Slate Creek SS (USFS 1991, 1999), Waters Creek SS (1992, 2001), Cedar Log Creek SS (USFS 1991, 1999), Ramsey Creek SS (USFS 1999) and NWFP (USFS and BLM 1994).

In general, streams within the watershed are confined, even in lower gradient reaches. It is unknown to what extent historic land use (e.g. timber harvest, roads) on NFS lands altered the bankfull channel dimensions within the watershed. Since the mid-1990s, riparian management under the NWFP has emphasized maintenance of habitat for fish and other aquatic resources. Consequently, instream habitat, including bankfull width/depth conditions, are improving on NFS lands. Downstream of NFS lands on private land, historic channelization and alteration of floodplains are well documented.

Streambank condition indicator – *Proper Functioning Condition*. Baseline: Butcherknife Creek SS (USFS 1993, 1999), Slate Creek SS (USFS 1991, 1999), Waters Creek SS (1992, 2001), Cedar Log Creek SS (USFS 1991, 1999) and Ramsey Creek SS (USFS 1999).

Data collected during stream surveys on NFS lands (Butcherknife Creek, Cedar Log Creek, Ramsey Creek, Slate Creek, and Waters Creek, documented stable streambanks along all streams.

Floodplain connectivity indicator – *At Risk*. Baseline: Butcherknife Creek SS (USFS 1993, 1999), Slate Creek SS (USFS 1991, 1999), Waters Creek SS (1992, 2001), Cedar Log Creek SS (USFS 1991, 1999) and Ramsey Creek SS (USFS 1999).

There are no prominent low gradient areas with expansive floodplains on NFS lands within the watershed. Streams tend to be moderately confined to confined and constrained by hillslopes or terraces. In Waters Creek and Slate Creek, there are stream reaches with wider valley widths (~200 feet), though the stream channels in these areas tend to be incised, with limited ability to engage floodplain features.

4) Flow/hydrology pathway - Lower Applegate River watershed

Change in peak/base flow indicator – *At Risk*. Baseline: Cheney/Slate WA (BLM 1996), Applegate River WA (ARWC 1994).

Timber harvest and roads can affect stream flow by intercepting water and transporting it to stream channels more rapidly than natural processes.

Increase in drainage network indicator – *At Risk*. Baseline: Cheney/Slate WA (BLM 1996), Applegate River WA (ARWC 1994).

On NFS lands, the major drainages (Slate Creek, Butcherknife Creek and Waters Creek) contain appreciable road systems. These roads were primarily constructed to facilitate timber harvest. On private land, particularly industrial timber land, road densities are higher than on public land.

5) Watershed conditions pathway – Lower Applegate River watershed

Road density and location indicator – *At Risk*. Baseline: Cheney/Slate WA (BLM 1996).

The average road density on NFS lands is 1.05 miles per square mile. There are roads in the valley bottom of both the Waters Creek and Slate Creek drainages on NFS lands. Many natural surfaced road systems are built on private lands, which are a major source of erosion and sedimentation into streams. There are approximately 6 miles of road per square mile on private lands. US Highway 199 bisects much of the watershed, and is located immediately adjacent to lower portions of Slate Creek.

Disturbance history indicator - *At Risk*. Baseline: Cheney/Slate WA (BLM 1996).

Human activities have altered watershed processes and functions throughout the watershed. Timber harvest, roads, and mining (primarily rock quarry and hard rock) are the primary disturbance activities.

Riparian Reserves indicator – *At Risk*. Baseline: Cheney/Slate WA (BLM 1996), Butcherknife Creek SS (USFS 1993, 1999), Slate Creek SS (USFS 1991, 1999), Waters Creek SS (1992, 2001), Cedar Log Creek SS (USFS 1991, 1999) and Ramsey Creek SS (USFS 1999).

Riparian areas have been fully harvested on private lands. On NFS lands, past timber harvest did occur in some riparian areas. Road construction along streams has also reduced riparian vegetation condition and extent.

Disturbance regime indicator – *At Risk*. Baseline: Cheney/Slate WA (BLM 1996).

Timber harvest and road development have altered flow patterns and vegetation in many drainages within the watershed. A limited amount of historic mining has occurred within the watershed.

c. Middle Applegate River watershed

Watershed overview - Middle Applegate River

The Middle Applegate River extends from the confluence of Williams Creek and the Applegate River upstream to the Little Applegate River confluence, and includes the mainstem Applegate River and all tributaries in between. Within the watershed, instream habitat complexity is simplified compared to historic conditions. Instream structure provided by large wood is lacking, and riparian canopy cover provides inadequate stream shading that contributes to elevated stream temperatures. This condition is exacerbated by agricultural water withdrawals and low summer stream flows. NFS lands within the watershed are only found in the extreme headwaters of Thompson Creek. The ownership distribution in the watershed encompasses: USFS 3%, BLM 56%, State lands <1% and the remaining 41% is in private ownership (Table 115).

Table 115. Watershed area and ownership distribution - Middle Applegate River watershed

Land Ownership	Acres	Ownership (percent)
USFS	2,196	3
BLM	46,655	56
State	198	<1
Private	33,554	41
Total	**82,603**	**100**

Prevalent land uses

- Federal – timber production, mining, recreation, and grazing
- Private – timber production, agriculture, rural residential development, mining, and grazing

Anthropomorphic alterations to habitat. European settlers cleared floodplains, trapped beavers, drained wetlands, and channelized streams to facilitate rural development and agriculture. Logging within the watershed was fairly small scale prior to World War II. The post-war housing boom stimulated an enormous amount of timber production in Southern Oregon, including within the Middle Applegate River watershed. Small-scale mining within the watershed began around 1850. Drainages mined within the watershed were Forest, Poorman, Humbug, Thompson, and Keeler Creeks. Additionally, numerous lode claims are located within the watershed. Beginning in the 1970s and continuing to the present, there has been a distinct transition from large farms and ranches to smaller "hobby" farms associated with rural residential development.

Suction dredging and high banking activity summary. There was one active filed claim as of 5/8/2013 within the Middle Applegate River watershed. There were no suction dredge NOI received by the RRS during the four-year period from 2009-2012 in the watershed on NFS land located within 1/4 mile of CCH (Table 4 and Figure 28). There are no mineral withdrawn areas within the watershed.

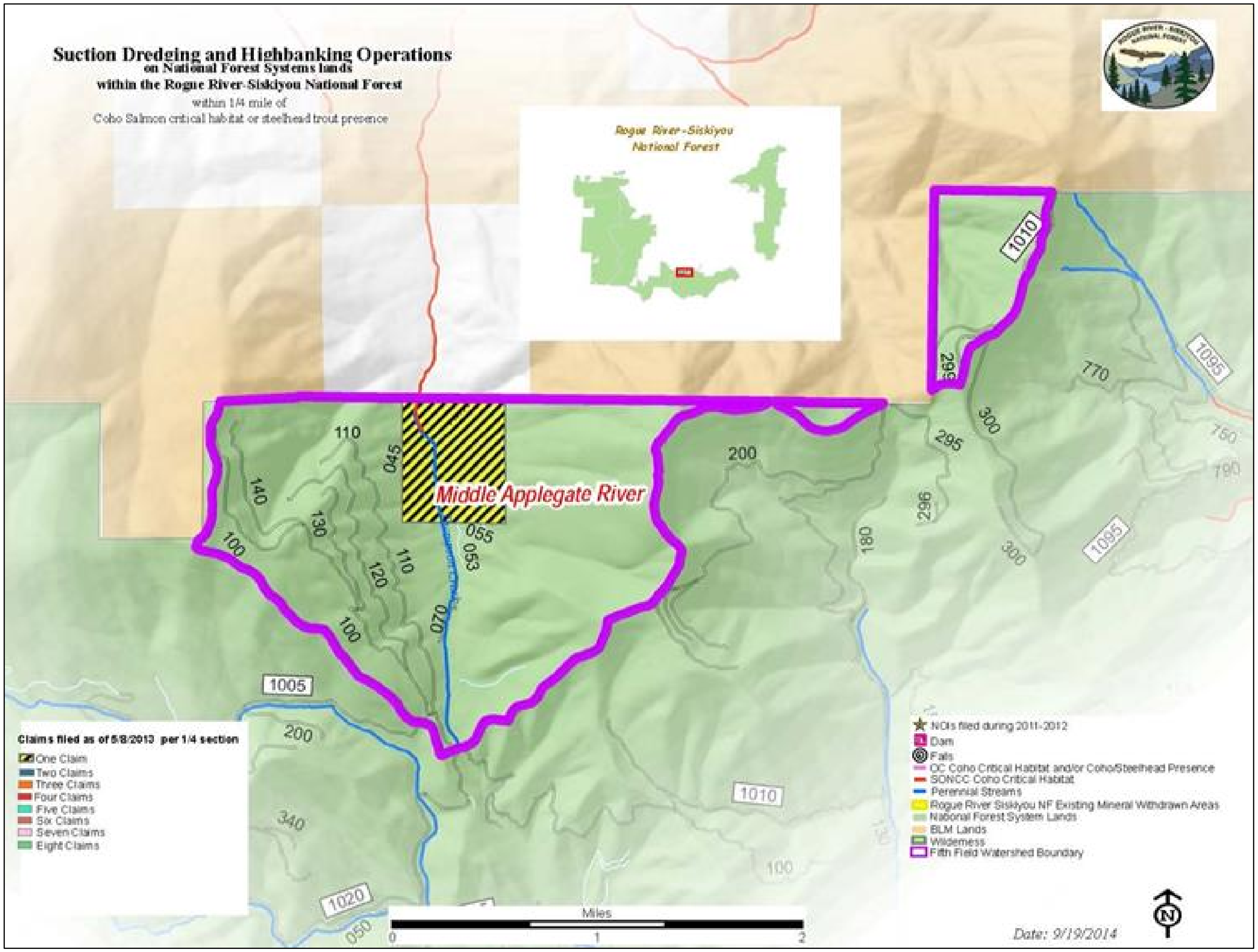

Figure 28. CCH with NOI and mining claims within 1/4 mile of CCH on NFS lands – Middle Applegate River watershed

Watershed population overview – Middle Applegate River

The Middle Applegate River watershed Coho Salmon population is part of the greater Middle Rogue/Applegate subbasins population. There are approximately 43.3 miles of CCH within the watershed and no miles on NFS lands (Figure 28 and Table 116). The watershed has a mixture of mostly high and medium IP (Table 117).

Table 116. Salmonid species and habitat length – Middle Applegate River watershed

Water-shed Acres	Anadro-mous Species Present[1]	NFS lands Miles of CCH (miles)[2]	NFS lands Miles of Chinook Habitat (miles)[3]	Water-shed CCH and EFH (miles)[4]	Watershed Potential Miles of Coho Salmon Habitat Type[5]		
					Spawning/ Rearing	Rearing/ Migration	Migration only
82,603	CO, CH, ST	0.2	0	43.3	43.3	0	0

[1] All, or a portion of, the waterbody supports the following anadromous salmonids: ST- steelhead trout; CO- Coho Salmon; CH - Chinook Salmon.

[2] Steelhead presence surveys were used to determine historic Coho Salmon habitat since CCH was not spatially delineated in the Federal Register 50 CFR Part 226. Values based on GIS data layer entitled RRS 2013 Total Salmon and Steelhead Distribution and field knowledge.

[3] Values based on GIS data layer entitled 2013 RRS Anadromous Salmonid Fish Distribution; Chinook Salmon presence survey layer.

[4] Values based on a combination of RRS 2013 SONCC Coho Salmon delineated CH 19 and ODFW steelhead presence survey data 2013 GIS map (as a surrogate for historic Coho Salmon habitat) website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[5] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

Table 117. Habitat typing and intrinsic potential within CCH – Middle Applegate watershed

Habitat Typing[1]	Intrinsic Potential[2] (miles)						Total (miles) CCN/IP/HT	
	High IP		Medium IP		Low IP			
	Water-shed	NFS lands	Water-shed	NFS lands	Water-shed	NFS lands	Water-shed	NFS lands
Spawning/rearing	15.6	0	18.4	0	9.3	0.2	43.3	0.2
Rearing/migration	0	0	0	0	0	0	0	0
Migration only	0	0	0	0	0	0	0	0
Total	**15.6**	**0**	**18.4**	**0**	**9.3**	**0.2**	**43.3**	**0.2**

[1] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[2] Values based on an intrinsic potential map derived from the NETMAP CLAMS data and also located http://www.fsl.orst.edu/clams/. Category for ranking were derived from the final SONCC Coho Salmon Recovery Plan (NMFS 2014); high =>/= 0.66, moderate = </=0.33 – 0.66 and low = <0.33.

Watershed habitat indicators – Middle Applegate River

1) Water quality pathway - Middle Applegate River watershed

Temperature indicator – *At Risk*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010), Applegate Subbasin TMDL and WQMP (ODEQ 2004), Middle Applegate WA (BLM 1995) and NWFP (USFS and BLM 1994) .

No streams in the watershed within the RRS are listed for temperature on the 303(d) list. There is an approved TMDL and WQMP in place for the Applegate subbasin, which addresses water temperature (ODEQ 2004). Management of the NFS lands within the Middle Applegate River watershed is guided by the Rogue River NF LRMP and NWFP. The aquatic and riparian standards and guidelines contained within these documents, particularly the Aquatic Conservation Strategy within the NWFP, are designed to provide for recovery and maintenance of cool/cold water thermal regimes within streams on NFS lands. Many factors contribute to elevated stream temperatures in the Middle Applegate watershed off NFS lands. Low summer stream flows combined with hot summer air temperatures result in stream temperatures that can stress aquatic biota. Low gradient valley bottoms, lack of riparian vegetation, and high channel width-to-depth ratios are additional conditions that contribute to this thermal regime off NFS lands.

Suspended sediment–intergravel/DO/turbidity indicator – *At Risk*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010), Applegate Subbasin TMDL and WQMP (ODEQ 2004), and Middle Applegate WA (BLM 1995).

Sediment input into stream channels on NFS lands has been primarily associated with past timber harvest and road systems. Streams on NFS lands tend to be higher gradient than downstream private land reaches, and stream substrates are dominated by cobbles and gravel. No streams within the watershed have been listed as water quality limited for sedimentation.

Chemical contamination/nutrients indicator – *Properly Functioning*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010), Applegate Subbasin TMDL and WQMP (ODEQ 2004), and Middle Applegate WA (BLM 1995).

No streams within the Middle Applegate River watershed are listed for chemical contaminants or excessive nutrients. The lack of human development within and immediately adjacent to NFS lands within the watershed limits the risk of chemical contamination and nutrient loading within the upper Thompson Creek drainage.

2) Habitat access/elements pathway - Middle Applegate River watershed

Physical barriers indicator – *At Risk*. Baseline: Middle Applegate WA (BLM 1995) and Thompson Creek SS (SRG 2010).

There is a 7 foot waterfall in Thompson Creek approximately 0.15 miles upstream from the Forest Boundary. It is a natural passage barrier to all species of fish. Downstream of NFS lands in Thompson Creek, there are several seasonal diversion dams (e.g. push up dams) that are constructed annually during the summer irrigation season.

Substrate/embeddedness indicator – *At Risk*. Baseline: Middle Applegate WA (BLM 1995) and Thompson Creek SS (SRG 2010).

A stream survey on upper Thompson Creek in 2010 found the streambed dominated by cobble and gravel. Pool habitat tended to contain copious amounts of gravel and sand/silt. Stream reaches on NFS lands tend to be higher gradient than downstream private land stream reaches, and are predominately transport reaches.

Large wood indicator – *Not Properly Functioning*. Baseline: Applegate River WA (APWC 1994), Middle Applegate WA (BLM 1995) and Thompson Creek SS (SRG 2010).

Large wood levels in streams within the Middle Applegate River watershed are low and below the expected range of natural variation in reaches accessible by or near roads. A 2010 stream survey on upper Thompson Creek noted only moderate amounts of small size class (~12" dbh) wood and essentially no larger size classes.

Pool frequency and quality indicator – *Not Properly Functioning*. Baseline: Thompson Creek SS (SRG 2010).

The dearth of large wood within many of the stream reaches on NFS lands within the watershed contributes to instream habitat conditions that are less complex than optimal.

Pools within upper Thompson Creek tend to be small and shallow, with appreciable amounts of deposited gravel and sand/silt. This finer bed material likely originated within downcut channel segments in the extreme headwaters of the stream. The small drainage area on NFS lands likely does not provide sufficient stream flow and power to form and maintain deeper pool habitats.

Table 118 summarizes pool habitat conditions on streams surveyed (using USFS R6 Level II survey protocol) on NFS lands in the watershed.

Table 118. Habitat percent and pool summary for surveyed streams – Middle Applegate River watershed

Stream Name	Year Survey-ed	Habitat % Pool	Habitat % Riffle	Pools/ Mile	Deep Pools/mile (>3ft)	Avg. Residual Pool Depth (ft)	Average Bankfull Width (ft)
Thompson Creek	2010	14.0	85.4	37.8	0.5	1.1	12.2

Off-channel habitat indicator – Not Properly Functioning. Baseline: Thompson Creek SS (SRG 2010).

Side channels are not a common feature on upper Thompson Creek on NFS lands due to the natural topography and channel gradient.

Refugia indicator – Not Properly Functioning. Baseline: Middle Applegate River WA (BLM 1995) and Thompson Creek SS (SRG 2010).

Fish bearing habitat on NFS lands is small and shallow and provides a limited amount of suitable habitat for fish. Due to the size of Thompson Creek on NFS lands and the lack of tributary streams, it offers essentially no suitable refugia for fish within the watershed.

1) Channel condition and dynamics pathway - Middle Applegate River watershed

Bankfull width depth ratio/ channel widening indicator - *At Risk*. Baseline: Middle Applegate River WA (BLM 1995), Thompson Creek SS (SRG 2010) and NWFP (USFS and BLM 1994).

Thompson Creek (on NFS lands) is located within an incised moderately sloped V-shaped canyon. It is unknown to what extent historic land use (e.g. timber harvest, roads) on NFS lands altered the bankfull channel dimensions within the watershed. Since the mid-1990s, riparian management under the NWFP has emphasized maintenance of habitat for fish and other aquatic resources. Consequently, instream habitat, including bankfull width/depth conditions, are improving on NFS lands. Downstream of NFS lands on private land, historic channelization and alteration of floodplains are well documented.

Streambank condition indicator – *At Risk*. Baseline: Thompson Creek SS (SRG 2010).

Data collected during a 2010 stream survey on upper Thompson Creek documented approximately 10% bank instability.

Floodplain connectivity indicator – *At Risk*. Baseline: Thompson Creek SS (SRG 2010).

There are no prominent low gradient areas with expansive floodplains on NFS lands within the watershed. Upper Thompson Creek tends to be moderately confined to confined and constrained by hillslopes or terraces.

4) Flow/hydrology pathway - Middle Applegate River watershed

Change in peak/base flow indicator – *At Risk*. Baseline: Middle Applegate River WA (BLM 1995).

Timber harvest and roads can affect stream flow by intercepting water and transporting it to stream channels more rapidly than natural processes. The combined effects of these disturbances within the Middle Applegate watershed are unknown. However, the majority of the watershed is located outside of the transient snow zone, which helps to attenuate effects to peak flows. Water withdrawals for private use reduce base flow volumes within the watershed.

Increase in drainage network indicator – *At Risk*. Baseline: Applegate River WA (ARWC 1994) and Middle Applegate WA (BLM 1995).

On NFS lands, the upper Thompson Creek drainage contains multiple roads, most notably a RRS road that is located immediately east of the stream. Other roads located to the west of the stream were constructed to facilitate timber harvest. On private land, particularly industrial timber land, road densities are higher than on public land.

5) Watershed conditions pathway – Middle Applegate River watershed

Road density and location indicator – *At Risk*. Baseline: Middle Applegate WA (BLM 1995).

RRS road 10 is a valley bottom road in upper Thompson Creek. There are multiple mid-slope roads located to the west of the upper Thompson Creek.

Disturbance history indicator - *At Risk*. Baseline: Middle Applegate River WA (BLM 1995).

Human activities have altered watershed processes and functions throughout the watershed. Timber harvest, roads, and mining are the primary disturbance activities.

Riparian Reserves indicator – *At Risk*. Baseline: Middle Applegate WA (BLM 1995) and Thompson Creek SS (SRG 2010).

Riparian areas have been fully harvested on private lands. On NFS lands, past timber harvest did occur in some riparian areas. Road construction along streams has also reduced riparian vegetation condition and extent.

Disturbance regime indicator – *At Risk*. Baseline: Middle Applegate River WA (BLM 1995).

Timber harvest, road development, and agriculture have altered flow patterns and vegetation in many drainages within the watershed.

d. Shasta Costa Creek-Rogue River watershed

Watershed overview – Shasta Costa Creek-Rogue River

The Shasta Costa watershed has been designated a Key Watershed by the 1994 NWFP Record of Decision (ROD) (USFS and BLM 1994a). The watershed is located in the Siskiyou Mountains of eastern Curry County, Oregon. Shasta Costa Creek originates from Bear Camp Mountain and drains a subwatershed area of 23,500 acres before joining the Rogue River approximately 30 miles east of the Pacific Ocean. The Shasta Costa Creek watershed contains a very low road density and contains the Rogue River. The pinnately shaped watershed is located within an elevation range between 200 feet and 4,900 feet and receives an annual average of over 110 inches of precipitation. Approximately 36% of the watershed is located within the transient snow zone between 2,500 feet and 4,000 feet in elevation and can receive moisture as either rain or snow. Rain on snow events can concentrate runoff and increase the size of a flood event. The watershed is mostly managed by the Gold Beach Ranger District of the RRS, with the exception of ~4% of privately and state owned land (Table 119).

Table 119. Watershed area and ownership distribution – Shasta Costa-Rogue River watershed

Land Ownership	Acres	Ownership (percent)
USFS	43,163	96
State	212	<1
Private	1,651	4
Total	**45,026**	**100**

Prevalent land uses

- Federal – recreation, fishing, and timber harvest
- Private – residential, and some small scale agriculture and industrial timber lands

Anthropomorphic alterations to habitat. Settlers cleared forests in small patches for agriculture and grazing of livestock in the mid-19th century. Considerable burning was done by aboriginal peoples and early settlers, which ceased around the turn of the century. Timber harvest has occurred on both private and public lands and road development is extensive on the north side of the river in the subwatersheds; no roads exist near the stream. Over 90% of the public lands in the watershed are now in the Late Successional Reserve allocation under the NWFP (USFS and BLM 1994).

Suction dredging and high banking activity summary. There are no recommendations or opportunities for management of suction dredging stated in the Rogue River-Marial to Agness WA (USFS 2000). The Shasta Costa Creek-Rogue River watershed within the Lower Rogue subbasin on NFS lands had no active filed claims as of 5/8/2013. There were no suction dredge NOI received by the RRS during the four-year period from 2009-2012 on NFS land located within 1/4 mile of CCH (Table 4 and Figure 29).

The Rogue River was administratively withdrawn from mineral entry on September 10, 1958 by Public Land Order (PLO) 1726. The withdrawal extends to 1 mile on either side of the river for the protection and preservation of scenic and recreation areas adjacent to the river and its tributaries. There are 22.1 miles of CCH within the watershed and 10.5 miles of those miles are withdrawn from mineral entry. The IP value and habitat use typing for these withdrawn miles are displayed in Table 120. See Appendix A for a summary and locations of suction dredging and high banking mineral withdrawals on the RRS.

Table 120. IP and habitat typing in mineral withdrawn areas – Shasta Costa Creek watershed

	Intrinsic Potential[Error! Bookmark not defined.2] (miles)			
Habitat Typing[1]	**High**	**Medium**	**Low**	**Total (miles)**
Spawning/rearing	0	2.9	0.3	3.2
Rearing/migration	0	0	0	0
Migration only	1.3	5.6	0.4	7.3
Total	**1.3**	**8.5**	**0.7**	**10.5**

[1] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[2] Values based on an intrinsic potential map derived from the NETMAP CLAMS data and also located http://www.fsl.orst.edu/clams/. Category for ranking were derived from the final SONCC Coho Salmon Recovery Plan (NMFS 2014); high =>/= 0.66, moderate = </=0.33 – 0.66 and low = <0.33.

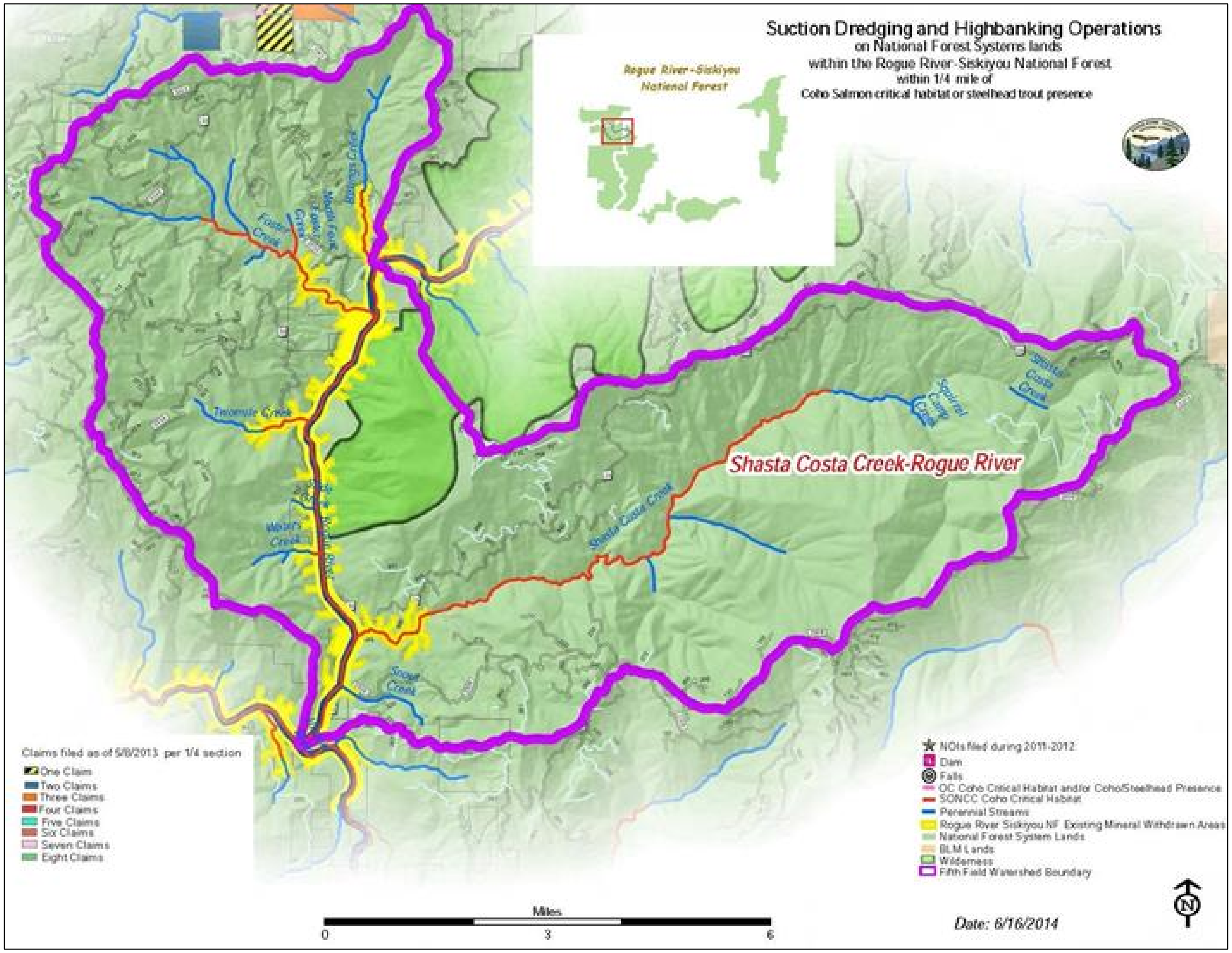

Figure 29. CCH with NOI and mining claims within 1/4 mile of CCH on NFS lands – Shasta Costa-Rogue River watershed

Watershed population overview – Shasta Costa Creek-Rogue River

The Shasta Costa Creek-Rogue River watershed Coho Salmon population is part of the greater Middle Rogue/Applegate Rivers population. There are approximately 22.1 miles of CCH within the watershed and all are within NFS lands (Figure 29 and Table 121).

Winter flows in the mainstem are believed to be too powerful to allow successful incubation of fish eggs in all but the very mildest of winters. The lower Rogue River is predominantly a canyon with short, steep tributaries. Few tributaries have well-developed habitat for salmonids. Characteristics of lower Rogue River salmonids within the watershed are: fish spawning here tend to enter the river at the end of the adult migration runs; juveniles enter the ocean earlier than upriver fish; and, in the ocean, they migrate south and stay close to shore (Rivers, 1991 and Meehan and Bjornn, 1991).

Shasta Costa Creek contains steelhead/rainbow trout, cutthroat trout, and sculpin as determined during snorkel surveys. Stream surveys have found Chinook Salmon in the lower 3.3 miles of Shasta Costa Creek (USFS, 1996). A 2000 stream survey found winter steelhead extending 9.45 miles upstream to where an anadromous fish barrier is located (USFS 2000). Above this feature Shasta Costa Creek contains a resident rainbow trout and cutthroat trout population. The watershed is predominately medium IP of the *spawning/rearing* and *migration only* habitat use types (Table 122).

Table 121. Salmonid species and habitat length - Shasta Costa Creek-Rogue River watershed

Water-shed Acres	Anadro-mous Species Present[1]	NFS lands Miles of CCH (miles)[2]	NFS lands Miles of Chinook Habitat (miles)[3]	Water-shed CCH and EFH (miles)[4]	Watershed Potential Miles of Coho Salmon Habitat Type[5]		
					Spawning/ Rearing	Rearing/ Migration	Migration only
45,026	CO, CH, ST	22.1	11.3	22.1	14.8	0	7.3

[1] All, or a portion of, the waterbody supports the following anadromous salmonids: ST- steelhead trout; CO- Coho Salmon; CH - Chinook Salmon.

[2] Steelhead presence surveys were used to determine historic Coho Salmon habitat since CCH was not spatially delineated in the Federal Register 50 CFR Part 226. Values based on GIS data layer entitled RRS 2013 Total Salmon and Steelhead Distribution and field knowledge.

[3] Values based on GIS data layer entitled 2013 RRS Anadromous Salmonid Fish Distribution; Chinook Salmon presence survey layer.

[4] Values based on a combination of RRS 2013 SONCC Coho Salmon delineated CH 19 and ODFW steelhead presence survey data 2013 GIS map (as a surrogate for historic Coho Salmon habitat) website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[5] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

Table 122. Habitat typing and intrinsic potential within CCH – Shasta Costa Creek-Rogue River watershed

Habitat Typing[1]	Intrinsic Potential[2] (miles)						Total (miles) CCN/IP/HT	
	High IP		Medium IP		Low IP			
	Water-shed	NFS lands	Water-shed	NFS lands	Water-shed	NFS lands	Water-shed	NFS lands
Spawning/rearing	0	0	10.2	10.2	4.6	4.6	14.8	14.8
Rearing/migration	0	0	0	0	0	0	0	0
Migration only	1.3	1.3	5.6	5.6	0.4	0.4	7.3	7.3
Total	**1.3**	**1.3**	**15.8**	**15.8**	**5.0**	**5.0**	**22.1**	**22.1**

[1] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[2] Values based on an intrinsic potential map derived from the NETMAP CLAMS data and also located http://www.fsl.orst.edu/clams/. Category for ranking were derived from the final SONCC Coho Salmon Recovery Plan (NMFS 2014); high =>/= 0.66, moderate = </=0.33 – 0.66 and low = <0.33.

Watershed habitat indicators – Shasta Costa-Rogue River

1) Water quality pathway - Shasta Costa Creek – Rogue River watershed

Temperature indicator – *At Risk*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010), Rogue River Basin TMDL (ODEQ 2008), Shasta Costa WA (USFS 1996) and Rogue River Marial to Agness WA (USFS 2000).

Table 123 displays the 303(d) list for water quality limited stream within the watershed on NFS lands. The mainstem Lower Rogue River is listed as temperature impaired on the Oregon 303(d) impaired water body list, and is included in the Rogue River TMDL (2008). The mainstem Rogue is warm during the summer months and reaches the high 70° F range. Shasta Costa and other tributaries have cool water habitats. Appendix B displays the 2010 303(d) list for streams within NFS lands on RRS.

Table 123. ODEQ, 2010 303(d) List for Oregon Waterbodies within NFS lands on RRS – Shasta Costa Creek-Rogue River watershed

Stream Name	Miles on RRS (miles)	River Mile Marker (miles)	Pollutant	Assess-ment	Assess-ment 2	Listing Status
Foster Creek	4.52	0 to 5.2	Temperature	2010	10/29/2010	Cat 4A: Water quality limited, TMDL approved
Rogue River	6.53	0 to 124.8	Temperature	2010	10/29/2010	Cat 4A: Water quality limited, TMDL approved
Shasta Costa Creek	13.08	0 to 13.4	Temperature	2010	10/29/2010	Cat 4A: Water quality limited, TMDL approved

Suspended sediment–intergravel DO/turbidity indicator- *At Risk*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010), Rogue River Basin TMDL (ODEQ 2008), Shasta Costa WA (USFS 1996) and Rogue River Marial to Agness WA (USFS 2000).

No streams in the watershed within the RRS are on the 303(d) list for sediment (Table 123). Past logging and road construction has not had lasting effects on turbidity. The turbidity levels in the Rogue River are probably above historic due to releases from Lost Creek Dam and general disturbance throughout the river basin.

Chemical contamination/nutrients indicator – *At Risk*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010), Rogue River Basin TMDL (ODEQ 2008), Shasta Costa WA (USFS 1996) and Rogue River Marial to Agness WA (USFS 2000).

No streams in the watershed within the RRS are on the 303(d) list for contaminants or excessive nutrients. More than one hundred fifty-thousand people live within the Rogue River basin and storm drains from the many municipalities plus agriculture runoff contribute to some contaminants reaching waterways. Local subwatersheds are functioning properly with few or no contaminants.

2) Habitat access/elements pathway - Shasta Costa Creek – Rogue River watershed

Physical barriers indicator – *Properly Functioning*. Baseline: Shasta Costa WA (USFS 1996), Rogue River Marial to Agness WA (USFS 2000), Shasta Costa SS (USFS 1994), Shasta Costa SS (SRG 2000), Foster Creek SS (USFS 1991, 1992).

There are no known human-caused fish barriers within the mainstem Rogue. Tributaries have no road crossings that are partial or whole barriers.

Substrate/embeddedness indicator – *At Risk*. Baseline: Shasta Costa WA (USFS 1996), Rogue River Marial to Agness WA (USFS 2000), Shasta Costa SS (USFS 1994), Shasta Costa SS (SRG 2000), Foster Creek SS (USFS 1991, 1992).

The mainstem Rogue River riverbed turns over during the typical high precipitation periods of winter. Some tributaries show periodic signs of local embeddedness, which often changes during winter storm events. Shasta Costa Creek flushes annually.

Large wood indicator – *Properly Functioning*. Baseline: Shasta Costa WA (USFS 1996), Rogue River Marial to Agness WA (USFS 2000), Shasta Costa SS (USFS 1994), Shasta Costa SS (SRG 2000), Foster Creek SS (USFS 1991, 1992).

The mainstem Rogue River rarely holds large wood through the winter in this section. Few roads are located near tributary streams and wood cleanout has not been widespread.

Pool frequency and quality indicator - *At Risk*. Baseline: Shasta Costa WA (USFS 1996), Rogue River Marial to Agness WA (USFS 2000), Shasta Costa SS (USFS 1994), Shasta Costa SS (SRG 2000), Foster Creek SS (USFS 1991, 1992).

The mainstem Rogue River is probably within the natural range of variability for pools. Some tributaries may have local pool filling from land management activities in the subwatershed or drainage.

Off-channel habitat indicator – *Properly Functioning*. Baseline: Shasta Costa WA (USFS 1996), Rogue River Marial to Agness WA (USFS 2000), Shasta Costa SS (USFS 1994), Shasta Costa SS (SRG 2000), Foster Creek SS (USFS 1991, 1992).

Off-channel habitats are rare in this constrained stream valley and in tributaries.

Refugia indicator – *Properly Functioning*. Baseline: Shasta Costa WA (USFS 1996), Rogue River Marial to Agness WA (USFS 2000), Shasta Costa SS (USFS 1994), Shasta Costa SS (SRG 2000), Foster Creek SS (USFS 1991, 1992).

Off-channel habitat is rare. Refugia for fish are principally associated with large boulders, substrate interstices habitats and cooler water at tributary confluences.

3) Channel condition and dynamics pathway - Shasta Costa Creek – Rogue River watershed

Average width/maximum depth ratio indicator - *At Risk*. Baseline: Shasta Costa WA (USFS 1996), Rogue River Marial to Agness WA (USFS 2000), Shasta Costa SS (USFS 1994), Shasta Costa SS (SRG 2000), Foster Creek SS (USFS 1991, 1992).

The mainstem Rogue River is probably within the natural range of variability because of bedrock controls and valley sidewalls. Constrained stream valleys of the tributaries are within the expected range of width/depth ratios.

Streambank condition indicator – *At Risk*. Baseline: Shasta Costa WA (USFS 1996), Rogue River Marial to Agness WA (USFS 2000), Shasta Costa SS (USFS 1994), Shasta Costa SS (SRG 2000), Foster Creek SS (USFS 1991, 1992).

Streambanks have been altered locally in the mainstem Rogue River to accommodate agriculture and residences. Tributaries are in good shape with little road access to stream channels.

Floodplain connectivity indicator - *At Risk*. Baseline: Shasta Costa WA (USFS 1996), Rogue River Marial to Agness WA (USFS 2000), Shasta Costa SS (USFS 1994), Shasta Costa SS (SRG 2000), Foster Creek SS (USFS 1991, 1992).

The watershed has constrained stream valleys with few developed floodplains.

4) Flow/hydrology pathway - Shasta Costa Creek – Rogue River watershed

Change in peak/base flow indicator – *At Risk*. Baseline: Shasta Costa WA (USFS 1996), Rogue River Marial to Agness WA (USFS 2000).

Timber harvest and road construction have affected peak flows in some tributaries. Flow changes affected by Lost Creek and Applegate Dam water releases have altered main river flows during all seasons. These two storage projects have somewhat offset the effects of water withdrawals from the river and tributaries upstream.

Increase in drainage network indicator – *At Risk*. Baseline: Shasta Costa WA (USFS 1996), Rogue River Marial to Agness WA (USFS 2000).

Most effects are detectable on tributaries where stream flow response to high rainfall may be altered somewhat.

5) Watershed conditions pathway – Shasta Costa Creek – Rogue River watershed

Road density and location indicator – *At Risk*. Baseline: Shasta Costa WA (USFS 1996), Rogue River Marial to Agness WA (USFS 2000).

Road densities are high locally in some tributary drainages north of the river. There are few valley bottom roads near fish streams due to the steep topography. Shasta Costa Creek is only lightly roaded with no valley bottom roads.

Disturbance history indicator – *At Risk*. Baseline: Shasta Costa WA (USFS 1996), Rogue River Marial to Agness WA (USFS 2000).

Timber harvest and road development have altered erosion processes in a few tributaries.

Riparian Reserves indicator – *At Risk*. Baseline: Shasta Costa WA (USFS 1996), Rogue River Marial to Agness WA (USFS 2000).

Riparian zones have been harvested locally in most tributaries where access is present. Riparian areas along the main river have been modified for more than 100 years. The Wild and Scenic River designation has caused more scrutiny of vegetation management along the river.

Disturbance regime indicator – *At Risk*. Baseline: Shasta Costa WA (USFS 1996), Rogue River Marial to Agness WA (USFS 2000).

Future effects of floods and fire events could be exacerbated by the past timber harvest, road development and fire suppression.

a. Stair Creek-Rogue River watershed

Watershed overview - Stair Creek-Rogue River

The Stair Creek-Rogue River watershed includes the Rogue River from the mouth of Mule Creek (upstream), but not including Mule Creek, to the mouth of Billings Creek (downstream), but not including the creek. All streams entering the Rogue River between these two points and the land drained by them are within the watershed. The ownership distribution in the watershed encompasses: USFS 95%, BLM 3% and the remaining 2% is in private ownership (Table 124).

Table 124. Watershed Area and Ownership Distribution – Stair Creek-Rogue River watershed

Land Ownership	Acres	Ownership (percent)
USFS	34,824	95
BLM	947	3
Private	773	2
Total	**67,250**	**100**

Prevalent land uses

- Federal – wilderness recreation, limited motorized use, fishing, and timber harvest is relegated to ridge tops outside of wilderness
- Private – local private parcels, recreation, and lodges and resorts

Anthropomorphic alterations to habitat. This watershed is predominantly in wilderness and Wild and Scenic River designation. A few private parcels have altered habitat locally along the river. Tributaries are pristine except in headwater areas where some timber harvest has occurred on the south side of the river. Much of the public lands are now in the Late Successional Reserve allocation under the NWFP (USFS and BLM 1994).

Suction dredging and high banking activity summary. There are no recommendations or opportunities for management of suction dredging stated in the Rogue River Marial to Agness WA (USFS 1999). The Stair Creek-Rogue River watershed on NFS lands had no filed claims as of 5/8/2013. There were no suction dredge NOI received by the RRS during the four-year period from 2009-2012 in the watershed on NFS land located within 1/4 mile of CCH (Table 4 and Figure 30).

The Rogue River was administratively withdrawn from mineral entry on September 10, 1958 by Public Land Order (PLO) 1726. The withdrawal extends to 1 mile on either side of the river for the protection and preservation of scenic and recreation areas adjacent to the river and its tributaries. There are 17.3 miles of CCH within the watershed and 16.2 miles of those miles are withdrawn from mineral entry. The IP value and habitat use typing for these withdrawn miles are displayed in Figure 30 and Table 125. See Appendix A for a summary and locations of suction dredging and high banking mineral withdrawals on the RRS.

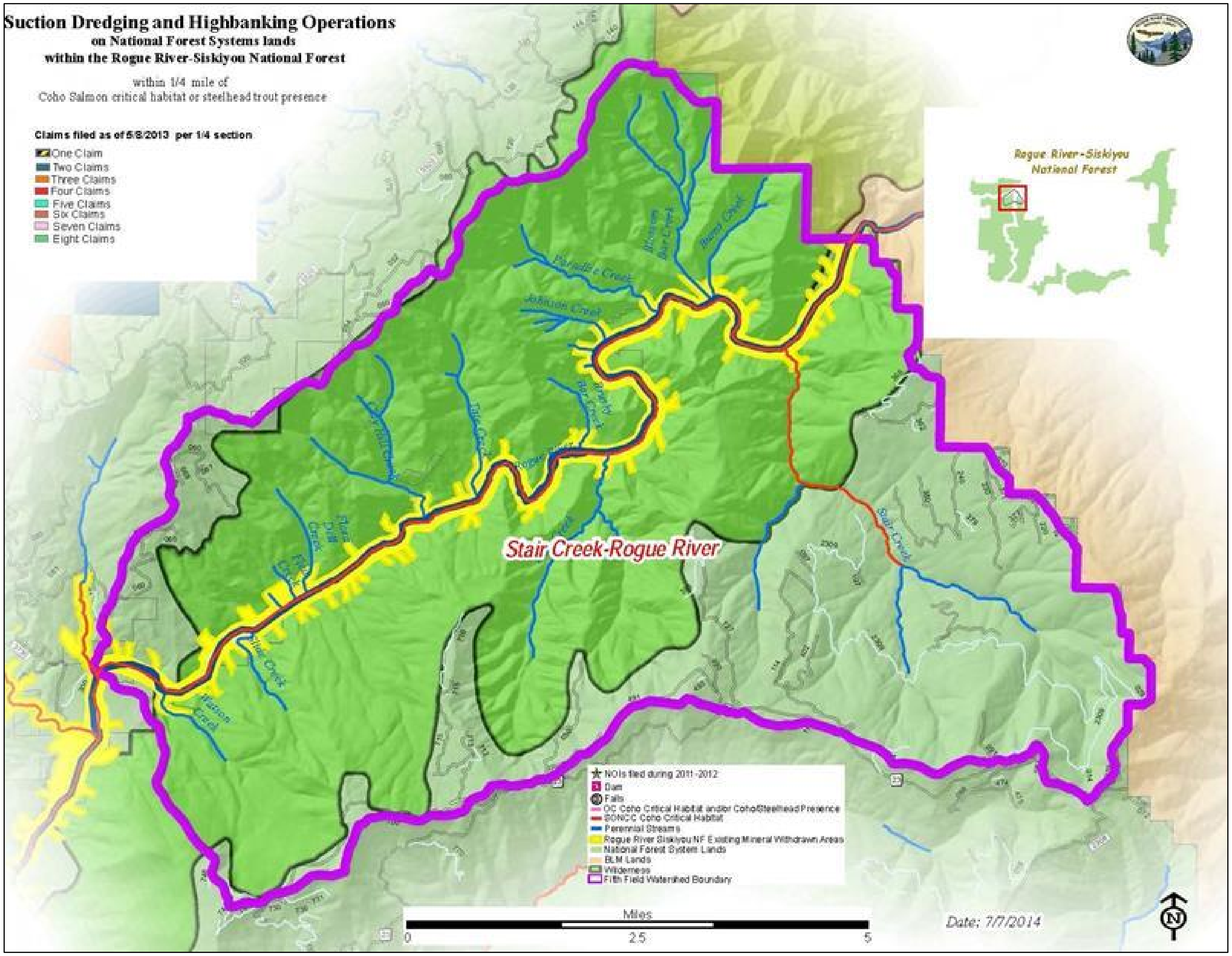

Figure 30. CCH with NOI and mining claims within 1/4 mile of CCH on NFS lands – Stair Creek-Rogue River watershed

Table 125. IP and habitat typing in mineral withdrawn areas – Stair Creek-Rogue River watershed

Habitat Typing[1]	Intrinsic Potential[2] (miles) High	Medium	Low	Total (miles)
Spawning/rearing	0	1.7	0.2	1.9
Rearing/migration	0	0	0	0
Migration only	0.9	12.6	0.8	14.3
Total	**0.9**	**14.3**	**1.0**	**16.2**

[1] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[2] Values based on an intrinsic potential map derived from the NETMAP CLAMS data and also located http://www.fsl.orst.edu/clams/. Category for ranking were derived from the final SONCC Coho Salmon Recovery Plan (NMFS 2014); high =>/= 0.66, moderate = </=0.33 – 0.66 and low = <0.33.

Watershed population overview – Stair Creek-Rogue River

The Stair Creek-Rogue River watershed Coho Salmon population is part of the greater Middle Rogue/Applegate Rivers population. All of the approximately 17.3 miles of CCH within the watershed is on NFS lands (Figure 30 and Table 126). The mainstem Rogue River within the watershed is a major migration corridor for anadromous fish. It is a link between the coast range, inland valleys and southern Cascade Mountains. Few Coho Salmon adults spawn in the mainstem, and redd success here is naturally very low. Winter flows in the mainstem are believed to be too powerful to allow successful incubation of fish eggs in all but the very mildest of winters. Stair Creek tributary is unique in that it provides extensive resident trout habitat due to a partial natural barrier near it mouth, which is passable to anadromous fish during extremely high flow events occurring on the Rogue River.

The lower Rogue River within the watershed is predominantly a canyon with short, steep tributaries. Few tributaries have well-developed habitat for salmonids. Characteristics of lower Rogue River salmonids are: fish spawning here tend to enter the river at the end of the adult migration runs; juveniles enter the ocean earlier than upriver fish; and, in the ocean, they migrate south and stay close to shore (Rivers 1991; Meehan and Bjornn 1991). The watershed consists primarily of medium IP and *migration only* habitat typing (Table 127).

Table 126. Salmonid species and habitat length - Stair Creek-Rogue River watershed

Water-shed Acres	Anadro-mous Species Present[1]	NFS lands Miles of CCH (miles)[2]	NFS lands Miles of Chinook Habitat (miles)[3]	Water-shed CCH and EFH (miles)[4]	Watershed Potential Miles of Coho Salmon Habitat Type[5] Spawning/ Rearing	Rearing/ Migration	Migration only
36,544	CO, CH, ST	17.3	13.4	17.3	3.0	0	14.37

[1] All, or a portion of, the waterbody supports the following anadromous salmonids: ST- steelhead trout; CO- Coho Salmon; CH - Chinook Salmon.

[2] Steelhead presence surveys were used to determine historic Coho Salmon habitat since CCH was not spatially delineated in the Federal Register 50 CFR Part 226. Values based on GIS data layer entitled RRS 2013 Total Salmon and Steelhead Distribution and field knowledge.

[3] Values based on GIS data layer entitled 2013 RRS Anadromous Salmonid Fish Distribution; Chinook Salmon presence survey layer.

[4] Values based on a combination of RRS 2013 SONCC Coho Salmon delineated CH 19 and ODFW steelhead presence survey data 2013 GIS map (as a surrogate for historic Coho Salmon habitat) website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[5] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

Table 127. Habitat typing and intrinsic potential within CCH – Stair Creek-Rogue River watershed

Habitat Typing[1]	Intrinsic Potential[2] (miles)						Total (miles) CCN/IP/HT	
	High IP		Medium IP		Low IP			
	Water-shed	NFS lands	Water-shed	NFS lands	Water-shed	NFS lands	Water-shed	NFS lands
Spawning/rearing	0	0	2.1	2.1	0.9	0.9	3.0	3.0
Rearing/migration	0	0	0	0	0	0	0	0
Migration only	0.9	0.9	12.6	12.6	0.8	0.8	14.3	14.3
Total	**0.9**	**0.9**	**14.7**	**14.7**	**1.7**	**1.7**	**17.3**	**17.3**

[1] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[2] Values based on an intrinsic potential map derived from the NETMAP CLAMS data and also located http://www.fsl.orst.edu/clams/. Category for ranking were derived from the final SONCC Coho Salmon Recovery Plan (NMFS 2014); high =>/= 0.66, moderate = </=0.33 – 0.66 and low = <0.33.

Watershed habitat indicators – Stair Creek-Rogue River

1) Water quality pathway - Stair Creek-Rogue River watershed

Temperature indicator – *At Risk*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010), Rogue River Basin TMDL (ODEQ 2008) and Rogue River Marial to Agness WA (USFS 2000).

The mainstem Lower Rogue River on NFS lands within the RRS (12.34 miles; mile marker 0 to 124.8) is listed as temperature impaired on the Oregon 303(d) impaired water body list. There is an approved TMDL in place for the Illinois subbasin, which addresses water temperature (Oregon DEQ 2008). The mainstem Rogue is warm during the summer months and reaches the high 70° F range. Tributaries are generally cooler than the mainstem of the river. Appendix B displays the 2010 303(d) list for streams within NFS lands on RRS.

Suspended sediment–intergravel DO/turbidity indicator- *At Risk*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010), Rogue River Basin TMDL (ODEQ 2008) and Rogue River Marial to Agness WA (USFS 2000).

No streams in the watershed within the RRS are listed for sediment on the 303(d) list. The turbidity levels are probably above historic levels due to releases from Lost Creek Dam and general disturbance throughout the river basin. Locally tributaries are largely undisturbed.

Chemical contamination/nutrients indicator – At Risk. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010), Rogue River Basin TMDL (ODEQ 2008), and Rogue River Marial to Agness WA (USFS 2000).

No streams in the watershed within the RRS are on the 303(d) list for contaminants or excessive nutrients. More than one hundred fifty thousand people live within the Rogue River basin and storm drains from the many municipalities plus agriculture runoff contribute to some contaminants reaching waterways. Local tributaries have little or no contaminants present.

2) Habitat access pathway - Stair Creek-Rogue River watershed

Physical barriers indicator – *Properly Functioning*. Baseline: Rogue River Marial to Agness WA (USFS 2000), and Stair Creek SS (USFS 1993).

There are no known fish barriers within the mainstem Rogue River. Stair Creek tributary is unique in that it provides extensive resident trout habitat due to a partial natural barrier near it mouth, which is passable to anadromous fish during extremely high flow events occurring on the Rogue River. No road crossings are migration barriers to fish.

Substrate/embeddedness indicator – *Properly Functioning*. Baseline: Rogue River Marial to Agness WA (USFS 2000), and Stair Creek SS (USFS 1993).

The mainstem Rogue River riverbed turns over during the typical high precipitation periods of winter. This section of the river is very confined. Tributaries are in excellent shape with no embeddedness evident.

Large wood indicator – *Properly Functioning*. Baseline: Rogue River Marial to Agness WA (USFS 2000), and Stair Creek SS (USFS 1993).

The mainstem of the river rarely holds large wood through the winter. Large wood in tributaries is at expected levels.

Pool frequency and quality indicator - *At Risk*. Baseline: Rogue River Marial to Agness WA (USFS 2000), and Stair Creek SS (USFS 1993).

The mainstem Rogue River is probably within the natural range of variability for pool frequency due to its Wild and Scenic protective status. Tributaries are largely unmanaged and have expected numbers of pools.

Large pools indicator - *At Risk*. Baseline: Rogue River Marial to Agness WA (USFS 2000), and Stair Creek SS (USFS 1993).

The mainstem Rogue River is probably within the natural range of variability for large pools due to its Wild and Scenic River protective status. Tributaries are largely unmanaged and have expected numbers of large pools.

Off-channel habitat indicator – *Properly Functioning*. Baseline: Rogue River Marial to Agness WA (USFS 2000), and Stair Creek SS (USFS 1993).

Off-channel habitats are rare in this constrained stream valley and in tributaries.

Refugia indicator – *Properly Functioning*. Baseline: Rogue River Marial to Agness WA (USFS 2000), and Stair Creek SS (USFS 1993).

Off-channel habitat is rare. Refugia for fish are principally associated with large boulders, substrate interstitial habitats and cooler water at tributary confluences.

3) Channel condition and dynamics - Stair Creek-Rogue River watershed

Average width/maximum depth ratio- *Properly Functioning*. Baseline: Rogue River Marial to Agness WA (USFS 2000), and Stair Creek SS (USFS 1993).

The mainstem Rogue River is probably within the natural range of variability because of bedrock controls and valley sidewalls due to its Wild and Scenic protective status. Constrained stream valleys are within the expected range of width/depth ratios in tributaries.

Streambank condition indicator – *At Risk*. Baseline: Rogue River Marial to Agness WA (USFS 2000), and Stair Creek SS (USFS 1993).

Streambanks have been altered locally in the mainstem Rogue River to accommodate agriculture and residences.

Floodplain connectivity indicator- *Properly Functioning*. Baseline: Rogue River Marial to Agness WA (USFS 2000), and Stair Creek SS (USFS 1993).

Constrained stream valleys result in few developed floodplains.

4) Flow/hydrology pathway - Stair Creek-Rogue River watershed

Change in peak/base flow indicator – *At Risk*. Baseline: Rogue River Marial to Agness WA (USFS 2000).

Timber harvest and road construction have affected peak flows in some tributaries. The flow changes affected by Lost Creek and Applegate Dam water releases have altered main river flows during all seasons. These projects have somewhat offset the effects of water withdrawals from the river and tributaries upstream.

Increase in drainage network indicator – *Properly Functioning*. Baseline: Rogue River Marial to Agness WA (USFS 2000).

Road effects on the drainage network are negligible in this watershed with few miles of roads and little human watershed disturbance.

5) Watershed conditions pathway – Stair Creek-Rogue River watershed

Road density and location indicator – *Properly Functioning*. Baseline: Rogue River Marial to Agness WA (USFS 2000).

Road densities are low in tributary drainages. There are no valley bottom roads near fish streams due to the steep topography.

Disturbance history indicator – *Properly Functioning*. Baseline: Rogue River Marial to Agness WA (USFS 2000).

Timber harvest and road development are minimal and the drainages are relatively undisturbed.

Riparian Reserves indicator – *Properly Functioning*. Baseline: Rogue River Marial to Agness WA (USFS 2000) and Stair Creek SS (USFS 1993).

Few impacts have taken place in riparian areas.

Disturbance regime indicator – *Properly Functioning*. Baseline: Rogue River Marial to Agness WA (USFS 2000).

Few human impacts have occurred in tributaries and on the mainstem of the river channel.

f. Upper Applegate River watershed

Watershed overview - Upper Applegate River

The Upper Applegate River watershed (52,296 acres) is located in the Klamath Mountains Physiographic Province in Southwestern Oregon within the Applegate River 4th field subbasin, and is 491,520 acres in size. Annual average precipitation is approximately 40 inches. The watershed was previously deemed a priority watershed under the USFS Region Six Aquatic Restoration program direction and has three subwatersheds: Beaver (17,489 acres); Palmer (18,668 acres); and, Star Gulch (16,099 acres). Most of the land ownership in Beaver and Palmer subwatersheds is on NFS lands. Land in the Star Gulch watershed is mostly managed by the BLM with NFS lands encompassing a ¾ mile stream segment in the lower subwatershed. A segment of the Applegate River is located within the Upper Applegate River watershed. The ownership distribution in the watershed encompasses: USFS 52%, BLM 34%, State lands 1% and the remaining 13% is in private ownership (Table 128).

Table 128. Watershed area and ownership distribution - Upper Applegate River watershed

Land Ownership	Acres	Ownership (percent)
USFS	27,271	52
BLM	17,812	34
Corp of Engineers (COE)	313	1
Private	6,901	13
Total	**52,296**	**100**

Prevalent land uses

- Federal – timber production, mining, recreation, and grazing
- Private – timber production, rural residential development, agriculture, ranching, and mining

Anthropomorphic alterations to habitat. With the discovery of gold in the Rogue River valley in 1851-52, Palmer Creek and adjacent stretches of the Applegate River saw intensive placer mining with rocker and sluice box systems. During the 1870s and 1880s, hydraulic mining occurred within the watershed, most notably in Palmer Creek, Flumet Gulch, China Gulch, Star Gulch and the Applegate River. Beaver Creek was largely unaffected by this mining. During the period following 1950, RRS and BLM became major suppliers of lumber for mills in Jackson and Josephine Counties. At present, timber sales, recreation developments, mining, and livestock grazing play an important role in economic uses of the federally managed lands in the watershed.

Suction dredging and high banking activity summary. There were 24 active filed placer claims as of 5/8/2013. Three suction dredge NOI were received by the RRS during the four-year period from 2009-2012 in the watershed on NFS land located within 1/4 mile of CCH (Table 4 and Figure 31). The NOI and related Coho Salmon habitat use type and its potential maximum impact are numerically displayed in Table 129. Suction dredging is administratively withdrawn from mineral entry on a RRS-administered area of the mainstem Applegate River adjacent to Jackson Campground, approximately 105 feet (.02 miles). The 105 feet is medium IP and its habitat use type is *spawning/rearing*.

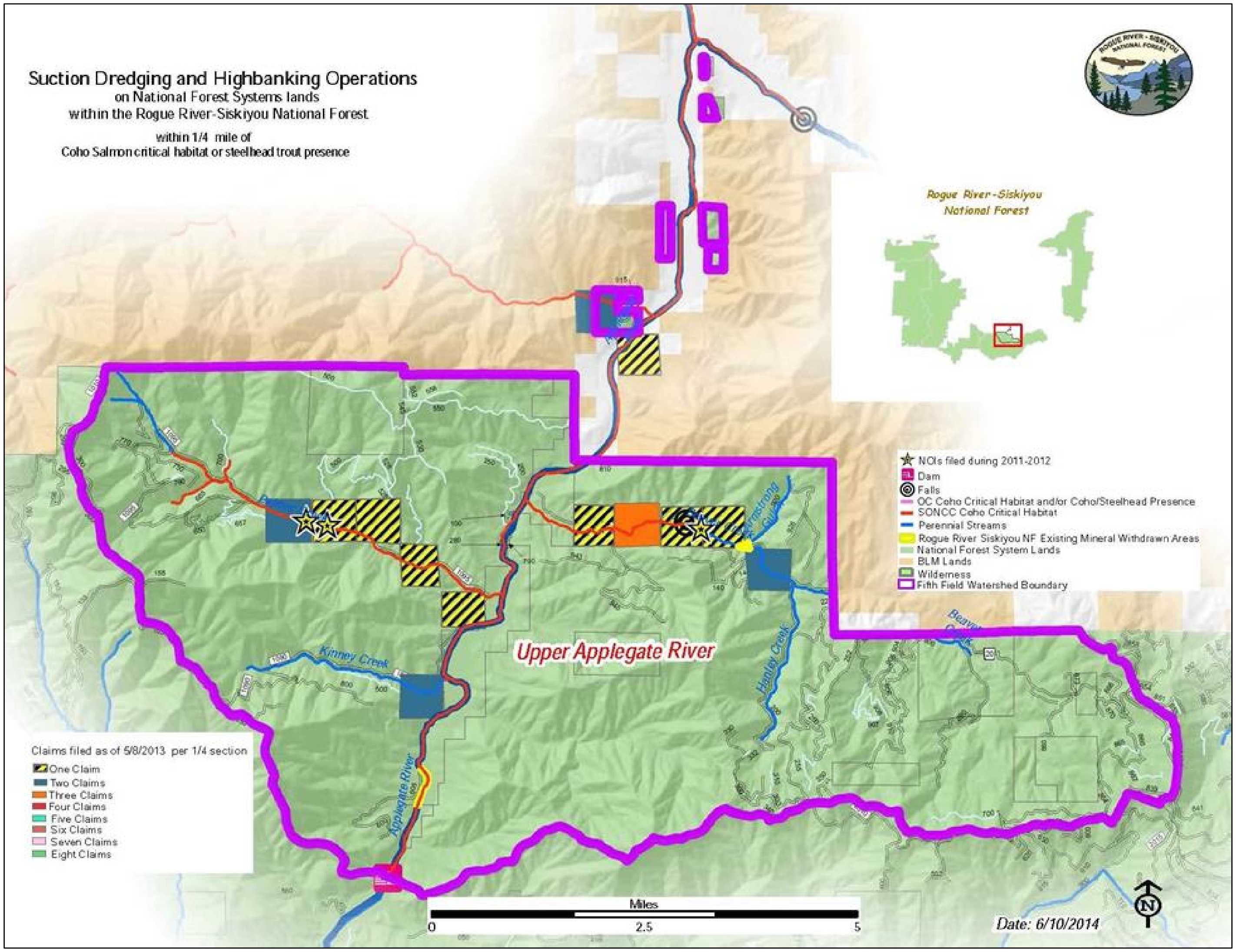

Figure 31. CCH with NOI and mining claims within 1/4 mile of CCH on NFS lands – Upper Applegate River watershed

Table 129. Suction dredging NOI received by RRS (2009-2012) within ¼ mile of CCH – Upper Applegate River watershed

Name/Location			Past NOI Information								Potential Habitat Use Coho Salmon		
							Total Maximum Disturbance[2]						
Stream w/River Mile (constant name)	Location[1] RS & Lat/Long	Name of Claim	NOI Received 2009-2012 (list years)	Number of Operators per claim Number of Operators per claim	Suction Dredge Activities (Y/N)	High Number of Operators per claim Banking Activities (Y/N)	Volume - NOI Listed (cubic yd.)	Volume – Assumed[3] or NOI Listed (cubic yd.)	Area (sq. ft.)	Stream Distance (ft.)	Spawning / Rearing ft.)	Rearing /Migration (ft.)	Migration (ft.)
Beaver Creek 2.4	T40S., R3W., Sec 3. SE N42.1155 W123.0437	Golden Beaver Association	2009	5	Y	N	0	25	225	15	15	0	0
Palmer Creek 2.5	T40S., R4W., Sec 1SW N42.116 W123.129	Red Dog	2010, 2012	4	Y	N	0	25	225	15	15	0	0
Palmer Creek 2.7	T40S., R4W., Sec 2SE N42.117 W123.134	Tall Timber	2010, 2012	4	Y	N	0	25	225	15	15	0	0
		AFFECTED Total within Watershed						75 yd^3	675 ft^2	45 ft	45 ft	0	0
		BASELINE Total within Watershed						3,088,800 yd^3	1,029,600 ft^2	159,456 ft	159,456 ft	0	0
		BASELINE Total CCH within Watershed								30.2 mi	30.2 mi	0.0	0.0
		AFFECTED Percent Watershed within CCH						0.002%	0.066%	0.028%	0.028%	0.000%	0.000%

[1] Proposed dredging mile marker starting point.

[2] Standard formula to calculate maximum 25 cubic yards suction dredge area of disturbance = 15 feet (length) X 15 feet (width) X 3 feet (depth). Width and depth is constant when cubic yard is stated differently in NOI.

[3] 25 cubic yards is the standard maximum volume anticipated when not specified in NOI.

Watershed population overview – Upper Applegate River

The Upper Applegate River watershed Coho Salmon population is part of the greater Middle Rogue/Applegate River population. There are approximately 30.2 miles of CCH within the watershed and 14.1 miles on NFS lands (Figure 31 and Table 130).

Fish habitat quality and water quality have been reduced by past and ongoing management activities, although significant watershed restoration and protection have occurred in the last 15 years. Habitat problems include: low pool quality and quantity; lack of spawning gravels; and, some partial fish barriers. Coho and Chinook salmon and winter Steelhead Trout spawn in the mainstem Applegate River in this watershed, including RRS sections near Jackson campground, McKee bridge day use area, and Boaz Gulch near a BLM section. Coho Salmon are found in Beaver Creek up to a natural waterfall near RM 1.8 and in Palmer Creek to a bedrock chute above the Lime Gulch confluence near RM 2.4.

Juvenile Coho Salmon snorkel surveys performed in Star Gulch in June of 2005 (following a productive winter when many adult Coho Salmon successfully spawned in the stream) documented that juvenile Coho Salmon densities averaged 0.91 fish/ m2 of pool habitat (BLM 2005). This is above the ODFW established benchmark of 0.7 fish/ m2 (Rodgers 2000), indicating a healthy population of Coho Salmon in lower Star Gulch. Densities were much less in 2002 and 2003, averaging less than 0.5 fish/m2. This may be a result of limited or no spawning by adults in Star Gulch during this period. Snorkel surveys in previous years have documented a decline in juvenile densities as the summer progressed. Lower reaches of Star Gulch commonly dry up during warm and dry periods, and thus limits juvenile Coho Salmon survival in Star Gulch. The watershed consists primarily of medium IP with some low IP in the *spawning/rearing* habitat use type (Table 131).

Table 130. Salmonid species and habitat length – Upper Applegate River watershed

Water-shed Acres	Anadro-mous Species Present[1]	NFS lands Miles of CCH (miles)[2]	NFS lands Miles of Chinook Habitat (miles)[3]	Water-shed CCH and EFH (miles)[4]	Watershed Potential Miles of Coho Salmon Habitat Type[5]		
					Spawning/ Rearing	Rearing/ Migration	Migration only
52,296	CO, CH, ST	14.1	6.8	30.2	30.2	0	0

[1] All, or a portion of, the waterbody supports the following anadromous salmonids: ST- steelhead trout; CO- Coho Salmon; CH - Chinook Salmon.

[2] Steelhead presence surveys were used to determine historic Coho Salmon habitat since CCH was not spatially delineated in the Federal Register 50 CFR Part 226. Values based on GIS data layer entitled RRS 2013 Total Salmon and Steelhead Distribution and field knowledge.

[3] Values based on GIS data layer entitled 2013 RRS Anadromous Salmonid Fish Distribution; Chinook Salmon presence survey layer.

[4] Values based on a combination of RRS 2013 SONCC Coho Salmon delineated CH 19 and ODFW steelhead presence survey data 2013 GIS map (as a surrogate for historic Coho Salmon habitat) website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[5] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

Table 131. Habitat typing and intrinsic potential within CCH – Upper Applegate River watershed

Habitat Typing[1]	Intrinsic Potential[2] (miles)						Total (miles) CCN/IP/HT	
	High IP		Medium IP		Low IP			
	Water-shed	NFS lands	Water-shed	NFS lands	Water-shed	NFS lands	Water-shed	NFS lands
Spawning/rearing	0.5	0.3	22.6	10.1	7.1	3.7	30.2	14.1
Rearing/migration	0	0	0	0	0	0	0	0
Migration only	0.	0	0	0	0	0	0	0
Total	**0.5**	**0.3**	**22.6**	**10.1**	**7.1**	**3.7**	**30.2**	**14.1**

[1] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[2] Values based on an intrinsic potential map derived from the NETMAP CLAMS data and also located http://www.fsl.orst.edu/clams/. Category for ranking were derived from the final SONCC Coho Salmon Recovery Plan (NMFS 2014); high =>/= 0.66, moderate = </=0.33 – 0.66 and low = <0.33.

Watershed habitat indicators – Upper Applegate River

1) Water quality pathway - Upper Applegate River watershed

Temperature indicator – Not Properly Functioning. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010), Applegate Subbasin TMDL and WQMP (ODEQ 2004), Applegate-McKee Bridge Aquatic Restoration Plan (ARP) (USFS 2006) and Beaver-Palmer WA (USFS 1994).

Table 132 displays the 303(d) list for water quality limited streams within the watershed on NFS lands. An Applegate River TMDL (ODEQ 2004) has been completed for temperature, while the one for its tributary Beaver Creek is for temperature and sediment. High summer water temperatures have been recorded in a number of tributaries and the mainstem Applegate River. These high summer temperatures are reducing the quality of rearing and spawning habitat for Coho and Chinook salmon, steelhead and resident trout. Contributing factors to the high water temperatures include: timber harvest (upland and riparian); agricultural land use in the riparian zone; road construction and maintenance; and, rural residential development within the riparian zone.

Table 132. ODEQ, 2010 303(d) List for Oregon Waterbodies within NFS lands on RRS – Upper Applegate River watershed

Stream Name	Miles on RRS (miles)	River Mile Marker (miles)	Pollutant	Assess-ment	Assess-ment 2	Listing Status
Applegate River	2.99	0 to 46.8	Temperature	2004	2004	Cat 4A: Water quality limited, TMDL approved
Beaver Creek	4.95	0 to 8.8	Biological Criteria	2010	2010	Cat 4C: Water quality limited, not a pollutant
Beaver Creek	4.95	0 to 8.8	Sedimentation	2004	2004	Cat 4A: Water quality limited, TMDL approved
Beaver Creek	2.50	0 to 3.5	Temperature	2004	2004	Cat 4A: Water quality limited, TMDL approved
Palmer Creek	5.45	0 to 5.7	Temperature	2004	2004	Cat 4A: Water quality limited, TMDL approved
Star Gulch	0.27	0 to 4.3	Temperature	2004	2004	Cat 4A: Water quality limited, TMDL approved

Suspended sediment–intergravel/DO/turbidity indicator – *At Risk*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010), Applegate Subbasin TMDL and WQMP (ODEQ 2004), Applegate-McKee Bridge Aquatic Restoration Plan (USFS 2006) and Beaver-Palmer WA (USFS 1994).

Beaver Creek was on the State 303(d) list for violations of the Oregon water quality standard for sedimentation (Table 132). This condition is now addressed within the Applegate River TMDL. Roads are a significant source of sediment influx into stream channels within the watershed. The Siskiyou Mountains Ranger District decommissioned 28.33 miles of roads, closed 6.86 miles of road, and storm-proofed (surfacing, drainage) 44.15 miles of road within the watershed in 2010 and 2011, in an effort to reduce road generated sediment and improve stream habitat. Historic mining activities are the greatest source of sediment within Palmer Creek, Flumet and China Gulches, and along the mainstem Applegate River. No streams within the watershed on NFS lands are listed specifically on the 303(d) list for sediment. However, Beaver Creek is listed for biological criteria, possibly as a result of sediment tolerant macroinvertebrate presence (Table 132).

Chemical contamination/nutrients indicator – Properly Functioning. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010), Applegate-McKee Bridge Aquatic Restoration Plan (USFS 2006) and Beaver-Palmer WA (USFS 1994).

No streams within the Upper Applegate River watershed are listed for chemical contaminants or excessive nutrients.

2) Habitat access/elements pathway - Upper Applegate River watershed

Physical barriers indicator – *Properly Functioning*. Baseline: Applegate-McKee Bridge Aquatic Restoration Plan (USFS 2006), Beaver-Palmer WA (USFS 1994), Applegate River SS (SRG 2009), Beaver Creek SS (SRG 1998) and Palmer Creek SS (SRG 2000).

There are no known culvert passage barriers to fish within the watershed. A natural falls on Beaver Creek upstream of Charlie Buck Gulch is a barrier.

Substrate/embeddedness indicator – *Not Properly Functioning*. Baseline: Applegate-McKee Bridge Aquatic Restoration Plan (USFS 2006), Beaver-Palmer WA (USFS 1994), Applegate River SS (SRG 2009), Beaver Creek SS (SRG 1998) and Palmer Creek SS (SRG 2000).

Substrate character within the watershed in streams on NFS lands is a recognized limiting factor to quality fish habitat and production. Within the mainstem Applegate River, spawning gravel abundance is low due to loss of downstream bedload movement at Applegate Dam. Within the Beaver Creek drainage, an unnaturally large proportion of streambeds are comprised of granitic sand, a product of the local geology. Much of this granitic sand is attributed to the road system within the subwatershed. Road treatments (decommissioning, closure, and storm proofing) were implemented in the subwatershed in 2010 and 2011 and should help to alleviate some of the sand influx. Historic hydraulic mining within the Palmer Creek subwatershed contributed significant quantities of sediment to stream channels. In some areas this influx of sediment resulted in the channel becoming seasonally dry and flowing subsurface. A 2010 and 2011 instream restoration project at Palmer Creek was implemented in an effort to address the substrate and flow issues.

Large wood indicator – *Not Properly Functioning*. Baseline: Applegate-McKee Bridge Aquatic Restoration Plan (USFS 2006), Beaver-Palmer WA (USFS 1994), Applegate River SS (SRG 2009), Beaver Creek SS (SRG 1998) and Palmer Creek SS (SRG 2000).

Stream cleanout in the 1970s removed instream large wood from both the Palmer Creek and Beaver Creek subwatersheds. The existing quantity of large wood in Beaver Creek and Palmer Creek is low to moderate. Future large wood recruitment in these drainages is poor due to the high hardwood to low conifer composition of the riparian vegetation. There have been several instream large wood placement projects implemented in Beaver Creek, Palmer Creek, and Star Gulch in the past 20 years, which have locally improved instream habitat complexity.

Pool frequency and quality indicator – *Not Properly Functioning*. Baseline: Applegate-McKee Bridge Aquatic Restoration Plan (USFS 2006), Beaver-Palmer WA (USFS 1994), Applegate River SS (SRG 2009), Beaver Creek SS (SRG 1998) and Palmer Creek SS (SRG 2000).

The dearth of large wood within many of the stream reaches on NFS lands within the watershed contributes to instream habitat conditions that are less complex than optimal. The Applegate River mainstem is a large river with a relatively wide valley. Pools within the mainstem tend to be formed by channel scour associated with streambed geomorphology or meander scour. Bedload movement and supply within the mainstem is inhibited by the presence of Applegate Dam. Large wood is the primary causal mechanism in low gradient streams to create complex and frequent pools. These pools and large wood also create off-channel habitat and refuge for salmonids. Table 133 summarizes pool habitat conditions on streams surveyed (using USFS R6 Level II survey protocol) on NFS lands in the watershed.

Table 133. Habitat percent and pool summary for surveyed streams – Upper Applegate River watershed

Stream Name	Year Survey-ed	Habitat % Pool	Habitat % Riffle	Pools/ Mile	Deep Pools/mile (>3ft)	Avg. Residual Pool Depth (ft)	Average Bankfull Width (ft)
Applegate River	2009	61.0	38.0	8.2	7.0	6.5	113.0
Beaver Creek	1998	18.0	79.2	30.5	3.4	1.7	17.9
Palmer Creek	2000	23.0	76.4	40.4	1.0	1.2	14.5

Off-channel habitat indicator – *Not Properly Functioning*. Baseline: Applegate-McKee Bridge Aquatic Restoration Plan (USFS 2006), Beaver-Palmer WA (USFS 1994), Applegate River SS (SRG 2009), Beaver Creek SS (SRG 1998) and Palmer Creek SS (SRG 2000).

Stream channels on NFS lands tend to have steeper gradients than valley bottom segments on downstream private land. In general, streams on NFS lands are moderately entrenched and/or confined by topography. Side channels are not a common feature in any fish bearing streams on NFS lands, due to the natural topography, and to a lesser degree because of road development and past hydraulic mining.

Refugia indicator – *At Risk*. Baseline: Applegate-McKee Bridge Aquatic Restoration Plan (USFS 2006), Beaver-Palmer WA (USFS 1994), Applegate River SS (SRG 2009), Beaver Creek SS (SRG 1998) and Palmer Creek SS (SRG 2000).

Deeper pools within the Applegate River mainstem likely provide thermal refugia for rearing fish within the watershed. Due to the headwater location of NFS lands within the watershed, accessible stream reaches could provide refuge from other parts of the watershed. The less than optimal stream habitat complexity and pool habitat within some streams on NFS lands may reduce the suitability and functionality of these headwater streams to function as refugia.

3) Channel condition and dynamics pathway - Upper Applegate River watershed

Bankfull width depth ratio/ channel widening indicator - *At Risk*. Baseline: Applegate-McKee Bridge Aquatic Restoration Plan (USFS 2006), Beaver-Palmer WA (USFS 1994), Applegate River SS (SRG 2009), Beaver Creek SS (SRG 1998), Palmer Creek SS (SRG 2000) and NWFP (USFS and BLM 1994).

The Applegate River mainstem within the watershed is in an entrenched channel with a large bankfull width-to-depth ratio (47). In general, tributary streams to the Applegate River within the watershed are confined, even in lower gradient reaches. It is unknown to what extent historic land use (e.g. timber harvest, roads) on NFS lands altered the bankfull channel dimensions within the watershed. Since the mid-1990s, riparian management under the NWFP has emphasized maintenance of habitat for fish and other aquatic resources. Consequently, instream habitat, including bankfull width/depth conditions are improving on NFS lands. Downstream of NFS lands on private land, historic channelization and alteration of floodplains are well documented.

Streambank condition indicator – *At Risk*. Baseline: Applegate-McKee Bridge Aquatic Restoration Plan (USFS 2006), Beaver-Palmer WA (USFS 1994), Applegate River SS (SRG 2009), Beaver Creek SS (SRG 1998) and Palmer Creek SS (SRG 2000).

Data collected on Beaver Creek, Palmer Creek and the Applegate River within the watershed suggest stream channels with relatively stable streams banks (less than 2.5% of reach lengths in an unstable state). Historic hydraulic mining in Palmer Creek and Star Gulch substantially altered and destabilized stream banks.

Floodplain connectivity indicator – *Not Properly Functioning*. Baseline: Applegate-McKee Bridge Aquatic Restoration Plan (USFS 2006), Beaver-Palmer WA (USFS 1994), Applegate River SS (SRG 2009), Beaver Creek SS (SRG 1998) and Palmer Creek SS (SRG 2000).

Past land management, including timber harvest, road construction, hydraulic mining, and private land development, have resulted in stream channels that are moderately incised to incised, with limited ability to access floodplains. Further, headwater areas of the watershed tend to be highly dissected and stream channels are topographically confined, with naturally limited floodplain areas.

4) Flow/hydrology pathway - Upper Applegate River watershed

Change in peak/base flow indicator – *Not Properly Functioning*. Baseline: Applegate-McKee Bridge Aquatic Restoration Plan (USFS 2006), Beaver-Palmer WA (USFS 1994).

The natural hydrograph within the Applegate River has been drastically altered by the presence of Applegate Dam. In general, the dam has reduced annual peak flows and increased summer base flows. Within Palmer Creek, historic hydraulic mining has resulted in a loss of surface flow during summer base flows in many years. In 2010 and 2011, a streambed restoration project was implemented at Palmer Creek on NFS land, in an attempt to restore and maintain a perennial flow regime in a stream reach that was heavily impacted by hydraulic mining. At present the long-term success of this project is undetermined, but initial observations are positive.

Increase in drainage network indicator – *At Risk*. Baseline: Beaver-Palmer WA (USFS 1994).

On NFS lands, the major drainages (Beaver Creek and Palmer Creek) contain appreciable road systems. These roads were primarily constructed to facilitate timber harvest. Road treatments (decommissioning, closure, and storm proofing) were implemented in the watershed in 2010 and 2011 on NFS lands, partially to restore hydrologic function and timing.

5) Watershed conditions pathway – Upper Applegate River watershed

Road density and location indicator – *Not Properly Functioning*. Baseline: Applegate-McKee Bridge Aquatic Restoration Plan (USFS 2006), Beaver-Palmer WA (USFS 1994).

There are valley bottom roads associated with all of the larger fish-bearing drainages (Applegate River, Beaver Creek, Palmer Creek, and Star Gulch) within the watershed. The presence of these roads limits the ability of the streams to migrate laterally, impairs riparian vegetation vigor and composition, and alters natural flow pathways.

Disturbance history indicator - *At Risk*. Baseline: Beaver Palmer WA (USFS 1994).

Human activities have altered watershed processes and functions throughout the watershed. Timber harvest, roads, mining, and private land development are the primary disturbance activities within the watershed.

Riparian Reserves indicator – *At Risk*. Baseline: Applegate-McKee Bridge Aquatic Restoration Plan (USFS 2006), Beaver-Palmer WA (USFS 1994), Applegate River SS (SRG 2009), Beaver Creek SS (SRG 1998) and Palmer Creek SS (SRG 2000).

The riparian area, although seemingly intact along much of the Applegate River and its tributaries in the watershed, has been impacted by roads, past mining activity, timber harvest, fire exclusion, and private land development.

Disturbance regime indicator – *At Risk*. Baseline: Applegate-McKee Bridge Aquatic Restoration Plan (USFS 2006), Beaver-Palmer WA (USFS 1994).

Timber harvest and road development have altered flow patterns and vegetation in many drainages within the watershed. Widespread historic mining has occurred within the watershed.

6. Pistol River population

Subbasin overview – Chetco

The Chetco subbasin is located entirely within Curry County, just south of the Rogue River subbasin. The subbasin contains the following watersheds: Pistol River, Chetco River, Winchuck River, Hunter Creek, Cape Ferrelo and Whaleshead Creek-Frontal (Figure 32). The first three watersheds are within the ESA action area.

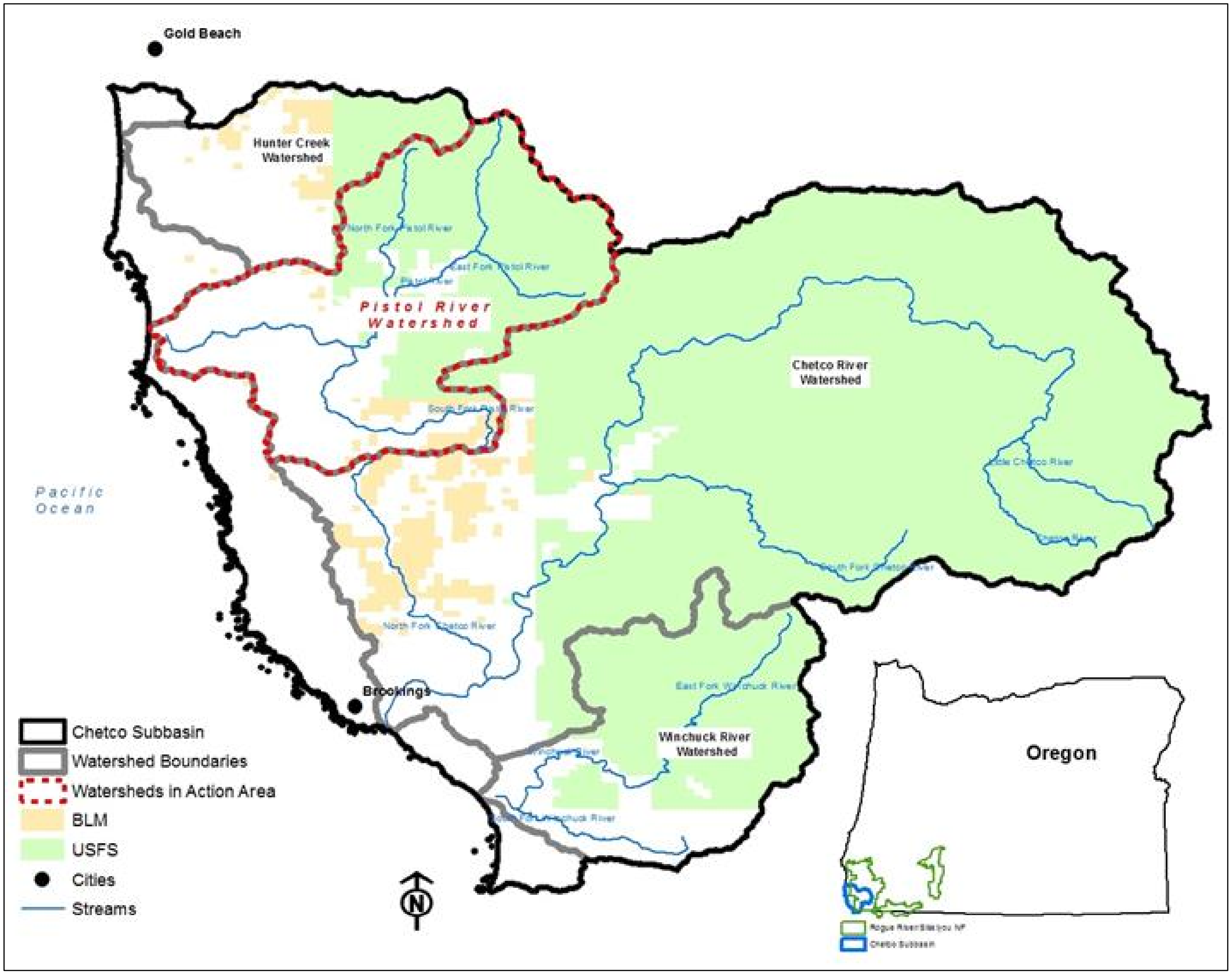

Figure 32. Pistol River population in relation to the Chetco River subbasin

Subbasin population overview – Chetco

There are three Coho Salmon populations within the ESA action area of the Chetco subbasin:

- Pistol River watershed, Core, Functioning Independent
- Chetco River watershed, Core, Functioning Independent
- Winchuck River watershed, Non-Core, Potentially Independent

The Chetco subbasin within the Southern Oregon Coastal Basin has intermittent Coho Salmon populations. Oregon Department of Fish and Wildlife personnel conducted a random survey for two seasons on reaches throughout the Chetco subbasin (Chetco River, Pistol River and Winchuck River watersheds) and saw few juvenile Coho Salmon (Russ Staff, ODFW, pers. comm., 2002). These streams exhibit flashy fall and winter flows and are constrained except near ocean tidal areas. Little side channel habitat exists in most streams. Ocean-rearing fall Chinook Salmon migrate farther upstream and more consistently spawn throughout these rivers than Coho Salmon.

Watershed within the ESA action area of the Pistol River population

Watershed conditions are described below for the Pistol River population, located within the Chetco subbasin, Pistol River watershed (Figure 32).

a. Pistol River watershed

Watershed overview – Pistol River

The Pistol River watershed encompasses approximately 67,250 acres of Curry County. About 58 percent of the basin is federal land managed by the RRS and the BLM (5 percent). About 42 percent of the basin is privately owned (Table 134). Forestry, whether public or private, is the dominant land use, involving 97 percent of the watershed. The remaining 3 percent is used for farming, livestock grazing, and rural homes. The Pistol River is located in the Klamath Mountain Province in southwestern Oregon. The Pistol River drains into the Pacific Ocean, with the mouth of the river located between the towns of Brookings and Gold Beach Oregon.

Table 134. Watershed area and ownership distribution – Pistol River watershed

Land Ownership	Acres	Ownership (percent)
USFS	35,896	53
BLM	3,062	5
State	157	<1
Private	28,135	42
Total	**67,250**	**100**

Prevalent land uses

- Federal – Timber harvest, mining, recreation
- Private – Timber harvest, mining, agriculture, rural residential development

Anthropomorphic alterations to habitat. The first Euroamerican settlers were miners who came to the area in the 1850's. Following or accompanying the miners were early settlers, farming in the flat lands along the rivers and major creeks and grazing cattle and sheep in the surrounding hills. Currently the flat land near the mouth of the Pistol River is occupied by residences and ranches. The middle portion of the watershed is primarily owned by private timber companies. The upper portion of the watershed is primarily NFS land. Timber commodity production has been an important human use of the middle and upper portions of the watershed since World War II. Fire suppression has caused the level and continuity of fuels to increase, leaving the watershed susceptible to larger, more intense fires (e.g. Biscuit Fire). Moderate timber harvest and road development on public lands has altered some watershed processes and functions.

Suction dredging and high banking activity summary. Pistol River does not have geological formations that bear gold and so was spared mining impacts similar to those experienced by interior basins of the Rogue River, but a large gravel operation on the floodplain terrace of the lower river is a moderate threat (NMFS 2014).

There are no recommendations or opportunities for management of suction dredging stated in the Pistol River WA (USFS 1995). The Pistol River watershed within the Chetco subbasin on NFS lands had no active filed claims as of 5/8/2013. There were no suction dredge NOI filed during the four-year period from 2009-2012 that were located within 1/4 mile of CCH (Table 4 and Figure 33). There are no mineral withdrawn areas within the watershed.

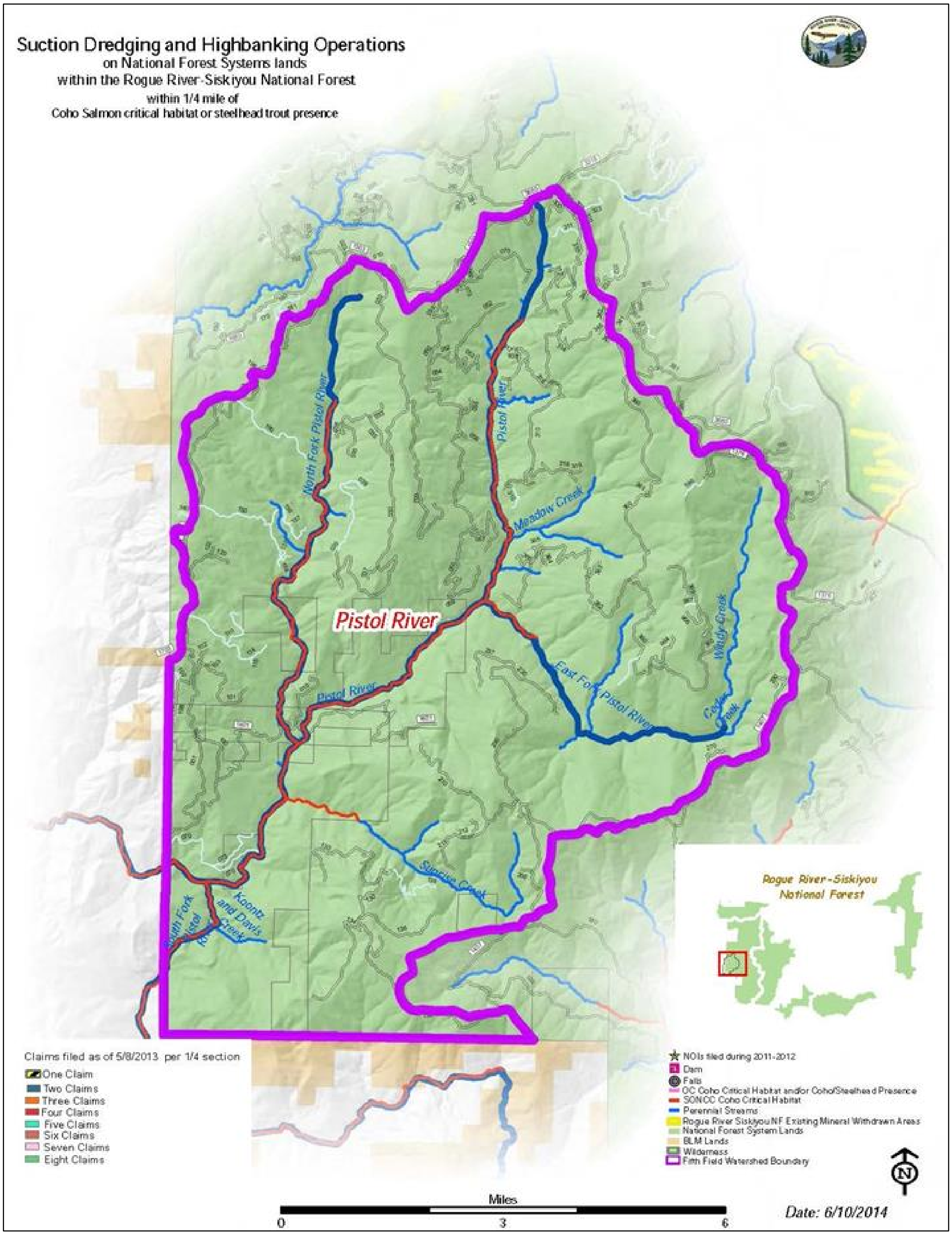

Figure 33. CCH with NOI and mining claims within 1/4 mile of CCH on NFS lands - Pistol River watershed

Watershed population overview – Pistol River

Population highlights (NMFS 2014)

- Northern Coastal Stratum
- Dependent
- Recovery criteria: 20% of IP habitat must be occupied in years following spawning of brood years with high marine survival
- 93 mi2
- 30 IP km (19 IP mi) (23% High)
- Dominant Land Uses are 'Timber Harvest' and 'Agriculture'
- Principal Stresses are 'Lack of Floodplain and Channel Structure' and 'Degraded Riparian Forest Conditions'
- Principal Threats are 'Roads' and 'Timber Harvest' (NMFS 2014)

There are approximately 49.6 miles of CCH within the watershed and 15.4 miles on NFS lands (Figure 33and Table 135). Pistol River Coho Salmon are part of a larger, south coast metapopulation and were probably not common in the watershed due to geology and gradient (Stauff 2002). There is no documented Coho Salmon use by the species in the watershed. However, the low-gradient mainstem was probably good Coho Salmon rearing habitat prior to the 1880s when the area was dominated by conifers and wetlands (Stauff 2002). Private land management has degraded the lower mainstem and eliminated the Coho Salmon rearing potential. The only potential spawning habitat for Coho Salmon in the watershed is the lower one-half mile of Crook Creek and possibly some third-order stream reaches in the upper watershed. There are no high IP miles on NFS lands (Table 136). The most important factor limiting recovery of Coho Salmon in the Pistol River is a deficiency in the amount of suitable rearing habitat for juveniles (NMFS 2014).

Table 135. Salmonid species and habitat length - Pistol River population

Water-shed Acres	Anadro-mous Species Present[1]	NFS lands Miles of CCH (miles)[2]	NFS lands Miles of Chinook Habitat (miles)[3]	Water-shed CCH and EFH (miles)[4]	Watershed Potential Miles of Coho Salmon Habitat Type[5]		
					Spawning/ Rearing	Rearing/ Migration	Migration only
67,250	CO, CH, ST	15.4	10.3	49.6	37.8	11.8	0

[1] All, or a portion of, the waterbody supports the following anadromous salmonids: ST- steelhead trout; CO- Coho Salmon; CH - Chinook Salmon.

[2] Steelhead presence surveys were used to determine historic Coho Salmon habitat since CCH was not spatially delineated in the Federal Register 50 CFR Part 226. Values based on GIS data layer entitled RRS 2013 Total Salmon and Steelhead Distribution and field knowledge.

[3] Values based on GIS data layer entitled 2013 RRS Anadromous Salmonid Fish Distribution; Chinook Salmon presence survey layer.

[4] Values based on a combination of RRS 2013 SONCC Coho Salmon delineated CH 19 and ODFW steelhead presence survey data 2013 GIS map (as a surrogate for historic Coho Salmon habitat) website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[5] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

Table 136. Habitat typing and intrinsic potential within CCH – Pistol River watershed

Habitat Typing[1]	Intrinsic Potential[2] (miles)						Total (miles) CCN/IP/HT	
	High IP		Medium IP		Low IP			
	Water-shed	NFS lands	Water-shed	NFS lands	Water-shed	NFS lands	Water-shed	NFS lands
Spawning/rearing	4.2	0	17.7	5.4	15.9	9.6	37.8	15.0
Rearing/migration	2.2	0	9.6	0.4	0	0	11.8	0.4
Migration only	0	0	0	0	0	0	0	0
Total	**6.4**	**0**	**27.3**	**5.8**	**15.9**	**9.6**	**49.6**	**15.4**

[1] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[2] Values based on an intrinsic potential map derived from the NETMAP CLAMS data and also located http://www.fsl.orst.edu/clams/. Category for ranking were derived from the final SONCC Coho Salmon Recovery Plan (NMFS 2014); high =>/= 0.66, moderate = </=0.33 – 0.66 and low = <0.33.

Watershed habitat indicators – Pistol River

1) Water quality pathway – Pistol River watershed

Temperature indicator – *Not Properly Functioning*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010) and Pistol River WA (USFS 1998).

The Pistol River is listed as water quality limited due to summer water temperatures from the mouth (confluence with the Pacific Ocean) upstream to river mile 19.8. Table 137 displays the 303(d) list for water quality limited streams within the watershed on NFS lands. Tributaries upstream of Sunrise Creek are located within the NFS lands and tend to be well-shaded and cooler than the mainstem Pistol River. Downstream agriculture lands and other development have removed stream shade in some locations and the channel is generally wide and shallow. Appendix B displays the 2010 303(d) list for streams within NFS lands on RRS.

Table 137. ODEQ, 2010 303(d) List for Oregon Waterbodies within NFS lands on RRS – Pistol River watershed

Stream Name	Miles on RRS (miles)	River Mile Marker (miles)	Pollutant	Assess-ment	Assess-ment 2	Listing Status
Eagle Creek	0.18	0 to 6.8	Temperature	2010	1/29/2013	Cat 5: Water quality limited, 303(d) list, TMDL needed
East Fork Pistol River	4.52	0 to 4.6	Temperature	2010	1/29/2013	Cat 5: Water quality limited, 303(d) list, TMDL needed
North Fork Pistol River	0.98	0 to 2.8	Temperature	2010	1/29/2013	Cat 5: Water quality limited, 303(d) list, TMDL needed
Pistol River	7.22	0 to 19.8	Temperature	2004	4/14/2005	Cat 5: Water quality limited, 303(d) list, TMDL needed

Suspended sediment–intergravel/DO/turbidity indicator – *Not Properly Functioning*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010), Pistol River WA (USFS 1998) and Sediment Production and Delivery in Pistol River Oregon and its Effect on Pool Morphology (Russell 1994).

No streams in the watershed within the RRS are listed for sediment on the 303(d) list. Sediment sources and transport are a large concern in the Pistol River watershed. The NPF ranking is determined with respect to the sediment indicator per ODFW's recommended benchmark for SW Oregon of less than 15% fines (ODFW 2000). A Pistol River sediment study was done during 1991-1994 as a cooperative effort between the USFS and Oregon State University to examine sediment processes in the watershed. This study found that from 1940 to 1991 an estimated fifty percent of the five million cubic meters of sediment delivered to streams was from management-related sources. Sediment production decreased after 1955, and affected streams have been recovering over the past four decades (Russell 1994). Debris flows that alter riparian vegetation and channel structure were most recently triggered in the upper mainstem and South Fork by the November 1996 storm.

Typically, streams in the Pistol River system are turbid during storms and clear quickly. Frequency and duration of turbidity may have increased following management activities that increased peak flows, erosion, or mass failures.

Chemical contamination/nutrients indicator – *Properly Functioning*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010) and Pistol River WA (USFS 1998).

No streams in the watershed within the RRS are on the 303(d) list for contaminants or excessive nutrients. Downstream on agriculture and residential lands some contamination may occur from agriculture runoff or effluent from septic tanks, lawns and other sources.

2) Habitat access/elements pathway – Pistol River watershed

Physical barriers indicator – *Properly Functioning*. Baseline: Pistol River WA (USFS 1998), Pistol River SS (USFS 1997), North Fork Pistol River SS (USFS 1997), East Fork Pistol River SS (1991, 2001) and Sunrise Creek SS (SRG 1992, 1998).

There are no known culverts or human structures on NFS lands that block passage of Coho Salmon at any life stage from upstream and downstream migration.

Substrate/embeddedness indicator – *At Risk*. Baseline: Pistol River WA (USFS 1998), Pistol River SS (USFS 1997), North Fork Pistol River SS (USFS 1997), East Fork Pistol River SS (1991, 2001) and Sunrise Creek SS (SRG 1992, 1998).

Stream surveys in the Pistol River watershed have collected data on streambed substrate within the mainstem, North Fork and Sunrise Creek on NFS lands. Fines represent from 15% to 22% of substrate particles in Sunrise Creek and 18% to 19% within the North Fork. The mainstem Pistol River within surveyed reaches had 17% to 20% of the substrate particles in fines.

Large wood indicator – *Not Properly Functioning*. Baseline: Pistol River SS (USFS 1997), North Fork Pistol River SS (USFS 1997), East Fork Pistol River SS (1991, 2001) and Sunrise Creek SS (SRG 1992, 1998).

Riparian condition is substantially altered by logging, disease, channel scour and mortality of trees that are overwhelmed by sediment. Consequently, large wood in stream channels is in short supply and likely to remain so for many decades without active restoration efforts. Lack of large wood in turn leads to very simplified stream habitats and a decrease in pool frequency and depth that represent other major limiting factors for Coho Salmon.

Pool frequency and quality indicator – *Not Properly Functioning*. Baseline: Pistol River SS (USFS 1997), North Fork Pistol River SS (USFS 1997), East Fork Pistol River SS (1991, 2001) and Sunrise Creek SS (SRG 1992, 1998).

The Pistol River watershed has some low-gradient reaches with high percentages of pool habitat despite low levels of large wood. For example, the mainstem Pistol River has an average of 70 percent pool habitat due to bedrock-formed pools. These reaches also have long shallow glides with low complexity and low-quality fish habitat. Stream surveys indicate that pool quality and fish habitat are degraded in the mainstem and throughout the watershed due to low quantities of large wood and high sediment deposition. Most pools are formed by bedrock canyon features and not by large wood complexes. Pool area averages almost 30% for the eight stream survey reaches. The area of pool habitat available is good and these pools are often long and un-complex, accounting for the discrepancy between pool frequency, large pools and pool area.

Off-channel habitat indicator – *At Risk*. Baseline: Pistol River SS (USFS 1997), North Fork Pistol River SS (USFS 1997), East Fork Pistol River SS (1991, 2001) and Sunrise Creek SS (SRG 1992, 1998).

Due to the bedrock confined nature of most of the Pistol River streams, off-channel habitat does not occur. Floodplains are generally non-existent, or are very narrow with inaccessible high terraces.

Refugia indicator – *At Risk*. Baseline: Pistol River SS (USFS 1997), North Fork Pistol River SS (USFS 1997), East Fork Pistol River SS (1991, 2001) and Sunrise Creek SS (SRG 1992, 1998).

Tributaries within the Pistol River provide critical thermal refugia areas for salmonids during summer heating periods.

3) Channel condition and dynamics pathway – Pistol River watershed

Bankfull width depth ratio/ channel widening indicator – *At Risk*. Baseline: Pistol River WA (USFS 1998), Pistol River SS (USFS 1997), North Fork Pistol River SS (USFS 1997), East Fork Pistol River SS (1991, 2001) and Sunrise Creek SS (SRG 1992, 1998).

Channel widths, maximum depths, streambank condition and floodplain connectivity are close to what is expected within the expected range of natural variability. Channel width/depth ratios are high in the mainstem Pistol River.

Streambank condition indicator – *At Risk*. Baseline: Pistol River WA (USFS 1998), Pistol River SS (USFS 1997), North Fork Pistol River SS (USFS 1997), East Fork Pistol River SS (1991, 2001) and Sunrise Creek SS (SRG 1992, 1998).

Streambanks have little sloughing in any of the surveyed reaches.

Floodplain connectivity indicator – *At Risk*. Baseline: Pistol River WA (USFS 1998), Pistol River SS (USFS 1997), North Fork Pistol River SS (USFS 1997), East Fork Pistol River SS (1991, 2001) and Sunrise Creek SS (SRG 1992, 1998).

Floodplains are narrow or non-existent in most reaches with a toe of slope to toe of slope measure of less than 100 feet in many cases, or the stream is terrace-confined.

4) Flow/hydrology pathway - Pistol River watershed

Change in peak/base flow indicator – *At Risk*. Baseline: Pistol WA (USFS 1998).

Timber harvest took place principally during the late 1960's, 1970's and 1980's in the Pistol River within the NFS lands. About 53% of the watershed is NFS land and less than 22% of this area has been harvested. Most of these plantations have rapidly recovered with tree growth in the wet coastal forests. Currently, peak flows are unaffected by past harvest. Road densities are relatively light in this watershed on public lands (.69 miles per square mile) and overall effects on peak and base water flows are low (USFS 2007, Hydrology Report, CHFT 2007).

Increase in drainage network indicator – *At Risk*. Baseline: Pistol WA (USFS 1998).

The road density (roads per square mile) for the watershed is about 2.0 miles per square mile of roads on NFS lands. The watershed is comprised of steep valley walls and a heavily dissected stream network. Downstream road densities are probably higher on private industrial timberlands.

5) Watershed conditions pathway – Pistol River watershed

Road density and location indicator – *At Risk*. Baseline: Pistol WA (USFS 1998).

All of the Pistol River subwatersheds have road densities in excess of 2.0 miles per square mile, with the exception of the East Fork Pistol River subwatershed. The highest overall road densities are in Glade Creek, Deep Creek, Lower Pistol mainstem, and Upper Pistol mainstem subwatersheds. The highest riparian road densities are in the Glade and Deep Creek, Lower Pistol mainstem and South Fork subwatersheds. Road densities on downstream private lands are anticipated to be higher in industrial timber lands. Most roads avoid streams and are located near ridge tops.

Disturbance history indicator – *At Risk*. Baseline: Pistol WA (USFS 1998).

As previously mentioned in the Change in Peak/base Flow indicator above, about 22% of the upper watershed on NFS lands have been harvested since the late 1960's. It is estimated that most of the forested lands off NFS lands (roughly one-half of the watershed area) are in early or mid-seral conditions due to timber production. There are scattered residences and small farms in the valley bottom downstream of public lands.

Riparian Reserves indicator – *At Risk*. Baseline: Pistol WA (USFS 1998), Coastal Healthy Forest Thin (CHFT) hydrology report (USFS 2007).

Considerable harvest has taken place in riparian areas in the past as approximately 1,901 acres of the total 3,068 acres scheduled for thinning from below on NFS land are located within previously entered Riparian Reserves in the Coastal Healthy Forest Thin (CHFT) project. Plantations are scattered throughout the entire watershed. Overall riparian conditions are good in the upper watershed on public lands. It is assumed, as previously mentioned, that on private lands much of riparian areas will remain in early and mid-seral conditions to maximize timber production.

Disturbance regime indicator – *At Risk*. Baseline: Pistol WA (USFS 1998), CHFT hydrology report (USFS 2007).

The upper watershed is composed of steep terrain and highly dissected stream networks. Past road construction and timber harvest have caused a few local landslides. Some roads causing chronic problems have been closed and decommissioned in the past decade. Generally most roads that remain are stable and do not cause chronic erosion problems. Downstream on private lands it is assumed that some aggravation of unstable areas may occur to maximize timber production. Fires occurred infrequently and were of moderate to high severity.

7. Smith River population

Subbasin overview – Smith River

The Smith River subbasin is located in Oregon and California and across two national forests (RRS and Six Rivers) and flows directly into the Pacific Ocean (Figure 34). The Smith River subbasin has intermittent Coho Salmon populations. Six Rivers National Forest personnel have conducted many surveys over the past decade on reaches throughout the North, South and Middle Forks Smith River and have seen few juvenile Coho Salmon (Mike McCain, Six Rivers National Forest, pers. comm., 2010). These streams exhibit flashy fall and winter flows and are constrained except near ocean tidal areas. Most of these very lower reaches are under private agriculture use where downcut streams have abandoned their floodplains, leaving little off-channel habitat available.

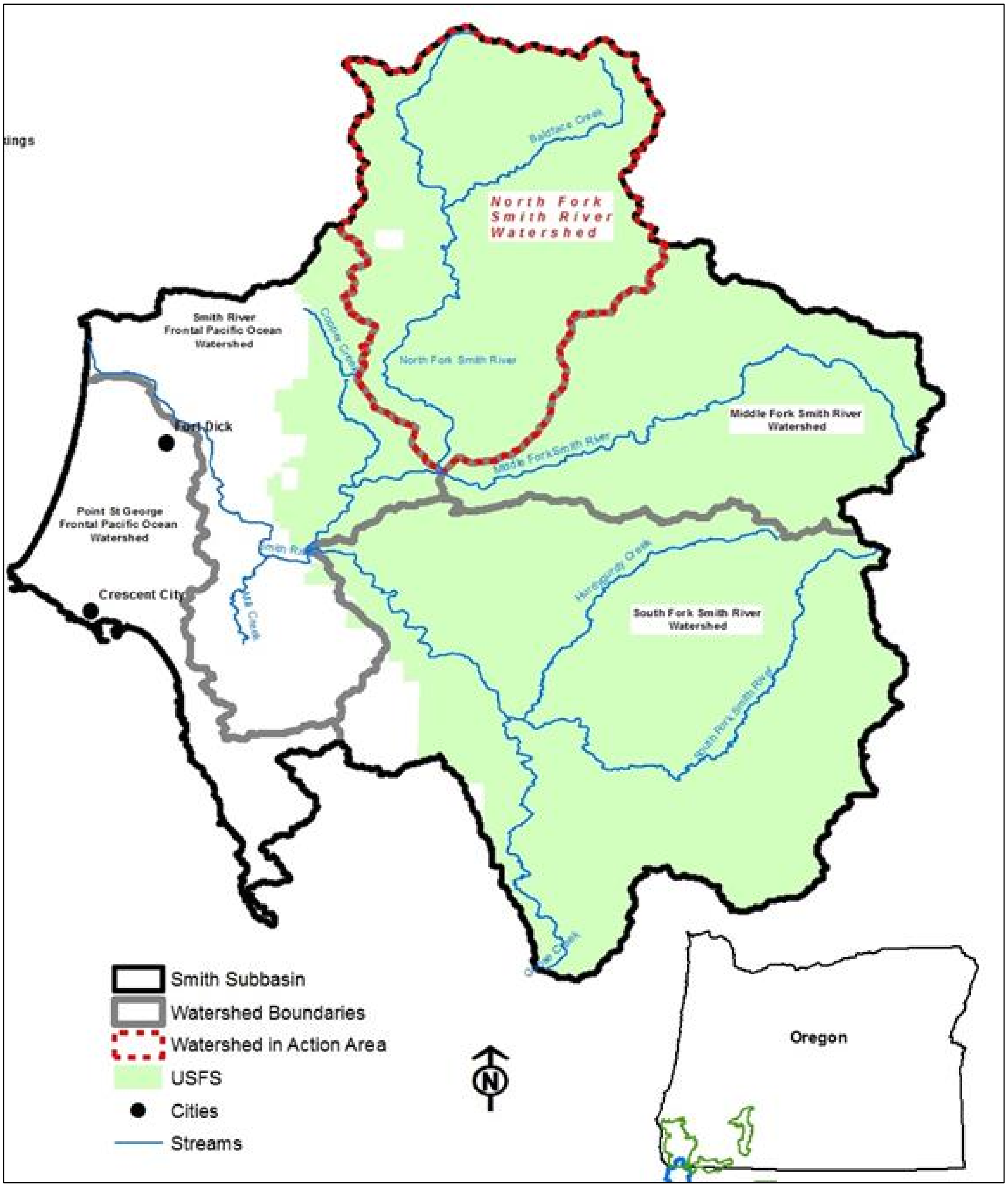

Figure 34. North Fork Smith River watershed in relation to the Smith River population

Suction dredging and high banking activity summary. The segment of the Smith River (from its headwaters within the Kalmiopsis Wilderness to the Oregon/California state line) was designated "Wild and Scenic" under the Omnibus Oregon Wild and Scenic Rivers Act of 1988. The River Management Plan (which is under Administrative Appeal) has proposed two sections of the North Fork for "Wild" designation. The upper section begins in the upper reaches of the river within the Kalmiopsis Wilderness and extends down to Acorn Creek. The lower section begins at Baldface Creek and follows the river to the Oregon/California state line. Both segments are currently segregated from mineral entry, and will soon be withdrawn from mineral appropriation. The segment of the river from Acorn Creek downstream to about Baldface Creek is within the Kalmiopsis Wilderness, but proposed as a "Scenic" section. Because it is located within a wilderness, it is automatically withdrawn. The entire length of the river is thus withdrawn or recommended for withdrawal (and currently segregated) from operations under the mining law.

While there is no development as such, recreational activities within the designated Wild and Scenic River center on Sourdough Camp, the access road to Sourdough, and some kayaking. Some segments of the river have a history of mining activity. The two-mile section between Baldface Creek and the Oregon-California state line has experienced some mineral exploration activity upslope. But, mining activities within the corridor are quite limited.

Subbasin population overview – Smith River

Population highlights (NMFS 2014)

- There is one Coho Salmon population within Smith River subbasin ESA action area: Smith River
- Central Coastal Stratum
- Core, Functionally Independent Population
- High Extinction Risk
- 6,800 Spawners Required for ESU Viability
- 762 mi2
- 325 IP km (202 IP mi) (23% High)
- Dominant Land Uses are Agriculture and Timber Harvest
- Principal Stresses are 'Impaired Estuary/Mainstem Function' and 'Lack of Floodplain and Channel Structure'
- Principal Threats are 'Channelization/Diking and 'Agriculture'

Juvenile and adult spawning surveys indicate that Coho Salmon in the Smith River population occur in widely separated tributaries. The majority of production appears to occur in Mill Creek and Rowdy Creek where spawning Coho Salmon have been observed regularly and juveniles occur in fairly high densities (Rellim 25 Redwood Company 1994; Scriven in progress). Historically, within the middle and upper watershed of the Smith River, Coho Salmon occurred at moderate to high densities in many tributaries in the North, South, and Middle Fork drainages. Today, Coho Salmon occur only rarely and in low densities outside of Mill Creek.

Based on the depressed population size, neutral growth rate, restricted distribution of spawning and rearing, low diversity, and the degraded condition of most IP habitat, this population is considered at high risk of extinction and is not currently viable. Population abundance appears to be significantly less than historic population estimates that suggest this watershed once supported thousands of returning spawning Coho Salmon each year. Currently, the population is restricted to just a few tributaries within the Smith River watershed and is sustained by production from Mill Creek. Coho Salmon spawn only intermittently in other areas amongst widely separated tributaries with low overall production. Spawning surveys conducted between 1980 through 2001 indicate that this Coho Salmon population has maintained current numbers in Mill Creek over the last three decades, but the population is far below depensation thresholds and likely is experiencing negative effects from its low population size (Voight and Waldvogel 2002). Although some life history diversity appears to be intact, the population genetics have been negatively impacted by past Coho Salmon hatchery programs in the basin. Nearly all the habitat having high intrinsic potential for Coho Salmon has been highly altered by human activities (NMFS 2014).

Watersheds within the ESA action area of the Smith River subbasin

Watershed baseline conditions are described for one 5th field watershed within the Smith River subbasin: North Fork Smith River watershed (Figure 34).

North Fork Smith River watershed

Watershed overview – North Fork Smith River

The North Fork of the Smith River watershed was designated a Key Watershed. There are 13 miles of the North Fork of the Smith River within Oregon. It flows south from the flank of the Chetco River watershed divide in the Kalmiopsis Wilderness. It meets the Smith River at Gasquet, California where it flows across Del Norte County to the Pacific Ocean at Smith River, California. The North Fork of the Smith was designated a Wild and Scenic River in 1988. The Outstandingly Remarkable Values are scenery, fisheries, and water quality. The portions designated 'Wild' are above Horse Creek and below Baldface Creek to the Oregon/California state line. The portion between Horse Creek and Baldface Creek is designated 'Scenic'.

The North Fork of the Smith watershed receives approximately 100 to 150 inches of precipitation per year. About 53% of the watershed is in the rain-dominated zone (under 2500 foot elevation); 46% is in the transient snow zone (2500 to 4000 foot elevation, mostly in Baldface and Chrome Creeks); and, 1% is in the snowpack zone (along the Chetco Divide). The three largest streams, North Fork of the Smith River, Baldface Creek, and Chrome Creek, show evidence of considerable stream power by the size and volume of sediment and large wood that they move. The gradients for these streams are for the most part under 3%, which is relatively low for mountain streams. Since the gradient is low, it can be concluded that stream power is a major component of high peak flows. Ultramafic soils are shallow and porous and occupy roughly half of the watershed. This contributes to the flashiness and power of these streams. The ownership distribution in the watershed encompasses: USFS 98%, State lands 1% and the remaining 1% is in private ownership (Table 138).

Table 138. Watershed area and ownership distribution - North Fork Smith River watershed

Land Ownership	Acres	Ownership (percent)
USFS	99,997	98
State	548	1
Private	651	1
Total	**67,250**	**100**

Prevalent land uses

- Federal – Wilderness, recreation, mining and timber harvest
- Private – there is very little private land

Anthropomorphic alterations to habitat. In general, humans have only made minor intrusions within the watershed. Mining is the most visible of the historic activities that occurred within the watershed, lasting from the late 1800's through the 1950's. Prior to 1900, mining was limited to placer mining for gold in a few locations. Mining activity increased after the turn of the century. Evidence of hydraulic mining has been reported on Spokane Creek, a tributary to Baldface Creek. The McKee Mine (gold), Baldface Nickel Mine, and Sourdough Mine (chrome) are notable historic mines in the watershed. The remoteness, difficult access, and the absence of arable or grazing land in the North Fork Smith River watershed has precluded extensive development. Human population density is extremely low. Much of the watershed lies within the Kalmiopsis Wilderness. The remainder of the watershed (on RRS land) has been designated as Late-Successional Reserve under the 1994 NWFP (USFS and BLM 1994). Road development and timber harvest is very scattered and minimal throughout the lower portion of the watershed and outside of the wilderness.

Suction dredging and high banking activity summary. There were 6 active filed placer claims as of 5/8/2013. There was 1 suction dredge NOI received by the RRS during the four-year period from 2009-2012 in the subbasin on NFS land located within 1/4 mile of CCH (Table 4 and Figure 35). The NOI and related Coho Salmon habitat use type, and its potential maximum impact are numerically displayed in Table 139. Some segments of the river have a history of mining activity. The two-mile section between Baldface Creek and the Oregon-California state line has experienced some mineral exploration activity upslope. But, mining activities within the corridor are quite limited.

The segment of the Smith River (from Sourdough Camp to the Rogue River-Siskiyou National Forest Boundary) was withdrawn from mineral entry by inclusion in the Wild and Scenic Rivers system (Omnibus Oregon Wild and Scenic Rivers Act 1988). The east side of the North Fork Smith River from Horse Creek downstream to Sourdough Camp was withdrawn as a part of the Kalmiopsis Wilderness on February 24, 1978. The west half of this segment was administratively withdrawn for a period of 20 years by Public Land Order 7556 on March 20, 2003 (68 FR 13726). There are 55.8 miles of CCH within the watershed and 22.6 miles of those miles are withdrawn from mineral entry. The IP value and habitat use typing for these withdrawn miles are displayed in Table 140. See Appendix A for a summary of the suction dredging and high banking mineral withdrawn areas on the RRS.

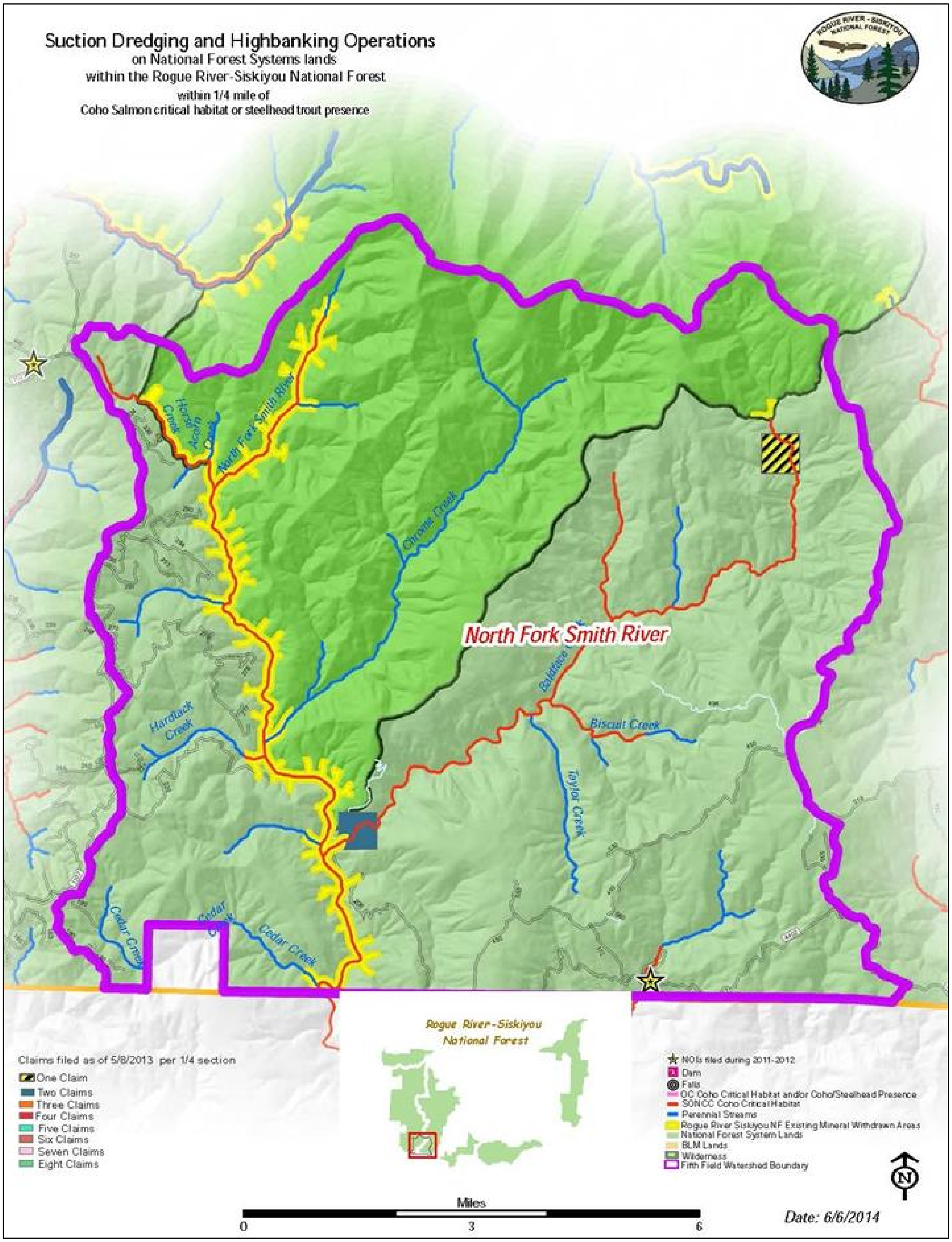

Figure 35. CCH with NOI and mining claims within 1/4 mile of CCH on NFS lands – North Fork Smith River watershed

Table 139. Suction dredging NOI received by RRS (2009-2012) within ¼ mile of CCH – North Fork Smith River watershed

Name/Location			Past NOI Information								Potential Habitat Use Coho Salmon		
							Total Maximum Disturbance[2]						
Stream w/River Mile (constant name)	Location[1] RS & Lat/Long	Name of Claim	NOI Received 2009-2012 (list years)	Number of Operators per claim Number of Operators per claim	Suction Dredge Activities (Y/N)	High Number of Operators per claim Banking Activities (Y/N)	Volume - NOI Listed (cubic yd.)	Volume – Assumed[3] or NOI Listed (cubic yd.)	Area (sq. ft.)	Stream Distance (ft.)	Spawning / Rearing ft.)	Rearing /Migration (ft.)	Migration (ft.)
North Fork Diamond Creek 2.4	T41S., R10W., Sec 16 N41.999 W123.884	***	2012	2	N	Y	0	25	225	15	15	0	0
		AFFECTED Total within Watershed						$25\ yd^3$	$225\ ft^2$	15 ft	15	0	0
		BASELINE Total within Watershed						$10,882,080\ yd^3$	$3,627,360\ ft^2$	241,824 ft	241,824 ft	0	0
		BASELINE Total CCH within Watershed								55.8 mi	55.8 mi	0.0	0.0
		AFFECTED Percent Watershed within CCH						0.000%	0.006%	0.006%	0.006%	0.000%	0.000%

[1] Proposed dredging mile marker starting point.

[2] Standard formula to calculate maximum 25 cubic yards suction dredge area of disturbance = 15 feet (length) X 15 feet (width) X 3 feet (depth). Width and depth is constant when cubic yard is stated differently in NOI.

[3] 25 cubic yards is the standard maximum volume anticipated when not specified in NOI.

Table 140. IP and habitat typing mineral withdrawn areas – North Smith River watershed

Habitat Typing[1]	Intrinsic Potential[2] (miles)			Total (miles)
	High	Medium	Low	
Spawning/rearing	0	20.3	2.3	22.6
Rearing/migration	0	0	0	0
Migration only	0	0	0	0
Total	**0**	**0**	**0**	**22.6**

[1] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[2] Values based on an intrinsic potential map derived from the NETMAP CLAMS data and also located http://www.fsl.orst.edu/clams/. Category for ranking were derived from the final SONCC Coho Salmon Recovery Plan (NMFS 2014); high =>/= 0.66, moderate = </=0.33 – 0.66 and low = <0.33.

Watershed population overview – North Fork Smith River

Fall Chinook Salmon, Coho Salmon, steelhead, anadromous cutthroat trout, resident rainbow and resident cutthroat trout use the watershed. There are 55.8 miles of critical habitat within the watershed and 38.7 miles on NFS lands (Figure 35 and Table 141). The distribution of fish within the basin is not fully understood for all species. Of the fish-producing streams in the North Fork of the Smith watershed, Baldface Creek is remarkable in its variety of habitats and very high fish production potential. There are no known blockages to fish migration in the watershed. Based on the near-pristine nature of the fish habitat in the basin, population trends for fish in the watershed appear to be governed by forces outside the basin such as downstream migration habitat condition, ocean conditions, ocean and lower river commercial and sport angling, and intrinsic population cycles (USFS 1995). The watershed is mostly within medium IP and *spawning/rearing* habitat typing (Table 142).

Table 141. Salmonid species and habitat length - North Fork Smith River watershed

Water-shed Acres	Anadro-mous Species Present[1]	NFS lands Miles of CCH (miles)[2]	NFS lands Miles of Chinook Habitat (miles)[3]	Water-shed CCH and EFH (miles)[4]	Watershed Potential Miles of Coho Salmon Habitat Type[5]		
					Spawning/ Rearing	Rearing/ Migration	Migration only
101,182	CO, CH, STW, CT	38.7	34.8	55.8	55.8	0	0

[1] All, or a portion of, the waterbody supports the following anadromous salmonids: ST- steelhead trout; CO- Coho Salmon; CH - Chinook Salmon.

[2] Steelhead presence surveys were used to determine historic Coho Salmon habitat since CCH was not spatially delineated in the Federal Register 50 CFR Part 226. Values based on GIS data layer entitled RRS 2013 Total Salmon and Steelhead Distribution and field knowledge.

[3] Values based on GIS data layer entitled 2013 RRS Anadromous Salmonid Fish Distribution; Chinook Salmon presence survey layer.

[4] Values based on a combination of RRS 2013 SONCC Coho Salmon delineated CH 19 and ODFW steelhead presence survey data 2013 GIS map (as a surrogate for historic Coho Salmon habitat) website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[5] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

Table 142. Habitat typing and intrinsic potential within CCH – North Fork Smith River watershed

Habitat Typing[1]	Intrinsic Potential[2] (miles)						Total (miles) CCN/IP/HT	
	High IP		Medium IP		Low IP			
	Water-shed	NFS lands	Water-shed	NFS lands	Water-shed	NFS lands	Water-shed	NFS lands
Spawning/rearing	0.4	0.4	46.7	33.3	8.7	5.0	55.8	38.7
Rearing/migration	0	0	0	0	0	0	0	0
Migration only	0	0	0	0	0	0	0	0
Total	**0.4**	**0.4**	**46.7**	**33.3**	**8.7**	**5.0**	**55.8**	**38.7**

[1] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[2] Values based on an intrinsic potential map derived from the NETMAP CLAMS data and also located http://www.fsl.orst.edu/clams/. Category for ranking were derived from the final SONCC Coho Salmon Recovery Plan (NMFS 2014); high =>/= 0.66, moderate = </=0.33 – 0.66 and low = <0.33.

Watershed habitat indicators – North Fork Smith River

1) Water quality pathway - North Fork Smith River watershed

Temperature indicator – *Properly Functioning*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010) and NF Smith WA (USFS 1995, 2004).

North Fork Smith River on NFS lands within the RRS is listed for temperature (1.58 miles; river mile 0 to 1.6 miles). 303(d) listing status is - Cat 5: Water quality limited, 303(d) list, TMDL needed. Stream temperatures within the North Fork Smith River and the lower reaches of Baldface and Chrome Creeks are warm, approaching the tolerance limit for salmonids, particularly during low flow years. Water temperatures exceed the State standard during the summer months within the wilderness due to the bedrock nature of the geology. Appendix B displays the 2010 303(d) list for streams within NFS lands on RRS.

Suspended sediment – intergravel/DO/turbidity indicator - *Properly Functioning*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010) and NF Smith WA (USFS 1995, 2004).

No streams in the watershed within the RRS are on the 303(d) list for sediment The major contributors of sediment in the North Fork Smith River watershed are natural slides, debris flows, and channel erosion within the Josephine ultramafic rock unit. Surface erosion as a contributor of sediment is negligible in the watershed.

Chemical contamination/nutrients indicator – *Properly Functioning*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010) and NF Smith WA (USFS 1995, 2004).

No streams in the watershed within the RRS are on the 303(d) list for contaminants or excessive nutrients. No evidence of chemical effects of mining has been found. The large chromite mine near the mouth of Baldface Creek included a mill and settling pond constructed in 1951 to concentrate the low-grade ore. The processing was mechanical and did not include chemical treatment or addition of chemical elements.

2) Habitat access/elements pathway - North Fork Smith River watershed

Physical barriers indicator – *Properly Functioning*. Baseline: NF Smith WA (USFS 1995, 2004), Smith Creek SS (USFS 1992, 1998), North Fork Smith SS (USFS 1991, 1994), Chrome Creek SS (USFS 1994), Biscuit Creek SS (USFS 2005) and Baldface Creek SS (USFS 1991, SRG 2005), Spokane Creek SS (SRG 2005), Cedar Creek SS (USFS 1994), Horse Creek SS (SRG 2006) and Hardtack Creek SS (USFS 1994).

There are no known barriers to fish migration in the watershed.

Substrate/embeddedness indicator – *Properly Functioning*. Baseline: NF Smith WA (USFS 1995, 2004), Smith Creek SS (USFS 1992, 1998), North Fork Smith SS (USFS 1991, 1994), Chrome Creek SS (USFS 1994), Biscuit Creek SS (USFS 2005) and Baldface Creek SS (USFS 1991, SRG 2005), Spokane Creek SS (SRG 2005), Cedar Creek SS (USFS 1994), Horse Creek SS (SRG 2006) and Hardtack Creek SS (USFS 1994).

Quality spawning habitats are common and widespread within watershed. Tremendous quantities of bedload move in most streams each winter, with few fines present as a result of local rock types and soils..

Large wood indicator – *Properly Functioning*. Baseline: NF Smith WA (USFS 1995, 2004), Smith Creek SS (USFS 1992, 1998), North Fork Smith SS (USFS 1991, 1994), Chrome Creek SS (USFS 1994), Biscuit Creek SS (USFS 2005) and Baldface Creek SS (USFS 1991, SRG 2005), Spokane Creek SS (SRG 2005), Cedar Creek SS (USFS 1994), Horse Creek SS (SRG 2006) and Hardtack Creek SS (USFS 1994).

The amount of vegetation potentially supplying large wood within the watershed varies by soil type. The mainstem North Fork Smith River, the upper reaches of Baldface Creek and most of the smaller tributaries are well-vegetated with large conifers. Ultramafic soils produce fewer trees per acre. This condition results in low amounts of large wood throughout Chrome Creek and lower portions of Baldface Creek. Retention of large wood within the mainstem North Fork Smith and lower Baldface Creek is limited, due to wide channel bottoms and powerful winter storm flows which transport instream wood out of the system.

Pool frequency and quality indicator – *Properly Functioning*. Baseline: NF Smith WA (USFS 1995, 2004), Smith Creek SS (USFS 1992, 1998), North Fork Smith SS (USFS 1991, 1994), Chrome Creek SS (USFS 1994), Biscuit Creek SS (USFS 2005) and Baldface Creek SS (USFS 1991, SRG 2005), Spokane Creek SS (SRG 2005), Cedar Creek SS (USFS 1994), Horse Creek SS (SRG 2006) and Hardtack Creek SS (USFS 1994).

The North Fork Smith River has high quality deep pools. Depth and interstitial spaces between bed particles constitutes most cover for salmonids. Frequent large pools are observed in the mainstem of the river and Baldface Creek. Table 143 summarizes pool habitat conditions on streams surveyed (using USFS R6 Level II survey protocol) that contain CCH on NFS lands.

Table 143. Habitat percent and pool summary for surveyed streams – North Fork Smith River watershed

Stream Name	Year Survey-ed	Habitat % Pool	Habitat % Riffle	Pools/ Mile	Deep Pools/mile (>3ft)	Avg. Residual Pool Depth (ft)	Average Bankfull Width (ft)
Biscuit Creek	2005	26.9	73.1	33.9	9.6	2.3	27.6
Baldface Creek	2005	27.9	70.8	17.6	12.9	3.0	40.6
Spokane Creek	2005	14.9	84.8	12.5	3.4	2.1	18.6
N.F. Smith River	2006	37.0	60.4	17.3	7.5	3.8	43.6
Chrome Creek	1994	19.8	80.0	10.5	8.0	3.5	53.7
Cedar Creek	1994	19.0	79.9	14.3	4.0	2.4	29.8
Horse Creek	2006	37.6	62.4	40.3	3.5	1.6	17.3
Hardtack Creek	1994	27.6	72.4	38.7	19.4	2.6	-

Off-channel habitat indicator – *Properly Functioning*. Baseline: NF Smith WA (USFS 1995, 2004), Smith Creek SS (USFS 1992, 1998), North Fork Smith SS (USFS 1991, 1994), Chrome Creek SS (USFS 1994), Biscuit Creek SS (USFS 2005) and Baldface Creek SS (USFS 1991, SRG 2005), Spokane Creek SS (SRG 2005), Cedar Creek SS (USFS 1994), Horse Creek SS (SRG 2006) and Hardtack Creek SS (USFS 1994).

Side channel habitat is naturally uncommon in the mainstem North Fork Smith River, and many of the tributary streams. Conversely, side channel habitat in Baldface Creek is common and complex.

Refugia indicator – *Properly Functioning*. Baseline: NF Smith WA (USFS 1995, 2004), Smith Creek SS (USFS 1992, 1998), North Fork Smith SS (USFS 1991, 1994), Chrome Creek SS (USFS 1994), Biscuit Creek SS (USFS 2005) and Baldface Creek SS (USFS 1991, SRG 2005), Spokane Creek SS (SRG 2005), Cedar Creek SS (USFS 1994), Horse Creek SS (SRG 2006) and Hardtack Creek SS (USFS 1994).

Refugia consists primarily of interstitial spaces between bed particles and depth in pools. There are few wood complexes.

3) Channel condition and dynamics pathway - North Fork Smith River watershed

Average width/maximum depth ratio indicator – *Properly Functioning*. Baseline: NF Smith WA (USFS 1995, 2004), Smith Creek SS (USFS 1992, 1998), North Fork Smith SS (USFS 1991, 1994), Chrome Creek SS (USFS 1994), Biscuit Creek SS (USFS 2005) and Baldface Creek SS (USFS 1991, SRG 2005), Spokane Creek SS (SRG 2005), Cedar Creek SS (USFS 1994), Horse Creek SS (SRG 2006) and Hardtack Creek SS (USFS 1994).

Naturally wide channels accommodate high winter flows.

Streambank condition indicator - *Properly Functioning*. Baseline: NF Smith WA (USFS 1995, 2004), Smith Creek SS (USFS 1992, 1998), North Fork Smith SS (USFS 1991, 1994), Chrome Creek SS (USFS 1994), Biscuit Creek SS (USFS 2005) and Baldface Creek SS

(USFS 1991, SRG 2005), Spokane Creek SS (SRG 2005), Cedar Creek SS (USFS 1994), Horse Creek SS (SRG 2006) and Hardtack Creek SS (USFS 1994).

In general, stream banks within the watershed are stable and dominated by large colluvial and alluvial deposits. Some natural landslides occur, particularly within tributary streams.

Floodplain connectivity indicator- *Properly Functioning*. Baseline: NF Smith WA (USFS 1995, 2004), Smith Creek SS (USFS 1992, 1998), North Fork Smith SS (USFS 1991, 1994), Chrome Creek SS (USFS 1994), Biscuit Creek SS (USFS 2005) and Baldface Creek SS (USFS 1991, SRG 2005), Spokane Creek SS (SRG 2005), Cedar Creek SS (USFS 1994), Horse Creek SS (SRG 2006) and Hardtack Creek SS (USFS 1994).

Terraces are occasional, and few wide floodplains exist because of hillslope confinement. Deeply incised V-shaped canyons are common, particularly within tributary streams and upper portions of the mainstem North Fork Smith River.

4) Flow/hydrology pathway - North Fork Smith River watershed

Change in peak/base flow indicator – *Properly Functioning*. Baseline: NF Smith WA (USFS 1995, 2004) surveys.

There are very flashy stream systems with little human influence in the wilderness above Baldface Creek.

Increase in drainage network indicator – *Properly Functioning*. Baseline: NF Smith WA (USFS 1995, 2004).

There is a low road density within the watershed. Roads systems are largely concentrated in the western portion of the watershed, between Horse Creek and Hardtack Creek, spurring off RRS Road 1107.

5) Watershed conditions pathway – North Fork Smith River watershed

Road density and location indicator – *Properly Functioning*. Baseline: NF Smith WA (USFS 1995, 2004).

There is a low road density within the watershed. Roads systems are largely concentrated in the western portion of the watershed, between Horse Creek and Hardtack Creek, spurring off RRS Road 1107.

Disturbance history indicator – *Properly Functioning*. Baseline: NF Smith WA (USFS 1995, 2004).

Anthropogenic disturbance within the watershed has primarily been associated with historic mining and timber harvest (west side of the watershed). The 2002 Biscuit Fire burned within the watershed. Upper portions of the watershed are located within the Kalmiopsis Wilderness Area.

Riparian Reserves indicator – *At Risk*. Baseline: NF Smith WA (USFS 1995, 2004).

Ultramafic soils prevent large trees in many areas. Riparian vegetation is often low-lying grasses/herbs/shrubs and hardwoods. Approximately 33% of the riparian zones within 1 site potential tree (SPT) of streams were burned severely enough to kill the forest canopy during the Biscuit Fire.

Disturbance regime indicator – *Properly Functioning*. Baseline: NF Smith WA (USFS 1995, 2004).

There has been some roading downstream in the watershed from past mining activities and in western portions of the watershed associated with timber harvest.

8. Upper Rogue River population

Subbasin overview – Upper Rogue River

The Upper Rogue subbasin and Middle Rogue subbasin are lumped together in this BA since they share the Upper Rogue River Coho Salmon population. The ESA action area encompasses three watersheds within the population: two of eight watersheds in the Upper Rogue subbasin (Elk and Little Butte Creek), and one of four watersheds in the Middle Rogue subbasin (Bear Creek) (Figure 36).

Upper Rogue subbasin. The Upper Rogue subbasin is a 1,613 square mile watershed that contains the headwaters and upper tributaries to the main stem of the Rogue River. The subbasin contains the following watersheds: Elk Creek, Little Butte Creek, Headwaters Rogue River, South Fork Rogue River, Lost Creek-Rogue River, Big Butte Creek, Trail Creek, and Shady Cover-Rogue River. The first two watersheds, Elk Creek and Little Butte Creek, are within the ESA action area.

The headwaters of the Rogue flow off of the west slopes of the Cascade Mountains and Crater Lake National Park in southern Oregon. The Lost Creek Dam (i.e. William L. Jess Dam) was completed in 1977, and created Lost Creek Reservoir. This condition alters the natural hydrograph of the mainstem Rogue River, prevents fish passage, and provides for flood control within the subbasin and downstream areas. Associated with the dam is the Cole Rivers Hatchery, which produces Coho and Chinook salmon, Steelhead Trout and rainbow trout for rivers and lakes within the middle and upper Rogue Basin.

Middle Rogue subbasin. The Middle Rogue subbasin covers 881 square miles in the middle of the larger Rogue River basin. The most densely populated areas of the Rogue basin are within the Middle Rogue subbasin, both in Jackson County on the western side of the watershed, and Josephine County on the eastern edge. Upstream is the Upper Rogue subbasin and downstream the watershed drains into the Lower Rogue.

The northern and southern portions of the watershed are higher elevation conifer forests, draining the slopes of the Siskiyou Mountains in the south and the Umpqua divide to the north. There are small parts of the watershed managed by the RRS, predominantly along Evans and Ashland Creeks, with the BLM owning a checkerboard of land parcels in the mid and lower elevation land. The overwhelming majority of property within this subbasin is privately owned and used for timberlands, agriculture, small industry and urban development.

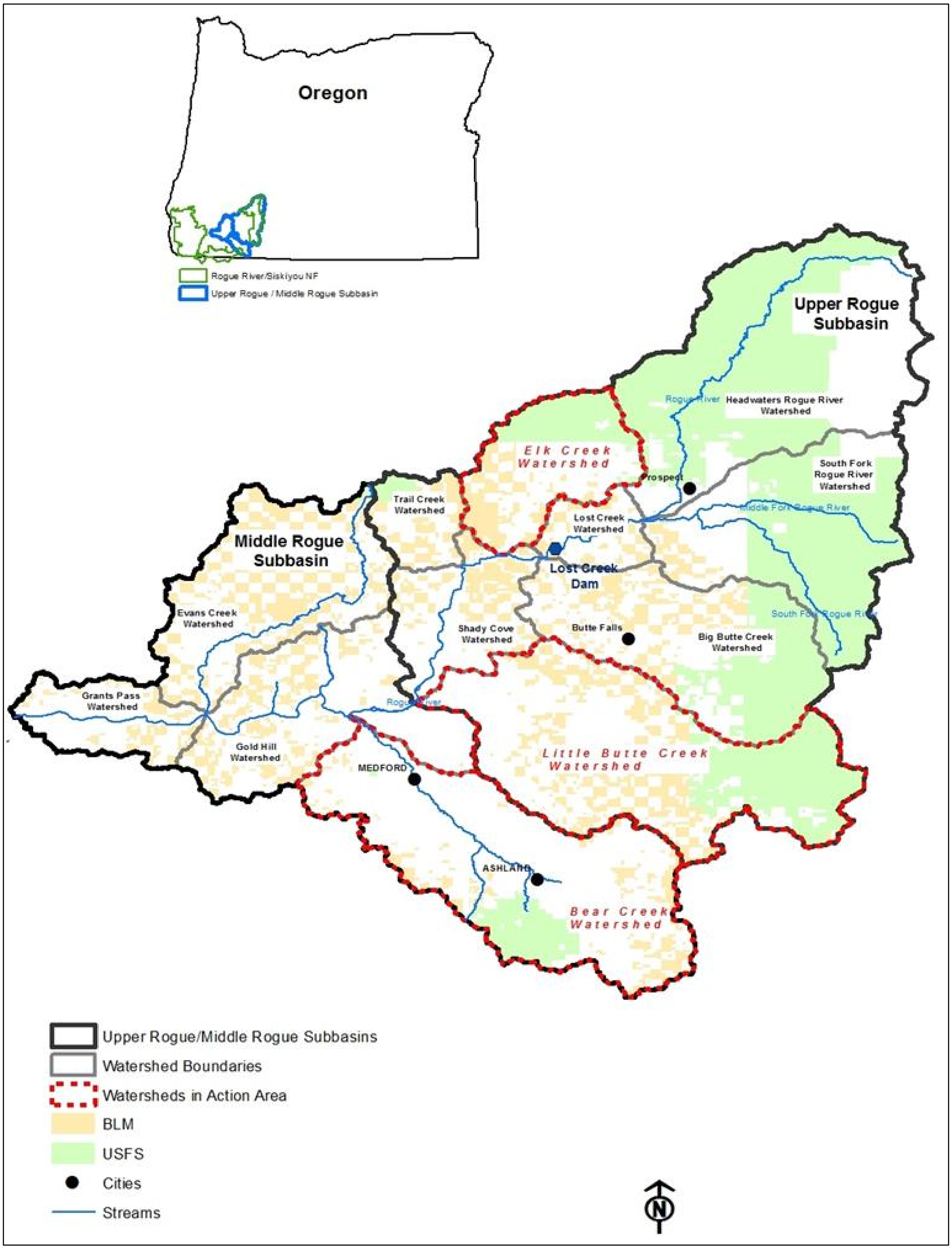

Figure 36. Upper Rogue River population in relation to watersheds within the ESA action area

Subbasin population overview – Upper Rogue River

Population highlights (NMFS 2014)

- Population is located in a mixture of the watersheds within the Middle Rogue and Upper Rogue subbasins
- Large Independent Population
- Northern stratum
- Most easterly of four Rogue River Populations
- Highest IP for Coho Salmon production occurs in low gradient reaches that overlap with agricultural and development activities
- Historic IP km is 915.43 (568 IP mi) and current IP (reflecting loss due to dams) is 508.21 IP km (315 IP mi), a,45% lost due to dams (Williams et al. 2007).
- Viability criteria: Depensation threshold: 915, Spawner density (fish/IP km): 20
- Low risk spawner threshold: 18,300
- Abundance and productivity: Low to Moderate
- Spatial distribution: Widespread below Lost Creek Dam
- Diversity: Low
- Current Viability Status: Moderate risk
- Dominant land uses are urban and residential development, agriculture, logging, mining
- Principal stresses are ‘Altered Hydrologic Function’ and ‘Impaired Water Quality’
- Principal threats are ‘Agricultural Practices’ and ‘Urban/Residential/Industrial Development’

While the Upper Rogue River basin overall still produces many Coho Salmon, much of the high IP (>0.66) Coho Salmon habitat (Williams et al. 2007) is blocked or no longer supporting the species. ODFW (2005b) asserts that loss of habitat above Lost Creek Dam is of much less extent than indicated by the Williams et al. (2008) model because of an impassable barrier on the mainstem just above Prospect. ODFW (2005a) conducted extensive Coho Salmon juvenile surveys in the Rogue River basin that confirm widespread presence and varying levels of abundance in Little Butte, Big Butte, Evans, Trail, Elk, and Antelope Creeks. The concentration of high density rearing is in the upper watersheds and often immediately below public land that supplies cool water. Lower reaches of the same streams, although formerly optimal habitat, now sometimes lack sufficient flow or, as in the case of Trail Creek, have no flow at all (RRWC 2006, Nawa 1999).

Watersheds within the ESA action area of the Upper Rogue population

Watershed baseline conditions are described for three 5th field watersheds within the Upper Rogue population: Bear Creek, Elk Creek and Little Butte Creeks watersheds (Figure 36).

a. Bear Creek watershed

Watershed overview – Bear Creek

The Bear Creek watershed has the highest human population density of any watershed in the Rogue basin with a population of over 110,000 people. Historically, Bear Creek was a major producer of Coho Salmon and other fishes due to its large amount of high IP habitat, which provided ample off-channel rearing areas preferred by Coho Salmon. For example, between the 1800s and early 1900s, a Coho Salmon cannery was operated near present day Lithia Park on Ashland Creek. Currently, the watershed hydrology, floodplain connectivity, sediment regime, water quality, and fish habitat have been significantly altered to the point where Coho Salmon are largely functionally extinct within the watershed. Within the watershed, factors limiting salmonid production include: fine sediment in stream channels; elevated water temperature; bedrock dominated channels; lack of instream large wood and lack of complex rearing habitat; eutrophication and chemical spills; passage barriers; urbanization; reverse hydrographs; invasive species; water withdrawals; and, polluted return flows. The ownership distribution in the watershed encompasses: USFS 9%, BLM 12%, State lands <1% and the remaining 78% is in private ownership (Table 144).

Table 144. Watershed area and ownership distribution - Bear Creek watershed

Land Ownership	Acres	Ownership (percent)
USFS	20,378	9
BLM	28,341	12
State	1,018	<1
Private	181,508	78
Total	**231,245**	**100**

Prevalent land uses

- Federal – Municipal watershed, developed recreation, timber production
- Private – Timber production, agriculture, rural residential development, urban

Anthropomorphic alterations to habitat. Historic homesteading gave way to incorporating the cities of Ashland, Talent, Phoenix, Medford, and Central Point. Irrigation districts created canal systems and Emigrant Reservoir, which blocked upstream Coho Salmon migration. Habitat was also blocked by two high-head dams on Ashland Creek that still remain. As the Bear Creek floodplain became more developed and paved with impervious surfaces, high nutrient levels and chemical concentrations from storm drains became more common. In portions of Bear Creek summer temperatures are lethal to juvenile Coho Salmon and the stream experiences thermal loading from irrigation returns, water withdrawals, riparian development, and urbanization/loss of groundwater recharge.

Suction dredging and high banking activity summary. The Bear Creek watershed within the Middle Rogue/Applegate Rivers population on NFS lands had no active filed claims as of 5/8/2013. There were no suction dredge NOI received by the RRS during the four-year period from 2009-2012 in the watershed on NFS land located within 1/4 mile of CCH (Table 4 and Figure 37). The area within the East Fork Ashland Creek Resource Natural Area (RNA) has been withdrawn from mineral entry. There are 86.7 miles of CCH within the watershed and 8.1 miles of those miles are withdrawn from mineral entry. The IP value and habitat use typing for these withdrawn miles are displayed in Table 145.

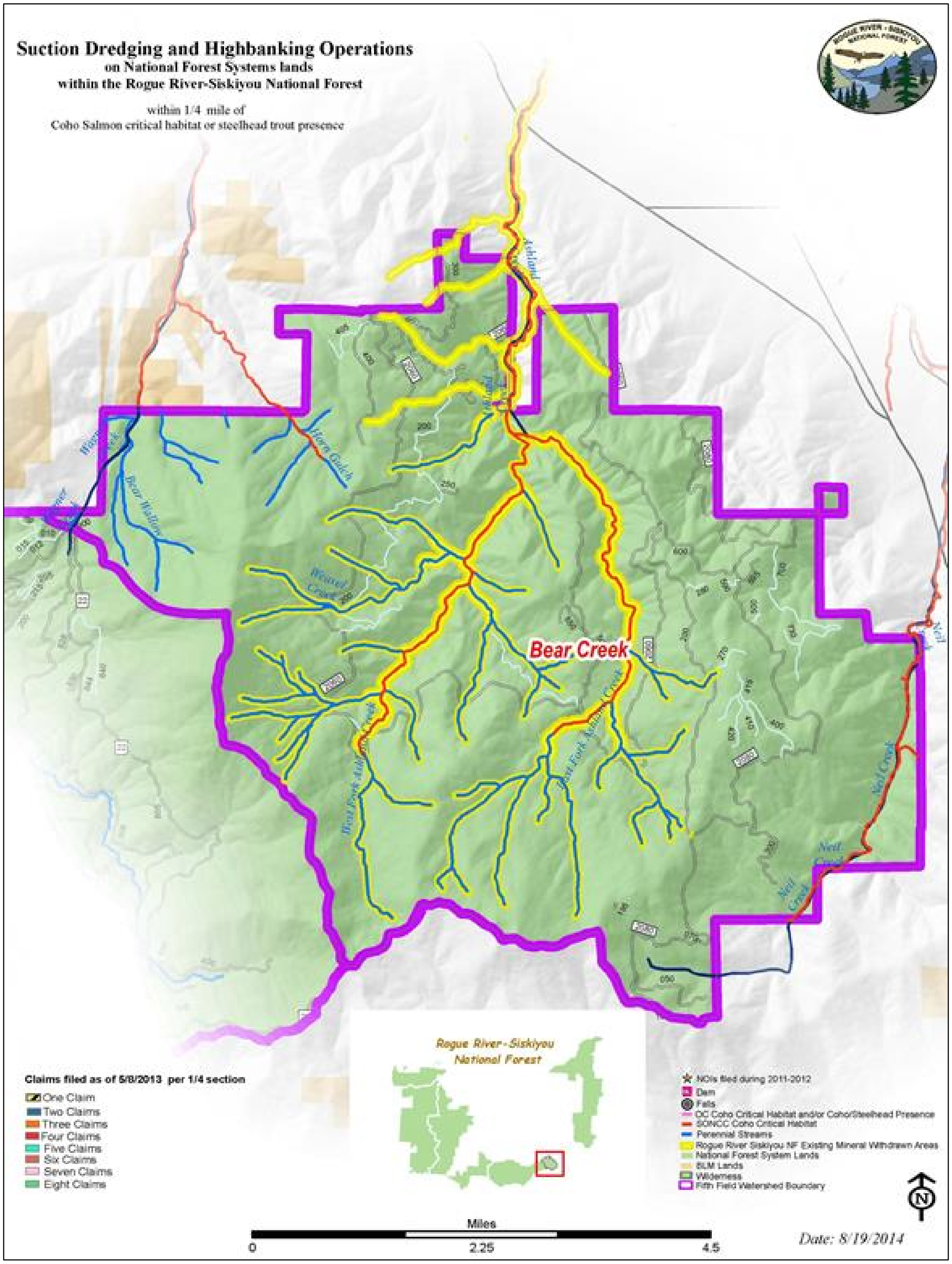

Figure 37. CCH with NOI and mining claims within 1/4 mile of CCH on NFS lands – Bear Creek watershed

Table 145. IP and habitat typing mineral withdrawn areas – Bear Creek watershed

Habitat Typing[1]	Intrinsic Potential[2] (miles)			Total (miles)
	High	Medium	Low	
Spawning/rearing	0	0.5	7.6	8.1
Rearing/migration	0	0	0	0
Migration only	0	0	0	0
Total	**0**	**0.5**	**7.6**	**8.1**

[1] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[2] Values based on an intrinsic potential map derived from the NETMAP CLAMS data and also located http://www.fsl.orst.edu/clams/. Category for ranking were derived from the final SONCC Coho Salmon Recovery Plan (NMFS 2014); high =>/= 0.66, moderate = </=0.33 – 0.66 and low = <0.33.

Watershed population overview – Bear Creek

The Bear Creek watershed Coho Salmon population is part of the greater Upper Rogue River population. Recent smolt trapping from the 2000s found very low numbers of Coho Salmon smolts produced in Bear Creek given its watershed size and high amount of high IP habitat. Occasionally, spawning Coho Salmon are observed in Bear Creek and lower Ashland Creek. There are approximately 86.7 miles of CCH within the watershed and 12.1 miles on NFS lands (Table 146). However, Coho Salmon have never been observed on NFS lands in the Bear Creek watershed, especially after long standing barriers have been built. Granite Street and Hosler Dams block Coho Salmon access into the forks of Ashland Creek although these streams are high gradient and not optimal Coho Salmon habitat (Montgomery et al. 1999). The forks of Ashland Creek are included in the critical habitat total although fish cannot access them because of downstream barriers (human-made municipal watershed dams; Hosler and Granite Street). The watershed has primarily high IP habitat located off NFS lands within the *spawning/rearing* habitat use type (Table 147).

Table 146. Salmonid species and habitat length - Bear Creek watershed

Water-shed Acres	Anadro-mous Species Present[1]	NFS lands Miles of CCH (miles)[2]	NFS lands Miles of Chinook Habitat (miles)[3]	Water-shed CCH and EFH (miles)[4]	Watershed Potential Miles of Coho Salmon Habitat Type[5]		
					Spawning/ Rearing	Rearing/ Migration	Migration only
231,244	CO, CH, ST	12.1	0	86.7	86.7	0	0

[1] All, or a portion of, the waterbody supports the following anadromous salmonids: ST- steelhead trout; CO- Coho Salmon; CH - Chinook Salmon.

[2] Steelhead presence surveys were used to determine historic Coho Salmon habitat since CCH was not spatially delineated in the Federal Register 50 CFR Part 226. Values based on GIS data layer entitled RRS 2013 Total Salmon and Steelhead Distribution and field knowledge.

[3] Values based on GIS data layer entitled 2013 RRS Anadromous Salmonid Fish Distribution; Chinook Salmon presence survey layer.

[4] Values based on a combination of RRS 2013 SONCC Coho Salmon delineated CH 19 and ODFW steelhead presence survey data 2013 GIS map (as a surrogate for historic Coho Salmon habitat) website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[5] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

Table 147. Habitat typing and intrinsic potential within CCH – Bear Creek watershed

Habitat Typing[1]	Intrinsic Potential[2] (miles)						Total (miles) CCN/IP/HT	
	High IP		Medium IP		Low IP			
	Water-shed	NFS lands	Water-shed	NFS lands	Water-shed	NFS lands	Water-shed	NFS lands
Spawning/rearing	55.9	0	17.2	0.8	13.6	11.3	86.7	12.1
Rearing/migration	0	0	0	0	0	0	0	0
Migration only	0	0	0	0	0	0	0	0
Total	**55.9**	**0**	**17.2**	**0.8**	**13.6**	**11.3**	**86.7**	**12.1**

[1] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[2] Values based on an intrinsic potential map derived from the NETMAP CLAMS data and also located http://www.fsl.orst.edu/clams/. Category for ranking were derived from the final SONCC Coho Salmon Recovery Plan (NMFS 2014); high =>/= 0.66, moderate = </=0.33 – 0.66 and low = <0.33.

Watershed habitat indicators – Bear Creek

1) Water quality pathway – Bear Creek watershed

Temperature indicator – *Not Properly Functioning*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010), Rogue River Basin TMDL (ODEQ 2008), Bear (upper) Creek WA (USFS 1995), Bear Creek Stream Temperature Study (Dambacher et al. 1992) and NWFP (USFS and BLM 1994).

Bear Creek and tributaries are listed as water quality limited due to elevated summer water temperature. Table 148 displays the 303(d) list for water quality limited stream within the watershed on NFS lands. There is an approved TMDL and Water Quality Management Plan in place for the Rogue basin, which address water temperature (Oregon DEQ 2008). Management of the NFS lands within the Bear Creek watershed is guided by the Rogue River NF LRMP and NWFP. The aquatic and riparian standards and guidelines contained within these documents, particularly the Aquatic Conservation Strategy within the NWFP, are designed to provide for recovery and maintenance of cool/cold water thermal regimes within streams on NFS lands. Nonetheless, high summer water temperatures are one of the many limiting factors to Coho Salmon production in the Bear Creek watershed. Around Phoenix, Bear Creek heats to the point where summer fish assemblages are dominated by non-salmonid fishes (Dambacher et al. 1992). Some of the thermal loading is due to water input from the Ashland Wastewater Treatment Plant. Appendix B displays the 2010 303(d) list for streams within NFS lands on RRS.

Table 148. ODEQ, 2010 303(d) List for Oregon Waterbodies within NFS lands on RRS – Bear Creek watershed

Stream Name	Miles on RRS (miles)	River Mile Marker (miles)	Pollutant	Assess-ment	Assess-ment 2	Listing Status
Ashland Creek	0.56	0 to 5.4	Temperature	2010	11/4/2010	Cat 4A: Water quality limited, TMDL approved
Wagner Creek	0.38	6 to 7.4	Temperature	2010	10/29/2010	Cat 4A: Water quality limited, TMDL approved

Suspended sediment-intergravel/DO/turbidity indicator – *Not Properly Functioning*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010), Bear (upper) Creek WA (USFS 1995).

No streams within the watershed have been listed as water quality limited for sedimentation. However, Reeder Reservoir is TMDL listed for sediment and Bear Creek runs turbid through Medford during the year. Sediment input into stream channels on NFS lands has been primarily associated with past timber harvest and road systems. Streams on NFS lands tend to be higher gradient than downstream private land reaches, and stream substrates are dominated by cobbles and gravel.

Chemical contamination/nutrients indicator – *Not Properly Functioning*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010), Bear (upper) Creek WA (USFS 1995).

No streams in the watershed within the RRS are on the 303(d) list for contaminants or excessive nutrients. The high amount of human development downstream of NFS lands within the watershed greatly increases the risk of chemical contamination and nutrient loading within the Bear Creek watershed, and several fish kills have occurred from storm drain pollution. Off NFS lands, Bear Creek and lower Ashland Creek are included on the 303(d) list for elevated levels of E. coli in the summer.

2) Habitat access/ elements pathway – Bear Creek watershed

Physical barriers indicator – Not Properly Functioning. Baseline: Bear (upper) Creek WA (USFS 1995), Ashland Creek SS (SRG 2000), East Fork Ashland Creek SS (USFS 1997), West Fork Ashland Creek SS (SRG 2001), Neil Creek SS (private lands) (USFS 2002), and Neil Creek SS (USFS 1990, 1999, 2002).

There are physical barriers to fish on NFS lands within the watershed in the form of Hosler Dam, Emigrant Dam and culverts. Emigrant Dam blocks upstream passage of Coho Salmon into upper Emigrant Creek, and culvert barriers exist on Jackson Creek, Larson Creek, and other Bear Creek tributaries.

Substrate/embeddedness indicator – Not Properly Functioning. Baseline: Bear (upper) Creek WA (USFS 1995), Ashland Creek SS (SRG 2000), East Fork Ashland Creek SS (USFS 1997), West Fork Ashland Creek SS (SRG 2001), Neil Creek SS (private lands) (USFS 2002), and Neil Creek SS (USFS 1990, 1999, 2002).

Stream surveys in lower Ashland Creek and Bear Creek at North Mountain Park found streambeds dominated by high amounts of decomposed granitic sand, with large amounts of deposition and embeddedness, which interfere with egg to fry survival. Stream reaches on NFS lands tend to be higher gradient than downstream private land stream reaches, and are predominately transport reaches. However, Reeder Reservoir, partially on NFS lands, is listed for sediment. Bedrock dominated streambed segments are present within many streams within the watershed. However, this condition is less common on NFS lands within headwater portions of the watershed.

Large wood indicator – Not Properly Functioning. Baseline: Bear (upper) Creek WA (USFS 1995), Ashland Creek SS (SRG 2000), East Fork Ashland Creek SS (USFS 1997), West Fork Ashland Creek SS (SRG 2001), Neil Creek SS (private lands) (USFS 2002), and Neil Creek SS (USFS 1990, 1999, 2002).

Large wood levels in streams within the Bear Creek Watershed are below the expected range of natural variation in reaches accessible by or near roads and in urbanized areas. High head dams above Reeder Reservoir on Ashland Creek block downstream passage of large wood into valley stream reaches favored by Coho Salmon. Bear Creek and its tributaries have lost much of their historic cottonwood gallery floodplain forest due to urbanization, interstate highway construction, agriculture, and housing developments. Where present, large wood provides for habitat complexity and retention of bedload.

Pool frequency and quality indicator – Not Properly Functioning. Baseline: Bear (upper) Creek WA (USFS 1995), Ashland Creek SS (SRG 2000), East Fork Ashland Creek SS (USFS 1997), West Fork Ashland Creek SS (SRG 2001), Neil Creek SS (private lands) (USFS 2002), and Neil Creek SS (USFS 1990, 1999, 2002).

Large wood is the primary causal mechanism in low gradient streams to create complex and frequent pools. These pools and large wood also create off-channel habitat and refuge for salmonids. Table 149 summarizes pool habitat conditions on streams surveyed (using USFS R6 Level II survey protocol) on NFS lands in the watershed. Expansive sections of exposed bedrock are a common feature in many streams within the watershed. This condition likely limits residual pool depth within many pools and streams.

Table 149. Habitat percent and pool summary for surveyed streams – Bear Creek watershed

Stream Name	Year Survey-ed	Habitat % Pool	Habitat % Riffle	Pools/ Mile	Deep Pools/mile (>3ft)	Avg. Residual Pool Depth (ft)	Average Bankfull Width (ft)
Ashland Creek	2000	31	69	39	2	2	21
East Fork Ashland Creek[1]	1997	16	84	43	14	2	20
West Fork Ashland Creek[1]	2001	17	83	30	3	1.6	12
Neil Creek (private lands)	2002	24	76	35	1	1.3	14
Neil Creek (FS lands)[1]	1999	13	87	28	0.75	1.3	11

[1] Includes areas surveyed upstream of CCH.

Off-channel habitat indicator – Not Properly Functioning. Baseline: Bear (upper) Creek WA (USFS 1995), Ashland Creek SS (SRG 2000), East Fork Ashland Creek SS (USFS 1997), West Fork Ashland Creek SS (SRG 2001), Neil Creek SS (private lands) (USFS 2002), and Neil Creek SS (USFS 1990, 1999, 2002).

Stream channels on NFS lands tend to have steeper gradients than valley bottom segments on downstream private land. In general, streams on NFS lands are moderately entrenched and/or confined by topography. Side channels are not a common feature in any fish bearing streams on NFS lands within the watershed, due to the natural topography. Side channels have been significantly reduced in the Bear Creek valley downstream due to urbanization and agricultural development. Bear Creek and its tributaries are now predominately single-thread channels where historically they contained secondary and tertiary channels.

Refugia indicator – Not Properly Functioning. Baseline: Bear (upper) Creek WA (USFS 1995), Ashland Creek SS (SRG 2000), East Fork Ashland Creek SS (USFS 1997), West Fork Ashland Creek SS (SRG 2001), Neil Creek SS (private lands) (USFS 2002), and Neil Creek SS (USFS 1990, 1999, 2002).

Due to its headwater location, habitats on NFS lands represent some of the most intact habitat within the watershed. However, these reaches are steeper than preferred by Coho Salmon (Montgomery et al. 1999) and often blocked by downstream barriers (e.g. Neil Creek culvert at Interstate 5, Hosler Dam on Ashland Creek).

3) Channel condition and dynamics pathway – Bear Creek watershed

Bankfull width depth ratio/ channel widening indicator - *Not Properly Functioning*. Baseline: Bear (upper) Creek WA (USFS 1995), Ashland Creek SS (SRG 2000), East Fork Ashland Creek SS (USFS 1997), West Fork Ashland Creek SS (SRG 2001), Neil Creek SS (private lands) (USFS 2002), Neil Creek SS (USFS 1990, 1999, 2002) and NWFP (USFS and BLM 1994).

In general, streams within the watershed are confined, even in lower gradient reaches. It is unknown to what extent historic land use, e.g. timber harvest and roads on NFS lands altered the bankfull channel dimensions within the watershed. Since the mid-1990s, riparian management under the NWFP has emphasized maintenance of habitat for fish and other aquatic resources. Consequently, instream habitat, including bankfull width/depth conditions are improving on NFS in general. Downstream of NFS lands on private land, historic channelization and alteration of floodplains are well documented.

Streambank condition indicator – *Not Properly Functioning*. Baseline: Bear (upper) Creek WA (USFS 1995), Ashland Creek SS (SRG 2000), East Fork Ashland Creek SS (USFS 1997), West Fork Ashland Creek SS (SRG 2001), Neil Creek SS (private lands) (USFS 2002), and Neil Creek SS (USFS 1990, 1999, 2002).

Streambanks in the lower watershed are mostly armored with invasive Armenian blackberry that often prevents riparian forest development.

Floodplain connectivity indicator – *Not Properly Functioning*. Baseline: Bear (upper) Creek WA (USFS 1995), Ashland Creek SS (SRG 2000), East Fork Ashland Creek SS (USFS 1997), West Fork Ashland Creek SS (SRG 2001), Neil Creek SS (private lands) (USFS 2002), and Neil Creek SS (USFS 1990, 1999, 2002).

There are no prominent low gradient areas with expansive floodplains on NFS lands within the watershed. Streams tend to be moderately confined to confined, and constrained by hillslopes or terraces.

4) Flow/hydrology pathway – Bear Creek watershed

Change in peak/base flow indicator– *Not Properly Functioning*. Baseline: Upper Bear Creek WA.

Timber harvest and roads can affect stream flow by intercepting water and transporting it to stream channels more rapidly than natural processes. Bear Creek has a reverse hydrograph due to storage and irrigation water conveyance.

Increase in drainage network indicator – *Not Properly Functioning*. Baseline: Upper Bear WA.

On NFS lands, the major drainages do not contain appreciable road systems. However, road density on private lands in the watershed is extreme and many of these roads are impervious with storm drains that route directly to CCH.

5) Watershed Conditions pathway – Bear Creek watershed

Road density and location indicator – Not Properly Functioning. Baseline: Bear (upper) Creek WA (USFS 1995).

Road densities within the watershed are very high (generally greater than 10 miles/mile2). On NFS lands, roads tend to be ridge top or mid-slope, with valley bottom road segments less common.

Disturbance history indicator- Not Properly Functioning. Baseline: Bear (upper) Creek WA (USFS 1995).

Human activities have altered watershed processes and functions throughout the watershed, with Bear Creek having one of the most altered watersheds in the range of SONCC Coho Salmon. Very little disturbance that would affect CCH is currently being conducted on NFS lands. Fuels reduction projects in the Ashland watershed will reduce fire severity and impacts to fish-bearing streams.

Riparian Reserves indicator – Not Properly Functioning. Baseline: Bear (upper) Creek WA (USFS 1995), Ashland Creek SS (SRG 2000), East Fork Ashland Creek SS (USFS 1997), West Fork Ashland Creek SS (SRG 2001), Neil Creek SS (private lands) (USFS 2002), and Neil Creek SS (USFS 1990, 1999, 2002).

Riparian areas have been significantly altered on private lands and converted to agricultural, residential, or urban uses. On NFS lands, past timber harvest did occur in some riparian areas. Under the NWFP, NFS lands within the watershed are predominately managed as Late Successional Reserve and Municipal Watershed that protect riparian and aquatic habitats. Streambanks in the lower watershed are mostly armored with invasive Armenian blackberry that often prevents riparian forest development.

Disturbance Regime indicator - Not Properly Functioning. Baseline: Bear (upper) Creek WA (USFS 1995).

Development and urbanization have altered flow patterns and vegetation in many drainages within the watershed.

b. Elk Creek watershed

Watershed overview - Elk Creek

The Elk Creek watershed is a major producer of anadromous salmonids in the Upper Rogue sub-basin. This watershed is designated as a Key watershed in the NW Forest Plan in recognition of the anadromous fish populations (Coho Salmon, winter steelhead, and summer steelhead). Within the watershed, factors limiting salmonid production include: fine sediment in stream channels; elevated water temperature; bedrock-dominated channels; lack of instream large wood; and, lack of complex rearing habitat. The ownership distribution in the watershed encompasses: USFS 34%, BLM 25%, State lands <1%, COE 1% and the remaining 41% is in private ownership (Table 150).

Table 150. Watershed area and ownership distribution - Elk Creek watershed

Land Ownership	Acres	Ownership (percent)
USFS	28,788	34
BLM	20,989	25
State	226	<1
Army Corp of Engineers (COE)	660	1
Private	34,814	41
Total	**85,476**	**100**

Prevalent land uses

- Federal – Timber production, recreation, and livestock grazing
- Private – Timber production, agriculture, and rural residential development

Anthropomorphic alterations to habitat. During the 1830s-40s, trappers captured beaver from the lower reaches of Elk Creek and its tributaries, which resulted in decreased beaver populations and beaver influenced stream-flow characteristics. Farming families began to homestead in the lower Elk Creek valley in the 1870s and early 1880s. Gold was discovered in Elk Creek in 1897. The Pearl Mining Company was incorporated in 1898, but the first ore was not shipped until 1909. The “Buzzard Mine” in the Swanson Creek drainage produced primarily gold, with lesser amounts of silver and lead.

World War II spurred the opening of the Elk Creek watershed to timber harvest. In the 1940s-50s, the BLM and the Elk Lumber Company began to road and harvest their lands in the lower and mid-elevation portions of the watershed. Timber harvesting in the higher elevation portions of the watershed including NFS lands did not get underway until the 1960s. The 1962 Columbus Day windstorm, which blew over millions of board feet of timber in the Upper Rogue subbasin, spurred the construction of new roads into formerly remote areas. By 1980, a relatively dense system of roads was present throughout public lands in the watershed.

Suction dredging and high banking activity summary. There were three active filed placer claims as of 5/8/2013, although none located within ¼ mile of CCH. There were no suction dredge NOI received by the RRS during the four-year period from 2009-2012 in the watershed on NFS land located within 1/4 mile of CCH (Table 4 and Figure 38). There are no mineral withdrawn areas within the watershed.

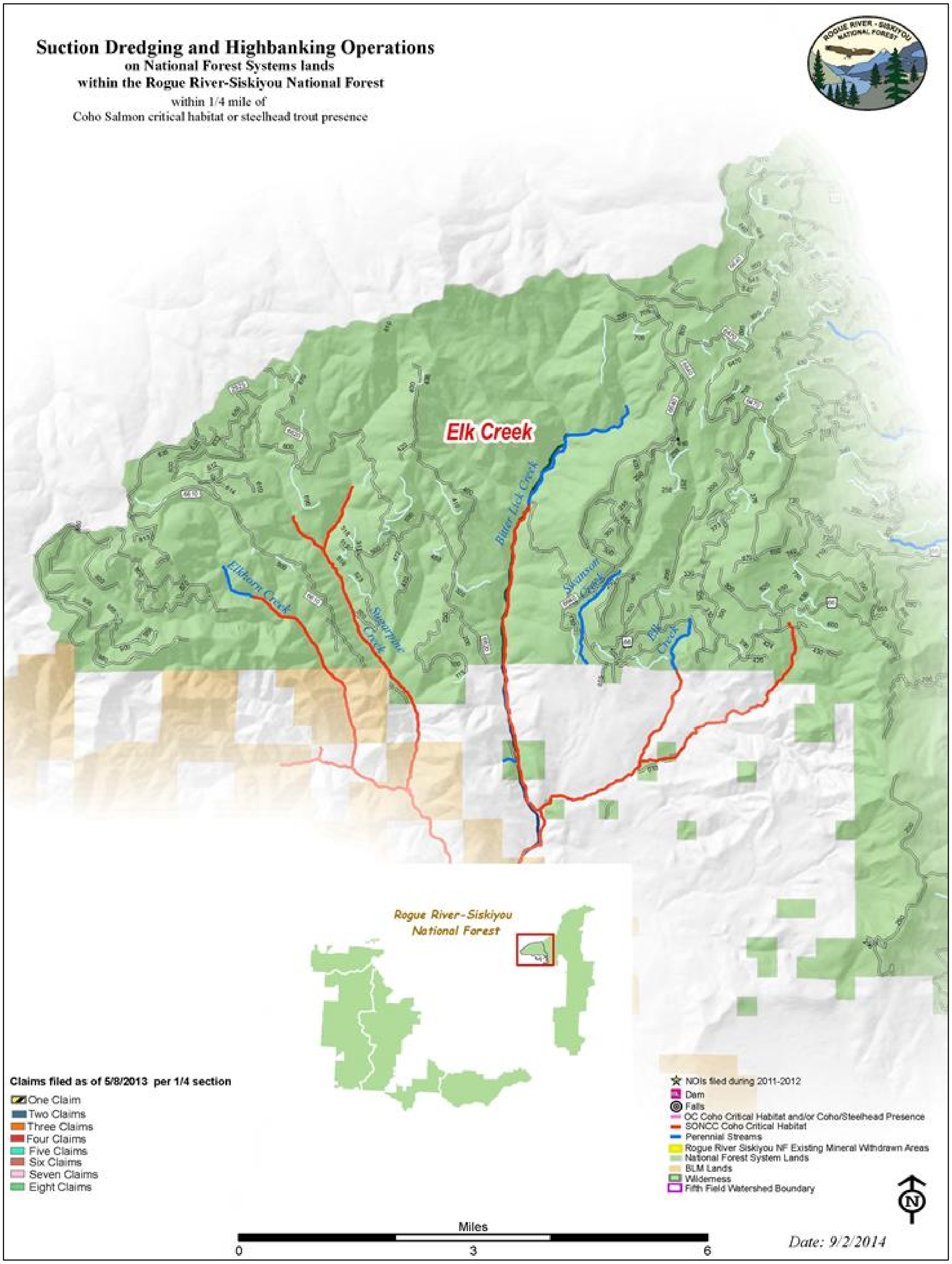

Figure 38. CCH with NOI and mining claims within 1/4 mile of CCH on NFS lands – Elk Creek watershed

Watershed population overview – Elk Creek

The Elk Creek watershed Coho Salmon population is part of the greater Upper Rogue River population. The upper Rogue River tributaries, including Elk Creek, produce about one-third of the wild Coho Salmon in the entire Rogue basin. The Elk Creek watershed is a high value spawning and rearing tributary for Coho Salmon and winter steelhead in the Upper Rogue subbasin. Historic and current distribution of Coho Salmon is extensive within the watershed, and includes nearly all of the major tributaries. There are approximately 53.7 miles of Coho Salmon critical habitat within the watershed and 9.5 miles on NFS lands (Figure 38 and Table 151). There is no high IP habitat on NFS lands; medium and low IP habitat is found within the *spawning/rearing* habitat use type (Table 152).

Table 151. Salmonid species and habitat length - Elk Creek watershed

Water-shed Acres	Anadro-mous Species Present[1]	NFS lands Miles of CCH (miles)[2]	NFS lands Miles of Chinook Habitat (miles)[3]	Water-shed CCH and EFH (miles)[4]	Watershed Potential Miles of Coho Salmon Habitat Type[5]		
					Spawning/ Rearing	Rearing/ Migration	Migration only
85,476	CO, CH, ST	9.5	0	53.7	53.7	0	0

[1] All, or a portion of, the waterbody supports the following anadromous salmonids: ST- steelhead trout; CO- Coho Salmon; CH - Chinook Salmon.

[2] Steelhead presence surveys were used to determine historic Coho Salmon habitat since CCH was not spatially delineated in the Federal Register 50 CFR Part 226. Values based on GIS data layer entitled RRS 2013 Total Salmon and Steelhead Distribution and field knowledge.

[3] Values based on GIS data layer entitled 2013 RRS Anadromous Salmonid Fish Distribution; Chinook Salmon presence survey layer.

[4] Values based on a combination of RRS 2013 SONCC Coho Salmon delineated CH 19 and ODFW steelhead presence survey data 2013 GIS map (as a surrogate for historic Coho Salmon habitat) website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[5] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

Table 152. Habitat typing and intrinsic potential within CCH – Elk Creek watershed

Habitat Typing[1]	Intrinsic Potential[2] (miles)						Total (miles) CCN/IP/HT	
	High IP		Medium IP		Low IP			
	Water-shed	NFS lands	Water-shed	NFS lands	Water-shed	NFS lands	Water-shed	NFS lands
Spawning/rearing	17.3	0	24.7	6	11.7	3.5	53.7	9.5
Rearing/migration	0	0	0	0	0	0	0	0
Migration only	0	0	0	0	0	0	0	0
Total	**17.3**	**0**	**24.7**	**6**	**11.7**	**3.5**	**53.7**	**9.5**

[1] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[2] Values based on an intrinsic potential map derived from the NETMAP CLAMS data and also located http://www.fsl.orst.edu/clams/. Category for ranking were derived from the final SONCC Coho Salmon Recovery Plan (NMFS 2014); high =>/= 0.66, moderate = </=0.33 – 0.66 and low = <0.33.

Watershed habitat indicators – Elk Creek

1) Water quality pathway – Elk Creek watershed

Temperature indicator – *Not Properly Functioning*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010), Rogue River Basin TMDL (ODEQ 2008), Elk Creek WA (USFS 1996), Elk Creek WRAP (USFS 2012) and NWFP (USFS and BLM 1994).

Bitter Lick Creek and Sugarpine Creek are listed as water quality limited due to elevated summer water temperature (Table 153). There is an approved TMDL and Water Quality Management Plan in place for the Rogue basin, which addresses water temperature (Oregon DEQ 2008). Management of the NFS lands within the Elk Creek watershed is guided by the Rogue River NF LRMP and NWFP. The aquatic and riparian standards and guidelines contained within these documents, particularly the Aquatic Conservation Strategy within the NWFP, are designed to provide for recovery and maintenance of cool/cold water thermal regimes within streams on NFS land. Appendix B displays the 2010 303(d) list for streams within NFS lands on RRS.

Table 153. ODEQ, 2010 303(d) List for Oregon Waterbodies within NFS lands on RRS – Elk Creek watershed

Stream Name	Miles on RRS (miles)	River Mile Marker (miles)	Pollutant	Assess-ment	Assess-ment 2	Listing Status
Bitter Lick Creek	7.06	0 to 8.6	Temperature	2010	10/29/2010	Cat 4A: Water quality limited, TMDL approved
Bitter Lick Creek	7.06	0 to 8.6	Biological Criteria	2010	1/29/2013	Cat 5: Water quality limited, 303(d) list, TMDL needed
Sugarpine Creek	5.58	0 to 9.1	Temperature	2010	10/29/2010	Cat 4A: Water quality limited, TMDL approved

Suspended sediment-intergravel/DO/turbidity indicator – *At Risk*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010), Rogue River Basin TMDL (ODEQ 2008), Elk Creek WA (USFS 1996), and Elk Creek WRAP (USFS 2012).

No streams on NFS lands within the Elk Creek Watershed are on the 303(d) list for sediment, although Bitter Lick Creek is listed for biological criteria, possibly as a result of sediment tolerant macroinvertebrate presence. Sediment input into stream channels on NFS lands has been primarily associated with past timber harvest and road systems. Streams on NFS lands tend to be higher gradient than downstream private land reaches, and stream substrates are dominated by cobbles and gravel.

Chemical contamination/nutrients indicator – *Properly Functioning*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010), Elk Creek WA (USFS 1996), and Elk Creek WRAP (USFS 2012).

No streams on NFS lands within the Elk Creek Watershed are listed for chemical contaminants or excessive nutrients. The lack of human development within and immediately adjacent to NFS lands within the watershed limits the risk of chemical contamination and nutrient loading within the Bitter Lick Creek and Sugarpine Creek subwatersheds.

2) Habitat access/elements pathway – Elk Creek watershed

Physical barriers indicator – Not Properly Functioning. Baseline: Elk Creek WRAP (USFS 2012), Bitterlick Creek SS (SRG 2009), Brush Creek SS (USFS 1990), Coalmine Creek SS (SRG 2009), Elk Creek SS (SRG 2000), Elkhorn Creek SS (SRG 2000), Hungry Creek SS (USFS 1993), Morine Creek SS (USFS 1993), Pelt Creek SS (SRG 2000), Spot Creek (USFS 1993), Sugarpine Creek SS (SRG 2009) and Swanson Creek SS (SRG 2000).

There are no physical barriers to fish on NFS lands within the watershed.

Substrate/embeddedness indicator – At Risk. Baseline: Elk Creek WRAP (USFS 2012), Bitterlick Creek SS (SRG 2009), Coalmine Creek SS (SRG 2009), Elk Creek SS (SRG 2000), Elkhorn Creek SS (SRG 2000) and Sugarpine Creek SS (SRG 2009).

Stream surveys in Bitter Lick, Sugarpine, Coalmine, Elk Creek, and Elkhorn Creeks found streambeds dominated by cobble and gravel, with limited amounts of deposition of fines and embeddedness. Stream reaches on NFS lands tend to be higher gradient than downstream private land stream reaches, and are predominately transport reaches. Bedrock dominated streambed segments are present within many streams within the watershed. However, this condition is less common on NFS lands within headwater portions of the watershed.

Large wood indicator – Not Properly Functioning. Baseline: Elk Creek WRAP (USFS 2012), Bitterlick Creek SS (SRG 2009), Brush Creek (USFS 1990), Coalmine Creek SS (SRG 2009), Elk Creek SS (SRG 2000), Elkhorn Creek SS (SRG 2000), Hungry Creek SS (USFS 1993), Morine Creek SS (USFS 1993), Pelt Creek SS (SRG 2000), Spot Creek (USFS 1993), Sugarpine Creek SS (SRG 2009) and Swanson Creek SS (SRG 2000).

Large wood levels in streams within the Elk Creek Watershed are below the expected range of natural variation in reaches accessible by or near roads. Several large wood placement projects have occurred on NFS lands within watershed, most notably within Sugarpine Creek and Bitter Lick Creek. Additionally, some large wood placement has occurred within Flat Creek, West Branch Elk Creek, and mainstem Elk Creek on BLM, USACE and private lands. Where present, large wood provides for habitat complexity and retention of bed load.

Pool frequency and quality indicator – At Risk. Baseline: Elk Creek WRAP (USFS 2012), Bitterlick Creek SS (SRG 2009), Brush Creek (USFS 1990), Coalmine Creek SS (SRG 2009), Elk Creek SS (SRG 2000), Elkhorn Creek SS (SRG 2000), Hungry Creek SS (USFS 1993), Morine Creek SS (USFS 1993), Pelt Creek SS (SRG 2000), Spot Creek (USFS 1993), Sugarpine Creek SS (SRG 2009) and Swanson Creek SS (SRG 2000).

Large wood is the primary causal mechanism in low gradient streams to create complex and frequent pools. These pools and large wood also create off-channel habitat and refuge for salmonids. Expansive sections of exposed bedrock are a common feature in many streams within the watershed. This condition limits residual pool depth within many pools and streams. Table 154 summarizes pool habitat conditions on streams surveyed (using USFS R6 Level II survey protocol) on NFS lands in the watershed.

Table 154. Habitat percent and pool summary for surveyed streams – Elk Creek Watershed

Stream Name	Year Survey-ed	Habitat % Pool	Habitat % Riffle	Pools/ Mile	Deep Pools/mile (>3ft)	Avg. Residual Pool Depth (ft)	Average Bankfull Width (ft)
Bitterlick Creek	2009	21.7	71.5	31.9	3.4	1.6	27.6
Brush Creek	1990	10.3	89.7	12.8	0.9	1.9	16.7
Coalmine Creek	2009	26.8	85.6	51.5	0.6	1.5	17.1
Elk Creek	2000	20.8	76.0	36.6	5.1	1.7	24.6
Elkhorn Creek	2000	20.3	79.3	34.4	1.2	1.6	16.3
Hungry Creek	1993	11.8	87.5	26.2	3.7	1.5	13.6
Morine Creek	1993	11.7	88.3	13.8	7.5	2.6	20.5
Pelt Creek	2000	25.2	73.3	45.2	3.6	1.7	14.0
Spot Creek	1993	10.4	87.0	34.3	0	1.2	15.5
Sugarpine Creek	2009	35.7	62.9	40.8	1.7	1.4	21.8
Swanson Creek	2000	21.3	77.1	35.2	1.9	1.1	9.3

Off-channel habitat indicator – Not Properly Functioning. Baseline: Elk Creek WRAP (USFS 2012), Bitterlick Creek SS (SRG 2009), Brush Creek (USFS 1990), Coalmine Creek SS (SRG 2009), Elk Creek SS (SRG 2000), Elkhorn Creek SS (SRG 2000), Hungry Creek SS (USFS 1993), Morine Creek SS (USFS 1993), Pelt Creek SS (SRG 2000), Spot Creek (USFS 1993), Sugarpine Creek SS (SRG 2009) and Swanson Creek SS (SRG 2000).

Stream channels on NFS lands tend to have steeper gradients than valley bottom segments on downstream private land. In general, streams on NFS lands are moderately entrenched and/or confined by topography. Side channels are not a common feature in any fish bearing streams on NFS lands, due to the natural topography, and to a lesser degree because of road development.

Refugia indicator – Not Properly Functioning. Baseline: Elk Creek WRAP (USFS 2012), Bitterlick Creek SS (SRG 2009), Brush Creek (USFS 1990), Coalmine Creek SS (SRG 2009), Elk Creek SS (SRG 2000), Elkhorn Creek SS (SRG 2000), Hungry Creek SS (USFS 1993), Morine Creek SS (USFS 1993), Pelt Creek SS (SRG 2000), Spot Creek (USFS 1993), Sugarpine Creek SS (SRG 2009) and Swanson Creek SS (SRG 2000).

Due to its headwater location, habitats on NFS lands represent some of the best habitat within the watershed. Therefore, accessible stream reaches on NFS lands may function as refugia for other portions of the watershed.

3) Channel condition and dynamics pathway – Elk Creek watershed

Bankfull width depth ratio/channel widening indicator- *Not Properly Functioning*. Baseline: Elk Creek WRAP (USFS 2012), Bitterlick Creek SS (SRG 2009), Brush Creek (USFS 1990), Coalmine Creek SS (SRG 2009), Elk Creek SS (SRG 2000), Elkhorn Creek SS (SRG 2000), Hungry Creek SS (USFS 1993), Morine Creek SS (USFS 1993), Pelt Creek SS (SRG 2000), Spot Creek (USFS 1993), Sugarpine Creek SS (SRG 2009), Swanson Creek SS (SRG 2000) and (USFS and BLM 1994).

In general, streams within the watershed are confined, even in lower gradient reaches. It is unknown to what extent historic land use, e.g. timber harvest, roads on NFS lands altered the bankfull channel dimensions within the watershed. Since the mid-1990s, riparian management under the NWFP has emphasized maintenance of habitat for fish and other aquatic resources. Consequently, instream habitat, including bankfull width/depth conditions are improving on NFS lands. Downstream of NFS lands on private land, historic channelization and alteration of floodplains are well documented.

Streambank condition indicator – *PFC*. Baseline: Elk Creek WRAP (USFS 2012), Bitterlick Creek SS (SRG 2009), Brush Creek (USFS 1990), Coalmine Creek SS (SRG 2009), Elk Creek SS (SRG 2000), Elkhorn Creek SS (SRG 2000), Hungry Creek SS (USFS 1993), Morine Creek SS (USFS 1993), Pelt Creek SS (SRG 2000), Spot Creek (USFS 1993), Sugarpine Creek SS (SRG 2009) and Swanson Creek SS (SRG 2000).

Data collected during stream surveys on NFS lands have generally documented stable streambanks along all streams.

Floodplain connectivity indicator – *Not Properly Functioning*. Baseline: Elk Creek WRAP (USFS 2012), Bitterlick Creek SS (SRG 2009), Brush Creek (USFS 1990), Coalmine Creek SS (SRG 2009), Elk Creek SS (SRG 2000), Elkhorn Creek SS (SRG 2000), Hungry Creek SS (USFS 1993), Morine Creek SS (USFS 1993), Pelt Creek SS (SRG 2000), Spot Creek (USFS 1993), Sugarpine Creek SS (SRG 2009) and Swanson Creek SS (SRG 2000).

There are no prominent low gradient areas with expansive floodplains on NFS lands within the watershed. Streams tend to be moderately confined to confined, and constrained by hillslopes or terraces.

4) Flow/Hydrology pathway – Elk Creek watershed

Change in peak/base flow indicator – Not Properly Functioning. Baseline: Elk Creek WA (USFS 1996), and Elk Creek WRAP (USFS 2012).

Past timber harvest and roads within the watershed can affect stream flow by intercepting water and transporting it to stream channels more rapidly than natural processes.

Increase in drainage network indicator – Not Properly Functioning. Baseline: Elk Creek WA (USFS 1996), and Elk Creek WRAP (USFS 2012).

On NFS lands, the major drainages (Sugarpine Creek and Bitter Lick Creek) contain appreciable road systems. These roads were primarily constructed to facilitate timber harvest. On private land, particularly industrial timber land, road densities are higher than on public land.

5) Watershed Conditions pathway – Elk Creek watershed

Road density and location indicator – *Not Properly Functioning*. Baseline: Elk Creek WA (USFS 1996), and Elk Creek WRAP (USFS 2012).

Road densities within the watershed are variable (generally between 2 and 7 miles/sq. mile). An estimated 57% of the watershed contains greater than 6 miles of road per square mile. On NFS lands, roads tend to be ridge top or mid-slope, with valley bottom road segments less common.

Disturbance history indicator- *Not Properly Functioning*. Baseline: Elk Creek WA (USFS 1996), and Elk Creek WRAP (USFS 2012).

Human activities have altered watershed processes and functions throughout the watershed. Timber harvest, roads, and grazing are the primary disturbance activities on NFS lands.

Riparian Reserves indicator – *Not Properly Functioning*. Baseline: Elk Creek WRAP (USFS 2012), Bitterlick Creek SS (SRG 2009), Brush Creek (USFS 1990), Coalmine Creek SS (SRG 2009), Elk Creek SS (SRG 2000), Elkhorn Creek SS (SRG 2000), Hungry Creek SS (USFS 1993), Morine Creek SS (USFS 1993), Pelt Creek SS (SRG 2000), Spot Creek (USFS 1993), Sugarpine Creek SS (SRG 2009), Swanson Creek SS (SRG 2000).

Riparian areas have been fully harvested on private lands. On NFS lands, past timber harvest did occur in some riparian areas. Under the NWFP, NFS lands within the watershed are predominately managed as Late Successional Reserve, which affords much protection of riparian and aquatic habitats. Some thinning to improve riparian health has occurred on NFS lands along Sugarpine Creek and Bitter Lick Creek (USFS AND BLM 1994) .

Disturbance regime indicator – *Not Properly Functioning*. Baseline: Elk Creek WA (USFS 1996), and Elk Creek WRAP (USFS 2012).

Timber harvest and road development have altered flow patterns and vegetation in many drainages within the watershed. Limited amounts of lode mining (Al Serena Buzzard Mine) have occurred within the watershed.

a. Little Butte Creek watershed

Watershed overview - Little Butte Creek

The Little Butte Creek Watershed is located in the southern Cascade Range and extends westward from the slopes of Mount McLoughlin into the Rogue Basin. The watershed is within the extreme eastern portion of "interior southwest Oregon". The climate for this area has the highest average summertime temperatures and the lowest average precipitation within western Oregon and Washington. Major tributaries to Little Butte Creek include Antelope Creek and the North and South Forks of Little Butte Creek. The watershed is located approximately 10 miles northeast of Medford, Oregon, primarily in Jackson County with the eastern edge in Klamath County. Little Butte Creek Watershed covers approximately 373 square miles (238,598 acres) and the elevation ranges from 1,200 feet where Little Butte Creek joins the Rogue River to 9,495 feet at the top of Mount McLoughlin. The ownership distribution in the watershed encompasses: USFS 25%, BLM 23%, State lands 1% and the remaining 51% is in private ownership (Table 155).

Table 155. Watershed area and ownership distribution - Little Butte Creek watershed

Land Ownership	Acres	Ownership (percent)
USFS	59,915	25
BLM	55,801	23
State	1,803	1
Private	121,365	51
Total	**238,883**	**100**

Prevalent land uses

- Federal – Timber production, recreation, and livestock grazing
- Private – Timber production, agriculture, urban development, livestock grazing, and rural residential development

Anthropomorphic alterations to habitat. European settlers cleared floodplains, trapped beavers, drained wetlands, and channelized streams to facilitate rural development and agriculture. Logging within the watershed was fairly small scale prior to World War II. The post-war housing boom stimulated an enormous amount of timber production in Southern Oregon, including within the Little Butte Creek watershed. Private land is concentrated in the lower elevations at the west end of the watershed and in the valleys that extend along the creeks into the foothills to the east. Downstream of NFS lands is a mix of rural residential, industrial timber land and ranch land. Eagle Point, the only incorporated community within the watershed, is located along Little Butte Creek approximately 3 miles east of the confluence with the Rogue River. Additionally, White City, an unincorporated area south of Eagle Point, is partially located in the watershed. People use the watershed not only for habitation, but for a variety of economic and recreational purposes. Ranching and farming characterize the private land uses in the valleys. Timber harvest and recreational uses occur on the public lands at higher elevations.

Suction dredging and high banking activity summary. There was one active filed placer claim as of 5/8/2013. There were no suction dredge NOI received by the RRS during the four-year period from 2009-2012 in the watershed on NFS land located within ¼ mile of CCH (Table 4 and Figure 39). There is no mineral withdrawn area within the watershed.

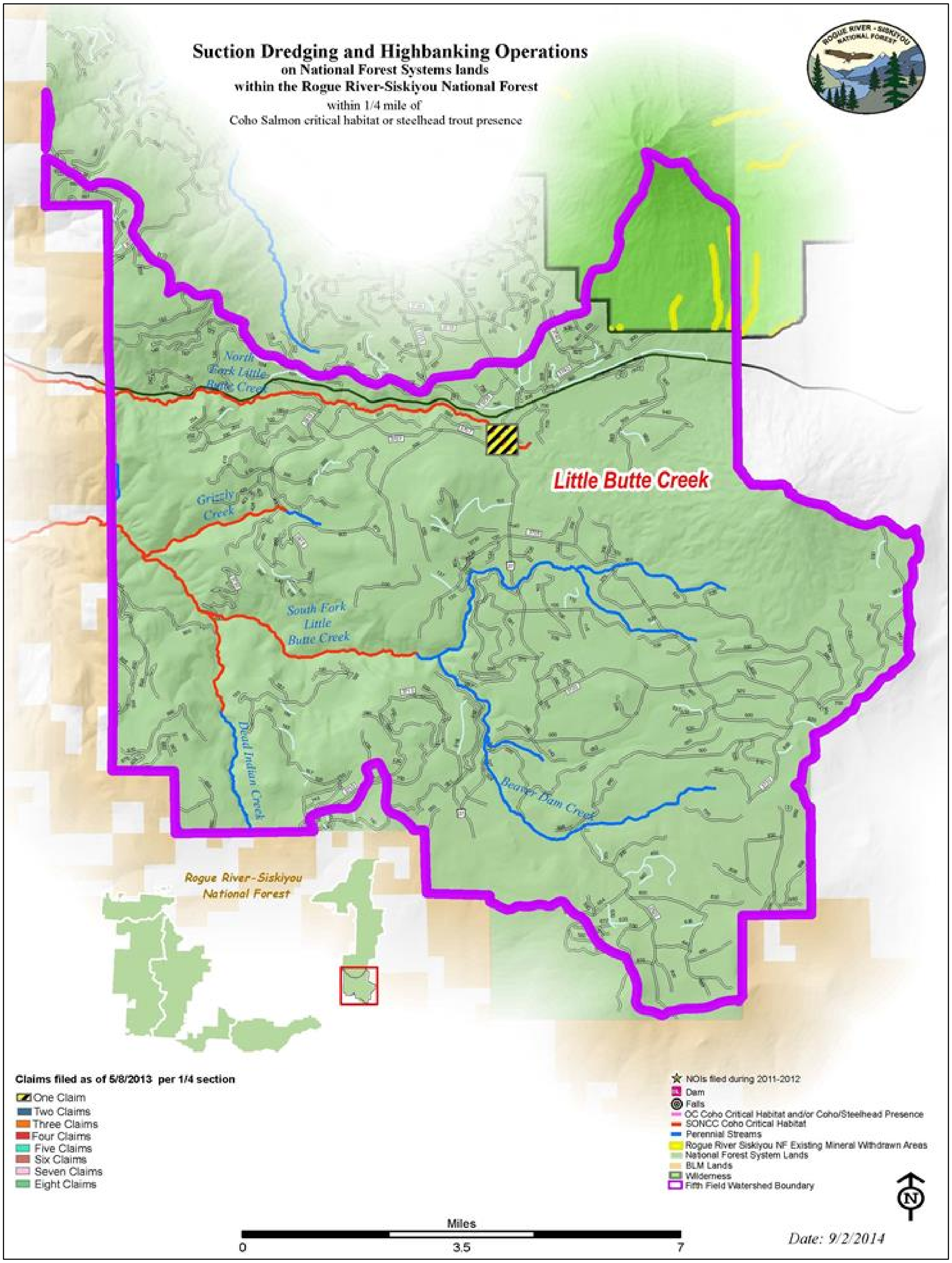

Figure 39. CCH with NOI and mining claims within 1/4 mile of CCH on NFS lands – Little Butte Creek watershed

Watershed population overview – Little Butte Creek

The Little Butte Creek watershed is a major producer of anadromous salmonids in the Upper Rogue sub-basin. The watershed is located 132 river miles from the mouth of the Rogue River. Headwater tributaries originate in the snow-dominated High Cascades with the potential to provide quality water to canyon and valley habitats accessible to anadromous fish. During 1994, a total of 10,685 Coho Salmon passed over Gold Ray Dam, located on the Rogue River in close proximity downstream of the Little Butte Creek tributary, of which 3,078 (29%) were wild Coho Salmon. Approximately 12 percent of Coho Salmon spawned in South Fork Little Butte Creek in 1994 to 1995 were wild salmon (BLM and USFS 1997). This watershed is designated as a Key watershed in the NW Forest Plan in recognition of the anadromous fish populations (Coho Salmon, Chinook Salmon, winter steelhead, and summer steelhead). Within the watershed, factors limiting salmonid production include: fine sediment in stream channels; elevated water temperature; and, habitat modification. There are 78.0 miles of critical habitat within the watershed and 13.6 miles on NFS lands (Figure 39 and Table 156). IP typing at the watershed scale is predominately high and medium. The habitat use type is entirely *spawning/rearing* (Table 157).

Table 156. Salmonid species and habitat length - Little Butte Creek watershed

Water-shed Acres	Anadro-mous Species Present[1]	NFS lands Miles of CCH (miles)[2]	NFS lands Miles of Chinook Habitat (miles)[3]	Water-shed CCH and EFH (miles)[4]	Watershed Potential Miles of Coho Salmon Habitat Type[5]		
					Spawning/ Rearing	Rearing/ Migration	Migration only
238,883	CO, CH, ST	13.6	0	78.0	78.0	0	0

[1] All, or a portion of, the waterbody supports the following anadromous salmonids: ST- steelhead trout; CO- Coho Salmon; CH - Chinook Salmon.

[2] Steelhead presence surveys were used to determine historic Coho Salmon habitat since CCH was not spatially delineated in the Federal Register 50 CFR Part 226. Values based on GIS data layer entitled RRS 2013 Total Salmon and Steelhead Distribution and field knowledge.

[3] Values based on GIS data layer entitled 2013 RRS Anadromous Salmonid Fish Distribution; Chinook Salmon presence survey layer.

[4] Values based on a combination of RRS 2013 SONCC Coho Salmon delineated CH 19 and ODFW steelhead presence survey data 2013 GIS map (as a surrogate for historic Coho Salmon habitat) website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[5] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

Table 157. Habitat typing and intrinsic potential within CCH – Little Butte Creek watershed

Habitat Typing[1]	Intrinsic Potential[2] (miles)						Total (miles) CCN/IP/HT	
	High IP		Medium IP		Low IP			
	Water-shed	NFS lands	Water-shed	NFS lands	Water-shed	NFS lands	Water-shed	NFS lands
Spawning/rearing	29.0	0	37.4	6.9	11.6	6.7	78.0	13.6
Rearing/migration	0	0	0	0	0	0	0	0
Migration only	0	0	0	0	0	0	0	0
Total	**29.0**	**0**	**37.4**	**6.9**	**11.6**	**6.7**	**78.0**	**13.6**

[1] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[2] Values based on an intrinsic potential map derived from the NETMAP CLAMS data and also located http://www.fsl.orst.edu/clams/. Category for ranking were derived from the final SONCC Coho Salmon Recovery Plan (NMFS 2014); high =>/= 0.66, moderate = </=0.33 – 0.66 and low = <0.33.

Watershed habitat indicators – Little Butte Creek

1) Water quality pathway – Little Butte Creek watershed

Temperature indicator – Not Properly Functioning. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010), Rogue River Basin TMDL (ODEQ 2008) and Little Butte Creek WA (BLM and USFS 1997).

South Fork Little Butte Creek and Dead Indian Creek are listed as water quality limited due to elevated summer water temperature. Table 158 displays the 303(d) list for water quality limited streams within the watershed on NFS lands. There is an approved TMDL and Water Quality Management Plan in place for the Rogue basin, which addresses water temperature (Oregon DEQ 2008) within the Little Butte watershed. Management of the NFS lands within the Little Butte Creek watershed is guided by the Rogue River NF LRMP and NWFP. The aquatic and riparian standards and guidelines contained within these documents, particularly the Aquatic Conservation Strategy within the NWFP, are designed to provide for recovery and maintenance of cool/cold water thermal regimes within streams on NFS lands. Appendix B displays the 2010 303(d) list for streams within NFS lands on RRS.

Table 158. ODEQ, 2010 303(d) List for Oregon Waterbodies within NFS lands on RRS – Little Butte Creek watershed

Stream Name	Miles on RRS (miles)	River Mile Marker (miles)	Pollutant	Assess-ment	Assess-ment 2	Listing Status
Dead Indian Creek	2.94	0 to 9.6	Temperature	2010	10/29/2010	Cat 4A: Water quality limited, TMDL approved
South Fork Little Butte Creek	4.62	0 to 16.4	Sedimentation	1998	12/1/1998	303(d) list
South Fork Little Butte Creek	4.62	0 to 16.4	Temperature (summer)	2010	12/22/2010	Cat 4A: Water quality limited, TMDL approved
South Fork Little Butte Creek	14.37	10.8 to 26.2	Temperature (undefined)	2010	10/29/2010	Cat 4A: Water quality limited, TMDL approved

Suspended sediment-intergravel/DO/turbidity indicator - *At Risk*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010) and Little Butte Creek WA (BLM and USFS 1997).

South Fork Little Butte Creek within NFS lands of the RRS is listed for sediment on the 303(d) list. Sediment input into stream channels on NFS lands has been primarily associated with past timber harvest and road systems, and through natural processes (e.g. 1997 New Year's Flood). Streams on NFS lands tend to be higher gradient than downstream private land reaches, and stream substrates are dominated by cobbles and gravel. There are no streams within the watershed that are listed as water quality impaired by turbidity.

Chemical contamination/nutrients indicator – *Properly Functioning*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010) and Little Butte Creek WA (BLM and USFS 1997).

No streams on NFS lands within the Little Butte Creek Watershed are listed for chemical contaminants or excessive nutrients. The lack of human development within and immediately adjacent to NFS lands within the watershed limits the risk of chemical contamination and nutrient loading.

2) Habitat access/elements pathway – Little Butte Creek watershed

Physical barriers indicator – *Not Properly Functioning*. Baseline: Little Butte Creek WA (BLM and USFS 1997), Beaver Dam Creek SS (USFS 1990), Daley Creek SS (USFS 1990), Dead Indian Creek SS (USFS 1998), Deadwood Creek SS (USFS 1993), Grizzly Creek SS (USFS 1993), North Fork Little Butte Creek SS (USFS 2009) and South Fork Little Butte Creek SS (SRG 2011).

A natural waterfall (18 feet high) upstream of Short Creek on NFS lands in South Fork Little Butte Creek is a natural barrier to all fish species and represents the upper extent of Coho Salmon and steelhead within the drainage. The Fish Lake Dam is a barrier to fish passage within the extreme upper portion of the North Fork of Little Butte Creek.

Substrate/embeddedness indicator – *At Risk*. Baseline: Little Butte Creek WA (BLM and USFS 1997), Beaver Dam Creek SS (USFS 1990), Daley Creek SS (USFS 1990), Dead Indian Creek SS (USFS 1998), Deadwood Creek SS (USFS 1993), Grizzly Creek SS (USFS 1993), North Fork Little Butte Creek SS (SRG 2009) and South Fork Little Butte Creek SS (SRG 2011).

Stream surveys on the North Fork Little Butte and South Fork Little Butte found the streambeds dominated by cobbles, with appreciable amounts of gravel and boulders also present. Pool habitat tended to contain copious amounts of gravel and sand/silt. Stream reaches on NFS lands tend to be higher gradient than downstream private land stream reaches, and are predominately transport reaches. The South Fork of Little Butte Creek is listed as water quality limited due to elevated amounts of sediment within the drainage. There were multiple inner-gorge landslides along South Fork Little Butte Creek and Dead Indian Creek during the 1997 flood, which contributed large amounts of fine sediment to the stream.

Large wood indicator – *Not Properly Functioning*. Baseline: Little Butte Creek WA (BLM and USFS 1997), Beaver Dam Creek SS (USFS 1990), Daley Creek SS (USFS 1990), Dead Indian Creek SS (USFS 1998), Deadwood Creek SS (USFS 1993), Grizzly Creek SS (USFS 1993), North Fork Little Butte Creek SS (USFS 2009) and South Fork Little Butte Creek SS (USFS 2011).

Large wood levels in streams within the Little Butte Creek Watershed are low and below the expected range of natural variation in reaches accessible by or near roads. Recent stream surveys of the North Fork and South Fork Little Butte Creek on NFS lands noted only moderate amounts of small size class (~12" dbh) wood and very few larger size classes. In the mid-1990s some large wood placement did occur on NFS lands in the South Fork, from the RRS boundary upstream to near Camp Latgawa.

Pool frequency and quality indicator – *At Risk*. Baseline: Little Butte Creek WA (BLM and USFS 1997), Beaver Dam Creek SS (USFS 1990), Daley Creek SS (USFS 1990), Dead Indian Creek SS (USFS 1998), Deadwood Creek SS (USFS 1993), Grizzly Creek SS (USFS 1993), North Fork Little Butte Creek SS (USFS 2009) and South Fork Little Butte Creek SS (USFS 2011).

The dearth of large wood within many of the stream reaches on NFS lands within the watershed contributes to instream habitat conditions that are less complex than optimal. Large wood is the primary causal mechanism in low gradient streams to create complex and frequent pools. These pools and large wood also create off-channel habitat and refuge for salmonids. Table 159 summarizes pool habitat conditions on streams surveyed (using USFS R6 Level II survey protocol) on NFS lands in the watershed.

Table 159. Habitat percent and pool summary for surveyed streams – Little Butte Creek Watershed

Stream Name	Year Survey-ed	Habitat % Pool	Habitat % Riffle	Pools/ Mile	Deep Pools/mile (>3ft)	Avg. Residual Pool Depth (ft)	Average Bankfull Width (ft)
Beaver Dam Creek	1990	29.8	39.2	29.3	3.6	1.3	15.2
Daley Creek	1990	62.0	30.9	35.5	4.4	1.0	17.3
Dead Indian Creek	1998	23.1	76.2	24.9	14.5	2.7	23.4
Deadwood Creek	1993	56.6	38.9	20.8	5.9	2.1	8.0
Grizzly Creek	1993	14.7	80.6	31.7	3.4	1.5	12.9
North Fork Little Butte Creek	2009	20.8	74.2	6.6	1.6	1.8	41.5
South Fork Little Butte Creek	2011	18.6	73.1	19.4	5.8	1.7	31.9

Off-channel habitat indicator – *Not Properly Functioning*. Baseline: Little Butte Creek WA (BLM and USFS 1997), Beaver Dam Creek SS (USFS 1990), Daley Creek SS (USFS 1990), Dead Indian Creek SS (USFS 1998), Deadwood Creek SS (USFS 1993), Grizzly Creek SS (USFS 1993), North Fork Little Butte Creek SS (USFS 2009) and South Fork Little Butte Creek SS (USFS 2011).

Side channels are not a common feature on tributary streams to the North Fork or South Fork Little Butte on NFS lands, due to the natural topography and channel gradient. There is a small amount (less than 10% of total stream length) of off-channel habitat along both the

North Fork and South Fork of Little Butte Creek. On NFS lands, natural topography is the primary limiting factor for off-channel habitat development. Upper portions of the South Fork Little Butte (above anadromy) have wider valley widths and greater potential for side channel occurrence.

Refugia indicator – *Not Properly Functioning*. Baseline: Little Butte Creek WA (BLM and USFS 1997), Beaver Dam Creek SS (USFS 1990), Daley Creek SS (USFS 1990), Dead Indian Creek SS (USFS 1998), Deadwood Creek SS (USFS 1993), Grizzly Creek SS (USFS 1993), North Fork Little Butte Creek SS (USFS 2009) and South Fork Little Butte Creek SS (USFS 2011).

Due to its headwater location, habitats on NFS lands represent some of the best habitat within the watershed. Therefore, accessible stream reaches on NFS lands may function as refugia for other portions of the watershed.

3) Channel condition and dynamics pathway – Little Butte Creek watershed

Bankfull width depth ratio/ channel widening indicator - *Not Properly Functioning*. Baseline: Little Butte Creek WA (BLM and USFS 1997), Beaver Dam Creek SS (USFS 1990), Daley Creek SS (USFS 1990), Dead Indian Creek SS (USFS 1998), Deadwood Creek SS (USFS 1993), Grizzly Creek SS (USFS 1993), North Fork Little Butte Creek SS (USFS 2009) and South Fork Little Butte Creek SS (USFS 2011).

In general, streams within the watershed are confined, even in lower gradient reaches. It is unknown to what extent historic land use, e.g. timber harvest, roads on NFS lands altered the bankfull channel dimensions within the watershed. Since the mid-1990s, riparian management under the NWFP has emphasized maintenance of habitat for fish and other aquatic resources. Consequently, instream habitat, including bankfull width/depth conditions are improving on NFS lands. Downstream of NFS lands on private land, historic channelization and alteration of floodplains are well documented.

Streambank condition indicator – *Not Properly Functioning*. Baseline: Little Butte Creek WA (BLM and USFS 1997), North Fork Little Butte Creek SS (USFS 2009) and South Fork Little Butte Creek SS (USFS 2011).

Data collected during recent stream surveys on the North Fork and South Fork documented low amounts (generally less than 5%) of bank instability. Following the 1997 flood, bank instability was common along the South Fork on NFS lands. Stream survey data from 2011 suggests that bank stability along the South Fork has greatly increased in the ~15 years since the flood.

Floodplain connectivity indicator – *Not Properly Functioning*. Baseline: Little Butte Creek WA (BLM and USFS 1997), Beaver Dam Creek SS (USFS 1990), Daley Creek SS (USFS 1990), Dead Indian Creek SS (USFS 1998), Deadwood Creek SS (USFS 1993), Grizzly Creek SS (USFS 1993), North Fork Little Butte Creek SS (USFS 2009) and South Fork Little Butte Creek SS (USFS 2011).

With the exception of upper portions of the South Fork Little Butte Creek (generally east of Forest Road 37), streams on NFS lands tend to be confined by topography and to a lesser extent by riparian roads. These conditions limit the spatial extent of active floodplain. Downstream of the Dead Indian Creek confluence, the South Fork Little Butte Creek valley widens and the floodplain becomes wider. On NFS lands, this floodplain is generally "active" at flows above bankfull.

4) Flow/hydrology pathway – Little Butte Creek watershed

Change in peak/base flow indicator – Not Properly Functioning. Baseline: Little Butte Creek WA (BLM and USFS 1997).

Timber harvest and roads can affect stream flow by intercepting water and transporting it to stream channels more rapidly than natural processes. The combined effects of these disturbances within the Little Butte Creek watershed are unknown. Three irrigation districts have water rights to divert over 1,000 cfs of water from the Little Butte Creek watershed. This does not include water rights for supplemental irrigation from private landowners. The North Fork of Little Butte is part of the irrigation district's inter-transport system, and as such, has an artificial flow regime. Lower flood peaks and pulses, high summer flows, and unseasonably cool stream temperatures in the summer months have altered the stream ecology.

Increase in drainage network indicator – Not Properly Functioning. Baseline: Little Butte Creek WA (BLM and USFS 1997).

On NFS lands, the major drainages (North Fork Little Butte and South Fork Little Butte) contain appreciable road systems. These roads were primarily constructed to facilitate timber harvest.

5) Watershed Conditions pathway – Little Butte Creek watershed

Road density and location indicator – *Not Properly Functioning*. Baseline: Little Butte Creek WA (BLM and USFS 1997).

On NFS lands, road density is considerable on the Dead Indian Plateau where the topography is flatter. Roads are present along the valley bottoms of the lower portions of both the North Fork and South Forks. Road densities in excess of 4.0 miles/sq. mile are present in many areas of the watershed, on both public and private lands.

Disturbance history indicator- *Not Properly Functioning*. Baseline: Little Butte Creek WA (BLM and USFS 1997).

Human activities have altered watershed processes and functions throughout the watershed. Timber harvest, roads, grazing, and urban development are the primary disturbance activities.

Riparian Reserves indicator – *Not Properly Functioning*. Baseline: Little Butte Creek WA (BLM and USFS 1997), Beaver Dam Creek SS (USFS 1990), Daley Creek SS (USFS 1990), Dead Indian Creek SS (USFS 1998), Deadwood Creek SS (USFS 1993), Grizzly Creek SS (USFS 1993), North Fork Little Butte Creek SS (USFS 2009) and South Fork Little Butte Creek SS (USFS 2011).

Riparian areas have been fully harvested on private lands. On NFS lands, past timber harvest did occur in some riparian areas. Road construction along streams has also reduced riparian vegetation condition and extent.

Disturbance regime indicator – *Not Properly Functioning*. Baseline: Little Butte Creek WA (BLM and USFS 1997).

Timber harvest, road development, water diversion, and agriculture have altered flow patterns and vegetation in many drainages within the watershed.

9. Winchuck River population

Subbasin overview – Chetco

The Chetco subbasin is located entirely within Curry County, just south of the Rogue River subbasin. The subbasin contains the following watersheds: Winchuck River, Chetco River, Pistol River, Hunter Creek, Cape Ferrelo and Whaleshead Creek-Frontal (Figure 40). The first three watersheds are within the ESA action area.

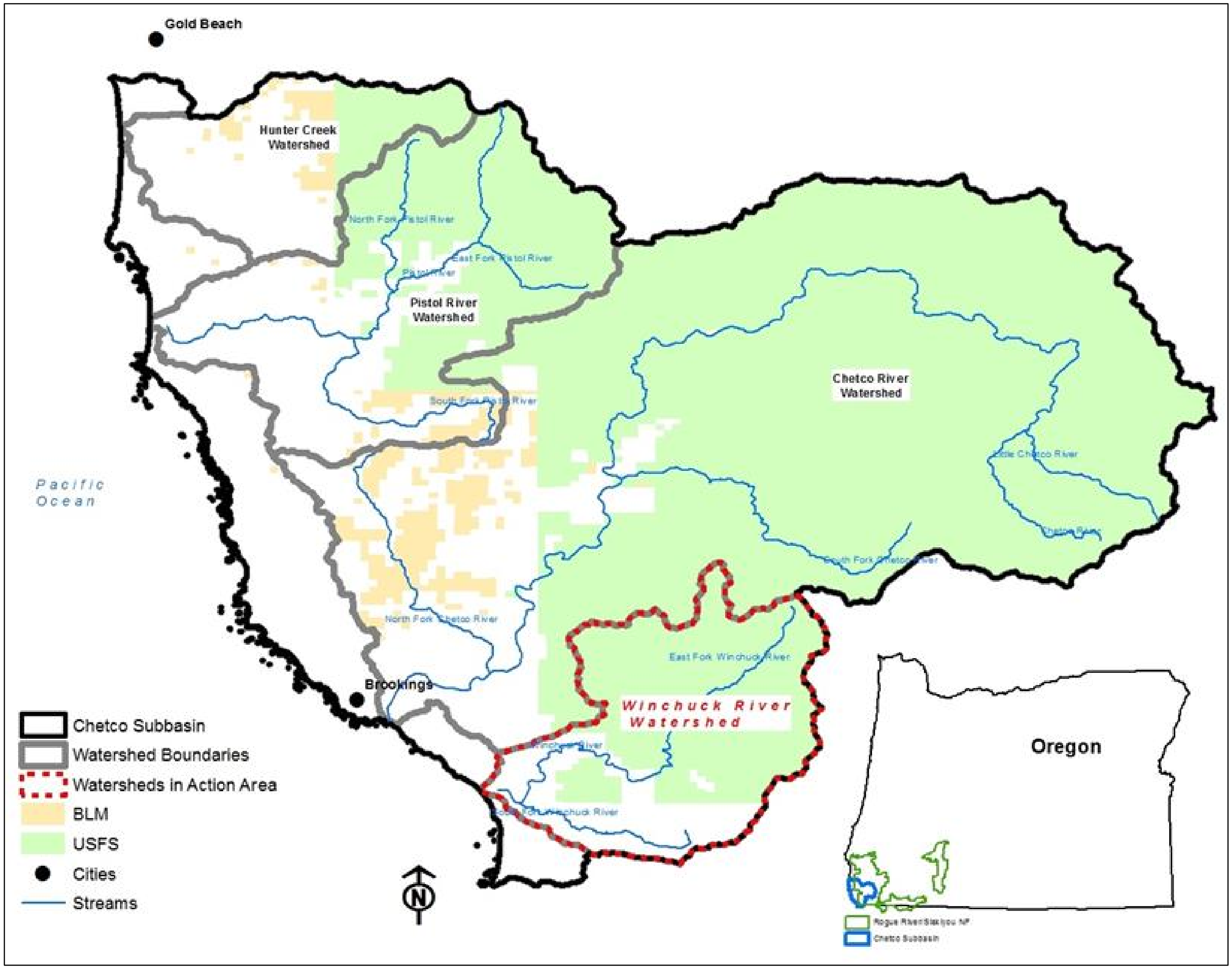

Figure 40. Winchuck River population in relation to the Chetco River subbasin

Subbasin population overview – Chetco

There are three Coho Salmon populations within the ESA action area of the Chetco subbasin:

- Winchuck River watershed, Non-Core, Potentially Independent
- Chetco River watershed, Core, Functioning Independent
- Pistol River watershed, Core, Functioning Independent

The Chetco subbasin within the Southern Oregon Coastal Basin has intermittent Coho Salmon populations. Oregon Department of Fish and Wildlife personnel conducted a random survey for two seasons on reaches throughout the Chetco subbasin (Chetco River, Pistol River and Winchuck River watersheds) and saw few juvenile Coho Salmon (Russ Stauff, ODFW, pers. comm., 2002). These streams exhibit flashy fall and winter flows and are constrained except near ocean tidal areas. Little side channel habitat exists in most streams. Ocean-rearing fall Chinook Salmon migrate farther upstream and more consistently spawn throughout these rivers than Coho Salmon.

Watershed within the ESA action area of the Winchuck River population

Watershed conditions are described below for the Winchuck River population, located within the Chetco subbasin, Winchuck River watershed (Figure 40).

a. Winchuck River watershed

Watershed overview – Winchuck River

The Winchuck River watershed drains approximately 45,631 acres or 71.4 square miles of land. This coastal river is among the smaller watersheds on the southern Oregon coast. The Winchuck is situated primarily within Curry County with some subwatersheds extending into California's Del Norte County including the South Fork, Middle Winchuck Mainstem, and Bear Creek. Flowing in a westerly direction, the Winchuck River crosses Highway 101 and drains into the Pacific Ocean about one half-mile north of the Oregon/California border and approximately five miles south of Brookings, Oregon. Elevations in the watershed range from sea level to approximately 2,925 feet on Mount Emily. Major tributaries include Fourth of July Creek, East Fork, Wheeler Creek, Bear Creek, and the South Fork. The upper portion of the basin is characterized by steeply sloped forested areas with narrow valleys and tributary streams that have moderately steep to very steep gradient. Grazing, rural residential development and other agricultural uses are dominant in the lower portion of the basin. The ownership distribution in the watershed encompasses: USFS 72%, State lands <1% and the remaining 28% is in private ownership (Table 160).

Table 160. Watershed area and ownership distribution - Winchuck River watershed

Land Ownership	Acres	Ownership (percent)
USFS	32,854	72
State	211	<1
Private	12,543	28
Total	**67,250**	**100**

Prevalent land uses

- Federal – Timber harvest, recreation
- Private – Timber harvest, agriculture/range, rural development

Anthropomorphic alterations to habitat. Fire suppression has caused the level and continuity of fuels to increase, leaving the watershed susceptible to larger, more intense fires (e.g. Biscuit Fire). Forestry, the most dominant land use in the watershed, accounts for 96% of the watershed area and includes private industrial and private non-industrial lands in forestry use as well as those lands managed by the RRS. Although forestry use is common throughout the entire watershed it is most prevalent in the middle and upper portions of the watershed. Agriculture/range and rural residential areas account for approximately 4% of the watershed. These lands are located primarily in the Lower Winchuck Mainstem, Middle Winchuck Mainstem and South Fork subwatersheds. Agricultural and range land are primarily managed for livestock grazing and lily bulb production. Cattle are the major type of livestock. According to recent anecdotal information, there are approximately 150 cows in the watershed (Maquire 2001).

Suction dredging and high banking activity summary. Mining occurred in the upper Winchuck River watershed in Wheeler Creek as early as the mid-1850s. Only hard rock mining claims were stated in the final SONCC Coho Salmon Recovery Plan (North Fork Wheeler Creek Mine and Mt. Emily Mine) (NMFS 2014). There was no mention of suction dredging in the recovery plan. There are also no recommendations or opportunities for management of suction dredging stated in the Winchuck River WA (USFS 1995).

The Winchuck River watershed within the Chetco subbasin on NFS lands had no active filed claims as of 5/8/2013 There were no suction dredge NOI received by the RRS during the four-year period from 2009-2012 in the watershed on NFS land located within ¼ mile of CCH (Table 4 and Figure 41). There are no mineral withdrawn areas within the watershed.

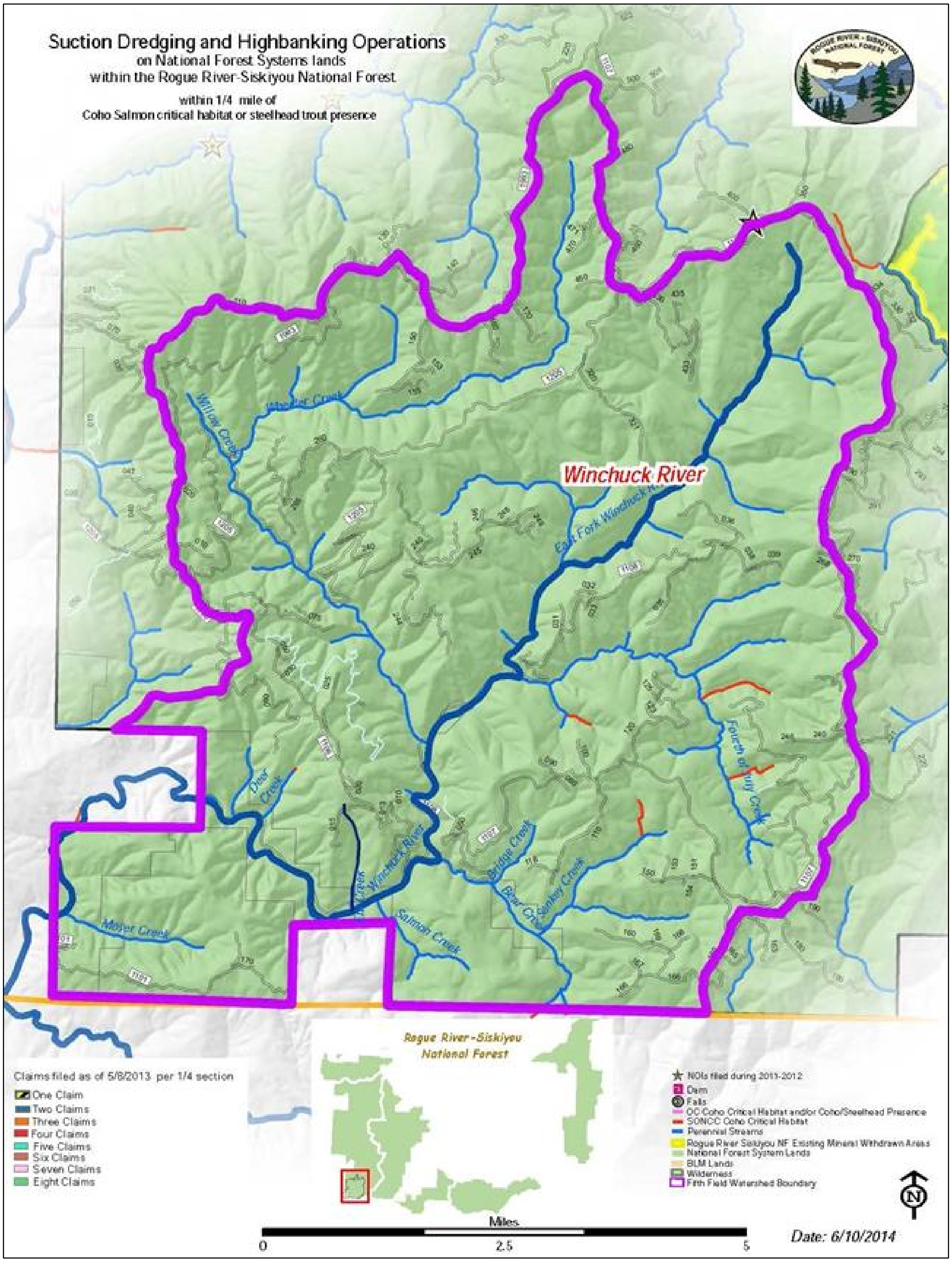

Figure 41. CCH with NOI and mining claims within 1/4 mile of CCH on NFS lands -Winchuck Creek watershed

Watershed population overview – Winchuck River

Population highlights (NMFS 2014)

- Northern Coastal Stratum
- Non-Core, Potentially Independent Population
- High Extinction Risk
- 220 Spawners Required 5 for ESU Viability
- 77 mi2
- 56 IP km (35 IP mi) (16% High)
- Dominant Land Uses are 'Forestry' and 'Urban/Residential/Industrial Development'
- Principal Stresses are 'Lack of Floodplain and Channel Structure' and 'Impaired Water Quality'
- Principal Threats are 'Channelization/Diking' and 'Urban/Residential/Industrial Development' (NMFS 2014).

There are approximately 50.4 miles of CCH within the watershed and 34.0 miles on NFS lands (Figure 41 and Table 161). The Winchuck River population is considered potentially independent because it likely receives sufficient immigration from the adjacent Chetco and Smith rivers to influence its dynamics and extinction risk (Williams et al. 2006). As an independent population, the Winchuck River was also a source of colonists for adjacent large river systems and smaller coastal tributaries further to the north and south. Any restored habitat in the Winchuck River and its tributaries provides potential connectivity that assists metapopulation function in the SONCC Coho Salmon ESU. As a non-core population, the Winchuck River population is expected to play a supporting role in recovery by supporting immigration from core populations. The recovery objective for the Winchuck River is to achieve a moderate risk of extinction (244 spawning adults) (NMFS 2014). Medium IP ranking dominates in the watershed (Table 162).

Table 161. Salmonid species and habitat length - Winchuck River population

Water-shed Acres	Anadro-mous Species Present[1]	NFS lands Miles of CCH (miles)[2]	NFS lands Miles of Chinook Habitat (miles)[3]	Water-shed CCH and EFH (miles)[4]	Watershed Potential Miles of Coho Salmon Habitat Type[5]		
					Spawning/ Rearing	Rearing/ Migration	Migration only
45,609	CO, CH, ST	34.0	28.9	50.4	33.3	17.1	0

[1] All, or a portion of, the waterbody supports the following anadromous salmonids: ST- steelhead trout; CO- Coho Salmon; CH - Chinook Salmon.

[2] Steelhead presence surveys were used to determine historic Coho Salmon habitat since CCH was not spatially delineated in the Federal Register 50 CFR Part 226. Values based on GIS data layer entitled RRS 2013 Total Salmon and Steelhead Distribution and field knowledge.

[3] Values based on GIS data layer entitled 2013 RRS Anadromous Salmonid Fish Distribution; Chinook Salmon presence survey layer.

[4] Values based on a combination of RRS 2013 SONCC Coho Salmon delineated CH 19 and ODFW steelhead presence survey data 2013 GIS map (as a surrogate for historic Coho Salmon habitat) website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[5] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

Table 162. Habitat typing and intrinsic potential within CCH – Winchuck River watershed

Habitat Typing[1]	Intrinsic Potential[2] (miles)						Total (miles) CCN/IP/HT	
	High IP		Medium IP		Low IP			
	Water-shed	NFS lands	Water-shed	NFS lands	Water-shed	NFS lands	Water-shed	NFS lands
Spawning/rearing	1.4	0.6	22.0	20.4	9.9	6.8	33.3	27.8
Rearing/migration	1.8	0	14.4	6.1	0.9	0.1	17.1	6.2
Migration only	0	0	0	0	0	0	0	0
Total	**3.2**	**0.6**	**36.4**	**26.5**	**10.8**	**6.9**	**50.4**	**34.0**

[1] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[2] Values based on an intrinsic potential map derived from the NETMAP CLAMS data and also located http://www.fsl.orst.edu/clams/. Category for ranking were derived from the final SONCC Coho Salmon Recovery Plan (NMFS 2014); high =>/= 0.66, moderate = </=0.33 – 0.66 and low = <0.33.

Watershed habitat indicators – Winchuck River

1) Water quality pathway – Winchuck River watershed

Temperature indicator – *At Risk*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010), Final SONCC Coho Salmon Recovery Plan (NMFS 2014) and Winchuck WA (USFS 1995).

The Winchuck River is listed as temperature impaired (up to its convergence with the East Fork) on the Oregon 303(d) Impaired Waterbodies list (ODEQ 2002). Table 163 displays the 303(d) list for water quality limited streams within the watershed on NFS lands. Elevated water temperatures are the primary concern with impaired water quality in the Winchuck River. The lower mainstem, which has the highest Coho Salmon IP habitat, is too warm during summer months to provide refugia. Weekly maximum temperatures downstream of the East Fork range from 67.1° F to 70.7° F. Tributaries flowing from NFS lands, including the upper East Fork Winchuck, Wheeler, Bear, and Fourth of July Creeks, all provide suitable water temperatures for Coho Salmon.

Table 163. ODEQ, 2010 303(d) List for Oregon Waterbodies within NFS lands on RRS – Winchuck watershed

Stream Name	Miles on RRS (miles)	River Mile Marker (miles)	Pollutant	Assess-ment	Assess-ment 2	Listing Status
East Fork Winchuck River	7.10	0 to 7.5	Biological Criteria	2010	1/29/2013	Cat 5: Water quality limited, 303(d) list, TMDL needed
East Fork Winchuck River	7.10	0 to 7.5	Temperature	2004	4/14/2005	Cat 5: Water quality limited, 303(d) list, TMDL needed
Fourth of July Creek	4.58	0 to 4.6	Temperature	2010	1/29/2013	Cat 5: Water quality limited, 303(d) list, TMDL needed
Wheeler Creek	10.94	0 to 11	Temperature	2010	1/29/2013	Cat 5: Water quality limited, 303(d) list, TMDL needed
Winchuck River	2.18	0 to 11.1	Temperature	2004	4/14/2005	Cat 5: Water quality limited, 303(d) list, TMDL needed

Suspended sediment–intergravel/DO/turbidity indicator – *At Risk*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010), Final SONCC Coho Salmon Recovery Plan (NMFS 2014), Winchuck WA (USFS 1995) and Winchuck River Watershed Assessment (Maguire 2001g).

No streams in the watershed within the RRS are listed for sediment on the 303(d) list. Altered sediment supply poses an overall high stress to Coho Salmon in the Winchuck River. Sediment contribution from landslides and erosion occurs naturally in the Winchuck River basin. However, roads, timber harvest, and bank erosion following removal of riparian vegetation have elevated fine sediment input. Excess fine sediment directly impacts Coho Salmon egg viability and can reduce food for fry, juveniles and smolts. Poor pool frequency and depth throughout the Winchuck River basin (Maguire 2001g) are likely due to elevated levels of fine sediment partially filling pools, a lack of scour-forcing obstructions such as large wood, and diminished scour due to channel widening in some reaches. No streams within the watershed on NFS lands are listed specifically on the 303(d) list for sediment, although the East Fork Winchuck River is listed for biological criteria, possibly as a result of sediment tolerant macroinvertebrate presence (Table 163).

Chemical contamination/nutrients indicator – *Properly Functioning*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010) and Winchuck WA (USFS 1995).

The Winchuck River is not listed on the 303(d) list for contaminants or excessive nutrients. Downstream on agriculture and residential lands some contamination may occur from agriculture runoff or effluent from septic tanks, lawns and other sources.

2) Habitat access/elements pathway – Winchuck River watershed

Physical barriers indicator – *At Risk*. Baseline: Final SONCC Coho Salmon Recovery Plan (NMFS 2014) and Winchuck WA (USFS 1995).

Diversions for agriculture and residential purposes are creating a deficit in the amount of water available in the river, which in turn presents a threat to Coho Salmon and their recovery. There is one particular diversion that is of great concern because it restricts Coho Salmon movement. In the lower South Fork Winchuck River, an agricultural diversion is thought to cause intermittent flow that seasonally blocks access.

Substrate/embeddedness indicator – *At Risk*. Baseline: Final SONCC Coho Salmon Recovery Plan (NMFS 2014), Winchuck WA (USFS 1995), Winchuck River SS (USFS 1994), East Fork Winchuck River SS (USFS 1994), Bear Creek SS (USFS 1990, SRG 2001), Wheeler Creek SS (USFS 1990, 1994, SRG 2007), Fourth of July Creek SS (USFS 1994, SRG 2007) and Willow Creek SS (USFS 1994, SRG 2002, 2007).

Stream surveys in the Winchuck River watershed have collected data on streambed substrate in all fish-bearing tributaries located on NFS lands. Fines represent from 10% to 15% of substrate particles in Fourth of July Creek and up to 25% in the East Fork Winchuck River and Wheeler Creek. The mainstem Winchuck River downstream of Wheeler Creek also has considerable fines in the bed of the channel.

Large wood indicator – *At Risk*. Baseline: Final SONCC Coho Salmon Recovery Plan (NMFS 2014), Winchuck WA (USFS 1995), Winchuck River SS (USFS 1994), East Fork Winchuck River SS (USFS 1994), Bear Creek SS (USFS 1990, SRG 2001), Wheeler Creek SS (USFS 1990, 1994, SRG 2007), Fourth of July Creek SS (USFS 1994, SRG 2007) and Willow Creek SS (USFS 1994, SRG 2002, 2007).

Large wood would have been extremely important historically in the Winchuck River in forming pools suited for Coho Salmon rearing. Large wood levels measured by the RRS show that levels are very good in the East Fork, in upper Wheeler Creek and most of the mainstem of Bear Creek. Only Upper Bear Creek immediately below private timber lands has a poor large wood level, while middle Bear Creek has only fair levels of large wood, and levels are good for lower Wheeler and Fourth of July Creeks. It is likely that previous channel scour events reduced large wood scores in the latter two tributaries and they are still in recovery (USFS 1995).

Pool frequency and quality indicator – *At Risk*. Baseline: Final SONCC Coho Salmon Recovery Plan (NMFS 2014), Winchuck WA (USFS 1995), Winchuck River SS (USFS 1994), East Fork Winchuck River SS (USFS 1994), Bear Creek SS (USFS 1990, SRG 2001), Wheeler Creek SS (USFS 1990, 1994, SRG 2007), Fourth of July Creek SS (USFS 1994, SRG 2007) and Willow Creek SS (USFS 1994, SRG 2002, 2007).

Pool frequency is poor (<10%) in Brush Creek, a tributary of Wheeler Creek, and in Salmon Creek in the Middle Winchuck, which is indicative of excess sediment supply and degraded Coho Salmon rearing habitat. Bear Creek has fair pool frequencies in its lower reaches (10-20%), but other USFS tributaries like East Fork Winchuck and Wheeler and Fourth of July Creeks have good ratings (20-35%) in their upper reaches that improve to very good (>35%) downstream. The ODFW rating system, however, may not represent pre-disturbance pool frequency conditions typical of the Pacific Northwest, which can be as high as 81% (Grett 1985) and from 39-67% pools in streams in old growth conifer forests (Murphy et al. 1984). In fact, the fair (10-20%) and good (20-35%) could reflect a reduction in pool frequency of nearly one-half, which is the common response of Oregon Coastal watersheds to widespread disturbance (Reeves et al. 1995, Frissell 1992).

Off-channel habitat indicator – *At Risk*. Baseline: Final SONCC Coho Salmon Recovery Plan (NMFS 2014), Winchuck WA (USFS 1995), Winchuck River SS (USFS 1994), East Fork Winchuck River SS (USFS 1994), Bear Creek SS (USFS 1990, SRG 2001), Wheeler Creek SS (USFS 1990, 1994, SRG 2007), Fourth of July Creek SS (USFS 1994, SRG 2007) and Willow Creek SS (USFS 1994, SRG 2002, 2007).

Clearing of land and its development for human use has encroached into the floodplain of the lower South Fork and lower mainstem Winchuck River, confining the river channel and cutting it off from its flood terraces. This eliminates side channels that were formerly the best Coho Salmon summer and over-wintering rearing habitat.

Refugia indicator – *At Risk*. Baseline: Final SONCC Coho Salmon Recovery Plan (NMFS 2014), Winchuck WA (USFS 1995), Winchuck River SS (USFS 1994), East Fork Winchuck River SS (USFS 1994), Bear Creek SS (USFS 1990, SRG 2001), Wheeler Creek SS (USFS 1990, 1994, SRG 2007), Fourth of July Creek SS (USFS 1994, SRG 2007), Willow Creek SS (USFS 1994, SRG 2002, 2007), Cumulative effects of land use on salmon habitat in southwest Oregon coastal streams (Frissell 1992) and Diversity of juvenile anadromous salmonid assemblages in coastal Oregon basins with different level of timber harvest (Reeves et al. 1995).

RRS tributaries like the upper East Fork and Fourth of July and Bear Creeks have recovered sufficiently to be functional Coho Salmon habitat (refugia) and their condition is likely to continue to improve. The lower East Fork reach is still slightly warm for Coho Salmon juvenile rearing, and large wood is good in lower Wheeler Creek and Fourth of July Creeks. Wheeler Creek had greater sediment impacts than other RRS tributaries, but its channel recovery is progressing. Over the coming decade the lower East Fork and Wheeler Creek are also likely to become more fully functional for Coho Salmon, although recovery of large wood frequency may take a century. Lower Bear Creek has high wood frequency, cold water temperatures and Coho Salmon presence, but its headwaters are industrial timberlands and disturbance there may retard channel recovery in downstream reaches (Frissell 1992, Reeves et al. 1993. All the stream reaches on USFS lands currently serving as Coho Salmon "refugia" fall into Frissell's (1992) category of "alluviated canyons", and sub-populations within them are subject to local extirpations when periodic debris torrents or channel scour events cause habitat change.

Moser Creek, a lower Winchuck River tributary, has its headwaters in NFS lands and water temperatures are known to have suitable habitat for Coho Salmon. However, there is insufficient information regarding channel conditions or present use by Coho Salmon on lower private land reaches to discern whether Moser Creek is functioning as refugia. The South Fork Winchuck River has sufficiently cold water temperatures for Coho Salmon to thrive, although its disturbance regime makes it unlikely that it is presently functioning as refugia (Reeves et al. 1993); confirmed by ODFW (2005a) during juvenile Coho Salmon surveys.

3) Channel condition and dynamics pathway – Winchuck River watershed

Bankfull width depth ratio/ channel widening indicator – *At Risk*. Baseline: Winchuck WA (USFS 1995), Winchuck River SS (USFS 1994), East Fork Winchuck River SS (USFS

1994), Bear Creek SS (USFS 1990, SRG 2001), Wheeler Creek SS (USFS 1990, 1994, SRG 2007), Fourth of July Creek SS (USFS 1994, SRG 2007) and Willow Creek SS (USFS 1994, SRG 2002, 2007).

Conditions are close to the expected range of natural variability in the stream reaches surveyed. Channel widths are high in mainstem Winchuck River and the first reach of East Fork Winchuck River.

Streambank condition indicator – *At Risk*. Baseline: Winchuck WA (USFS 1995), Winchuck River SS (USFS 1994), East Fork Winchuck River SS (USFS 1994), Bear Creek SS (USFS 1990, SRG 2001), Wheeler Creek SS (USFS 1990, 1994, SRG 2007), Fourth of July Creek SS (USFS 1994, SRG 2007) and Willow Creek SS (USFS 1994, SRG 2002, 2007).

Streambanks have been altered where valley-bottom roads occur and where timber harvest, gravel mining or agricultural actions have removed vegetation. Streambanks have little sloughing in any of the eight surveyed Winchuck River reaches.

Floodplain connectivity indicator – *At Risk*. Baseline: Final SONCC Coho Salmon Recovery Plan (NMFS 2014), Winchuck WA (USFS 1995), Winchuck River SS (USFS 1994), East Fork Winchuck River SS (USFS 1994), Bear Creek SS (USFS 1990, SRG 2001), Wheeler Creek SS (USFS 1990, 1994, SRG 2007), Fourth of July Creek SS (USFS 1994, SRG 2007) and Willow Creek SS (USFS 1994, SRG 2002, 2007).

Lack of floodplain and channel structure constitutes a medium to very high stress across all Coho Salmon life history phases in the Winchuck River. Clearing of land and its development for human use has encroached into the floodplain of the lower South Fork and lower mainstem Winchuck River, confining the river channel and cutting it off from its flood terraces. This eliminates side channels that were formerly the best Coho Salmon summer and over-wintering rearing habitat. Residential development also contributes to channel confinement and riparian alteration.

4) Flow/hydrology pathway – Winchuck River watershed

Change in peak/base flow indicator – *At Risk*. Baseline: Final SONCC Coho Salmon Recovery Plan (NMFS 2014) and Winchuck WA (USFS 1995).

The Winchuck River basin suffers from flow depletion and changes in peak flow related to watershed disturbance patterns. There have been no formal evaluations on the current flows in the Winchuck River, so the degree of any deficit in water amount is unknown. However, evidence suggests that such a deficit exists. The Winchuck River Watershed Council identified two issues relevant to this stress (Maguire 2001g). The Council recognized that “low summer flow results in elevated stream temperatures,” and that “the cool water that used to go into the river from the tributaries is now being withdrawn.” The relationship between the amount of water and the temperature of the water is well established, as are the problems with water temperature in many areas of the Winchuck. Aerial photos and USGS topographic maps of the South Fork Winchuck River suggest a hydrologic disruption represented by a water storage reservoir near the mouth.

Increase in drainage network indicator – *At Risk*. Baseline: Winchuck WA (USFS 1995).

The road density for the watershed is about 1.42 miles per square mile of roads on NFS lands. The watershed is comprised of steep valley walls and a heavily dissected stream network. Most roads avoid streams and are located near ridge tops. Downstream road densities are probably higher on private industrial timberlands.

5) Watershed conditions pathway – Winchuck River watershed

Road density and location indicator – *At Risk*. Baseline: Winchuck WA (USFS 1995).

Road densities are relatively low in most basins, with only the Wheeler Creek basin exceeding thresholds recognized as impaired.

Disturbance history indicator – *At Risk*. Baseline: Winchuck WA (USFS 1995).

About 10% of the upper watershed on NFS land has been harvested since the late 1970’s. Downstream of the National Forest, roughly one-quarter of the watershed area, it is assumed that most of the forested lands are in early or mid-seral conditions to maximize timber production. There are scattered residences and small farms in the valley bottom downstream of public lands.

Riparian Reserves indicator – *At Risk*. Baseline: Final SONCC Coho Salmon Recovery Plan (NMFS 2014) and Winchuck WA (USFS 1995).

Little data exist to quantitatively evaluate the riparian forest conditions in the Winchuck River basin. In 1996, the last year for which data were available, the percentage of the lower river basin that had large trees (>30 inches DBH) was very low, but the percentage with medium-sized trees (>20 inches DBH) was more favorable. Current conditions are highly altered compared to conditions prior to Anglo-American settlement. Ground and aerial photos indicate that the much of the lower mainstem and lower South Fork Winchuck riparian canopy has been simplified, decreased, and converted to hardwoods. Trees have been removed from riparian zones, creating narrow buffer widths and decreasing potential for large wood recruitment. The middle mainstem Winchuck River at its confluence with Elk and Salmon Creeks has degraded riparian conditions. The mainstem and lower Elk Creek have narrow strips of riparian hardwoods with agricultural fields encroaching very close to the stream, while tributaries have narrow or no riparian buffers.

Disturbance regime indicator – *At Risk*. Baseline: Winchuck WA (USFS 1995).

The upper watershed is composed of steep terrain and highly dissected stream networks. Past road construction and timber harvest have caused a few local landslides. Some roads causing chronic problems have been closed and decommissioned in the past decade. Generally most roads that remain are stable and do not cause chronic erosion problems. Downstream on private lands it is assumed that some aggravation of unstable areas may occur to maximize timber production. Fires occurred infrequently and were of moderate to high severity. About 2,000 acres of fires have occurred within the watershed on NFS lands since 1959.

D. Environmental baseline: OC Coho Salmon ESU

There are two distinct populations in the OC Coho Salmon ESA action area. OC Coho Salmon within these populations exists either at the subbasin or watershed level. OC Coho Salmon distinct populations within the ESA action area are described for each of the following populations:

Population

1. Coquille
2. Sixes

The environmental baseline conditions for each of the populations are organized as by the following format:

Subbasin

Subbasin overview

Subbasin population overview

Watershed

Watershed overview

Watershed population overview

Watershed indicator baseline conditions

1. Coquille population

Subbasin overview – Coquille

The Coquille subbasin is the largest completely coastal river subbasin in Oregon. Its drainage area is exceeded in Oregon only by the Columbia, Rogue, and Umpqua River basins. The mainstem portion of the Coquille River is tidally influenced within its lower 40 miles (from the ocean to just upstream of the town of Myrtle Point). The hydrologic overview of the subbasin is rainfall driven as is typical of the coast range. NFS lands in the subbasin support the following anadromous fish species: Coho Salmon, winter steelhead, Chinook Salmon (both fall and spring runs), sea-run coastal cutthroat trout, and Pacific lamprey (NOAA 2007).

Subbasin population overview – Coquille

Population highlights (Stout 2012)

- OC Coho Salmon population
- Southern Oregon Coastal Basin
- Mid-South Coast Stratum
- Functioning independent

The State evaluated the Coquille population and determined that it “passed” all of their viability criteria as an independent population. Like the ESU, it was found to be viable, but adult abundance was not high enough to meet the goals under the Oregon Plan. The State determined the primary limiting factor reducing adult abundance of the ESU and the Coquille population was the “loss of stream complexity”. Stream complexity was defined as the variety of physical habitat conditions that provide overwinter shelter conditions. 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; abundant wood; pools; connected offchannel alcoves; beaver ponds; pasture trenches; lakes; reservoirs; wetlands and well vegetated floodplains; and, other conditions afforded by complex channel form. The State 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. The identified threats are: floodplain development; exotic fish management; fishing; forestry; historic channeling; navigation; road management; and, historic large woody debris removal.

Watersheds within the ESA action area of the Coquille subbasin

Watershed baseline conditions are described for one 5th field watershed within the Coquille subbasin: South Fork Coquille River watershed (Figure 42).

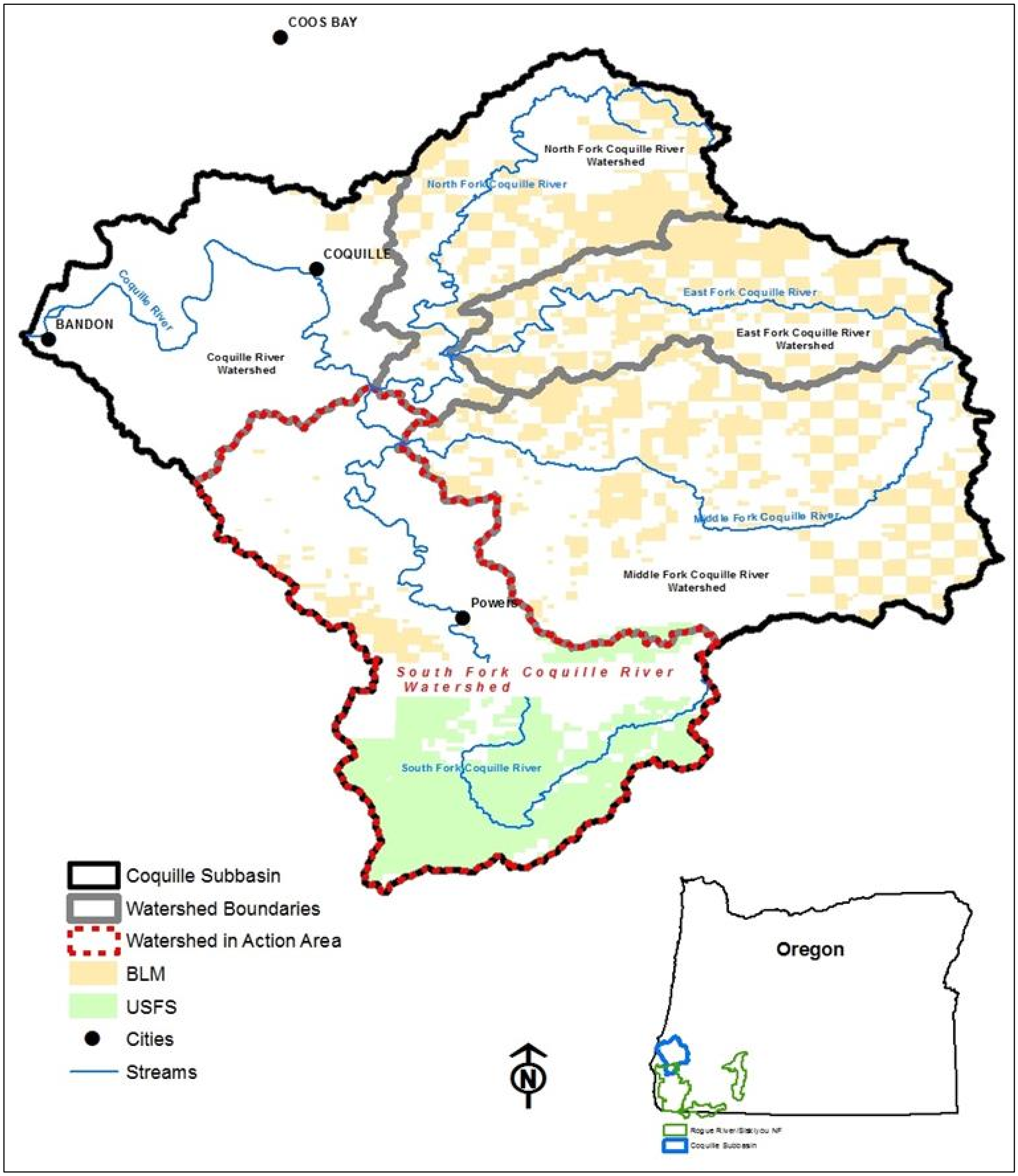

Figure 42. South Fork Coquille River watershed in relation to the Coquille subbasin population

a. South Fork Coquille River watershed

Watershed overview - South Fork Coquille River

The South Fork Coquille River is the largest tributary of the Coquille River. From its headwaters in the Oregon Coast Range, the river flows northwest to join the North Fork Coquille River at Myrtle Point, forming the main stem Coquille River. The South Fork is about 62.8 miles long, and its watershed drains roughly 600 square miles of rural Coos County.

The ownership distribution in the watershed encompasses: USFS 35%, BLM 4%, State lands <1% and the remaining 60% is in private ownership (Table 164). As is typical of coastal watersheds in southern Oregon, the South Fork Coquille River typically experiences high winter and spring flows with much smaller flows in the summer months and early fall. Even during wetter than normal winters, flows can fluctuate from very high to flows nearly as low as typical summertime flows.

Table 164. Watershed area and ownership distribution – South Fork Coquille River watershed

Land Ownership	Acres	Ownership (percent)
USFS	64,802	35
BLM	7,870	4
State	35	<1
Private	110,289	60
Total	**182,995**	**100**

Prevalent land uses

- Federal – timber production, mining, recreation
- Private – timber production, urban development, rural residential, agriculture

Anthropomorphic alterations to habitat. Substantial timber harvest and road development on public and private lands has altered some watershed processes and functions. Railroad and road construction within the watershed were instrumental in providing access to timber resources, beginning in the early 20th century. Other prevalent uses on NFS lands in the watershed include fuelwood gathering, gathering of other forest products (e.g. mushrooms, salal, etc.) and recreation. Downstream of NFS lands, prevalent land uses include agriculture, private timberland, and development in and around the town of Powers.

Suction dredging and high banking activity summary. There is a long history of mineral extraction within the watershed. Historically, there were hydraulic and lode mining operations centered in the Rock Creek and Johnson Creek drainages (USFS 1995). Most of the suction dredging occurs above Myrtle Grove Campground, primarily in the Johnson Creek subwatershed. There are no recommendations or opportunities for management of suction dredging stated in the South Fork Coquille WA (USFS 1995).

There were 21 active filed placer claims as of 5/8/2013. There were 12 suction dredge NOI received by the RRS during the four-year period from 2009-2012 in the subbasin on NFS land located within 1/4 mile of CCH (Table 4 and Figure 43). The NOI and related Coho Salmon habitat use types, and its potential maximum impact are numerically displayed in Table 165. There are no mineral withdrawn areas within the watershed.

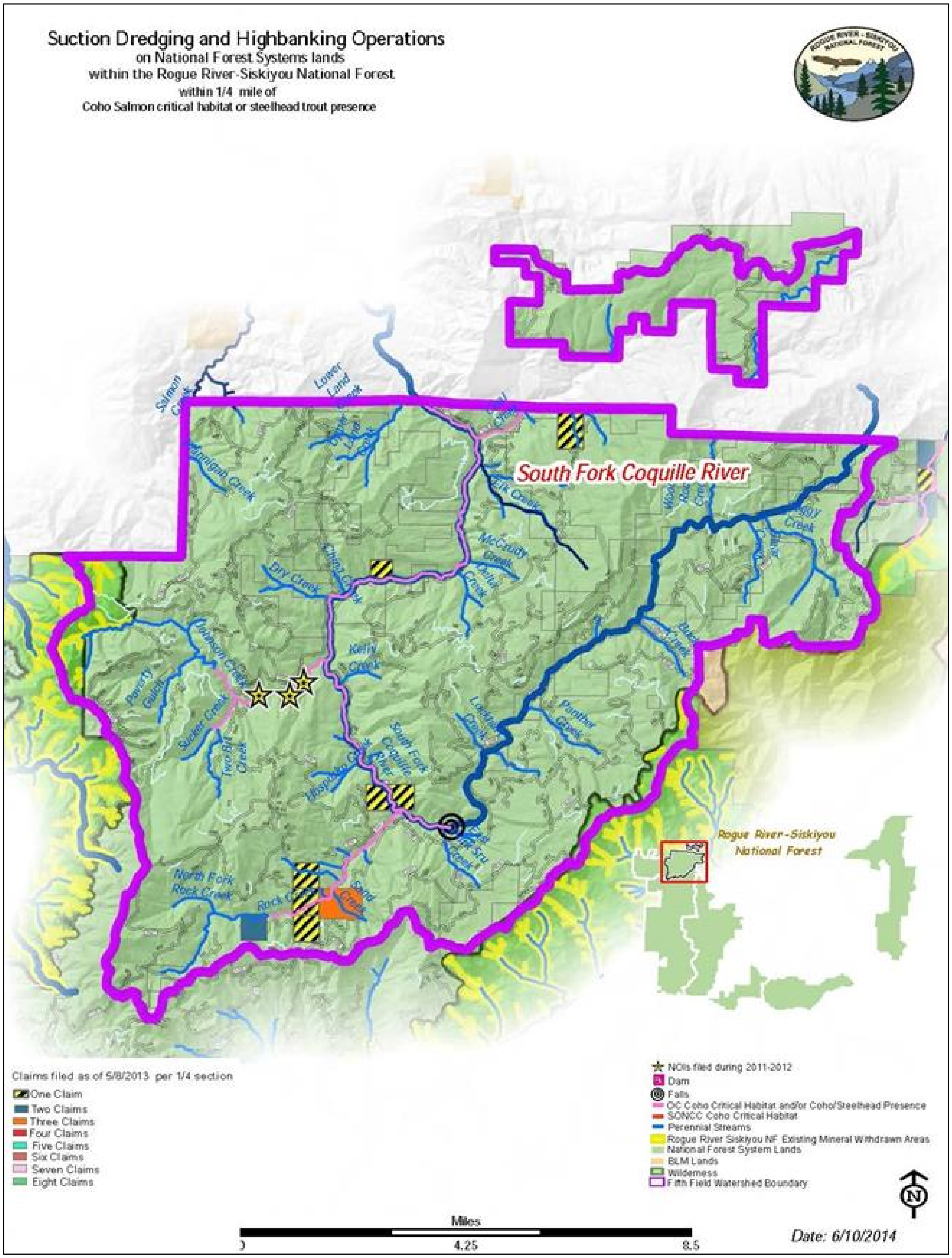

Figure 43. CCH with NOI and mining claims within 1/4 mile of CCH on NFS lands – South Fork Coquille River watershed

Table 165. Suction dredging NOI received by RRS (2009-2012) within ¼ mile of CCH – South Fork Coquille River watershed

Name/Location			Past NOI Information								Potential Habitat Use Coho Salmon		
							Total Maximum Disturbance[2]						
Stream w/River Mile (constant name)	Location[1] RS & Lat/Long	Name of Claim	NOI Received 2009-2012 (list years)	Number of Operators per claim Number of Operators per claim	Suction Dredge Activities (Y/N)	High Number of Operators per claim Banking Activities (Y/N)	Volume - NOI Listed (cubic yd.)	Volume – Assumed[3] or NOI Listed (cubic yd.)	Area (sq. ft.)	Stream Distance (ft.)	Spawning / Rearing ft.)	Rearing /Migration (ft.)	Migration (ft.)
Johnson Creek 1.6	T32S., R12W., Sec34NW N42.753611 W124.0822	Lost Nugget	2009, 2010, 2011, 2012	2	Y	N	10	10	90	6	6	0	0
Johnson Creek 1.8	T32S., R12W., Sec34NW N42.752778 N124.0938	Top Rock	2009, 2010, 2011, 2012	2	Y	N	10	10	90	6	6	0	0
Johnson Creek 2.2	T32S., R12W., Sec33NE N42.751389 W124.1013	Bonanza Queen	2009, 2010, 2011, 2012	5	Y	N	0	25	225	15	15	0	0
		AFFECTED Total within Watershed						45 yd^3	405 ft^2	27 ft	27 ft	0	0
		BASELINE Total within Watershed						22,857,120 yd^3	7,619,040 ft^2	507,936 ft	231,264 ft	276,672 ft	0
		BASELINE Total CCH within Watershed								96.2 mi	43.8 mi	52.4 mi	0.0
		AFFECTED Percent Watershed within CCH						0.000%	0.005%	0.005%	0.012%	0.000%	0.000%

[1] Proposed dredging mile marker starting point.

[2] Standard formula to calculate maximum 25 cubic yards suction dredge area of disturbance = 15 feet (length) X 15 feet (width) X 3 feet (depth). Width and depth is constant when cubic yard is stated differently in NOI.

[3] 25 cubic yards is the standard maximum volume anticipated when not specified in NOI.

Watershed population overview – South Fork Coquille River

The South Fork Coquille River is a watershed within the Coquille subbasin OC population. There are approximately 96.2 miles of CCH within the watershed and no miles on NFS lands. The South Fork Coquille River within the RRS boundary, though occupied by OC Coho Salmon, is exempt from critical habitat designation due to economic benefits of exclusion outweighing the benefits of designation (73 FR 7816, February 11, 2008). CCH ends at the town of Powers, six miles below the confluence of Coal Creek and the South Fork Coquille River. EFH closely mirrors the occupied and historic habitat of Coho and Chinook salmon; EFH miles reflect those of steelhead presence on the RRS, which is approximately 22.9 miles (Figure 43 and Table 166).

Populations and species within the South Fork Coquille River are very diverse in life cycle and habitat requirements. The South Fork Coquille River supports anadromous runs of Chinook (fall and spring) Salmon, Coho Salmon, Chum Salmon, winter steelhead trout, sea run cutthroat trout and Pacific lamprey. There is a series of three vertical falls at approximately river mile 46.7 on the South Fork Coquille River that are a natural barrier to all anadromous fish. Past management activities on NFS lands have increased upstream sediment delivery and depleted large wood recruitment into the streams.

The primary limiting factors within the South Fork Coquille River watershed are:

- loss of mature forest within the Riparian Reserve;
- higher than optimum stream temperatures;
- in-stream fish habitat below potential condition;
- excessive fine sediment in stream channels;
- obstructions at road crossings that inhibit upstream movement of fish and movement of large woody material to fish-bearing stream reaches.

Rock Creek and downstream was utilized by many anadromous fish species, including Fall and Spring Chinook, Coho Salmon, winter steelhead, sea run cutthroat and pacific lamprey. Fall and Spring Chinook have not been seen in Rock Creek for many years. Historically, large numbers of coho salmon were observed in the early 1930s and 1940s from Rock Creek down (Grandmontagne 1995, Shorb 1995). When a person went salmon fishing they went after coho, and it was not uncommon to catch “a pick-up full of coho” (Shorb 1995). During the past several decades, few Coho Salmon have been observed spawning in the vicinity of Rock Creek campground. A pair of adults were observed in Rock Creek during December of 1969 (Grandmontagne 1995). Since that sighting, no coho adults or juveniles have been observed in the anadromous portion of the key watershed other than a few tributaries above (USFS 1995). The watershed consists primarily of high and medium IP within the *spawning/rearing* and *rearing/migration* habitat use types (Table 167). There is no high IP within NFS lands.

Table 166. Salmonid species and habitat length - South Fork Coquille River watershed

Water-shed Acres	Anadro-mous Species Present[1]	NFS lands Miles of CCH (miles)[2]	NFS lands Miles of Chinook Habitat (miles)[3]	Water-shed CCH and EFH (miles)[4]	Watershed Potential Miles of Coho Salmon Habitat Type[5]		
					Spawning/ Rearing	Rearing/ Migration	Migration only
182,994	CO, CH, ST	0	13.1	73.7[1]/96.9[2]	43.8	52.4	0

[1] All, or a portion of, the waterbody supports the following anadromous salmonids: ST- steelhead trout; CO- Coho Salmon; CH - Chinook Salmon.

[2] Steelhead presence surveys were used to determine historic Coho Salmon habitat since CCH was not spatially delineated in the Federal Register 50 CFR Part 226. Values based on GIS data layer entitled RRS 2013 Total Salmon and Steelhead Distribution and field knowledge.

[3] Values based on GIS data layer entitled 2013 RRS Anadromous Salmonid Fish Distribution; Chinook Salmon presence survey layer.

[4] Values based on a combination of RRS 2013 SONCC Coho Salmon delineated CH 19 and ODFW steelhead presence survey data 2013 GIS map (as a surrogate for historic Coho Salmon habitat) website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[5] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

Table 167. Habitat typing and intrinsic potential – South Fork Coquille River watershed

Habitat Typing[1]	Intrinsic Potential[2] (miles)						Total (miles) CCN/IP/HT	
	High IP		Medium IP		Low IP			
	Water-shed	NFS lands	Water-shed	NFS lands	Water-shed	NFS lands	Water-shed	NFS lands
Spawning/rearing	17.1	0	23.4	16.3	3.3	2.9	43.8	19.2
Rearing/migration	25.3	0	25.2	3.4	1.9	0.3	52.4	3.7
Migration only	0	0	0	0	0	0	0	0
Total	**42.4**	**0**	**48.6**	**19.7**	**5.2**	**3.2**	**96.2**	**22.9**

[1] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[2] Values based on an intrinsic potential map derived from the NETMAP CLAMS data and also located http://www.fsl.orst.edu/clams/. Category for ranking were derived from the final SONCC Coho Salmon Recovery Plan (NMFS 2014); high =>/= 0.66, moderate = </=0.33 – 0.66 and low = <0.33.

Watershed habitat indicators – South Fork Coquille River

1) Water quality pathway - South Fork Coquille River watershed

Temperature indicator – *Not Properly Functioning*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010), South Fork Coquille WQMP (ODEQ 2000), South Fork Coquille WA (USFS 1995) and South Fork Coquille ARP (USFS 2007).

The South Fork Coquille River is listed under temperature on ODEQ's 303(d) list. The water quality temperature standard of 16o C (60.8o F) is designed to maintain core cold water habitat for salmon and steelhead rearing. The ODEQ and its partners (including the RRS) prepared a TMDL and WQMP for the Upper South Fork Coquille River watershed in 2001. The assessment addressed temperature in 303(d) listed streams, and concluded that "no thermal loads are available for allocation to anthropogenic sources in this system." For the purposes of the ESA action area, this means that any increases in stream water temperature resulting from land management activities would be a violation of state water quality standards. Table 168 displays the 303(d) list for water quality limited streams within the watershed on NFS lands. Appendix B displays the 2010 303(d) list for streams within NFS lands on RRS.

Table 168. ODEQ, 2010 303(d) List for Oregon Waterbodies within NFS lands on RRS – South Fork Coquille watershed

Stream Name	Miles on RRS (miles)	River Mile Marker (miles)	Pollutant	Assess-ment	Assess-ment 2	Listing Status
Johnson Creek	6.98	0 to 7.1	Temperature	2004	4/14/2005	Cat 4A: Water quality limited, TMDL approved
Rock Creek	2.85	0 to 3	Temperature	2002	8/1/2002	TMDL approved
Salmon Creek	0.24	0 to 9.2	Temperature	1998	12/1/1998	303(d)
South Fork Coquille River	13.65	0 to 51.9	Biological Criteria	2010	1/29/2013	Cat 5: Water quality limited, 303(d) list, TMDL needed
South Fork Coquille River	4.64	53.4 to 61.9	Biological Criteria	2010	1/29/2013	Cat 5: Water quality limited, 303(d) list, TMDL needed
South Fork Coquille River	19.20	18.1 to 61.9	Temperature (non- spawning)	2004	4/14/2005	Cat 5: Water quality limited, 303(d) list, TMDL needed
South Fork Coquille River	13.87	42.1 to 61.9	Temperature/summer	2002	8/1/2002	TMDL approved

Suspended sediment–intergravel/DO/turbidity indicator – ***At Risk*****.** Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010), South Fork Coquille WA (USFS 1995) and South Fork Coquille ARP (USFS 2007).

No streams in the watershed on NFS lands are listed specifically on the 303(d) list for sediment. However, two segments of the South Fork Coquille River are listed for biological criteria, possibly as a result of sediment tolerant macroinvertebrate presence (Table 168). The Upper South Fork Coquille River watershed straddles the Klamath/Siskiyou Province that is separated by the Coquille River Fault Zone (Dott 1971) from the Coast Range Province. Both geologies weather rapidly and produce fine grain sediments that are transported to stream channels. Therefore, sediment inputs within the watershed are naturally high. Anthropogenic activities including road construction and maintenance, and timber harvest have created sediment inputs and turbidity above expected background levels.

Chen (1991) suggested that past management activities (e.g. timber harvest, roads) have increased upland sediment delivery to stream channels within Rock Creek. In fact, this condition is recognized throughout the South Fork Coquille River watershed. Naturally occurring earthflows and debris slides are recognized as a significant source of sediment into stream channels within the watershed, and in certain locations are likely the largest contributors of instream sediment (e.g. landslide on Rock Creek). Since the mid-1990s, riparian management under the NWFP has emphasized maintenance and enhancement of habitat for fish and other aquatic resources. Consequently, instream habitat including sediment conditions is improving on NFS lands. Recreational suction mining during low summer flows have been observed to cloud the water for a short section below the mining activity. This turbidity is a recognized short-term condition associated with annual suction dredging activities on active claims.

Chemical contamination/nutrients indicator – *PF*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010), South Fork Coquille WA (USFS 1995) and South Fork Coquille ARP (USFS 2007).

The South Fork Coquille River and its tributary streams are not listed on the 303(d) list for contaminants or excessive nutrients. Downstream on agriculture and residential lands some contamination may occur from agriculture runoff or effluent from septic tanks, lawns and other sources. The City of Powers currently uses the mainstem of the South Fork Coquille for a public drinking water source and they also use the river to eliminate treated waste water at the sewer plant.

2) Habitat access/elements pathway - South Fork Coquille River watershed

Physical barriers indicator – *Not Properly Functioning*. Baseline: South Fork Coquille WA (USFS 1995) and South Fork Coquille ARP (USFS 2007).

Coal Creek culvert in the Coal Creek 6th field subwatershed restricts some adult upstream passage and all juvenile upstream passage near the confluence of the South Fork Coquille River at this time. NEPA and some of the pre-work are already completed for the removal of the two culverts and installation of a bridge will occur when funding is available. The Coal Creek Bridge project is not connected to this action. There are no other known human-made structures on NFS lands within the ESA action area that block passage of Coho Salmon at any life stage from upstream and downstream migration.

Substrate/embeddedness indicator – *At Risk*. Baseline: South Fork Coquille WA (USFS 1995) and South Fork Coquille ARP (USFS 2007), Buck Creek SS (USFS 1999), Coal Creek SS (SRG 2010), Foggy Creek SS (USFS 1997), Granite Creek SS (SRG 2001), Johnson Creek SS (SRG 2001), Lockhart Creek SS (SRG 1999), Panther Creek SS (SRG 1999), Poverty Gulch SS (SRG 2001), Rock Creek SS (SRG 1997), SF Coquille River SS (SRG 1997), Sucker Creek SS (SRG 2001), Wooden Rock Creek SS (SRG 1997).

Streams within the watershed tend to be high energy systems, with substrates dominated by cobbles and boulders. Embeddedness in these systems tends to be low. However, in lower gradient sections, stream substrate can be dominated by gravels and sand, and these reaches are susceptible to sediment deposition. Excessive bedload is most evident where it is stored in unconstrained reaches. Aerial photo interpretation shows where aggradation has buried large boulders and created wide gravel bars, resulting in decreased pool quality and riparian vegetation vigor. Stream surveys conducted since 1997 on NFS lands indicate that fine sediment and embeddedness is a limiting factor for fish and aquatic insect production within the watershed.

Large wood indicator – *At Risk*. Baseline: South Fork Coquille ARP (USFS 2007).

Standing and instream large wood are below historic conditions throughout the watershed. This is primarily a result of past timber harvest and stream clean out operations. Flood events have effectively transported large wood downstream and out of the system, particularly within the wider stream channel associated with the mainstem South Fork Coquille River. In recent years, the RRS has placed large wood within multiple streams in the watershed, including the mainstem South Fork Coquille River, Johnson Creek, and Rock Creek. Current riparian management strategies are designed to promote recruitment of instream large wood, which should lead to an upward trend for large wood quantity within the watershed.

Pool frequency and quality indicator – ***At Risk*****.** Baseline: South Fork Coquille ARP (USFS 2007), Buck Creek SS (USFS 1999), Coal Creek SS (SRG 2010), Foggy Creek SS (USFS 1997), Granite Creek SS (SRG 2001), Johnson Creek SS (SRG 2001), Lockhart Creek SS (SRG 1999), Panther Creek SS (SRG 1999), Poverty Gulch SS (SRG 2001), Rock Creek SS (SRG 1997), SF Coquille River SS (SRG 1997), Sucker Creek SS (SRG 2001), Wooden Rock Creek SS (SRG 1997).

Fine sediment inputs and lack of instream large wood reduce the number and quality of pools within this watershed. Large wood is a primary causal mechanism in the low gradient stream segments for creating and maintaining complex and frequent pools. Residual pool depths are generally less than 3 feet in most tributary streams, and these pools tend to be formed by boulder and bedrock features and not by large wood complexes. Table 169 summarizes pool habitat condition on streams surveyed (using USFS Region 6 Level II survey protocol) on NFS lands in the watershed. Subsequent to the stream surveys in Johnson Creek and Rock Creek, the RRS has placed large wood complexes in these streams to create complex aquatic habitats, including deep pools, for anadromous fish.

Table 169. Habitat percent and pool summary for surveyed streams – South Fork Coquille River watershed

Stream Name	Year Survey-ed	Habitat % Pool	Habitat % Riffle	Pools/ Mile	Deep Pools/mile (>3ft)	Avg. Residual Pool Depth (ft)	Average Bankfull Width (ft)
Buck Creek[1]	1999	47.7	51.5	58.6	5.3	1.8	16
Coal Creek	2010	30.4	66.8	36.4	9.5	2.1	27.1
Foggy Creek[1]	1997	80.3	19.7	30.1	11.8	5.6	18.5
Granite Creek	2001	14.4	83.7	33.3	0	1.6	19.3
Johnson Creek	2001	28	69.3	24.5	11.4	2.6	39.2
Lockhart Creek[1]	1999	43	48.9	85.19	1.9	1.5	20.2
Panther Creek	1999	44.5	53.5	45.74	7.5	2	27.8
Poverty Gulch	2001	23.3	75.5	38.1	5.1	1.8	20.9
Rock Creek	1997	23.18	76.5	14	9.7	2.7	75.3
SF Coquille River	1997	59.9	39.6	13.3	5.8	3.1	49.8
Sucker Creek	2001	23.4	75.6	36	8.6	2	26.4
Wooden Rock Creek[1]	1997	69.1	30.9	24.8	9.5	2.3	38.7

[1] Streams located upstream of Coquille River Falls contain resident fish only.

Off-channel habitat indicator – *At Risk*. Baseline: South Fork Coquille ARP (USFS 2007).

Most stream reaches are confined within narrow valleys, and can be dominated by high gradient habitats. Off-channel habitat is rare, but important to anadromous salmonid rearing where it occurs.

Refugia indicator – *At Risk*. Baseline: South Fork Coquille ARP (USFS 2007).

Refugia are primarily present within deep pools and at tributary confluences within the mainstem South Fork Coquille River. Within tributary streams, complex pools and off-channel habitat features function as key Refugia indicator habitats where they are present. Sediment inputs within the watershed and the paucity of unconstrained low gradient stream reaches limit refugia within the watershed.

3) Channel condition and dynamics pathway - South Fork Coquille River watershed

Bankfull width depth ratio/channel widening indicator – *Not Properly Functioning*. Baseline: South Fork Coquille ARP (USFS 2007).

Bankfull width-depth ratios indicate channel widening. All reaches, with the exception of the uppermost South Fork Coquille River and Foggy Creek, exceed ODFW benchmarks for a “good” width-depth ratio. Many reaches have width-depth ratios that exceed 30.

Streambank condition indicator – *At Risk*. Baseline: South Fork Coquille ARP (USFS 2007).

Streambanks have been altered where valley bottom roads occur and where timber harvest or hydraulic mining have removed vegetation and soil. Many streambanks are well armored with large boulders and bedrock.

Floodplain connectivity indicator – *At Risk*. Baseline: South Fork Coquille ARP (USFS 2007).

On NFS lands, most streams are hillslope confined or terrace confined and human development (e.g. roads) has altered some historic floodplains.

4) Flow/hydrology pathway - South Fork Coquille River watershed

Change in peak/base flow indicator – *At Risk*. Baseline: South Fork Coquille WA (USFS 1995) and South Fork Coquille ARP (USFS 2007).

Peak flows have been altered moderately by vegetation removal. However, current vegetation management strategies on NFS lands are generally designed to not affect peak flows. Base flow conditions are assumed to be within the normal range, and tend to be controlled by geomorphology and climate within the watershed.

Increase in drainage network indicator – *At Risk*. Baseline: South Fork Coquille WA (USFS 1995) and South Fork Coquille ARP (USFS 2007).

Road development has increased the drainage network within the watershed.

5) Watershed conditions pathway – South Fork Coquille River watershed

Road density and location indicator – At Risk. Baseline: South Fork Coquille WA (USFS 1995) and South Fork Coquille ARP (USFS 2007).

Roads are located in high erosion potential areas in all subwatersheds. A dual-pipe culvert on Coal Creek just upstream of the confluence with the South Fork Coquille River creates a partial barrier to anadromous salmonids and a full barrier to lamprey.

Disturbance history indicator - At Risk. Baseline: South Fork Coquille WA (USFS 1995) and South Fork Coquille ARP (USFS 2007).

Human activities have altered watershed processes and functions throughout the watershed. Timber harvest, roads, and historic hydraulic and load mining are the primary disturbance activities.

Riparian Reserves indicator – At Risk. Baseline: South Fork Coquille WA (USFS 1995) and South Fork Coquille ARP (USFS 2007).

Riparian areas have been fully harvested on private lands. On NFS lands, riparian timber harvest did occur in some riparian areas in the past. Road construction along streams has also reduced riparian vegetation condition and extent. Port Orford cedar, a common and sometime dominant vegetative component within Riparian Reserves in the watershed, is at risk for infestation from Port Orford cedar root disease (Phytophthora lateralis (PL). Roads and stream corridors are primary vectors for transport of PL.

Disturbance regime indicator – At Risk. Baseline: South Fork Coquille WA (USFS 1995) and South Fork Coquille ARP (USFS 2007).

Timber harvest, road development, agricultural activity, hydraulic mining and urban development (including rural residential development) have altered flow paths and vegetation in the watershed. With the exception of hydraulic mining, all of these disturbance mechanisms still occur within the watershed. Current mining activity generally consists of small-scale suction dredging, high banking, and panning.

2. Sixes population

Subbasin overview – Sixes

The Sixes subbasin within the ESA action area of the OC Coho Salmon ESU includes the Sixes River watershed Figure 44. The climate is typical of coastal Oregon with a strong marine influence, high winter precipitation, and moderate year-round temperatures. The subbasin exhibits flashy fall and winter flows, driven primarily by rainfall. Stream habitat is quite variable, ranging from unconfined low gradient alluvial valleys to steep colluvial and bedrock canyons.

Suction dredging and high banking activity summary. One of the factors for decline and habitat limiting factors for OC Coho Salmon in the ESU is gravel mining and suction dredge activities. These, along with other factors, have led to a modification or curtailment of the range as stated in the draft Scientific Conclusions of the Status Review for Oregon Coast Coho Salmon (NMFS 2011b). Although, it is further explained in NMFS (2011b) that mining, overall, and gravel mining in particular were identified as factors for decline by NMFS (1997c) in the draft review.

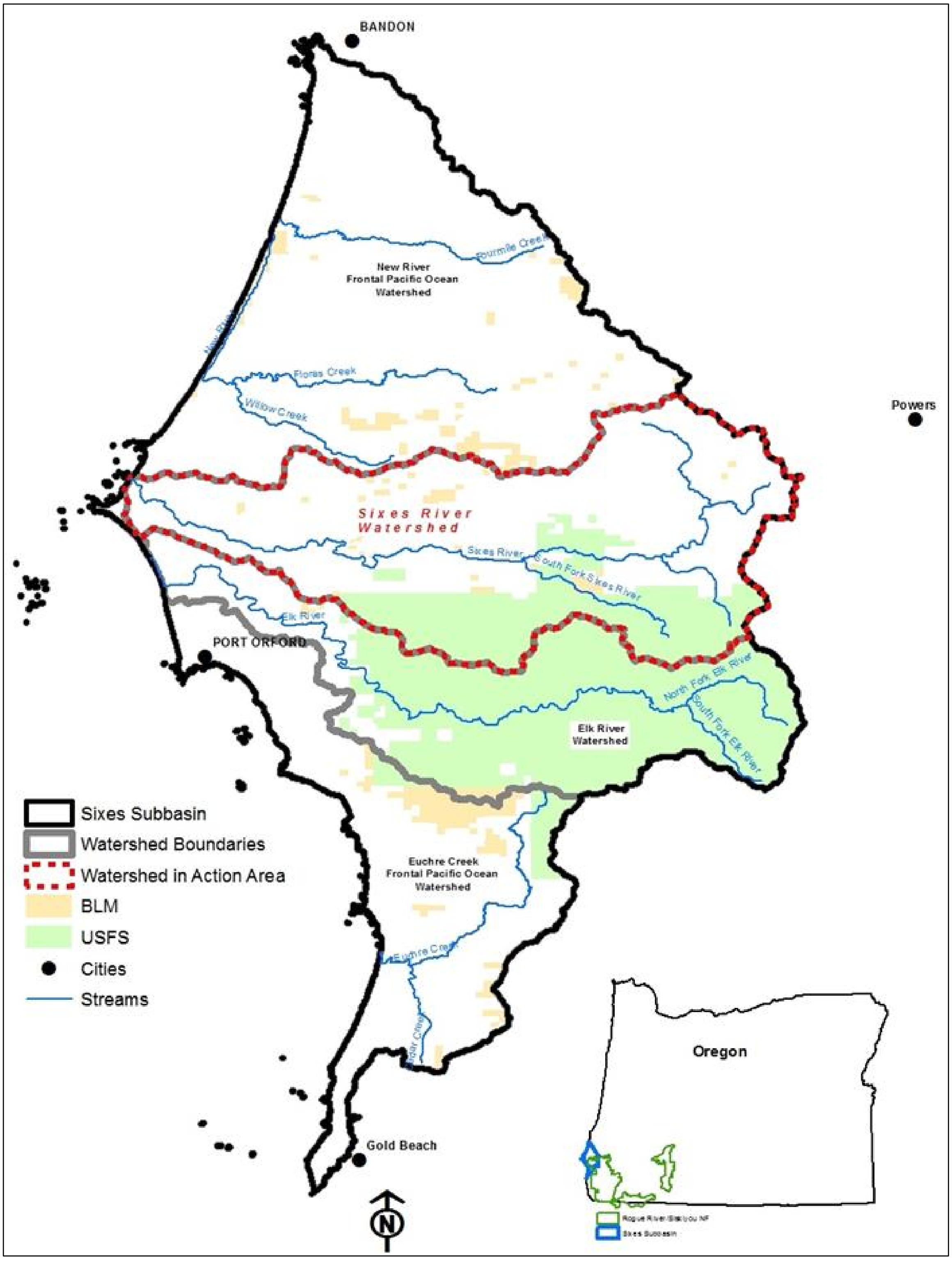

Figure 44. Sixes River subbasin in relation to the Sixes River watershed population within the ESA action area

Subbasin population overview – Sixes

Population highlights (Stout 2012)

- Subbasin contains two separate Coho Salmon ESUs and four watersheds.
- Within the two Coho Salmon ESUs are four distinct populations within the following watersheds: Sixes River, New River-Frontal Pacific Ocean, Elk River, and Euchre Creek-Frontal Pacific Ocean watersheds. The Sixes River and New River-Frontal Pacific Ocean are within the OC Coho Salmon ESU. Elk River and Euchre Creek-Frontal Pacific Ocean are within the SONCC Coho Salmon ESU.
- Independent population
- Mid-South coast
- Primary limiting factor is stream complexity and secondary is water quality.
- Sixes River watershed is the only population within the OC ESU located within the ESA action area.

Anadromous fish species include: Chinook Salmon, Coho Salmon, winter steelhead, sea-run cutthroat trout, and Pacific lamprey.

Watersheds within the ESA action area of the Sixes subbasin

Watershed baseline conditions are described for one 5th field watershed within the Sixes subbasin: Sixes River watershed (Figure 44).

a. Sixes River watershed

Watershed overview – Sixes River

The Sixes River watershed drains approximately 85,832 acres (134 square miles). Sixes River is situated almost entirely within Curry County except for a small area of the Upper Sixes Mainstem subwatershed that extends into Coos County. This basin is among the larger watersheds on the southern Oregon coast. The Sixes River drains into the Pacific Ocean just north of Cape Blanco. Elevations in the watershed range from sea level to approximately 3,315 feet. The upper portion of the basin is characterized by steeply sloped forested areas with narrow valleys and tributary streams that have moderately steep to very steep gradient. Grazing, rural residential development and other agricultural uses are dominant in the lower portion of the basin. The ownership distribution in the watershed encompasses: USFS 26%, BLM 3%, State lands 1% and the remaining 71% is in private ownership (Table 170).

Table 170. Watershed area and ownership distribution - Sixes River watershed

Land Ownership	Acres	Ownership (percent)
USFS	22,028	26
BLM	2,217	3
State	608	1
Private	61,413	71
Total	**86,267**	**100**

Prevalent land uses

- Federal – wilderness, timber production, recreation, and mining
- Private – timber production, agriculture, grazing, and mining

Anthropomorphic alterations to habitat. Private land in the lower watershed and north of the mainstem was logged beginning in the early 1900's. The RRS began pursuing timber production and road construction in the watershed in earnest following World War II. Roads have been associated with a variety of sediment delivery processes in the watershed such as cutbank and fillslope failures, and rock fall from steep road cuts. Old side-cast road designs in the watershed have caused numerous fill failures, and debris flows (USFS 1997).

Suction dredging and high banking activity summary. Historic mining dating back to the mid 1800's has occurred in the Sixes River watershed. Hydraulic mining occurred at the mouth of Dry Creek and on the South Fork Sixes River. Hydraulic mining results in increased sediment loading, entrenchment, lower sinuosity, and channel widening. A system of mining ditches was developed to bring water to hydraulic mine operations. After mining activity declined in the watershed, much of the landscape had time to begin restoring itself. At present, mining within the watershed occurs primarily through the use of suction dredges in various stream reaches, including the South Fork Sixes and mainstem Sixes River on NFS lands.

There were 12 active filed placer claims, as of 5/8/2013. There were 9 suction dredge NOI received by the RRS during the four-year period from 2009-2012 in the watershed on NFS land located within 1/4 mile of CCH (Table 4 and Figure 45). The NOI and related Coho Salmon habitat use types, and potential maximum impact are numerically displayed in Table 171.

Dry Creek and its tributaries within the Dry Creek subwatershed on NFS lands were withdrawn from mineral entry by the designation of the Grassy Knob Wilderness in the Oregon Wilderness Act of 1984 (Public Law 98-328). The uppermost reach of Sixes River was withdrawn from mineral entry by the designation of the Copper Salmon Wilderness. The wilderness area was created by the Omnibus Public Land Management Act of 2009 (Public Law 111-11). There are 67.5 miles of CCH within the watershed and 3.7 miles of those miles are withdrawn from mineral entry on NFS lands. The IP value and habitat typing for these withdrawn miles are displayed in Table 172. See Appendix A for a summary and locations of suction dredging and high banking mineral withdrawals on the RRS.

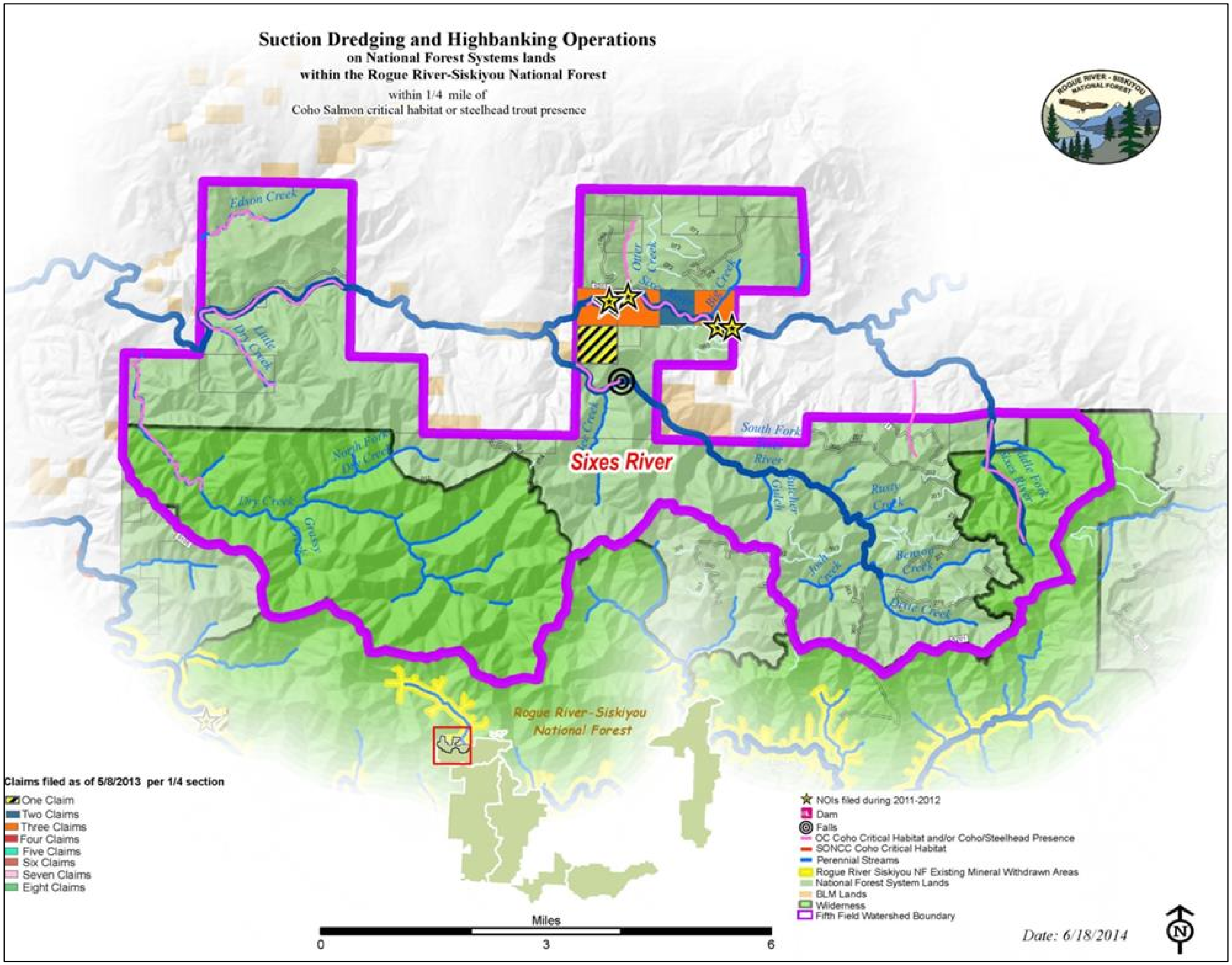

Figure 45. CCH with NOI and mining claims within 1/4 mile of CCH on NFS lands – Sixes River watershed

Table 171. Suction dredging NOI received by RRS (2009-2012) within ¼ mile of CCH – Sixes River watershed

Name/Location			Past NOI Information								Potential Habitat Use Coho Salmon		
							Total Maximum Disturbance[2]						
Stream w/River Mile (constant name)	Location[1] RS & Lat/Long	Name of Claim	NOI Received 2009-2012 (list years)	Number of Operators per claim Number of Operators per claim	Suction Dredge Activities (Y/N)	High Number of Operators per claim Banking Activities (Y/N)	Volume - NOI Listed (cubic yd.)	Volume – Assumed[3] or NOI Listed (cubic yd.)	Area (sq. ft.)	Stream Distance (ft.)	Spawning / Rearing ft.)	Rearing /Migration (ft.)	Migration (ft.)
Sixes 20.2	T32S., R13W., Sec 7NW N42.811 W124.289	Hope	2010, 2011, 2012	2	Y	N	25	25	225	15	0	15	0
Sixes 21.1	T32S., R13W., Sec 8NW N42.8097 W124.289	Douglas Bonanza	2010, 2011, 2012	3	Y	N	25	25	225	15	0	15	0
Sixes 22.0	T32S., R13W., Sec 8NE N42.806 W124.261	Shadow 2	2011	5	Y	N	0	25	225	15	0	15	0
Sixes 22.2	T32S., R13W., Sec 8NE N42.806 W124.258	Shadow Dancer	2010, 2011	4	Y	N	0	25	225	15	0	15	0
		AFFECTED Total within Watershed						$100 yd^3$	$900 ft^2$	60 ft	0 ft	60 ft	0
		BASELINE Total within Watershed						$16,038,000 yd^3$	$5,346,000 ft^2$	356,400 ft	178,992 ft	177,408 ft	0
		BASELINE Total CCH within Watershed								67.5 mi	33.9 mi	33.6 mi	0.0
		AFFECTED Percent Watershed within CCH						0.001%	0.017%	0.017%	0.000%	0.034%	0.000%

[1] Proposed dredging mile marker starting point.

[2] Standard formula to calculate maximum 25 cubic yards suction dredge area of disturbance = 15 feet (length) X 15 feet (width) X 3 feet (depth). Width and depth is constant when cubic yard is stated differently in NOI.

[3] 25 cubic yards is the standard maximum volume anticipated when not specified in NOI.

Table 172. IP and habitat typing mineral withdrawn areas – Sixes River watershed

Habitat Typing[1]	Intrinsic Potential[2] (miles) High	Medium	Low	Total (miles)
Spawning/rearing	0	3.6	0.1	3.7
Rearing/migration	0	0	0	0
Migration only	0	0	0	0
Total	**0**	**3.6**	**0.1**	**3.7**

[1] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[2] Values based on an intrinsic potential map derived from the NETMAP CLAMS data and also located http://www.fsl.orst.edu/clams/. Category for ranking were derived from the final SONCC Coho Salmon Recovery Plan (NMFS 2014); high =>/= 0.66, moderate = </=0.33 – 0.66 and low = <0.33.

Watershed population overview – Sixes River

Population highlights (Stout 2012)

- OC Coho Salmon Population
- Southern Oregon Coastal Basin
- Mid-South Coast Stratum
- Potentially Independent

There are 67.5 miles of critical habitat within the watershed and 5.6 miles on NFS lands (Figure 45 and Table 173). The Sixes River and tributary streams provide important freshwater spawning and rearing habitats for Chinook Salmon, Coho Salmon, winter steelhead, sea-run cutthroat trout, and resident rainbow and coastal cutthroat trout. Populations of salmonids within the watershed are depressed from historic levels. Important tributaries for Coho Salmon spawning and rearing include Dry Creek, Crystal Creek, Edson Creek, Middle Fork, North Fork and the upper mainstem (Frissell 1992). The watershed consists mostly of medium and high IP habitat within the *spawning/rearing* and *rearing/migration* habitat use types (Table 174). There is no high IP habitat within NFS lands.

Table 173. Salmonid species and habitat length - Sixes River population

Water-shed Acres	Anadro-mous Species Present[1]	NFS lands Miles of CCH (miles)[2]	NFS lands Miles of Chinook Habitat (miles)[3]	Water-shed CCH and EFH (miles)[4]	Watershed Potential Miles of Coho Salmon Habitat Type[5] Spawning/ Rearing	Rearing/ Migration	Migration only
86,267	CO, CH, ST	5.6	6.7	67.5	33.9	33.6	0

[1] All, or a portion of, the waterbody supports the following anadromous salmonids: ST- steelhead trout; CO- Coho Salmon; CH - Chinook Salmon.

[2] Steelhead presence surveys were used to determine historic Coho Salmon habitat since CCH was not spatially delineated in the Federal Register 50 CFR Part 226. Values based on GIS data layer entitled RRS 2013 Total Salmon and Steelhead Distribution and field knowledge.

[3] Values based on GIS data layer entitled 2013 RRS Anadromous Salmonid Fish Distribution; Chinook Salmon presence survey layer.

[4] Values based on a combination of RRS 2013 SONCC Coho Salmon delineated CH 19 and ODFW steelhead presence survey data 2013 GIS map (as a surrogate for historic Coho Salmon habitat) website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[5] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

Table 174. Habitat typing and intrinsic potential within CCH – Sixes River population

Habitat Typing[1]	Intrinsic Potential[2] (miles)						Total (miles) CCN/IP/HT	
	High IP		Medium IP		Low IP			
	Water-shed	NFS lands	Water-shed	NFS lands	Water-shed	NFS lands	Water-shed	NFS lands
Spawning/rearing	9.0	0	21.1	2.6	3.8	0.1	33.9	2.7
Rearing/migration	9.4	0	22.3	2.7	1.9	0.2	33.6	2.9
Migration only	0	0	0	0	0	0	0	0
Total	**18.4**	**0**	**43.4**	**5.3**	**5.7**	**0.3**	**67.5**	**5.6**

[1] Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

[2] Values based on an intrinsic potential map derived from the NETMAP CLAMS data and also located http://www.fsl.orst.edu/clams/. Category for ranking were derived from the final SONCC Coho Salmon Recovery Plan (NMFS 2014); high =>/= 0.66, moderate = </=0.33 – 0.66 and low = <0.33.

Watershed habitat indicators – Sixes River

1) Water quality pathway – Sixes River watershed

Temperature indicator – *NPF*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010) and Sixes River WA (USFS 1997).

The Sixes River is listed as water quality limited due to summer water temperatures from the mouth (confluence with the Pacific Ocean) upstream 30.1 river miles. Table 175 displays the 303(d) list for water quality limited streams within the watershed on NFS lands. Stream temperature in the mainstem increased 6 to 8 degrees F shortly after the 1964 flood, but temperature data collected in the 1990's by the DEQ showed a cooling trend where temperatures were 3 to 5 degrees F cooler than those collected in the late 1960's. Appendix B displays the 2010 303(d) list for streams within NFS lands on RRS

Table 175. ODEQ, 2010 303(d) List for Oregon Waterbodies within NFS lands on RRS – Sixes River watershed

Stream Name	Miles on RRS (miles)	River Mile Marker (miles)	Pollutant	Assess-ment	Assess-ment 2	Listing Status
Sixes River	0.07	0 to 15.1	Biological Criteria	2010	1/29/2013	Cat 5: Water quality limited, 303(d) list, TMDL needed
Sixes River	2.45	15.1 to 30.1	Biological Criteria	2010	1/29/2013	Cat 5: Water quality limited, 303(d) list, TMDL needed
Sixes River	2.52	0 to 30.1	Temperature	2004	4/14/2005	Cat 5: Water quality limited, 303(d) list, TMDL needed
Rogue River	16.01	0 to 124.8	Temperature	2010	10/29/2010	Delisted - TMDL approved

Suspended sediment–intergravel/DO/turbidity indicator – *At Risk*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010) and Sixes River WA (USFS 1997).

The Sixes River has naturally high levels of turbidity following storms when compared to other coastal watersheds, such as Elk River. This is attributed to larger amounts of silt and clay in the watershed that enter the streams through landslides and surface erosion. Roads and timber harvest within the watershed can cause landslides and surface erosion that are cumulative to the natural sedimentation rate. No streams in the watershed within NFS lands are on the 303(d) list for sediment. However, two segments of the Sixes River are listed for biological criteria, possibly as a result of sediment tolerant macroinvertebrate presence (Table 175).

Chemical contamination/nutrients indicator – *Properly Functioning*. Baseline: Oregon's 2010 Integrated Report Assessment Database and 303(d) List (ODEQ 2010), Rogue River Basin TMDL (ODEQ 2008) and Sixes River WA (USFS 1997).

The Sixes River is not listed on the 303(d) list for contaminants or excessive nutrients. Downstream on private lands some contamination may occur from agriculture runoff or effluent from septic tanks, fields and other sources. Decades of historic mining, without environmental protection, introduced mercury into the Sixes River.

2) Habitat access/elements pathway – Sixes River watershed

Physical barriers indicator – *At Risk*. Baseline: Sixes River WA (USFS 1997).

A culvert on Little Otter Creek located at NFS lands on Road 5201 at mile post 1.73 is a potential barrier to upstream movement of anadromous salmonids.

Substrate/embeddedness indicator – *At Risk*. Baseline: Sixes River WA (USFS 1997), Big Creek SS (SRG 2006), Otter Creek SS (SRG 2006), South Fork Sixes River SS (USFS 1995) and Dry Creek SS (SRG 2013).

An estimated 5.6 times the natural landslide sediment volume was delivered to stream channels between 1943 and 1986 on NFS land (McHugh 1986). A combination of the 1964 flood and associated increases in natural sediment delivered, exacerbated by sediment generated from logging and roads, altered instream substrates. Large amounts of sediment from these sources were stored in the upper and lower valley segments of the mainstem. Stream surveys conducted in 2006 document a large amount of fine sediment in Otter and Big Creeks, which appeared to be negatively affecting the quality of the aquatic habitat by embedding channel substrate and reducing the amount and quality of spawning habitat.

The mainstem Sixes River can be characterized in four segments. The lower segment extends from the Pacific Ocean to river mile 12 and traverses a low gradient wide valley. The stream is wide and shallow with large gravel bars and substrate dominated by gravels and cobbles. In the middle segment, from river mile 12 to 22, the gradient increases and the stream is confined by hillslopes. Substrate in this segment is dominated by boulders, with lesser amounts of cobbles, gravels, and sand. Upstream of RM 22, the river enters an upper low gradient valley with channel conditions similar to the lower valley segment. The final segment is steep with gradients exceeding 20% as the river climbs to its headwaters. Within tributary streams, channel gradients tend to be higher than in the mainstem. There, substrate tends to be larger and is dominated by boulder and cobble size classes.

Large wood – *At Risk*. Baseline: Sixes River WA (USFS 1997), Big Creek SS (SRG 2006), Otter Creek SS (SRG 2006), South Fork Sixes River SS (USFS 1995) and Dry Creek SS (SRG 2013).

Instream large wood has been removed from stream channels in association with mining, logging, and post-storm salvage. Instream large wood that was abundant in aerial photos in the late 1950's had all but disappeared by the mid 1960's, likely because of salvage logging. The long-term supply of large wood has been reduced from riparian areas primarily by timber harvest and clearing for agriculture. Since the mid-1990s, riparian management under the NWFP has emphasized maintenance and enhancement of habitat for fish and other aquatic resources. Consequently, large wood recruitment and quantities of standing large wood are increasing on NFS lands.

Pool frequency and quality indicator – *At Risk*. Baseline: Sixes River WA (USFS 1997), Big Creek SS (SRG 2006), Otter Creek SS (SRG 2006), South Fork Sixes River SS (USFS 1995) and Dry Creek SS (SRG 2013).

Within higher gradient stream reaches, pools tend to be formed by boulders or bedrock plunges. Large wood is the primary causal mechanism in low gradient reaches to create complex and frequent pools. These pools and associated large wood also can create off-channel habitat and refuge for salmonids. Table 176 summarizes pool habitat condition on stream surveyed (using USFS Region 6 Level II survey protocol) on NFS lands in the watershed.

Table 176. Habitat percent and pool summary for surveyed streams – Sixes River watershed

Stream Name	Year Survey-ed	Habitat % Pool	Habitat % Riffle	Pools/ Mile	Deep Pools/mile (>3ft)	Avg. Residual Pool Depth (ft)	Average Bankfull Width (ft)
Big Creek	2006	29.2	70.8	51.8	5.4	1.8	21.7
Otter Creek	2006	40.6	56.9	46.7	6.7	1.8	24.4
South Fork Sixes R..	1995	42.7	57.2	22.7	16.4	3.2	45.2

Off-channel habitat indicator – *At Risk*. Baseline: Sixes River WA (USFS 1997), Big Creek SS (SRG 2006), Otter Creek SS (SRG 2006), South Fork Sixes River SS (USFS 1995) and Dry Creek SS (SRG 2013).

Due to the confined nature of most of the Sixes River streams, off-channel habitat does not generally occur. Floodplains are generally non-existent, very narrow or have inaccessible high terraces. Exceptions are found along the mainstem Sixes River in the two low gradient valley segments, where expansive floodplains are present.

Refugia indicator – *At Risk*. Baseline: Sixes River WA (USFS 1997), Big Creek SS (SRG 2006), Otter Creek SS (SRG 2006), South Fork Sixes River SS (USFS 1995) and Dry Creek SS (SRG 2013).

Thermal refugia are primarily present within deep pools and at tributary confluences with the mainstem Sixes River. Within tributary streams, complex or deep pools and to a lesser degree off-channel habitat features function as usable refugia for rearing salmonids.

3) Channel condition and dynamics pathway – Sixes River watershed

Bankfull width depth ratio/ channel widening indicator - *At Risk*. Baseline: Sixes River WA (USFS 1997), Big Creek SS (SRG 2006), Otter Creek SS (SRG 2006), South Fork Sixes River SS (USFS 1995) and Dry Creek SS (SRG 2013).

There is limited historical documentation of channel conditions prior to 1940. However, some reasoned assumptions can be made regarding the channel morphology within the watershed. Lower gradient, depositional reaches are more likely to be influenced by natural and anthropogenic disturbance. Higher gradient, more confined stream reaches tend to be very stable and resist change in channel morphology under most disturbance processes.

In the late 1800's there were five hydraulic mines operating in the watershed. The use of hydraulic giants concentrated powerful streams of water to wash material from stream banks. This type of operation can cause significant change to channel dimensions, including bankful width and floodprone width. Anecdotal evidence suggests that hydraulic mining near the mouth of Dry Creek resulted in increased floodprone width, which exacerbated deposition of bedload at the mouth of the creek. Since the mid-1990s, riparian management under the NWFP has emphasized maintenance and enhancement of habitat for fish and other aquatic resources. Consequently, instream habitat including bankfull width/depth conditions is improving on NFS lands.

Streambank condition indicator – *At Risk*. Baseline: Sixes River WA (USFS 1997), Big Creek SS (SRG 2006), Otter Creek SS (SRG 2006), South Fork Sixes River SS (USFS 1995) and Dry Creek SS (SRG 2013).

Streambanks have been altered where valley bottom roads occur and where timber harvest or hydraulic mining have removed vegetation and soil. Many streambanks are well armored with large boulders and bedrock, particularly within confined tributary drainages.

Floodplain connectivity indicator – *At Risk*. Baseline: Sixes River WA (USFS 1997), Big Creek SS (SRG 2006), Otter Creek SS (SRG 2006), South Fork Sixes River SS (USFS 1995) and Dry Creek SS (SRG 2013).

On NFS lands, most streams are hillslope confined or located within naturally incised canyons. Consequently, floodplains where they occur tend to be small. Roads located within riparian areas have altered historic floodplains and their connectivity.

4) Flow/hydrology pathway – Sixes River watershed

Change in peak/base flow indicator – *At Risk*. Baseline: Sixes River WA (USFS 1997).

Timber harvest and roads can affect stream flow by intercepting water and transporting more rapidly than natural processes. However, there is insufficient information and research to determine if and to what degree human activities have affected stream flow in the watershed.

Increase in drainage network indicator – *At Risk*. Baseline: Sixes River WA (USFS 1997).

On NFS lands, the watershed is comprised of steep valley walls and a heavily dissected stream network. Most roads avoid streams and are located near ridge tops. On private land, particularly industrial timberland, it is assumed that road densities are higher than on public land.

5) Watershed conditions pathway – Sixes River watershed

Road density and location indicator – *At Risk*. Baseline: Sixes River WA (USFS 1997).

Roads are located in high erosion potential areas in all subwatersheds. Historic road failures within the watershed are well documented. However, road management has improved over time and many poorly designed and/or located road segments have been decommissioned.

Disturbance history indicator - *At Risk*. Baseline: Sixes River WA (USFS 1997).

Human activities have altered watershed processes and functions throughout the watershed. Timber harvest, roads, and historic hydraulic mining are the primary disturbance activities.

Riparian Reserves indicator – *At Risk*. Baseline: Sixes River WA (USFS 1997), Big Creek SS (SRG 2006), Otter Creek SS (SRG 2006), South Fork Sixes River SS (USFS 1995) and Dry Creek SS (SRG 2013).

Riparian areas have been fully harvested on private lands. On NFS lands, riparian timber harvest did occur in the past in some riparian areas. Road construction along streams has also reduced riparian vegetation condition and extent. Port Orford cedar, a common and sometime dominant vegetative component within Riparian Reserves in the watershed, is at risk for infestation from Port Orford cedar root disease. Roads and stream corridors are primary vectors for transport of PL.

Disturbance regime indicator – *At Risk*. Baseline: Sixes River WA (USFS 1997).

Timber harvest, road development, agricultural activity, hydraulic mining and urban development (including rural residential development) have altered flow paths and vegetation in the watershed. With the exception of hydraulic mining, all of these disturbance mechanisms still occur within the watershed. Current mining activity generally consists of small-scale suction dredging, high banking, and panning.

V. Effects of the Programmatic Actions

Suction dredging, high banking, and associated activities may have direct and indirect effects to ESA-listed fish species, their designated Critical Habitat (CH) and Essential Fish Habitat (EFH). Direct effects cause an immediate impact. Indirect effects are those that occur later in time.

This chapter is organized as described below:

> **Part "A"** describes the process for assessing effects of suction dredging and high banking activities using the FWS/NMFS matrix of pathways and indicators (USDI FWS and USDC NOAA NMFS, 2004) (commonly known as the MPI) and the *Analytical Process for Developing Biological Assessments for Federal Actions Affecting Fish Within the Northwest Forest Plan Area* (USDA FS et al. 2004) (hereafter described as the AP).
>
> **Part "B"** analyzes the effects of the proposed action at the *individual site scale* using the AP format and NMFS MPI indicators.
>
> **Part "C"** analyzes the effects of the proposed action at the *individual site scale* to the Primary Constituent Elements (PCE) of designated CH.
>
> **Part "D"** discusses effects to the species that may result in harm or harassment.
>
> **Parts "E, F and G"** analyzes the effects of the proposed action at the *5th field watershed scale*.
>
> **Part "H"** is a summary of the effects to the species and their habitat, and concludes with the ESA effect determination.
>
> **Part "I"** discusses aggregated federal effects.
>
> **Part "J"** discusses ESA cumulative effects.
>
> **Part "K"** is an assessment of effects to EFH for Coho and Chinook salmon.

A. Process for assessing effects of the suction dredging and high banking activities

The AP addresses effects of individual actions, aggregated Federal effects, ESA cumulative effects, and watershed-scale effects. It utilizes the pathways and indicators of the FWS/NOAA MPI. The MPI contains 22 indicators in 7 pathways (Table 177).

Table 177. FWS/NOAA Matrix of Pathways and Indicators

Pathway	Indicator
1. Water quality	a. Temperature
	b.Suspended sediment: intergravel DO/turbidity
	c. Chemical contamination/nutrients
2. Habitat access	a. Physical barriers
3. Habitat elements	a. Substrate character and embeddedness
	b. Large wood
	c. Pool frequency and quality
	d. Large pools
	e. Off-channel habitat
	f. Refugia
4. Channel condition and dynamics	a. Average wetted width/maximum depth ratio in scour pools in a reach
	b. Streambank condition
	c. Floodplain connectivity
5. Flow/hydrology	a. Change in peak/base flows
	b. Increase in drainage network
6. Watershed conditions	a. Road density and location
	b. Disturbance history
	c. Riparian Reserves
	d. Disturbance regime
7. Population characteristics	a. Population size and distribution
	b. Growth and survival
	c. Life history diversity and isolation
	d. Persistence and genetic integrity

The AP divides the proposed action into discrete units known as Project Elements (PE). The AP then uses eight factors to evaluate effects for each PE by MPI indicator: proximity, probability, magnitude, distribution, frequency, duration, timing, and nature. The first three factors allow for a quick evaluation of a PE to determine if effects will not occur, or are insignificant or discountable. If the species or habitat is not in proximity to the effects of the PE, then no further analysis is needed. If the probability of an effect is entirely discountable (extremely unlikely to occur), no further analysis is required for that PE. If the outcome of the probability analysis is not discountable, then magnitude is assessed. If the magnitude analysis results in a conclusion of insignificant effects, no further factor analysis is required for that PE. However, if that is not the case, the remaining five factors are analyzed.

Each PE will either have a positive, negative or neutral effect to the baseline conditions for an indicator. A positive effect would improve the direction of the baseline for an indicator. A negative effect would cause a decline in the direction of the baseline for an indicator. A neutral effect would not affect the direction of the baseline for an indicator, either positively or negatively. A discountable impact (either positive or negative) is a qualitative statement indicating that there is an extremely unlikely probability of an impact occurring. An insignificant impact (either positive or negative) is a qualitative statement indicating a potential impact, but that impact cannot be meaningfully measured, detected or evaluated.

Project Elements (PE)

The PEs for the proposed action are listed and described below. Each PE includes following the conservation measures associated with it (see list and descriptions in Chapter II).

Mining - includes suction dredging, high banking and associated activities, such as equipment set-up and take-down, refueling and maintenance.

Onsite occupancy - involves camping near the suction dredging and high banking sites.

B. Effects on matrix indicators at the site scale

Indicators *not affected* by the proposed action

The following indicators are reasonably expected *not* to be subject to effects from the proposed action:, physical barriers, large wood, floodplain connectivity, change in peak/base flows, increase in drainage network, road density and location, life history diversity and isolation, and persistence and genetic integrity. Effects by PE to all other MPI indicators will be analyzed using the AP factor analysis process. The following MPI numbers correspond with the pathway and indicator numbering in Table 177.

MPI #2a. Habitat access pathway: Physical barriers indicator. The proposed action neither creates nor removes any migration barriers to fish.

MPI #3b. Habitat elements pathway: Large wood indicator. Conservation measures (CM) included in the proposed action prevent the removal of large wood from any waterway, and protect live or dead wood within 150 feet of any stream while occupying sites for camping.

MPI #4c. Channel conditions pathway: Floodplain connectivity indicator. The proposed action has no causal mechanism to reduce the linkage of wetlands, floodplains and riparian areas to main channels. CM 30 and 34 require all dredge tailings piles and piles resulting from high banking to be replaced back into the excavations. This would prevent any disconnection with floodplains from occurring.

MPI #5a. Flow/hydrology pathway: Change in peak/base flows indicator. The proposed action does not remove or increase vegetation, or change the timing or intensity of flows.

MPI # 5b. Flow/hydrology pathway: Increase in drainage network indicator. The proposed action does not include any new roads or road decommissioning that would change the existing drainage network.

MPI #6a. Watershed condition pathway: Road density and location indicator. The proposed action does not include any new roads, road decommissioning or closure, or any change in road maintenance levels.

MPI #7c. Population characteristics pathway: Life history diversity and isolation indicator. This indicator is more relevant to bull trout than anadromous fish. All Salmon in the ESA action area are anadromous. Therefore, concern about losing the migratory form of the species is irrelevant. The proposed action does not have any causal mechanism to isolate any subpopulations.

MPI #7d. Population characteristics pathway: Persistence and genetic integrity indicator. This indicator is more relevant to bull trout than anadromous fish. The proposed action does not have any causal mechanism to affect connectivity with other subpopulations, the risk of extinction of any subpopulation, or influence competition with other fish species that would displace Coho Salmon. The potential for hybridization with other species is irrelevant to ESA-listed Coho Salmon.

Indicators *affected* by the proposed action and effects to spawning, rearing and migratory habitat

The effects to each of the indicators by the proposed action are analyzed below using the AP process, including factor analysis where appropriate. A description of how the effects to the indicator impact spawning, rearing and migratory habitat for Coho Salmon is presented after the conclusion of the analysis for each indicator.

Chapter III, Table 6 and Table 9 in this document display the in-water work windows[9] for the waterways in the ESA action area. The work windows were compared with the life-cycle timing tables for specific waterways within the state of Oregon[10] to determine which life cycle stages for Coho Salmon would be present during the ODFW in-water work windows. The results were used to determine which life cycle stages of Coho Salmon would be potentially exposed to the effects of the action (see analysis in Section D: Effects to the species that may result in harm or harassment). This information also provides context to determine whether or not spawning, rearing and migration habitat may be affected.

The following MPI numbers correspond with the pathway and indicator numbering in Error! Reference source not found.

MPI #1a. Water quality pathway: temperature indicator

PE 1: *mining*

Proximity. Water quality pathway: temperature indicator; PE 1: *mining*

The *mining* PE includes suction dredging and high banking. Dredging occurs within the wetted perimeter of stream channels and high banking is done on exposed gravel bars between the wetted stream and streambank. The potentially affected stream reaches are in or within one-quarter mile of occupied habitat for ESA-listed SONCC and OC Coho Salmon or their respective designated CH.

Probability. Water quality pathway: temperature indicator; PE 1: *mining*

Sullivan and Adams (1991) state that the primary determinants of stream temperature are climatic drivers (such as solar radiation), stream morphology, groundwater influences and riparian canopy condition. Poole et al. (2001) explain that shade vegetation can reduce fluctuations in stream temperature over the day. Poole et al. (2001) also state that wide shallow channels are more easily heated than deep, narrow channels. This analysis evaluates three aspects of these determinants most relevant to the *mining* PE: (1) the removal of riparian canopy providing shade to the stream channel, (2) increases in width-to-depth (WD) ratio, and (3) the interception of cool seepage water.

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[9] ODFW website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=guidelineTimingTables.
[10] ODFW website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=timingtables.

The *mining* PE would not remove vegetation that provides shade to the stream channel. CM 13b, in effect for both suction dredging and high banking, specifically prohibits the removal or disturbance of any rooted vegetation, including live or dead trees or limbs from streambanks. CM 36 prohibits the cutting or removal of riparian vegetation, and prohibits exposing tree roots within the canopy width, during high banking operations. There will be no loss of vegetation providing shade to stream channels from the *mining* PE. Therefore, there is no probability of an effect to the temperature PE from loss of shade vegetation.

There are several CM that limit the potential for an increase in WD ratio. CM 13 protects the integrity of streambanks by prohibiting actions that would undercut, erode, destabilize or excavate streambanks. It specifically prohibits the removal or disturbance of rooted vegetation, boulders, embedded wood (including root wads, stumps or logs), and other habitat structure that extends into the stream channel from the streambank. CM 25 prohibits operating nozzles of a suction dredge or the removal of material within 3 feet of the lateral stream edge of the current water level, including at edges of gravel bars or under overhanging banks.

CM 26c protects streambanks by prohibiting directing the existing stream current or the discharge from the sluice into streambanks during suction dredge operations. The stated intent is to prevent erosion or destruction of the natural form of the channel, undercutting the streambank or widening the channel. CM 26d also does not allow the diverting of flow into the bank.

Piled suction dredge tailings have the potential to direct stream flow into streambanks during high flow events that occur later in time. However, CM 30 requires the backfilling of suction dredge holes with tailings by the end of the in-water work window. This would eliminate a potential cause for increased WD ratio by removing the tailings before high flow events could redirect flows around tailing piles and into streambanks. CM 31 provides a further requirement to reduce the possibility of redirection of flow into streambanks. It requires the spreading of tailing piles so that they are no more than 4 inches in depth and conform to the contour of the natural stream bottom.

CM 33 provides similar protections for streambanks that would limit the potential for an increase in WD ratio from high banking operations. There are distance buffers between the wetted stream and all work areas. It prohibits activity beyond the toe of a streambank including the terrace and beyond (above the high water level). In addition, all excavations must be filled to original contour levels prior to the end of the in-water work window.

In summary, CM 13, 25, 26, 30, 31, 33 and 36 protect streambank integrity and would maintain stream channel WD ratios. The probability of an increase in WD ratio by the effects of the *mining* PE is extremely unlikely. It follows that the probability of an increase in water temperature is therefore also extremely unlikely.

Suction dredging results in dredge holes. The typical depth of suction dredge holes in streams on the RRS is 3 feet (Kevin Johnson, pers. comm. 2014). Harvey and Lisle (1998) describe that pools temporarily formed or deepened by suction dredging may intersect subsurface flow and create pockets of cool water during the summer. The authors did not describe specific temperature differences between summer surface flows and subsurface flows intercepted at the bottom of temporary dredge pools. We could not find literature identifying specific temperature differences between summer surface flow and that at the bottom of created dredge pools.

Matthews et al. (1994) describe sources of cool water in pools. They cite Nielsen et al. (1994) when stating that zones of cool water in pools are apparently caused by at least two mechanisms:

influx of cool seepage water; and retention of cool, dense water at lower levels. Citing multiple literature sources, they further state that cool seepage water originates from intragravel, groundwater, hill slope, or tributary surface inflow that is physically isolated by a barrier such as a gravel bar or organic debris that slows mixing with warmer stream water (Keller and Hofstra 1983; Bilby 1984; Ozaki 1988; Nielsen et al. 1994).

The conditions described above that are the source of cool seepage water entering pools exist within ESA action area watersheds. It is probable that suction dredging will result in pockets of cool water habitat that would not otherwise be present in the stream channel. This will occur in a subset of dredge holes where cool seepage water is present.

Magnitude. Water quality pathway: temperature indicator; PE 1: *mining*

It is not known what proportion of all dredge holes would intercept cool seepage water and provide cool-water refugia. Dredge holes would occupy a small fraction of all stream channels with Coho Salmon designated CH. For purposes of determining effects, this BA uses an average surface area of each dredge hole to be 15 feet by 15 feet. The interception of cool seepage water would be localized. It would have little influence on stream temperature beyond each individual dredge hole.

Distribution. Water quality pathway: temperature indicator; PE 1: *mining*

The effect will occur at each suction dredge site.

Frequency. Water quality pathway: temperature indicator; PE 1: *mining*

There will be no more than one suction dredge hole at one time at each NOI site. CM 30a requires each dredge hole be backfilled by the NOI operator before moving to a new individual work site (suction dredge hole). Please see Appendix F for more details.

Duration. Water quality pathway: temperature indicator; PE 1: *mining*

The positive effect on water temperature would be short-term. It would only last as long as the dredge hole exists. Each dredge hole must be backfilled and tailings spread before moving to a new work site (CM 30a). At the last work site, backfilling and spreading of tailings must take place before the end of the in-water work window (CM 30b). A single dredge hole could potentially be available throughout the entire time period of the in-water work window.

Timing. Water quality pathway: temperature indicator; PE 1: *mining*

Dredge holes intercepting cool seepage water would be available during the juvenile rearing life cycle stage for Coho Salmon, and to a lesser degree during the juvenile out-migration and adult migration life cycle stages.

Nature. Water quality pathway: temperature indicator; PE 1: *mining*

The nature of the effect is a localized decrease in water temperature that would be beneficial during the juvenile rearing, smolt outmigration and adult upstream migration periods of the Coho Salmon life cycle.

ELEMENT SUMMARY – Water quality pathway: temperature indicator; PE 1: *mining*

The *mining* PE would not result in any removal of riparian vegetation providing stream shade. There would be no increase in solar radiation to the stream channel and no increase in water temperature. There is a discountable probability that stream channel WD ratios would increase. Therefore, there is a discountable probability of a water temperature increase as a result of an increase in channel surface area exposed to solar radiation. However, it is probable that a subset of all created suction dredge holes would intercept cool seepage water that would be colder than surface flows and there would be a localized, short-term positive (+) effect to the Temperature indicator from the *mining* PE. This positive effect would be short-term because the proposed action requires that dredge holes be filled before moving to a new work site and at the end of the in-water work window. However, any positive effect to the water temperature indicator would be localized. Dredge holes would occupy a small fraction of all stream channels with Coho Salmon designated CH. The interception of cool seepage water would have little influence on stream temperature beyond each individual dredge hole.

PE 2: *onsite occupancy*

Proximity. Water quality pathway: temperature indicator; PE 2: *onsite occupancy*

Miners will occupy sites adjacent to their operations. The potentially affected stream reaches are in or within one-quarter mile of occupied habitat for ESA-listed SONCC and OC Coho Salmon or their respective designated CH.

Probability. Water quality pathway: temperature indicator; PE 2: *onsite occupancy*

Sullivan and Adams (1991) state that the primary determinants of stream temperature are climatic drivers (such as solar radiation), stream morphology, groundwater influences and riparian canopy condition. Poole et al. (2001) explain that shade vegetation can reduce fluctuations in stream temperature over the day. Poole et al. (2001) also state that wide shallow channels are more easily heated than deep, narrow channels. This analysis evaluates two aspects of these determinants most relevant to the *onsite occupancy* PE: (1) the removal of riparian canopy providing shade to the stream channel, and (2) increases in (WD) ratio.

Overstory and understory woody vegetation (trees) provide the vast majority of shade canopy along streams in the ESA action area. CM 44 prohibits the removal of woody material for firewood or other purposes within 150 feet of the stream. This applies to live or dead woody vegetation. CM 47 restricts motorized access to existing roads and trails, so no vegetation providing shade to stream channels would be removed for motorized access. The intent of CM 48 is to use existing/established dispersed campsites and paths, while locating any new camp areas and paths away from the stream and streambanks. The outcome of these three CM would protect vegetation providing shade canopy. Therefore, it is extremely unlikely that vegetation providing shade canopy to stream channels will be impacted. An effect to water temperature by removal of shade canopy as a result of the *onsite occupancy* PE is extremely unlikely to occur.

There is a discountable probability that stream channels would widen and WD ratios would increase as a result of the *onsite occupancy* PE. The three CM described above that protect riparian vegetation, as well as an additional feature of CM 48 that prevents creating new areas of exposed soil along stream and streambanks, effectively minimize the probability of increased WD ratios to the point where it is extremely unlikely to occur. It follows that an increase in water temperature is also extremely unlikely to occur.

ELEMENT SUMMARY – Water quality pathway: temperature indicator; PE 2: *onsite occupancy*

There would be a **discountable negative (-) effect** to the **temperature** indicator from the *onsite occupancy* PE. It is extremely unlikely that riparian vegetation providing shade canopy would be impacted. Similarly, it is extremely unlikely that any activities associated with *onsite occupancy* would result in channel widening and increased WD ratios. Therefore, it is extremely unlikely that water temperatures would be impacted. The probability of an effect occurring is discountable.

INDICATOR SUMMARY

The analysis above concluded that the *mining* PE would not remove riparian vegetation providing shade and consequently would not result in a water temperature increase from that mechanism. It is extremely unlikely that implementing the mining PE would increase WD ratios and result in a water temperature increase. There would be a **discountable negative (-) effect** to the **temperature** indicator. However, the *mining* PE would result in a **short-term measurable positive (+) effect** to the indicator because a subset of all created dredge holes would intercept cool seepage water. This effect would not likely extend beyond the dredge hole into other surface waters, and would be transient because of CM 30a that requires the filling of dredge holes with dredge piling material to take place before moving to a new work site.

It was concluded that the *onsite occupancy* PE would have a **discountable negative (-) effect** to the water temperature indicator because it is extremely unlikely that riparian vegetation providing shade canopy would be impacted or WD ratios would increase.

EFFECTS TO SPAWNING, REARING AND MIGRATORY HABITAT as a result of water temperature changes caused by the water quality pathway: temperature indicator; PE 1 *mining* and PE 2 *onsite occupancy*

As described in the above factor analysis, the only measurable effect to the temperature indicator by the proposed action is a short-term beneficial effect that would be localized in a subset of dredge holes. This would be a result of the interception of cool seepage water in a subset of dredge holes.

The short-term beneficial effect would last only as long as the dredge holes are extant. CM 30 requires the backfilling of suction dredge holes with tailings by the end of the in-water work window. End dates for in-water work windows are September 15, September 30 or October 31, depending upon the waterway.

Spawning. No habitat used for spawning will be affected. The timing of spawning for SONCC and OC Coho Salmon is outside the in-water work windows. All suction dredge holes providing cool-water refugia would be filled before spawning begins.

Rearing. Dredge holes providing cool water refugia can be created at any time during the in-water work windows, which varies by water body. Juvenile Coho Salmon are present during the entirety of the various work windows. There would a localized, short-term positive effect on rearing habitat for juvenile Coho Salmon.

Migration. As described in detail in Chapter V. D., the *adult migration* life cycle stage overlaps with the in-water work windows for three waterways for 15 days and one waterway for 45 days. Suction dredge holes providing cool water refugia would be present during these time frames and would have a positive effect on migratory habitat used by adult Coho Salmon.

Smolt out-migration takes place within the in-water work window for two waterways. Dredge holes providing cool water refugia would have a positive effect on migratory habitat used by juvenile Coho Salmon. This would only occur in the Illinois River waterway from June 15 to June 30 and in the Rogue River tributaries above Mariel waterway from June 15 to July 15. In both cases, it is at the tail of the out-migration time period and would affect a small percentage of all out-migrating Coho Salmon.

MPI #1b. Water quality pathway: suspended sediment: intergravel DO/turbidity indicator

There are two components to the suspended sediment: intergravel DO/turbidity indicator. One is the percent fines: (1) <0.85 mm in spawning gravel, or (2) < 6 mm on the surface or at depth of spawning habitat. The other is the level of turbidity. Because there are two different size criteria for fines in or on spawning gravel/habitat, the analysis that follows will use the word “fines” as a generic term to address both size categories.

PE 1: *mining*

Proximity. Water quality pathway: suspended sediment: intergravel DO/turbidity indicator; PE 1: *mining*

The *mining* PE includes suction dredging and high banking. Dredging occurs within the wetted perimeter of stream channels and high banking is done on exposed gravel bars between the wetted stream and streambank. The potentially affected stream reaches are in or within one-quarter mile of occupied habitat for ESA-listed SONCC and OC Coho Salmon or their respective designated CH.

Probability. Water quality pathway: suspended sediment: intergravel DO/turbidity indicator; PE 1: *mining*

It is certain that the *mining* PE will increase turbidity and may increase fines in or on spawning gravel/habitat. The *mining* PE includes suction dredging and high banking. The act of suction dredging vacuums streambed particles. Particles not heavy enough to be caught in the sluice box exit back into the stream. Particles that exit the sluice box that are small enough to be suspended in the water column will increase turbidity. Suspended sediments eventually settle out of the water column, with heavier particles settling out first. If there is spawning gravel present downstream, and the sediment plume flows over the spawning gravel, some fines are likely to settle in or on the gravel.

Once suction dredging is completed, a CM requires that dredge holes be filled with dredge piling material. If there are fine streambed particles in the dredge pile, turbidity above background levels may result when the dredge pile is moved.

Fall flows sufficiently large to move fine streambed materials will mobilize those fines that were deposited on the surface of the streambed downstream from the dredging operation. Remobilized fines will combine with fines already in the water column and bedload from upstream sources.

High banking operations are located on dry gravel bars between the wetted stream and streambank. Water for high banking operations is not diverted from or disposed/discharged into the nearby stream. Consequently there is no mobilization of fine sediments into the water column at the time that it takes place. However, fine sediments disturbed by high banking operations will be mobilized by stream flows that occur later in time that are large enough to overflow the gravel bar.

Magnitude. Water quality pathway: suspended sediment: intergravel DO/turbidity indicator; PE 1: *mining*

Turbidity. CDFG (2009) summarizes existing literature on the magnitude of turbidity and total suspended solids (TSS) increases downstream from suction dredges:

"Generally, suction dredging causes turbidities of between 15 and 50 Nephelometric Turbidity Units (NTU) immediately downstream of the operation, with background levels returning between 50 and 160 m downstream, and in some cases as short as 11 m (Harvey 1986; Somer and Hassler 1992; Thomas 1985; Griffith and Andrews 1981; Stern 1988; Prussian, et al. 1999)."

"Suction dredging has been shown to elevate suspended sediment concentrations up to 300-340 milligrams per liter (mg/L) immediately downstream of the dredge, decreasing to background levels within 160 m (Stern 1988; Thomas, 1985)."

An independent reading of Stern (1988) found this reference to turbidity and total suspended solids (TSS) levels at the four dredge sites he evaluated: "Values 50 m below the dredge were at least 2 to 3 times higher than that of the control, but at 100 m below values approached control levels."

We could not find literature that evaluated the magnitude of turbidity increases from: (1) moving individual dredge piles, (2) fall/winter freshets remobilizing fines deposited downstream on the streambed surface from dredge operations, or (3) fines mobilized by fall/winter freshets from gravel bars at which high banking operations had taken place. The turbidity beyond background levels caused by moving dredge piles is expected to be far less than that during active suction dredging, as most of the fines small enough to be suspended in the water column will have been carried downstream during the dredging operation.

Regarding mechanisms (2) and (3), above, the remobilization of previously disturbed fine sediment would occur when the water column already is becoming turbid from all sources of fine sediments upstream. The amount of fine sediment remobilized as a result of the *mining* PE would be a very small component of the entire fine sediment load in the water column at that time. Turbidity resulting from fines mobilized by fall/winter freshets would not be meaningfully measured, detected or evaluated, and therefore would have an insignificant negative effect to the indicator.

CM 29d serves to limit the magnitude of turbidity: "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."

Percent fines in or on spawning gravel. We could not find literature specifically evaluating the magnitude of increases in fines in natural gravel spawning areas as a result of suction dredge mining. There are multiple sources documenting increases in the deposition rates of sediments on the streambed downstream from suction dredge operations.

For example, Stern (1988) measured sediment deposition rates downstream from four 4 to 6 inch diameter suction dredges in Canyon Creek, Trinity County, California. Number 10 cans filled with clean rounded gravels were buried flush with the streambed surface along transects below four dredge sites and at upstream controls. Cans were removed from the streambed 2 to 10 days later, after a period of active suction dredge mining. Deposited sediment <2 mm in diameter was removed from the gravel matrix, dried, sieved, and weighed. Sediment deposited per dredge day (g/m2/day) was calculated. A dredge day was defined as 2.5 hours of dredging.

The rate of deposition at transects from 4 to 10 meters (13 to 33 feet) downstream from operations ranged from 1,859 to 42,366 grams/m2/day compared to background rates ranging from 7 to 105 g/m2/day. For sites 1 and 2, deposition rates at 72 meters (236 feet) downstream were 62 and 117 g/m2/day, respectively, compared to background rates of 7 and 46 g/m2/day (0.2 and 1.4 ounces/yd2 /day). The deposition rates at 72 meters (236 feet) downstream were considerably diminished from the maximum deposition rates of 1,859 g/m2/day (54.8 ounces/yd2 /day) at the 10 meter (33 feet) transect for Site 1 and 3,858 g/m2/day (113.8 ounces/yd2 /day)at the 22 meter (72 feet) transect for Site 2. The farthest downstream transect at which deposition rates for sites 3 and 4 were measured was 25 meters (82 feet). At that distance, deposition rates were 1,207 and 285 g/m2/day (35.6 and 8.4 ounces/yd2 /day). None of the deposition rates at the farthest transect downstream (72 or 25 meters) (236 feet or 82 feet) were at background levels.

Stern (1988) also evaluated substrate embeddedness at a control and for varying distances downstream from suction dredging sites 3 and 4. Stern found that substrate embeddedness increased significantly ($p \leq .05$) at all six transects for site 3 (4 to 49 meter distances downstream from dredge) (13 feet to 161 feet) and for transects 3 to 6 for site 4 (16 to 49 meters downstream from dredge) (52 feet to 161 feet).

Sediment in the 0.85 mm size class could be characterized as sand. Harvey et al. (1982) as cited in ODFW (2009), observed that sand was observable in the substrate to 60 meters [197 feet] downstream from a suction dredging area, where no sand was observed prior to the operation.

The CM 26a would reduce the magnitude of fine sediment deposition in natural spawning gravels. The CM 26a directs NOI operators 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). This would reduce fine sedimentation, but would not eliminate it as indicated by deposition rates for fine sediments exceeding background levels as far downstream as 72 meters [236 feet] during active suction dredge mining activities, cited above.

CM 29d serves to limit the magnitude of fine sediment deposition in sediment in natural spawning gravels because it limits areas/distances of increased turbidity: “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.”

Fine sediments disturbed by high banking operations will be mobilized by stream flows that occur later in time that are large enough to overflow the gravel bar. Fines from high banking operations will enter the water column and as bedload. Because CM 34 requires that all excavations be back-filled and tailings spread prior to the end of the in-water work window, and CM 35 requires any remaining tailings to be spread out to no more than 4-inches in depth and conform to the contour of the natural stream channel, sources of fine sediment that could be mobilized at higher flows would be reduced. Fines from high banking operations will combine with fines already in the water column and bedload from upstream sources. The amount of fine sediment remobilized as a result of the *mining* PE would be a very small component of the entire fine sediment load in the water column and as bedload at that time. It would not be meaningfully measured, detected or evaluated, and therefore would have an insignificant negative effect to the indicator.

Distribution. Water quality pathway: suspended sediment: intergravel DO/turbidity indicator; PE 1: *mining*

Turbidity. Increases in turbidity will occur downstream from each operating dredge. The literature citations in the “Magnitude” section above indicate that turbidity generally returned to background levels 50 to 160 meters (164.0 feet to 524.9 feet) downstream from dredge operations, but as short as 11 meters. CM 29d limits turbidity plumes to 300 feet (91.4 m). CDFG (2009) notes that the extent of turbidity plumes is dependent upon particle sizes in the vacuumed streambed; higher proportions of fine materials will generate a longer plume.

Turbidity plumes from more than one operating suction dredge will not overlap. CM 27 requires a minimum spacing of at least 500 linear feet between suction dredging operations.

Percent fines in or on spawning gravel. Increases in percent fines will occur on the streambed located downstream from each suction dredge site. Because CM 29d limits turbidity plumes (and thereby limits fine sediment deposition on the streambed), natural spawning gravels beyond 300 feet downstream from a dredge operation will not be at risk of an increase in fine sediment. Fine sediment deposition will stop at the downstream end of the turbidity plume.

Frequency. Water quality pathway: suspended sediment: intergravel DO/turbidity indicator; PE 1: *mining*

Turbidity. Turbidity events occur each time a suction dredge is operated. It is not known how many times in a day an operator will turn a dredge on and off.

Percent fines in or on spawning gravel. Because fines are deposited downstream from operating suction dredges, the frequency is the same as for turbidity events.

Duration. Water quality pathway: suspended sediment: intergravel DO/turbidity indicator; PE 1: *mining*

Turbidity. Turbidity events are short-term. Suction dredges may operate from minutes to hours at one time. The total daily operating time has been calculated or estimated at between 2 to 5.6 hours per day (Hassler et al. 1986; CDFG 1994; Harvey and Lisle 1998; USFS 2013). Dredges may only operate between 9 a.m. and 5 p.m. (CM 19) (a maximum of 8 hours). Turbidity events may occur any time during the in-water work window.

Percent fines in or on spawning gravel. The duration of events that result in potential deposition of fines in downstream natural spawning gravels is the same as for turbidity. The persistence of fines introduced to natural spawning gravel from dredging operations will vary. Some of this material would be reintroduced into the water column and as bedload as freshets occur in the fall/winter, and would be entirely remobilized and dispersed downstream during a bankfull flow event. Harvey et al. (1982) as cited in ODFW (2009) stated that sand observed up to 60 meters downstream from a dredging operation had been completely flushed away from the cobble substrate one year later. Female Coho Salmon would move some of these fines out of spawning gravels during construction of redds.

Timing. Water quality pathway: suspended sediment: intergravel DO/turbidity indicator; PE 1: *mining*

Turbidity. Spawning adult Coho Salmon will not be exposed to turbidity events created by operating suction dredges. The timing of spawning for SONCC and OC Coho Salmon is outside the in-water work windows.

Rearing and out-migrating juvenile Coho Salmon may be present when suction dredges create turbidity events. The overlap of the in-water work window and out-migration only occurs in the Illinois River waterway from June 15 to June 30 and in the Rogue River tributaries above Mariel waterway from June 15 to July 15. In both cases, it is at the tail of the out-migration time period and would affect a small percentage of all out-migrating Coho Salmon, and none at all in most years.

As described in detail in Section D, the adult migration life cycle stage overlaps with the in-water work windows for three waterways for 15 days and one waterway for 45 days.

Percent fines in or on spawning gravel. Fines generated by dredge mining may be present within spawning gravel during the time period that includes spawning, incubation and emergence.

Nature. Water quality pathway: suspended sediment: intergravel DO/turbidity indicator; PE 1: *mining*

Turbidity. The nature of the effect is periodic, short-term increases in turbidity that may negatively impact the growth and health of individual rearing juveniles, out-migrating juveniles or upstream migrating adult Coho Salmon, but is not likely to result in mortality. A short-term measurable positive effect would be a reduced risk of predation by the use of turbidity plumes as cover by juvenile salmon (Bisson and Bilby 1982).

Percent fines in or on spawning gravel. The nature of the effect is an increase in fine sediment in spawning gravel that may negatively impact incubating embryos, alevin, and swim-up fry.

ELEMENT SUMMARY – Water quality pathway: suspended sediment: intergravel DO/turbidity indicator; PE 1: *mining*

There would be an overall **negative (-) effect** to the **suspended sediment: intergravel DO/turbidity** indicator from the *mining* PE. The two components of the indicator, **turbidity** and **percent fines in or on spawning gravel**, will both be negatively affected by the *mining* PE.

Turbidity plumes would occur when suction dredges are operating. Other increases in turbidity would occur when dredge tailings are moved to fill dredge holes, and when fall/winter flows are sufficiently large to remobilize fine sediments deposited downstream from dredge operations, or fine sediments from gravel bars where high banking took place. The latter two sources of suspended fine sediment that will occur later in time than when suction dredges are operating will result in insignificant effects to turbidity.

It is probable that fine sediment will settle in or on natural spawning gravel if any gravel is present within 300 feet downstream from an individual suction dredge operation, as this is the maximum distance allowed for a turbidity plume. However, it would be redistributed during high flows occurring later in time. Spawning Coho Salmon would also remove some of the deposited fine sediment during the construction of redds.

PE 2: *onsite occupancy*

Proximity. Water quality pathway: suspended sediment: intergravel DO/turbidity indicator; PE 2: *onsite occupancy*

Miners will occupy sites adjacent to their operations. The potentially affected stream reaches are in or within one-quarter mile of occupied habitat for ESA-listed SONCC and OC Coho Salmon or their respective designated CH.

Probability. Water quality pathway: suspended sediment: intergravel DO/turbidity indicator; PE 2: *onsite occupancy*

Turbidity. Potential sources of fine sediment from the *onsite occupancy* PE would be from erosion at the occupied area. Any fine sediment resulting from erosion caused by this PE must have a delivery mechanism to the stream channel to affect turbidity.

Vegetation provides roots that bind soil, intercepts raindrops to minimize impact erosion, and dead vegetation (duff) covers the ground surface. These features serve to minimize soil erosion and delivery of eroded fine sediment to a stream channel. The proposed action includes CM to protect vegetation and minimize erosion. CM 44 prohibits the removal of woody material for firewood or other purposes within 150 feet of the stream. This applies to live or dead woody vegetation. CM 47 restricts motorized access to existing roads and trails, so no vegetation would be removed to create new motorized access. The intent of CM 48 is to use existing/established dispersed campsites and paths, while locating any new camp areas and paths away from the stream and streambanks. The outcome of these three CM will effectively limit erosion of fine sediments to that generated by use of existing non-paved roads, trails, campsites and paths.

Some of the fine sediment generated by use of these areas will remain on site or be captured by existing vegetation and duff before it can reach a stream channel. A sub-set of lengths/areas of non-paved roads, trails, campsites and paths used for the *onsite occupancy* PE drain to stream-channels. Some will drain to low order tributary streams that are not designated CH while others may drain directly to streams with designated CH. It is likely that some fine sediment generated by the *onsite occupancy* PE will enter stream channels with Coho Salmon designated CH and become mobilized in the water column as suspended sediment.

Percent fines in or on spawning gravel. Fine sediment delivery to spawning gravels from the *onsite occupancy* PE is dependent upon the same delivery mechanism as turbidity (described above). Some fine sediment may reach Coho Salmon spawning gravel.

Magnitude. Water quality pathway: suspended sediment: **intergravel DO/turbidity** indicator; PE 2: *onsite occupancy*

Turbidity. The amount of fine sediment reaching stream channels will be small and would be delivered later in time, during rainfall events. At that time the water column already is becoming turbid from all sources of fine sediments upstream. The amount of fine sediment generated by the *onsite occupancy* PE would be a very small component of the entire fine sediment load in the water column at that time. It would not be meaningfully measured, detected or evaluated, and therefore would have an insignificant negative effect to the indicator.

Percent fines in or on spawning gravel. Any fine sediment generated by the *onsite occupancy* PE entering the stream channel will become bedload at flows with sufficient stream power. Sediment particles will be dispersed and distributed downstream. The amount that may settle on spawning gravels is expected to be nominal compared to that from background sources. It would not be meaningfully measured, detected or evaluated, and therefore would have an insignificant negative effect to the indicator.

ELEMENT SUMMARY – Water quality pathway: suspended sediment: intergravel DO/turbidity indicator; PE 2: *onsite occupancy*

There would be an insignificant negative (-) effect to the suspended sediment: intergravel DO/turbidity indicator from the *onsite occupancy* PE. Effects to turbidity and to percent fines in spawning gravel would occur later in time as a result of sediment delivery during rainfall events. The amounts would be nominal compared to background levels of suspended sediment and fines settling in spawning gravel, and could not be meaningfully measured, detected or evaluated.

INDICATOR SUMMARY

Overall, there would be a measurable, short-term **negative (-) effect** to the **suspended sediment: intergravel DO/turbidity** indicator as a result of the proposed action. A measurable negative impact to the indicator will result from implementing the *mining* PE. Episodic increases in turbidity will occur whenever suction dredges are operating. Increases are likely to have a peak magnitude between 15 to 50 NTU nearest the dredge operation, are limited by CM 29 to a plume no greater than 300 feet downstream, plumes cannot span the entire wetted perimeter of the stream, may have a duration from minutes to hours but will occur on average not more than 5.6 hours/day, and can only be operated for a maximum of 8 hours per day, between 9 a.m. and 5 p.m. (CM 19).

Turbidity events caused by suction dredges will occur during the juvenile rearing, juvenile downstream migration, and adult migration life cycle stages of Coho Salmon. Effects to habitat utilized by downstream migrants would occur at the tail of the out-migration period in two waterways. The possibility of SONCC or OC Coho Salmon adults being present during the latter part of the in-water period is rare since fall freshets generally occur in October and draw adults upstream in southwest Oregon (Lestelle 2007). Therefore, migration into ESA action area streams may not occur during the period of active operations in most years.

The nature of the effect is that periodic, short-term increases in turbidity may negatively impact the growth and health of individual rearing juveniles, juvenile downstream migrants, or adult migrating Coho Salmon, but are not likely to result in mortality.

Increases in turbidity would also occur later in time as a result of the *mining* PE. These occur when: 1) dredge tailing piles are moved to fill dredge holes; 2) fall/winter freshets mobilize fine sediments that settled on the substrate downstream from the dredge operation; and, 3) fall/winter freshets overtop gravel bars subject to high banking operations and mobilize fine sediments that were disturbed.

The turbidity beyond background levels caused by moving dredge piles would be detectable, but far less than that during active suction dredging because most of the fines small enough to be suspended in the water column will have been carried downstream earlier during the dredging operation. The remobilization of previously disturbed fine sediment would occur when the water column already is becoming turbid from all sources of fine sediments upstream. The amount of fine sediment remobilized as a result of the *mining* PE would be a very small component of the entire fine sediment load in the water column at that time compared to background levels, and would have insignificant effects to the indicator.

The effect to turbidity by the *onsite occupancy* PE was determined to be insignificant. The amount of fine sediment reaching stream channels will be small and would be delivered later in time, during fall/winter freshets. At that time the water column already is becoming turbid from all sources of fine sediments upstream. The amount of fine sediment generated by the *onsite occupancy* PE would be a very small component of the entire fine sediment load in the water column at that time compared to background levels, and could not be meaningfully measured, detected or evaluated.

There will be a measurable negative short-term effect to percent fines in or on spawning gravel as a result of suction dredge operations that are a component of the *mining* PE. This will occur when spawning gravels are located in areas subject to turbidity plumes. Because CM 29d limits turbidity plumes (and thereby limits fine sediment deposition on the streambed), natural spawning gravels beyond 300 feet downstream from a dredge operation will not be at risk of an increase in fine sediment.

The persistence of fines introduced to natural spawning gravel from dredging operations will vary. Some fines would be reintroduced into the water column and as bedload as freshets occur in the fall/winter, and would be entirely remobilized and dispersed downstream during a bankfull flow event. Given the variability of the timing of flows sufficient to move fines from coarser substrate, fines generated by dredge mining may be present within spawning gravel during the time period that includes spawning, incubation and emergence. Female Coho Salmon would move some of these fines out of spawning gravels during construction of redds.

Fine sediments disturbed by high banking operations will be mobilized by stream flows that occur later in time that are large enough to overflow the gravel bar. Fines from high banking operations will enter the water column and as bedload. Because CM 34 requires that all excavations be back-filled and tailings spread prior to the end of the in-water work window, and CM 35 requires any remaining tailings to be spread out to no more than 4-inches in depth and conform to the contour of the natural stream channel, sources of fine sediment that could be mobilized at higher flows would be reduced. Fines from high banking operations, and fines deposited on the streambed from turbidity plumes during suction dredging, will combine with fines already in the water column and bedload from upstream sources. The amount of fine sediment remobilized as a result of the *mining* PE would be a very small component of the entire fine sediment load in the water column and as bedload at that time. The amount that may settle on spawning gravels at that time is expected to be nominal compared to background levels. It would not be meaningfully measured, detected or evaluated, and therefore would have an insignificant negative effect to the indicator.

The effect to percent fines in or on spawning gravel by the *onsite occupancy* PE was determined to be insignificant. Fines generated by the *onsite occupancy* PE entering the stream channel will become bedload at flows with sufficient stream power. Sediment particles will be dispersed and distributed downstream. The amount that may settle on spawning gravels at that time is expected to be nominal compared to background levels. It could not be meaningfully measured, detected or evaluated.

EFFECTS TO SPAWNING, REARING AND MIGRATORY HABITAT as a result of increases in turbidity and percent fines in or on spawning gravels caused by PE 1 *mining* and PE 2 *onsite occupancy*

Spawning. Spawning habitat would be negatively affected by an increase in fines in or on spawning gravels as a result of dredge operations. Fine sediment would settle from the turbidity plume onto the streambed, and has the potential to impact natural spawning gravel for a distance up to 300 feet downstream from the dredge site (the maximum distance allowed for a turbidity plume under CM 29a). The effect would last until a flow sufficient to mobilize fine sediments out of spawning gravels took place. Harvey et al. (1982) noted that the sand deposited up to 60 meters downstream from a dredge operation had been completely flushed away from the cobble substrate one year later. The negative effect would be somewhat mitigated by removal of fine sediments during the redd creation process by spawning female Coho Salmon.

Turbidity events that may occur during the spawning period involve remobilization of deposited fine sediments that settled out downstream from dredge operations, from the surface of gravel bars subject to high banking, and from erosion by the use of native surface roads, trails, campsites and paths. The effects to turbidity from these sources were determined to be insignificant, and therefore any potential deposition of fines from these events on spawning gravels is also insignificant.

Rearing. Rearing habitat for juvenile Coho Salmon would be negatively affected by turbidity episodes. Habitat for incubating embryos, alevin and emergent fry would be negatively impacted by an increase in percent fines in spawning gravels.

Migration. As described in detail in Section D, the adult migration life cycle stage overlaps with the in-water work windows for three waterways for 15 days and one waterway for 45 days. Turbidity events from the proposed action would affect migratory habitat used by adult Coho Salmon, if they are present.

Smolt out-migration takes place within the in-water work windows for two waterways. This would only occur in the Illinois River waterway from June 15 to June 30 and in the Rogue River tributaries above Mariel waterway from June 15 to July 15. In both cases, it is at the tail of the out-migration time period and would affect a small percentage of all out-migrating Coho Salmon. The extent to which episodic turbidity events during daylight hours affect habitat used for Coho smolt out-migration is not known.

MPI #1c. Water quality pathway: chemical contamination/nutrients indicator

PE 1: *mining*

Proximity. Water quality pathway: chemical contamination/nutrients indicator; PE 1: *mining*

The *mining* PE includes suction dredging and high banking. Dredging occurs within the wetted perimeter of stream channels and high banking is done on exposed gravel bars between the wetted stream and streambank. The potentially affected stream reaches are in or within one-quarter mile of occupied habitat for ESA-listed SONCC and OC Coho Salmon or their respective designated CH.

Probability. Water quality pathway: chemical contamination/nutrients indicator; PE 1: mining

Mercury and trace metals. The use of mercury, cyanide or other chemical agents is not part of the proposed action. CM 12 prohibits use of chemical agents, such as mercury, to improve mineral processing or metal extraction.

It is probable that mercury and other trace metals such as copper, zinc and lead will be mobilized from deep streambed sediment by suction dredging and high banking. Mercury was used in historic gold mining operations to concentrate fine gold particles. Mercury entering stream channels during historic mining periods now resides in sediment that is typically too deep to scour during winter flows, but could be reached by suction dredging and high banking. Other trace metals may also be found in deep sediments, and would also be remobilized by implementing the *mining* PE.

Petroleum products. Petroleum products may enter the water column. Gasoline engines mounted on the dredge power suction dredges. Refueling, lubrication and oil changes take place. Spills or leaks may occur during refueling, operations, or maintenance.

However, CM lower the probability of petroleum products entering stream channels or near-stream areas. CM 11 requires that all fuels, lubricants, petroleum products and hazardous chemicals be stored a minimum of 100 feet from ordinary high water in impermeable container and spill proof containers. CM 11 also provides that if storage occurs within 100 feet, then a containment system must to be used that will accommodate the full volume of all materials without overtopping or leaking.

CM 24 states that discharging oil, grease and fuel is prohibited. Equipment will not release petroleum products, equipment surfaces will be free of oils and grease, and will be checked for fuel and oil leaks, and all leaks repaired, prior to the start of operations on a daily basis.

CM 24 addresses refueling. Suction dredges will be located adjacent to the streambank for fueling, so that fuel need not be carried out into the stream. 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.

CM 24 also protects against the effects of leaks or spills when refueling. 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. A spill kit will be available in case of accidental spills. 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.

Nutrients. The NMFS (1996) criterion for this indicator uses the descriptor “excess nutrients.” This is interpreted here to mean substances containing phosphate, nitrogen, or potassium, such as fertilizers, soap or detergent. There is no probability that the *mining* PE will introduce such materials into the stream channel.

Magnitude. Water quality pathway: chemical contamination/nutrients indicator; PE 1: mining

Mercury and trace metals. Some of the mercury would be captured in the sluice during suction dredging operations and may be removed and saved by the operator. Remaining mercury would enter the water column and/or settle on substrate downstream from the suction dredge operation. Mercury would be moved from deep sediments to the surface during high banking operations. However, any mercury disturbed during this time would not enter the water column or submerged surface substrate until after fall/winter flows overtop the gravel bar. Mechanisms for mobilization of other trace metals by suction dredging and high banking are the same as for mercury.

CDFG (2011) did a worst-case analysis to evaluate the magnitude of mercury release from suction dredging. They used two sites (named Pit #1 and Pit #2:BC) within the South Yuba River. Both are contaminated by historic gold-mining mercury. Pit #2:BC had among the highest levels of mercury measured in California. The total mercury (THg) discharge rate from a 4 inch suction dredge was estimated at 0.08 mg/hr. at Pit #1 and 296 mg/hr. at Pit #2. It is not known whether these rates would approximate the range for suction dredges operating in the RRS.

CDFG (2011) also estimated the amount of total recoverable mercury in discharge water from suction dredges. They used data on total suspended solids in suction dredge discharge and sediment mercury levels to estimate total recoverable mercury in the discharge. They used 340 mg/l as the worst case for total suspended solids in sediment discharge by suction dredging from Thomas (1985). Based upon THg sediment concentrations measured in Pit #2:BC sediments, they estimated a total recoverable mercury concentration of 3.77 micrograms/l. For Pit #1 the total recoverable mercury concentration was calculated at 0.0938 micrograms/l. Again, it is not known whether these concentrations would approximate the range for suction dredges operating in the RRS.

Only a few studies have been identified regarding mobilization and transport of other metals by suction dredging (CDFG 2011). One study identified a maximum copper concentration of 9.3 micrograms/l in suction dredge effluent on the Similkemeen River in in Washington (Johnson and Peterschmidt 2005). In the Fortymile River of Alaska, maximum concentration of copper was 20 micrograms/l and the maximum zinc concentration was 43 micrograms/l (Prussian et al. 1999). In both studies, concentrations returned to background levels a short distance from the dredging site.

High banking does not release mercury or other trace metals into the stream at the time of the operation because the water used in the operation does not enter the stream channel. However, mercury and other metals may be present in disturbed areas on the surface of the gravel bar, and would enter the water column and as bedload later in time when flows overtop the gravel bar. Note that CM 34 requires all high banking holes be backfilled prior to the end of the in-water work window. The magnitude of mercury and other metals released into the stream channel by high banking would therefore be considerably less than that described for suction dredge operations, above. However, there are no estimates available from the literature.

Petroleum products. The conservation measures described above that minimize the probability of petroleum products entering the water column and riparian areas also serve to limit the magnitude of effects to the indicator by the *mining* PE. It is extremely unlikely that a gasoline spill would include all 2 gallons allowed for refueling at one time. The magnitude of any spill is not likely to exceed several ounces. The CM and dilution by stream flows would reduce the magnitude of effects.

Distribution. Water quality pathway: chemical contamination/nutrients indicator; PE 1: mining

Mercury and trace metals. Mercury and other trace metals would be remobilized downstream from each operating dredge. Elemental mercury is dense and some of it will settle quickly onto the streambed. However, fine particles may enter the water column and drift downstream in the plume. Initially, the distribution would be limited to the dredge tailings pile and the extent of the plume. However, freshets occurring later in time would further disperse and distribute the remobilized mercury and trace metals downstream.

Mercury and other trace metals disturbed by high banking would be distributed downstream from each site by freshets occurring later in time.

Petroleum products. Spilled fuel would mix with stream flow and be dispersed downstream.

Frequency. Water quality pathway: chemical contamination/nutrients indicator; PE 1: mining

Mercury and trace metals. Mercury and other trace metals may be remobilized from deep sediment into the stream channel and water column each time a suction dredge is operated. It is not known how many times in a day an operator will turn a dredge on and off. Remobilization from high banking operations would occur later in time, when stream flows overtop gravel bars.

Petroleum products. A spill could occur each time a suction dredge engine is refueled.

Duration. Water quality pathway: chemical contamination/nutrients indicator; PE 1: mining

Mercury and trace metals. Remobilization events are short-term. Suction dredges may operate from minutes to hours at one time. The total number of hours of use per day has been calculated or estimated at between 2 and 5.6 hours per day (Hassler et al. 1986; CDFG 1997; Harvey and Lisle 1998; USFS 2013). Dredges may only operate from 9 a.m. to 5 p.m. (CM 19). Remobilization events from suction dredging may occur any time during the in-water work window. The duration of remobilization from material disturbed by high banking would depend on the shear stress of stream flows occurring later in time.

Remobilized mercury has several fates. Some elemental mercury will persist in the streambed. Mercury may also oxidize and then be converted to methyl mercury, which is the predominant form that bioaccumulates in fish (Bloom 1992).

Petroleum products. The effects to the indicator would last until evaporation of the fuel and dilution by stream flow results in a no-effect level.

Timing. Water quality pathway: chemical contamination/nutrients indicator; PE 1: *mining*

Mercury and trace metals. Since mercury persists in the environment, all life stages of Coho Salmon present in the ESA action area will be exposed to the remobilized mercury.

Petroleum products. Rearing Coho Salmon would have the greatest exposure to the potential effects, as they are present throughout the in-water work window. Out-migrating juvenile Coho Salmon may be present when suction dredges are operating. The overlap of the in-water work window and out-migration only occurs in the Illinois River waterway from June 15 to June 30 and in the Rogue River tributaries above Mariel waterway from June 15 to July 15. In both cases, it is at the tail of the out-migration time period and would affect a small percentage of all out-migrating Coho Salmon, and none at all in most years.

As described in detail in Section D, the adult migration life cycle stage overlaps with the in-water work windows for three waterways for 15 days and one waterway for 45 days. The possibility of SONCC or OC Coho Salmon adults being present during the latter part of the in-water period is rare since fall freshets generally occur in October and draw adults upstream in southwest Oregon (Lestelle 2007). Therefore, migration into ESA action area streams may not occur during the period of active operations in most years.

Nature. Water quality pathway: chemical contamination/nutrients indicator; PE 1: *mining*

Mercury and trace metals. The nature of the effects caused by remobilized mercury and trace metals is a negative impact to the food chain and health of Coho Salmon. Rearing juvenile Coho Salmon will have the greatest exposure, as they are present when the mercury and trace metals are initially mobilized by suction dredging. In addition, juvenile Coho Salmon may bioaccumulate methyl mercury as a result of eating macroinvertebrates that have methyl mercury within them.

Petroleum products. There would be a negative impact to the health of aquatic insects used as forage and to individual Coho Salmon.

ELEMENT SUMMARY – Water quality pathway: chemical contamination/nutrients indicator; PE 1: *mining*

There would be an overall *negative (-) effect* to the **chemical contamination/nutrients** indicator from the *mining* PE. The negative effects are to **chemical contamination**. There is no probability that the *mining* PE would introduce excess nutrients (defined as substances containing phosphates, nitrogen or potassium, such as fertilizers, soap or detergent).

Chemical contamination may occur from petroleum products, and the remobilization of mercury and other trace metals from deep sediments. The negative effect to the indicator from potential introduction of petroleum products into the water column or riparian areas is expected to be small in magnitude. This is because the combined effect of multiple conservation measures will make large spills of fuel extremely unlikely to occur, and the requirement to use a spill kit would remove some of the contaminant.

Because mercury was used in historic gold mining activities throughout the ESA action area, it is presumed to be present in deep streambed sediments that would be disturbed during suction dredging and high banking operations. The amount of mercury that may be remobilized is not known, although a study in California did a worst case analysis of two sites in the Yuba River and determined that the total mercury discharge rate was 0.08 mg/hr. at one site and 296 mg/hr. at another site for a 4 inch suction dredge. Remobilization of mercury and other trace metals into the water column and the streambed would occur whenever a suction dredge is in operation. For high banking it would occur later in time during fall/winter freshets that overtop the gravel bar.

Initially, the remobilized mercury and trace metals would settle out in the dredge pile and on the streambed under the turbidity plume whenever the suction dredge is operating. Fall/winter freshets would disperse the metals downstream. These metals are persistent in the environment. Mercury may oxidize and then be converted to methyl mercury, which is the predominant form that bioaccumulates in fish (Bloom 1992). All freshwater life cycle stages of Coho Salmon would be exposed to the effect. The nature of the effects caused by remobilized mercury and trace metals is a negative impact to the food chain and health of Coho Salmon.

PE 2: *onsite occupancy*

Proximity. Water quality pathway: chemical contamination/nutrients indicator; PE 2: *onsite occupancy*

Miners will occupy sites adjacent to their operations. The potentially affected stream reaches are in or within one-quarter mile of occupied habitat for ESA-listed SONCC and OC Coho Salmon or their respective designated CH.

Probability. Water quality pathway: chemical contamination/nutrients indicator; PE 2: *onsite occupancy*

The most likely contaminants (that are chemical or nutrients in nature) that could enter water bodies from waste discharge associated with encampments include: decomposable organic matter, inorganic chemicals (e.g., salts, nitrogen, and phosphorus), or pathogens (CDFG 2011). CDFG (2011) also concluded that accidental spills at encampments might include oils, solvents, or other household products that may contain trace metals (e.g., copper, zinc) or synthetic organic compounds.

The probability of chemical contamination or introducing excess nutrients to Coho Salmon habitat is dependent upon several variables that include, but are not limited to: duration of camping at the site; distance of the encampment from streams; number of people camping (more = potentially more pollutants); amount of vegetation and duff between the encampment and streams (filtering effect); whether the campsite is developed and has a toilet facility or is undeveloped; and, whether the occupants are using an RV or camper.

The proposed action includes three CM that will reduce the probability that chemical contamination may occur or excess nutrients are added to Coho Salmon habitat as a result of camping. CM 45 directs that human waste must be kept greater than 200 feet from any live water. All refuse, trash, litter or other items must be removed from the site and properly disposed. CM 46 directs that camp sites and any related material must be cleared within 7 days of the end of the suction dredging and/or high banking operation. CM 48 directs new camping areas to be located away from the stream and streambanks. However, these three CM do not reduce the probability to a level that it is extremely unlikely to occur.

Magnitude. Water quality pathway: chemical contamination/nutrients indicator; PE 2: *onsite occupancy*

The magnitude of chemical contamination or introduction of excess nutrients to Coho Salmon habitat as a result of the onsite occupancy PE is likely to be very small. CDFG (2011) states that based upon the limited amount of information that is available, suction dredging encampments are not expected to cause substantial discharges of wastes or contaminants. Reasons provided for this conclusion are that encampment sites are dispersed, in rural areas, and camping is conducted on a seasonal and temporary basis. We conclude that the magnitude of chemical contamination or introduction of excess nutrients to Coho Salmon habitat as a result of the onsite occupancy PE would not be meaningfully measured, detected or evaluated. Therefore, the effect to the indicator is insignificant.

ELEMENT SUMMARY – Water quality pathway: chemical contamination/nutrients indicator; PE 2: *onsite occupancy*

There would be an **insignificant negative (-) effect** to the **chemical contamination/nutrients** indicator from the *onsite occupancy* PE 2: *onsite occupancy* is not expected to cause substantial discharges of wastes or chemical/nutrient contaminants. The effect to the indicator would not be meaningfully measured, detected or evaluated. Therefore, the effect to the indicator is insignificant.

INDICATOR SUMMARY

Overall, there would be a **measurable negative (-) effect** to the **chemical contamination/nutrients** indicator as a result of the proposed action. The largest impact to the indicator is a result of chemical contamination from implementing the *mining* PE. Mercury and other trace metals would be remobilized from deep sediment when suction dredges are operating. Coarse particles (particularly mercury) would settle out initially on dredge tailing piles. Smaller particles would be suspended in the water column, and settle out on substrate beneath the turbidity plume. Subsequent fall/winter freshets would further distribute and disperse mercury and other trace metals downstream that were initially remobilized by suction dredging, and also that remobilized from high banking sites. Some mercury may oxidize and then become methyl mercury, a form that bioaccumulates.

All freshwater life cycle stages of Coho Salmon would be exposed to the negative effect to the indicator. The nature of the effects caused by remobilized mercury and trace metals is a negative impact to the food chain and health of Coho Salmon.

The effect to the indicator from potential introduction of petroleum products into the water column or riparian areas from the *mining* PE is expected to be small in magnitude. It is extremely unlikely that a gasoline spill would include all 2 gallons allowed for refueling at one time. The magnitude of any spill is probably not likely to exceed several ounces. CM 24a to 24h, and dilution by stream flows would reduce the magnitude of effects.

There is no probability that the *mining* PE would introduce excess nutrients (defined as substances containing phosphorus and nitrogen, such as fertilizers, soap or detergent).

The *onsite occupancy* PE is not expected to cause substantial discharges of wastes or chemical/nutrient contaminants. The magnitude of chemical contamination or introduction of excess nutrients to Coho Salmon habitat as a result of the *onsite occupancy* PE would not be meaningfully measured, detected or evaluated. Therefore, the effect to the indicator is insignificant.

EFFECTS TO SPAWNING, REARING AND MIGRATORY HABITAT as a result of increased chemical contamination or excess nutrients caused by the *mining* and onsite *occupancy PEs*

The analysis above determined that there is no mechanism for the *mining* PE to introduce "excess nutrients" into the environment, and it was concluded that the *onsite occupancy* PE would not result in effects to the "excess nutrients" component of the indicator that could be meaningfully measured, detected or evaluated. Therefore, its effects to life cycle stages will not be discussed in this section.

Spawning. An increase in mercury or other trace metals in spawning gravels may negatively affect spawning habitat. Dilution and dispersal of these contaminants would take place during fall/winter freshets. This, combined with the removal of fine materials by the construction of redds, would substantially reduce effects to spawning habitat. There would be no effect to spawning habitat from fuel spills, as spawning does not occur during the in-water work windows.

Rearing. Increased levels of mercury or trace metals would negatively affect rearing habitat for juvenile Coho Salmon. Effects would be greatest when dredges are operated and would be reduced when fall/winter freshets disperse and dilute the contaminants. Habitat for incubating embryos, alevin and emergent fry would be negatively impacted by an increase in metal contaminants, particularly mercury, in substrate. Rearing habitat would be negatively impacted by fuel spills.

Migration. There would be levels of mercury and other trace metals above background in habitat used by smolts during their out-migration. Whether or not this would reduce the utility of that habitat for out-migration is not known. The overlap of the in-water work window and out-migration only occurs in the Illinois River waterway from June 15 to June 30 and in the Rogue River tributaries above Mariel waterway from June 15 to July 15. In both cases, it is at the tail of the out-migration time period and would affect a small percentage of all out-migrating Coho Salmon, and none at all in most years.

As described in detail in Section D, the adult migration life cycle stage overlaps with the in-water work windows for three waterways for 15 days and one waterway for 45 days. The possibility of SONCC or OC Coho Salmon adults being present during the latter part of the in-water period is rare since fall freshets generally occur in October and draw adults upstream in southwest Oregon (Lestelle 2007). Therefore, migration into ESA action area streams may not occur during the period of active operations in most years. Dilution and dispersal of these contaminants would take place during freshets. It is not known to what degree mercury and other trace metals would reduce the utility of habitat for upstream adult migration.

Fuel spills may occur at any time within the in-water work windows. It would negatively impact migration habitat for smolts and adults.

MPI # 3a. Habitat elements pathway: substrate character and embeddedness indicator

Descriptors for the substrate character and embeddedness indicator focus on dominant particle sizes being gravel or cobble with interstitial spaces clear, or degree of embeddedness. Negative impacts to the indicator would be characterized as fining of the streambed (dominant substrate reduced in size towards sand, silt or small gravel) or increased embeddedness.

PE 1: *mining*

Proximity. Habitat elements pathway, substrate character and embeddedness indicator; PE 1: *mining*

The *mining* PE includes suction dredging and high banking. Dredging occurs within the wetted perimeter of stream channels and high banking is done on exposed gravel bars between the wetted stream and streambank. The potentially affected stream reaches are in or within one-quarter mile of occupied habitat for ESA-listed SONCC and OC Coho Salmon or their respective designated CH.

Probability. Habitat elements pathway, substrate character and embeddedness indicator; PE 1: *mining*

It is certain that the *mining* PE would affect substrate composition and embeddedness. Suction dredging removes substrate from streambeds and redistributes it into tailing piles. Fine particles settle on substrate downstream. High banking redistributes gravel bar materials with different timing. The redistribution into the wetted stream channel occurs later in time, during fall/winter freshets. Substrate composition and embeddedness at and downstream from the high banking site would be affected at that time.

Magnitude. Habitat elements pathway, substrate character and embeddedness indicator; PE 1: *mining*

Bed composition is changed at and downstream from suction dredge sites. Coarse particles with very little fines are found in the tailing pile and the particles that settle on substrate downstream gradually become smaller. This is a result of stream flow carrying away bed particles small enough to be suspended in the water column. Thus, substrate particles in the tailing pile are “cleaner” than the original substrate. At varying distances downstream, the streambed would have more fines than the original substrate.

The total amount of substrate that can be moved per NOI is 25 cubic yards (20.9 m2 (CM 17). The areal extent of the streambed involved can vary for this total amount. The typical depth of suction dredge holes in streams on the RRS is 3 feet (1 yard or 0.91 meter) (Kevin Johnson, pers. comm. 2014). If the dredge hole averages one yard in depth, then the surface area disturbed per NOI would be 25 square yards (20.9 m2). The total affected surface area would be greater than 25 square yards (20.9 m2) because it would include the surface areas of the suction dredge hole, the tailings pile, and the area where fines settle out downstream.

The mean surface area disturbed by suction dredges in Canyon Creek, Trinity County, California was calculated at 39 m2 (46.6 yd2) in 1984 (n=20) and 49 m2 (58.6 yd2) in 1985 (n=15) (Stern 1988). Mean surface area of dredge tailing piles was 22.3 m2 (26.7 yd2) in 1984 and 27.9 m2 (33.4 yd2) in 1985 (Stern 1988). Hassler et al. (1986) measured the surface area of disturbance at suction dredge sites downstream from those evaluated by Stern in Canyon Creek. The results for mean surface area were 48.5 m2 (58.0 yd2) per dredge in 1984 (n=24) and 59.7 m2 (71.4 yd2) in 1985 (n=18). Suction dredges in the studies were ≤6 inch intake nozzle diameter in contrast to the ≤4 inch allowed under the proposed action, and the miners were not limited to 25 cubic yards (20.9 m2) of substrate that could be moved.

Increased substrate embeddedness downstream from suction dredge operations has been observed and evaluated. Stern (1988) evaluated substrate embeddedness at a control and for distances downstream from suction dredging sites 3 and 4. Stern found that substrate embeddedness increased significantly ($p \leq .05$) at all six transects for site 3 (4 to 49 meter, or 13 to 161 feet distances downstream from dredge) and for transects 3 to 6 for site 4 (16 to 49 meters, or 53 to 161 feet distances downstream from dredge). Harvey et al. (1982) as cited in ODFW (2009), stated that sand was observable in the substrate to 60 meters (197 feet) downstream from a suction-dredging site, where no sand was observed prior to the operation.

Fine sediments disturbed by high banking operations will be mobilized by stream flows that occur later in time that are large enough to overflow the gravel bar. Because CM 34 requires that all excavations be back-filled and tailings spread prior to the end of the in-water work window, and CM 35 requires any remaining tailings to be spread out to no more than 4-inches in depth and conform to the contour of the natural stream channel, sources of fine sediment that could be mobilized as bedload at higher flows would be reduced. Fines from high banking operations will combine with fines already in the bedload from upstream sources. The amount of fine sediment remobilized as a result of the *mining* PE would be a very small component of the entire fine sediment bedload at that time. It would not be meaningfully measured, detected or evaluated, and therefore would have an insignificant negative effect to the indicator.

Distribution. Habitat elements pathway, substrate character and embeddedness indicator; PE 1: *mining*

The effects will occur at and downstream from each suction dredge site.

Frequency. Habitat elements pathway, substrate character and embeddedness indicator; PE 1: *mining*

The effects would occur each time the suction dredge is operated.

Duration. Habitat elements pathway, substrate character and embeddedness indicator; PE 1: *mining*

Effects on substrate composition and embeddedness would be short-term for suction dredging. Each dredge hole must be backfilled and tailings spread before moving to a new work site (CM 30a). At the last work site, backfilling and spreading of tailings must take place before the end of the in-water work window (September 15 or 30) (CM 30b). Fall/winter freshets would then redistribute the disturbed surface material.

Stern (1988), Thomas (1985) and Harvey et al. (1982) as cited by CDFG (2011) all reported that dredge holes and tailings were generally not visible the next year as a result of peak flows after the dredging season. There were a few exceptions for sites not near the thalweg and where cobbles and boulders had been piled.

Stern (1988) described that his study site in Canyon Creek, a tributary to the Trinity River in Northern California experienced a 23.7 cm (837 cfs) peak flow during the winter of 1984/1985 that resulted in 8.9 percent of areas disturbed by suction dredges still visible the next summer. The recurrence interval for the peak flow was estimated at 1.9 years and was characterized as a bankfull flow. The Canyon Creek watershed is 167.8 km2 (64.8 mi2) in area and his study reach in the lower 20 km (12.4 mi) averaged 2.3 percent channel slope. Stern describes the study area location as a narrow, mountainous and partially glaciated canyon.

Thomas (1985) describes the study stream, Gold Creek, in Missoula County, Montana as third-order. However, the author did not provide a peak flow estimate or channel dimensions/slope information. The streambed material from dredge tailings piles that was moved by peak flows was described as gravel. Boulders were moved out of the way for dredging purposes and piled at the two sites. One year later, it was difficult to see that any dredging had been done at one site, but the boulder pile at the other site was reduced in size by high spring flows, but still visible.

We could not locate the source document for Harvey et al. (1982) to determine if peak flow information was provided. CDFG (2011) stated that Harvey et al. (1982) monitored American River and Butte Creek dredge sites in California one year after suction dredge activities. They observed that scour holes and downstream sand deposits were no longer visible.

Of the ESA action area watersheds, 26 of 29 exceed the drainage area of Canyon Creek (65 mi2). Ten range between 68-100 mi2, 12 range between 100 -200 mi2, 1 is between 200-300 mi2 and 3 exceed 300 mi2. One of the three remaining watersheds is comparable in drainage area to Canyon Creek. It is the Lawson Creek-Illinois River watershed at 64 mi2. The two watersheds smaller in drainage area are Althouse Creek (47 mi2) and Stair Creek-Rogue River (57mi2). They are both third order or larger, and in that respect are comparable to the Gold Creek, Montana study stream described above. Watershed drainage areas and stream orders of ESA action area watersheds meet or exceed those of the study streams. This suggests that typical winter flows, and associated stream power, would be comparable or greater for ESA action area watersheds.

The CM for the proposed action require excavated holes be filled and tailings redistributed to original bed contours. In the studies described above, dredge tailings piles were not required to be placed back into the dredge holes. It would take higher peak flows to move entire dredge tailings piles than it would to move and redistribute the remaining sediment on the streambed surface that will result from the proposed action after tailings piles are put back into the dredge holes. For this reason we believe that it will not require a bankfull peak flow (2 year recurrence interval flow) to return substrate composition and embeddedness to conditions similar to the original bed. We believe it is likely that the substrate composition and embeddedness will be similar to the original bed by the next summer. However, this could occur earlier than by the next summer provided there is a peak flow with sufficient stream power to move the excavated and deposited material.

Timing. Habitat elements pathway, substrate character and embeddedness indicator; PE 1: *mining*

The effects to substrate composition and embeddedness would be greatest during the juvenile rearing and out-migration life cycle stages for Coho Salmon and to a lesser degree during the adult migration, spawning, and incubation/emergence life cycle stages.

Nature. Habitat elements pathway, substrate character and embeddedness indicator; PE 1: *mining*

The nature of the effect is a reduction of interstitial rearing space between cobbles for juvenile Coho Salmon as a result of deposited fines. Coho forage may be also negatively impacted as increased embeddedness reduces/covers surfaces suitable for rearing macroinvertebrates. Increased fines in spawning gravel will potentially reduce its ability to provide suitable habitat for incubating embryos, sac fry and swim-up fry. It is not known to what degree increased fines and embeddedness of the streambed for short distances of stream would affect migratory habitat for adult Coho Salmon or juvenile downstream migrants.

ELEMENT SUMMARY– Habitat elements pathway, substrate character and embeddedness indicator; PE 1: *mining*

There would be a **negative (-) effect** to the **substrate character and embeddedness** indicator from the *mining* PE. Suction dredge mining would negatively affect substrate by reducing interstitial spaces between cobbles and gravel downstream from the activities with fine sediment. Negative effects are likely to remain until a peak flow sufficient to move bedload materials takes place, typically during autumn, winter or spring after dredge/high banking activities. This would impact all life history stages for Coho Salmon that occur in freshwater, but the effect to habitat would be greatest during the juvenile rearing and out-migration life cycle stages.

PE 2: *onsite occupancy*

Proximity. Habitat elements pathway, substrate character and embeddedness indicator; PE 2: *onsite occupancy*

Miners will occupy sites adjacent to their operations. The potentially affected stream reaches are in or within one-quarter mile of occupied habitat for ESA-listed SONCC and OC Coho Salmon or their respective designated CH.

Probability. Habitat elements pathway, substrate character and embeddedness indicator; PE 2: *onsite occupancy*

The *onsite occupancy* PE may affect substrate composition in streams as a result of erosion of the occupied area. Any fine sediment resulting from erosion of bare surfaces caused by the PE must have a delivery mechanism to the stream channel to affect substrate composition and embeddedness.

Vegetation provides root strength, intercepts raindrops to minimize impact erosion potential, and dead vegetation (duff) covers the ground surface. These features serve to minimize soil erosion and delivery of eroded fine sediment to a stream channel. The proposed action includes CM to protect vegetation and minimize erosion. CM 44 prohibits the removal of woody material for firewood or other purposes within 150 feet of the stream. This applies to live or dead woody vegetation. CM 47 restricts motorized access to existing roads and trails, so no vegetation would be removed to create new motorized access. The intent of CM 48 is to use existing/established dispersed campsites and paths, while locating any new camp areas and paths away from the stream and streambanks. The outcome of these three CM will effectively limit erosion of fine sediments to that generated by use of existing non-paved roads, trails, campsites and paths.

Some of the fine sediment generated by use of these areas will remain on site or be captured by existing vegetation and duff before it can reach a stream channel. A sub-set of lengths/areas of non-paved roads, trails, campsites and paths used for the *onsite occupancy* PE drain to stream-channels. Some will drain to low order tributary streams that are not designated CH while others may drain directly to streams with designated CH. It is likely that some fine sediment generated by the *onsite occupancy* PE will enter stream channels with Coho Salmon designated CH and become mobilized as bedload.

Magnitude. Habitat elements pathway, substrate character and embeddedness indicator; PE 2: *onsite occupancy*

The amount of fine sediment reaching stream channels will be small and would be delivered later in time, during freshets. The amount of fine sediment generated by the *onsite occupancy* PE would be a very small component of the entire fine sediment load in the bedload at that time. The effects to the interstitial spaces between cobbles and gravel, or embeddedness, cannot be meaningfully measured, detected or evaluated, and therefore would have an insignificant negative effect to the indicator.

ELEMENT SUMMARY– Habitat elements pathway, substrate character and embeddedness indicator; PE 2: *onsite occupancy*

There would be an insignificant negative (-) effect to the substrate character and embeddedness indicator from the *onsite occupancy* PE. Effects to substrate composition and embeddedness cannot be meaningfully measured, detected or evaluated and are therefore insignificant.

INDICATOR SUMMARY

Overall, there would be a short-term **measurable negative (-) effect** to the **substrate character and embeddedness** indicator as a result of the proposed action. The largest impact to the indicator is a result of implementing the *mining* PE. Suction dredge mining and high banking would negatively affect substrate by reducing interstitial spaces between cobbles and gravel with fine sediment, downstream from the activities. For high banking, the effects would occur later in time when flows overtop gravel bars. Negative effects are likely to remain until a peak flow sufficient to move bedload materials takes place, typically during autumn, winter or spring after dredge/high banking activities. This would impact habitat used by all life history stages for Coho Salmon that occur in freshwater, but the effect to habitat would be greatest during the juvenile rearing and out-migration stages.

Effects to substrate by the *onsite occupancy* PE were determined to be insignificant. The amount of fine sediment reaching stream channels will be small and would be delivered later in time, during freshets. At that time the water column and bedload include fine sediments from all sources upstream. The amount of fine sediment generated by the *onsite occupancy* PE would be a very small component of the entire fine sediment load in the water column and bedload at that time, and the effects to the indicator would not be meaningfully measured, detected or evaluated.

EFFECTS TO SPAWNING, REARING AND MIGRATORY HABITAT as a result of effects to substrate character and embeddedness caused by the *mining* and *onsite occupancy* PEs

Spawning. Spawning habitat may be negatively affected by an increase in fine sediment in spawning gravel downstream from suction dredge and high banking sites. CM 30 and 35 require filling of holes created by dredging and high banking, and restoring streambed contours where there were dredge tailings. This would occur before spawning takes place. Dispersal of fine sediments in substrate, including spawning gravel, would occur to some degree by fall freshets that may occur before spawning begins. This, combined with the removal of fine materials by the construction of redds, would substantially reduce effects to spawning habitat. However, while the negative effects may be mitigated to some degree as described above, there would be measurable short-term negative effects to spawning habitat as a result of increased fine sediments in spawning gravels from suction dredging and high banking activities.

Rearing. Effects to substrate would negatively affect rearing habitat for juvenile Coho Salmon. Deposited fine sediments would reduce interstitial spaces between cobbles and gravels downstream from dredging sites. This would occur to a greatly reduced degree downstream from high banking sites, because fine sediment would only enter occupied rearing habitat when fall flows overtop the gravel bar. The capability of rearing habitat to produce macroinvertebrates serving as forage for out-migrating Coho Salmon would be negatively impacted.

Habitat for incubating embryos, alevin and emergent fry would be negatively impacted by an increase in fine sediment in spawning gravel. However, the effect would be reduced by dispersal of fine sediment from gravel by freshets before spawning takes place, and by the reduction of fines during construction of redds.

Migration. It is not known to what degree increases in fine sediments and embeddedness of the streambed for short reaches of stream would affect the utility of migration habitat for adult Coho Salmon. The possibility of SONCC or OC Coho Salmon adults being present during the latter part of the in-water period is rare since fall freshets generally occur in October and draw adults upstream in southwest Oregon (Lestelle 2007). Therefore, migration into ESA action area streams may not occur during the period of active operations in most years.

It is not known to what degree increases in fine sediments and embeddedness of the streambed for short reaches of stream would affect the utility of habitat for out-migrating juvenile Coho Salmon. However, macroinvertebrates serving as forage for out-migrating Coho Salmon would be negatively impacted.

MPI #3c. Habitat element pathway: pool frequency and quality indicator

The criteria for the indicator are concerned with numbers of pools, large wood recruitment, cover in pools, water temperatures, and the degree of reduction of pool volume by fine sediment. It was determined earlier in this document that there is no causal mechanism in the proposed action to affect large wood recruitment.

PE 1: mining

Proximity. Habitat elements pathway: pool frequency and quality indicator; PE 1: *mining*

The *mining* PE includes suction dredging and high banking. Dredging occurs within the wetted perimeter of stream channels and high banking is done on exposed gravel bars between the wetted stream and streambank. The potentially affected stream reaches are in or within one-quarter mile of occupied habitat for ESA-listed SONCC and OC Coho Salmon or their respective designated CH.

Probability. Habitat elements pathway: pool frequency and quality indicator; PE 1: *mining*

It is probable that suction dredging will affect the indicator. Suction dredging creates dredge holes that form pools in the stream channel. The typical suction dredge hole pool is 3 feet in depth on the RRS (Kevin Johnson, pers. comm. 2014).

There is no probability that high banking will affect the indicator. High banking does not create holes that form pools used by Coho Salmon as habitat. Holes created by high banking are filled before the gravel bars are over-topped by fall freshets (CM 34).

Harvey (1986) observed a 25 percent temporary reduction in pool volume when dredging added sand to a small pool in Butte Creek in California. It is extremely unlikely that any sediment created by a suction dredge or high-bank operation would fill any pool completely so as to reduce the total number of pools, or measurably reduce pool volume. CM 30c prohibits filling of natural pools by suction dredge activities. CM 30 and 34 require backfilling of holes created by dredging and high banking, and also require that original streambed contours be established. Therefore, the sources of substrate materials to fill downstream pools when fall/winter freshets are large enough to move bedload will be diminished. Furthermore, fall/winter freshets will disperse sediments and it is unlikely that they will fill pools.

Magnitude. Habitat elements pathway: pool frequency and quality indicator; PE 1: *mining*

The number of pools would increase. A pool, typically three feet in depth, would be created at each suction dredge site.

Distribution. Habitat elements pathway: pool frequency and quality; PE 1: *mining*

Each dredge site would have one created pool that is typically three feet in depth.

Frequency. Habitat elements pathway: pool frequency and quality indicator; PE 1: *mining*

The effect to the indicator would typically occur once at each suction dredge site.

Duration. Habitat elements pathway: pool frequency and quality indicator; PE 1: *mining*

Created pools at dredge sites provide temporary habitat. They would be present until they are filled as required by CM 30. The CM requires that a dredge hole be backfilled before moving to a new work site, and the last dredge hole be filled by the end of the in-water work window (September 15 or 30). An individual created pool may be available as habitat for time periods ranging from days to the entire span of the in-water work window (three months at the greatest).

Timing. Habitat elements pathway: pool frequency and quality indicator; PE 1: *mining*

Created pools are available during the juvenile rearing, out-migration and adult upstream migration life cycle stages for Coho Salmon.

Nature. Habitat elements pathway: pool frequency and quality indicator; PE 1: *mining*

Created pools would provide additional rearing space for juvenile Coho Salmon. They may be utilized as holding habitat for out-migrating juveniles and adult upstream migrants.

ELEMENT SUMMARY – Habitat elements pathway: pool frequency and quality indicator; PE 1: *mining*

There would be an overall short-term **measurable positive (+) effect** to the **pool frequency and quality** indicator from the *mining* PE. Suction dredging would create pools, typically 3 feet in depth. The positive effect would be short-term, only lasting until pools are back-filled as required by CM 30. An individual created pool may be available as habitat for time periods ranging from days to the entire span of the in-water work window (three months at the greatest). It is extremely unlikely that any sediment generated by the *minin*g PE would reduce the number of pools.

PE 2: *onsite occupancy*

Proximity. Habitat elements pathway: pool frequency and quality indicator; PE 2: *onsite occupancy*

Miners will occupy sites adjacent to their operations. The potentially affected stream reaches are in or within one-quarter mile of occupied habitat for ESA-listed SONCC and OC Coho Salmon or their respective designated CH.

Probability. Habitat elements pathway: pool frequency and quality indicator; PE 2: *onsite occupancy*

There is no instream excavation associated with the *onsite occupancy* PE. Therefore, there is no mechanism to create pools of any depth. Pool numbers and depths can be affected by sediment delivery from an activity. As discussed in the factor analysis for the **suspended sediment: intergravel DO/turbidity** indicator and **substrate character and embeddedness** indicators above, the *onsite occupancy* PE would result in some sediment delivery to stream channels.

Small amounts of sediment resulting from the *onsite occupancy* PE would be delivered either into the water column or as bedload, when fall/winter freshets are sufficient to move the sediment. At that time the water column and bedload include fine sediments from all sources upstream. The amount of fine sediment generated by the *onsite occupancy* PE would be a very small component of the entire fine sediment load in the water column and bedload at that time. It would be extremely unlikely that sediment resulting from the *onsite occupancy* PE would reduce the number of pools. Therefore, the effect to the indicator is discountable.

ELEMENT SUMMARY – Habitat elements pathway: pool frequency and quality indicator; PE 2: *onsite occupancy*

There would be a **discountable negative (-) effect** to the **pool frequency and quality** indicator from the *onsite occupancy* PE. No pools would be created and there would be no reduction in the total number of pools.

INDICATOR SUMMARY – Habitat elements pathway: pool frequency and quality indicator; PE 1: *mining* and PE 2: *onsite occupancy*

Overall, there would be a short-term **measurable positive (+) effect** to the **pool frequency and quality** indicator from the *mining* PE. Suction dredging would create pools, typically 3 feet in depth. The positive effect would be short-term, only lasting until pools are back-filled as required by CM 30. An individual created pool may be available as habitat for time periods ranging from days to the entire span of the in-water work window (three months at the greatest). It is extremely unlikely that any sediment generated by the mining PE would reduce the number of pools.

There would be a **discountable negative (-) effect** to the indicator from the *onsite occupancy* PE. No pools would be created and there would be no reduction in the total number of pools.

EFFECTS TO SPAWNING, REARING AND MIGRATORY HABITAT as a result of effects to pool frequency and quality caused by the *mining* and *onsite occupancy* PEs

Spawning. Spawning Coho Salmon use pools as escape cover. However, the pools created by suction dredge mining would be backfilled before the Coho Salmon spawning time period begins. Therefore, there would be no effect to spawning habitat.

Rearing. There would be a positive effect to rearing habitat for juvenile Coho Salmon from a temporary increase in pool habitat.

Migration. Created pools would be available to adult migrating Coho Salmon as holding habitat if they are present. The possibility of SONCC or OC Coho Salmon adults being present during the latter part of the in-water period is rare since fall freshets generally occur in October and draw adults upstream in southwest Oregon (Lestelle 2007). Therefore, migration into ESA action area streams may not occur during the period of active operations defined by the in-water work windows in most years. It could occur for up to six weeks in the Rogue River tributaries below Mariel, for two weeks in the Rogue River tributaries above Mariel and in the Coquille River and tributaries dependent on precipitation and river levels.

To the extent that pools are used by out-migrating juvenile Coho Salmon, there would be a positive effect to migration habitat.

MPI #3d. Habitat elements pathway: large pools indicator

The criterion for the indicator is the number of pools > 1 meter (approximately 3 feet) deep.

PE 1: *mining*

Proximity. Habitat elements pathway: large pools indicator; PE 1: *mining*

The *mining* PE includes suction dredging and high banking. Dredging occurs within the wetted perimeter of stream channels and high banking is done on exposed gravel bars between the wetted stream and streambank. The potentially affected stream reaches are in or within one-quarter mile of occupied habitat for ESA-listed SONCC and OC Coho Salmon or their respective designated CH.

Probability. Habitat elements pathway: large pools indicator; PE 1: *mining*

It is probable that suction dredging will affect the indicator. Suction dredging creates dredge holes that form pools in the stream channel. The typical suction dredge hole pool is 3 feet in depth on the RRS (Kevin Johnson, pers. comm. 2014).

There is no probability that high banking will affect the indicator. High banking does not create holes that form pools used by Coho Salmon as habitat. Holes created by high banking are filled before the gravel bars are over-topped by fall freshets (CM 34).

It is extremely unlikely that any sediment created by a suction dredge would fill a deep pool to the degree that it would be less than 3 feet in depth. CM 30 and 34 require backfilling of holes created by dredging and high banking, and also require that original streambed contours be established. Therefore, the sources of substrate materials to fill downstream pools when fall/winter freshets are large enough to move bedload will be diminished. Furthermore, the fall/winter freshets will disperse sediments and it is unlikely that they will fill pools.

Magnitude. Habitat elements pathway: large pools indicator; PE 1: *mining*

The number of pools > 3 feet in depth would temporarily increase. A pool, typically three feet in depth, would be created at each suction dredge site.

Distribution. Habitat elements pathway: large pools indicator; PE 1: *mining*

Each dredge site would typically have one created large pool.

Frequency. Habitat elements pathway: large pools indicator; PE 1: *mining*

The effect to the indicator would occur once at each suction dredge site.

Duration. Habitat elements pathway: large pools indicator; PE 1: *mining*

Created large pools at dredge sites provide temporary habitat. They would be present until they are filled as required by CM 30. The CM requires that a dredge hole be backfilled before moving to a new work site. It also requires the last dredge hole be filled by the end of the in-water work window (September 15 or 30). An individual created pool may be available as habitat for time periods ranging from days to the entire span of the in-water work window (three months at the greatest).

Timing. Habitat elements pathway: large pools indicator; PE 1: *mining*

Created large pools indicator are available during the juvenile rearing, out-migration and adult upstream migration life cycle stages for Coho Salmon.

Nature. Habitat elements pathway: large pools indicator; PE 1: *mining*

Created large pools would provide additional rearing space for juvenile Coho Salmon. They may be utilized as holding habitat for out-migrating juveniles and adult upstream migrants.

ELEMENT SUMMARY – Habitat elements pathway: large pools indicator; PE 1: *mining*

There would be an overall short-term **measurable positive (+) effect** to the **large pools indicator** from the *mining* PE. Suction dredging would create pools, typically 3 feet in depth. The positive effect would be short-term, only lasting until pools are back-filled as required by CM 30. An individual created pool may be available as habitat for time periods ranging from days to the entire span of the in-water work window (three months at the greatest). It is extremely unlikely that any sediment generated by the mining PE would reduce the number of pools >3 feet in depth.

PE 2: *onsite occupancy*

Proximity. Habitat elements pathway: large pools indicator; PE 2: *onsite occupancy*

Miners will occupy sites adjacent to their operations. The potentially affected stream reaches are in or within one-quarter mile of occupied habitat for ESA-listed SONCC and OC Coho Salmon or their respective designated CH.

Probability. Habitat elements pathway: large pools indicator; PE 2: *onsite occupancy*

There is no instream excavation associated with the *onsite occupancy* PE. Therefore, there is no mechanism to create pools of any depth. Pool depths can be affected by sediment delivery from an activity. As discussed in the factor analysis for the **suspended sediment: intergravel**

DO/turbidity indicator and **substrate character and embeddedness** indicators above, the *onsite occupancy* PE would result in some sediment delivery to stream channels.

Small amounts of sediment resulting from the *onsite occupancy* PE would be delivered either into the water column or as bedload, when fall/winter freshets are sufficient to move the sediment. At that time the water column and bedload include fine sediments from all sources upstream. The amount of fine sediment generated by the *onsite occupancy* PE would be a very small component of the entire fine sediment load in the water column and bedload at that time. It would be extremely unlikely that sediment resulting from the *onsite occupancy* PE would reduce the number of pools > 3 feet in depth. Therefore, the effect to the indicator is discountable.

ELEMENT SUMMARY – Habitat elements pathway: large pools indicator; PE 2: *onsite occupancy*

There would be a **discountable negative (-) effect** to the **large pools indicator** from the *onsite occupancy* PE. The PE would not create deep pools and it is extremely unlikely that it would reduce the number of pools > 3 feet in depth.

INDICATOR SUMMARY

Overall, there would be a short-term **measurable positive (+) effect** to the **large pools** indicator from the *mining* PE. Suction dredging would create large pools, typically 3 feet in depth. The positive effect would be short-term, only lasting until pools are back-filled as required by CM 30. An individual created large pool may be available as habitat for time periods ranging from days to the entire span of the in-water work window (three months at the greatest). It is extremely unlikely that any sediment generated by the *mining* PE would reduce the number of pools, or pools ≥ 3 feet in depth.

There would be a **discountable negative (-) effect** to the **large pools** indicator from the *onsite occupancy* PE. No large pools would be created and it is extremely unlikely that implementing the PE would reduce the total number of pools ≥ 3 feet in depth.

EFFECTS TO SPAWNING, REARING AND MIGRATORY HABITAT as a result of effects to the large pools indicator caused by the *mining* and *onsite occupancy* PEs

Spawning. Spawning Coho Salmon use large pools as escape cover. However, the large pools created by suction dredge *mining* would be backfilled before the Coho Salmon spawning time period begins. Therefore, there would be no effect to spawning habitat.

Rearing. There would be a positive effect to rearing habitat for juvenile Coho Salmon from a temporary increase in large pool habitat.

Migration. Created large pools would be available to adult migrating Coho Salmon as holding habitat. To the extent that large pools are used by out-migrating juvenile Coho Salmon, there would be a positive effect to migration habitat.

MPI #3c. Habitat elements pathway: off-channel habitat indicator

Criteria for the indicator include the availability and quality of backwaters.

PE 1: *mining*

Proximity. Habitat elements pathway: off-channel habitat indicator; PE 1: *mining*

The *mining* PE includes suction dredging and high banking. Dredging occurs within the wetted perimeter of stream channels and high banking is done on exposed gravel bars between the wetted stream and streambank. The potentially affected stream reaches are in or within one-quarter mile of occupied habitat for ESA-listed SONCC and OC Coho Salmon or their respective designated CH, and may include off-channel habitat.

Probability. Habitat elements pathway: off-channel habitat indicator; PE 1: *mining*

There is very little potential for off-channel habitat to be affected by the *mining* PE. Off-channel habitats are rare as described in the Environmental Baseline section of this BA. Stream channels on the RRS tend to have steeper gradients than valley bottom segments on downstream private land. In general, streams on the RRS are moderately entrenched and/or confined by topography, features that limit the potential for extensive floodplains with off-channel habitat. The intersection between the few areas with off-channel habitat and NOI operations will be small.

Many off-channel habitats do not flow water during the in-water work window and would only be available for potential high banking operations. CM 33 states that high banking will only occur in medium and large streams and excludes small streams. Off-channel habitat commonly known as side-channels typically would qualify as small streams.

CM 33 effectively eliminates high banking from any dry channel that is ≤ 30 feet plus the width of the excavation. CM 33 requires a 15 foot buffer from the toe of a stream bank. Off-channel habitat areas greater than 30 feet in width are extremely rare on the RRS. For this reason, it is extremely unlikely that any off-channel habitat would be subject to high banking.

For the few off-channel habitat areas that have flowing water within the time frame of the in-water work window, CM 25 effectively requires that the flow width be greater than 6 feet plus the width of the excavation. CM 25 states that 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. This further reduces the potential number of off-channel habitat areas that are available for suction dredging.

CM 29b would further reduce availability of off-channel habitats for suction dredging. It requires that suction dredging must be modified, curtailed or stopped immediately if any visible increase in turbidity covers the entire wetted perimeter of the stream. It is likely that the small flows in side-channels would experience turbidity in the entire wetted perimeter if a suction dredge were to operate. Recognizing this, NOI operators may avoid off-channel areas with small flows.

For the reasons discussed above (rarity of off-channel habitat, CM that effectively require certain minimum widths of areas subject to suction dredging and high banking, and the likely narrow dimensions of off-channel habitat), it is extremely unlikely that any off-channel habitat would be subject to suction dredging or high banking.

It is possible that an off-channel habitat area that has stream flow during the in-water work window would be located immediately downstream from an active suction dredge operation in a main channel. Part of the turbidity plume from the active suction dredge operation may enter the inlet to the off-channel habitat and negative impacts may occur.

CM 38 prohibits traceable discharge of turbidity to groundwater or surface water, or the direct discharge of processing water to streams during high banking. No turbidity to side-channel flows would occur as a result of high-banking operations.

Magnitude. Habitat elements pathway: off-channel habitat indicator; PE 1: *mining*

Should a turbidity plume enter an off-channel habitat area, based upon the factor analysis for other indicators presented earlier in this section, there would be impacts to the **suspended sediment: intergravel DO/turbidity, chemical contamination/nutrients** and **substrate character and embeddedness** indicators that are not discountable or insignificant. The effects to the **off-channel habitat** indicator would be similar, but the magnitude would likely be much less, as only a portion of the turbidity plume would enter the off-channel habitat. Rather than reiterate the extensive description of characteristics of the effects to the above listed MPI indicators for all remaining AP factors here, the reader is directed to the narratives for the affected indicators, in this effects analysis section at MPI #1b, MPI #1c, and MPI #3a, respectively.

ELEMENT SUMMARY – Habitat elements pathway: off-channel habitat indicator; PE 1: *mining*

There would be an overall short-term **negative (-) effect** to the **off-channel habitat** indicator from the *mining* PE. However, there is a very small subset of off-channel habitat that may be affected. It is extremely unlikely that any suction dredging or high banking will take place in off-channel habitat as a combination of the rarity of off-channel habitat on RRS streams, implementation of CM, and flow/width characteristics of off-channel habitats. Only a subset of those off-channel habitats with flow during the in-water work window may be impacted. Specifically, it would be those that have flow inlets located where they are subject to part of a turbidity plume from an active suction dredge *mining* operation that may be negatively affected. No off-channel habitats with stream flow would be negatively impacted by high-banking activities. There is no potential for turbidity from a high banking operation to affect a side-channel due to the restrictions of CM 38.

PE 2: *onsite occupancy*

Proximity. Habitat elements pathway: off-channel habitat indicator; PE 2: *onsite occupancy*

Miners will occupy sites adjacent to their operations. The potentially affected stream reaches are in or within one-quarter mile of occupied habitat for ESA-listed SONCC and OC Coho Salmon or their respective designated CH, and may include off-channel habitat.

Probability. Habitat elements pathway: off-channel habitat indicator; PE 2: *onsite occupancy*

Off-channel habitats are relatively rare on the RRS. The probability of an encampment being adjacent to off-channel habitat is very low. In the rare circumstance that an encampment is adjacent to off-channel habitat it is possible that there may be an effect to off-channel habitat.

Magnitude. Habitat elements pathway: off-channel habitat indicator; PE 2: *onsite occupancy*

The magnitude of any effect to the **off-channel habitat** indicator by implementing the *onsite occupancy* PE is dependent upon effects to other NMFS MPI indicators analyzed elsewhere in this BA. Negative impacts to the **suspended sediment: intergravel DO/turbidity** indicator, **chemical contamination** and **substrate character and embeddedness** indicators by the *onsite occupancy* PE were determined to be insignificant (please see analysis in this effects analysis section at MPI #1b, MPI #1c, and MPI #3a, respectively). For those evaluations, it was determined that effects could not be meaningfully measured, detected or evaluated. Therefore, negative effects to the **off-channel habitat** indicator by implementing the *onsite occupancy* PE are characterized as insignificant.

ELEMENT SUMMARY – Habitat elements pathway: off-channel habitat indicator; PE 2: *onsite occupancy*

There would be an **insignificant** short-term **negative (-) effect** to the **off-channel habitat** indicator from the *onsite occupancy* PE. Only a very small subset of off-channel habitat areas present in the ESA action area may be affected, and effects would not be meaningfully measured, detected or evaluated. Therefore the negative effects to the indicator are characterized as insignificant.

INDICATOR SUMMARY – Habitat elements pathway: off-channel habitat indicator; PE 1: mining and PE 2: *onsite occupancy*

Overall, there would be a short-term **measurable negative (-) effect** to the **off-channel habitat** indicator as a result of the proposed action. Effects to the indicator that are beyond discountable or insignificant may occur in the rare circumstance when an off-channel habitat area that has stream flow during the in-water work window is affected by an active suction dredge operation in a main channel. Part of the turbidity plume from the active suction dredge operation may enter the inlet to the off-channel habitat and negative impacts may occur.

Effects would be similar to, but reduced in magnitude from, those described in this effect analysis section at MPI #1b, MPI #1c, and MPI #3a, respectively, for the **suspended sediment: intergravel DO/turbidity** indicator, **chemical contamination** and **substrate character and embeddedness** indicators.

EFFECTS TO SPAWNING, REARING AND MIGRATORY HABITAT as a result of negative effects to the off-channel habitat indicator caused by the *mining* and *onsite occupancy* PEs

Spawning. Fine sediments in spawning gravels reduce intergravel flow of oxygenated water, reduce flows needed to flush metabolic waste produced by sac-fry, and may impede movement of swim-up fry out of the gravel and into the water column. Spawning areas in off-channel habitat would be negatively affected by an increase in fine sediment in spawning gravels. This would be a result of dredge operations in the mainstem that may introduce fines from the turbidity plume into the inlet to off-channel habitat. Fines may settle onto spawning gravels in the off-channel habitat. The sediment would be remobilized during fall/winter freshets and dispersed downstream. The negative effect would be somewhat mitigated by removal of fine sediments during the redd creation process by spawning female Coho Salmon. However, while the negative effects may be mitigated to some degree as described above, there would be measurable short-term negative effects to spawning habitat in side-channels.

Turbidity events that may occur during the spawning period involve remobilization of deposited fine sediments that settled out downstream from dredge operations, from the surface of gravel bars subject to high banking, and from erosion by the use of native surface roads, trails, campsites and paths. The effects to turbidity for those situations were determined to be insignificant, and therefore any potential deposition of fines from these events on spawning gravels in off-channel habitat areas is also insignificant.

An increase in mercury or other trace metals in spawning gravels may negatively affect spawning habitat. Dilution and dispersal of these contaminants would take place during fall/winter freshets. This, combined with the removal of fine materials by the construction of redds, would substantially reduce effects to spawning habitat.

Rearing. Rearing habitat for juvenile Coho Salmon in off-channel habitat areas would be negatively affected by episodic turbidity events and by fines deposited in substrate. Deposited fine sediments from a turbidity plume entering an off-channel area would reduce interstitial spaces between cobbles and gravels. Habitat for incubating embryos, alevin and emergent fry would be negatively impacted by an increase in fines in spawning gravel. However, the effect would be reduced by dispersal of sediment from gravel by freshets before spawning takes place, and by the reduction of fines during construction of redds. Increased fines and embeddedness would negatively impact the ability of rearing habitat to produce macroinvertebrates utilized as forage.

Increased levels of mercury or trace metals would negatively affect rearing habitat for juvenile Coho Salmon in off-channel habitat. Effects would be greatest when dredges are operated causing part of a main stem turbidity plume to enter off-channel habitat, and would be reduced when fall/winter freshets disperse and dilute the contaminants. Habitat for incubating embryos, alevin and emergent fry would be negatively impacted by an increase in metal contaminants, particularly mercury, in substrate.

Migration. As described in detail in Section D, the adult migration life cycle stage overlaps with the in-water work windows for three waterways for 15 days and one waterway for 45 days. The possibility of SONCC or OC Coho Salmon adults being present during the latter part of the in-water period is rare since fall freshets generally occur in October and draw adults upstream in southwest Oregon (Lestelle 2007). Therefore, migration into ESA action area streams may not occur during the period of active operations in most years. It is not known to what degree upstream migrating Coho Salmon use small side-channels with limited flow, or if streambeds with increased fine sediment/embeddedness or increased mercury/trace metal presence would impact the habitat's utility as migratory habitat. Dilution and dispersal of these contaminants would occur during the freshets that would attract migrating adult Coho Salmon into the tributaries and any accessible side-channel habitat.

Off-channel habitats may not be utilized by out-migrating Coho Salmon smolts. McMahon and Holtby (1992), citing Bustard and Narver (1975) and Tschaplinski and Hartman (1983), stated that overwintering Coho Salmon moved from off-channel sites to the main channel of Carnation Creek, British Columbia up to 6 weeks prior to the main period of smolt migration.

If Coho Salmon utilize off-channel habitat for out-migration, the extent to which episodic turbidity events during daylight hours affects habitat used for Coho Salmon smolt out-migration is not known. Out-migrating juvenile Coho Salmon experience a wide range of streambed habitat conditions. McMahon and Holtby (1992), studying Coho Salmon smolt habitat use in Carnation Creek and Dicks Creek, British Columbia, determined that over 95% of Coho Salmon smolts were within 2 m of wood material. Characteristics of the large wood jam sites where Coho Salmon smolts were clumped included depths > 1 m, slow-moving water, overhead shade, and complex cover provided by root masses, undercut banks and submerged logs. Streambed characteristics such as embeddedness were not evaluated in that study, but it appears that Coho Salmon smolt habitat utilization during outmigration is determined by conditions other than that of the substrate. Increased fines and embeddedness would negatively impact the ability of off-channel habitat to produce macroinvertebrates utilized as forage by juvenile Coho Salmon out-migrants.

There would be levels of mercury and other trace metals above background in habitat used by smolts during their out-migration. Whether or not this would reduce the utility of that habitat for out-migration is not known.

MPI #3f. Habitat elements pathway: refugia indicator

The definition of the refugia indicator in NMFS (1996) is: "important remnant habitat for sensitive aquatic species." The criteria used for descripting the functional classifications of the indicator in the NMFS MPI (NMFS 1996) include:

- Existence of habitat refugia
- Adequate buffering by riparian reserves
- Sufficient in size, number and connectivity to maintain viable populations or sub-populations

The environmental baseline section of this BA identifies that the existence of refugial conditions varies between watersheds. Where refugia exist, it is provided in the ESA action area by deep pools, where cold tributaries enter the main-stems of streams (thermal), complex habitats, instream large wood and where off-channel habitat is available. Headwater areas of watersheds on the RRS provide some of the best habitat conditions in the watershed and serve as refugia. Earlier in this BA, it was determined that effects to several components of refugia that exists in the ESA action area (e.g., water temperature, the depth of pools, large wood) were either neutral, beneficial, or, if negative, discountable or insignificant. Furthermore, riparian vegetation is protected by multiple CM and the function of riparian areas will not be negatively impacted by the proposed action.

PE 1: *mining*

Proximity. Habitat elements pathway, refugia indicator; PE 1: *mining*

The *mining* PE includes suction dredging and high banking. Dredging occurs within the wetted perimeter of stream channels and high banking is done on exposed gravel bars between the wetted stream and streambank. The potentially affected stream reaches are in or within one-quarter mile of occupied habitat for ESA-listed SONCC and OC Coho Salmon or their respective designated CH.

Probability. Habitat elements pathway: refugia indicator; PE 1: *mining*

The analysis of water quality and habitat elements in this BA has determined that there are several effects to indicators from the *mining* PE that are not neutral, discountable or insignificant. They are to the **suspended sediment: intergravel DO/turbidity, chemical contamination/nutrients, substrate character and embeddedness** and **off-channel habitat** indicators. It is probable that there may be some impact to refugia from these negative effects.

Magnitude. Habitat elements pathway: refugia indicator; PE 1: *mining*

Rather than reiterate the extensive description of characteristics of the effects to the above listed MPI indicators for all remaining AP factors here, the reader is directed to the narratives for the affected indicators in this effects analysis section at MPI #1b, MPI #1c, MPI #3a and MPI #3e, respectively. The effects to refugial conditions are short-term and would not rise to a level that would reduce the size, number and connectivity of refugia for Coho Salmon.

ELEMENT SUMMARY– Habitat elements pathway: refugia indicator; PE 1: *mining*

There would be an overall short-term **measurable negative (-) effect** to the **refugia** indicator from the *mining* PE. However, the negative effect would be short-term and would not rise to a level that would reduce the size, number and connectivity of refugia for Coho Salmon.

PE 2: *onsite occupancy*

Proximity. Habitat elements pathway: refugia indicator; PE 2: *onsite occupancy*

Miners will occupy sites adjacent to their operations. The potentially affected stream reaches are in or within one-quarter mile of occupied habitat for ESA-listed SONCC and OC Coho Salmon or their respective designated CH.

Probability. Habitat elements pathway: refugia indicator; PE 2: *onsite occupancy*

The analysis of water quality and habitat elements in this BA has determined that there are several effects to indicators from the *onsite occupancy* PE that are not neutral, and therefore an analysis of the magnitude of the effects is required.

Magnitude. Habitat elements pathway: refugia indicator; PE 2: *onsite occupancy*

All negative (-) effects to water quality and habitat elements evaluated earlier in this effects analysis section that would be components of habitat refugia were determined to be insignificant. These effects were to the *suspended sediment: intergravel DO/turbidity, chemical contamination/nutrients, substrate character and embeddedness* and *off-channel habitat* indicators. The reader is directed to the narratives for the affected indicators in this effects analysis section at MPI #1b, MPI #1c, MPI #3a and MPI #3e, respectively. Consequently, the effect conclusion for the Refugia indicator from the *onsite occupancy* PE is also an insignificant negative (-) effect.

ELEMENT SUMMARY – Habitat elements pathway: refugia indicator; PE 2: *onsite occupancy*

There would be an overall **insignificant negative (-) effect** to the **refugia** indicator from the *onsite occupancy* PE because the conclusions for negative effects earlier in this effects analysis section to indicators that are components of habitat refugia were all insignificant.

INDICATOR SUMMARY

Overall, there would be a short-term **measurable negative (-) effect** to the **refugia** indicator as a result of the proposed action from the mining PE. However, the effect would be short-term and would not rise to a level that would reduce the size, number and connectivity of refugia for Coho Salmon.

EFFECTS TO SPAWNING, REARING AND MIGRATORY HABITAT as a result of negative impacts to the **refugia** indicator caused by the *mining* and *onsite occupancy* PEs

Conclusions regarding effects to the **refugia** indicator were based upon effects to other indicators. Negative effects to refugial conditions for turbidity, fine sediment in spawning gravel, mercury and other trace metals contamination, substrate embeddedness, and off-channel habitat conditions are anticipated. Rather than reiterate the extensive discussion of the effects to spawning, rearing and migration habitat for those indicators here, please refer to the following sub-sections in this effects analysis section:

- Suspended sediment: intergravel DO/turbidity indicator (MPI #1b)

- Chemical contamination/nutrients (MPI #1c,)
- Substrate character and embeddedness (MPI #3a)
- Off-channel habitat (MPI #3e)

MPI # 4a. Channel condition and dynamics pathway: average wetted width-depth / maximum depth ratio in scour pools in a reach indicator (WD Ratio)

PE 1: *mining*

Proximity. Channel condition and dynamics pathway: average wetted width-depth / maximum depth ratio in scour pools in a reach indicator (WD Ratio); PE 1: *mining*

The *mining* PE includes suction dredging and high banking. Dredging occurs within the wetted perimeter of stream channels and high banking is done on exposed gravel bars between the wetted stream and streambank. The potentially affected stream reaches are in or within one-quarter mile of occupied habitat for ESA-listed SONCC and OC Coho Salmon or their respective designated CH.

Probability. Channel condition and dynamics pathway: average wetted width-depth / maximum depth ratio in scour pools in a reach indicator (WD Ratio); PE 1: *mining*

There are several CM that limit the potential for an increase in WD ratio by the *mining* PE. CM 13 protects the integrity of streambanks by prohibiting actions that would undercut, erode, destabilize or excavate streambanks. It specifically prohibits the removal or disturbance of rooted vegetation, boulders, embedded wood (including root wads, stumps or logs), and other habitat structure that extends into the stream channel from the streambank. CM 25 prohibits operating nozzles of a suction dredge or the removal of material within 3 feet of the lateral stream edge of the current water level, including at edges of gravel bars or under overhanging banks.

CM 26 protects streambanks by prohibiting directing the existing stream current or the discharge from the sluice into streambanks during suction dredge operations. The stated intent is to prevent erosion or destruction of the natural form of the channel, undercutting the streambank or widening the channel. CM 26 also does not allow the diverting of flow into the bank.

Piled suction dredge tailings have the potential to direct stream flow into streambanks during high flow events that occur later in time. However, CM 30 requires the backfilling of suction dredge holes with tailings by the end of the in-water work window. This would eliminate a potential cause for increased WD ratio by removing the tailings before high flow events could redirect flows into streambanks. CM 31 provides a further requirement to reduce the possibility of redirection of flow into streambanks. It requires the spreading of tailing piles so that they are no more than 4 inches in depth and conform to the contour of the natural stream bottom.

CM 33 provides similar protections for streambanks that would limit the potential for an increase in WD ratio from high banking operations. There are distance buffers between the wetted stream and all work areas. It prohibits activity beyond the toe of a streambank including the terrace and beyond (above the high water level). In addition, all excavations must be filled to original contour levels prior to the end of the in-water work window.

In summary, CM 13, 25, 26, 30, 31 and 33 protect streambank integrity and would maintain stream channel WD ratios. The probability of an increase in WD ratio by the effects of the *mining* PE is extremely unlikely and is considered discountable.

ELEMENT SUMMARY – Channel condition and dynamics pathway: average wetted width-depth / maximum depth ratio in scour pools in a reach indicator (WD Ratio); PE 1: *mining*

There would be a **discountable negative (-) effect** to the **WD Ratio** indicator from the *mining* PE. CM reduce the probability of an increase in WD ratio to the point that it is extremely unlikely to occur, and therefore, it is discountable.

PE 2: *onsite occupancy*

Proximity. Channel condition and dynamics pathway: average wetted width-depth / maximum depth ratio in scour pools in a reach indicator (WD Ratio); PE 2: *onsite occupancy*

Miners will occupy sites adjacent to their operations. The potentially affected stream reaches are in or within one-quarter mile of occupied habitat for ESA-listed SONCC and OC Coho Salmon or their respective designated CH.

Probability. Channel condition and dynamics pathway: average wetted width-depth / maximum depth ratio in scour pools in a reach indicator (WD Ratio); PE 2: *onsite occupancy*

Several CM reduce the probability of an increase in WD ratio as a result of the *onsite occupancy* PE. CM 44 prohibits the removal of woody material for firewood or other purposes within 150 feet of the stream. This applies to live or dead woody vegetation. CM 47 restricts motorized access to existing roads and trails, so no vegetation would be removed for motorized access. The intent of CM 48 is to use existing/established dispersed campsites and paths, while locating any new camp areas and paths away from the stream and streambanks. The outcome of these three CM is to extremely limit effects to vegetation that protect streambanks from erosion.

The three CM described above that protect riparian vegetation, as well as an additional feature of CM 48 that prevents creating new areas of exposed soil along stream and streambanks, effectively eliminate causal mechanisms to widen stream channels as a result of the *onsite occupancy* PE. WD ratios would be maintained. The probability of an increase in WD ratio by the *onsite occupancy* PE is discountable.

ELEMENT SUMMARY– Channel condition and dynamics pathway: average wetted width-depth / maximum depth ratio in scour pools in a reach indicator (WD Ratio); PE 2: *onsite occupancy*

There would be a **discountable negative (-) effect** to the **WD Ratio** indicator from the *onsite occupancy* PE. The potential for erosion to streambanks that would be sufficient to increase stream channel WD ratio is extremely low. There is a discountable probability of an effect to the indicator.

INDICATOR SUMMARY – Channel condition and dynamics pathway: average wetted width-depth / maximum depth ratio in scour pools in a reach indicator (WD Ratio); PE 1: mining and PE 2: *onsite occupancy*

Overall, there would be a **discountable negative (-) effect** to the **WD ratio** indicator as a result of the proposed action. CM for suction dredging, high banking and onsite occupancy protect streambanks from erosion to the point that the probability of an increase in WD ratio is extremely unlikely to occur. Therefore, there is a discountable probability of an effect to the indicator.

EFFECTS TO SPAWNING, REARING AND MIGRATORY HABITAT as a result of effects to the WD Ratio indicator caused by the *mining* and *onsite occupancy* PEs

Because there is a discountable probability of an effect occurring to the WD ratio indicator, there is no basis for discussing effects to spawning, rearing or migratory habitat for Coho Salmon.

MPI #4b. Channel condition and dynamics pathway: streambank condition indicator

This indicator focuses on the stability of streambanks.

PE 1: *mining*

Proximity. Channel condition and dynamic pathway: streambank condition indicator; PE 1: *mining*

The *mining* PE includes suction dredging and high banking. Dredging occurs within the wetted perimeter of stream channels and high banking is done on exposed gravel bars between the wetted stream and streambank. The potentially affected stream reaches are in or within one-quarter mile of occupied habitat for ESA-listed SONCC and OC Coho Salmon or their respective designated CH.

Probability. Channel condition and dynamic pathway: streambank condition indicator; PE 1: *mining*

There are several CM that limit the potential for a negative effect to the streambank condition indicator by the *mining* PE. CM 13 protects the integrity of streambanks by prohibiting actions that would undercut, erode, destabilize or excavate streambanks. It specifically prohibits the removal or disturbance of rooted vegetation, boulders, embedded wood (including root wads, stumps or logs), and other habitat structure that extends into the stream channel from the streambank. CM 25 prohibits operating nozzles of a suction dredge or the removal of material within 3 feet of the lateral stream edge of the current water level, including at edges of gravel bars or under overhanging banks.

CM 26 protects streambanks by prohibiting directing the existing stream current or the discharge from the sluice into streambanks during suction dredge operations. The stated intent is to prevent erosion or destruction of the natural form of the channel, undercutting the streambank or widening the channel. CM 26 also does not allow the diverting of flow into the bank.

Piled suction dredge tailings have the potential to direct stream flow into streambanks during high flow events that occur later in time. However, CM 30 requires the backfilling of suction dredge holes with tailings by the end of the in-water work window. This would eliminate a potential cause for bank erosion by removing the tailings before high flow events could redirect flows into streambanks. CM 31 provides a further requirement to reduce the possibility of redirection of flow into streambanks. It requires the spreading of tailing piles so that they are no more than 4 inches in depth and conform to the contour of the natural stream bottom.

CM 33 provides similar protections for streambanks that would limit the potential for bank erosion from high banking operations. There are distance buffers between the wetted stream and all work areas. It prohibits activity beyond the toe of a streambank including the terrace and beyond (above the high water level). In addition, all excavations must be filled to original contour levels prior to the end of the in-water work window.

In summary, CM 13, 25, 26, 30, 31 and 33 protect streambank integrity and would limit erosion to streambanks. However, it is likely that the initial moving in and set-up of the suction dredge, take down and removal of the suction dredge, and repeated walking along streambanks to access suction dredge and high banking sites, would result in some bank erosion.

Magnitude. Channel condition and dynamic pathway: streambank condition indicator; PE 1: *mining*

The set-up, take-down, and removal of the suction dredge, and repeated walking along streambanks to access sites, would result in very limited surface bank erosion. NOI operators would take the path of least resistance to dredge sites. It is often easier to walk through the relatively open forest rather than along densely vegetated streambanks. Many streambanks are armored with rock that would limit erosion. In addition, miners will use existing footpaths to the extent practicable. All of these factors will combine to reduce the length of streambank subject to erosion by foot traffic. The limited amount of surface erosion is not anticipated to destabilize streambanks. The effect to streambank stability would not be meaningfully measured, detected or evaluated. By definition, the effect to the indicator would be insignificant.

ELEMENT SUMMARY – Channel condition and dynamic pathway: streambank condition indicator; PE 1: *mining*

There would be an **insignificant negative (-) effect** to the **streambank condition** indicator from the *mining* PE. CM reduce the potential for eroded stream banks as well as the magnitude of erosion. However, some limited bank erosion would occur from set-up, take-down and removal of the suction dredge, as well as repeated walking along streambanks to access sites. The limited amount of surface erosion is not anticipated to destabilize streambanks and would result in an insignificant effect to the indicator.

PE 2: *onsite occupancy*

Proximity. Channel condition and dynamic pathway: streambank condition indicator; PE 2: *onsite occupancy*

Miners will occupy sites adjacent to their operations. The potentially affected stream reaches are in or within one-quarter mile of occupied habitat for ESA-listed SONCC and OC Coho Salmon or their respective designated CH.

Probability. Channel condition and dynamic pathway: streambank condition indicator; PE 2: *onsite occupancy*

The proportion of the total area used by NOI operators for campsites that includes streambanks is very limited. Several CM reduce the probability of creating unstable streambanks for the limited area of streambank involved in the *onsite occupancy* PE. CM 44 prohibits the removal of woody material for firewood or other purposes within 150 feet of the stream. This applies to live or dead woody vegetation. CM 47 restricts motorized access to existing roads and trails, so no vegetation along streambanks would be removed for motorized access. The intent of CM 48 is to use existing/established dispersed camp sites and paths, while locating any new camp areas and paths away from the stream and streambanks. The outcome of these three CM is to extremely limit effects to vegetation that protect streambanks from erosion.

The three CM described above that protect riparian vegetation, as well as an additional feature of CM 48 that prevents creating new areas of exposed soil along stream and streambanks, almost eliminates the probability of increasing the amount of unstable streambank as a result of the *onsite occupancy* PE. The probability of a negative impact to the **streambank condition** indicator by the *onsite occupancy* PE is therefore discountable.

ELEMENT SUMMARY – Channel condition and dynamic pathway: streambank condition indicator; PE 2: *onsite occupancy*

There would be a **discountable negative (-) effect** to the **streambank condition** indicator from the *onsite occupancy* PE. The potential for an increase in erosion that would result in unstable streambanks is extremely low. There is a discountable probability of an effect to the indicator.

INDICATOR SUMMARY

Overall, there would be an **insignificant negative (-) effect** to the **streambank condition** indicator as a result of the proposed action. CM for suction dredging, high banking and onsite occupancy protect streambanks from erosion. Nevertheless, a very small amount of streambank erosion could occur as a result of the set-up, take-down, and removal of the suction dredge, and repeated walking along streambanks to access sites. Effects to the indicator would not be meaningfully measured, detected or evaluated, and are therefore considered insignificant.

EFFECTS TO SPAWNING, REARING AND MIGRATORY HABITAT as a result of effects to the streambank condition indicator caused by the *mining* and *onsite occupancy* PEs

There is no basis for discussing effects to spawning, rearing or migratory habitat for Coho Salmon because there is an insignificant effect occurring to the **streambank condition** indicator.

MPI #6b. Watershed conditions pathway: Disturbance history indicator

The AP states that the Watershed Condition Indicators (WCI) will not be evaluated using the eight factors or by project element. Changes to WCI values/conditions will be described as a result of the entire action (not by each project element).

The criteria for this indicator include:

- Percent equivalent clear-cut area (ECA)
- Amount of late successional old growth (LSOG) habitat
- Concentration of disturbance in unstable or potentially unstable areas, and/or refugia, and/or riparian area

There is no mechanism in the proposed action to affect percent ECA or LSOG habitat. There will be no clearings created and CM 13, 36, 44, 47, and 46 protect riparian vegetation. The proposed action is not concentrated in unstable or potentially unstable areas. Should suction dredging, high banking or activities associated with encampments take place adjacent to an unstable hill slope, it is extremely unlikely that it would trigger or contribute to further destabilization of the hill slope. The conclusion for the factor analysis for the **streambank condition** indicator (subsection V.B, MPI #4b, above) was an insignificant effect to the indicator for both PE. Therefore, it would be extremely unlikely that implementing the proposed action would contribute to hill slope failure.

The proposed action is not concentrated in refugia, but will occur within some areas of fish habitat refugia. Access to and from suction dredge and high banking sites, and encampments, will occur within riparian areas.

The key concerns for the **disturbance history** indicator (percent ECA, percent LSOG, and concentration in unstable or potentially unstable areas) would either not be affected or have an extremely unlikely probability of an effect, by the proposed action. Disturbance is not concentrated in fish habitat refugia, effects to riparian areas would not impair its functions, and the footprint of the action would affect a very small proportion of all riparian habitat. Effects to the indicator would not be meaningfully measured, detected and are therefore characterized as insignificant.

INDICATOR SUMMARY

Overall, there would be an **insignificant negative (-) effect** to the **disturbance history** indicator as a result of the proposed action. The main drivers for the indicator would either not be impacted at all or would have an extremely low probability of an effect. Disturbance is not concentrated in fish habitat refugia, effects to riparian areas would not impact its functions, and the footprint of the action would affect a very small proportion of all riparian habitat. Effects to the indicator would not be meaningfully measured, detected or evaluated and are therefore characterized as insignificant.

EFFECTS TO SPAWNING, REARING AND MIGRATORY HABITAT as a result of effects to the disturbance history indicator caused by the proposed action

Because the effects to the indicator are insignificant, there is no basis for discussing effects to spawning, rearing or migratory habitat for Coho Salmon.

MPI #6c. Watershed conditions pathway: Riparian Reserves indicator

Criteria for the indicator address the structure and functions of Riparian Reserves:

- Provides adequate shade, LW recruitment, habitat protection and connectivity in all subwatersheds
- Buffers or includes known refugia for sensitive aquatic species

The proposed action would maintain shade, LW recruitment, habitat protection and connectivity of Riparian Reserves. Multiple CM protect vegetation. Other CM minimize erosion to streambanks and in encampment sites. It is extremely unlikely that the buffering capability of Riparian Reserves for fish habitat refugia would be impacted as a result of the proposed action. Consequently, the probability of a negative impact to the Riparian Reserve indicator by the proposed action is discountable.

INDICATOR SUMMARY

Overall, there would be a **discountable negative (-) effect** to the **Riparian Reserves** indicator as a result of the proposed action. The proposed action would maintain shade, LW recruitment, habitat protection and connectivity of Riparian Reserves. CM for suction dredging, high banking and onsite occupancy protect vegetation and minimize erosion of streambanks and encampment sites. It is extremely unlikely that the function of Riparian Reserves to buffer aquatic refugia would be impacted. Therefore, the effect to the indicator from the proposed action is discountable.

EFFECTS TO SPAWNING, REARING AND MIGRATORY HABITAT as a result of effects to the Riparian Reserves indicator caused by proposed action.

There is no basis for discussing effects to spawning, rearing or migratory habitat for Coho Salmon because the probability of an effect to the Riparian Reserves indicator is discountable.

MPI #6d. Watershed conditions pathway: disturbance regime indicator

Criteria for the indicator address the frequency of major disturbances such as floods, scour events, debris torrents, catastrophic fire, and the resilience of habitat to recover from environmental disturbance. The proposed action has no influence on the frequency of major disturbances, either increasing or decreasing the frequency. Effects of the proposed action are short-term, localized, and affect a very limited amount of habitat. Consequently, the proposed action will not affect habitat conditions to the degree that the resilience of habitat to recover from environmental disturbance would be impacted. Effects to the indicator would not be meaningfully measured, detected, or evaluated and are therefore insignificant.

INDICATOR SUMMARY

Overall, there would be an **insignificant negative (-) effect** to the **disturbance regime** indicator as a result of the proposed action. There are no causal mechanisms for the proposed action to affect the frequency of major disturbances. Effects of the proposed action are short-term, localized and affect a limited amount of habitat. The proposed action will not impact habitat conditions to the degree that the resilience of habitat to recover from environmental disturbance would be impacted.

EFFECTS TO SPAWNING, REARING AND MIGRATORY HABITAT as a result of effects to the disturbance regime indicator caused by proposed action

There is no basis for discussing effects to spawning, rearing or migratory habitat for Coho Salmon because the effects to the **disturbance regime** indicator are insignificant.

MPI #7a. Fish population characteristics pathway: population size and distribution indicator

These indicators will be addressed in a narrative rather than a factor analysis. They also do not represent specific habitat or watershed conditions and therefore a discussion of effects to spawning, rearing or migratory habitat is not relevant. The criteria used for each indicator are derived from the AP final document (USDA FS et al. 2004).

The criteria for the indicator focus on:

- Numbers of adults in sub-populations
- Local habitat capacity
- All life stages being evenly represented in the subpopulation (this criterion is not relevant to Coho Salmon; therefore this criterion will not be discussed further)

The effect of the proposed action to the **population size and distribution** indicator is insignificant and negative, because the effects to the numbers of adults in sub-populations, and to local habitat capacity, cannot be meaningfully measured, detected or evaluated. The rationale is presented below.

Numbers of adults in sub-populations – Fish population characteristics pathway: population size and distribution indicator

The probability of death of adult Coho Salmon due to the effects of the proposed action is extremely low. There is limited exposure of adult salmon to the proposed action. As described above in detail in Section B at the subheading *Indicators affected by the proposed action and effects to spawning, rearing and migratory habitat*, the adult migration life cycle stage overlaps with the in-water work windows at three waterways for 15 days and one waterway for 45 days. The possibility of SONCC or OC Coho Salmon adults being present during the latter part of the in-water period is rare since fall freshets generally occur in October and draw adults upstream in southwest Oregon (Lestelle 2007). Therefore, migration into ESA action area streams may not occur during the period of active operations in most years.

The discussion of effects of the proposed action that may result in harm or harassment (discussion follows in subsection D) determined that there are sub-lethal and potentially lethal effects to various life history stages of salmon in the ESA action area. These effects may ultimately reduce survival to adult life history stage for an undetermined, but likely very small number of salmon. At the sub-population scale, the effects cannot be meaningfully measured, detected or evaluated.

Local habitat capacity – Fish population characteristics pathway: population size and distribution indicator

The analysis of water quality and habitat MPI indicators determined that there would be measurable negative effects to several indicators. The effects to the **suspended sediment: intergravel DO/turbidity, chemical contamination/nutrients, substrate character and embeddedness, off-channel habitat** and **refugia** indicators were not discountable or insignificant. There would be a measurable positive effect to the **pool frequency and quality** and **large pools** indicators. The negative effects are short-term except for the **chemical contamination/nutrients** indicator (mercury persists in the environment). The negative effects to the indicators, largely short-term, suggest that there would be a slight reduction in local habitat capacity. However, this negative effect cannot be meaningfully measured, detected or evaluated.

In addition, the analysis of the effects of the proposed action to PCE of designated CH presented below for SONCC and OC Coho Salmon in subsections C.1 and C.2, respectively, determined that there would be measurable negative effects to multiple PCE. The negative effects to the PCE, largely short-term, suggest that there would be a slight reduction in local habitat capacity. However, this negative effect cannot be meaningfully measured, detected or evaluated.

INDICATOR SUMMARY

Overall, there would be an **insignificant negative (-) effect** to the **population size and distribution** indicator as a result of the proposed action. Analysis elsewhere in subsection V determined that there were negative effects to five habitat and water quality indicators, negative effects to several PCE of designated CH, and effects leading to harassment and potentially, to harm of individual Coho Salmon. Collectively, these would slightly reduce the number of adults in sub-populations and slightly reduce local habitat capacity, but the negative effects cannot be meaningfully measured, detected or evaluated.

MPI #7b. Fish population characteristics pathway: growth and survival indicator

The criteria for the indicator focus on:

- Resilience to recover from short term disturbances (e.g., catastrophic events) or subpopulation declines within one to two generations (5 to 10 years).
- Survival or growth rates being reduced from those in the best habitats.

The effect of the proposed action to the **growth and survival** indicator is insignificant and negative, because the effects to resilience to recover from short term disturbances or subpopulation declines, and to survival or growth rates being reduced from those in the best habitats, cannot be meaningfully measured, detected or evaluated. The rationale is presented below.

Resilience to recover from short-term disturbances or subpopulation declines – Fish population characteristics pathway: growth and survival indicator

There would be measurable negative effects to the **suspended sediment: intergravel DO/turbidit**y indicator, **chemical contamination/nutrients, substrate character and embeddedness, off-channel habitat** and **refugia** indicators. There would be a positive effect to the **pool frequency and quality** and **large pools** indicators. All are short-term effects except for the **chemical contamination** indicator (mercury persists in the environment). The negative effects to the indicators, largely short-term, would not have an effect on the resilience to recover from short term disturbances or subpopulation declines that could be meaningfully measured, detected or evaluated.

In addition, the analysis of the effects of the proposed action to PCE of designated CH presented below for SONCC and OC Coho Salmon in subsections C.1 and C.2, respectively, determined that there would be measurable negative effects to multiple PCE. The negative effects to the PCE, largely short-term, also would not have an effect on the resilience to recover from short term disturbances or subpopulation declines that could be meaningfully measured, detected or evaluated.

Survival or growth rates being reduced from those in the best habitats – Fish population characteristics pathway: growth and survival indicator

The discussion of effects of the proposed action that may result in harm or harassment (discussion follows in subsection D) determined that there are sub-lethal and potentially lethal effects to various life history stages of salmon in the ESA action area. These effects may ultimately reduce survival to adult life history stage for an undetermined, but likely very small number of salmon. At the sub-population scale, the effects cannot be meaningfully measured, detected or evaluated.

In addition, there is a small potential for harm to juvenile salmon by being entrained in a suction dredge, or by being stepped on. Suction dredge operations affect juvenile Coho Salmon behavior in several ways. They would move to avoid highly turbid plumes from suction dredge operations. Their feeding behavior may change as they consume macroinvertebrates in the plume. Cobbles would become embedded downstream from the dredge operation, reducing cover for juvenile salmon. There may be reduced quality of spawning gravels from deposition of fine sediment, resulting in lower egg to emergent fry survival. Collectively, these effects would immeasurably reduce survival or growth rates, and would have little to no effect on the resilience of salmon sub-populations to recover from catastrophic events or sub-population declines. However, these effects cannot be meaningfully measured, detected or evaluated.

Consequently, the conclusion is a short-term negative but insignificant effect to the **growth and survival** indicator.

INDICATOR SUMMARY

Overall, there would be an **insignificant negative (-) effect to the growth and survival** indicator as a result of the proposed action. Growth and survival may be negatively affected due to impacts to habitat, PCE of designated CH and direct impacts to the species. However, these effects are largely short-term and affect only a small proportion of the total habitat and numbers of Coho

Salmon in the ESA action area. Effects cannot be meaningfully measured, detected or evaluated, and are therefore insignificant.

C. Effects to primary constituent elements of critical habitat at the site scale

1. SONCC Coho Salmon ESU - effects of proposed activities to PCE of CH at the site scale.

Table 178 displays the PCE for SONCC Coho Salmon that apply to the ESA action area, and summarizes the effects of the proposed action. A detailed analysis follows.

Table 178. PCE of critical habitat for SONCC Coho Salmon applicable to the ESA action area and summary of the effects of the proposed action

Primary Constituent Elements		Effect of the Proposed Action
Site Type	**Site Attribute**	
Spawning and juvenile rearing areas	Cover/shelter	Measurable negative
	Food (juvenile rearing)	Measurable negative
	Riparian vegetation	Discountable negative
	Space	Measurable negative
	Spawning gravel	Measurable negative
	Water quality	Measurable negative
	Water quantity	Neutral
	Water temperature	Measurable positive
Adult and juvenile migration corridors	Cover/shelter	Measurable positive
	Food (juvenile)	Measurable negative
	Riparian vegetation	Discountable negative
	Safe passage	Insignificant negative
	Space	Measurable positive
	Substrate	Measurable negative
	Water quality	Measurable negative
	Water quantity	Neutral
	Water temperature	Measurable positive
	Water velocity	Discountable negative

The effects of the proposed action to the PCE are presented below in alphabetical order by site attribute (site type in parentheses). This analysis is informed by the factor analysis for the habitat indicators presented above in section B of this chapter.

Cover/shelter (spawning/juvenile rearing areas and adult/juvenile migration corridors) - Effect of project activities to PCE of CH at the site scale - SONCC ESU.

Spawning/juvenile rearing areas. There would be short-term measurable positive and short-term measurable negative effects to the cover/shelter PCE. A short-term measurable positive effect would be the use of turbidity plumes as cover by juvenile salmon (Bisson and Bilby 1982). Likewise, the temporary pools created by suction dredging may also be used as cover by juvenile rearing Coho Salmon and by spawning Coho salmon. A short-term measurable negative effect to the cover/shelter PCE would be a reduction of interstitial space between cobbles due to deposition of fines downstream from suction dredge operations. This would negatively affect cover for juvenile rearing Coho Salmon but would not affect cover for Coho Salmon spawners. Turbidity plumes could last from minutes to hours. Pools created by suction dredge operations must be backfilled before moving to a new site (CM 30a), and the last pool must be backfilled before the end of the in-water work window (CM 30b). Fines would be flushed from substrate during fall/winter freshets.

The overall effect to the cover/shelter PCE during the juvenile life cycle stage would be short-term, measurable and negative[11]. For the spawning life cycle stage it would be short-term, measurable and positive. Since the two life cycle stages are combined in the designated CH, the overall effect is short-term, measurable and negative.

Adult/juvenile migration corridors. For the combined life cycle stages of adult/juvenile migration, the effect to the cover/shelter PCE is short-term positive, as Coho Salmon may benefit from use of created pools and turbidity plumes for cover/shelter. It is not known to what degree the loss of interstitial space between cobbles in the streambed for short reaches of stream would affect the utility of migration habitat for out-migrating juvenile Coho Salmon. They may be too large to utilize interstitial spaces between cobbles as cover. Cover for upstream migrating adult Salmon would not be negatively impacted, as they are too large to use spaces between cobbles for cover. Also, the possibility of Coho Salmon adults being present during the latter part of the in-water period is rare since fall freshets generally occur in October and draw adults upstream in southwest Oregon (Lestelle 2007). Therefore, adult migration into ESA action area streams may not occur during the period of active operations in most years. Turbidity plumes could last from minutes to hours. Pools created by suction dredge operations must be backfilled before moving to a new site (CM 30a), and the last pool must be backfilled before the end of the in-water work window (CM 30b).

Food (juvenile rearing and juvenile migration corridors) – Effect of proposed activities to PCE of CH at the site scale - SONCC ESU.

There would be short-term measurable positive and short-term measurable negative impacts to the Food PCE for both life cycle stages. Entrainment of macroinvertebrates from substrate moved during suction dredging will result in greater availability of forage items in the drift for juvenile Coho Salmon in the short term. Salmonids have been observed actively feeding downstream from suction dredge operations (NMFS 2013). However, the suction dredging process removes various life stages of macroinvertebrates from substrate surfaces. Experiments and observations have determined that macroinvertebrates recolonize substrate that has been cleaned during the dredging process. Harvey and Lisle (1998), citing Griffith and Andrews (1981), Thomas (1985) and Harvey (1986), noted that the abundance and general taxonomic composition of benthic invertebrates can be restored on suction dredge tailings within four to six weeks. In addition, there will be a reduction in forage due to suction dredge tailings piles covering substrate. This negative effect is short-term and will last until the suction dredge tailing piles are removed and the formerly buried substrate is recolonized. There will be an overall short-term measurable negative effect to the PCE.

[11] In this case, there are measurable positive effects (rearing juveniles may use temporary dredge holes and turbidity plumes for cover) as well as a measurable negative effect (loss of cover from interstitial spaces being filled between cobbles). When this occurs, the conclusion is an overall measurable negative effect.

Riparian vegetation (spawning/juvenile rearing areas and adult/juvenile migration corridors) - Effect of proposed activities to PCE of CH at the site scale - SONCC ESU.

Riparian vegetation is protected by multiple CM applicable to the *suction dredging/high banking and onsite occupancy* PEs. There would be no impact to the riparian vegetation PCE that would affect its functions (e.g., instream habitat conditions, water quality and channel geometry). Therefore, the effect to the PCE is discountable.

Safe Passage (adult/juvenile migration corridors) - Effect of proposed activities to PCE of CH at the site scale - SONCC ESU.

The proposed action does not include the creation or removal of physical barriers to migration. It is not known if episodic turbidity events ranging from minutes to hours during daylight hours would negatively affect juvenile Coho Salmon out-migration or adult Coho Salmon upstream migration. However, since CM 29b does not allow the turbidity plume to fill the entire wetted perimeter, migrating Salmon could avoid the plume. Overall, the effect to the PCE would at most be characterized as short-term, negative but insignificant.

Space (spawning/juvenile rearing areas and adult/juvenile migration corridors) – Effect of proposed activities to PCE of CH at the site scale - SONCC ESU

There would be short-term measurable positive and short-term measurable negative effects to the PCE. Space likely to be utilized by rearing juvenile Coho Salmon, and to a lesser degree, Coho Salmon out-migrants and adult upstream migrants, would be created in temporary dredge holes, and would be a short-term measurable positive effect. Space would be reduced temporarily at the locations of suction dredge tailing piles, which would negatively impact use by rearing juvenile Coho Salmon. Interstitial spaces between substrate particles that may be used as cover would be reduced in the short-term from sediments.

It is not known to what degree the loss of interstitial space between cobbles in the streambed for short reaches of stream would affect the utility of migration habitat for out-migrating juvenile Coho Salmon. They may be too large to utilize interstitial spaces between cobbles as cover. Cover for upstream migrating adult Salmon would not be impacted, as they are too large to use spaces between cobbles for cover. Also, the possibility of Coho Salmon adults being present during the latter part of the in-water period is rare since fall freshets generally occur in October and draw adults upstream in southwest Oregon (Lestelle 2007). Therefore, adult migration into ESA action area streams may not occur during the period of active operations in most years. The positive and negative effects to the Space PCE would be short-term and small in magnitude.

In summary, there would be a short-term measurable negative effect to the Space PCE for the combined spawning/juvenile rearing areas designated CH. There would be a short-term, measurable positive effect to the Space PCE for the combined adult/juvenile migration corridor designated CH.

Spawning gravel (spawning) - Effect of proposed activities to PCE of CH at the site scale - SONCC ESU.

There will be a short-term, measurable negative effect to the PCE. The quality of spawning gravel may be reduced by deposition of fine sediments from turbidity plumes. This negative effect may be mitigated should fall freshets have sufficient power to remove fines prior to Coho spawning. Fines are also removed from spawning substrate by female Salmon during redd construction, which may also reduce the negative effect to the PCE. Harvey and Lisle (1998) identify a concern that adult salmon may spawn in unconsolidated gravels in dredge tailing piles. Harvey and Lisle (1999) studied Chinook Salmon redds constructed on dredge tailings and natural substrates in three tributaries of the Klamath River in California. They determined that net and maximum scour of redds on dredge tailings was significantly greater than scour on redds in natural substrates. However, dredge tailings piles under the proposed action would be removed to fill dredge holes prior to the onset of spawning by Coho Salmon in the fall. The extent to which the remaining disturbed streambed surface would still be attractive to spawners is not known.

Substrate (adult/juvenile migration corridors) – Effect of proposed activities to PCE of CH at the site scale - SONCC ESU.

It is not known to what degree increases in fine sediments and embeddedness of the streambed for short reaches of stream would affect the utility of migration habitat for out-migrating juvenile Coho Salmon. They may be too large to utilize interstitial spaces between cobbles as cover. Cover for upstream migrating adult Salmon would not be impacted, as they are too large to use spaces between cobbles for cover. Also, the possibility of Coho Salmon adults being present during the latter part of the in-water period is rare since fall freshets generally occur in October and draw adults upstream in southwest Oregon (Lestelle 2007). Therefore, adult migration into ESA action area streams may not occur during the period of active operations in most years.

The effect to the substrate aspect of the PCE would at most be characterized as short-term, negative but insignificant. However, out-migrating juvenile salmon would be both positively and negatively affected by effects on substrate that lead to changes in food availability, as described in the effects to the Food PCE, above. Overall, there will be a short-term measurable negative effect to the PCE.

Water quality (spawning/juvenile rearing areas and adult/juvenile migration corridors) - Effect of proposed activities to PCE of CH at the site scale - SONCC ESU

Water quality would be measurably negatively impacted in the short-term by turbidity plumes from active suction dredging and by remobilization of mercury and other trace metals from deep sediment in streambeds. The PCE would be negatively impacted throughout the juvenile rearing life cycle stage. Negative effects to the PCE would also occur during the tail of the juvenile out-migration life cycle stage in two waterways, and at the beginning of the adult migration life cycle stage for three waterways for 15 days and one waterway for 45 days. The possibility of Coho Salmon adults being present during the latter part of the in-water period is rare since fall freshets generally occur in October and draw adults upstream in southwest Oregon (Lestelle 2007). Therefore, migration into ESA action area streams may not occur during the period of active operations in most years.

Turbidity plumes would last from minutes to hours during daylight hours. CM 29a and 29b, respectively, do not allow plumes to extend greater than 300 feet in length or occupy the entire wetted perimeter. Mercury and other trace metals would be remobilized from deep sediment and dispersed at the site and downstream, on the streambed surface and in the turbidity plume.

There would be no active operations during the spawning life cycle stage that would affect the water quality PCE. Increases in turbidity from sediment delivered later in time to designated CH from erosion as a result of the onsite occupancy PE was determined to have an insignificant effect during the AP factor analysis. Consequently, there will be an insignificant effect to the water quality PCE during the spawning life cycle stage. However, since the designated CH combines the spawning life cycle stage with the juvenile rearing life cycle stage, the overall conclusion is a short-term, measurable negative effect the PCE.

Water quantity (spawning/juvenile rearing areas and adult/juvenile migration corridors) - Effect of proposed activities to PCE of CH at the site scale - SONCC ESU.

There is no causal mechanism in the proposed action that would affect water quantity. There would be a neutral effect to the water quantity PCE.

Water temperature (spawning/juvenile rearing areas and adult/juvenile migration corridors) – Effect of proposed activities to PCE of CH at the site scale - SONCC ESU.

This analysis is based upon conclusions described in detail in Section B above in the analysis for effects to **MPI #1a. Water quality pathway: temperature indicator**.

There would be a positive, short-term measurable effect to the water temperature PCE. A subset of dredge holes would intercept cool seepage water colder than surface flows. The effect would be short-term because dredge holes must be filled in before moving to a new site and by the end of the in-water work window. The effect would be localized and is not likely to be detectable beyond the dredge hole. Dredge holes intercepting cool seepage water would be utilized by rearing juveniles, and to a lesser degree by juvenile out-migrants and upstream migrating adults, as there is less overlap between the periods of out-migration and upstream migration with the in-water work windows. Dredge holes are not present when spawning takes place.

The conclusions in Section B for effects to the temperature indicator from both PE of the proposed action was that there was a discountable probability of a negative effect to the indicator (increase in water temperature). This applies to the same life stages as in the previous paragraph.

Considering an effect that is reasonably certain to occur (positive effect to water temperature by intercepting cool seepage water) and a negative effect that is extremely unlikely to occur (increase in water temperature), the overall effect to the PCE is short-term, measurable and positive.

Water velocity (adult/juvenile migration corridors) - Effect of proposed activities to PCE of CH at the site scale - SONCC ESU

There would be a discountable, short-term negative effect to the PCE. The only change in water velocity that might affect migration corridors would occur at the suction intake of the dredge hose. While it is possible for an out-migrating juvenile Coho Salmon to be entrained in the suction intake of the dredge hose, it is extremely unlikely, as Coho Salmon of that size would readily avoid it. Suction intake velocities would not affect migrating adults.

4. OC Coho Salmon ESU - effects of proposed activities to PCE of CH at the site scale

Table 179 displays the PCE for OC Coho Salmon that apply to the ESA action area, and summarizes the effects of the proposed action. A detailed analysis follows.

Table 179. PCE of critical habitat for OC Coho Salmon applicable to the ESA action area and summary of the effects of the proposed action

Primary Constituent Elements		Effect of the Proposed Action
Site Type	**Site Attribute**	
Freshwater spawning	Substrate	Measurable negative
	Water quality	Insignificant negative
	Water quantity	Neutral
Freshwater rearing	Floodplain connectivity	Neutral
	Forage	Measurable negative
	Natural cover	Measurable negative
	Water quality	Measurable negative
	Water quantity	Neutral
Freshwater migration	Free of artificial obstruction	Insignificant negative
	Natural cover	Measurable positive
	Water quality	Measurable negative
	Water quantity	Neutral

The effects of the proposed action to the PCE are presented below in alphabetical order by site attribute (site type in parentheses). This analysis is informed by the factor analysis for the habitat indicators presented above in section B of this chapter.

Floodplain connectivity (rearing) **-** Effect of proposed activities to PCE of CH at the site scale - OC ESU.

The proposed action will not affect the connectivity, quality, or function of floodplains in the ESA action area. At the beginning of Section B of this Chapter of the BA, it was determined during the analysis of **MPI #4c. Channel conditions pathway: Floodplain connectivity indicator**, that the proposed action has no causal mechanism to reduce the linkage of wetlands, floodplains and riparian areas to main channels. CM 30 and 34 require all dredge tailings piles and piles resulting from high banking to be replaced back into the excavations. This would prevent any disconnection with floodplains from occurring. The effect to the PCE is neutral.

Forage (rearing) - Effect of proposed activities to PCE of CH at the site scale - OC ESU.

There will be short-term measurable positive and short-term measurable negative impacts to the Forage PCE. Entrainment of macroinvertebrates from substrate moved during suction dredging will result in greater availability of forage items in the drift for juvenile salmon in the short-term. Salmonids have been observed actively feeding downstream from suction dredge operations (Thomas 1985). However, the suction dredging process removes various life stages of macroinvertebrates from substrate surfaces. Experiments and observations have determined that macroinvertebrates recolonize substrate that has been cleaned during the suction dredging process in time frames ranging from 4 to 6 weeks (Harvey and Lisle (1998) citing Griffith and Andrews (1981); Thomas (1985); and Harvey (1986). In addition, there will be a reduction in forage due to dredge tailing piles covering substrate. This negative effect will last until the dredge tailing piles are removed and the formerly buried substrate is recolonized. The overall effect to the Forage PCE is short-term, measurable and negative.

Free of artificial obstruction (migration) - Effect of proposed activities to PCE of CH at the site scale - OC ESU.

The proposed action does not include the creation or removal of physical barriers to migration. It is not known if episodic turbidity events ranging from minutes to hours during daylight hours would negatively affect juvenile Coho Salmon out-migration or adult Coho Salmon upstream migration. However, since CM 29b does not allow the turbidity plume to fill the entire wetted perimeter, out-migrating juveniles and adult Coho Salmon could avoid the plume. Overall, the effect to the PCE would at most be characterized as short-term, negative but insignificant.

Natural cover (rearing and migration) - Effect of proposed activities to PCE of CH at the site scale - OC ESU.

Rearing. There would be short-term measurable positive and short-term measurable negative effects to the cover/shelter PCE. A short-term measurable positive effect would be the use of turbidity plumes as cover by juvenile salmon (Bisson and Bilby 1982). Likewise, the temporary pools created by suction dredging may also be used as cover by juvenile rearing Coho Salmon. A short-term measurable negative effect to the cover/shelter PCE would be a reduction of interstitial space between cobbles due to deposition of fines downstream from suction dredge operations. Turbidity plumes could last from minutes to hours. Pools created by suction dredge operations must be backfilled before moving to a new site (CM 30a), and the last pool must be backfilled before the end of the in-water work window (CM 30b). Fines would be flushed from substrate during fall/winter freshets.

The overall effect to the cover/shelter PCE during the juvenile life cycle stage would be short-term, measurable and negative.[12]

Migration. The effect to the cover/shelter PCE is short-term positive, as migrating adult and out-migrating juvenile Coho Salmon may benefit from use of created pools and turbidity plumes for cover/shelter. It is not known to what degree the loss of interstitial space between cobbles in the streambed for short reaches of stream would affect the utility of migration habitat for out-migrating juvenile Coho Salmon. They may be too large to utilize interstitial spaces between cobbles as cover. Cover for upstream migrating adult Salmon would not be negatively impacted, as they are too large to use spaces between cobbles for cover. Also, the possibility of Coho Salmon adults being present during the latter part of the in-water period is rare since fall freshets generally occur in October and draw adults upstream in southwest Oregon (Lestelle 2007). Therefore, adult migration into ESA action area streams may not occur during the period of active operations in most years. Turbidity plumes could last from minutes to hours. Pools created by suction dredge operations must be backfilled before moving to a new site (CM 30a), and the last pool must be backfilled before the end of the in-water work window (CM 30b).

Substrate (spawning) - Effect of proposed activities to PCE of CH at the site scale - OC ESU.

There will be a short-term, measurable negative effect to the PCE. The quality of spawning gravel may be reduced by deposition of fine sediments from turbidity plumes. This negative effect may be mitigated should fall freshets have sufficient power to remove fines prior to Coho Salmon

[12] In this case, there are measurable positive effects (rearing juveniles may use temporary dredge holes and turbidity plumes for cover) as well as a measurable negative effect (loss of cover from interstitial spaces being filled between cobbles). When this occurs, the conclusion is an overall measurable negative effect.

spawning. Fines are also removed from spawning substrate by female Coho Salmon during redd construction, which may also reduce the negative effect to the PCE. The literature identifies a concern that adult salmon may spawn in unconsolidated gravels in dredge tailings piles (Thomas and Lisle 1998). However, dredge tailings piles would be removed to fill dredge holes prior to spawning by Coho Salmon in the fall. The extent to which the remaining disturbed streambed surface would still be attractive to spawners is not known.

Water quality (migration, rearing and spawning) - Effect of proposed activities to PCE of CH at the site scale - OC ESU

Water quality would be measurably negatively impacted in the short-term by turbidity plumes from active suction dredging and by remobilization of mercury and other trace metals from deep sediment in streambeds. The PCE would be negatively impacted throughout the juvenile rearing life cycle stage. Measurable negative effects from increased turbidity to the PCE would also occur during the tail of the juvenile out-migration life cycle stage in two waterways, and at the beginning of the adult migration life cycle stage for three waterways for 15 days and one waterway for 45 days. The possibility of Coho Salmon adults being present during the latter part of the in-water period is rare since fall freshets generally occur in October and draw adults upstream in southwest Oregon (Lestelle 2007). Therefore, migration into ESA action area streams may not occur during the period of active operations in most years.

Turbidity plumes would probably last from minutes to hours during daylight hours. CM 29a and 29b, respectively, do not allow plumes to extend greater than 300 feet in length or occupy the entire wetted perimeter. Mercury and other trace metals would be remobilized from deep sediment and dispersed at the site and downstream, on the streambed surface and in the turbidity plume.

There would be a short-term, measurable positive effect to water temperature in the subset of dredge holes that intercept cool seepage water. The effect would be localized and is not likely to be detectable beyond the dredge hole.

There would be no suction dredging active operations during the spawning life cycle stage that would affect the **water quality** PCE. Increases in turbidity from sediment delivered later in time to designated CH from erosion as a result of the *onsite occupancy* PE was determined to have a short-term insignificant effect during the AP factor analysis. Consequently, there will be a short-term insignificant effect to the **water quality** PCE during the spawning life cycle stage.

Water quantity (migration, rearing and spawning) - - Effect of proposed activities to PCE of CH at the site scale - OC ESU.

There is no causal mechanism in the proposed action that would affect water quantity. The effect to the PCE from the proposed action is neutral.

D. Effects to the species that may result in harm or harassment

This section discusses potential effects to individual Coho Salmon from the proposed action by exposed life cycle stage. The Pacific Eulachon and Green Sturgeon are discussed later in this section, D.8. Chemical Contamination, in relation to the estuary and mercury effects located off NFS lands and in the ESA action area.

Coho Salmon

Sources of potential harm or harassment were determined from scientific literature sources read for the purpose of analyzing effects to the MPI indicators and to the PCE.

The exposed life cycle stages to be evaluated were determined largely by the evaluation of the ODFW life-cycle timing tables for specific waterways within the state of Oregon with the in-water work windows for those waterways described below. Exceptions include: (1) exposure to fine sediment in spawning gravel and exposure to effects resulting from increased substrate embeddedness, (2) the potential effect of exposure to spawning on unstable dredge tailings, and (3) the potential effect of exposure to mercury or other trace metals. In these cases, effects would persist after the in-water work periods have ended.

The ESA definition of *harm* is an act that actually kills or injures fish (may include significant habitat modification or degradation that significantly impairs essential behavioral patterns such as breeding, spawning, rearing, migrating, feeding or sheltering). The ESA definition of *harass* is an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding or sheltering.

Chapter III, Table 6 and Table 9 in this document display the in-water work windows[13] for the waterways in the ESA action area. The work windows were compared with the life-cycle timing tables for specific waterways within the state of Oregon[14] to determine which life cycle stages for Coho Salmon would be present during the ODFW in-water work windows. The results were used to determine which life cycle stages of Coho Salmon would be potentially exposed to the effects of the action. The results indicate the following for waterways in the ESA action area:

The *spawning* life cycle stage is entirely outside of the in-water work windows.

The *egg incubation to fry emergence* life cycle stage is entirely outside of the in-water work windows.

The *juvenile rearing* life cycle stage occurs throughout the in-water work windows.

The *downstream juvenile migration* life cycle stage is predominately outside of the work windows, with the exception of two areas: Illinois River and Rogue River tributaries above Mariel. A detailed analysis of the potential exposure of Coho Salmon smolts in these two areas to the proposed action based upon available smolt trap data and smolt counts at Savage Rapids dam, and diel timing of out-migration, is presented in Appendix B.

- Illinois River: The work window begins on June 15 and out-migration extends to June 30. The overlap of two weeks is at the tail of the out-migration period. The peak out-migration period ends by May 30. The potential exposure of this life cycle stage to the proposed action can be framed by looking at the number of NOIs for the waterway. Under the proposed action, 188 NOIs would be allowed for the waterway.
- Rogue River tributaries above Mariel: The work window begins on June 15 and out-migration extends to July 15. The peak out-migration period ends by May 30, so the one-month overlap is at the tail of the out-migration period. The potential exposure of

[13] ODFW website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=timingtables
[14] ODFW website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=guidelineTimingTables

this life cycle stage to the proposed action can be framed by looking at the number of NOIs for the waterway. Under the proposed action, 15 NOIs would be allowed for the waterway.

The *upstream adult migration* life cycle stage overlaps with the in-water work windows for the following waterways: 1) Rogue River tributaries below Mariel (8/15 to 9/30); 2) Rogue River tributaries above Mariel (9/1 to 9/15); and, 3) Coquille River and tributaries (9/1 to 9/15).

The ODFW life-cycle timing table for the Rogue River tributaries below Mariel waterway described the timing for *adult holding* life cycle stage as “not applicable.” The ODFW life-cycle timing table for the Rogue River tributaries above Mariel waterway did not provide information regarding timing of the *adult holding* life cycle stage. The ODFW life-cycle timing table for the Coquille River indicated that the beginning of the *adult holding* life cycle stage is 9/15, which coincides with the end of the in-water work window. The possibility of SONCC or OC Coho Salmon adults being present during the latter part of the in-water period is rare since fall freshets generally occur in October and draw adults upstream in southwest Oregon (Lestelle 2007). Therefore, migration into ESA action area streams may not occur during the period of active operations in most years.

In summary, there will be no exposure of Coho Salmon or their habitat in the ESA action area to active operations of the proposed action during the *Incubation to Emergence, Spawning and Adult Holding* life cycle stages[15]. The *juvenile rearing* life cycle stage would be exposed to the proposed action during the entirety of the work windows in all waterways. The *downstream juvenile migration* life cycle stage is predominately outside of the work windows, with the exception of two areas: Illinois River and Rogue River tributaries above Mariel. The *upstream adult migration* life cycle stage overlaps with the in-water work windows for three waterways: 1) Rogue River tributaries below Mariel (8/15 to 9/30); 2) Rogue River tributaries above Mariel (9/1 to 9/15); and, 3) Coquille River and tributaries (9/1 to 9/15).

The risk of each potential effect is assessed. Table 180 lists the source of potential harm or harassment by Coho Salmon life cycle stage that may be affected. A detailed analysis follows in the text.

[15] While acknowledging that the ODFW life-cycle timing table for the Coquille River indicated that the beginning of the *adult holding* life cycle stage is 9/15, which coincides with the end of the in-water work window.

Table 180. Source of potential harm or harassment effect and associated Coho Salmon life history stages that may be affected

Source of Potential Harm or Harassment	Exposed Coho Salmon Life Cycle Stage(s)
1. Entrainment in suction dredge or impingement on screens	Juvenile rearing Juvenile out-migration
2. Trampling by wading by NOI operators	Juvenile rearing Juvenile out-migration
3. Displacement by dredge tailings	Juvenile rearing
4. Disturbance	Juvenile rearing Juvenile out-migration Adult upstream migration Adult holding
5. Spawning on unstable dredge tailings	Spawning Egg incubation through fry emergence
6. Stranding	Juvenile rearing
7. Fine sediment deposition on substrate	Juvenile rearing Juvenile out-migration Spawning Egg incubation through fry emergence
8. Chemical contamination	Juvenile rearing Juvenile out-migration Adult upstream migration Adult holding Spawning
9. Increased turbidity/suspended solids	Juvenile rearing Juvenile out-migration Adult upstream migration Adult holding
10. Impacts to forage/food	Juvenile rearing Juvenile out-migration

1. Entrainment - source of potential harm or harassment effect

Coho Salmon - entrainment or impingement on screens effects to the species that may result in harm or harassment

Of the life stages determined to be present during the in-water work windows, Adult Coho Salmon during the upstream migration and holding life cycle stages will not be exposed to entrainment because CM 21b requires suction dredging to cease if an adult Coho Salmon is present. In addition, adult Coho Salmon are too large to be entrained in a 4-inch or smaller diameter suction dredge nozzle, or impinged on a screen.

Suction dredges have pump and nozzle intakes that draw in water. CM 23b requires that dredge pump intakes be covered with 3/32nd inch mesh screen, preventing entrainment into the pump intake. However, it is possible that fish may be impinged on the screen.

Harvey and Lisle (1998) state that most juvenile fishes are likely to avoid or survive passage through a suction dredge. They cite an experiment by Griffith and Andrews (1981) where 36 juvenile and adult rainbow and brook trout were intentionally entrained in a suction dredge. No mortality was observed during the following 48 hours. Harvey (1986) found juvenile rainbow trout observed after passage through a suction dredge showed no immediate ill effects. However, there may be an increased risk of predation in the short-term as fish would be disoriented after passing through the suction dredge.

NMFS (2013) prepared a Biological Opinion (BO) regarding suction dredge activities of the Lolo Creek suction-dredging program in Idaho, with regard to ESA-listed steelhead trout (*O. mykiss*). They stated:

> "The action has the potential to harm, harass, or kill juvenile fish by sucking fish through dredges or against screens. However, this risk is exceedingly low because small dredging activities move slowly and juvenile mobility is increased due to higher summer water temperatures and the larger size of juvenile fish at this time of year."

The proposed action for this BA meets the criterion to be described as a small dredging activity that moves slowly. The maximum nozzle diameter for suction dredges in the Lolo Creek project is 5 inches, while it is 4 inches for the proposed action. However, the in-water work window for the Lolo Creek project is from July 15 to August 15, while the in-water work windows for the proposed action begin earlier and end later, thereby potentially involving smaller fish and colder water flows than the Lolo Creek example. Nevertheless, the risk of entrainment is reduced due to small dredging activities, which move slowly.

Rearing juvenile Coho Salmon at the fry stage are particularly vulnerable to entrainment. Because they have weak swimming speeds they typically utilize low velocity areas, often in shallow waters. These areas tend to be along the flow margins at the stream's edge. CM 25 prohibits operating the nozzle of a suction dredge within 3 feet of the lateral stream edge of the current water level. The CM will reduce, but not prevent, exposure of Coho Salmon fry to entrainment in suction dredges.

CDFG (2011) evaluates the potential for entrainment of fish into suction dredge nozzle intakes. The approach taken was to estimate flow velocities at the nozzle intake for different increments of nozzle diameters, then compare that to burst/darting speed by length of fish. They used a formula based upon length of a typical fish species, rather than for specific species, to determine dart speed. It is:

Dart Speed (m/s) = 9L, where L is the total length of a typical fish species

Nozzle intake flow velocities for suction dredges < 4 inches in diameter (that allowed under the proposed action) ranged from 100 to138 cm/s (3.3 to 4.5 ft./s). The highest velocity would overwhelm dart speed for fish estimated to be 154 mm (6.1 inches) in length. Consequently, fish that size or smaller would be vulnerable to entrainment.

The only specific literature reference that we could locate for juvenile Coho Salmon burst speeds is Taylor and McPhail (1985). Experiments determined that the mean burst speed for study groups of wild Coho Salmon from three different streams in British Columbia, calibrated to 5.5 cm (2.1 inches) standard length, ranged from 62.9 to 74.1 cm/s (2.1 to 2.4 ft./s), while maximum burst speed (the most athletic fish in each group) ranged from 102.3 to 104.7 cm/s (both round to 3.4 ft./s). Coho Salmon in this size class would be vulnerable to entrainment under the proposed action based upon the results of CDFG (2011).

Mean length for Coho Salmon out-migrants caught in smolt traps at the peak of downstream migration in five tributaries of the Upper Rogue River (Bear Creek, Little Butte Creek, West Evans Creek and Elk Creek), for varying years of record from 1998-2003, ranged from approximately 75 to 135 mm (3.0 to 5.3 inches) in length to (Vogt 2003). Fish in this size class range or smaller would be vulnerable to entrainment as determined by the CDFG (2011) analysis.

CM 32c prohibits the willful entrainment of fish in a suction dredge. However, despite the two CM that would reduce exposure to entrainment, and the fact that small dredging operations move slowly, it is probable that harm or harassment will occur to some individual Coho Salmon in the juvenile rearing and juvenile out-migrant life cycle stages as a result of suction dredge entrainment/impingement.

Macroinvertebrates – entrainment effects to the species that may result in harm or harassment

WDFW (2006), citing Griffith and Andrews (1981), stated that in a study on several streams in Idaho, over 3,500 macroinvertebrates were entrained during the collection of 12 ten-minute dredge samples using an intake diameter of 3 inches. Less than 1 percent of the entrained invertebrates died or had severe injuries as a result of passing through the dredge. Entrained macroinvertebrates would enter the drift and be available as food items for foraging Coho Salmon. However, the capability of substrate disturbed by the suction dredge to provide forage for Coho Salmon would be impaired until it was recolonized by macroinvertebrates. This meets the definition of harassment. Harvey and Lisle (1998), citing Griffith and Andrews (1981), Thomas (1985) and Harvey (1986), noted that the abundance and general taxonomic composition of benthic invertebrates can be restored on dredge tailings within four to six weeks.

2. Trampling by wading by NOI operators - source of potential harm or harassment effect

Injury or death to rearing juvenile and juvenile out-migrant Coho Salmon may occur from being trampled when wading by NOI operators. There is little information in the literature regarding the risk of this occurring. R2 Resource Consultants (2006), for WDFW, addressed the issue of impacts from wading during small-scale mining operations. However, their focus was on effects to incubating eggs and pre-emergent fry. The egg incubation to emergence life cycle stage of Coho Salmon will not be exposed to trampling associated with the proposed action because its timing does not coincide with that of the in-water work windows (see analysis at beginning of section B of this chapter).

Harvey and Lisle (1998) did not address the issue in their overview of effects of suction dredge mining on streams, although they addressed other biological effects. The topic is not addressed in CDFG (2011). The Lolo Creek BO (NMFS 2013) stated that some steelhead juveniles hiding in the streambed may be crushed from trampling by suction dredge miners.

We conclude that harm or harassment will occur to some individual Coho Salmon in the juvenile rearing and juvenile out-migrant life cycle stages by trampling during wading.

3. Displacement by dredge tailings - source of potential harm or harassment effect

Dredge tailings piles accumulate on the surface of the streambed. Juvenile Coho Salmon that occupied the space temporarily covered by dredge tailings would be displaced. Displacement is much more likely than entombment as the development of a dredge tailing pile is a gradual process. Displacement may result in increased competition for space with other juvenile Coho Salmon, movement to less favorable feeding positions, and an increased risk of predation. We conclude that harm or harassment will occur to some individual Coho Salmon in the juvenile rearing life cycle stage from displacement by dredge tailings.

4. Disturbance – source of potential harm or harassment effect

The Lolo Creek Suction Dredging Program BO (NMFS 2013) evaluated the effects of disturbance from suction dredge operations to steelhead (*O. mykiss*). NMFS concluded that noise from the suction dredge operation and repeated movements of miners within and adjacent to streams would lead to interruptions and alterations of normal behavior patterns to juvenile rearing steelhead. This may lead to lower feeding success that would reduce fish growth. However, it was also stated that NMFS and RRS personnel had observed fish (presumably juvenile rearing steelhead) actively feeding within a few feet of an operating suction dredge (NMFS 2013). While NMFS (2013) did not address specifically the effects to the juvenile steelhead out-migrant life cycle stage, we assume that the effects described above would be the same for steelhead out-migrants. We also conclude that the effects described above would be the same for the Coho Salmon juvenile rearing and juvenile out-migration life cycle stages, as well.

NMFS (2013) also evaluated potential delays in juvenile rearing steelhead movement through areas of action suction dredging during daylight hours. The conclusion was that it would be unlikely to have any appreciable effect on growth or survival.

CDFG (2011) stated that salmonids exhibit a fright response to sounds in their environment that is described as “startle” or “start” behavior. The behavior involves sudden bursts of swimming that are short in duration (usually < 60 cm). Rainbow trout in the 30-70 mm size class and Chinook Salmon fry exhibited startle responses to sound fields similar to those of small combustion engines in an experiment (Mueller et al. 1998 as cited by CDFG 2011). Coho Salmon in the ESA action area would be in these size classes.

CDFG (2011) assessed potential effects of disturbance to adult salmonids. They stated that it was reasonable to conclude that diving activity in association with dredging operations can affect fish behavior, but did not express what types of effects would occur to salmonids from reactions to divers, and to what life stages. They did state that disturbances may increase adult movement in pools and may increase adult stress (Campbell and Moyle 1992). Also, minor disturbances may harm adult salmonids because their energy supply is limited, and are particularly impacting when water temperatures are elevated (Nielsen et al. 1994). However, CM 32 states that no person shall disturb actively spawning salmon, and if adult salmon are encountered while operating a suction dredge, operations must stop and be relocated. CM 21b also requires suction dredging activity to cease if an adult salmon is present. CM 33h requires high banking to stop when Coho Salmon spawners are present.

We conclude that normal behavior patterns such as feeding and/or sheltering will be significantly disrupted by repeated disturbance due to suction dredge and high-banking operations during the juvenile rearing and juvenile out-migration life cycle stages. This meets the ESA definition of harassment. Because of the CM that require operations to stop when adult Coho Salmon are present, we conclude that disturbance to the individual Coho Salmon of the adult upstream migration and holding life cycle stages will not cause significant disruptions of normal behavior patterns such as breeding and/or sheltering.

5. Spawning on unstable dredge tailings – source of potential harm or harassment effect

Use of gravel in dredge tailings for spawning by Coho and Chinook salmon has been documented (Hassler et al. 1986, Harvey and Lisle 1998). Mortality of incubating eggs and sac fry may occur because the tailings are not as stable as natural gravel and could be scoured away by freshets (Harvey and Lisle 1999).

The risk of this occurring as a result of the proposed action is reduced, but not eliminated, by three CM. Dredge tailings piles would be removed to fill dredge holes by the end of the instream work-windows (CM 30), which is prior to the onset of Coho Salmon spawning. CM 31 requires that tailings remaining after the suction dredge holes are filled must be redistributed locally to avoid creating unstable spawning gravels. It also requires the NOI operator to rake or otherwise spread out all suction dredge tailing piles so that they are no more than 4-inches in depth and conform to the contour of the natural stream bottom. CM 34 requires all excavations created by high-banking operations to be filled to original contour levels prior to the end of the in-water work window. Consequently, there would be few remaining aggregations of gravel on the streambed created by the proposed action that would attract spawning Coho Salmon. There may not be the depth and velocities at those locations that spawners prefer because suction dredge operations are not allowed within 50 feet of Coho Salmon spawning habitat areas (CM 26). Such sites are described as being located at a pool tail crest (the head of a riffle).

Despite three CM that reduce the risk of gravels created by suction-dredging and high banking being used for spawning, with subsequent risk of redds being scoured, we conclude that a few redds may be constructed on unstable gravels. This would meet the ESA definition of harm to Coho Salmon in the spawning and egg incubation to emergence life cycle stages.

6. Stranding – source of potential harm or harassment effect

R2 Resource Consultants (2006), for WDFW, evaluated the issue of fish stranding as a result of suction dredging. When stream flows recede, fish could become trapped in depressions caused by suction dredging and exposed to predation. However, it was noted that no observations of stranding had been reported in the literature. CDFG (2011) states that dewatering or diversion of the stream channel may strand fish.

The potential for stranding is reduced, but not eliminated, by CM 30, 31 and 34 that require backfilling of excavations and recontouring of streambeds, thereby removing depressions in the streambed. The risk of dewatering parts of the stream channel, or diverting stream flow, is reduced by several CM: (1) CM 13 prohibits undercutting, eroding, destabilizing or excavation of streambanks; removing or disturbing boulders, rooted vegetation or embedded wood, and other habitat structure from streambanks as well as wood or rocks that extend from streambanks into the channel, (2) CM 14 prohibits creating dams, weirs, or otherwise concentrating flow that reduces the total wetted area of a stream, (3) CM 26c prohibits operating a suction dredge such that stream current or sluice discharge is directed into the stream bank, causing destruction of the natural form of the channel or widening the channel, and, (4) CM 26d prohibits diverting the flow into the bank.

Despite multiple CM that reduce the risk of stranding by eliminating depressions in the streambed, and reduce the risk of dewatering parts of the stream channel or diverting stream flow, we conclude that it is possible that juvenile rearing Coho Salmon may be stranded, and may die, as a result of the proposed action. This would meet the ESA definition of harm to Coho Salmon in the juvenile rearing life cycle stage. We anticipate this to be a rare event, as suggested by the R2 Resource Consultants (2006) statement that no observations of stranding as a result of suction dredge mining activities had been reported in the literature.

7. Fine sediment deposition on substrate – source of potential harm or harassment effect

Deposition of fine sediment will occur on substrate downstream from suction dredging and high-banking operations. This would occur during active suction dredge operations, and later in time when dredge tailings piles are used to fill excavations. It would also occur when freshets overtop areas where high banking has taken place. Fines would also be redistributed and dispersed with subsequent freshets.

Fine sediments on the streambed would result in increased embeddedness. This would physically limit interstitial space between particles, such as cobble, that may be used as rearing habitat and escape cover. Juvenile rearing Coho Salmon would be displaced to other areas, resulting in increased competition with other juvenile Coho, movement to less favorable feeding positions, and an increased risk of predation.

Food resources for juvenile rearing and juvenile out-migrating Coho Salmon would be negatively impacted, as physical space would be locally reduced for macroinvertebrates. An additional concern is less favorable substrate for certain macroinvertebrates as a result of deposition of fines. WDFW (2006), citing Everest et al. (1987) and Waters (1995), stated that mayflies, caddisflies, and stoneflies are favored by salmonids as food items, they prefer large substrate particles in riffles, and are negatively affected by fine sediment.

There is the potential for fine sediment deposition on gravel that would reduce its quality for use by spawning Coho Salmon. Fine sediment deposition can clog interstitial spaces, thereby reducing intergravel water velocities and dissolved oxygen levels (Stern 1988). This would reduce the availability of oxygenated water needed by incubating embryos and pre-emergent fry, as well as reduce the flushing of metabolic waste products. This has the potential to reduce survival and production of juvenile year-classes (Spence et al. 1996). Fine sediment atop redds can also lengthen the time that it takes for fry to emerge from the redd or entomb them completely (Koski 1966). This negative effect may be mitigated should fall freshets have sufficient power to remove fines prior to Coho Salmon spawning. However, this is dependent upon the fall flow regime for individual streams and may not occur prior to spawning activities. Fines are also removed from spawning substrate by female Coho Salmon during redd construction, which may also reduce the negative effect.

For the reasons described above, we conclude that there will be harm and/or harassment to Coho Salmon in the juvenile rearing, juvenile out-migration, spawning and egg incubation to emergence life cycle stages from the proposed action.

8. Chemical contamination – source of potential harm or harassment effect

Gasoline – chemical contamination effects to the species that may result in harm or harassment

Gasoline is toxic to aquatic organisms and may cause long-term adverse effects in the aquatic environment (3E Company 2012). EC50 and LC50 for various components of unleaded gasoline and species of aquatic life are presented in Appendix C. Effects to individual Coho Salmon for all life cycle stages present during the in-water work windows will range from avoidance behavior to death. Macroinvertebrates serving as forage for rearing juvenile and juvenile out-migrating Coho Salmon will also have the same range of effects. Loss of forage will result in reduced growth of rearing and juvenile out-migrant Coho Salmon.

We conclude that there will be harm and/or harassment to the following life cycle stages of Coho Salmon that may be exposed to a gasoline spill: juvenile rearing, juvenile out-migration, adult upstream migration, and adult holding.

Mercury or Other Metals – chemical contamination effects to the species that may result in harm or harassment

<u>Effects to Coho Salmon</u>

Introduction. Mercury (Hg) and trace metals that are remobilized from streambed sediments during suction dredging and high banking have the potential to negatively impact the food chain and health of Coho Salmon. Legacy Hg can occur in rivers and streams of the Rogue River basin as a result of historic gold mining practices that utilized elemental mercury in the Hg-amalgamation process. Legacy Hg can also occur from other anthropogenic sources (e.g. atmospheric deposition) and can naturally be found in the environment. The rearing juvenile life cycle stage of Coho Salmon will have the greatest exposure of all life cycle stages. Juvenile Coho Salmon may bioaccumulate methylHg (MeHg) as a result of eating macroinvertebrates that have MeHg within them. In addition, rearing juvenile coho salmon are present when the Hg and trace metals are initially mobilized by suction dredging in the water column, and will be exposed at a lesser degree to Hg from water passing over the gills.

Coho Salmon in the juvenile out-migration, adult upstream migration, adult holding, spawning, and egg incubation to emergence life cycle stages will also be exposed to Hg and trace metals to a lesser degree. The reasons are: (1) less time of exposure since these life cycle stages are temporary as opposed to year around juvenile rearing, (2) Hg and trace metals have settled into the streambed, (3) Hg and trace metals are transitory downstream in the system during subsequent high stream flows or while being cleaned out by the act of spawning, and (4) adult life stages do not consume forage contaminated by Hg or trace metals.

Fate and transport of Hg. The US EPA evaluated the fate and transport of Hg in the environment in a report to Congress (US EPA 1997). The report summarized sources and processes by which Hg impacts freshwater aquatic environments and is concentrated in fish tissue. Bloom (1992) as cited by US EPA (1997) described that over 95 percent of Hg in fish tissue is in the MeHg form. MeHg is the form that bioaccumulates upwards through the food chain. Sandheinrich and Wiener (2011) state that wild fish obtain >90 percent of the MeHg in their tissue from food, with much less obtained as a result of water passing over gills.

Inorganic Hg in a water body is methylated by microbial action and abiotic processes. It can occur in the water column as well as in bottom sediment. Abiotic processes that result in converting mercuric ions to MeHg include the presence of humic and fulvic acids in solution (Nagase et al., 1982 as cited in US EPA 1997).

There are several properties that influence the amount of MeHg in a water body that has sources of Hg. They include pH, anoxia, dissolved organic carbon, water temperature, concentration of sulfates, turbidity and the presence of wetlands (US EPA 1997). The US EPA (1997) describes that bacterial methylation rates increase under anaerobic conditions (primarily by anaerobic bacteria that are sulfate reducers). Higher temperatures and low pH also contribute to increased methylation. Reduction and demethylation occurs with increased water clarity. Waters with increased turbidity from high concentrations of dissolved organic carbon and solids are expected to have higher net rates of methylation.

In describing the model that was created to evaluate watershed fate and transport of Hg, US EPA (1997) stated: “Wetlands are expected to contribute more methyl Hg to the lake than other watershed elements.” In a study of southeastern Alaska watersheds, Nagorski et al. (2009) determined that there was a positive correlation between the percent wetlands in a watershed and levels of MeHg in streams as well as in the tissue of juvenile Coho Salmon.

Marvin-DiPasquale et al. (2011) describe the results of laboratory experiments examining whether sediment contaminated by legacy Hg from historic gold mining practices, mobilized from a riverine environment by suction-dredging or other means, would result in increased MeHg production at three different types of downstream depositional areas. The authors report on the result of spiking sediments from the mainstem South Fork Yuba River, Engelbright Lake (a deep reservoir downstream on the mainstem Yuba River), and from Delta Meadows wetland (a shallow, vegetated wetland in the San Francisco Bay delta), with Hg contaminated sediment from three sites. The three sites are in the vicinity of the South Fork Yuba River-Humbug Creek confluence area in California. The sites included a pit in a gravel bar on the mainstem South Yuba River (to simulate Hg contaminated overburden material at a dredging site), material from a cliff face of historic hydraulic mining debris, and material from the bedrock contact layer at a pit at the mouth of Humbug Creek, a tributary to the South Fork Yuba River (to simulate Hg contaminated sediment from the target area for suction dredgers).

These three sites varied 30 fold in initial concentrations of total Hg (THg). Concentrations in the <63 µm size class (clay-silt, determined to have the highest concentration of all sediment size classes) were 10.8 ppm at the bedrock contact layer site, 1.40 ppm at the hydraulic mining debris cliff face site and 0.26 ppm in the mainstem South Fork Yuba river gravel bar site.

Results indicate that statistically significant MeHg production during the 6-8 day duration of the “spiking” experiments occurred where the receiving sediment was from the deep reservoir and wetland sites. There was no statistically significant production of MeHg when the receiving sediment was from the South Fork Yuba River main channel. The authors suggest that the main-channel depositional zones of the South Fork Yuba River are not very conducive for MeHg production. The authors offer that the results are at least partially linked to the presence of organic matter in the receiving sediments. Organic matter is a primary factor that controls microbial rates, and sediments from the reservoir and wetland sites had higher organic content than that from the mainstem South Fork Yuba River sites.

US EPA (1997) also discussed what parameters were most sensitive to their model for predicting Hg concentrations in fish tissue. The most sensitive parameter was maximum monthly water temperature. Increased maximum water temperature leads to increased methylation and a subsequent increase in fish tissue concentrations. Higher levels of sediment total organic carbon also lead to increased methylation and increased concentration in fish tissue. Higher partitioning of MeHg to abiotic solids and sediments causes water column Hg levels to decrease and benthic concentrations to increase. Then, elevated levels of MeHg in benthic sediments enter the food chain from benthic biota to fish.

Another parameter affecting MeHg in fish tissue is the hydraulic residence time. Lower flow rates provide less dilution, leading to higher fish tissue concentrations. Average sunlight and light extinction coefficients affect water column reduction and demethylation. Increased light levels lead to lower MeHg concentrations in the water column and lower fish tissue levels of Hg.

Factors that affect bioaccumulation of MeHg include fish size, fish age and position within the trophic structure (US EPA 1997). Generally, the larger the fish, the older the fish, and the higher it is in the trophic structure, the greater the concentration of MeHg in its tissues. Of particular interest to this evaluation of the potential effects to Coho Salmon is the statement in US EPA (1997) when citing a study of lake trout Hg tissue concentration levels by MacCrimmmon et al. (1983): “Levels in trout appeared to increase dramatically when they become large enough (about 6 years old) to switch from a diet of benthic invertebrates to smelt.” US EPA acknowledged this phenomenon by stating that: “It is well known that the diet of a piscivorous fish changes with age, tending in many cases to be dominated by invertebrates until fish reach a critical size that allows them to prey efficiently upon small fish.” US EPA (1997) cited the conclusions of Monteiro et al. (1991) that for most piscivorous fish, the increase in Hg concentrations appear to be linear in younger fish but may be closer to exponential for older fish.

Fish tissue concentration threshold levels for sublethal/lethal Hg effects. A number of papers have synthesized existing information regarding the Hg concentration levels in fish tissue and associated sublethal/lethal effects. Several are discussed here, in chronological order of their publication, with their conclusions regarding threshold tissue concentration levels for sublethal and lethal effects. Generally, as more data sets have become available over time, the conclusions of the papers regarding concentration levels that may result in adverse effects to fish has led to a downward revision of the threshold levels for no effect.

Wiener and Spry (1996) state that for axial muscle tissue, field studies indicate that residues of 6 to 20 µg/g wet weight are associated with toxicity. Ranges for laboratory studies are similar. Sublethal effects or death are associated with muscle tissue residues of 5 to 8 µg/g in walleyes and 10 to 20 µg/g in salmonids. Sublethal or lethal toxic effects in adult salmonids are at levels of about 5 µg/g wet weight for brook trout and 10 µg/g for rainbow trout. They also estimated no-observed-effect concentrations in salmonids at 3 µg/g for the whole body and 5 µg/g for brain or axial muscle tissue. Wiener and Spry (1996) also speculated that tissue residue levels causing behavioral effects may be much lower than those associated with overt toxicity that were stated earlier in this paragraph.

Beckvar et al. (2005) as cited by Dillon et al. (2010), reported that Hg tissue concentrations below which are unlikely to cause adverse effects to fish were 0.2 mg/kg wet weight (equivalent to µg/g wet weight) in whole bodies of juvenile or adult fish and 0.02 mg/kg wet weight in early life stage fish. These were based primarily on endpoints such as survival, reproduction, growth, development and behavior.

Dillon et al. (2010) evaluated the results of 15 experiments for test endpoints associated with lethality, such as fish mortality, failure to spawn, failure to hatch and lethal developmental abnormalities. Seven of the experiments involved salmonids (brook trout, rainbow trout, and grayling). They used percent injury as a common metric across the differing biological endpoints.

Their dose-response curve for the juveniles/adults model (based upon 60 paired observations of percent injury and Hg tissue concentration) identified that at the smallest Hg tissue residue evaluated of 0.1 mg/kg (equivalent to µg/g wet weight), the predicted injury rate was 2.8 percent. At the same Hg tissue residue, the early life stage model (based upon 16 paired observations) predicted 19.8 percent injury. At a Hg tissue residue of 0.5 mg/kg, the predicted values were 13.2 percent and 55.2 percent injury, respectively. At 10 mg/kg, the predicted values were 77.8 percent and 96.1 percent injury, respectively.

Sandheinrich and Wiener (2011) also summarize the literature relevant to fish tissue concentrations of Hg and sublethal/ethal effects. They considered the work of Wiener and Spry (1996) and more current information. They concluded that even lower tissue concentration levels than those reported by Wiener and Spry (1996) are associated with adverse effects to fish. Effects on biochemical processes, damage to cells and tissues, and reduced reproduction in fish have been documented at MeHg concentrations of about 0.3-0.7 µg/g wet weight in the whole body and about 0.5-1.2 µg/g wet weight in axial muscle.

Rhea et al. (2012) citing Hamilton (2002) stated that whole-body tissue criteria used by Canada to evaluate the toxicological significance of Hg to fish is 0.5 µg/g wet weight. Rhea et al. (2012) citing Wiener and Spry (1996) also identified that whole-body Hg concentrations associated with lethal and sublethal effects in adult salmonids are approximately 5 µg/g wet weight for brook trout (*Salmo fontinalis*) and 10 µg/g wet weight for rainbow trout (*O. mykiss*); and critical Hg concentrations that affect earlier life stages, such as eggs and fry, may be less (e.g., 0.27 µg/g wet weight; Fjeld et al. 1998; Dillon et al. 2010).

Effects to fish from Hg exposure. A variety of adverse effects to fish from Hg exposure are identified in the literature. A list of such adverse effects described in Wiener and Spry (1996) are presented below. However, most of these effects were observed in fish in laboratory experiments given diets with MeHg concentrations typically much higher than that observed in nature, for water concentrations also typically far exceeding that found in nature and for tissue concentrations not likely to be observed in Rogue River juvenile Coho Salmon (please see analysis below in subsection titled “Tissue concentration of Hg in Rogue River fish.”). The range of Hg concentrations for rivers and streams is described as 1-7 ng/L (NJDEPE 1993 as cited by US EPA 1997). Citing Wiener and Spry (1996), US EPA (1997) states that in the laboratory, fish can accumulate high concentrations of MeHg via direct uptake from water if exposed to waterborne concentrations that greatly exceed those in toxic surface waters, which typically contain less than 1.0 ng Hg/L.

Laboratory experiments observations:

- Increased mortality
- Reduced growth
- Loss of coordination
- Inability to feed
- Diminished responsiveness
- Brain lesions
- Diminished escape behavior
- Deformities

- Teratogenic effects of waterborne mercury on fish embryos and larvae
- Reproductive impairment

Sandheinrich and Wiener (2011) provide a more comprehensive review of adverse effects to fish from Hg exposure. Only those effects that differ or are more specific than those described by Wiener and Spry (1996) and are for freshwater fish are presented below. Again, those specifically described for laboratory experiments result from dietary MeHg and inorganic Hg in solution concentrations that typically far exceed those found in nature.

Laboratory experiments observations (those for salmonid species identified):

- Reduced number of spawning fish
- Reduced sex hormones
- Delayed onset of spawning
- Reduced female gonadal somatic index
- Increased ovarian follicular apoptosis
- Changes in antioxidant enzyme activity (Atlantic salmon parr)
- Changes in gene transcription
- Histological change in brain (Atlantic salmon parr)
- Increased lipid peroxidative products (Atlantic salmon parr)
- Decreased neural enzyme activity (Atlantic salmon parr)
- Decreased feeding behavior (Atlantic salmon parr)
- Decreased mitochondrial energy metabolism
- Histological changes in skeletal muscle
- Histological changes in liver, gill and testes

Sandheinrich and Wiener (2011) also describe effects to fish (other than Coho Salmon) from field studies. Most of these effects are at tissue concentrations (reported variously as whole body, muscle or liver) that may be in the range of tissue concentrations hypothesized for juvenile Coho Salmon in the Rogue River (please see analysis below in subsection titled “Tissue concentration of Hg in Rogue River fish.”).

Field studies observations (those for salmonid species identified):

- Changes in gene transcription (cutthroat trout)
- Histological change in spleen and kidney (brook trout)
- Reduced plasma testosterone
- Reduced gonadal somatic index
- Reduced plasma estradiol
- Reduced condition factor and relative weight
- Changes 1 1-Ketotestosterone
- Reduced glutathione peroxidase selenium-dependent activity

- Reduced glutathione S-transferase activity
- Increased amount of lipofuscin in liver
- Increased histological change in liver
- Decreased hepatosomatic index

Sandheinrich and Wiener (2011) describe effects to fish behavior from Hg contamination (other than Coho Salmon) from published studies.

- Swimming and feeding behavior can be disrupted by chemicals at concentrations that subsequently reduced growth.
- Altered predator-evasion behavior to model avian predators was observed in adult shiners fed diets containing MeHg (Webber and Haines 2003).
- Permanent impairment of feeding efficiency and reduced competitive ability. Grayling embryos were exposed to treatments of aqueous MeHg for 10 days. No supplemental MeHg treatments, either in solution or feed, occurred for a 3-year period. The experimental grayling subjects were then tested for feeding efficiency with control grayling in foraging experiments with *Daphnia magna* as prey (Fjeld et al. 1998).

The results of other papers of interest describing effects to salmonids (and providing more detail for the grayling experiment performed by Fjeld et al. 1998) from dietary MeHg or Hg in solution are presented below.

- Negative impacts to olfactory function. Baatrup and Doving (1990) determined that Atlantic Salmon (S. salar) fed pellets containing methylmercuric chloride for 4 weeks or exposed to dissolved mercuric chloride at 270 µg Hg/L for 2, 6 and 12 hours all displayed Hg deposition in olfactory rosettes and their nerves. Impaired olfactory function can impact prey or predator recognition, food search, communication, orientation and migration.
- Increased mortality of developing embryos. Devlin and Mottet (1992) exposed groups of 50 embryonic Coho Salmon to concentrations of MeHg ranging from 0, 6, 13, 29, 62 and 139 µg /L continuously for 48 days in an incubator. There were three replicates. There was little mortality exhibited until about day 12 for each replicate. Groups exposed to the 62 and 139 µg/l solutions experienced increased mortality, with the highest concentration resulting in 100 percent mortality within the 48 day period in all three replicates.
- Permanent impairment of feeding behavior. Fjeld et al. (1998) exposed grayling embryos to concentrations of MeHg of 0.16, 0.8, 4.0 and 20 µg/l-1 during the first 10 days of development. These resulted in body concentrations of 0.09, 0.27, 0.63 and 3.80 µg Hg g-1 wet weight, respectively. Morphological disturbances were only found in the highest exposure group. Groups were tested three years later, at a mean size of 13.8 cm, for sublethal effects on foraging behavior. Groups were placed with control fish in aquaria and Daphnia magna were used as prey. Impaired feeding efficiencies and reduced competitive abilities were found in grayling from the exposed groups that as yolk-fry had Hg concentrations of 0.27 µg Hg g-1 or more.
- Induced hyperplasia in the gill epithelium in rainbow trout (*Oncorhynchus mykiss*) as a result of chronic exposure to dietary MeHg (Wobeser 1975 as cited by Liu et al. 2013).
- Impacted gene expression. Liu et al. (2013) describes experiments that exposed juvenile rainbow trout and young adult zebrafish to food with MeHg added at 0, 0.5, 5 and 50

ppm. At six weeks, 50 ppm dietary MeHg caused an accumulation of 30.6 ppm of total Hg in zebrafish and 10.7 ppm of total Hg in rainbow trout. Total RNA from individual fish were isolated and were randomly selected for microarray analysis to determine impacts to gene expression. For rainbow trout, a total of 20 microarrays were used to identify genes dysregulated in MeHg-treated rainbow trout, and 162 probes were found to be significantly dysregulated (FDR < 0.05) following MeHg exposure for six weeks. For zebrafish, a total of 24 microarrays were used to identify genes dysregulated in MeHg-treated zebrafish (12 array for male and female, respectively). 1,975 and 320 dysregulated genes were found for female and male fishes, respectively; (FDR<0.05). However in the Liu et al. (2013) study, exposed trout and zebrafish did not show overt signs of toxicity or pathology, nor were significant differences seen in mortality, length, mass, or condition factor.

Concentration of Hg in river water. US EPA (1997), citing NJDEPE (1993), describes the concentration of Hg in flowing waters (rivers and streams) as ranging from 1 to 7 ng Hg/L. Citing Wiener and Spry (1996), US EPA (1997) states that in the laboratory, fish can accumulate high concentrations of MeHg via direct uptake from water if exposed to waterborne concentrations that greatly exceed those in toxic surface waters, which typically contain less than 1.0 ng Hg/L.

ODEQ has a database that includes the results of testing for mercury concentrations in surface water samples taken from several locations in the Rogue River Basin (E. Brawner. pers. comm. 2014).

- Four of five samples collected from 12/17/80 to 10/28/81 from the Rogue River at the Lobster Creek bridge were <0.0005 mg/L Hg and were reported as non-detects. The fifth sample had an estimated value of 0.0012 mg/L.
- Four water samples collected at the Rogue River at Robertson Bridge (Merlin) site from 11/28/79 to 8/26/80 were <0.0005 mg/L Hg and were reported as non-detects.
- Six samples taken at the Rogue River 2.5 miles west of Grants Pass site from 11/28/79 to 12/16/80 were <0.0005 mg/L Hg and were reported as non-detects.
- Three samples taken at the Rogue River at Hwy 234 (north of Gold Hill) site from 11/28/79 to 5/20/80 were <0.0005 mg/L Hg and were reported as non-detects.
- Two samples taken at the Rogue River at Hwy 234 (Dodge Park) site on 2/26/80 and 5/20/80 were <0.0005 mg/L Hg and were reported as non-detects.
- Two samples taken at the Evans Creek at mouth (Rogue River) site on 2/26/80 and 8/26/80 were <0.0005 mg/L Hg and were reported as non-detects.
- One sample was collected at the City of Gold Hill PWS Intake, Rogue River at RM 120.61 site on 10/8/08 was <0.020 µg/L, and was reported as a non-detect.
- One sample was collected at the City of Gold Hill PWS Intake, Rogue River at RM 120.61 site on 10/8/08 was <0.020 µg/L, and was reported as a non-detect.
- One sample was collected at the Rogue River at RM 120.76, 200 yards upstream the City of Gold Hill PWS Intake site on 10/8/08 was <0.020 µg/L, and was reported as a non-detect.

Tissue concentration of Hg in Rogue River fish. Data available to the RRS for Rogue River basin fish identified to species is a limited 2010 data set from ODEQ (L. Pillsbury, pers. comm., 2014). There are no Coho Salmon or other salmonids in the data set. Data are available for smallmouth bass (*Micropterus dolomieu*) (SMB) (n= 4) and largemouth bass (*M. salmoides*) LMB (n=5) in Emigrant Lake near Ashland, OR. The RRS believes that these data are not relevant to the current analysis as Emigrant Lake is a reservoir and is not CCH. However, other information may be relevant regarding mercury levels in Emigrant Lake fish. Sampling in 2006 indicated that mercury levels in trout were far below human health standards, but sampling of other species resulted in a public health advisory against eating all non-trout Emigrant Lake caught fish (AP 2014).

Data are available for northern pikeminnow (*Ptychocheilus oregonensis*) (NPM) (n=5) sampled at the Robertson Bridge on the mainstem Rogue River near Merlin, Oregon. This area is within CCH. Whole body tissue mercury concentrations ranged from 0.34 to 0.54 mg/kg wet weight (equivalent to µg/g wet weight). Fish sampled ranged from 310-390 mm estimated total length. Hankin and Richards (2000) evaluated age and growth of NPM in the Columbia River and Snake River. Von Bertalanffy growth equations fit separately to male and female NPM were developed from data collected at locations in the Columbia River and Snake River. A fork length at age table was developed for the "Below Bonneville" location. If Rogue River NPM grow at similar rates, lengths represented in the Rogue River samples would correspond to ages 5 to 8 (acknowledging that total length is greater than fork length). Hankin and Richards (2000) report that NPM first begin eating juvenile salmonids at ages 4 and 5. NPM at the sizes sampled in the Rogue River are therefore piscivorous.

Data are also available for LMB (n=5) sampled upstream from the Raygold Dam on the mainstem Rogue River. This area is within CCH. Whole body tissue mercury concentrations ranged from 0.40 to 0.62 mg/kg wet weight (equivalent to µg/g wet weight). Fish sampled ranged from 412-455 mm estimated total length. Based upon a length at age chart for LMB created by the group Pennsylvania Bass, fish in this length group from a northern, fast-moving river would be in the 5 year old age class.[16] This is corroborated by another length at age chart created for northern Illinois. LMB in this length range would be 5 or 6 years old.[17] LMB begin shifting from a diet of plankton and insects to fish when they range from 50 mm to 100 mm total length (Goldstein 1993). The LMB sampled in the Rogue River are therefore piscivorous.

In contrast to the NPM and LMB sampled in the Rogue River in 2010, Coho Salmon smolts (age 1+) for five streams in the Rogue River basin (Elk Creek, Slate Creek, Bear Creek, Little Butte Creek and West Evans Creek) ranged from about 74 mm to about 135 mm mean length (whether fork length or total length is not reported) for varying periods of record between 1998 and 2003 (Vogt 2003). Mean fork lengths presented here were estimated from interpretation of a bar graph. In 14 of the 18 years of record, mean fork lengths ranged from 100-135 mm. Juvenile Coho Salmon are typically not piscivorous, in contrast to NPM and LMB, with the majority of their diet being aquatic macroinvertebrates and occasional terrestrial insects.

ODEQ also has Hg tissue concentration data for other fish sampled in the Rogue River basin from 9-14-80 to 8-11-92 (E. Brawner. pers. comm. 2014). However, there are difficulties with the data set. There are 18 results for tissue sample concentrations, but they cannot be connected to individual fish. There is an ODEQ sampling notebook that records the dates, locations in the Rogue River basin, numbers of fish and fish species. The number of fish sampled at the sites exceeds the number of numeric results. Nevertheless, the data is useful for presenting the range of Hg tissue concentrations in fish in the Rogue River basin. Most of the fish sampled were suckers,

[16] Accessed December 26, 2014 at http://fishingthebigd.com/index_Page373.htm
[17] Accessed December 26, 2014 at http://windycityfishing.com/bass_age_chart.htm

which would not be piscivorous. The information is presented below by site and date. All results are presented in milligrams / kilogram wet weight (equivalent to µg/g wet weight). Those from 1985, 1986 and 1992 were reported as dry weight. The RRS located a website that displays wet weight to dry weight conversion factors for eight species of Pacific ocean marine fish from waters in Alaska (CRESP 2014). The range was 4.3 to 5.6, and the source stated that in general the factor for fish is around 5. The values reported for Rogue River fish Hg tissue concentrations as dry weight were converted to wet weight by dividing using a factor of 5. The 18 Hg tissue concentration results range from a low of 0.00005 to a high of 0.13 milligrams / kilogram wet weight. Note that the "suckers" described below are likely to be Klamath smallscale suckers (*Catostomus rimiculus*).

Rogue River at Lobster Creek Bridge

- 1/27/81. 3 rainbow trout (no livers). Two results: 0.06 and 0.10.

Rogue River at Robertson Bridge

- 10/13/81. 4 suckers, 1 steelhead. Two results: 0.05 and 0.10.
- 9/28/82. 4 suckers, 1 18 inch Chinook. Two results: 0.08 and 0.13.
- 11/16/83. 3 suckers. One result: 0.05.
- 10/17/84. 6 suckers, 1 salmon. Two results: 0.02 and 0.07.
- 10/15/85. 5 suckers. One result: 0.00009.
- 9/9/86. 5 suckers. One result: 0.00006.
- 8/11/92. 24 suckers (362-450 mm fork length) and 1 rainbow trout (350 mm fork length. Four results: 0.0004, 0.007, 0.00013, 0.00005.

Illinois River at mouth

- 9/14/80. Unspecified number of Chinook Salmon, unknown life history stage. One result: <0.02.

Rogue River at bridge upstream of Agnes

- 9/9/1980. Unknown species and number. One result: 0.10.
- 9/14/1980. Unspecified number of Chinook Salmon, unknown life history stage. One result: 0.09.

Peterson et al. (2007) reports the results of a US EPA study that sampled fish for Hg tissue concentration assessment in rivers and streams of the western United States. They sampled 2,707 large fish (>120 mm total length). The large fish were divided into two groups: piscivores and non-piscivores. Genera with more than 50 individuals in the piscivore group included *Micropterus* (Bass,) Esox (northern pike) *Ptychocheilus* (pikeminnow) and *Sander* (sauger and walleye). Among the 10 genera of non-piscivores with more than 50 individuals were *Oncorhynchus* (cutthroat and rainbow trout) and Salmo (brown trout). They reported that "Large" fish tissue Hg levels were strongly related to both fish length and trophic guild (piscivorous / non-piscivorous). The mean Hg concentration in piscivores was nearly three times that of non-piscivores.

The US EPA reviewed concentration rates of mercury in tissue between trophic levels for fish in lake systems (US EPA 1997). The term used to describe this is a predator-prey factor (PPF). They described PPF3 as the predator-prey factor for forage fish feeding on contaminated zooplankton and PPF4 as that for piscivorous fish feeding on forage fish. While not an exact fit for juvenile Coho Salmon in a riverine environment, the RRS believes the closest PPF for juvenile Coho Salmon would be PPF3. For NPM and LMB in the Rogue River we believe the appropriate PFF would be PPF4.

There are a variety of PPF4 fish species for the 14 predator-prey pairings evaluated in Appendix D of US EPA (1997), including largemouth and smallmouth bass, northern pike, lake trout and walleye. PPF4 values ranged from 2.75 for lake trout feeding on bloater to 9.8 for northern pike and walleye feeding on spottail shiner and yellow perch. For LMB in Clear Lake, California with the prey species being silversides, the value was 7.1. The arithmetic mean was 5.29 with a standard deviation of 2.04. The median was 5.06.

Coho Salmon juveniles are within the ESA action area for less than 2 years (including incubation time in redds) compared to the 5-8 year ages represented in the NPM and LMB sampled in the Rogue River. Juvenile Coho Salmon are also one trophic level below NPM and LMB sampled in the Rogue River. Conditions in the Rogue River and its tributaries are likely at the lower range for methylation rates (considering water column pH, anoxia, dissolved organic carbon, water temperature, concentration of sulfates, turbidity and the presence of wetlands as discussed above in the *Fate and Transport of Hg* subsection).

Without data on MeHg concentrations in tissues of juvenile Coho Salmon in the Rogue River or its tributaries within the ESA action area, the RRS can only provide a possible range informed by the following sources of information:

- Hg tissue concentration levels for non-salmonid species, NPM and LMB, in the Rogue River in 2010 at two sites.
- PPF4 values provided in US EPA (1997).
- A factor of approximately 3 between Hg tissue levels in piscivorous vs non-piscivorous large fish in streams and rivers in the western United States determined by Peterson et al. (2007) for the US EPA study.
- Age, size and time of exposure differences between 1+ year old Coho Salmon and 5-8 year old NPM and LMB in the Rogue River.

The RRS conservatively uses the single highest tissue concentration of 0.62 µg/g wet weight for the 10 sampled NPM and LMB in the Rogue River in 2010. At that starting point, the RRS believes the greatest concentration of Hg in juvenile Coho Salmon tissue may be in the range of 0.12 to 0.21 µg/g wet weight (0.62 divided by a factor of 5.29 or 3). This range may even have smaller values if the conclusion by Monteiro et al. (1991), as cited by US EPA (1997) is in play here. That is, for most piscivorous fish, the increase in Hg concentrations appears to be linear in younger fish but may be closer to exponential for older fish. The Hg tissue concentration data from ODEQ for fish sampled in the Rogue River basin that cannot be connected to specific individual fish (displayed above), also suggests that the estimated range of 0.12 to 0.21 µg/g Hg wet weight for juvenile Coho Salmon may be high, as the highest reported concentration was 0.13 for the 18 reported tissue sample results.

There is little in the published literature regarding fish tissue concentration levels of Hg in stream segments known to be contaminated by Hg from legacy gold mining operations, as in the Rogue River. Rhea et al. (2012) describes a study that sampled mountain whitefish (*Prosopium williamsoni*) (MWF) and shorthead sculpin (*Cottus confusus*) (SSC) from the Yankee Fork of the

Salmon River, Idaho. Like many Rogue River tributaries, the Yankee Fork is a stream known to have historic mining activities that used the Hg amalgamation process to recover gold and silver, resulting in tailings and alluvium contaminated by Hg. The Yankee Fork at the time of the study had current placer and hard rock mining activities.

The bulk of the diet of MWF consists of aquatic macroinvertebrates, but also includes terrestrial insects on the surface, fish eggs and small fish (WGFD 2014).[18] The diet of SSC also consists of aquatic macroinvertebrates. COSEWIC (2010)[19] reports that the diet of SSC is mostly caddis and stonefly nymphs as well as chironomid larvae, while young-of-the-year (~0-3 months age class) forage primarily on chironomid larvae. Because the diet of both MWF and SSC is primarily or entirely aquatic macroinvertebrates, they can be considered to occupy the same trophic level as juvenile Coho Salmon in the ESA action area.

Mean whole fish concentrations of Hg for MWF in 2001 at sites in the Yankee Fork were reported in µg/g dry weight. The dry weight results of Rhea et al. (2012) were divided by a factor of 5 to convert them to wet weight tissue concentrations (derived from CRESP 2014 as described above), so as to compare them to tissue concentration levels reported for effects to fish in the literature.

Mean whole fish tissue concentrations for MWF at four sites in the Yankee Fork of the Salmon River in 2001 ranged from 0.06 to 0.11 µg/g wet weight (n = 4 or 5). For SSC in 2001 at two sites in the Yankee Fork the mean whole fish concentrations were 0.06 and 0.07 µg/g wet weight (n = 5). Mean whole fish concentrations of Hg for MWF in 2002 at four sites in the Yankee Fork ranged from 0.06 to 0.08 µg/g wet weight (n = 3 or 4). For SSC in 2002 at four sites in the Yankee Fork the mean whole fish concentrations ranged from 0.09 to 0.13 µg/g wet weight (n = 5).

These values suggest that the hypothesized range of Hg tissue concentrations of 0.12 to 0.21 µg/g wet weight for juvenile Coho Salmon in the ESA action area developed above may be reasonable. Rhea et al. (2012) concluded that the concentrations of Hg in whole MWF and SSC indicated a low risk of Hg-induced toxicity to fish. These ranges of tissue concentrations, at the high end, are near the threshold levels of no adverse effect to fish for the juvenile/adult fish model (0.13 µg/g would correspond to approximately a 3 percent injury rate), but correspond to about a 20 percent injury rate in the early life stage (~3-12 months age class) fish model created by Dillon et al. (2010).

The hypothetical range of tissue concentration developed above for Coho Salmon, would reflect *baseline* conditions in the ESA action area, where there is already a level of suction-dredge and high-banking activity. Values up to 0.21 µg/g wet weight are below the range of about 0.3-0.7 µg/g wet weight whole body described by Sandheinrich and Wiener (2011) at which effects on biochemical processes, damage to cells and tissues, and reduced reproduction in fish have been documented. However, the range of 0.12 to 0.21 µg/g wet weight does indicate some level of adverse effect predicted by models created for juveniles/adults and early life stages of fish from the work of Dillon et al. (2010), described above. Specifically the injury rate would range from 2.8 percent to approximately 5.5 percent from the juvenile/adult fish model, and 19.8 percent to approximately 33.0 percent from the early life stage fish model.

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[18] Accessed December 28, 2014 at: http://wgfd.wyo.gov/web2011/Departments/Wildlife/pdfs/SWAP_MOUNTAINWHITEFISH0000557.pdf

[19] Accessed December 28, 2014 at: http://sararegistry.gc.ca/default.asp?lang=En&n=69D4B716-1#_Toc305137480

A further caveat to this hypothesized range of Hg concentrations in tissues of juvenile Coho Salmon in the ESA action area is that there may be hot spot (higher concentrations) locations of Hg contamination that are unknown at this time. Fish at hot spots may have higher Hg tissue concentrations than at other sites.

Given the uncertainties and lack of site-specific information, the RRS finds it challenging to determine what the specific effects to juvenile Coho Salmon may be as a result of, at worst case, implementing all of the NOI allowed in the proposed action. The RRS acknowledges that some level of increased Hg exposure to habitat, the food chain, individual juvenile Coho Salmon and individuals of other life cycle stages of Coho Salmon is reasonably certain to occur. However, there is an incomplete understanding of the following:

- Background levels of Hg in the water column, streambed, tissue of macroinvertebrate food items and tissue of juvenile Coho Salmon.
- It is not known what potential increases above background levels of concentration would occur as a result of the proposed action for inorganic Hg and MeHg in the water column, food chain or within the streambed.
- Net methylation rates are unknown.
- The duration of any increases is unknown.
- The effects to Coho Salmon of likely small increases in concentration levels in the water column for time periods that are discontinuous are unknown (as opposed to the laboratory experiments cited above that were typically for concentration levels far exceeding that found in nature and in some cases for extended periods).

The US EPA discussed the potential effect of remobilization of Hg by small placer mining in Idaho for a National Pollutant Discharge Elimination System (NPDES) General Permit (US EPA 2012). The US EPA concluded that it had no specific information with which to predict the amount of MeHg generated from suction dredge mining or the impact that it would have on the aquatic food web.

While the RRS also has no specific information, the use of information from peer-reviewed articles and limited existing data for non-Coho Salmon in the Rogue River in the analysis above, suggests that baseline conditions for Hg concentrations in fish tissue of juvenile Coho Salmon in the Rogue River may be in the range of 0.12 to 0.21 µg/g wet weight whole body. The work of Dillon et al. (2010) suggests that this range results in some baseline level of adverse effects to fish. However, the hypothesized range is below the MeHg tissue concentrations of about 0.3 – 0.7 µg/g wet weight whole body at which effects on biochemical processes, damage to cells and tissues, and reduced reproduction in fish have been documented, as reported by Sandheinrich and Wiener (2011). Conservatively, using the information of Dillon et al. (2010), the RRS therefore concludes that the incremental increases in Hg exposure created by the proposed action will result in harm or harassment to Coho Salmon. The types of effects may encompass those described above.

The effects of Hg on Coho Salmon in the ESA action area are predominately due to MeHg accumulated in tissue from eating contaminated macroinvertebrates. The work of Marvin-DiPasquale et al. (2011), described above, suggests that riverine environments at sites where the suction dredging and high banking takes place on the RRS are not conducive to MeHg production. Their work suggests that Hg-contaminated fine sediments in the clay-silt sediment fraction may travel far downstream in the water column and settle in slow velocity areas, and that wetlands provide substrates rich in organic materials that are conducive to MeHg production. This suggests that wetlands in estuarine environments of the river systems of the RRS involved in this consultation may be areas where there is increased MeHg production as a consequence of the proposed action, and where adverse effects to Coho Salmon from MeHg contamination may occur.

The amount of increased MeHg production in these estuarine wetland areas is unquantifiable. However, it is known that the Rogue River, Chetco River and Elk River drainages in the SONCC Coho Salmon ESU have relatively short estuaries.

Mercury effects to Pacific Eulachon and Green Sturgeon

Introduction. The analysis above for the effects of the proposed action to Chemical Contamination that may result in harm or harassment to Coho Salmon resulted in an expansion of the ESA action area to include river estuaries. As described earlier in this sub-section, the work of Marvin-DiPasquale et al. (2011) suggests that wetlands in estuarine environments of the river systems of the RRS involved in this consultation may be areas where there is increased MeHg production as a consequence of the proposed action. Because the ESA action area includes estuaries, two additional fish species listed under the ESA are now included in the analysis for potential harm or harassment from the effects of Hg contamination. They are Pacific Eulachon and Green Sturgeon. The analysis for each of the two species follows.

Effects to Pacific Eulachon. Pacific Eulachon utilize estuaries and lower reaches of rivers in Oregon for parts of their life cycle. Federal Register 76 FR 65324 describes that Pacific Eulachon spawning in many rivers is limited to tidal-influenced reaches, but exceptions exist. Spawning generally occurs in the months of January, February and March in the coastal rivers of Oregon (76 FR 65324). The RRS could not find information regarding the length of time that adult Pacific Eulachon are present in river systems during their spawning run. Pacific Eulachon spawn once and die after spawning.

Fertilized eggs attach to substrate and hatch in 20 to 40 days. After hatching, larvae are carried downstream and dispersed by estuarine, tidal and ocean currents. Federal Register 76 FR 65324, citing Hay and McCarter (2000) describe that larval Pacific Eulachon may remain in low salinity surface waters of estuaries for several weeks or longer.

Pacific Eulachon are only found in the lowermost reaches of rivers and in estuaries. They are not present during the work window for suction gold dredge mining and high-banking activities. Therefore, the only potential effects of the action to Pacific Eulachon are from Hg contaminated sediment during the incubation time period and exposure to MeHg contaminated forage.

Newly hatched fry are approximately 4 millimeters long, are weak swimmers, and are washed downstream to the ocean as the yolk sac is absorbed (Parente and Snyder 1970). Soon after their yolk sacs are depleted they initiate feeding on pelagic plankton (WDFW and ODFW 2001). Fereral Register 76 FR 65324 describes the prey of larval and juvenile eulachon as “…including phytoplankton, copepods, copepod eggs, mysids, barnacle larvae, and worm larvae.” These are primarily marine prey species. Adult eulachon do not feed during spawning.

There would be no effect to adult eulachon from MeHg contamination during their spawning run because they do not feed during that time period. However, larvae and juvenile eulachon may be present in estuaries for several weeks or longer and are actively feeding. They may consume MeHg contaminated phytoplankton or zooplankton.

Newly hatched larvae would not have any MeHg in their tissues. It is not known if the amount of Hg potentially absorbed from bed particles during the incubation period, or MeHg accumulated during the residency period of “several weeks or longer” in estuaries would result in tissue accumulations sufficient to result in adverse effects to their health, behavior, or later in life to reproduction. It is possible that outliers in a year class of eulachon may be resident in an estuary for several months with greater exposure to MeHg contaminated food items, as may be true for juvenile Coho Salmon. It is also unknown what proportion of the Hg or MeHg that would be accumulated by larval or juvenile eulachon could be attributed to the proposed action.

Despite these uncertainties, and similar to the conclusion for effects to juvenile Coho Salmon from Hg presented earlier in Chapter V, the RRS conservatively concludes that the health, behavior or reproductive success at a later life history stage, of some individual eulachon may be negatively impacted by the proposed action, resulting in harm or harassment. There is no designated CH for the Southern DPS of eulachon in the ESA action area for this consultation.

Effects to Green Sturgeon. As described in Chapter III of this document, the Rogue River population of Green Sturgeon is part of the Northern DPS. The Northern DPS is not federally listed, and thus does not require consultation under the Endangered Species Act. Some Southern DPS sturgeon are known to stray into the Rogue River, though their distribution is limited to the tidal influence zone, which is approximately 5 miles downstream of USFS lands. Green Sturgeon in the Southern DPS do not spawn within the Rogue River.

Southern DPS Green Sturgeon are known to stray into the Rogue River, and likely other tidal influence areas of Southern Oregon rivers within the ESA action area. They are actively feeding during these times and will be exposed to food items contaminated by MeHg in these tidal influence areas as a result of the proposed action (see analysis of effects from Hg contamination to Coho Salmon presented earlier in this sub-section).

Green Sturgeon are long-lived. Bio-accumulation of MeHg may result in baseline tissue concentration levels in Green Sturgeon exceeding that described in the literature for negative effects to fish health, reproduction and behavior (see analysis for Hg effects to Coho Salmon earlier in this sub-section). Additional increments of MeHg from consumption of food items contaminated by MeHg as a result of the proposed action would exacerbate the negative impacts. In addition, the feeding behavior of Green Sturgeon (stirring up bed sediment) and the benthic orientation of the species result in further exposure to Hg contamination from bed particles transported and deposited in estuary areas as a result of the proposed action.

Consequently, the RRS concludes that the health, behavior or reproductive success of some individual Green Sturgeon of the Southern DPS may be negatively impacted by the proposed action, resulting in harm or harassment. There is no designated CH for the Southern DPS of Green Sturgeon in the ESA action area for this consultation.

9. Turbidity / suspended solids – source of potential harm or harassment effect

Potential lethal effects - turbidity/suspended solids effects to the species that may result in harm or harassment

It is unlikely that rearing Coho Salmon would die as a result of exposure to turbidity plumes resulting from active suction dredging in the proposed action. High levels of suspended solids for sustained periods of time are required to cause acute mortality in Coho Salmon. Experiments described in the literature that resulted in death have continuous exposure times extending for multiple days and/or turbidity/total suspended solids levels that far exceed that predicted to result from the proposed action. The proposed action will only have exposures of minutes to a maximum of 8 hours. CDFG (2009) stated that generally turbidity immediately downstream from active suction dredges would be in the range of 15-50 NTUs and the maximum total suspended solids (TSS) levels would be in the range of 300-340 mg/l. The proposed action also includes CM 29b that prohibits visible turbidity from covering the entire wetted perimeter of the stream, allowing affected Coho Salmon to avoid the plume.

Greene (2010) summarizes the existing literature on avoidance behavior of salmonids to increased turbidity:

> "Avoidance is the primary fish behavioral response to locally turbid water. All life stages of salmonids have been observed to prefer clear water when given the option of clear or turbid water (Bisson and Bilby 1982). Salmonids move laterally (Servizi and Martens 1992) and/or downstream to avoid turbid areas (McLeay et al. 1984, 1987). Avoidance of turbid water may begin as turbidities approach 30 NTU (Sigler et al. 1984; Lloyd 1987). Servizi and Martens (1992) noted a threshold for the onset of avoidance at 37 NTU (300 mg/l TSS). However, Berg and Northcoat (sic) (1985) provide evidence that juvenile Coho Salmon did not avoid moderate turbidity increases when background levels were low, but exhibited significant avoidance when turbidity exceeded a threshold that was relatively high (>70 NTU)."

Newcombe and Jensen (1996) present results for 10 trials to determine TSS levels that resulted in Coho Salmon death (Table D-1 in Appendix D). Nine of the trials reported the TSS level at which 50 percent mortality occurred at 96 hours exposure to Coho Salmon life stages described as fry, pre-smolts, smolts, under-yearling and juveniles. The TSS levels ranged from 509 to 35,000 mg/l, (Stober et al. 1981, Servizi and Martens 1992, Noggle 1978). The tenth study reported the TSS level at which there was 1 percent mortality over a 96 hour exposure period as 8,000 mg/l (Servizi and Martens 1992). The lowest concentration in these trials was 509 mg/l, far exceeding the maximum anticipated TSS levels immediately downstream from active suction dredges.

Newcombe and Jensen (1996) used 37 data sets to develop empirical severity-of-ill-effects scores for juvenile salmonids. The scores were then used to predict onset of lethal effects at various concentrations of suspended solids (mg/l) against time. At a duration of 7 hours it would require a concentration of 8,100 mg/l suspended solids for onset of lethal effects. At a duration of 24 hours it would require a concentration of about 1,100 mg/l suspended solids. Neither concentration is likely to occur under the proposed action.

Based upon the information presented above, we conclude that death to Coho Salmon in the juvenile rearing, juvenile out-migration, adult upstream migration, and adult holding life cycle stages will not occur as a result of projected maximum turbidity/TSS levels and 8 hour maximum exposure times occurring under the proposed action.

Potential sublethal effects - turbidity/suspended solids effects to the species that may result in harm or harassment

Newcombe and Jensen (1996) present a table that is a dose-response database for fish exposed to suspended sediment. Table D-1 in Appendix D is adapted from the Newcombe and Jensen (1996) table, and presents only those sources that studied effects on Coho Salmon. Summarized here are a sub-set of those sources that represent likely exposure times and TSS levels that would occur as a result of the proposed action. We consider that a dredge could operate for a maximum of 8 hours in a day and TSS levels would not exceed 340 mg/l under the proposed action. Within that time frame and TSS level, the following non-lethal effects to juvenile/under-yearling Coho Salmon were found in the literature by Newcombe and Jensen (1996):

- Alarm reaction (Berg 1983; Bisson and Bilby 1982)
- Avoidance behavior (Bisson and Bilby 1982; Servizi and Martens 1992)
- Cough frequency increased > fivefold (Servizi and Martens 1992)
- Changes in territorial behavior (Berg and Northcote 1985)
- Feeding rate decreased at TSS levels 25 to 250 mg/l (Noggle 1978)
- Feeding ceased at TSS level of 300 mg/l (Noggle 1978)
- Increased physiological stress (Berg and Northcote 1985)

Other sublethal effects of elevated suspended sediment levels noted by Bash et al. (2001) not already described above include:

- Gill trauma (Servizi and Martens 1987)
- Impacts on osmoregulation during smolting (Noggle 1978)
- Reduced risk of predation (Gregory and Levings 1988)
- Slower growth (Sigler et al. 1984)
- Changes in blood physiology indicating increased stress (Servizi and Martens 1987; Servizi and Martens 1992; Redding et al. 1987)
- Reduced reactive distance of salmonids to drifting prey (Barrett et al. 1992)
- Reduced prey capture success (Berg and Northcote 1985)

Increased turbidity and suspended solids can negatively affect macroinvertebrates, thereby impacting forage for juvenile Coho Salmon. Effects to macroinvertebrates can include increased invertebrate drift, feeding impacts and respiratory problems (Cederholm and Reid 1987, as cited in WDFW 2006). A reduction of macroinvertebrate availability would negatively impact growth of Coho Salmon in the juvenile rearing and juvenile out-migrant life cycle stages.

Conditions that may increase the impacts of suspended sediment to stream biota include smaller sediment particle size (Servizi and Martens 1987), high water temperatures (Servizi and Martens 1991), and higher organic content of the sediment (McLeay et al. 1987) (all cited in CDFG 2009).

For the reasons described above, we conclude that some individual Coho Salmon would be injured, and there would be significant disruptions of normal behavior patterns such as breeding, feeding, or sheltering as a result of increases in turbidity/TSS under the proposed action. This would affect the juvenile rearing, juvenile out-migration, adult upstream migration, and adult holding life cycle stages. This level of effects meets the definition of harm or harassment under the ESA.

10. Impacts to forage/food – source of potential harm or harassment effect

The capability of habitat to produce macroinvertebrate food items for rearing juvenile Coho Salmon and juvenile out-migrating Coho Salmon would be affected by the proposed action. This analysis is largely a synthesis of effects described earlier in Section V of this BA.

Macroinvertebrates would be entrained in suction dredges. As described in detail in subsection V.D.1 (effects that may result in harm/harassment, entrainment), above, entrained macroinvertebrates would enter the drift and be available as food items for foraging Coho Salmon. However, the capability of substrate disturbed by the suction dredge to provide forage for Coho Salmon would be impaired until it was recolonized by macroinvertebrates. The literature suggests that it can be restored on dredge tailings within four to six weeks.

As described in detail in subsections V.C.1 and V.C.2 (effects to PCE at the site scale, SONCC Coho Salmon and OC Coho Salmon, respectively), above, forage/food for juvenile rearing and out-migrating Coho Salmon would be negatively impacted, as physical space would be locally reduced for macroinvertebrates by fine sediment deposition downstream from dredge operations. Macroinvertebrates favored by salmonids as food items (i.e., mayflies, caddisflies, and stoneflies), prefer large substrate particles in riffles and are negatively affected by fine sediment. There would also be a temporary loss of macroinvertebrate production on substrate covered by the dredge tailings pile, and again when the dredge tailings pile is removed and put back into the dredge hole or spread out as required by several CM. This would set back the recolonization by macroinvertebrates.

Gasoline is toxic to aquatic organisms. Spills may result in mortality of macroinvertebrates, reducing availability of forage for juvenile rearing and out-migrating Coho Salmon. The health of individual macroinvertebrates may be impacted by contact with metallic mercury. The quality of macroinvertebrate forage may be negatively impacted by methyl mercury contamination, as it bioaccumulates in aquatic organisms. Please see subsection V.D.8 (effects that may result in harm/harassment, chemical contamination), above.

Subsection V.D.9 (effects that may result in harm/harassment, increased turbidity/suspended solids), above, describes effects of increased turbidity to macroinvertebrates and to feeding behavior of juvenile salmonids. Increased turbidity may negatively impact macroinvertebrates by increasing invertebrate drift, affecting feeding behavior and causing respiratory problems. Impacts to salmonid feeding behavior include decreased feeding rates, cessation of feeding, reduced reactive distance of salmonids to drifting prey, and reduced prey capture success.

For the reasons described above, we conclude that there would be significant disruptions of the normal behavior pattern of feeding to some individual Coho Salmon in the juvenile rearing and out-migrating life cycle stages under the proposed action. This level of effects meets the definition of harm or harassment under the ESA.

E. Effects at the watershed scale: overview

In this sub-section, the effects described earlier in Section V to MPI indicators, PCE of designated CH, and to individuals of the species at the site scale are evaluated at the watershed scale. The effects to the MPI indicators (subsection V.B), PCE (subsection V.C) and to individuals of the species that may result in harm or harassment (subsection V.D) are the same for each watershed, but would be proportional to the number of NOI allowed under the proposed action in each watershed and the corresponding length in feet of designated CH that may be affected. In other words, more habitat and individuals of the species would be impacted in the watersheds with higher numbers of NOI permitted.

Each individual watershed evaluation that follows includes:

- A summary of environmental baseline conditions from Chapter IV for the MPI indicators that were determined to be measurably negatively affected by the proposed action.[20]
- A description of limiting stresses at the watershed and Coho Salmon population scales presented in Chapter IV[21] that would be measurably negatively affected by the proposed action
  - For those limiting stresses measurably negatively affected by the proposed action, a description of affected PCE and life history stages
- Miles of designated CH on NFS lands, total watershed miles, and percentage of total watershed miles that are on NFS land
- Miles by Coho Salmon habitat intrinsic potential (IP) class[22] on NFS lands, total watershed miles by IP class and percentage of watershed totals by IP class on NFS lands
- Areas and total miles of designated CH that are withdrawn from mineral entry
  - Remaining miles available for suction dredging and high banking by IP class and by habitat use type.[23]
- History of past NOI
- Number of NOI allowed under the proposed action, total linear distance of stream projected to be affected, percentage of total watershed miles of Coho Salmon designated CH that would be affected, and maximum percentage of all high/medium combined habitat at the watershed scale that could be affected

The presentation of the Coho Salmon populations and watersheds that follow is similarly organized to that in Chapter IV. Populations are numbered and watersheds are listed alphabetically.

The linear stream distance of the effects at each NOI site is projected to be 433 feet. This distance was used to calculate the percentage of total designated CH by Coho Salmon habitat use type in each watershed that would be affected by the proposed action. A detailed description of the process is presented in Appendix F.

Table 181 displays the results for each watershed in the SONCC and OC Coho Salmon ESUs in the ESA action area. The total length of designated CH for SONCC Coho Salmon in each watershed was based on a combination of 1) Steelhead presence surveys to determine historic Coho Salmon habitat on NFS lands since CCH was not spatially delineated in the Federal Register 50 CFR Part 226 (NMFS 1999) and 2) SONCC Coho Salmon CH off NFS lands were based on ODFW steelhead presence survey data 2013 GIS map (as a surrogate for historic Coho

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[20] Suspended sediment: intergravel DO/turbidity, chemical contamination /nutrients, substrate character and embeddedness, off-channel habitat, and refugia.

[21] Limiting stresses by population are based upon information in the final SONCC Coho Salmon Recovery Plan (NMFS 2014). Those identified as principal limiting stresses for each population as bullet statements on the first page of each population description in the Recovery Plan were utilized for this analysis. Key limited life stage(s) were derived from the severity of stresses tables for each population in the Recovery Plan.

[22] IP classes are *high*, *medium* and *low*.

[23] Habitat use types include: *spawning and rearing*, *rearing and migration*, and *migration only.* Values based on a habitat type map derived from ODFW database, August 29, 2013 website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

Salmon habitat) website.[24] The total length of designated CH for OC Coho Salmon was based on the OC Coho Salmon ESU spatially delineated CH, Federal Register (FR) 50 CFR Part 226 (NMFS 1999).

Migration only habitat type rarely occurs on the RRS. It is only included within four watersheds in the SONCC Coho Salmon ESU in the ESA action area. They are: (1) Rogue River (144,672 feet, 27.4 miles); (2) Hellgate Canyon (156,288 feet, 29.6 miles); (3) Shasta Costa Creek-Rogue River (38,544 feet, 7.3 miles); and (4) Stair Creek-Rogue River (75,504 feet, 14.3 miles). These four watersheds also have habitat typed as *spawning/rearing* in addition to that typed as *migration only*.

None of the *migration only* habitat use type within each of the four watersheds is affected by the proposed action although the spawning/rearing habitat type within these watersheds is affected. The *migration only* habitat type in the ESA action area is only located on the mainstem Rogue River within NFS lands that was administratively withdrawn from mineral entry on September 10, 1958 by Public Land Order (PLO) 1726. The withdrawal extends to 1 mile on either side of the river for the protection and preservation of scenic and recreation areas adjacent to the river and its tributaries. This includes the river from the NFS lands boundary near Marial to the NFS lands boundary near the Lobster Creek Bridge. Only the remaining habitat type (*spawning/rearing*) within these watersheds located outside of the mineral withdrawn areas will be available for NOI.

[24] Website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

Table 181. Linear distance of designated critical habitat by habitat use type, by watershed, estimated maximum linear distance affected by NOI suction dredging by watershed, and percent of total linear distance of all habitat use types combined by watershed affected by NOI suction dredging and high banking on RRS NFS lands in the SONCC and OC Coho Salmon ESU

Coho Salmon ESU and Population	Watershed (5th Field)	Stream Length of Designated Critical Habitat by Habitat Use Type (linear distance – feet)				Estimated Maximum Linear NFSL Suction Dredge Disturbance (feet)	Percent NFSL Suction Dredge Disturbance of Watershed Total for All Habitat Use Types Combined
		Spawning/ Rearing	Rearing/Migration	Migration Only	Combined Total		
SONCC Coho Salmon ESU							
Chetco River	Chetco River	578,688	241,824	0	820,512	7,361	0.9%
Elk River	Elk River	206,976	82,896	0	289,872	2,165	0.7%
Illinois River	Althouse Creek	74,976	0	0	74,796	6,495	8.7%
	Briggs Creek[1]	3,696	0	0	3,696	2,165	58.6%
	Deer Creek	297,792	0	0	297,792	2,165	0.7%
	East Fork Illinois River	152,064	16,896	0	168,960	8,227	4.9%
	Indigo Creek	159,984	0	0	159,984	5,629	3.5%
	Josephine Ck. Illinois River	138,336	122,496	0	260,832	28,145	10.8%
	Klondike CK. Illinois River	96,624	128,832	0	225,456	2,165	1.0%
	Lawson Ck. Illinois River	56,496	53,328	0	109,824	2,165	2.0%
	Silver Creek	116,688	0	0	116,688	8,227	7.1%
	Sucker Creek	157,344	0	0	157,344	10,825	6.9%
	West Fork Illinois River	303,072	0	0	303,072	5,196	1.7%
Lower Rogue River	Lobster Creek	142,560	0	0	142,560	3,031	2.1%
	Rogue River	128,832	0	144,672	273,504	2,165	0.8%
Middle Rogue/Applegate Rivers	Hellgate Canyon-Rogue R.	204,864	0	156,288	361,152	6,495	1.8%
	Lower Applegate River	429,264	0	0	429,264	2,165	0.5%
	Middle Applegate River	228,624	0	0	228,624	1,000[2]	0.4%
	Shasta Costa Ck.-Rogue R.	78,144	0	38,544	116,688	2,165	1.9%
	Stair Creek-Rogue River	15,840	0	75,504	91,344	2,165	2.4%

Coho Salmon ESU and Population	Watershed (5th Field)	Stream Length of Designated Critical Habitat by Habitat Use Type (linear distance – feet)				Estimated Maximum Linear NFSL Suction Dredge Disturbance (feet)	Percent NFSL Suction Dredge Disturbance of Watershed Total for All Habitat Use Types Combined
		Spawning/ Rearing	Rearing/Migration	Migration Only	Combined Total		
	Upper Applegate River	159,456	0	0	159,456	3,897	2.4%
Pistol River	Pistol River	199,584	62,304	0	261,888	2,165	0.8%
Smith River	North Fork Smith River	294,624	0	0	294,624	2,165	0.7%
Upper Rogue River	Bear Creek	457,776	0	0	457,776	2,165	0.5%
	Elk Creek	283,536	0	0	283,536	2,165	0.8%
	Little Butte Creek	411,840	0	0	411,840	2,165	0.5%
Winchuck R.	Winchuck River	175,824	90,288	0	266,112	2,165	0.8%
OC Coho Salmon ESU							
Coquille R.	SF Coquille River[3]	231,264	276,672	0	507,936	3,464	0.7%
Sixes	Sixes River	178,992	177,408	0	356,400	3,031	0.9%

[1] There is a waterfall that is a barrier to Coho Salmon upstream passage on Briggs Creek. It limits designated CH to 0.7 miles. The lower ¼ mile of Briggs Creek is excluded from mineral entry due to it being within the boundary of the Wild and Scenic Illinois River. However, an additional ¼ mile above the waterfall barrier is included with regard to potential downstream effects to designated CH.

[2] There are only 1,000 feet of Coho Salmon Designated CH on the RRS that could be affected.

[3] The South Fork Coquille River within the RRSNF, though occupied by OC Coho Salmon, is exempt from critical habitat designation due to economic benefits of exclusion outweighing the benefits of designation as per the Federal Register, 50 CFR Parts 223 and 226 (NMFS 2008). A surrogate for historic Coho Salmon habitat is based using ODFW steelhead presence survey data 2013 GIS (off NFS lands) and RRSNF Anadromous Salmonid Fish Distribution; steelhead presence on NFS lands, website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

The watersheds are presented in descending order of potential impact by suction dredging under the proposed action (Table 182). The ranking is based upon the total linear distance affected by the proposed action for all habitat use types for Coho Salmon designated CH on NFS lands, divided by the total linear distance for all habitat use types for Coho Salmon designated CH in the entire watershed (far right column).

Table 182. Potential impact of suction dredge mining and high banking on NFS lands as a percentage of total designated critical habitat for all habitat use types combined at the watershed scale, in descending order

Population	Subbasin	Watershed (listed in order of highest to lowest percent of column 4)	Percent of Coho Salmon Designated CH (All Habitat Use Types Combined) in the Watershed Affected by Suction Dredging on NFS Lands
Illinois River	Illinois	1. Briggs Creek	58.6
		2. Josephine Creek – Illinois River	10.8
		3. Althouse Creek	8.7
		4. Silver Creek	7.1
		5. Sucker Creek	6.9
		6. East Fork Illinois River	4.9
		7. Indigo Creek	3.5
Middle Rogue/Applegate River	Applegate	8. Upper Applegate River	2.4
	Lower Rogue	9. Stair Creek – Rogue River	2.4
Lower Rogue River	Lower Rogue	10. Lobster Creek	2.1
Illinois River	Illinois	11. Lawson Creek –Illinois River	2.0
Lower Rogue River	Lower Rogue	12. Shasta Costa Creek – Rogue River	1.9
Middle Rogue/Applegate R	Lower Rogue	13. Hellgate Canyon – Rogue River	1.8
Illinois River	Illinois	14. West Fork Illinois River	1.7
		15. Klondike Creek – Illinois River	1.0
Chetco River	Chetco	16. Chetco River	0.9
Sixes River	Sixes	17. Sixes River	0.9
Pistol River	Pistol	18. Pistol River	0.8
Winchuck River	Chetco	19. Winchuck River	0.8
Middle Rogue/Applegate River	Lower Rogue	20. Rogue River	0.8
Upper Rogue River	Upper Rogue	21. Elk Creek	0.8
Elk River	Sixes	22. Elk River	0.7
Smith River	NF Smith	23. North Fork Smith River	0.7
Illinois River	Illinois	24. Deer Creek	0.7
SF Coquille River	SF Coquille	25. SF Coquille River	0.7
Upper Rogue River	Upper Rogue	26. Little Butte Creek	0.5

Population	Subbasin	Watershed (listed in order of highest to lowest percent of column 4)	Percent of Coho Salmon Designated CH (All Habitat Use Types Combined) in the Watershed Affected by Suction Dredging on NFS Lands
Lower Rogue River	Lower Rogue	27. Lower Applegate River	0.5
Upper Rogue River	Middle Rogue	28. Bear Creek	0.5
Middle Rogue /Applegate Rivers	Applegate	29. Middle Applegate River	0.4

The percentage of Coho Salmon designated CH affected by suction dredging on NFS, as a percentage of all designated CH in a watershed, ranges from 0.4 percent to 58.6 percent. Fifteen watersheds would have 1 percent or less of all Coho Salmon designated CH affected by the proposed action. Nine watersheds would range from >1 percent to 5 percent. Five watersheds range from 6.9 percent to 58.6 percent. The five watersheds most impacted by the proposed action are (organized by highest percentage to lowest): Briggs Creek (58.6%), Josephine Creek Illinois River (10.8%), Althouse Creek (8.7%), Silver Creek (7.1%), and Sucker Creek (6.9%). These five watersheds are all located in the Illinois subbasin.

F. Effects at the watershed scale: SONCC Coho Salmon ESU

1. Chetco River population

a. Chetco River watershed

The Chetco River watershed is in the Chetco River subbasin within the SONCC Coho Salmon ESU. Of the MPI indicators that would be measurably negatively affected by the proposed action, the environmental baseline is characterized as *Properly Functioning* for the chemical contamination/nutrients indicator and *At Risk* for the suspended sediment: intergravel DO/turbidity, substrate character and embeddedness, off-channel habitat, and refugia indicators.

The final SONCC Coho Salmon Recovery Plan (NMFS 2014) identifies the key limited life stage as “juvenile,” and the following principal limiting stresses for the Chetco River population:

- Lack of floodplain and channel structure
- Degraded riparian forest conditions

Of the principal limiting stresses, the proposed action would not measurably negatively impact floodplains or riparian forest conditions. Channel structure would be measurably negatively impacted in the short-term by temporary dredge tailings piles.

The final SONCC Coho Salmon ESA recovery plan discusses lack of floodplain and channel structure at section 3.1.6. The focus is on the loss of connectivity of low gradient, unconstrained stream reaches with floodplains that provide diverse, slow water habitats, particularly in off-channel areas. Stream channels that are straightened, diked or leveed also lose complex habitats and indirectly change timing of peak flows. Loss of large wood was also discussed. None of these aspects of floodplain and channel structure would be measurably negatively impacted by the proposed action.

However, channel structure would be measurably negatively impacted in the short-term and at the site-scale by temporary dredge tailings piles. PCE site attributes (and associated Coho Salmon life cycle stages) associated with effects from loss of channel structure by temporary dredge tailings piles that would be measurably negatively impacted include cover/shelter (juvenile rearing) and space (juvenile rearing).

The RRS manages about 77 percent of the watershed, including approximately 106 miles (68 percent) of the total 155.4 miles of Coho Salmon designated CH. The following percentages of the total watershed miles by Coho Salmon IP class that is designated CH are within the RRS:

- High IP: 8 percent (0.4 of 4.8 total watershed miles)
- Medium IP: 72 percent (95.1 of 132.0 total watershed miles)
- Low IP: 59 percent (10.9 of 18.6 total watershed miles)

On October 28, 1988, 44.5 miles of the Chetco River located in the RRS was designated for inclusion in the National System under the Omnibus Oregon Wild and Scenic Rivers Act (102 Stat. 2782 (1988)). On July 26, 2013, Federal Register, Public Land Order No. 7819 the lower 19 miles (outside the wilderness boundary) was withdrawn, for a period of 5 years, from location and entry under the United States mining laws and to leasing under the mineral and geothermal leasing laws while legislation is being considered to make a technical correction to Section 3(a)(69) of the Wild and Scenic Rivers Act (16 U.S.C. 1274(69)). This order withdrew approximately 5,610 acres of NFS lands subject to valid existing rights. There are 2 such active filed mineral claims near the lower boundary of NFS lands. The numerical analysis below regarding miles of stream withdrawn from mineral entry only considers the 44.5 miles withdrawn in 1988. It does not include the 19 miles outside the wilderness boundary that was withdrawn for a period of 5 years. The 2 active filed claims are within those 19 miles.

The upper segments of the river down to Boulder Creek are within the Kalmiopsis Wilderness and are designated as “Wild.” Mining, in some form, is part of the history of the upper and lower segments of this river. However, by virtue of being within the Wilderness, this segment of the river is automatically withdrawn from location. There are no active filed mining claims in this area. It should be noted that the upper portions of the Chetco River watershed and portions of several tributaries are composed of ultramafic geology. This geology often contains forests of stunted trees due to toxic elements in the soils and riparian areas are often sparse. Streams in ultramafic geology are generally warm in the summer, contain little instream large wood and Coho Salmon do not thrive in these environments (personnel communication with ODFW biologists, Chetco WA). Coho Salmon populations are intermittent in the upper Chetco River and some tributaries.

Mineral withdrawn areas within the watershed on NFS lands (42.6 miles) reduce the amount of IP habitat that is available for suction dredging and high banking as noted below:

- High IP: All 0.4 miles are withdrawn, leaving no high IP habitat
- Medium IP: 35.6 miles are withdrawn, leaving 59.5 miles available for mining. Of those miles:
    - 48.1 miles are typed *spawning/rearing*

- o 11.4 miles are typed *rearing/migration*
- o Low IP: 6.6 miles are withdrawn, leaving 4.3 miles available for mining. Of those miles:
- o 3.0 miles are typed *spawning/rearing*
- o 1.3 miles are typed *rearing/migration*

There were 14 active claims as of 5/8/2013 within ¼ mile of Coho Salmon designated CH. During the time period 2009 to 2012, the highest number of NOI filed (12) occurred during 2010, 2011 and 2012). The average number of NOI for the four years was 10.3 per year (Table 4). Approximately 8.5 NOI per year were for claims on the mainstem Chetco River, all in habitat typed as *rearing and migration*. Approximately 1.8 NOI per year were in tributary streams Emily Creek, Nook Creek and Quail Prairie Creek in habitat typed as *spawning and rearing* (Chapter 4, Table 18).

The proposed action would allow a maximum of 17 NOI annually in this watershed. If all 17 NOI were implemented in the same year, it would affect 7,361 linear feet (1.40 miles) of Coho Salmon designated CH. This represents 0.9 percent of all designated CH in the watershed (Chapter 4, Table 21) (1.40 of 155.4 miles that is typed *spawning/rearing* and *rearing/migration*). There is no Coho Salmon designated CH typed as *migration only* in the watershed. The maximum amount of medium IP habitat that could be affected by the proposed action in any year is 1.40 miles, or 1.5 percent of the 95.1 miles of medium IP habitat in the watershed.

2. Elk River population

a. Elk River watershed

The Elk River watershed is in the Sixes River subbasin within the SONCC Coho Salmon ESU. Of the MPI indicators that would be measurably negatively affected by the proposed action, the environmental baseline is characterized as *Properly Functioning* for the chemical contamination/nutrients indicator and *At Risk* for the suspended sediment: intergravel DO/turbidity, substrate character and embeddedness, off-channel habitat, and refugia indicators.

The draft SONCC Coho Salmon Recovery Plan (NMFS 2012) identifies the key limited life stage as “juvenile,” and the following principal stresses for the Elk River population:

- Lack of floodplain and channel structure
- Impaired water quality

Of the principal limiting stresses, the proposed action would not measurably negatively impact floodplains. Channel structure and water quality would be measurably negatively impacted in the short-term.

The draft SONCC Coho Salmon ESA recovery plan discusses lack of floodplain and channel structure at section 3.1.6. The focus is on the loss of connectivity of low gradient, unconstrained stream reaches with floodplains that provide diverse, slow water habitats, particularly in off-channel areas. Stream channels that are straightened, diked or leveed also lose complex habitats and indirectly change timing of peak flows. Loss of large wood was also discussed. None of these aspects of floodplain and channel structure would be measurably negatively impacted by the proposed action.

However, channel structure would be measurably negatively impacted in the short-term and at the site-scale by temporary dredge tailings piles. PCE site attributes (and associated Coho Salmon life cycle stages) associated with effects from loss of channel structure by temporary dredge tailings piles that would be measurably negatively impacted include cover/shelter (juvenile rearing) and space (juvenile rearing).

Water quality would be measurably negatively impacted in the short-term by increased turbidity, gasoline spills and mercury/trace metal contamination. The PCE site attribute (and associated Coho Salmon life cycle stage) associated with effects from impacts to water quality that would be measurably negatively impacted is water quality (juvenile rearing).

The RRS manages about 53 percent of the watershed, including 36.8 miles (63 percent) of the total 58.6 miles of Coho Salmon designated CH. The following percentages of the total watershed miles by Coho Salmon IP class that is designated CH are within the RRS:

- High IP: 11 percent (1.2 of 10.6 total watershed miles)
- Medium IP: 74 percent (32.2 of 43.8 total watershed miles)
- Low IP: 81 percent (3.4 of 4.2 total watershed miles)

As a result of Wild and Scenic River status and a ban by the State of Oregon on suction dredge mining in Scenic Waterways, there is no suction dredge mining activity in the mainstem of Elk River. Mineral withdrawals within the watershed on NFS lands (32.6 miles) reduce the amount of IP habitat that is available for suction dredging and high banking as noted below:

- High IP: 0.6 miles are withdrawn, leaving 0.6 miles available for mining. Of those miles:
    - 0.6 miles are typed *spawning/rearing*
- Medium IP: 29.4 miles are withdrawn, leaving 2.8 miles available for mining. Of those miles:
    - 2.8 miles are typed *spawning/rearing*
- Low IP: 2.6 miles are withdrawn, leaving 0.8 miles available for mining. Of those miles:
    - 0.8 miles are typed *spawning/rearing*

There was one active claim as of 5/8/2013 within ¼ mile of Coho Salmon designated CH and two NOI were submitted during the time period 2009 to 2012 (2010 and 2011 – one per year). During the time period 2009 to 2012, the highest number of NOI filed (1) occurred during 2010 and 2011. The average number of NOI for the four years was 0.5 per year (Chapter 1, Table 4). The NOI were both for the same claim on the mainstem Elk River at river mile (RM) 15.8 in habitat typed as *spawning and rearing* (Chapter 4, Table 28).

The proposed action would allow a maximum of 5 NOI annually in this watershed. If all 5 NOI were implemented in the same year, it would affect 2,165 linear feet (0.41 miles) of Coho Salmon designated CH. This represents 0.7 percent of all Coho Salmon designated CH in the watershed (Table 181) (0.41 of 58.6 miles that is typed *spawning/rearing* and *rearing/migration*). There is no *rearing/migration* habitat on NFS lands. There is no *migration only* habitat in the watershed.

The maximum amount of high IP habitat at the watershed scale that could be affected by the proposed action in any year is 3.9 percent (0.41 of 10.6 miles). The maximum amount of medium IP habitat at the watershed scale that could be affected by the proposed action in any year is 0.9 percent (0.41 of 43.8 miles).

3. Illinois population

a. Althouse Creek watershed

The Althouse Creek watershed is in the Illinois River subbasin within the SONCC Coho Salmon ESU. Of the MPI indicators that would be measurably negatively affected by the proposed action, the environmental baseline is characterized as *Properly Functioning* for the suspended sediment: intergravel DO/turbidity, chemical contamination/nutrients, and substrate character and embeddedness indicators, *At Risk* for the refugia indicator, and *Not Properly Functioning* for the off-channel habitat indicator.

The final SONCC Coho Salmon Recovery Plan (NMFS 2014) identifies the key limited life stage as “juvenile,” and the following principal stresses for the Illinois River population:

- Altered hydrologic function
- Degraded riparian forest conditions

The proposed action would not measurably negatively affect either of the principal limiting stresses for the Illinois River population.

However, among the additional factors limiting Coho Salmon production in the Althouse watershed, as determined by the FS and listed in Chapter IV, the only one that would be negatively measurably impacted by the proposed action is “lack of complex rearing habitat.” This would be a result of short-term negative impacts from temporary dredge tailings piles and by increased embeddedness of the substrate. PCE site attributes (and associated Coho Salmon life cycle stages) would be measurably negatively impacted by the loss of complex rearing habitat as a result of temporary dredge tailings piles and increased embeddedness of the substrate. They are cover/shelter (juvenile rearing) and space (juvenile rearing).

The RRS manages about 46 percent of the watershed, including 3.7 miles (26 percent) of the total 14.2 miles of Coho Salmon designated CH. There are no mineral withdrawn areas in the watershed. The following percentages of the total watershed miles by Coho Salmon IP class that are designated CH are within the RRS and are available for suction dredging and high banking:

- High IP: 0 percent (0.0 of 6.1 total watershed miles)
- Medium IP: 25 percent (1.4 of 5.5 total watershed miles) Of those miles:
  - 1.4 miles are typed *spawning/rearing*
- Low IP: 88 percent (2.3 of 2.6 total watershed miles). Of those miles:
  - 2.3 miles are typed *spawning/rearing*

There were 15 active claims as of 5/8/2013 within ¼ mile of Coho Salmon designated CH. During the time period 2009 to 2012, there were no NOI filed (Table 4).

The proposed action would allow a maximum of 15 NOI annually in this watershed. If all 15 NOI were implemented in the same year, it would affect 6,495 linear feet (1.23 miles) of Coho Salmon designated CH. This represents 8.7 percent of all Coho Salmon designated CH in the watershed (1.23 of 14.2 miles that is typed *spawning/rearing* in the watershed) (Table 181). There is no Coho Salmon designated CH typed as *rearing/migration* or *migration only* in the watershed.

There is no high IP habitat on the RRS. The maximum amount of medium IP habitat could be affected by the proposed action in any year is 1.23 miles, or 22.4 percent of the 5.5 miles of medium IP habitat in the watershed. This would occur in the extremely unlikely event that none of the 15 NOI would occur on the 2.3 miles of low IP habitat on the RRS, and is concentrated only on the 1.4 miles of medium IP habitat on the RRS.

The final SONCC Coho Salmon Recovery Plan (NMFS 2014) identifies that Coho Salmon rearing in Illinois River tributaries, such as Althouse Creek, is concentrated in small patches in the upper reaches just below federal land. The Althouse Creek watershed is relatively productive for Coho Salmon in the Illinois River basin. It had comparatively high juvenile Coho Salmon rearing densities in surveys done from 1998 to 2004.

b. Briggs Creek watershed

The Briggs Creek watershed is in the Illinois River subbasin within the SONCC Coho Salmon ESU. Of the MPI indicators that would be measurably negatively affected by the proposed action, the environmental baseline is characterized as *Properly Functioning* for all five: suspended sediment: intergravel DO/turbidity, chemical contamination/nutrients, substrate character and embeddedness, off-channel habitat, and refugia.

The final SONCC Coho Salmon Recovery Plan (NMFS 2014) identifies the key limited life stage as “juvenile,” and the following principal limiting stresses for the Illinois River population:

- Altered hydrologic function
- Degraded riparian forest conditions

The proposed action would not measurably negatively affect either of the principal limiting stresses for the Illinois River population.

However, an additional factor limiting Coho Salmon production in the Briggs Creek watershed, listed in Chapter IV, is natural falls migration barriers; barriers are considered to be a high stress to the Illinois River population. The proposed action would not affect this limiting factor.

The RRS manages about 95 percent of the watershed, including 100 percent of the total 0.7 miles of Coho Salmon designated CH. The following percentages of the total watershed miles by Coho Salmon IP class that are designated CH are within the RRS:

- High IP: 0 percent (Briggs Creek watershed has no high IP habitat)
- Medium IP: 100 percent (0.4 of 0.4 total watershed miles)
- Low IP: 100 percent (0.3 of 0.3 total watershed miles)

Suction dredge mining is not allowed within the Illinois River mainstem between Deer Creek and Nancy Creek or within ¼ mile of its tributaries (including Briggs Creek) because it was designated a Wild River in 1984 under the Wild and Scenic Rivers Act.

Mineral withdrawn areas within the watershed on NFS lands (0.25 miles) reduce the amount of IP habitat that is available for suction dredging and high banking as noted below:

- High IP: There is no high IP habitat in the watershed
- Medium IP: 0.25 miles are withdrawn, leaving 0.15 miles available for mining that is entirely typed *spawning/rearing*
- Low IP: 0 miles are withdrawn, leaving 0.3 miles available for mining that is entirely typed *spawning/rearing*

There were 5 active claims as of 5/8/2013 within ¼ mile of Coho Salmon habitat designated CH. No NOI were submitted during the time period 2009 to 2012.

The proposed action would allow a maximum of 5 NOI annually in this watershed. If all 5 NOI were implemented in the same year, it would affect 2,165 linear feet (0.41 miles) of Coho Salmon designated CH. This represents 58.6 percent of all Coho Salmon designated CH in the watershed (Table 181) (0.41 of 0.7 miles that is typed *spawning/rearing*). There is no Coho Salmon habitat typed as *rearing and migration* or *migration only* in the watershed. There is no high IP habitat in the watershed. The maximum amount of medium IP habitat that could be affected by the proposed action in any year is 0.15 miles (note, 0.25 miles of medium IP habitat is withdrawn from mineral entry), or 38 percent of the 0.4 miles of medium IP habitat in the watershed. The total 0.7 miles of Briggs Creek that is designated CH is located below the historic long-standing natural waterfall barrier to Coho Salmon. This stream reach has a steep gradient averaging 5 percent and has a channel that is constrained by a bedrock gorge. The high percentage of Coho Salmon designated CH that may be affected by the proposed action (58.6 percent) is somewhat of an anomaly. It is a result of the 5 NOI allowed under the proposed action being concentrated within a stream reach ¼ mile upstream from the barrier waterfall to Coho Salmon, downstream to within ¼ mile of the Illinois River.

c. Deer Creek watershed

The Deer Creek watershed is in the Illinois River subbasin within the SONCC Coho Salmon ESU. Of the MPI indicators that would be measurably negatively affected by the proposed action, the environmental baseline is characterized as *Properly Functioning* for chemical contamination/nutrients and off-channel habitat, *At Risk* for substrate character and embeddedness and *Not Properly Functioning* for suspended sediment: intergravel DO/turbidity and refugia.

The final SONCC Coho Salmon Recovery Plan (NMFS 2014) identifies the key limited life stage as “juvenile,” and the following principal stresses for the Illinois River population:

- Altered hydrologic function
- Degraded riparian forest conditions

The proposed action would not measurably negatively affect either of the principal limiting stresses for the Illinois River population.

However, among the additional factors limiting Coho Salmon production in the Deer Creek watershed, as determined by the FS and listed in Chapter IV, the only one that may be negatively measurably impacted by the proposed action is “lack of complex rearing habitat.” This would be a result of short-term negative impacts from temporary dredge tailings piles and by increased embeddedness of the substrate. PCE site attributes (and associated Coho Salmon life cycle stages) would be measurably negatively impacted by the loss of complex rearing habitat as a result of temporary dredge tailings piles and increased embeddedness of the substrate. They are cover/shelter (juvenile rearing) and space (juvenile rearing).

The RRS manages about 11 percent of the watershed, including 2.6 miles (4.6 percent) of the total 56.4 miles of Coho Salmon designated CH. The RRS manages a 1.9 mile long section of Deer Creek near its confluence with the Illinois River. This section is largely bedrock and boulder dominated, with lethal and sublethal stream temperatures for Coho Salmon in summer months. The RRS also manages a small section of Clear Creek, tributary to Deer Creek in this watershed.

Clear Creek is typed as low Coho Salmon IP on the RRS and Coho Salmon have not been detected on NFS lands in this stream. The watershed produces large numbers of Coho Salmon in its middle and upper sections that flow through a broad alluvial valley under largely private ownership.

The following percentages of the total watershed miles by Coho Salmon IP class that is designated CH are within the RRS:

- High IP: 0 percent (0 of 37.0 total watershed miles)
- Medium IP: 16 percent (2.3 of 14.7 total watershed miles)
- Low IP: 6 percent (0.3 of 4.7 total watershed miles)

There were 2 active claims as of 5/8/2013 within ¼ mile of Coho Salmon designated CH. During the time period 2009 to 2012 (Table 4), the highest number of NOI filed (1) occurred during 2012. The average number of NOI for the four years was 0.3 per year (Chapter I, Table 4). The NOI was for a claim at RM 0.4 on Deer Creek in habitat typed as *spawning and rearing* (Chapter 4, Table 45).

The proposed action would allow a maximum of 5 NOI annually in this watershed. If all 5 NOI were implemented in the same year, it would affect 2,165 linear feet (0.41 miles) of Coho Salmon designated CH. This represents 0.7 percent of all Coho Salmon designated CH in the watershed (Table 181) (0.41 of 56.4 miles that is typed *spawning/rearing*). There is no Coho Salmon designated CH typed as *rearing and migration* or *migration only* in the watershed. There is no high IP habitat in the watershed. The maximum amount of medium IP habitat that could be affected by the proposed action in any year is 0.41 miles, or 2.8 percent of the 14.7 miles of medium IP habitat in the watershed.

d. East Fork Illinois River watershed

The East Fork Illinois River watershed is in the Illinois River subbasin within the SONCC Coho Salmon ESU. Of the MPI indicators that would be measurably negatively affected by the proposed action, the environmental baseline is characterized as *Properly Functioning* for chemical contamination/nutrients and *At Risk* for suspended sediment: intergravel DO/turbidity, substrate character and embeddedness, off-channel habitat and refugia.

The final SONCC Coho Salmon Recovery Plan (NMFS 2014) identifies the key limited life stage as “juvenile,” and the following principal stresses for the Illinois River population:

- Altered hydrologic function
- Degraded riparian forest conditions

The proposed action would not measurably negatively affect either of the principal limiting stresses for the Illinois River population.

However, among the additional factors limiting Coho Salmon production in the East Fork Illinois River watershed, as determined by the FS and listed in Chapter IV, the two that may be measurably negatively impacted by the proposed action are “sedimentation” and “lack of complex rearing habitat.”

Sedimentation would result from deposition of fine sediment downstream from dredge operations. PCE site attributes (and associated Coho Salmon life cycle stages) would be measurably negatively impacted by sedimentation. They are cover/shelter (juvenile rearing), space (juvenile rearing), spawning gravel (spawning), food (juvenile migration) and substrate (juvenile migration).

Complex rearing habitat would be temporarily negatively impacted by temporary dredge tailings piles and by increased embeddedness of the substrate. PCE site attributes (and associated Coho Salmon life cycle stages) would be measurably negatively impacted by the loss of complex rearing habitat as a result of temporary dredge tailings piles and increased embeddedness of the substrate. They are cover/shelter (juvenile rearing) and space (juvenile rearing).

The RRS manages about 63 percent of the watershed, including 12.8 miles (40 percent) of the total 32.0 miles of Coho Salmon designated CH. There are no mineral withdrawn areas in the watershed. The following percentages of the total watershed miles by Coho Salmon IP class that are designated CH are within the RRS and are available for suction dredging and high banking as noted below:

- High IP: 5 percent (0.7 of 14.9 total watershed miles). Of those miles:
    - 0.7 miles are typed *spawning/rearing*
- Medium IP: 60 percent (5.5 of 9.2 total watershed miles). Of those miles:
    - miles are typed *spawning/rearing*
- Low IP: 84 percent (6.6 of 7.9 total watershed miles). Of those miles:
    - miles are typed *spawning/rearing*

There were 19 active claims as of 5/8/2013 within ¼ mile of Coho Salmon habitat and no NOI were submitted during the time period 2009 to 2012 (Table 4). The proposed action would allow a maximum of 19 NOI annually in this watershed. If all 19 NOI were implemented in the same year, it would affect 8,227 linear feet (1.56 miles) of Coho Salmon designated CH. This represents 4.9 percent of all Coho Salmon designated CH in the watershed (Table 181) (1.56 of 32.0 miles that is typed *spawning/rearing* and *rearing/migration*). There is no Coho Salmon designated CH typed as *migration only* in the watershed. The maximum amount of high IP habitat that could be affected by the proposed action in any year is 0.7 miles, or 10.5 percent of the 14.9 miles of high IP habitat in the watershed. The maximum amount of medium IP habitat that could be affected by the proposed action in any year is 1.56 miles, or 16.9 percent of the 9.2 miles of medium IP habitat in the watershed.

e. Indigo Creek watershed

The Indigo Creek watershed is in the Illinois River subbasin within the SONCC Coho Salmon ESU. Of the MPI indicators that would be measurably negatively affected by the proposed action, the environmental baseline is characterized as *Properly Functioning* for suspended sediment: intergravel DO/turbidity, chemical contamination/nutrients, substrate character and embeddedness, off-channel habitat and refugia.

The Indigo Creek watershed has not been documented to support Coho Salmon due to its geomorphology and associated low IP (Indigo WA 1994). The 2014 final SONCC Coho Salmon Recovery Plan reported, “Coho Salmon production potential is limited in other areas [outside of the upper Illinois Valley]. Tributaries of the lower Illinois River subbasin, such as Silver, Lawson, and Indigo creeks, are too steep and confined for Coho Salmon to flourish”.

The final SONCC Coho Salmon Recovery Plan (NMFS 2014) identifies the key limited life stage as “juvenile,” and the following principal stresses for the Illinois River population:

- Altered hydrologic function
- Degraded riparian forest conditions

The proposed action would not measurably negatively affect either of the principal stresses for the Illinois River population.

The RRS manages about 98 percent of the watershed, including 100 percent of the total 30.3 miles of Coho Salmon designated CH. The following percentages of the total watershed miles by Coho Salmon IP class that are designated CH are within the RRS:

- High IP: 0 percent (Indigo Creek watershed has no high IP habitat)
- Medium IP: 100 percent (25.7 total watershed miles)
- Low IP: 100 percent (4.6 total watershed miles)

Suction dredge mining is not allowed within ¼ mile of Illinois River tributaries since it was designated a Wild River in 1984 under the Wild and Scenic Rivers Act. Mineral withdrawn areas within the watershed on NFS lands (0.3 miles) reduce the amount of IP habitat that is available for suction dredging and high banking as noted below:

- High IP: There is no high IP habitat on NFS lands
- Medium IP: 0.3 miles are withdrawn, leaving 25.4 miles available for mining. Of those miles:
    - 25.4 miles are typed *spawning/rearing*
- Low IP: 0 miles are withdrawn, leaving 4.6 miles available for mining. Of those miles:
    - miles are typed *spawning/rearing*

There were 13 active claims as of 5/8/2013 within ¼ mile of Coho Salmon designated CH and no NOI were submitted during the time period 2009 to 2012 (Table 4). The proposed action would allow a maximum of 13 NOI annually in this watershed. If all 13 NOI were implemented in the same year, it would affect 5,629 linear feet (1.07 miles) of Coho Salmon designated CH. This represents 3.5 percent of all Coho Salmon designated CH in the watershed (Table 181) (1.07 of 30.3 miles that is typed *spawning/rearing*). There is no Coho Salmon designated CH typed as *rearing/migration* or *migration only* in the watershed. There is no high IP habitat in the watershed. The maximum amount of medium IP habitat that could be affected by the proposed action in any year is 1.07 miles, or 4.1 percent of the 25.4 miles of medium IP habitat in the watershed.

f. Josephine Creek-Illinois River watershed

The Josephine Creek-Illinois River watershed is in the Illinois River subbasin within the SONCC Coho Salmon ESU. Of the MPI indicators that would be measurably negatively affected by the proposed action, the environmental baseline is characterized as *Properly Functioning* for the chemical contamination/nutrients indicator and *At Risk* for the suspended sediment: intergravel DO/turbidity, substrate character and embeddedness, off-channel habitat, and refugia indicators.

The mainstem Illinois River in this watershed serves as a migration corridor for adult and juvenile Coho Salmon that are spawned in the upper Illinois subbasin and Deer Creek. The mainstem Illinois River has a habitat use type of *rearing/migration*.

The geology of the watershed results in low productivity for Coho Salmon. The final SONCC Coho Salmon Recovery Plan (2014) reported, “A substantial portion of the western Illinois River subbasin has serpentine ultramafic soils that naturally support sparse riparian conditions…that likely result in warm stream temperatures. Therefore, streams that flow from this terrain, such as Rough and Ready and Josephine Creeks, are unsuitable for Coho Salmon”. The plan expanded that, “In most cases, coho Salmon are naturally absent from steep lower Illinois River tributaries and those that drain the serpentine bedrock area of the western part of the subbasin (e.g., Rough and Ready and Josephine Creeks)”. Coho Salmon juveniles have not been detected in Josephine Creek and its tributaries such as Days Gulch and Canyon Creek in multiple snorkel censuses between the 1980s and 2010s.

The final SONCC Coho Salmon Recovery Plan (NMFS 2014) identifies the key limited life stage as “juvenile,” and the following principal stresses for the Illinois River population:

- Altered hydrologic function
- Degraded riparian forest conditions

The proposed action would not measurably negatively affect either of the principal stresses for the Illinois River population.

Among the additional factors limiting Coho Salmon production in the Josephine Creek-Illinois River watershed, listed in Chapter IV, the only one that may be negatively measurably impacted by the proposed action is “lack of complex rearing habitat.” Complex habitat would be temporarily negatively impacted by dredge tailings piles and by increased embeddedness of the substrate. PCE site attributes (and associated Coho Salmon life cycle stages) would be measurably negatively impacted by loss of channel structure as a result of temporary dredge tailings piles and increased embeddedness of the substrate. They are cover/shelter (juvenile rearing) and space (juvenile rearing).

The RRS manages about 98 percent of the watershed, including 37.7 miles (76 percent) of the total 49.4 miles of Coho Salmon designated CH. The following percentages of the total watershed miles by Coho Salmon IP class that are designated CH are within the RRS:

- High IP: 0 percent (0 of 0.7 total watershed miles)
- Medium IP: 84 percent (33.1 of 39.2 total watershed miles)
- Low IP: 48 percent (4.6 of 9.5 total watershed miles)

Mineral withdrawn areas within the watershed on NFS lands (14.4 miles) reduce the amount of IP habitat that is available for suction dredging and high banking as noted below:

- High IP: There is no high IP habitat on NFS lands
- Medium IP: 13.7 miles are withdrawn, leaving 19.4 miles available for mining. Of those miles:
    - 15.5 miles are typed *spawning/rearing*
    - 3.9 miles are typed *rearing/migration*
- Low IP: 0.7 miles are withdrawn, leaving 3.9 miles available for mining. Of those miles:
    - 3.8 miles is typed *spawning/rearing*
    - 0.1 miles is typed *rearing/migration*

There were 130 active claims as of 5/8/2013 within ¼ mile of Coho Salmon designated CH. During the time period 2009 to 2012, the highest number of NOI filed (8) occurred during 2009. The average number of NOI for the four years was 4.5 per year (Chapter I, Table 4). All the NOI were filed for Josephine Creek or for Fiddler Gulch, a tributary to Josephine Creek, although active claims are present elsewhere in the watershed. Habitat in Josephine Creek and Fiddler Gulch is typed as *spawning and rearing*. Approximately 3.8 NOI per year were for claims on the mainstem of Josephine Creek, and approximately 0.8 NOI per year were in Fiddler Gulch (Chapter 4, Table 62).

The proposed action would allow a maximum of 65 NOI annually in this watershed. If all 65 NOI were implemented in the same year, it would 28,145 linear feet (5.33 miles) of Coho Salmon designated CH. This represents 10.8 percent of all Coho Salmon designated CH in the watershed (Table 181) (5.33 of 49.4 miles that is typed *spawning/rearing* and *rearing/migration*). There is no Coho Salmon designated CH typed as *migration only* in the watershed. There is no high IP habitat on NFS lands. The maximum amount of medium IP habitat that could be affected by the proposed action in any year is 5.33 miles, or 13.6 percent of the 39.2 miles of medium IP habitat in the watershed.

g. Klondike Creek-Illinois River watershed

The Klondike Creek-Illinois River watershed is in the Illinois River subbasin within the SONCC Coho Salmon ESU. Approximately 97% of the watershed is located within the Kalmiopsis Wilderness Area. Of the MPI indicators that would be measurably negatively affected by the proposed action, the environmental baseline is characterized as *Properly Functioning* for suspended sediment: intergravel DO/turbidity, chemical contamination/nutrients, substrate character and embeddedness, off-channel habitat and refugia.

The final SONCC Coho Salmon Recovery Plan (NMFS 2014) identifies the key limited life stage as “juvenile,” and the following principal stresses for the Illinois River population:

- Altered hydrologic function
- Degraded riparian forest conditions

The proposed action would not measurably negatively affect either of the principal stresses for the Illinois River population.

The RRS manages 100 percent of the watershed, including all of the total 42.7 miles of Coho Salmon designated CH. The following percentages of the total watershed miles by Coho Salmon IP class that are designated CH are within the RRS:

- High IP: 0 percent (Klondike Creek-Illinois River watershed has no high IP habitat)
- Medium IP: 100 percent of the 33.1 total watershed miles
- Low IP: 100 percent of the 9.6 total watershed miles

Suction dredge mining is not allowed within the Illinois River mainstem between Deer Creek and Nancy Creek or within ¼ mile of its tributaries because it was designated a Wild River in 1984 under the Wild and Scenic Rivers Act. Mineral withdrawn areas within the watershed on NFS lands (40.9 miles) reduce the amount of IP habitat that is available for suction dredging and high banking as noted below:

- High IP: There is no high IP habitat on NFS lands

- Medium IP: 32.2 miles are withdrawn, leaving 0.9 miles available for mining. Of those miles:
  - o 0.9 miles are typed *spawning/rearing*
- Low IP: 8.7 miles are withdrawn, leaving 0.9 miles available for mining. Of those miles:
  - o 0.9 miles are typed *spawning/rearing*

There were no active claims as of 5/8/2013 within ¼ mile of Coho Salmon designated CH and there were no NOI submitted during the time period 2009 to 2012 (Table 4). The proposed action would allow a maximum of 5 NOI annually in this watershed. If all 5 NOI were implemented in the same year, it would affect 2,165 linear feet (0.41 miles) of Coho Salmon designated CH. This represents 1.0 percent of all Coho Salmon designated CH in the watershed (Table 181) (0.41 of 42.7 miles that is typed *spawning/rearing* and *rearing/migration*). There is no Coho Salmon designated CH typed as *migration only* in the watershed. There is no high IP habitat in the watershed. The maximum amount of medium IP habitat that could be affected by the proposed action in any year is 0.41 miles, or 1.2 percent of the 33.1 miles of medium IP habitat in the watershed.

h. Lawson Creek-Illinois River watershed

The Lawson Creek-Illinois River watershed is in the Illinois River subbasin within the SONCC Coho Salmon ESU. Of the MPI indicators that would be measurably negatively affected by the proposed action, the environmental baseline is characterized as *Properly Functioning* for substrate character and embeddedness, off-channel habitat and refugia, and *At Risk* for suspended sediment: intergravel DO/turbidity and chemical contamination/nutrients.

The final SONCC Coho Salmon Recovery Plan (NMFS 2014) identifies the key limited life stage as “juvenile,” and the following principal stresses for the Illinois River population:

- Altered hydrologic function
- Degraded riparian forest conditions

The proposed action in would not measurably negatively affect either of the principal stresses for the Illinois River population.

Among the additional factors limiting Coho Salmon production in the Lawson Creek-Illinois River watershed, listed in Chapter IV, the only one that may be negatively measurably impacted by the proposed action is lack of suitable spawning gravel. The proposed action would have a short-term measurable negative effect to percent fines < 0.85 mm in size in spawning gravels. The PCE site attribute (and associated Coho Salmon life cycle stage) associated with effects to spawning gravels from sedimentation that would be measurably negatively impacted is spawning gravel (spawning adults).

The RRS manages 94 percent of the watershed, including 16.4 miles (82 percent) of the total 20.8 miles of Coho Salmon designated CH. The following percentages of the total watershed miles by Coho Salmon IP class that is designated CH are within the RRS:

- High IP: 0 percent (Lawson Creek-Illinois River watershed has no high IP habitat)
- Medium IP: 72 percent (10.2 of 14.1 total watershed miles)
- Low IP: 93 percent (6.2 of 6.7 total watershed miles)

Mineral withdrawn areas within the watershed on NFS lands (12.0 miles) reduce the amount of IP habitat that is available for suction dredging and high banking as noted below:

- High IP: There is no high IP habitat on NFS lands
- Medium IP: 5.8 miles are withdrawn, leaving 4.4 miles available for mining. Of those miles:
    - 4.4 miles are typed *spawning/rearing*
- Low IP: 6.2 miles are withdrawn, leaving 0 miles available for mining.

There were no active claims as of 5/8/2013 within ¼ mile of Coho Salmon designated CH and there were no NOI submitted during the time period 2009 to 2012 (Table 4). The proposed action would allow a maximum of 5 NOI annually in this watershed. If all 5 NOI were implemented in the same year, it would affect 2,165 linear feet (0.41 miles) of Coho Salmon designated CH. This represents 2.0 percent of all Coho Salmon designated CH in the watershed (Table 181) (0.41 of 20.8 miles that is typed *spawning/rearing* and *rearing/migration*). There is no Coho Salmon designated CH typed as *migration only* in the watershed. There is no high IP habitat in the watershed. The maximum amount of medium IP habitat that could be affected by the proposed action in any year is 0.41 miles, or 2.9 percent of the 14.1 miles of medium IP habitat in the watershed.

i. Silver Creek watershed

The Silver Creek watershed is in the Illinois River subbasin within the SONCC Coho Salmon ESU. Of the MPI indicators that would be measurably negatively affected by the proposed action, the environmental baseline is characterized as *Properly Functioning* for chemical contamination/nutrients, substrate character and embeddedness, off-channel habitat and refugia, and *At Risk* for suspended sediment: intergravel DO/turbidity.

The final SONCC Coho Salmon Recovery Plan (NMFS 2014) identifies the key limited life stage as “juvenile,” and the following principal stresses for the Illinois River population:

- Altered hydrologic function
- Degraded riparian forest conditions

The proposed action in would not measurably negatively affect either of the principal stresses for the Illinois River population.

Additional factors limiting Coho Salmon production for the Silver Creek watershed, listed in Chapter IV, are physical features of the channel that would not be affected by the proposed action (natural migration barriers, stream gradients, and channel confinement due to steep canyon walls).

The RRS manages 83 percent of the watershed, including 100 percent of the total 22.1 miles of Coho Salmon designated CH. The following percentages of the total watershed miles by Coho Salmon IP class that are designated CH are within the RRS:

- High IP: 0 percent (Silver Creek watershed has no high IP habitat)
- Medium IP: 100 percent of 19.5 total watershed miles
- Low IP: 100 percent of 2.6 total watershed miles)

Suction dredge mining is not allowed within the Illinois River mainstem between Deer Creek and Nancy Creek or within ¼ mile of its tributaries because it was designated a Wild River in 1984 under the Wild and Scenic Rivers Act. Mineral withdrawn areas within the watershed on NFS lands (0.3 miles) reduce the amount of IP habitat that is available for suction dredging and high banking as noted below:

- High IP: There is no high IP habitat on NFS lands
- Medium IP: 0.3 miles are withdrawn, leaving 19.2 miles available for mining. Of those miles:
  - 19.2 miles are typed *spawning/rearing*
- Low IP: 0 miles are withdrawn, leaving 2.6 miles available for mining. Of those miles:
  - 2.6 miles are typed *spawning/rearing*

There were 37 active claims as of 5/8/2013 within ¼ mile of Coho Salmon designated CH and there was one NOI submitted during the time period 2009 to 2012. That NOI filed was filed in 2011. The average number of NOI for the four years was 0.3 per year (Table 4). The NOI was for a claim at RM 7.8 of North Fork Silver Creek, in habitat typed as *spawning and rearing* (Chapter 4, Table 79).

The proposed action would allow a maximum of 19 NOI annually in this watershed. If all 19 NOI were implemented in the same year, it would affect 8,227 linear feet (1.56 miles) of Coho Salmon designated CH. This represents 7.1 percent of all Coho Salmon designated CH in the watershed (Table 181) (1.56 of 22.1 miles that is typed *spawning/rearing*). There is no Coho Salmon designated CH typed as *rearing/migration* or *migration only* in the watershed. There is no high IP habitat in the watershed. The maximum amount of medium IP habitat that could be affected by the proposed action in any year is 1.56 miles, or 8.0 percent of the 19.2 miles of medium IP habitat in the watershed.

j. Sucker Creek watershed

The Sucker Creek watershed is in the Illinois River subbasin within the SONCC Coho Salmon ESU. Of the MPI indicators that would be measurably negatively affected by the proposed action, the environmental baseline is characterized as *Properly Functioning* for chemical contamination/nutrients, and *At Risk* for suspended sediment: intergravel DO/turbidity, substrate character and embeddedness, off-channel habitat and refugia.

The final SONCC Coho Salmon Recovery Plan (NMFS 2014) identifies the key limited life stage as “juvenile,” and the following principal stresses for the Illinois River population:

- Altered hydrologic function
- Degraded riparian forest conditions

The proposed action would not measurably negatively affect either of the principal stresses for the Illinois River population. Among the additional factors limiting Coho Salmon production in the Sucker Creek watershed, listed in Chapter IV, the two that may be measurably negatively impacted by the proposed action are “sedimentation” and “lack of complex rearing habitat.”

Sedimentation would be temporarily negatively impacted by deposition of fine sediment downstream from dredge operations. PCE site attributes (and associated Coho Salmon life cycle stages) would be measurably negatively impacted by sedimentation. They are cover/shelter (juvenile rearing), space (juvenile rearing), spawning gravel (spawning), food (juvenile migration) and substrate (juvenile migration).

Complex rearing habitat would be temporarily negatively impacted by temporary dredge tailings piles and by increased embeddedness of the substrate. PCE site attributes (and associated Coho Salmon life cycle stages) would be measurably negatively impacted by the loss of complex rearing habitat as a result of temporary dredge tailings piles and increased embeddedness of the substrate. They are cover/shelter (juvenile rearing) and space (juvenile rearing).

The RRS manages 72 percent of the watershed, including 12.1 miles (41 percent) of the total 29.8 miles of Coho Salmon designated CH. There are no mineral withdrawn areas in the watershed. The following percentages of the total watershed miles by Coho Salmon IP class that are designated CH are within the RRS and are available for suction dredging and high banking:

- High IP: 13.0 percent (1.2 of 9.2 total watershed miles). Of those miles:
    - 1.2 miles are typed *spawning/rearing*
- Medium IP: 42.9 percent (7.0 of 16.3 watershed miles). Of those miles:
    - 7.0 miles are typed *spawning/rearing*
- Low IP: 90.1 percent (3.9 of 4.3 total watershed miles). Of those miles:
    - 3.9 miles are typed *spawning/rearing*.

There were 50 active claims as of 5/8/2013 within ¼ mile of Coho Salmon designated CH. During the time period 2009 to 2012, the highest number of NOI filed (1) occurred during 2010 and 2011. The average number of NOI for the four years was 0.5 per year (Table 4). Each of the two NOI were for the same claim at RM 20.5 on the mainstem of Sucker Creek, in habitat typed as *spawning and rearing* (Chapter 4, Table 86). The claim is located in low IP habitat.

The proposed action would allow a maximum of 25 NOI annually in this watershed. If all 25 NOI were implemented in the same year, it would affect 10,825 linear feet (2.05 miles) of Coho Salmon designated CH. This represents 6.9 percent of all Coho Salmon designated CH in the watershed (Table 181) (2.05 of 29.8 miles that is typed *spawning/rearing*). There is no Coho Salmon designated CH typed as *rearing/migration* or *migration only* in the watershed. The maximum amount of high IP habitat that could be affected by the proposed action in any year is 1.2 miles, or 13.0 percent of the 9.2 miles of high IP habitat in the watershed. The maximum amount of medium IP habitat that could be affected by the proposed action in any year is 2.05 miles, or 12.6 percent of the 16.3 miles of medium IP habitat in the watershed.

k. West Fork Illinois River watershed

The West Fork Illinois River watershed is in the Illinois River subbasin within the SONCC Coho Salmon ESU. Of the MPI indicators that would be measurably negatively affected by the proposed action, the environmental baseline is characterized as *Properly Functioning* for chemical contamination/nutrients, and *At Risk* for suspended sediment: intergravel DO/turbidity, substrate character and embeddedness, off-channel habitat and refugia.

The West Fork Illinois River watershed supports sizable populations of Coho Salmon and other native fishes. Portions of the watershed have serpentine geology, such as Rough and Ready Creek, and these areas are generally not used heavily by Coho Salmon due to high summer temperatures and general lack of habitat. Portions of the watershed that are not serpentine geology, such as Elk Creek, are strong areas for Coho Salmon production, with very high juvenile densities.

The final SONCC Coho Salmon Recovery Plan (NMFS 2014) identifies the key limited life stage as “juvenile,” and the following principal stresses for the Illinois River population:

- Altered hydrologic function
- Degraded riparian forest conditions

The proposed action would not measurably negatively affect either of the principal stresses for the Illinois River population. Among the additional factors limiting Coho Salmon production in the West Fork Illinois River watershed, listed in Chapter IV, “lack of complex rearing habitat” may be measurably negatively impacted by the proposed action. Complex habitat would be negatively impacted in the short-term by temporary dredge tailings piles and by increased embeddedness of the substrate. PCE site attributes (and associated Coho Salmon life cycle stages) would be measurably negatively impacted by the loss of complex rearing habitat as a result of temporary dredge tailings piles and increased embeddedness of the substrate. They are cover/shelter (juvenile rearing) and space (juvenile rearing).

The RRS manages 49 percent of the watershed, including 25.8 miles (45 percent) of the total 57.4 miles of Coho Salmon designated CH. There are no mineral withdrawn areas in the watershed. The following percentages of the total watershed miles by Coho Salmon IP class that are designated CH are within the RRS and are available for suction dredging and high banking:

- High IP: 8.7 percent (1.7 of 19.6 total watershed miles). Of those miles:
  - 1.7 miles are typed *spawning/rearing*
- Medium IP: 57.7 percent (17.6 of 30.5 watershed miles). Of those miles:
  - 17.6 miles are typed *spawning/rearing*
- Low IP: 89.0 percent (6.5 of 7.3 total watershed miles). Of those miles:
  - 6.5 miles are typed *spawning/rearing*.

There were 23 active claims as of 5/8/2013 within ¼ mile of Coho Salmon designated CH and there were no NOI submitted during the time period 2009 to 2012 (Table 4). The proposed action would allow a maximum of 12 NOI annually in this watershed. If all 12 NOI were implemented in the same year, it would affect 5,196 linear feet (0.98 miles) of Coho Salmon designated CH. This represents 1.7 percent of all Coho Salmon designated CH in the watershed (Table 181) (0.98 of 57.4 miles that is typed *spawning/rearing*). There is no Coho Salmon designated CH typed as *rearing/migration* or *migration only* in the watershed. The maximum amount of high IP habitat that could be affected by the proposed action in any year is 0.98 miles, or 5.0 percent of the 19.6 miles of high IP habitat in the watershed. This would occur in the unlikely event that all 12 NOI were concentrated in the 1.7 miles of high IP habitat on the RRS. The maximum amount of medium IP habitat that could be affected by the proposed action in any year is 0.98 miles, or 3.2 percent of the 30.5 miles of medium IP habitat in the watershed.

4. Lower Rogue River population

a. Lobster Creek watershed

The Lobster Creek watershed is in the Lower Rogue River subbasin within the SONCC Coho Salmon ESU. Of the MPI indicators that would be measurably negatively affected by the proposed action, the environmental baseline is characterized as *Properly Functioning* for chemical contamination/nutrients, and *At Risk* for suspended sediment: intergravel DO/turbidity, substrate character and embeddedness, off-channel habitat and refugia.

The final SONCC Coho Salmon Recovery Plan (NMFS 2014) identifies the key limited life stage as "juvenile," and the following principal stresses for the Lower Rogue River population:

- Lack of floodplain and channel structure
- Impaired water quality

The proposed action would not measurably negatively impact floodplains. Channel structure and water quality would be measurably negatively impacted in the short-term.

The final SONCC Coho Salmon ESA recovery plan discusses lack of floodplain and channel structure at section 3.1.6. The focus is on the loss of connectivity of low gradient, unconstrained stream reaches with floodplains that provide diverse, slow water habitats, particularly in off-channel areas. Stream channels that are straightened, diked or leveed also lose complex habitats and indirectly change timing of peak flows. Loss of large wood was also discussed. None of these aspects of floodplain and channel structure would be measurably negatively impacted by the proposed action.

However, channel structure would be measurably negatively impacted in the short-term and at the site-scale by temporary dredge tailings piles. PCE site attributes (and associated Coho Salmon life cycle stages) associated with effects from loss of channel structure by temporary dredge tailings piles that would be measurably negatively impacted include cover/shelter (juvenile rearing) and space (juvenile rearing).

Water quality would be measurably negatively impacted in the short-term by increased turbidity, gasoline spills and mercury/trace metal contamination. The PCE site attribute (and associated Coho Salmon life cycle stages) associated with effects from impacts to water quality that would be measurably negatively impacted is water quality (juvenile rearing and adult upstream migration).

The RRS manages 62 percent of the watershed, including 16.1 miles (60 percent) of the total 27.0 miles of Coho Salmon designated CH. The following percentages of the total watershed miles by Coho Salmon IP class are within the RRS:

- High IP: 0 percent (there is no High IP habitat in the watershed)
- Medium IP: 60.0 percent (12.5 of 21.2 total watershed miles)
- Low IP: 62.0 percent (3.6 of 5.8 total watershed miles)

Mineral withdrawn areas within the watershed on NFS lands (0.4 miles) reduce the amount of IP habitat that is available for suction dredging and high banking as noted below:

- High IP: There is no high IP habitat in the watershed

- Medium IP: 0.4 miles are withdrawn, leaving 12.1 miles available for mining. Of those miles:
  - 12.1 miles are typed *spawning/rearing*
- Low IP: 0 miles are withdrawn, leaving 3.6 miles available for mining. Of those miles:
  - 3.6 miles are typed *spawning/rearing*

There were 7 active claims as of 5/8/2013 within ¼ mile of Coho Salmon designated CH. During the time period 2009 to 2012, there was one NOI submitted in 2010. The average number of NOI for the four years was 0.3 per year (Table 4). The NOI was for a claim located at RM 3.8 on South Fork Lobster Creek in habitat typed as *spawning and rearing* (Chapter 4, Table 96).

The proposed action would allow a maximum of 7 NOI annually in this watershed. If all 7 NOI were implemented in the same year, it would affect 3,031 linear feet (0.57 miles) of Coho Salmon designated CH. This represents 2.1 percent of all Coho Salmon designated CH in the watershed (Table 181) (0.57 of 27.0 miles that is typed *spawning/rearing*). There is no Coho Salmon designated CH typed as *rearing/migration* or *migration only* in the watershed. There is no high IP habitat on the RRS. The maximum amount of medium IP habitat that could be affected by the proposed action in any year is 0.57 miles, or 2.7 percent of the 21.2 miles of medium IP habitat in the watershed.

b. Rogue River watershed

The Rogue River watershed is in the Lower Rogue River subbasin within the SONCC Coho Salmon ESU. Of the MPI indicators that would be measurably negatively affected by the proposed action, the environmental baseline is characterized as *Properly Functioning* for off-channel habitat and refugia, and *At Risk* for suspended sediment: intergravel DO/turbidity, chemical contamination/nutrients, and substrate character and embeddedness.

The final SONCC Coho Salmon Recovery Plan (NMFS 2014) identifies the key limited life stage as “juvenile,” and the following principal stresses for the Lower Rogue River population:

- Lack of floodplain and channel structure
- Impaired water quality

The proposed action would not measurably negatively impact floodplains. Channel structure and water quality would be measurably negatively impacted in the short-term.

The final SONCC Coho Salmon ESA recovery plan discusses lack of floodplain and channel structure at section 3.1.6. The focus is on the loss of connectivity of low gradient, unconstrained stream reaches with floodplains that provide diverse, slow water habitats, particularly in off-channel areas. Stream channels that are straightened, diked or leveed also lose complex habitats and indirectly change timing of peak flows. Loss of large wood was also discussed. None of these aspects of floodplain and channel structure would be measurably negatively impacted by the proposed action.

However, channel structure would be measurably negatively impacted in the short-term and at the site-scale by temporary dredge tailings piles. PCE site attributes (and associated Coho Salmon life cycle stages) associated with effects from loss of channel structure by temporary dredge tailings piles that would be measurably negatively impacted include cover/shelter (juvenile rearing) and space (juvenile rearing).

Water quality would be measurably negatively impacted in the short-term by increased turbidity, gasoline spills and mercury/trace metal contamination. The PCE site attribute (and associated Coho Salmon life cycle stages) associated with effects from impacts to water quality that would be measurably negatively impacted is water quality (juvenile rearing and adult upstream migration).

The RRS manages 53 percent of the watershed, including 26.6 miles (51 percent) of the total 51.8 miles of Coho Salmon designated CH. The following percentages of the total watershed miles by Coho Salmon IP class are within the RRS:

- High IP: 19.4 percent (1.9 of 9.8 total watershed miles)
- Medium IP: 61.4 percent (22.0 of 35.8 total watershed miles)
- Low IP: 43.5 percent (2.7 of 6.2 total watershed miles)

Mineral withdrawn areas within the watershed on NFS lands (19.3 miles) reduce the amount of IP habitat that is available for suction dredging and high banking as noted below:

- High IP: 0.8 miles are withdrawn, leaving 1.1 miles available for mining. Of those miles:
    - 1.1 miles are typed *spawning/rearing*
- Medium IP: 16.6 miles are withdrawn, leaving 5.4 miles available for mining. Of those miles:
    - 5.4 miles are typed *spawning/rearing*
- Low IP: 1.9 miles are withdrawn, leaving 0.8 miles available for mining. Of those miles:
    - 0.8 miles are typed *spawning/rearing*

There were no active claims as of 5/8/2013 within ¼ mile of Coho Salmon designated CH and there were no NOI submitted during the time period 2009 to 2012 (Table 4). The proposed action would allow a maximum of 5 NOI annually in this watershed. If all 5 NOI were implemented in the same year, it would affect 2,165 linear feet (0.41 miles) of Coho Salmon designated CH. This represents 0.8 percent of all Coho Salmon designated CH in the watershed (Table 181) (0.41 of 51.8 miles that is typed *spawning/rearing* and *migration only*). The maximum amount of high IP habitat that could be affected by the proposed action in any year is 0.41 miles, or 4.2 percent of the 9.8 miles of high IP habitat in the watershed. This would occur in the unlikely event that all of the NOI were concentrated in the 1.1 miles of high IP habitat on the RRS. The maximum amount of medium IP habitat that could be affected by the proposed action in any year is 0.41 miles, or 1.1 percent of the 35.8 miles of medium IP habitat in the watershed.

5. Middle Rogue/Applegate Rivers population

a. Hellgate Canyon-Rogue River watershed

The Hellgate Canyon-Rogue River watershed is in the Lower Rogue River subbasin within the SONCC Coho Salmon ESU. Of the MPI indicators that would be measurably negatively affected by the proposed action, the environmental baseline is characterized as *Properly Functioning* for chemical contamination/nutrients, and *At Risk* for suspended sediment: intergravel DO/turbidity, substrate character and embeddedness, off-channel habitat, and refugia.

The final SONCC Coho Salmon Recovery Plan (NMFS 2014) identifies the key limited life stage as “juvenile,” and the following principal stresses for the Middle Rogue / Applegate River population:

- Lack of floodplain and channel structure
- Altered hydrologic function

Of the principal limiting stresses, the proposed action would not measurably negatively impact floodplains or altered hydrologic function. Channel structure would be measurably negatively impacted in the short-term by temporary dredge tailings piles.

The final SONCC Coho Salmon ESA recovery plan discusses lack of floodplain and channel structure at section 3.1.6. The focus is on the loss of connectivity of low gradient, unconstrained stream reaches with floodplains that provide diverse, slow water habitats, particularly in off-channel areas. Stream channels that are straightened, diked or leveed also lose complex habitats and indirectly change timing of peak flows. Loss of large wood was also discussed. None of these aspects of floodplain and channel structure would be measurably negatively impacted by the proposed action.

However, channel structure would be measurably negatively impacted in the short-term and at the site-scale by temporary dredge tailings piles. PCE site attributes (and associated Coho Salmon life cycle stages) associated with effects from loss of channel structure by temporary dredge tailings piles that would be measurably negatively impacted include cover/shelter (juvenile rearing) and space (juvenile rearing).

The RRS manages 32 percent of the watershed, including 14.4 miles (21 percent) of the total 68.4 miles of Coho Salmon designated CH. There are no mineral withdrawn areas in the watershed. The following percentages of the total watershed miles by Coho Salmon IP class are within the RRS and are available for suction dredging and high banking:

- High IP: 9.5 percent (0.9 of 9.5 total watershed miles). Of those miles:
    - 0.9 miles are typed *spawning/rearing*
- Medium IP: 19.4 percent (9.6 of 49.4 total watershed miles). Of those miles:
    - 9.6 miles are typed *spawning/rearing*
- Low IP: 41.1 percent 3.9 of 9.5 total watershed miles). Of those miles:
    - 3.9 miles are typed *spawning/rearing*

There were 29 active claims as of 5/8/2013 within ¼ mile of Coho Salmon designated CH and no NOI were submitted during the time period 2009 to 2012 (Table 4). The proposed action would allow a maximum of 15 NOI annually in this watershed. If all 15 NOI were implemented in the same year, it would affect 6,495 linear feet (1.23 miles) of Coho Salmon designated CH. This represents 1.8 percent of all Coho Salmon designated CH in the watershed (Table 181) (1.23 of 68.4 miles that is typed *spawning/rearing* and *migration only*). The maximum amount of high IP habitat that could be affected by the proposed action in any year is 0.9 miles, or 9.5 percent of the 9.5 miles of high IP habitat in the watershed. This would occur in the unlikely event that all of the NOI were concentrated in the 0.9 miles of high IP habitat on the RRS. The maximum amount of medium IP habitat that could be affected by the proposed action in any year is 1.23 miles, or 2.5 percent of the 49.4 miles of medium IP habitat in the watershed.

b. Lower Applegate River watershed

The Lower Applegate River watershed is in the Applegate River subbasin within the SONCC Coho Salmon ESU. Of the MPI indicators that would be measurably negatively affected by the proposed action, the environmental baseline is characterized as *Properly Functioning* for chemical contamination/nutrients, and *At Risk* for suspended sediment: intergravel DO/turbidity, substrate character and embeddedness, off-channel habitat and refugia.

The final SONCC Coho Salmon Recovery Plan (NMFS 2014) identifies the key limited life stage as “juvenile,” and the following principal stresses for the Middle Rogue / Applegate River population:

- Lack of floodplain and channel structure
- Altered hydrologic function

Of the principal limiting stresses, the proposed action would not measurably negatively impact floodplains or altered hydrologic function. Channel structure would be measurably negatively impacted in the short-term by temporary dredge tailings piles.

The final SONCC Coho Salmon ESA recovery plan discusses lack of floodplain and channel structure at section 3.1.6. The focus is on the loss of connectivity of low gradient, unconstrained stream reaches with floodplains that provide diverse, slow water habitats, particularly in off-channel areas. Stream channels that are straightened, diked or leveed also lose complex habitats and indirectly change timing of peak flows. Loss of large wood was also discussed. None of these aspects of floodplain and channel structure would be measurably negatively impacted by the proposed action.

However, channel structure would be measurably negatively impacted in the short-term and at the site-scale by temporary dredge tailings piles. PCE site attributes (and associated Coho Salmon life cycle stages) associated with effects from loss of channel structure by temporary dredge tailings piles that would be measurably negatively impacted include cover/shelter (juvenile rearing) and space (juvenile rearing).

Among the additional factors limiting Coho Salmon production in the Lower Applegate River watershed, listed in Chapter IV, “erosion” and “lack of complex rearing habitat” would be measurably negative impacted by the proposed action.

An outcome of erosion is streambed sedimentation. Increased fine sediments in the streambed are a short-term negative impact of the proposed action. PCE site attributes (and associated Coho Salmon life cycle stages) would be measurably negatively impacted by sedimentation. They are cover/shelter (juvenile rearing), space (juvenile rearing), spawning gravel (spawning), food (juvenile migration) and substrate (juvenile migration).

Complex habitat would be negatively impacted in the short-term by temporary dredge tailings piles and by increased embeddedness of the substrate. PCE site attributes (and associated Coho Salmon life cycle stages) would be measurably negatively impacted by the loss of complex rearing habitat as a result of temporary dredge tailings piles and increased embeddedness of the substrate. They are cover/shelter (juvenile rearing) and space (juvenile rearing).

The RRS manages 14 percent of the watershed, including 10.1 miles (12 percent) of the total 81.3 miles of Coho Salmon designated CH. There are no mineral withdrawn areas in the watershed.

The following percentages of the total watershed miles by Coho Salmon IP class are within the RRS and are available for suction dredging and high banking:

- High IP: 0 percent (0 of 29.8 total watershed miles)
- Medium IP: 13.2 percent (4.6 of 34.9 total watershed miles). Of those miles:
    - 4.6 miles are typed *spawning/rearing*
- Low IP: 33.1 percent (5.5 of 16.6 total watershed miles). Of those miles:
    - 5.5 miles are typed *spawning/rearing*

There were 4 active claims as of 5/8/2013 within ¼ mile of Coho Salmon designated CH and there were no NOI submitted during the time period 2009 to 2012 (Table 4). The proposed action would allow a maximum of 5 NOI annually in this watershed. If all 5 NOI were implemented in the same year, it would affect 2,165 linear feet (0.41 miles) of Coho Salmon designated CH. This represents 0.5 percent of all Coho Salmon designated CH in the watershed (Table 181) (0.41 of 81.3 miles that is typed *spawning/rearing*. There is no habitat typed *rearing/migration* or *migration only* in the watershed). There is no high IP habitat in the watershed. The maximum amount of medium IP habitat that could be affected by the proposed action in any year is 0.41 miles, or 1.2 percent of the 34.9 miles of medium IP habitat in the watershed.

c. Middle Applegate River watershed

The Middle Applegate River watershed is in the Applegate River subbasin within the SONCC Coho Salmon ESU. Of the MPI indicators that would be measurably negatively affected by the proposed action, the environmental baseline is characterized as *Properly Functioning* for chemical contamination/nutrients, *At Risk* for suspended sediment: intergravel DO/turbidity and substrate character and embeddedness, and *Not Properly Functioning* for off-channel habitat and refugia.

The final SONCC Coho Salmon Recovery Plan (NMFS 2014) identifies the key limited life stage as “juvenile,” and the following principal stresses for the Middle Rogue/Applegate River population:

- Lack of floodplain and channel structure
- Altered hydrologic function

Of the principal limiting stresses, the proposed action would not measurably negatively impact floodplains or altered hydrologic function. Channel structure would be measurably negatively impacted in the short-term by temporary dredge tailings piles.

The final SONCC Coho Salmon ESA recovery plan discusses lack of floodplain and channel structure at section 3.1.6. The focus is on the loss of connectivity of low gradient, unconstrained stream reaches with floodplains that provide diverse, slow water habitats, particularly in off-channel areas. Stream channels that are straightened, diked or leveed also lose complex habitats and indirectly change timing of peak flows. Loss of large wood was also discussed. None of these aspects of floodplain and channel structure would be measurably negatively impacted by the proposed action.

However, channel structure would be measurably negatively impacted in the short-term and at the site-scale by temporary dredge tailings piles. PCE site attributes (and associated Coho Salmon life cycle stages) associated with effects from loss of channel structure by temporary dredge tailings piles that would be measurably negatively impacted include cover/shelter (juvenile rearing) and space (juvenile rearing).

Of the watershed-scale limiting factors listed in Chapter IV, lack of complex rearing habitat would be measurably negatively impacted by the proposed action. Complex habitat would be negatively impacted in the short-term by temporary dredge tailings piles and by increased embeddedness of the substrate. PCE site attributes (and associated Coho Salmon life cycle stages) would be measurably negatively impacted by the loss of complex rearing habitat as a result of temporary dredge tailings piles and increased embeddedness of the substrate. They are cover/shelter (juvenile rearing) and space (juvenile rearing).

The RRS manages three percent of the watershed, including 0.2 miles (1,000 feet) (0.02 percent) of the 43.3 miles of Coho Salmon designated CH in the watershed. The following percentages of the total watershed miles by Coho Salmon IP class are within the RRS and are available for suction dredging and high banking:

- High IP: 0 percent (0 of 15.6 total watershed miles)
- Medium IP: 0 percent (0 of 18.4 total watershed miles).
- Low IP: 2.1 percent (0.2 of 9.5 total watershed miles). Of those miles:
    - 0.2 miles are typed *spawning/rearing*

There was 1 active claim as of 5/8/2013 within ¼ mile of Coho Salmon designated CH and there were no NOI submitted during the time period 2009 to 2012 (Table 4). There are no mineral withdrawn areas in the watershed. The proposed action would allow a maximum of 5 NOI annually in this watershed. If the 5 NOI were implemented, it would affect 1,000 linear feet (0.2 miles) of Coho Salmon designated CH.[25] This represents 0. 4 percent of all Coho Salmon designated CH in the watershed (Table 181) (0.2 of 43.3 miles that is typed *spawning/rearing* in the watershed). There is no high or medium IP habitat in the watershed on NFS lands within the RRS.

d. Shasta Costa Creek-Rogue River watershed

The Shasta Costa-Rogue River watershed is in the Lower Rogue River subbasin within the SONCC Coho Salmon ESU. Of the MPI indicators that would be measurably negatively affected by the proposed action, the environmental baseline is characterized as *Properly Functioning* for off-channel habitat and refugia, and *At Risk* for chemical contamination/nutrients, suspended sediment: intergravel DO/turbidity, and substrate character and embeddedness.

The final SONCC Coho Salmon Recovery Plan (NMFS 2014) identifies the key limited life stage as “juvenile,” and the following principal stresses for the Middle Rogue / Applegate River population:

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[25] While there is only 1,000 feet (0.2 mile) of Coho Salmon designated CH on the RRS within the Middle Applegate River watershed, it is possible for 5 NOI to occur on that 1,000 feet. Claims are not necessarily lined up on a stream sequentially (one after the other). Placer claims are 20 to 160 acres in size. The legal description of each claim is a portion of a section and claims are rectangular in shape. Consequently, if a stream segment with designated CH meanders through a section, it may intersect small portions of multiple rectangular-shaped claims. For example, a small corner of a 20-acre claim could intersect designated CH followed by another corner of a different claim, and so on.

- Lack of floodplain and channel structure
- Altered hydrologic function

Of the principal limiting stresses, the proposed action would not measurably negatively impact floodplains or altered hydrologic function. Channel structure would be measurably negatively impacted in the short-term by temporary dredge tailings piles.

The final SONCC Coho Salmon ESA recovery plan discusses lack of floodplain and channel structure at section 3.1.6. The focus is on the loss of connectivity of low gradient, unconstrained stream reaches with floodplains that provide diverse, slow water habitats, particularly in off-channel areas. Stream channels that are straightened, diked or leveed also lose complex habitats and indirectly change timing of peak flows. Loss of large wood was also discussed. None of these aspects of floodplain and channel structure would be measurably negatively impacted by the proposed action.

However, channel structure would be measurably negatively impacted in the short-term and at the site-scale by temporary dredge tailings piles. PCE site attributes (and associated Coho Salmon life cycle stages) associated with effects from loss of channel structure by temporary dredge tailings piles that would be measurably negatively impacted include cover/shelter (juvenile rearing) and space (juvenile rearing).

The RRS manages 96 percent of the watershed, including 100 percent of the total 22.1 miles of Coho Salmon designated CH. The following percentages of the total watershed miles by Coho Salmon IP class are within the RRS:

- High IP: 100 percent of 1.3 total watershed miles
- Medium IP: 100 percent of 15.8 total watershed miles
- Low IP: 100 percent of 5.0 total watershed miles

Mineral withdrawn areas within the watershed on NFS lands (10.5 miles) reduce the amount of IP habitat that is available for suction dredging and high banking as noted below:

- High IP: 1.3 miles are withdrawn, leaving 0 miles available for mining.
- Medium IP: 8.5 miles are withdrawn, leaving 7.3 miles available for mining. Of those miles:
    - 7.3 miles are typed *spawning/rearing*
- Low IP: 0.7 miles are withdrawn, leaving 4.3 miles available for mining. Of those miles:
    - 4.3 miles are typed *spawning/rearing*

There were no active claims as of 5/8/2013 within ¼ mile of Coho Salmon designated CH and no NOI were submitted during the time period 2009 to 2012 (Table 4). The proposed action would allow a maximum of 5 NOI annually in this watershed. If all 5 NOI were implemented in the same year, it would affect 2,165 linear feet (0.41 miles) of Coho Salmon designated CH. This represents 1.9 percent of all Coho Salmon designated CH in the watershed (Table 181) (0.41 of 22.1 miles that is typed *spawning/rearing* and *migration only*). There is no habitat typed *rearing/migration* in the watershed). All high IP habitat on the RRS is withdrawn from mineral entry. The maximum amount of medium IP habitat that could be affected by the proposed action in any year is 0.41 miles, or 2.6 percent of the 15.8 miles of medium IP habitat in the watershed.

e. Stair Creek-Rogue River watershed

The Stair Creek-Rogue River watershed is in the Lower Rogue River subbasin within the SONCC Coho Salmon ESU. Of the MPI indicators that would be measurably negatively affected by the proposed action, the environmental baseline is characterized as *Properly Functioning* for substrate character and embeddedness refugia, and *At Risk* for suspended sediment: intergravel DO/turbidity, chemical contamination/nutrients, and chemical contamination/nutrients.

This watershed is predominantly wilderness and Wild and Scenic River designation. There is very little Coho Salmon production in the watershed, as winter flows in the mainstem are believed to be too powerful to allow successful incubation of fish eggs in all but the very mildest of winters. The lower Rogue River is predominantly a canyon with short, steep tributaries that do not provide quality Coho Salmon habitat. Stair Creek, the primary tributary in the watershed, has a natural falls near its mouth that is an anadromous fish barrier in most years. It is passable only during large flood events when the surface of the Rogue River flow is unusually high, raising the water level to make the falls passable (personal communication with David Haight, ODFW Assistant Fish Biologist and Susan Maiyo, November 2013).

The final SONCC Coho Salmon Recovery Plan (NMFS 2014) identifies the key limited life stage as "juvenile," and the following principal stresses for the Middle Rogue / Applegate River population:

- Lack of floodplain and channel structure
- Altered hydrologic function

Of the principal limiting stresses, the proposed action would not measurably negatively impact floodplains or altered hydrologic function. Channel structure would be measurably negatively impacted in the short-term by temporary dredge tailings piles.

The final SONCC Coho Salmon ESA recovery plan discusses lack of floodplain and channel structure at section 3.1.6. The focus is on the loss of connectivity of low gradient, unconstrained stream reaches with floodplains that provide diverse, slow water habitats, particularly in off-channel areas. Stream channels that are straightened, diked or leveed also lose complex habitats and indirectly change timing of peak flows. Loss of large wood was also discussed. None of these aspects of floodplain and channel structure would be measurably negatively impacted by the proposed action.

However, channel structure would be measurably negatively impacted in the short-term and at the site-scale by temporary dredge tailings piles. PCE site attributes (and associated Coho Salmon life cycle stages) associated with effects from loss of channel structure by temporary dredge tailings piles that would be measurably negatively impacted include cover/shelter (juvenile rearing) and space (juvenile rearing).

The RRS manages 95 percent of the watershed, including 100 percent of the total 17.3 miles of Coho Salmon designated CH. The following percentages of the total watershed miles by Coho Salmon IP class are within the RRS:

- High IP: 100 percent of 0.9 total watershed miles
- Medium IP: 100 percent of 14.7 total watershed miles
- Low IP: 100 percent of 1.7 total watershed miles

There are 14.3 miles of *migration only* habitat in the Rogue River mainstem in the watershed. However, suction dredge mining is not allowed due to its Wild and Scenic River status. The withdrawal from mineral entry extends to 1 mile on either side of the river for the protection and preservation of scenic and recreation areas adjacent to the river and its tributaries. This currently includes the entire river from the RRS boundary, near Marial, to the RRS Boundary near the Lobster Creek Bridge. It is possible for Coho Salmon spawners to enter Stair Creek at extreme high flows in the mainstem Rogue River in most years and occupy 3.2 miles of CCH, classified as *spawning/rearing* habitat.

Mineral withdrawn areas within the watershed on NFS lands (16.2 miles) reduce the amount of IP habitat that is available for suction dredging and high banking as noted below:

- High IP: 0.9 miles are withdrawn, leaving 0 miles available for mining.
- Medium IP: 14.3 miles are withdrawn, leaving 0.4 miles available for mining. Of those miles:
    - 0.4 miles are typed *spawning/rearing*
- Low IP: 1.0 miles are withdrawn, leaving 0.7 miles available for mining. Of those miles:
    - 0.7 miles are typed *spawning/rearing*

There were no active claims as of 5/8/2013 within ¼ mile of Coho Salmon designated CH and no NOI were submitted during the time period 2009 to 2012 (Table 4). The proposed action would allow a maximum of 5 NOI annually in this watershed. If all 5 NOI were implemented in the same year, it would affect 2,165 linear feet (0.41 miles) of Coho Salmon designated CH. This represents 2.4 percent of all Coho Salmon designated CH in the watershed (Table 181) (0.41 of 17.3 miles that is typed *spawning/rearing* and *migration only*). There is no habitat typed *rearing/migration* in the watershed). All high IP habitat on the RRS is withdrawn from mineral entry. The maximum amount of medium IP habitat that could be affected by the proposed action in any year is 0.41 miles, or 2.8 percent of the 14.7 miles of medium IP habitat in the watershed.

f. Upper Applegate River watershed

The Upper Applegate River watershed is in the Applegate River subbasin within the SONCC Coho Salmon ESU. Of the MPI indicators that would be measurably negatively affected by the proposed action, the environmental baseline is characterized as *Properly Functioning* for chemical contamination/nutrients, *At Risk* for suspended sediment: intergravel DO/turbidity and refugia, and *Not Properly Functioning* for substrate character and embeddedness and off-channel habitat.

The final SONCC Coho Salmon Recovery Plan (NMFS 2014) identifies the key limited life stage as “juvenile,” and the following principal stresses for the Middle Rogue / Applegate River population:

- Lack of floodplain and channel structure
- Altered hydrologic function

Of the principal limiting stresses, the proposed action would not measurably negatively impact floodplains or altered hydrologic function. Channel structure would be measurably negatively impacted in the short-term by temporary dredge tailings piles.

The final SONCC Coho Salmon ESA recovery plan discusses lack of floodplain and channel structure at section 3.1.6. The focus is on the loss of connectivity of low gradient, unconstrained stream reaches with floodplains that provide diverse, slow water habitats, particularly in off-channel areas. Stream channels that are straightened, diked or leveed also lose complex habitats and indirectly change timing of peak flows. Loss of large wood was also discussed. None of these aspects of floodplain and channel structure would be measurably negatively impacted by the proposed action.

However, channel structure would be measurably negatively impacted in the short-term and at the site-scale by temporary dredge tailings piles. PCE site attributes (and associated Coho Salmon life cycle stages) associated with effects from loss of channel structure by temporary dredge tailings piles that would be measurably negatively impacted include cover/shelter (juvenile rearing) and space (juvenile rearing).

Fish habitat quality and water quality are described as being reduced in the watershed in Chapter IV. Both would be measurably negatively impacted by the proposed action from short-term increases in turbidity, fines < 0.85 mm in size in spawning gravels, increased substrate embeddedness, reduced habitat complexity by the creation of temporary dredge tailings piles and increased embeddedness of the substrate, gasoline spills, as well as remobilization of mercury/trace metals.

The PCE site attributes (and associated Coho Salmon life cycle stages) associated with effects from impacts to fish habitat quality (other than water quality) that would be measurably negatively impacted include: (1) cover/shelter (juvenile rearing), (2) space (juvenile rearing), (3) spawning gravel (spawning adults), (4) food (juvenile migration), (5) substrate (juvenile migration).

The PCE site attribute (and associated Coho Salmon life cycle stages) associated with effects from impacts to water quality that would be measurably negatively impacted is water quality (juvenile rearing, juvenile out-migration and adult upstream migration).

The RRS manages 52 percent of the watershed, including 14.1 miles (47 percent) of the total 30.2 miles of Coho Salmon designated CH. There are no mineral withdrawn areas in the watershed. The following percentages of the total watershed miles by Coho Salmon IP class are within the RRS and are available for suction dredging and high banking:

- High IP: 60 percent (0.3 of 0.5 total watershed miles). Of those miles:
    - 0.3 miles are typed *spawning/rearing*
- Medium IP: 44.7 percent (10.1 of 22.6 total watershed miles). Of those miles:
    - 10.1 miles are typed *spawning/rearing*
- Low IP: 52.1 percent (3.7 of 7.1 total watershed miles). Of those miles:
    - 3.7 miles are typed *spawning/rearing*

There were 17 active claims as of 5/8/2013 within ¼ mile of Coho Salmon habitat. During the time period 2009 to 2012, the highest number of NOI filed (2) occurred during 2010 and 2012. The average number of NOI for the four years was 1.3 per year (Table 4). Approximately 1.0 NOI per year were for two claims located on Palmer Creek at RM 2.5 and 2.7, all in habitat typed as *spawning and rearing*. Approximately 0.3 NOI per year were in habitat typed as *spawning and rearing* on a claim in Beaver Creek at RM 2.4 (Chapter 4, Table 129).

The proposed action would allow a maximum of 9 NOI annually in this watershed. If all 9 NOI were implemented in the same year, it would affect 3,897 linear feet (0.74 miles) of Coho Salmon designated CH. This represents 2.4 percent of all Coho Salmon designated CH in the watershed (Table 181) (0.74 of 30.2 miles that is typed *spawning/rearing*). There is no habitat typed *rearing/migration* or *migration only* in the watershed. The maximum amount of high IP habitat that could be affected by the proposed action in any year is 0.3 miles (all that exists on the RRS), or 60 percent of the 0.5 miles of high IP habitat in the watershed. This would occur in the unlikely event that NOI activity would be concentrated on the 0.3 miles of high IP habitat on the RRS rather than being distributed among the total 14.1 miles available for mining on the RRS. The maximum amount of medium IP habitat that could be affected by the proposed action in any year is 0.74 miles, or 3.3 percent of the 22.6 miles of medium IP habitat in the watershed.

6. Elk River population

a. Pistol River watershed

The Pistol River watershed is in the Chetco River subbasin within the SONCC Coho Salmon ESU. Of the MPI indicators that would be measurably negatively affected by the proposed action, the environmental baseline is characterized as *Properly Functioning* for chemical contamination/nutrients, *At Risk* for substrate character and embeddedness, off-channel habitat and refugia, and *Not Properly Functioning* for suspended sediment: intergravel DO/turbidity.

The final SONCC Coho Salmon Recovery Plan (NMFS 2014) identifies the key limited life stage as “juvenile,” and the following principal stresses for the Pistol River population:

- Lack of floodplain and channel structure
- Degraded riparian forest conditions

Because the population is at the same scale as the watershed, these would be considered limiting factors at the watershed scale. The proposed action would not measurably negatively affect floodplains or riparian forest conditions. Lack of channel structure would be measurably negatively impacted in the short-term by the proposed action.

The final SONCC Coho Salmon ESA recovery plan discusses lack of floodplain and channel structure at section 3.1.6. The focus is on the loss of connectivity of low gradient, unconstrained stream reaches with floodplains that provide diverse, slow water habitats, particularly in off-channel areas. Stream channels that are straightened, diked or leveed also lose complex habitats and indirectly change timing of peak flows. Loss of large wood was also discussed. None of these aspects of floodplain and channel structure would be measurably negatively impacted by the proposed action.

However, channel structure would be measurably negatively impacted in the short-term and at the site-scale by temporary dredge tailings piles. PCE site attributes (and associated Coho Salmon life cycle stages) associated with effects from loss of channel structure by temporary dredge tailings piles that would be measurably negatively impacted include cover/shelter (juvenile rearing) and space (juvenile rearing).

The RRS manages 53 percent of the watershed, including 15.4 miles (31 percent) of the total 49.6 miles of Coho Salmon designated CH. There are no mineral withdrawn areas in the watershed. The following percentages of the total watershed miles by Coho Salmon IP class are within the RRS and are available for suction dredging and high banking:

- High IP: 0 percent (0 of 6.4 total watershed miles)
- Medium IP: 21.2 percent (5.8 of 27.3 total watershed miles). Of those miles:
  - 5.4 miles are typed *spawning/rearing*
  - 0.4 miles are typed *rearing/migration*
- Low IP: 60.4 percent (9.6 of 15.9 total watershed miles). Of those miles:
  - 9.6 miles are typed *spawning/rearing*

There were no active claims as of 5/8/2013 within ¼ mile of Coho Salmon designated CH and no NOI were submitted during the time period 2009 to 2012 (Table 4). The proposed action would allow a maximum of 5 NOI annually in this watershed. If all 5 NOI were implemented in the same year, it would affect 2,165 linear feet (0.41 miles) of Coho Salmon designated CH. This represents 0.8 percent of all Coho Salmon designated CH in the watershed (Table 181) (0.41 of 49.6 miles that is typed *spawning/rearing* and *rearing/migration*). There is no habitat typed *migration only* in the watershed. There is no high IP habitat on the RRS. The maximum amount of medium IP habitat that could be affected by the proposed action in any year is 0.41 miles, or 1.5 percent of the 27.3 miles of medium IP habitat in the watershed.

7. Smith River population

a. North Fork Smith River watershed

The North Fork Smith River watershed is in the Smith River subbasin within the SONCC Coho Salmon ESU. Of the MPI indicators that would be measurably negatively affected by the proposed action, the environmental baseline is characterized as *Properly Functioning* for suspended sediment: intergravel DO/turbidity, chemical contamination/nutrients, substrate character and embeddedness, off-channel habitat and refugia.

The North Fork Smith River has intermittent Coho Salmon populations. Few juvenile Coho Salmon have been observed during surveys over the past decade (Mike McCain, Six River NF, personal communication). Streams exhibit flashy fall and winter flows and are constrained.

The final SONCC Coho Salmon Recovery Plan (NMFS 2014) identifies the key limited life stage as “juvenile,” and the following principal stresses for the Smith River population:

- Impaired estuary/mainstem function
- Lack of floodplain and channel structure

The proposed action would not measurably negatively impact floodplains. The discussion of the “impaired estuary/mainstem function” limiting factor in the final SONCC Coho Salmon Recovery Plan (NMFS 2014) focuses on impairment of the estuary, which will not be impacted by the proposed action. The proposed action would measurably negatively impact channel structure in the short term.

The final SONCC Coho Salmon ESA recovery plan discusses lack of floodplain and channel structure at section 3.1.6. The focus is on the loss of connectivity of low gradient, unconstrained stream reaches with floodplains that provide diverse, slow water habitats, particularly in off-channel areas. Stream channels that are straightened, diked or leveed also lose complex habitats and indirectly change timing of peak flows. Loss of large wood was also discussed. None of these aspects of floodplain and channel structure would be measurably negatively impacted by the proposed action.

However, channel structure would be measurably negatively impacted in the short-term and at the site-scale by temporary dredge tailings piles. PCE site attributes (and associated Coho Salmon life cycle stages) associated with effects from loss of channel structure by temporary dredge tailings piles that would be measurably negatively impacted include cover/shelter (juvenile rearing) and space (juvenile rearing).

The USFS manages 98 percent of the watershed, including 38.7 miles (69 percent) of the total 55.8 miles of Coho Salmon designated CH. The following percentages of the total watershed miles by Coho Salmon IP class are within the RRS:

- High IP: 100 percent of 0.4 total watershed miles
- Medium IP: 71.3 percent (33.3 of 46.7 total watershed miles)
- Low IP: 57.5 percent (5.0 of 8.7 total watershed miles)

The east side of the North Fork Smith River from Horse Creek downstream to Sourdough Camp (about 4.5 miles) was withdrawn as a part of the Kalmiopsis Wilderness on February 24, 1978.The west side of this segment was administratively withdrawn for a period of 20 years by PLO 7556 on March 20, 2003. The segment of the Smith River from Sourdough Camp to the NFS land boundary was withdrawn by inclusion in the Wild and Scenic Rivers system in 1988 by act of Congress (P.L. 100-557).

Mineral withdrawn areas within the watershed on NFS lands (22.6 miles) reduce the amount of IP habitat that is available for suction dredging and high banking as noted below:

- High IP: 0 miles are withdrawn, leaving 0.4 miles available for mining. Of those miles:
  - 0.4 miles are typed *spawning/rearing*
- Medium IP: 20.3 miles are withdrawn, leaving 13.0 miles available for mining. Of those miles:
  - 13.0 miles are typed *spawning/rearing*
- Low IP: 2.3 miles are withdrawn, leaving 2.7 miles available for mining. Of those miles:
  - 2.7 miles are typed *spawning/rearing*

There were 3 active claims as of 5/8/2013 within ¼ mile of Coho Salmon designated CH and one NOI was submitted during the time period 2009 to 2012 (Table 4). It was submitted in 2012 for a claim at RM 2.4 of North Fork Diamond Creek, in habitat typed as *spawning and rearing* (Chapter IV, Table 139).

The proposed action would allow a maximum of 5 NOI annually in this watershed. If all 5 NOI were implemented in the same year, it would affect 2,165 linear feet (0.41 miles) of Coho Salmon designated CH. This represents 0.7 percent of all Coho Salmon designated CH in the watershed (Table 181) (0.41 of 55.8 miles that is typed *spawning/rearing*). There is no habitat typed *rearing/migration* or *migration only* in the watershed. The maximum amount of high IP habitat that could be affected by the proposed action in any year is 0.4 miles (all that exists on the RRS and in the watershed). This would occur in the unlikely event that all NOI activity would be concentrated on the 0.4 miles of high IP habitat on the RRS rather than being distributed among the total 16.1 miles available for mining on the RRS. The maximum amount of medium IP habitat that could be affected by the proposed action in any year is 0.41 miles, or 0.9 percent of the 46.7 miles of medium IP habitat in the watershed.

8. Upper Rogue River population

a. Bear Creek watershed

The Bear Creek watershed is in the Middle Rogue River subbasin within the SONCC Coho Salmon ESU. Of the MPI indicators that would be measurably negatively affected by the proposed action, the environmental baseline is characterized as *Not Properly Functioning* for suspended sediment: intergravel DO/turbidity, chemical contamination/nutrients, substrate character and embeddedness, off-channel habitat and refugia.

The watershed has the highest human density of any watershed within the Rogue River Basin. Human development has altered habitat conditions to the point where Coho Salmon are largely functionally extinct. Coho Salmon have never been observed on NFS lands in the Bear Creek watershed, especially after long-standing barriers were built. Granite Street and Hosler Dams block Coho access into the forks of Ashland Creek although these streams are high gradient and not optimal Coho Salmon habitat (Montgomery et al. 1999). The forks of Ashland Creek are included in the designated CH total although salmon cannot access them because of downstream human-made barriers.

Within the watershed, limiting factors described in Chapter IV that may be measurably negatively impacted by the proposed action include fine sediment, lack of complex rearing habitat and chemical spills. Sedimentation would result from deposition of fine sediment downstream from dredge operations. Complex habitat would be temporarily negatively impacted by dredge tailings piles and by increased embeddedness of the substrate. Fuel may be spilled during refueling of dredge engines. Chemical contamination would also result from remobilization of mercury from deep in the substrate.

The final SONCC Coho Salmon Recovery Plan (NMFS 2014) identifies the key limited life stage as “juvenile,” and the following principal stresses for the Upper Rogue River population:

- Altered hydrologic function
- Impaired water quality

The proposed action would not measurably negatively affect hydrologic function, but would measurably negatively affect water quality in the short-term. Water quality would be measurably negatively impacted in the short-term by increased turbidity, gasoline spills and mercury/trace metal contamination. The PCE site attribute (and associated Coho Salmon life cycle stages) associated with effects from impacts to water quality that would be measurably negatively impacted is water quality (juvenile rearing, juvenile out-migration and adult upstream migration).

Within the watershed, limiting factors described in Chapter IV that may be measurably negatively impacted by the proposed action include fine sediment, lack of complex rearing habitat and chemical spills.

Sedimentation would be temporarily negatively impacted by deposition of fine sediment downstream from dredge operations. PCE site attributes (and associated Coho Salmon life cycle stages) would be measurably negatively impacted by sedimentation. They are cover/shelter (juvenile rearing), space (juvenile rearing), spawning gravel (spawning), food (juvenile migration) and substrate (juvenile migration).

The final SONCC Coho Salmon ESA recovery plan discusses lack of floodplain and channel structure at section 3.1.6. The focus is on the loss of connectivity of low gradient, unconstrained stream reaches with floodplains that provide diverse, slow water habitats, particularly in off-channel areas. Stream channels that are straightened, diked or leveed also lose complex habitats and indirectly change timing of peak flows. Loss of large wood was also discussed. None of these aspects of floodplain and channel structure would be measurably negatively impacted by the proposed action.

However, channel structure would be measurably negatively impacted in the short-term and at the site-scale by temporary dredge tailings piles. PCE site attributes (and associated Coho Salmon life cycle stages) associated with effects from loss of channel structure by temporary dredge tailings piles that would be measurably negatively impacted include cover/shelter (juvenile rearing) and space (juvenile rearing).

Complex habitat would be negatively impacted in the short-term by temporary dredge tailings piles and by increased embeddedness of the substrate. PCE site attributes (and associated Coho Salmon life cycle stages) would be measurably negatively impacted by the loss of complex rearing habitat as a result of temporary dredge tailings piles and increased embeddedness of the substrate. They are cover/shelter (juvenile rearing) and space (juvenile rearing).

Fuel may be spilled during refueling of dredge engines. Chemical contamination would also result from remobilization of mercury from deep in the substrate. The PCE site attributes (and associated Coho Salmon life cycle stages) associated with effects from chemical spills that would be measurably negatively impacted are: (1) water quality (juvenile rearing, juvenile out-migration and adult upstream migration), (2) food (juvenile migration) and, (3) substrate (juvenile migration).

The USFS manages 9 percent of the watershed, including 12.1 miles (14 percent) of the total 86.7 miles of Coho Salmon designated CH. The following percentages of the total watershed miles by Coho Salmon IP class are within the RRS:

- High IP: 0 percent (0 of 55.9 total watershed miles)
- Medium IP: 4.7 percent (0.8 of 17.2 total watershed miles)
- Low IP: 83.0 percent (11.3 of 13.6 total watershed miles)

The area within the East Fork Ashland Creek Research Natural Area (RNA) has been withdrawn from mineral entry. Mineral withdrawn areas within the watershed on NFS lands (8.1 miles) reduce the amount of IP habitat that is available for suction dredging and high banking as noted below:

- High IP: There is no high IP habitat on the RRS
- Medium IP: 0.5 miles are withdrawn, leaving 0.3 miles available for mining. Of those miles:
    - 0.3 miles are typed *spawning/rearing*
- Low IP: 7.6 miles are withdrawn, leaving 3.7 miles available for mining. Of those miles:
    - 3.7 miles are typed *spawning/rearing*

There were no active claims as of 5/8/2013 within ¼ mile of Coho Salmon designated CH and no NOI were submitted during the time period 2009 to 2012 (Table 4). The proposed action would allow a maximum of 5 NOI annually in this watershed. If all 5 NOI were implemented in the same year, it would affect 2,165 linear feet (0.41 miles) of Coho Salmon designated CH. This represents 0.5 percent of all Coho Salmon designated CH in the watershed (Table 181) (0.41 of 86.7 miles that is typed *spawning/rearing*). There is no habitat typed *rearing/migration* or *migration only* in the watershed. There is no high IP habitat on the RRS. The maximum amount of medium IP habitat that could be affected by the proposed action in any year is 0.3 miles (the entirety of medium IP habitat on the RRS that is available for mining), or 1.7 percent of the 17.2 miles of medium IP habitat in the watershed. This would occur in the unlikely event that NOI activity would be concentrated on the 0.3 miles of medium IP habitat on the RRS rather than being distributed among the total 4.0 miles available for mining on the RRS.

b. Elk Creek watershed

The Elk Creek watershed is in the Upper Rogue River subbasin within the SONCC Coho Salmon ESU. Of the MPI indicators that would be measurably negatively affected by the proposed action, the environmental baseline is characterized as *Properly Functioning* for chemical contamination, *At Risk* for suspended sediment: intergravel DO/turbidity and substrate character and embeddedness, and *Not Properly Functioning* for off-channel habitat and refugia.

The final SONCC Coho Salmon Recovery Plan (NMFS 2014) identifies the key limited life stage as “juvenile,” and the following principal stresses for the Upper Rogue River population:

- Altered hydrologic function
- Impaired water quality

The proposed action would not measurably negatively affect hydrologic function, but would measurably negatively affect water quality in the short-term. Water quality would be measurably negatively impacted in the short-term by increased turbidity, gasoline spills and mercury/trace metal contamination. The PCE site attribute (and associated Coho Salmon life cycle stages) associated with effects from impacts to water quality that would be measurably negatively impacted is water quality (juvenile rearing, juvenile out-migration and adult upstream migration).

Within the watershed, limiting factors described in Chapter IV that may be measurably negatively impacted by the proposed action include fine sediment and lack of complex rearing habitat.

Sedimentation would be temporarily negatively impacted by deposition of fine sediment downstream from dredge operations. PCE site attributes (and associated Coho Salmon life cycle stages) would be measurably negatively impacted by sedimentation. They are: (1) cover/shelter (juvenile rearing), (2) space (juvenile rearing), (3) spawning gravel (spawning), (4) food (juvenile migration) and, (5) substrate (juvenile migration).

Complex rearing habitat would be temporarily negatively impacted by temporary dredge tailings piles and by increased embeddedness of the substrate. PCE site attributes (and associated Coho Salmon life cycle stages) would be measurably negatively impacted by the loss of complex rearing habitat as a result of temporary dredge tailings piles and increased embeddedness of the substrate. They are cover/shelter (juvenile rearing) and space (juvenile rearing).

The USFS manages 34 percent of the watershed, including 9.5 miles (18 percent) of the total 53.7 miles of Coho Salmon designated CH. There are no mineral withdrawn areas in the watershed. The following percentages of the total watershed miles by Coho Salmon IP class are within the RRS and are available for suction dredging and high banking:

- High IP: 0 percent (0 of 17.3 total watershed miles)
- Medium IP: 24.3 percent (6.0 of 24.7 total watershed miles). Of those miles:
  - 6.0 miles are typed *spawning/rearing*
- Low IP: 29.9 percent (3.5 of 11.7 total watershed miles). Of those miles:
  - 3.5 miles are typed *spawning/rearing*

There were no active claims as of 5/8/2013 within ¼ mile of Coho Salmon designated CH and no NOI were submitted during the time period 2009 to 2012 (Table 4). The proposed action would allow a maximum of 5 NOI annually, in this watershed. If all 5 NOI were implemented in the same year, it would affect 2,165 linear feet (0.41 miles) of Coho Salmon designated CH. This represents 0.8 percent of all Coho Salmon designated CH in the watershed (Table 181) (0.41 of 53.7 miles that is typed *spawning/rearing*). There is no habitat typed *rearing/migration* or *migration only* in the watershed. There is no high IP habitat on the RRS. The maximum amount of medium IP habitat that could be affected by the proposed action in any year is 0.41 miles, or 1.7 percent of the 24.7 miles of medium IP habitat in the watershed.

c. Little Butte Creek watershed

The Little Butte Creek watershed is in the Upper Rogue River subbasin within the SONCC Coho Salmon ESU. Of the MPI indicators that would be measurably negatively affected by the proposed action, the environmental baseline is characterized as *Properly Functioning* for chemical contamination, *At Risk* for suspended sediment: intergravel DO/turbidity and substrate character and embeddedness, and *Not Properly Functioning* for off-channel habitat and refugia.

The final SONCC Coho Salmon Recovery Plan (NMFS 2014) identifies the key limited life stage as “juvenile,” and the following principal stresses for the Upper Rogue River population:

- Altered hydrologic function
- Impaired water quality

The proposed action would not measurably negatively affect hydrologic function, but would measurably negatively affect water quality in the short-term. Water quality would be measurably negatively impacted in the short-term by increased turbidity, gasoline spills and mercury/trace metal contamination. The PCE site attribute (and associated Coho Salmon life cycle stages) associated with effects from impacts to water quality that would be measurably negatively impacted is water quality (juvenile rearing, juvenile out-migration and adult upstream migration).

Within the watershed, limiting factors described in Chapter IV that may be measurably negatively impacted by the proposed action include fine sediment and habitat modification.

Sedimentation would be temporarily negatively impacted by deposition of fine sediment downstream from dredge operations. PCE site attributes (and associated Coho Salmon life cycle stages) would be measurably negatively impacted by sedimentation. They are: (1) cover/shelter (juvenile rearing), (2) space (juvenile rearing), (3) spawning gravel (spawning), (4) food (juvenile migration) and, (5) substrate (juvenile migration).

Habitat modification (which is inclusive of sedimentation) would be measurably negatively impacted by the proposed action from short-term increases in turbidity, fines < 0.85 mm in size in spawning gravels, increased substrate embeddedness, reduced habitat complexity by the creation of temporary dredge tailings piles and increased embeddedness of the substrate, gasoline spills, as well as remobilization of mercury/trace metals.

The PCE site attributes (and associated Coho Salmon life cycle stages) associated with effects from habitat modification that would be measurably negatively impacted include: (1) cover/shelter (juvenile rearing), (2) space (juvenile rearing), (3) spawning gravel (spawning adults), (4) food (juvenile migration), (5) substrate (juvenile migration) and, (6) water quality (juvenile rearing, juvenile out-migration and adult upstream migration).

The USFS manages 25 percent of the watershed, including 13.6 miles (17 percent) of the total 78.0 miles of Coho Salmon designated CH. There are no mineral withdrawn areas in the watershed. The following percentages of the total watershed miles by Coho Salmon IP class are within the RRS and are available for suction dredging and high banking:

- High IP: 0 percent (0 of 29.0 total watershed miles)
- Medium IP: 18.4 percent (6.9 of 37.4 total watershed miles). Of those miles:
    - 6.9 miles are typed *spawning/rearing*
- Low IP: 57.8 percent (6.7 of 11.6 total watershed miles). Of those miles:
    - 6.7 miles are typed *spawning/rearing*

There was one active claim as of 5/8/2013 within ¼ mile of Coho Salmon designated CH and no NOI were submitted during the time period 2009 to 2012 (Table 4). The proposed action would allow a maximum of 5 NOI annually, in this watershed. If all 5 NOI were implemented in the same year, it would affect 2,165 linear feet (0.41 miles) of Coho Salmon designated CH. This represents 0.5 percent of all Coho Salmon designated CH in the watershed (Table 181) (0.41 of 78.0 miles that is typed *spawning/rearing*). There is no habitat typed *rearing/migration* or *migration only* in the watershed. There is no high IP habitat on the RRS. The maximum amount of medium IP habitat that could be affected by the proposed action in any year is 0.41 miles, or 1.1 percent of the 37.4 miles of medium IP habitat in the watershed.

9. Winchuck River population

a. Winchuck River watershed

The Winchuck River watershed is in the Chetco River subbasin within the SONCC Coho Salmon ESU. Of the MPI indicators that would be measurably negatively affected by the proposed action, the environmental baseline is characterized as *Properly Functioning* for Chemical Contamination and *At Risk* for suspended sediment: intergravel DO/turbidity, substrate character and embeddedness, off-channel habitat and refugia.

The final SONCC Coho Salmon Recovery Plan (NMFS 2014) identifies the key limited life stage as “juvenile,” and the following principal stresses for the Chetco River population:

- Lack of floodplain and channel structure
- Impaired water quality

The proposed action would not measurably negatively impact floodplains. Channel structure and water quality would be measurably negatively impacted in the short-term.

The final SONCC Coho Salmon ESA recovery plan discusses lack of floodplain and channel structure at section 3.1.6. The focus is on the loss of connectivity of low gradient, unconstrained stream reaches with floodplains that provide diverse, slow water habitats, particularly in off-channel areas. Stream channels that are straightened, diked or leveed also lose complex habitats and indirectly change timing of peak flows. Loss of large wood was also discussed. None of these aspects of floodplain and channel structure would be measurably negatively impacted by the proposed action.

However, channel structure would be measurably negatively impacted in the short-term and at the site-scale by temporary dredge tailings piles. PCE site attributes (and associated Coho Salmon life cycle stages) associated with effects from loss of channel structure by temporary dredge tailings piles that would be measurably negatively impacted include cover/shelter (juvenile rearing) and space (juvenile rearing).

Water quality would be measurably negatively impacted in the short-term by increased turbidity, gasoline spills and mercury/trace metal contamination. The PCE site attribute (and associated Coho Salmon life cycle stages) associated with effects from impacts to water quality that would be measurably negatively impacted is water quality (juvenile rearing, juvenile out-migration and adult upstream migration).

The USFS manages 72 percent of the watershed, including 34.0 miles (67 percent) of the total 50.4 miles of Coho Salmon designated CH. There are no mineral withdrawn areas in the watershed. The following percentages of the total watershed miles by Coho Salmon IP class are within the RRS and are available for suction dredging and high banking:

- High IP: 18.8 percent (0.6 of 3.2 total watershed miles)
- Medium IP: 72.8 percent (26.5 of 36.4 total watershed miles). Of those miles:
  - 20.4 miles are typed *spawning/rearing*
  - 6.1 miles are typed *rearing/migration*
- Low IP: 63.9 percent (6.9 of 10.8 total watershed miles). Of those miles:
  - 6.8 miles are typed *spawning/rearing*
  - 0.1 miles are typed *rearing/migration*

There were no active claims as of 5/8/2013 within ¼ mile of Coho Salmon designated CH and no NOI were submitted during the time period 2009 to 2012 (Table 4). The proposed action would allow a maximum of 5 NOI annually in this watershed. If all 5 NOI were implemented in the same year, it would affect 2,165 linear feet (0.41 miles) of Coho Salmon designated CH. This represents 0.8 percent of all Coho Salmon designated CH in the watershed (Table 181) (0.41 of 50.4 miles that is typed *spawning/rearing* and *rearing/migration*). There is no habitat typed *migration only* in the watershed.

The maximum amount of high IP habitat that could be affected by the proposed action in any year is 0.41 miles, or 12.8 percent of the 3.2 miles of high IP habitat in the watershed. This would occur in the unlikely event that all NOI activity would be concentrated on the 0.6 miles of high IP habitat on the RRS rather than being distributed among the total 34.0 miles available for mining on the RRS. The maximum amount of medium IP habitat that could be affected by the proposed action in any year is 0.41 miles, or 1.1 percent of the 36.4 miles of medium IP habitat in the watershed.

G. Effects at the watershed scale: OC Coho Salmon ESU

1. Coquille River population

a. South Fork Coquille River watershed

The South Fork Coquille River watershed is in the Coquille River subbasin within the OC Coho Salmon ESU. Of the MPI indicators that would be measurably negatively affected by the proposed action, the environmental baseline is characterized as *Properly Functioning* for the chemical contamination/nutrients indicator and *At Risk* for the suspended sediment: intergravel DO/turbidity, substrate character and embeddedness, off-channel habitat, and refugia indicators.

The primary limiting factors for the watershed listed in Chapter IV that would be measurably negatively affected by the proposed action include in-stream fish habitat below potential condition, and excessive fine sediment in stream channels. We interpret in-stream fish habitat below potential condition as the physical habitat conditions of the streambed. PCE site attributes (and associated Coho Salmon life cycle stages) would be measurably negatively impacted by reducing in-stream fish habitat below potential condition and by increasing fine sediment in the streambed. This would be a result of the following short-term impacts from the proposed action: (1) dredge tailings piles, (2) increased embeddedness of the substrate and, (3) increases in fine sediment <0.85 millimeter in spawning gravel. They are natural cover (freshwater rearing) and substrate (freshwater spawning)

The State of Oregon determined the primary limiting factor reducing adult abundance of the ESU and the Coquille population was the “loss of stream complexity”. Stream complexity was defined as the variety of physical habitat conditions that provide overwinter shelter conditions. Some off-channel habitat that serves as overwinter habitat may be measurably negatively impacted by the proposed action, but the effects are not anticipated to last throughout the winter. This would impact the juvenile rearing life cycle stage for Coho Salmon.

The RRS manages about 35 percent of the watershed, including 22.9 miles (24 percent) of the total 96.2 miles of Coho Salmon habitat. The South Fork Coquille River within the RRS, though occupied by OC Coho Salmon, is exempt from critical habitat designation due to economic benefits of exclusion outweighing the benefits of designation as per the Federal Register, 50 CFR Parts 223 and 226 (NMFS 2008). The 96.2 miles is based on a combination of 1) OC Coho Salmon delineated CH for areas located below Powers, Oregon and 2) ODFW steelhead presence survey 2013 GIS data for areas located above Powers, Oregon (off NFS lands) and RRS Anadromous Salmonid Fish Distribution steelhead presence GIS layer on NFS lands (as a surrogate for current and historic Coho Salmon habitat).

There are no mineral withdrawn areas in the watershed. The following percentages of the total watershed miles by Coho Salmon IP class are within the RRS and are available for suction dredging and high banking:

- High IP: 0 percent (0 of 42.4 total watershed miles)
- Medium IP: 40.5 percent (19.7 of 48.6 total watershed miles). Of those miles:
    - 16.3 miles are typed *spawning/rearing*
    - 3.4 miles are typed *rearing/migration*
- Low IP: 61.5 percent (3.2 of 5.2 total watershed miles). Of those miles:

- o 2.9 miles are typed *spawning/rearing*
- o 0.3 miles are typed *rearing/migration*

There were 16 active claims as of 5/8/2013 within ¼ mile of Coho Salmon habitat. During the time period 2009 to 2012, the highest number of NOI filed (3) occurred during 2009, 2010, 2011, and 2012. The average number of NOI for the four years was 3.0 per year (Chapter I, Table 4). They were for 3 claims on the mainstem of Johnson Creek at RMs 1.6, 1.8, and 2.2, all in habitat typed as *spawning and rearing* (Chapter 4, Table 165).

The proposed action would allow a maximum of 8 NOI annually in this watershed. If all 8 NOI were implemented in the same year, it would affect 3,464 linear feet (0.66 miles) of Coho Salmon habitat. This represents 0.7 percent of all Coho Salmon habitat in the watershed (Table 181) (0.66 of 96.2 miles that is typed *spawning/rearing* and *rearing/migration*). There is no habitat typed *migration only* in the watershed. There is no high IP habitat in the RRS. The maximum amount of medium IP habitat that could be affected by the proposed action in any year is 0.66 miles, or 1.3 percent of the 48.6 miles of medium IP habitat in the watershed.

2. Sixes River population

a. Sixes River watershed

The Sixes River watershed is in the Sixes River subbasin within the OC Coho Salmon ESU. Of the MPI indicators that would be measurably negatively affected by the proposed action, the environmental baseline is characterized as *Properly Functioning* for the chemical contamination/nutrients indicator and *At Risk* for the suspended sediment: intergravel DO/turbidity, substrate character and embeddedness, off-channel habitat, and refugia indicators.

One of the factors for decline and habitat limiting factors for OC coho in the ESU is gravel mining and suction dredge activities classified as a modification or curtailment of the range (NMFS 2012). At the scale of the Sixes River population, a primary limiting factor is stream complexity and a secondary limiting factor is water quality. Both would be measurably negatively impacted in the short-term by the proposed action.

Stream habitat complexity would be reduced in the short-term by dredge tailings piles and increased substrate embeddedness. A PCE site attribute (and associated Coho Salmon life cycle stage) would be measurably negatively impacted by the loss of stream habitat complexity as a result of temporary dredge tailings piles and increased embeddedness of the substrate. It is natural cover (freshwater rearing).

Water quality would be impacted in the short-term by increased turbidity, gasoline spills and mercury/trace metal contamination. The PCE site attribute (and associated Coho Salmon life cycle stages) associated with effects from impacts to water quality that would be measurably negatively impacted is water quality (freshwater rearing and freshwater migration.

The RRS manages about 26 percent of the watershed, including 5.6 miles (8 percent) of the total 67.5 miles of Coho Salmon designated CH. The following percentages of the total watershed miles by Coho Salmon IP class are within the RRS:

- High IP: 0 percent (0 of 18.4 total watershed miles)
- Medium IP: 14.5 percent (6.3 of 43.4 total watershed miles)
- Low IP: 5.3 percent (0.3 of 5.7 total watershed miles)

Mineral withdrawn areas within the watershed on NFS lands (3.7 miles) reduce the amount of IP habitat that is available for suction dredging and high banking as noted below:

- High IP: There is no high IP habitat on the RRS
- Medium IP: 3.6 miles are withdrawn, leaving 2.7 miles available for mining. Of those miles:
  - 2.7 miles are typed *rearing and migration*
- Low IP: 0.1 miles are withdrawn, leaving 0.2 miles available for mining. Of those miles:
  - 0.2 miles are typed *rearing and migration*

There were 7 active claims as of 5/8/2013 within ¼ mile of Coho Salmon habitat. During the time period 2009 to 2012, the highest number of NOI filed (4) occurred during 2011. The average number of NOI for the four years was 2.3 per year (Chapter I, Table 4). The NOI were for four claims on the mainstem Sixes River, located from RM 20.2 to 22.2), all in habitat typed as *rearing and migration* (Chapter 4, Table 171).

The proposed action would allow a maximum of 7 NOI annually in this watershed. If all 7 NOI were implemented in the same year, it would affect 3,031 linear feet (0.57 miles) of Coho Salmon designated CH. This represents 0.9 percent of all Coho Salmon designated CH in the watershed (Table 181) (0.57 of 67.5 miles that is typed *spawning/rearing* and *rearing/migration*). There is no habitat typed *migration only* in the watershed. There is no high IP habitat in the RRS. The maximum amount of medium IP habitat that could be affected by the proposed action in any year is 0.57 miles, or 1.3 percent of the 43.4 miles of medium IP habitat in the watershed.

H. ESA Effect Determination

Table 183 summarizes the results of the analysis of effects to the MPI Indicators. The analysis was for the purpose of determining the effects of the action to SONCC and OC Coho Salmon and their designated CH. The analysis for effects of the action to Southern DPS Green Sturgeon and Southern DPS Pacific Eulachon tier to the results of the chemical contamination/nutrients indicator and to the analysis for effects of chemical contamination that may result in harm/harassment of individuals of both ESUs of Coho Salmon.

Table 184 displays ESA effect determinations for SONCC and OC Coho Salmon and their designated CH, to Southern DPS Green Sturgeon and to Southern DPS Pacific Eulachon. Five MPI indicators would have measurable negative effects from the proposed action. Multiple PCE of designated CH for both SONCC and OC Coho Salmon would be negatively impacted by the proposed action. There are also sublethal and possibly lethal effects to individuals of the species as a result of the proposed action. Consequently, the ESA effect determination for both ESUs of Coho Salmon is “May Affect, Likely to Adversely Affect” the species and their respective designated CH.

The analysis for effects to the chemical contamination/nutrients indicator determined that deep streambed sediments contaminated by legacy Hg would be mobilized by suction dredge mining. Hg attached to fine sediment particles would travel downstream and settle in slow velocity areas such as estuaries. Estuaries may contain wetland areas that provide conditions favorable to MeHg production. MeHg would enter the food chain and be consumed by juvenile eulachon and juvenile/adult Green Sturgeon, potentially resulting in negative effects to behavior, health and future reproductive success. Green Sturgeon may also be exposed to Hg associated with estuary bed particles because of their benthic orientation and feeding behavior. Consequently, the ESA effect determination for both the Southern DPS Green Sturgeon and Southern DPS Pacific Eulachon is "May Affect, Likely to Adversely Affect" the species.

Table 183. Summary of effects to the MPI indicators by the proposed action

Indicator	Effect Conclusion by PE[1]		Overall Effect Conclusion
	Mining	Onsite Occupancy	
Population size and distribution	NA[2]	NA[2]	-I
Growth and survival	NA[2]	NA[2]	-I
Life history diversity and isolation	NA[2]	NA[2]	N
Persistence and genetic integrity	NA[2]	NA[2]	N
Temperature	+M	-I	+M
Suspended sediment: intergravel DO/turbidity indicator	-M	-I	-M
Chemical contamination/nutrients	-M	-I	-M
Physical barriers	N	N	N
Substrate character and embeddedness	-M	-I	-M
Large wood	N	N	N
Pool frequency and quality	+M	-D	+M
Large pools	+M	-D	+M
Off-channel habitat	-M	-I	-M
Refugia	-M	-I	-M
Ave. wetted width/max. depth ratio in scour pools in a reach	-D	-D	-D
Streambank condition	-I	-D	-I
Floodplain connectivity	N	N	N
Change in peak/base flows	N	N	N
Increase in drainage network	N	N	N
Road density and location	N	N	N
Disturbance history	NA[2]	NA[2]	-I
Riparian Reserves	NA[2]	NA[2]	-D
Disturbance regime	NA[2]	NA[2]	-I

[1] Negative effect = "-", Positive effect = "+", Neutral effect = "N", Measurable magnitude (greater than insignificant) = "M", Insignificant magnitude. = "I", Discountable probability = "D"

[2] Not Applicable. Population characteristic indicators do not lend themselves to a factor analysis by PE. The AP process does not evaluate watershed condition indicators by PE or a factor analysis.

Table 184. ESA effect determinations for listed fish species and designated critical habitat

Species	ESA Listing Status	Determination of Effects	
		Individuals	Critical Habitat
Southern Oregon/Northern California Coho Salmon	Threatened	LAA	LAA
Oregon Coast Coho Salmon	Threatened	LAA	LAA
Southern DPS Green Sturgeon	Threatened	LAA	NA
Southern DPS Pacific Eulachon	Threatened	LAA	NA

ESA Effects Rationale

Project Effects Determination Key for Species and Designated Critical Habitat

1) Do any of the indicator summaries have a positive (+) or negative (-) conclusion?

Yes – Go to 2

No – No Effect

2) Are the indicator summary results only positive?

Yes – NLAA

No – Go to 3

3) If any of the indicator summary results are negative, are the effects insignificant or discountable?

Yes – NLAA

No – LAA, fill out Adverse Effects Form

See Appendix G for Adverse Effects form.

I. Aggregated Federal Effects

We are not aware of any proposed federal actions for which a Biological Assessment has been submitted contemporaneously with this BA for ESA consultation, which would affect the ESA action area for this project. All ongoing actions with potential adverse effects (where ESA consultation has been concluded), and effects of completed federal actions, are included in the environmental baseline for each indicator and have been considered in this analysis.

J. ESA Cumulative Effects

Endangered Species Act cumulative effects include the effects of future state, tribal, local or private actions that are reasonably certain to occur in the ESA action area considered in this BA. Future federal actions that are unrelated to the proposed action, and have not already undergone consultation under the ESA, are not considered here because they require separate consultation pursuant to Section 7 of the ESA.

The amount of non-federal land ownership varies considerably by watershed in the ESA action area. Land uses on non-federal lands have a wide range of effects to stream physical characteristics, water quality, riparian areas and to individual Coho Salmon. Typical rural uses include, but are not limited to, intensive timber management, cattle grazing, recreational use, agriculture and road maintenance. Land development in urban areas results in more pavement, concentrated stream flows, and thereby alters natural runoff patterns. Developed areas often generate polluted runoff that enters streams. The RRS anticipates that these uses and associated impacts will continue in the future, and will increase with human population growth in the ESA action area. It is also expected that activities on these lands will comply with county, state, and federal laws and regulations.

The State of Oregon is implementing the Oregon Plan, a comprehensive aquatic conservation strategy. The goal is to restore fish populations and fisheries to productive and sustainable levels. The plan includes coordination of efforts by local, state, and federal governments as well as tribal, private, and other interests. Oregon Plan activities are reasonably certain to occur in the ESA action area and will benefit Coho Salmon and their habitat.

Of particular relevance to this discussion of ESA cumulative effects is the amount of suction dredge gold mining activity that may occur within the ESA action area that is not on the RRS. The proposed action includes the approval of up to 307 NOI per year (Chapter 1, Table 4). Each approved NOI, as well as any suction dredging activity within the state Essential Salmonid Habitat that is located outside the RRS, requires an authorization by the Oregon Department of State Lands (ODSL) to allow for operations. Senate Bill 838, approved by the Oregon Legislature in 2013, limits the total number of state-wide annual authorizations to 850.

Should all 307 RRS NOI be authorized by the ODSL, 543 authorizations would remain available in other parts of Oregon outside of the RRS lands. It is not known what proportion of the remaining 543 authorizations may be approved within the ESA action area by watershed on non-federal land. However, an ODSL memo dated April 9, 2013 from Director Mary M. Abrams to Governor John Kitzhaber and others regarding an update on 2012 placer mining, and specifically suction dredge gold mining (ODSL 2013), states that the greatest activity is taking place in the southwest and northeast quarters of the state. The two most heavily used rivers are the Rogue and the South Umpqua. The Rogue River basin is within the ESA action area for this consultation.

The ODSL issues authorizations in waters identified as Essential Salmonid Habitat (ESH). ESH is defined as the habitat necessary to prevent the depletion of native salmonid species, including: Chum, Sockeye, Chinook, and Coho Salmon, and steelhead and Cutthroat trout during their spawning and rearing life stages. The ESH in watersheds in the ESA action area is inclusive of OC Coho Salmon designated CH. However, ESH within the SONCC Coho Salmon ESU on the RRS only includes 508.3 of the 728.7 total miles of SONNC Coho Salmon designated CH (approximately 70 percent). Therefore, the RRS has chosen to use the number of ODEQ permits issued as it far more reaching and more accurately represents effects to Coho Salmon and its habitat. The number of ODSL permits issued in SONNC Coho Salmon watersheds of the RRS would under-represent the area that would be affected by suction dredging, as no ODSL authorizations are required outside of ESH.

There were 748 ODEQ authorizations issued in 2014 for suction dredging in Oregon (Table 185). Of the 29 subbasins for which ODEQ authorizations were issued, nine subbasins are part of the ESA action area. The total number ODEQ permits issued in those nine subbasins was 420, or 56 percent of the total issued in Oregon. The distribution of ODEQ permits issued across Oregon in 2014 is shown in Figure 46. The 2014 distribution validates what was stated in the April 9, 2013 ODSL memo described above.

Of the 428 ODEQ permits issued in the nine subbasins, 146 were issued in the 29 watersheds of the ESA action area (Table 186). Of the 146, 125 or 86 percent were within ¼ mile of CCH (79 (63 percent) in the 27 watersheds of the SONCC Coho Salmon ESU and 46 (37 percent) in the two watersheds of the OC Coho Salmon ESU).

Of the 79 ODEQ permits within ¼ of CCH in the SONCC Coho Salmon ESU, 53 (67%) were on the RRS, 9 (11%) were on BLM land and 17 (22%) were on private land. Only 14 of the 27 watersheds in the ESA action area had permits issued. In 7 of the 14 watersheds, the majority of the permits were on RRS lands.

Of the 46 ODEQ permits within ¼ mile of CCH in the OC Coho Salmon ESU, 10 (22%) were on the RRS, 12 (26%) were on BLM land and 24 (52%) were on private land. Of the two watersheds in the OC Coho Salmon ESU, the majority of the permits were on the RRS in the South Fork Coquille River watershed only. The distribution of the 2014 ODEQ permits issued within ¼ mile of CCH within the 29 watersheds of the ESA action area is displayed in Figure 47.

Table 185. Number of Oregon Department of Environmental Quality permits issued for suction dredge gold mining in 2014 in Oregon, by subbasin

Subbasin	Number per Subbasin
Applegate	*45*
Burnt	12
Chetco	*2*
Coast Fork Willamette	23
Coquille	*21*
Illinois	*71*
Little Deschutes	1
Lower Columbia-Sandy	1
Lower Crooked	1
Lower John Day	3
Lower Rogue	*61*
Middle Fork John Day	29
Middle Fork Willamette	3
Middle Rogue	*179*
Molalla-Pudding	17
Nehalem	1
North Fork John Day	4
North Santiam	7
North Umpqua	6
Powder	12
Sixes	*40*
South Santiam	37
South Umpqua	156
Umpqua	5
Upper John Day	1
Upper Klamath	1
Upper Malheur	1
Upper Rogue	*3*
Upper Willamette	5
Total	748

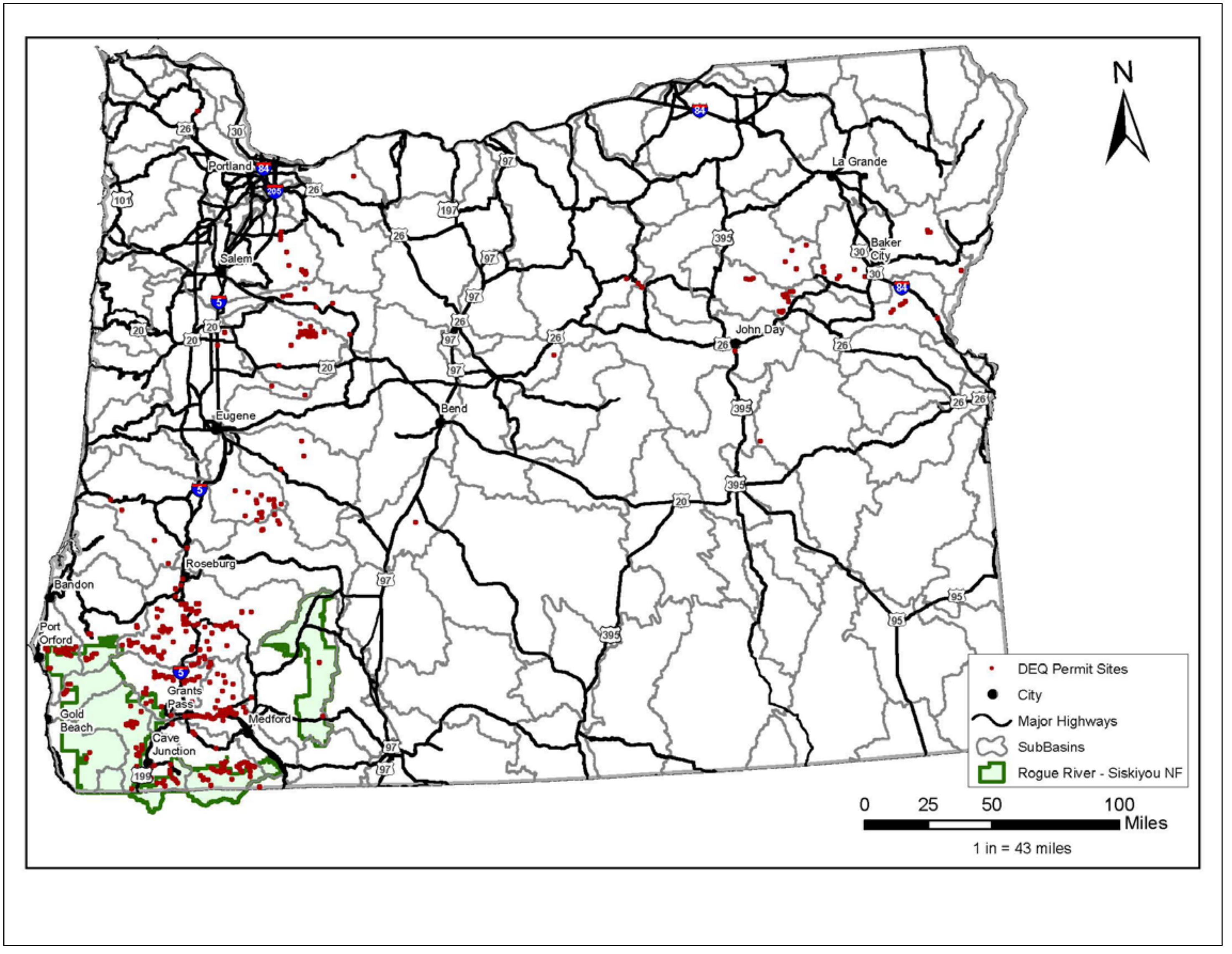

Figure 46. Location of permits issued by the Oregon Department of Environmental Quality for suction dredge mining in 2014

Table 186. 2014 Oregon Department Environmental Quality suction dredging and high banking permits within Coho Salmon Critical Habitat RRS watersheds – across all ownerships

Coho Population	Subbasin (4th field)	Watershed (5th field)	2014 Oregon Department of Environmental Quality Permits Issued for Suction Dredging and High Banking by Land Ownership: Total and Within ¼ mile of Coho Salmon Designated Critical Habitat									
			USFS		BLM		State		Private		TOTAL	
			Total	CCH	Total	CCH	Total	CCH	Total	CCH	Total	CCH
SONCC Coho ESU												
Chetco River	Chetco	Chetco River1710031201	2	2	0	0	0	0	0	0	2	2
Elk River	Sixes	Elk River 1710030603	1	1	0	0	0	0	1	1	2	2
Illinois River	Illinois	Althouse Creek 1710031101	1	1	0	0	0	0	0	0	1	1
		Briggs Creek 1710031107	14	2	0	0	0	0	0	0	14	2
		Deer Creek 1710031105	0	0	0	0	0	0	0	0	0	0
		East Fork Illinois 1710031103	1	1	1	1	0	0	1	1	3	3
		Indigo Creek 1710031110	0	0	0	0	0	0	0	0	0	0
		Josephine Creek-Illinois River 1710031106	29	29	0	0	0	0	0	0	29	29
		Klondike Creek-Illinois River 1710031108	1	1	0	0	0	0	0	0	1	1
		Lawson Creek-Illinois River 1710031111	0	0	0	0	0	0	0	0	0	0
		Silver Creek 1710031109	0	0	0	0	0	0	0	0	0	0
		Sucker Creek 1710031102	6	6	4	4	0	0	0	0	10	10
		West Fork Illinois River 1710031104	0	0	2	2	0	0	0	0	2	2
Lower Rogue River	Lower Rogue	Lobster Creek 1710031007	2	2	0	0	0	0	4	4	6	6
		Rogue River 1710031008	0	0	0	0	0	0	0	0	0	0
Middle Rogue / Applegate Rivers	Applegate	Lower Applegate River 1710030906	0	0	0	0	0	0	4	4	4	4
	Applegate	Middle Applegate River 1710030904	0	0	0	0	0	0	1	1	1	1
	Applegate	Upper Applegate River 1710030902	5	5	1	1	0	0	6	6	12	12
	Lower Rogue	Hellgate Canyon-Rogue River 1710031002	3	3	4	1	0	0	0	0	7	4
	Lower Rogue	Shasta Costa Creek-Rogue River1710031006	0	0	0	0	0	0	0	0	0	0
	Lower Rogue	Stair Creek-Rogue River 1710031005	0	0	0	0	0	0	0	0	0	0
Pistol River	Chetco	Pistol River 1710031204	0	0	0	0	0	0	0	0	0	0
Smith River	Smith	North Fork Smith River 1801010101	0	0	0	0	0	0	0	0	0	0

Coho Population	Subbasin (4th field)	Watershed (5th field)	2014 Oregon Department of Environmental Quality Permits Issued for Suction Dredging and High Banking by Land Ownership: Total and Within ¼ mile of Coho Salmon Designated Critical Habitat									
			USFS		**BLM**		**State**		**Private**		**TOTAL**	
			Total	**CCH**	**Total**	**CCH**	**Total**	**CCH**	**Total**	**CCH**	**Total**	**CCH**
Upper Rogue River	Middle Rogue	Bear Creek 1710030801	0	0	0	0	0	0	0	0	0	0
	Upper Rogue	Elk Creek 1710030705	0	0	0	0	0	0	0	0	0	0
		Little Butte Creek 1710030708	0	0	0	0	0	0	0	0	0	0
Winchuck River	Chetco	Winchuck River 1710031202	0	0	0	0	0	0	0	0	0	0
		SONCC Coho Salmon – population total	**65**	**53**	**12**	**9**	**0**	**0**	**17**	**17**	**94**	**79**
OC Coho ESU												
1. Coquille	Coquille	South Fork Coquille River[1] 1710030502	9	9	0	0	0	0	6	6	15	15
Sixes	Sixes	Sixes River 1710030602	5	1	13	12	0	0	19	18	37	31
		OC Coho Salmon – population total	**14**	**10**	**13**	**12**	**0**	**0**	**25**	**24**	**52**	**46**
		SONCC and OC Coho Salmon – populations' grand total	**79**	**63**	**25**	**21**	**0**	**0**	**42**	**41**	**146**	**125**

[1] Values based on a combination of 1) OC Coho Salmon delineated CH for areas located below Powers, Oregon and 2) ODFW steelhead presence survey 2013 GIS data for areas located above Powers, Oregon (off NFS lands) and RRS Anadromous Salmonid Fish Distribution steelhead presence GIS layer on NFS lands (as a surrogate for current and historic Coho Salmon habitat); website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata.

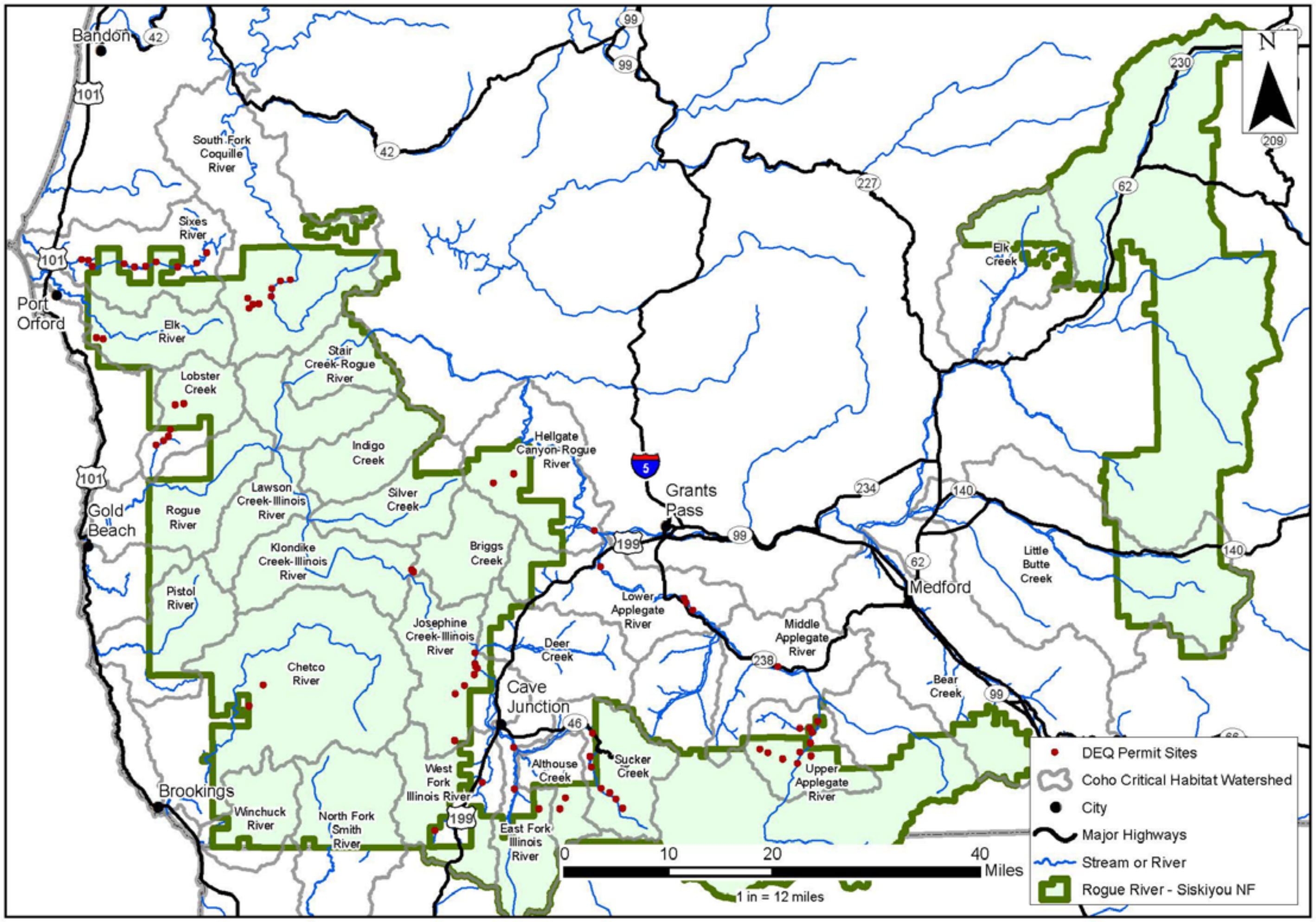

Figure 47. Oregon Department of Environmental Quality permits issued in 2014 for suction dredge mining in the 29 watersheds of the ESA action area

K. EFH Effect Determination

Essential Fish Habitat provisions of the Magnuson-Stevens Act require heightened consideration of habitat for commercial species in resource management decisions, including EFH for Coho and Chinook salmon. EFH is defined in section 3 of the Magnuson-Stevens Act as “those waters and substrates necessary to fish for spawning, breeding, feeding, or growth to maturity” and includes all waters historically used by anadromous salmonids of commercial value. NMFS interprets EFH to include aquatic areas and their associated physical, chemical and biological properties used by fish that are necessary to support a sustainable fishery and the contribution of the managed species to a healthy ecosystem.

For purposes of this analysis, EFH for Coho and Chinook salmon is considered to be the same area as that for SONCC and OC Coho Salmon designated CH in the ESA action area. This document conducted a thorough analysis of the effects of implementing the proposed action to the indicators of the MPI, and to the PCE of designated CH of SONCC and OC Coho Salmon. Based upon that analysis, the ESA effect determination was “May Affect, Likely to Adversely Affect.” Because the indicators of the MPI and the PCE of designated CH address the characteristics of EFH, it is concluded that implementation of the proposed action “**May Adversely Affect**” EFH for Coho and Chinook salmon.

The ESA action area includes estuaries of rivers in Southern Oregon that pass through the RRS. Some of the 25 species found in Oregon constituting Pacific Groundfish and Coastal Pelagic species may utilize estuarine tidal influence areas during part of their life history. Consequently an analysis of effects to EFH for these species is required.

The proposed action will result in reintroduction of Hg from deep streambed sediment into the water column. Hg attached to fine sediment particles in the clay-silt size class is likely to be transported to estuary areas where conditions in associated wetlands are conducive to microbial production of MeHg (see analysis of effects to Coho Salmon from Hg described earlier in Section D, sub-section 8 of this Chapter). This will negatively impact the chemical properties of EFH for some Pacific Groundfish and Coastal Pelagic species. For this reason, it is concluded that implementation of the proposed action “**May Adversely Affect**” EFH for Pacific Groundfish and Coastal Pelagic species.

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VII. Appendices

Appendix A. Suction Dredging and High Banking Mineral Withdrawn Areas on the Rogue River-Siskiyou National Forest within the ESA Action Area

Wild and Scenic Rivers, Wilderness Areas, and Administrative Mineral Withdrawn Areas within the ESA Action Area on the Rogue River-Siskiyou National Forest

The Wild and Scenic Rivers Act (Act) was signed into law in 1968, establishing a formal network of protected rivers. To qualify as "Wild and Scenic", a river must be free-flowing and possess at least one "outstandingly remarkable value" (ORV) such as scenery, recreation, geologic, fish, wildlife, historic, cultural or other similar features. The Act balances demands for consumptive uses of water and their need for modifying rivers with dams or other features, with the desire to protect rivers in their natural free-flowing state. Passage of the Act provided immediate protection for eight rivers in the nation, among them the Rogue River. Since passage of the Act, four additional rivers (Illinois River, Elk River, Chetco River, and North Fork Smith River) have been designated Wild and Scenic in the Rogue River–Siskiyou National Forest. Congress designated the Illinois River in 1984 (PL 98-454), and the remaining rivers were designated in 1988 in the Omnibus Oregon Wild and Scenic Rivers Act of 1988, with an addition to the Elk River in 2009. The Forest is now nationally recognized for the number and quality of Wild and Scenic Rivers within its boundaries.

Section 9 (a)(iii) of the 1968 Wild and Scenic Rivers Act congressionally withdrew all segments designated as "wild" from mineral appropriation, subject to valid existing rights. ("Subject to valid existing rights" means that miners with claims properly filed prior to an area being withdrawn from mineral location and entry have the right to mine that claim subject to verification of a valid discovery on that claim). The Act (Section 2(b)(1) described the term "wild" as those rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. The delineation of these segments has been accomplished during the "River Management Plan" process or through Congressional designation and the withdrawals of these segments are in place. Withdrawals from mineral entry, of wild sections of Wild and Scenic Rivers, include all lands within ¼ mile of the river or as established by the final river management boundary (with wider or narrower boundaries allowed, but overall the boundary must average ¼ mile on each side of the river).

All rivers and streams within Wilderness areas are also withdrawn from mineral entry (Section 4 (3)(d)(3) of the 1964 Wilderness Act) subject to valid existing rights.

In addition to statutory withdrawals from mineral entry, through the Wild and Scenic and Wilderness Acts, rivers and streams areas may be withdrawn through administrative procedures (43 CFR 2310). In these types of withdrawals the land managing agency may apply to the BLM for withdrawals of up to 20 years (withdrawals prior to the Federal Land Policy and Management Act may be longer) to maintain resource values which may not receive adequate protection under the Forest Service's surface mining regulations.

Mining claims and mining, in some form, are part of the history of all designated Wild and Scenic Rivers on the Forest. At the time of designation of these rivers, their mining history and current mining activity were known. Suction dredge activity, however, was minimal when the Wild and Scenic Rivers Act was passed. It was, however, near a peak when The Omnibus Oregon Wild and Scenic Rivers Act of 1988 designated the Chetco, North Fork Smith, and Elk rivers. The generally held view at the time was that suction dredge mining was of minimal effect.

Rogue River. The Rogue River was administratively withdrawn from mineral entry on September 10, 1958 by Public Land Order (PLO) 1726. The withdrawal extends to 1 mile on either side of the river for the protection and preservation of scenic and recreation areas adjacent to the river and its tributaries. This currently includes the entire river from the Forest boundary, near Marial, to the Forest Boundary near the Lobster Creek bridge.

Illinois River. The Illinois River was designated as "Wild and Scenic" by Congress in 1984 (PL 98-454). Mining, in some form, is part of the history of the upper and lower segments of the Illinois River. Much of the mineral potential along this river was poorly explored due to the nearly impassable terrain and the inherent lack of access into the heart of what is now the Kalmiopsis Wilderness.

The 1985 River Management Plan delineated Briggs Creek downstream to Nancy Creek as the Wild section. This section of river was automatically withdrawn from mineral entry and location. Then by recommendation of the River Management Plan, the Secretary of Interior, in 1993, withdrew from mineral appropriation, the river from Briggs Creek up to Deer Creek by Public Land Order 6986 for a period of 20 years. The administrative withdrawal was renewed in 2013 for another 20 year period by PLO 7817.

There are no additional withdrawals on the remaining eight miles of river. About four of the eight miles not withdrawn from mineral appropriation are largely privately owned (Nancy Creek to the mouth), the other four miles remaining open to mineral entry, run from the Forest Boundary, near Sauer Flat, downstream to about Deer Creek. This section of river was not withdrawn from mineral entry because historic mining had already heavily modified the river and surrounding benches, access was good, and mining demand was high. Since the character had already been heavily altered the view then was that withdrawal would accomplish little. This section of river is completely overlain with placer claims, as are most of the Illinois' tributaries in this upper section. One section here was formally a patented mining claim which was acquired by the Forest Service through land exchange in the mid 1990's and then subsequently claimed by individuals and by a couple of mining organization/clubs. This stretch of river sees a high amount of suction dredge activity.

Chetco River. On October 28, 1988, 44.5 miles of the Chetco River located in the Rogue River-Siskiyou National Forest was designated for inclusion in the National System under the Omnibus Oregon Wild and Scenic Rivers Act (102 Stat. 2782 (1988)). On July 26, 2013, Federal Register, Public Land Order No. 7819 the lower 19 miles (outside the wilderness boundary) was withdrawn, for a period of 5 years, from location and entry under the United States mining laws and to leasing under the mineral and geothermal leasing laws while legislation is being considered to make a technical correction to Section 3(a)(69) of the Wild and Scenic Rivers Act (16 U.S.C. 1274(69)). This order withdrew approximately 5,610 acres of NFS lands subject to valid existing rights. There are 2 such active filed mineral claims near the lower boundary of NFS lands.

The upper segments of the river down to Boulder Creek are within the Kalmiopsis Wilderness and are designated as “Wild”. Mining, in some form, is part of the history of the upper and lower segments of this River. However, by virtue of being within the Wilderness, this segment of the river is automatically withdrawn from location. There are no active filed mining claims in this area.

North Fork Smith River. The east side of the North Fork Smith River from Horse Creek downstream to Sourdough Camp (about 4.5 miles) was withdrawn as a part of the Kalmiopsis Wilderness on February 24, 1978.The west half of this segment was administratively withdrawn for a period of 20 years by PLO 7556 on March 20, 2003.

The segment of the Smith River (from Sourdough Camp to the Rogue River-Siskiyou National Forest Boundary) was withdrawn by inclusion in the Wild and Scenic Rivers system in 1988 by act of Congress (P.L. 100-557).

Some segments of the river have a history of mining activity. The two-mile section between Baldface Creek and the Oregon-California state line has experienced some mineral exploration activity upslope. But, mining activities within the corridor are quite limited.

Sixes River. Dry Creek and its tributaries within the Dry Creek subwatershed on NFS lands was withdrawn from mineral entry by the designation of the Grassy Knob Wilderness (June 26, 1984, PL 98-328). The upper most reach of Sixes River was withdrawn from mineral entry by the designation of the Copper Salmon Wilderness. The wilderness area was created by the Omnibus Public Land Management Act of 2009.

Miscellaneous withdrawn sites. There are other mineral withdrawn areas on the Forest aside from the above. These are mineral withdrawn areas at a smaller scale, such as, specific recreation sites. A regional effort is put forth to identify the sites on Forest by the later part of 2014, although they will not be identified by the completion of this BA. The sites are generally small in size and should not overall skew the available miles of CCH affected by NOIs suction dredging and high banking activities.

Appendix B. Water Quality 303d Listed Stream within NFS lands on RRS

Table B-1. ODEQ, 2010 303d List for Oregon Waterbodies on CCH within NFS lands on RRS

Subbasin	Stream Name	Miles on RRS (miles)	River Mile Marker (miles)	Pollutant	Season	Assess-ment Date	Listing Status
Applegate	**Lower Applegate watershed**						
	Waters Creek	1.89	2.4 to 4.3	Temperature	Summer	5/9/2005	Cat 4A: Water quality limited, TMDL approved
	Upper Applegate watershed						
	Applegate River	2.99	0 to 46.8	Temperature	Summer	5/9/2005	Cat 4A: Water quality limited, TMDL approved
	Beaver Creek	4.95	0 to 8.8	Biological Criteria	Year Around	2/18/2011	Cat 4C: Water quality limited, not a pollutant
	Beaver Creek	4.95	0 to 8.8	Sedimentation	Undefined	5/24/2005	Cat 4A: Water quality limited, TMDL approved
	Beaver Creek	2.50	0 to 3.5	Temperature	Summer	5/9/2005	Cat 4A: Water quality limited, TMDL approved
	Palmer Creek	5.45	0 to 5.7	Temperature	Summer	5/9/2005	Cat 4A: Water quality limited, TMDL approved
	Star Gulch	0.27	0 to 4.3	Temperature	Summer	5/9/2005	Cat 4A: Water quality limited, TMDL approved
Chetco	**Chetco River watershed**						
	Boulder Creek	9.39	0 to 9.5	Temperature	Year Around	1/29/2013	Cat 5: Water quality limited, 303(d) list, TMDL needed
	Chetco River	43.93	0 to 57.1	Temperature	Year Around	4/14/2005	Cat 5: Water quality limited, 303(d) list, TMDL needed
	Chetco River	43.93	0 to 57.1	Biological Criteria	Year Around	1/29/2013	Cat 5: Water quality limited, 303(d) list, TMDL needed
	Eagle Creek	5.44	0 to 6.8	Temperature	Year Around	1/29/2013	Cat 5: Water quality limited, 303(d) list, TMDL needed
	Emily Creek	7.64	0 to 8.1	Temperature	Year Around	1/29/2013	Cat 5: Water quality limited, 303(d) list, TMDL needed
	Eagle Creek	0.18	0 to 6.8	Temperature	Year Around	1/29/2013	Cat 5: Water quality limited, 303(d) list, TMDL needed
	East Fork Pistol River	4.52	0 to 4.6	Temperature	Year Around	1/29/2013	Cat 5: Water quality limited, 303(d) list, TMDL needed
	North Fork Pistol River	0.98	0 to 2.8	Temperature	Year Around	1/29/2013	Cat 5: Water quality limited, 303(d) list, TMDL needed
	Pistol River	7.22	0 to 19.8	Temperature	Year Around	4/14/2005	Cat 5: Water quality limited, 303(d) list, TMDL needed
	Winchuck River watershed						

Subbasin	Stream Name	Miles on RRS (miles)	River Mile Marker (miles)	Pollutant	Season	Assess-ment Date	Listing Status
	East Fork Winchuck R.	7.10	0 to 7.5	Biological Criteria	Year Around	1/29/2013	Cat 5: Water quality limited, 303(d) list, TMDL needed
	East Fork Winchuck R.	7.10	0 to 7.5	Temperature	Year Around	4/14/2005	Cat 5: Water quality limited, 303(d) list, TMDL needed
	Fourth of July Creek	4.58	0 to 4.6	Temperature	Year Around	1/29/2013	Cat 5: Water quality limited, 303(d) list, TMDL needed
	Wheeler Creek	10.94	0 to 11	Temperature	Year Around	1/29/2013	Cat 5: Water quality limited, 303(d) list, TMDL needed
	Winchuck River	2.18	0 to 11.1	Temperature	Year Around	4/14/2005	Cat 5: Water quality limited, 303(d) list, TMDL needed
Illinois	**Althouse Creek watershed**						
	Althouse Creek	8.04	0 to 18	Temperature	Year Around	10/29/2010	Cat 4A: Water quality limited, TMDL approved
	Althouse Creek	8.04	0 to 18	Biological Criteria	Year Around	1/29/2013	Cat 5: Water quality limited, 303(d) list, TMDL needed
	Briggs Creek Watershed						
	Briggs Creek	14.65	0 to 15.5	Temperature	Year Around	10/29/2010	Cat 4A: Water quality limited, TMDL approved
	Soldier Creek	2.48	2 to 4.5	Temperature	Summer	10/29/2010	Cat 4A: Water quality limited, TMDL approved
	Soldier Creek	2.00	0 to 2	Temperature	Summer	12/22/2010	Cat 4A: Water quality limited, TMDL approved
	Deer Creek Watershed						
	Anderson Creek	0.01	0 to 3.2	Temperature	Year Around	10/29/2010	Cat 4A: Water quality limited, TMDL approved
	Deer Creek	1.90	0 to 17	Temperature	Year Around	10/29/2010	Cat 4A: Water quality limited, TMDL approved
	Deer Creek	1.90	0 to 17	Temperature	October 15 - May 15	10/29/2010	Cat 4A: Water quality limited, TMDL approved
	Squaw Creek	0.79	0 to 3	Temperature	Year Around	10/29/2010	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	10/29/2010	Cat 4A: Water quality limited, TMDL approved
	Indigo Creek watershed						
	Indigo Creek	0.03	0 to 8.2	Temperature	Year Around	10/29/2010	Cat 4A: Water quality limited, TMDL approved
	North Fork Indigo Creek	5.85	0 to 6	Temperature	Summer	10/29/2010	Cat 4A: Water quality limited, TMDL approved
	Josephine Creek-Illinois River watershed						

Subbasin	Stream Name	Miles on RRS (miles)	River Mile Marker (miles)	Pollutant	Season	Assess-ment Date	Listing Status
	Canyon Creek	5.86	0 to 5.9	Temperature	Summer	10/29/2010	Cat 4A: Water quality limited, TMDL approved
	Fall Creek	4.76	0 to 4.8	Temperature	Year Around	10/29/2010	Cat 4A: Water quality limited, TMDL approved
	Illinois River	22.61	0 to 56.1	Temperature	Year Around	10/29/2010	Cat 4A: Water quality limited, TMDL approved
	Josephine Creek	12.29	0 to 12.4	Temperature	Summer	10/29/2010	Cat 4A: Water quality limited, TMDL approved
	Little Sixmile Creek	1.21	0 to 1.2	Temperature	Summer	10/29/2010	Cat 4A: Water quality limited, TMDL approved
	Rancherie Creek	4.85	0 to 5.2	Temperature	Summer	10/29/2010	Cat 4A: Water quality limited, TMDL approved
	Sixmile Creek	5.17	0 to 5.2	Temperature	Year Around	10/29/2010	Cat 4A: Water quality limited, TMDL approved
	South Fork Canyon Creek	2.36	0 to 2.4	Temperature	Summer	10/29/2010	Cat 4A: Water quality limited, TMDL approved
	Klondike Creek watershed						
	Collier Creek	4.46	0 to 4.5	Temperature	Summer	10/29/2010	Cat 4A: Water quality limited, TMDL approved
	Illinois River	22.61	0 to 56.1	Temperature	Year Around	10/29/2010	Cat 4A: Water quality limited, TMDL approved
	Illinois River	22.61	0 to 56.1	Temperature	October 15 - May 15	10/29/2010	Cat 4A: Water quality limited, TMDL approved
	Klondike Creek	7.28	0 to 7.4	Temperature	Summer	10/29/2010	Cat 4A: Water quality limited, TMDL approved
	Panther Creek	2.59	0 to 2.6	Temperature	Year Around	10/29/2010	Cat 4A: Water quality limited, TMDL approved
	Lawson Creek watershed						
	Illinois River	6.33	0 to 56.1	Temperature	Year Around	10/29/2010	Cat 4A: Water quality limited, TMDL approved
	Lawson Creek	10.63	0 to 11.1	Temperature	Summer	10/29/2010	Cat 4A: Water quality limited, TMDL approved
	Silver Creek watershed						
	Silver Creek	0.08	0 to 10.9	Temperature	Year Around	10/29/2010	Cat 4A: Water quality limited, TMDL approved
	North Fork Silver Creek	6.80	0 to 7	Temperature	Summer	10/29/2010	Cat 4A: Water quality limited, TMDL approved
	Silver Creek	10.68	0 to 10.9	Temperature	Year Around	10/29/2010	Cat 4A: Water quality limited, TMDL approved
	South Fork Silver Creek	6.98	0 to 7	Temperature	Summer	10/29/2010	Cat 4A: Water quality limited, TMDL approved
	Sucker Creek watershed						
	Sucker Creek	3.09	0 to 17.9	Temperature	Summer	8/1/2002	TMDL approved
	Sucker Creek	10.24	11.7 to 26	Temperature	Summer	8/1/2002	TMDL approved

Subbasin	Stream Name	Miles on RRS (miles)	River Mile Marker (miles)	Pollutant	Season	Assess-ment Date	Listing Status
	Sucker Creek	10.84	0 to 26	Temperature	Year Around	4/14/2005	Cat 4A: Water quality limited, TMDL approved
	Sucker Creek	5.99	0 to 21.1	Temperature	October 15 - May 15	4/14/2005	Cat 4A: Water quality limited, TMDL approved
	West Fork Illinois River watershed						
	Rough & Ready Creek	3.80	0 to 6.1	Temperature	Year Around	10/29/2010	Cat 4A: Water quality limited, TMDL approved
	South Fork Rough & Ready Creek	6.23	0 to 6.3	Temperature	Summer	10/29/2010	Cat 4A: Water quality limited, TMDL approved
	West Fork Illinois River	2.10	0 to 17.3	Biological Criteria	Year Around	1/29/2013	Cat 5: Water quality limited, 303(d) list, TMDL needed
	West Fork Illinois River	1.77	0 to 14.7	Temperature	Year Around	10/29/2010	Cat 4A: Water quality limited, TMDL approved
	West Fork Illinois River	0.03	14.7 to 17	Temperature	Year Around	12/22/2010	Cat 4A: Water quality limited, TMDL approved
	Whiskey Creek	3.85	0 to 4.2	Temperature	Summer	10/29/2010	Cat 4A: Water quality limited, TMDL approved
Lower Rogue	**Lobster Creek watershed**						
	Lobster Creek	1.05	0 to 9.7	Temperature	Summer	8/1/2002	TMDL approved
	Lobster Creek	0.01	0 to 9.7	Temperature	Summer	8/1/2002	TMDL approved
	Lobster Creek	0.01	0 to 9.7	Temperature	Year Around	4/14/2005	Cat 4A: Water quality limited, TMDL approved
	North Fork Lobster Creek	3.18	0 to 3.3	Temperature	Summer	8/1/2002	TMDL approved
	South Fork Lobster Creek	3.63	0 to 3.7	Temperature	Summer	8/1/2002	TMDL approved
	Rogue River watershed						
	Jim Hunt Creek	0.55	0 to 4.3	Biological Criteria	Year Around	1/29/2013	Cat 5: Water quality limited, 303(d) list, TMDL needed
	Quosatana Creek	7.85	0 to 8.1	Temperature	Summer	10/29/2010	Cat 4A: Water quality limited, TMDL approved
	Rogue River	16.01	0 to 124.8	Temperature	Year Around	10/29/2010	Cat 4A: Water quality limited, TMDL approved
	Shasta Costa-Rogue River watershed						
	Foster Creek	4.52	0 to 5.2	Temperature	Summer	10/29/2010	Cat 4A: Water quality limited, TMDL approved
	Rogue River	6.53	0 to	Temperature	Year Around	10/29/2010	Cat 4A: Water quality limited, TMDL approved

Subbasin	Stream Name	Miles on RRS (miles)	River Mile Marker (miles)	Pollutant	Season	Assess-ment Date	Listing Status
			124.8				
	Rogue River	12.34	0 to 124.8	Temperature	Year Around	10/29/2010	Cat 4A: Water quality limited, TMDL approved
	Shasta Costa Creek	13.08	0 to 13.4	Temperature	Year Around	10/29/2010	Cat 4A: Water quality limited, TMDL approved
	Rogue River	12.34	0 to 124.8	Temperature	Year Around	10/29/2010	Cat 4A: Water quality limited, TMDL approved
	Waters Creek	1.89	2.4 to 4.3	Temperature	Summer	5/9/2005	Cat 4A: Water quality limited, TMDL approved
Middle Rogue	**Bear Creek watershed**						
	Ashland Creek	0.56	0 to 5.4	Temperature	Year Around	11/4/2010	Cat 4A: Water quality limited, TMDL approved
	Wagner Creek	0.38	6 to 7.4	Temperature	Summer	10/29/2010	Cat 4A: Water quality limited, TMDL approved
Sixes	**Elk River watershed**						
	Bald Mountain Creek	1.17	0 to 2.3	Temperature	Summer	12/1/1998	303(d)
	Elk River	15.77	0 to 29.9	Temperature	Year Around	4/14/2005	Cat 5: Water quality limited, 303(d) list, TMDL needed
	Sunshine Creek	1.20	0 to 1.2	Biological Criteria	Year Around	1/29/2013	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	1/29/2013	Cat 5: Water quality limited, 303(d) list, TMDL needed
	Sixes River	2.45	15.1 to 30.1	Biological Criteria	Year Around	1/29/2013	Cat 5: Water quality limited, 303(d) list, TMDL needed
	Sixes River	2.52	0 to 30.1	Temperature	Year Around	4/14/2005	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	4/14/2005	Cat 5: Water quality limited, 303(d) list, TMDL needed
South Fork Coquille	**South Fork Coquille River watershed**						
	Johnson Creek	6.98	0 to 7.1	Temperature	Summer	8/1/2002	TMDL approved
	Johnson Creek	6.98	0 to 7.1	Temperature	Year Around	4/14/2005	Cat 4A: Water quality limited, TMDL approved
	Lake Creek	0.88	0 to 0.9	Biological Criteria	Year Around	1/29/2013	Cat 5: Water quality limited, 303(d) list, TMDL

Subbasin	Stream Name	Miles on RRS (miles)	River Mile Marker (miles)	Pollutant	Season	Assess-ment Date	Listing Status
							needed
	Rock Creek	2.85	0 to 3	Temperature	Summer	8/1/2002	TMDL approved
	Salmon Creek	0.24	0 to 9.2	Temperature	Summer	12/1/1998	303(d)
	South Fork Coquille R.	13.65	0 to 51.9	Biological Criteria	Year Around	1/29/2013	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	1/29/2013	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	1/29/2013	Cat 5: Water quality limited, 303(d) list, TMDL needed
	South Fork Coquille R.	19.20	18.1 to 61.9	Temperature	Year Around	4/14/2005	Cat 5: Water quality limited, 303(d) list, TMDL needed
	South Fork Coquille R.	13.87	42.1 to 61.9	Temperature	Summer	8/1/2002	TMDL approved
Upper Rogue	**Elk Creek watershed**						
	Bitter Lick Creek	7.06	0 to 8.6	Temperature	Summer	10/29/2010	Cat 4A: Water quality limited, TMDL approved
	Bitter Lick Creek	7.06	0 to 8.6	Biological Criteria	Year Around	1/29/2013	Cat 5: Water quality limited, 303(d) list, TMDL needed
	Sugarpine Creek	5.58	0 to 9.1	Temperature	Year Around	10/29/2010	Cat 4A: Water quality limited, TMDL approved
	Sugarpine Creek	2.53	0 to 6	Temperature	October 15 - June 15	10/29/2010	Cat 4A: Water quality limited, TMDL approved
	Little Butte Creek watershed						
	Dead Indian Creek	2.94	0 to 9.6	Temperature	Year Around	10/29/2010	Cat 4A: Water quality limited, TMDL approved
	South Fork Little Butte Creek	4.62	0 to 16.4	Sedimentation	Undefined	12/1/1998	303(d)
	South Fork Little Butte Creek	4.62	0 to 16.4	Temperature	Summer	12/22/2010	Cat 4A: Water quality limited, TMDL approved
	South Fork Little Butte Creek	14.37	10.8 to 26.2	Temperature	Undefined	10/29/2010	Cat 4A: Water quality limited, TMDL approved

Appendix C. Potential Exposure of Coho Salmon Smolts to Suction Dredging

Potential Exposure of Coho Salmon Smolts to Suction Dredging Analysis of smolt trap data

There will be limited exposure of Coho Salmon or their habitat during the juvenile out-migration life cycle stage to active operations of the proposed action. This was determined by comparing the in-water work windows[26] for the waterways in the ESA action area with life-cycle timing tables[27]. The exposure will occur in the Illinois River waterway for two weeks (June 15-30) and for one month in the Rogue River tributaries above Mariel waterway (June 15 to July 15). In both cases, it will occur during the tail of the out-migration period.

The RRS requested smolt migration trap data sets for both waterways from ODFW staff to assess the potential proportion of out-migrants that may be exposed. There were no data sets available for the Illinois River waterway. Data sets were available for Bear Creek, Elk Creek and Little Butte Creek in the Rogue River tributaries above Mariel waterway for various years between 2001 and 2006. A summary table is presented in Table C-1.

Table C-1. Coho smolt trap information for three streams in the Rogue River tributaries above Mariel waterway

Stream	Year	End Trap Date	Peak Catch Per Week	Peak Catch Week	Total Smolts Caught	Notes
Bear Creek	2001	6/24	9	4/23-29	27	Last smolt caught 6/7
Bear Creek	2002	6/16	21	4/6-12	68	Last smolt caught 5/28
Bear Creek	2003	6/29	4	3/10-16	14	Last smolt caught 5/25
Bear Creek	2004	6/16	0	NA	0	
Bear Creek	2005	6/18	0	NA	0	
Bear Creek	2006	6/9	2	3/20-26 5/15-21	8	Last smolt caught 5/26
Elk Creek	2002	6/4	290	4/29-5/5	1,770	0,6,0 caught last 3 days
Elk Creek	2003	6/22	293	3/17-23	2,157	3 caught 6/9 to 6/22
Elk Creek	2004	6/12	344	3/8-14	1,862	6 caught 5/31 to 6/12
L. Butte Creek	2001	6/24	815	5/20-26	3,484	17 caught last week
L. Butte Creek	2002	6/16	3,583	5/20-26	14,228	537 caught last week
L. Butte Creek	2003	6/15	5,331	5/19-25	16,192	444 caught last week
L. Butte Creek	2004	6/23	1,257	5/10-16	5,423	1 caught last 7 days

[26] ODFW website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=guidelineTimingTables.
[27] ODFW website: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=timingtables.

The data suggests that Coho smolt migration in Bear Creek is completed by mid-June. No Coho smolts were captured after June 10 for the 2001-2006 period of record. For Elk Creek, the data suggests the Coho smolt out-migration was essentially completed on or before June 15 for the three years of record.

Little Butte Creek produces the largest number of Coho smolts of the three streams. Smolt trap records indicate that in two of four years, the Coho smolt-out-migration was essentially completed by the end of the second or third week of June. In the last week the trap fished in 2001, 17 Coho smolts were caught. In the last week the trap fished in 2004, only 1 Coho smolt was caught. However, in 2002 and 2003 trapping ended even though there were 537 and 444 smolts caught in the last week.

A review of the weekly Coho smolt catch for Little Butte Creek for the four years of record (Tables C-2 to C-5), determined that smolt capture totals declined by about 50 percent or more (in some cases, substantially more) from the preceding week for the last three weeks of record. A conservative estimate of projections of catch by week to the week including July 15 would be to take the last week of record and use 50 percent reductions by week after that.

This would result in a projected additional catch of 15, 523, 431 and 7 Coho smolts each year from 2001 to 2004, respectively. New total catches for each year would be 3,499, 14,751, 16,623 and 5,430, respectively. The percentage of Coho smolts that would be potentially exposed to the proposed action would be those actually caught on or after June 15 added to those projected to be caught by the smolt trap during the week that includes July 15, divided by the total projected catch. The calculations result in percentages of 1.3, 4.3, 2.8 and 0.2 of the total smolt catch that would be potentially exposed to the proposed action using the 2001 to 2004 data sets.

In summary, there is no data available to determine the proportion of Coho smolts that may be exposed to the proposed action in the June 15-30 period that overlaps between the beginning of the in-water work window and the end of the juvenile out-migration life cycle identified by ODFW for the Illinois River waterway. However, it is at the tail of the out-migration period.

Using data, and assumptions based upon the data, for Coho smolt trap catches in three tributaries in the Rogue River tributaries above Mariel waterway, the RRS concludes that in years where Coho smolt outmigration has not ended by June 15, no more than 5 percent of the total number of out-migrating Coho smolts may be affected by the proposed action.

Based upon the number of NOIs in the four-year period from 2009-12, it is certain that there will be some exposure to active operations in the Illinois River waterway. However, the level of exposure in the Rogue River tributaries above Mariel waterway is likely to be low, as there was only one NOI in that entire time period.

Table C-2. Coho smolt catch by week at a screw trap in Little Butte Creek in 2001

Week	Total Smolts Caught
Feb 26 - Mar 4	5
Mar 5-10	30
Mar 11-17	24
Mar 18-24	50
Mar 25-Mar 31	64
Apr 1-7	114
Apr 8-14	45
Apr 13-21	35
Apr 22-28	95
Apr 29 - May 5	97
May 6-12	512
May 13-19	764
May 20-26	815
May 27-June 2	520
June 3-9	231
June 10-16	66
June 17-23	17
Total Catch	3,484

Table C-3. Coho smolt catch by week at a screw trap in Little Butte Creek in 2002

Week	Total Smolts Caught
Feb 26 - Mar 4	25
Mar 5-10	128
Mar 11-17	52
Mar 18-24	118
Mar 25-Mar 31	106
Apr 1-7	314
Apr 8-14	281
Apr 13-21	364
Apr 22-28	119
Apr 29 - May 5	552
May 6-12	776
May 13-19	3,161
May 20-26	3,583
May 27-June 2	2,797
June 3-9	1,315
June 10-16	537
Total Catch	14,228

Table C-4. Coho smolt catch by week at a screw trap in Little Butte Creek in 2003

Week	Total Smolts Caught
Feb 24 - Mar 2	18
Mar 3-9	158
Mar 10-16	279
Mar 17-23	430
Mar 24-30	192
Mar 31-Apr 6	194
Apr 7-13	100
Apr 14-20	70
Apr 21-27	253
Apr 28-May 4	445
May 5-11	545
May 12-18	1,106
May 19-25	5,331
May 26-June 1	4,331
June 2-8	2,296
June 9-15	444
Total Catch	16,192

Analysis of Coho Salmon smolt migration timing through Savage Rapids Dam

Savage Rapids dam was located at river mile 107, east of Grants Pass, Oregon. The site of the former dam is upstream from the Illinois River waterway and downstream from the Rogue River tributaries above Mariel waterway.

Cramer and Pellissier (1998) monitored juvenile fish passage at a trap placed on the north-side bypass at Savage Rapids dam in 1998. Sampling began on June 8 and concluded on August 11. Only five yearling Coho were captured, and the last was captured on June 16. In 2000 only two yearling Coho were captured, and the last was captured on May 18, during a trapping season that ran from May 16 to July 15 (Cramer and Pellissier 2001). No Coho yearlings were captured in 2001 during a trapping season that ran from May 8 to July 15 (Cramer and Pellissier 2002).

However, the authors evaluated ODFW data sets for the years 1976-86 and 1987-90 for Coho smolt catches at the northside bypass (Cramer and Pellissier 1998). The data were daily counts for the 1976-86 period and two days per week counts for the 1987-90 period. Interpretation of their Figure 9 bar chart for the 1976-86 time period indicates that the mean percentage of Coho smolts trapped at the bypass after the week concluding June 17 (the time period of concern for the Rogue River tributaries above Mariel waterway) was approximately 11 percent. Interpretation of their Table 7 indicates the mean percentage of Coho smolts passing through the bypass in the time period 1987-90 after the week concluding June 17 was approximately 14 percent.

Smolt trap data at Savage Rapids Dam is not specific to tributaries in the Rogue River tributaries above Mariel waterway. It would include Coho smolts from other tributary streams. It is also uncertain if Coho smolts, once leaving tributary streams, would have had additional residency time in the Rogue River before passing through Savage Rapids dam.

Cramer and Pellissier (1998), citing ODFW (1991), stated that emigration timing of Coho smolts as evaluated by the bypass trap at the Savage Rapids Dam tends to be earlier in years of high flow. In the high flow years of 1979 and 1983, over 95 percent of the catch in the trap had occurred by June 10 (ODFW 1991).

Diel timing of Coho smolt out-migration

The literature strongly supports that the seaward movement of Coho smolts primarily takes place at night. The literature suggests that the percentage of Coho smolts migrating at night is in the range of 75-95 percent. Therefore, the large majority of smolts would not encounter suction dredge activities at the hours in which they migrate, because suction dredge activities only take place during daylight hours. However, smolts at an active suction dredge site or up to 300 feet downstream from it during daylight hours would be subject to the same effects as other rearing juvenile Coho Salmon.

Meehan and Siniff (1962), citing multiple authors, stated that there is much evidence of nocturnal downstream migration for smolts of several species of salmonids. They examined a scoop trap in the Taku River in Alaska at two-hour intervals in 1961. Approximately 75 percent of Coho smolts were captured between the hours of 8 p.m. and 8 a.m. The peak capture time period was between midnight and 2 a.m.

Feola (2007) studied the downstream movement of pit-tagged Coho Salmon in three streams in Humboldt County, California. Seventy-eight percent of all tagged fish captured at smolt traps in 2003 moved between the hours of 20:00 and 07:59. Eskelin (2004) while evaluating smolt trap efficiency in a small Alaskan stream noted for Coho smolts that: “Capture rates showed a strong diel pattern. Periodic checks of the livebox revealed daytime catches were low and that there was a dramatic increase in catch rate beginning at dusk with high catches continuing until just before dawn.”

Harper (1980) trapped Coho Salmon smolts in Jacoby Creek, a tributary to Humboldt Bay in northern California. He observed that Coho smolts primarily migrated downstream during the hours of darkness. Seller et al. (2003) used screw traps to capture Coho smolts in the Cedar River, a tributary to Lake Washington in Washington. They calculated weekly day/night catch ratios for Coho smolts in 1999. The day catch rates averaged 5 percent over a 13-week period. In other words, 95 percent of the Coho smolts were caught in traps at night. Brege et al. (1996) examined downstream migration of coho juveniles at the John Day dam on the Columbia River. They determined that 88.6 percent of seaward migrating juvenile Coho Salmon passed at night (2200 to 0600 hours) for the time periods 1987-89 and 1991-93.

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3E Company. 2012. Material Safety Data Sheet for unleaded gasoline. Prepared in accordance with 29 CFR 1910. 17 pp.

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Seiler, D., G. Volkhardt and L. Kishimoto. 2003. Evaluation of Downstream Migrant Salmon Production in 1999 and 2000 From Three Lake Washington Tributaries: Cedar River, Bear Creek, and Issaquah Creek. Washington Department of Fish and Wildlife, Olympia, Washington.

Appendix D. EC50 and LC50 for Aquatic Life Exposed to Components of Unleaded Gasoline. Adapted from 3E Company (2012).

The Material Safety Data Sheet prepared by the 3E Company (2012) lists EC50 or LC50 for aquatic life exposed to various components of unleaded gasoline. The information is presented here in Table D-1.

Table D-1. LC50 for aquatic life exposed to components of unleaded gasoline

Component of Unleaded Gasoline	EC50 or LC50	Species of Aquatic Life	Test Results
1,2,4, Trimethylbenzene	LC50	Fathead minnow (*Pimephales promelas*)	7.19 - 8.28 mg/l, 96 hours
Benzene	EC50	Water flea (*Daphnia magna*)	8.76 - 15.6 mg/l, 48 hours
Benzene	LC50	Rainbow Trout, donaldson trout (*Oncorhynchus mykiss*)	5.3 mg/l, 96 hours
Cumene	EC50	Brine shrimp (*Artemia* sp.)	3.55 - 11.29 mg/l, 48 hours
Cumene	LC50	Rainbow trout, donaldson trout (*O. mykiss*)	2.7 mg/l, 96 hours
Cyclohexane	LC50	Fathead minnow (*P.promelas*)	3.961 - 5.181 mg/l, 96 hours
Ethanol	EC50	Freshwater algae	275 mg/l, 72 Hours
Ethanol	LC50	Fathead minnow (*P.promelas*)	> 100 mg/l, 96 hours
Ethanol	LC50	Freshwater fish	11200 mg/l, 96 Hours
Ethanol	EC50	Freshwater invertebrate	5012 mg/l, 48 Hours
Ethylbenzene	EC50	Water flea (*Daphnia magna*)	1 - 4 mg/l, 48 hours
Ethylbenzene	LC50	Rainbow trout, donaldson trout (*O. mykiss*)	4 mg/l, 96 hours
n-Hexane	LC50	Fathead minnow (*P. promelas*)	2.101 - 2.981 mg/l, 96 hours
Toluene	EC50	Water flea (*Daphnia magna*)	5.46 - 9.83 mg/l, 48 hours
Toluene	LC50	Coho Salmon (*O. kisutch*)	5.5 mg/l, 96 hours
Xylene	LC50	Rainbow Trout, Donaldson trout (*O. mykiss*)	8 mg/l, 96 Hours

Reference

3E Company (Valero). 2012. Material Safety Data Sheet for unleaded gasoline. 17 pp.

Appendix E. Dose-response Database for Coho Salmon Exposed to Suspended Sediment. Adapted from Newcombe and Jensen (1996)

Newcombe and Jensen (1996) prepared a dose-response database for fish species exposed to suspended sediment. References specific to Coho Salmon in that document are presented in Table E-1. For reference, the proposed action is expected to result in maximum concentrations of suspended sediments less than 340 mg/l immediately downstream from active suction-dredging operations.

Table E-1. Dose-response database for Coho Salmon exposed to suspended sediment. Adapted from Newcombe and Jensen (1996)

Life Stage[1]	Exposure Concen-tration (mg/l)	Exposure Duration (h)	Description	Reference
J	53.5	0.02	Alarm reaction	Berg (1983)
J	88	0.02	Alarm reaction	Bisson and Bilby (1982)
U	20	0.05	Cough frequency not increased	Servizi and Martens (1992)
J	53.5	12	Changes in territorial behavior	Berg and Northcote (1985)
J	88	0.08	Avoidance behavior	Bisson and Bilby (1982)
J	6,000	1	Avoidance behavior	Noggle (l978)
U	300	0.17	Avoidance behavior within minutes	Servizi and Martens (1992)
J	25	1	Feeding rate decreased	Noggle (l978)
J	100	1	Feeding rate decreased to 55% of maximum	Noggle (l978)
J	250	1	Feeding rate decreased to 10% of maximum	Noggle (l978)
J	300	1	Feeding ceased	Noggle (l978)
U	2,460	.05	Coughing behavior manifest within minutes	Servizi and Martens (1992)
J	53.5	12	Increased physiological stress	Berg and Northcote (1985)
U	2,460	1	Cough frequency greatly increased	Servizi and Martens (1992)
U	240	24	Cough frequency increased > 5 -fold	Servizi and Martens (1992)
U	530	96	Blood glucose levels increased	Servizi and Martens (1992)
J	1,547	96	Gill damage	Noggle (1978)
U	2,460	24	Fatigue of the cough reflex	Servizi and Martens (1992)
U	3,000	48	High level sublethal stress; avoidance	Servizi and Martens (1992)
J	102	336	Growth rate reduced	Sigler et al. (1984)
U	8,000	96	Mortality rate 1%	Servizi and Martens (1992)
J	1,200	96	Mortality rate 50%	Noggle(l978)
J	35,000	96	Mortality rate 50%	Noggle (l978)
U	22,700	96	Mortality rate 50%	Servizi and Martens (1992)
F	8,100	96	Mortality rate 50%	Servizi and Martens

Life Stage[1]	Exposure Concen-tration (mg/l)	Exposure Duration (h)	Description	Reference
				(1992)
PS	18,672	96	Mortality rate 50%	Stober et al. (1981)
S	509	96	Mortality rate 50%	Stober et al. (1981)
S	1,217	96	Mortality rate 50%	Stober et al. (1981)
S	28,184	96	Mortality rate 50%	Stober et al. (1981)
S	29,580	96	Mortality rate 50%	Stober et al. (1981)

[1] F = fry, J = juvenile, PS = pre-smolt, S = smolt, U = under-yearling.

Appendix F. Process to Determine Percentage of Coho Salmon Designated Critical Habitat and the Maximum High/Medium Intrinsic Potential Habitat that Could be Affected by the Proposed Action at the Watershed Scale

The following process was used to determine the percentage of Coho Salmon designated critical habitat to be affected by the proposed action for each watershed.

Footprint of effects at each NOI site. The potential footprint of the effects at each NOI site was determined. This includes the linear distance of: (1) the stream section the NOI operator(s) typically work in, (2) the dredge hole(s), (3) the dredge tailings pile(s), and (4) the turbidity plume.

1. The overall stream distance a typical suction dredge operator(s) works during an annual NOI season is dependent on the local makeup of the area, such as, geology (gold presence), channel constraint, streambed substrate or gradient. Suction dredge NOI operator(s) and mining claim operator(s) in Oregon have been observed working a claim, "punching holes" within an average stream length of 50-100 feet per NOI or claim. This average length observation pertains to both single and multiple operators working a single NOI. This observation is based on a combined 40 years of professional experience, as stated by Kevin Johnson (USFS Geologist, Certified Mineral Examiner #50, WO Minerals and Geology Management covering Regions 5 and 6), and Howard Jubas (USFS Region 6 Zoned Minerals Administrator for Oregon) (personal conversation between Kevin Johnson, Howard Jubas and Susan Maiyo, September 8, 2014). The RRS for all intents and purposes of the effects section of this BA, will use 100 feet as a typical length of stream channel that is generally operated by single or multiple operators annually for each NOI.

2. The total amount of streambed substrate that can be moved at each NOI site is 25 cubic yards, or 675 cubic feet. At an average depth of 3 feet, the total surface area disturbed would be 225 square feet. Assuming that the disturbed area approximates a square in shape, the dimensions of the square would be 15 feet on each side. Therefore, the linear distance of a single dredge hole at an NOI site where the maximum of 25 cubic yards is excavated/filled would be 15 feet.

3. There may be more than one suction dredge hole created at an NOI site during the operating season. 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) per CM 30a. The cumulative maximum amount of substrate that could be removed and filled remains 25 cubic yards. The total linear distance of each dredge hole could be proportional to that portion of the 25 cubic yards that is moved/filled. Therefore, we anticipate that the cumulative total linear length of the dredge holes at an NOI site during the operating season would be a maximum of 15 linear feet.

4. The linear distance of the dredge tailings pile must be added. While some of the dredge hole may be filled as the dredging operation proceeds, there will still be an area occupied by the dredge tailings pile that is in addition to the area occupied by the dredge hole. Stern (1988) measured the area of each dredge hole and its associated dredge tailings pile at suction dredging sites in Canyon Creek, Trinity County, California for the years 1984 and 1985. The data set included dredges with suction dredge apertures up to 6 inches. We reduced the data

set to those sites with suction dredges 4 inches or less in diameter, to account for the maximum size suction dredge aperture allowed under the proposed action. The mean area of the dredge sites was compared to the mean area for the dredge tailings piles (N=23). The ratio of the mean surface area of dredge tailings piles to the mean surface area of the dredge holes was 1.4. Consequently, the mean dredge tailings pile dimensions for the proposed action would be 1.4 times 225 square feet, or 315 square feet. Assuming that the dredge tailings pile approximates a square in shape, the dimensions of the square would be approximately 17.8 feet (rounded up to 18 feet). Therefore, the linear distance of the dredge tailings pile is 18 feet.

There may be more than one dredge tailings pile created at an NOI site (although each dredge hole must be backfilled with tailings and remaining tailings spread before moving to a new dredge hole site per CM 30a and CM 31b). However, the cumulative maximum amount of substrate that can be removed/filled remains a maximum of 25 cubic yards. We believe the total linear distance of each tailings pile will be proportional to that portion of the 25 cubic yards that is moved/filled. Therefore, we anticipate that the cumulative total length of the tailings piles at an NOI site will be a maximum of 18 feet.

5. The turbidity plume can be no longer than 300 feet in length (CM 29d). The following rationale is provided to support the RRS conclusion that fine sediment deposition from active suction dredge mining will stop at the downstream end of the turbidity plume (300 feet maximum). Deposition of fine sediment (defined as sand or finer sediment particles) on streambed substrate will occur downstream from active suction dredging operations. Variables affecting deposition include the turbulence and velocity of the stream flow. The larger particles, such as sand, will settle out first, generally resulting in a gradation of continually smaller particles settling out downstream. However, an exception to this general statement is where there are micro-pockets downstream from, and between, larger streambed particles such as gravel and cobble that will have slow velocity areas allowing for fine sediment deposition.

   A turbidity plume from a suction dredge operation is visible evidence of suspended fine sediment. Turbidity and the suspended fine sediment load in the water column diminishes as the plume moves downstream. The suspended sediment load decreases due to fines settling on the streambed. At the point where the turbidity plume is no longer visible, the water column has dropped its fine sediment load. Consequently, the RRS concludes that fine sediment deposition from active suction dredge mining will stop at the downstream end of the turbidity plume.

   Adding the results of 1 through 4 above (100 + 15 + 18 + 300), the total linear distance of stream channel affected by the proposed action at each NOI site is 433 feet.

Calculating the percentages of total Coho Salmon designated CH, maximum high IP habitat, and maximum medium IP habitat affected by the proposed action by watershed.

1. The linear distance of stream channel that may be affected by the proposed action at each NOI site was estimated as described above (433 feet).

2. The upper limit (cap) of NOI by watershed in the proposed ESA action area were multiplied by 433 feet to calculate the total linear distance affected by the proposed action in each watershed.

3. The product of step 2 was divided by the total linear distance of Coho Salmon designated CH in each watershed and displayed as a percentage.

4. The product of step 2 was divided by the total linear distance of high IP habitat in each watershed (if any would be impacted in that watershed), and displayed as a percentage to determine the maximum high IP habitat that could be affected by the proposed action.

5. The product of step 2 was divided by the total linear distance of medium IP habitat in each watershed, and displayed as a percentage to determine the maximum medium IP habitat that could be affected by the proposed action.

Appendix G. Adverse Effects Form.

Note: The form begins on the next page.

DOCUMENTATION OF EXPECTED ADVERSE EFFECTS TO LISTED FISH SPECIES AND THEIR HABITAT

Name of action: Suction Dredging and High Banking Operations on National Forest Systems lands within the Rogue River-Siskiyou National Forest.

Species of concern: Oregon Coast and Southern Oregon/Northern California Coast Evolutionarily Significant Units of Coho Salmon (*O. kisutch*); Southern DPS of Green Sturgeon (*Acipenser medirostris*); Southern DPS of Pacific Eulachon (*Thaleichthys pacificus*).

HUC names and numbers in ESA action area: HUC names and numbers by Coho Salmon ESU are presented in Table G-1.

Table G-1. Subbasin and watershed names and numbers in the ESA action area by Coho Salmon ESU and population

Population	Subbasin	Watershed (5th field)
SONCC Coho ESU Population		
Chetco River	Chetco	Chetco River1710031201
Illinois River	Illinois	Althouse Creek 1710031101
		Briggs Creek 1710031107
		Deer Creek 1710031105
		East Fork Illinois River 1710031103
		Indigo Creek 1710031110
		Josephine Creek-Illinois River 1710031106
		Klondike Creek-Illinois River 1710031108
		Lawson Creek-Illinois River 1710031111
		Silver Creek 1710031109
		Sucker Creek 1710031102
		West Fork Illinois River 1710031104
Lower Rogue River	Lower Rogue	Lobster Creek 1710031007
		Rogue River 1710031008
Middle Rogue / Applegate Rivers	Applegate	Lower Applegate River 1710030906
	Applegate	Middle Applegate River 1710030904
	Applegate	Upper Applegate River 1710030902
	Lower Rogue	Hellgate Canyon-Rogue River 1710031002
	Lower Rogue	Shasta Costa Creek-Rogue River1710031006
	Lower Rogue	Stair Creek-Rogue River 1710031005
Pistol River	Chetco	Pistol River 1710031204
Smith River	Smith	North Fork Smith River 1801010101
Upper Rogue River	Middle Rogue	Bear Creek 1710030801
	Upper Rogue	Elk Creek 1710030705
		Little Butte Creek 1710030708
Winchuck River	Chetco	Winchuck River 1710031202
OC Coho Population		
Coquille	Coquille	South Fork Coquille River 1710030502
Sixes	Sixes	Sixes River 1710030602

Identify critical habitat area of concern: OC Coho Salmon: PCE for freshwater spawning, rearing and migration. SONCC Coho Salmon: PCE for spawning and juvenile rearing areas, and adult and juvenile migration corridors. There is no designated CH for the Southern DPS Green Sturgeon or the Southern DPS Pacific Eulachon in the ESA action area.

Element(s) of the action causing the expected adverse effects: The *mining* PE is expected to result in measurable adverse effects. Effects caused by the *onsite occupancy* PE are expected to be insignificant or discountable.

1. The proposed action may result in adverse effects through which of the following mechanisms (underline or circle and describe in a narrative).

Harm: act that actually kills or injures fish (may include habitat modification that significantly impairs behavioral patterns such as breeding, spawning, rearing, migrating, feeding or sheltering).

Parts of the proposed action that may kill or injure fish include:

- Suction dredging and high banking would reintroduce Hg and other metals into the aquatic environment, increasing Hg available for methylation. Resulting MeHg will enter the food chain and affect the health, behavior and possible future reproductive success of individual Coho Salmon, Green Sturgeon and Pacific Eulachon.
- Small amounts of petroleum products that are toxic to Coho Salmon (primarily fuel from spilling during refueling) may enter the water column.
- Juvenile Coho Salmon may have an increased risk of predation when they dart away from disturbance, if they are entrained in the suction dredge and emerge disoriented, or are temporarily displaced from habitat no longer usable (temporary dredge tailings piles).
- There is a low probability that juvenile Coho Salmon may be injured or killed by being stepped on.
- There is a low probability of reduced spawning success by deposition of fines in spawning gravel or by spawning on unstable gravels created by suction dredging or high banking.
- Increased turbidity/suspended solids would cause the following:
  - Increased physiological stress, including changes in blood physiology
  - Gill trauma
  - Impacts on osmoregulation during smolting
  - Increased cough frequency
  - Cessation of feeding
  - Slower growth

Harass: significantly disrupt normal behavior patterns such as breeding, feeding, or sheltering.

Normal behavior patterns will be disrupted by:

- Repeated disturbance from noise and movements of NOI Operators.

- Avoidance of turbidity plumes and concomitant disruption of territorial behavior.
- Inability to use existing habitat because it has been temporarily modified by deposition of fine sediments or buried by dredge tailings piles.
- Short-term reduction in macroinvertebrate prey availability.
- Altered feeding patterns by suspended sediments reducing prey capture success.
- Alarm reactions
- Changes in territorial behavior

Habitat: cause an adverse effect to occupied or accessible habitat of listed/proposed species; proposed/designated critical habitat. For anadromous fish, accessible habitat is considered occupied.

There will be adverse effects to occupied habitat and to designated critical habitat for both SONCC and OC Coho Salmon. There will be an adverse effect to occupied habitat of Southern DPS Green Sturgeon and Southern DPS Pacific Eulachon.

2. Nature, magnitude and probability

Describe the nature, magnitude and probability of the effects of the action on a species or habitat. Quantify where possible.

Nature: what indicator or habitat feature will be affected

Magnitude: severity and intensity

Probability: likelihood of occurrence

Table 183 in Chapter V subsection G of this BA summarizes the effects to MPI indicators. Here a brief narrative describing the nature, magnitude and probability of the adverse effects is presented. Please refer to the AP factor analysis by indicator in Chapter V of this BA for more details. Only those MPI indicators for which there is a measurable negative effect by the proposed action are described here.

Nature: Suspended sediment: intergravel DO/turbidity indicator

Magnitude: Turbidity up to 50 NTU and TSS up to 340 mg/l will occur each time a suction dredge is operated (CDFG 2009 citing multiple authors). Levels are anticipated to return to background from 11 (CDFG 2009) to 91.4 m downstream from active dredge sites. Conservation Measure (CM) 29d requires dredging to be modified, curtailed or stopped if the visible plume exceeds 300 feet (91.4 m). Fine sediment in the sand size class has been observed to settle in the streambed up to 60 m downstream from the dredge site (Harvey et al. 1982 as cited in CDFG 2009).

Probability: It is certain that the mining PE will temporarily increase turbidity and may temporarily increase fines <0.85 mm in spawning gravel if spawning gravels are within range of a turbidity plume.

Nature: Chemical contamination/nutrients

Magnitude: Total mercury discharge rates from suction dredging at two sites known to be contaminated from historic gold mining in California were 0.08 mg/hr. and 296 mg/hr., respectively (CDFG 2011). It is not known if these rates would approximate rates for the proposed action. An unknown amount of MeHg may enter the food chain at distant downstream locations. Conditions conducive for MeHg production are found in wetlands associated with estuaries. The magnitude of fuel spills into streams is not likely to exceed several ounces.

Probability: It is certain that mercury and other trace metals will be remobilized from deep sediments by suction dredging and high banking. It is likely that petroleum products may enter the water column.

Nature: Substrate character and embeddedness

Magnitude: Bed composition is changed at and downstream from suction dredge sites. Coarse particles with very little fines are found in the tailings pile. The particles that settle on substrate downstream gradually become smaller. At varying distances downstream, dependent upon the amount of fine sediments redistributed, the streambed would temporarily have more fines than the original substrate and become embedded. The total affected surface area would include the surface areas of the dredge hole, the tailings pile, and the area where fines settle out downstream.

Probability: It is certain that suction dredging and high banking would negatively affect substrate composition and embeddedness.

Nature: Off-channel habitat

Magnitude: Suction dredging in a main channel may negatively impact off-channel habitat by a temporary turbidity plume. Turbidity would be far less than the 50 NTU maximum and TSS would also be far less than the maximum 340 mg/l anticipated at the active dredge. Mercury and other trace metals would enter off-channel habitat with the plume as well, but the magnitude is not known. Fine sediments may result in a temporary change in substrate composition and increased embeddedness.

Probability: There is a very low probability that suction dredging or high banking would occur within off-channel habitat. CM indirectly set minimum widths of channels for operations, and most off-channel habitats are narrow. It is possible that an off-channel habitat area that has stream flow during the in-water work window would be located immediately downstream from an active suction dredge operation in a main channel. Part of the turbidity plume from the active suction dredge operation may enter the inlet to the off-channel habitat and negative impacts may occur.

Nature: refugia

Magnitude: Because it was determined that there were measurable negative effects to several MPI indicators that are component parts of refugial conditions, it was concluded that there would be a measurable negative effect to the refugia indicator. The negative effects would be short-term and would not rise to a level that would reduce the size, number and connectivity of refugia for Coho Salmon.

Probability: It is probable that refugial conditions may be impacted from negative effects to the suspended sediment: intergravel DO/turbidity indicator, Chemical contamination/nutrients, substrate character and embeddedness, and off-channel habitat indicators.

3. Which of the following life stages, forms and essential behaviors will be adversely affected (underline or circle and describe as appropriate)?

Life history forms

Resident
Fluvial
Adfluvial
Anadromous. While Coho Salmon are anadromous, the adverse effects are only to the freshwater life stages and habitat for the species. Adverse effects may also occur to life stages of anadromous Pacific Eulachon and anadromous Green Sturgeon that utilize lower river and estuary habitats.

Life stages and essential behaviors

Fertilization to emergence (incubation).

Coho Salmon. There is a low probability of reduced spawning success by deposition of fines in spawning gravel or by spawning on unstable gravels created by suction dredging or high banking. Fines that may land on spawning gravel as a result of turbidity plumes are likely to be remobilized by freshets in the fall and redistributed elsewhere in the streambed. Redd creation will also remobilize fines deposited on gravel as a result of the proposed action. CM require dredge tailings piles and piles created by high banking to be used to fill in the created holes, and to be spread and redistributed locally to conform to the contour of the natural stream bottom. The intent is to reduce the probability of creating potentially unstable spawning gravels. Emergence is complete before the work-windows begin, so there will be no exposure of that life cycle stage to the proposed action.

Eulachon. There is an incubation period for Eulachon embryos that ranges from 20-40 days. They are attached to bed sediment particles at this time, and some of those bed particles may be contaminated by Hg as a result of suction dredging or high banking. This may affect the behavior and health of incubating eulachon embryos.

Emergence to juvenile out-migration (freshwater rearing).

Coho Salmon. The effects that may result in harm or harassment to this life stage are described above in Section 1 of this form. Effects to habitat components utilized by this life stage are described above in Section 2 of this form.

Eulachon. Newly hatched eulachon are carried swiftly by currents to estuaries or are swept out into the ocean. The timing is brief and no effects from Hg contamination are expected in this brief time frame.

Juvenile out-migration and smoltification (including estuarine rearing).

Coho Salmon. It is not known to what extent increased substrate embeddedness, noise and movements of NOI operators, and intermittent plumes of turbidity during daylight hours may affect out-migrating juvenile Coho Salmon. Regarding smoltification, Noggle

(1978) found in laboratory studies on juvenile salmonids that the LC50s were less than 1,500 mg/l TSS in the summer compared to 30,000 mg/l in autumn, suggesting that there may be less tolerance for suspended sediment during the smolt transformation time period that occurs in the spring. However, a threshold of 1,500 mg/l still far exceeds the maximum of 340 mg/l expected to be generated at an active suction dredge site. Conditions conducive to methylation of Hg are found in wetlands in estuary areas. Juvenile out-migrants would be exposed to MeHg-contaminated macroinvertebrates in wetland estuarine environments.

Eulachon. Eulachon larval and juvenile rearing in estuaries would be exposed to MeHg-contaminated phytoplankton and zooplankton that they consume in wetland estuarine environments.

Sub-adults and Adults. Southern DPS Green Sturgeon are known to enter estuaries and lower river reaches of the Rogue River, and likely other estuaries of rivers flowing through the RRS that are in the upriver parts of the ESA action area. These rivers are not the natal rivers for Southern DPS Green Sturgeon, so they are not on spawning runs. However, they will be exposed to food items contaminated by MeHg that was produced in wetland areas of estuaries, as a result of sediment from the action settling in those areas. Green Sturgeon will also be exposed to Hg because of the benthic orientation and feeding behavior (stirring of bottom sediment).

Adult migration to spawning areas. It is not known to what extent increased substrate embeddedness, noise and movements of NOI operators, and intermittent plumes of turbidity during daylight hours may affect upstream migrating adult Coho Salmon.

Adult holding
Gamete survival and maturation
Spawning

6. Temporal Scale (frequency and duration) (underline or circle and describe as appropriate).

Only effects that are not discountable, insignificant, or entirely beneficial are discussed here.

Frequency: How often will the effect occur?

Suspended sediment: intergravel DO/turbidity indicator. Increases in turbidity would occur intermittently. It is dependent upon how often a suction dredge is turned on and off. Deposition of fines <0.85 mm in spawning gravel would occur at the same frequency, as the source of the sediment is the turbidity plumes.

Chemical contamination/nutrients. Mercury and other trace metals may be remobilized from deep sediment into the stream channel and water column each time a suction dredge is operated. It is not known how many times in a day an operator will turn a dredge on and off. Remobilization from high banking operations would occur later in time, when fall/winter freshets overtop gravel bars. Fuel spills may occur whenever refueling takes place. Hg associated with the fine sediment fraction (clay-silt) will settle out in distant slow velocity locations (locations such as wetlands in estuaries have conditions conducive to methylation) over varying periods of time.

Substrate character and embeddedness. The negative effects would occur each time the suction dredge is operated. For high banking, the effects would occur when fall/winter freshets overtop the gravel bar and redistribute disturbed substrate.

Off-channel habitat. The effects would occur each time the suction dredge is operated, but only if the turbidity plume from the dredge operation enters the inlet of off-channel habitat.

Refugia. Effects to components of refugia would occur each time with the same frequency as that listed for four preceding MPI indicators.

<u>Duration</u>

Short term or pulse effect: subsides almost immediately.
Long term or press effect: chronic.

Sediment/turbidity. Turbidity events are short-term pulse effects. Suction dredges may operate from minutes to hours at one time. The total daily operating time has been calculated or estimated at between 2 to 5.6 hours per day (Hassler et al. 1986; CDFG 1994; Harvey and Lisle 1998; USFS 2013). Dredges may only operate during daylight hours (CM 19). Turbidity events may occur any time during the in-water work window.

The duration of events that result in potential deposition of fines in downstream natural spawning gravels is the same as for turbidity. It would also be termed a pulse effect. The persistence of fines <0.85 mm introduced to natural spawning gravel from dredging operations will vary. Some of this material would be reintroduced into the water column and as bedload as freshets occur in the fall/winter, and would be entirely remobilized and dispersed downstream during a bankfull flow event. Harvey et al. (1982) as cited in ODFW (2009), commented that sand observed up to 60 meters downstream from a dredging operation had been completely flushed away from the cobble substrate one year later. Female Coho Salmon would move some of these fines out of spawning gravels during construction of redds.

Chemical contamination/nutrients. Remobilization events are short-term pulse effects. Suction dredges may operate from minutes to hours at one time. The total number of hours of use per day has been calculated or estimated at between 2 and 5.6 hours per day (Hassler et al. 1986; CDFG 1997; Harvey and Lisle 1998; USFS 2013). Dredges may only operate during daylight hours (CM 19). Suction dredging may occur any time during the in-water work window. The duration of remobilization from material disturbed by high banking would depend on the shear stress of stream flows occurring later in time.

Remobilized mercury has several fates. Some elemental mercury will persist in the streambed. Mercury may also oxidize and be converted by microbial action to MeHg, which is the predominant form that bioaccumulates in fish (Bloom 1992). This will take place where conditions are favorable for methylation, such as wetlands in estuary areas. Long-term persistence of mercury in the aquatic environment and food chain may be considered a press effect.[28]

[28] As described in subsection V.D.8 (effects that may result in harm/harassment, chemical contamination) of this BA, the US EPA discussed the potential effect of remobilization of mercury by small placer mining

A gasoline spill would result in a short-term pulse effects.

Substrate character and embeddedness. Effects on substrate composition and embeddedness would be short-term pulse effects for both suction dredging and high banking. For suction dredging, each dredge hole must be backfilled and tailings spread before moving to a new work site (CM 30a). At the last work site, backfilling and spreading of tailings must take place before the end of the in-water work window (September 15 or 30) (CM 30b). Fall/winter freshets would then redistribute the disturbed surface material. Similarly, excavations from high banking must be refilled to original contour levels by the end of the work window (CM 33e) and freshets would then redistribute the disturbed surface material.

Stern (1988), Thomas (1985) and Harvey et al. (1982) all reported that dredge holes and tailings were generally not visible the next year as a result of peak flows after the dredging season. There were a few exceptions for sites not near the thalweg and where cobbles and boulders had been piled. Because the CM for the proposed action require excavated holes be filled and tailings redistributed to original bed contours, for both suction dredging and high banking operations, it is likely that the substrate composition and embeddedness will be similar to the original bed by the next summer. However, this could occur earlier than by the next summer whenever there is a peak flow with sufficient stream power to move the excavated and deposited material.

Off-channel habitat. Please refer to the descriptions of duration of the effects presented immediately above for the *Sediment/Turbidity, Chemical contamination/nutrients* and *Substrate Character/Embeddedness* indicators.

Refugia. Effects to the refugia indicator result from adverse effects to the four preceding MPI indicators, above. The effects are considered pulse effects, with the possible exception of mercury contamination, which may be considered a press effect.

5. Spatial scale

Distribution: Describe the geographic extent of the effect.

Effects to each of the indicators below would occur at NOI sites in the 29 watersheds shown in Table G-1, above. The distribution of effects by indicator is presented below.

Suspended sediment: intergravel DO/turbidity indicator. Increases in turbidity will occur downstream from each operating dredge. Levels are anticipated to return to background from 11 (CDFG 2009) to 91.4 m downstream from active dredge sites. A CM requires dredging to be modified, curtailed or stopped if the visible plume exceeds 300 feet (91.4 m). CDFG (2009) notes that the extent of turbidity plumes is dependent upon particle sizes in the vacuumed streambed; higher proportions of fine materials will generate a longer plume. Turbidity plumes from more than one operating suction dredge will not overlap. CM 27 requires a minimum spacing of at least 500 linear feet between suction dredging operations.

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in Idaho for a National Pollutant Discharge Elimination System (NPDES) General Permit (US EPA 2012). The US EPA concluded that it had no specific information with which to predict the amount of methyl mercury generated from suction dredge mining or the impact that it would have on the aquatic food web. We also arrive at that conclusion.

Temporary increases in percent fines will occur on the streambed located downstream from each suction dredge site. Because of CM 29(d) that limits turbidity plumes (and thereby limits fine sediment deposition on the streambed), natural spawning gravels beyond 300 feet downstream from a dredge operation will not be at risk of increased sedimentation from particles <0.85 mm in size. Fine sediment in the sand size class has been observed to settle in the streambed up to 60 m downstream from the dredge site (Harvey et al. 1982 as cited in CDFG 2009).

Chemical contamination/nutrients. Mercury and other trace metals would be remobilized downstream from each operating dredge. Elemental mercury is dense and some of it will settle quickly onto the streambed. However, fine particles may enter the water column and drift downstream in the plume. Initially, the distribution would be limited to the dredge tailings pile and the extent of the plume. However, freshets occurring later in time would further disperse and distribute the remobilized mercury and trace metals downstream. Mercury and other trace metals disturbed by high banking would be distributed downstream from each site by freshets occurring later in time. Conditions favorable to methylation occur in wetlands within estuary areas. Effects from increased MeHg entering the food chain will take place in estuary areas.

Spilled gasoline would enter the water column. That not captured by the required spill kit would be dispersed and diluted for varying distances downstream.

Substrate character and embeddedness. Temporary “fining” of the streambed and increased embeddedness will occur at and downstream from each suction dredge site and high banking site. Fine sediment in the sand size class has been observed to settle in the streambed up to 60 m downstream from the dredge site (Harvey et al. 1982 as cited in CDFG 2009).

Off-channel habitat. Effects would occur to a small sub-set of off-channel habitats. Effects resulting from turbidity plumes entering off-channel habitats from main channel suction dredging would be distributed not more than 300 feet downstream into the off-channel habitat.

Refugia. Effects to the **refugia** indicator result from adverse effects to the four preceding MPI indicators, above. Effects would occur wherever the effects to the four MPI indicators impact refugial conditions.

Proximity: Describe where the effect is in relation to the species and its habitat. Note relationship to occupied habitat, designated critical habitat, or essential fish habitat

The effects to the **sediment/turbidity, chemical contamination/nutrients, substrate character/ embeddedness, off-channel habitat and refugia** indicators would be in or within one-quarter mile of occupied habitat, designated critical habitat or essential fish habitat. In addition, effects from increases in MeHg entering the food chain and impacting juvenile Coho Salmon, Pacific Eulachon, and Green Sturgeon, would occur in wetlands in estuary areas, which have conditions conducive to methylation.

6. Tracking Adverse Effects

Catalogue a unit number for this adverse effect and identify the specific location on the GIS water theme as a point, segment, or polygon datum (depending upon the nature of the effect).