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Forest Service

Waucoma

Huckleberry Enhancement

Fisheries Resource Report

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1.0 Introduction

Forest management activities that may alter aquatic habitat or affect individuals or populations of proposed, endangered, threatened, and sensitive fish and aquatic species require a biological evaluation to be completed (FSM 267l.44 and FSM 2670.32) as part of the National Environmental Policy Act (NEPA) process and Endangered Species Act to determine their potential effects on sensitive, threatened or endangered species. The biological evaluation process (FSM 2672.43) is intended to conduct and document analyses necessary to ensure proposed management actions will not likely jeopardize the continued existence or cause adverse modification of habitat for:

A. Species listed or proposed to be listed as endangered (E) or threatened (T) by the USDI Fish and Wildlife Service or USDC NOAA Fisheries, and their listed or proposed listed critical habitat.

The biological evaluation process (FSM 2672.41) is also intended to conduct and document analyses to ensure that Forest Service actions do not contribute to loss of viability of any native or desired non-native plant or contribute to animal species or trends toward Federal listing of any species for:

B. Species listed as sensitive (S) by USDA-Forest Service Region 6.

1.1 Executive Summary

This Biological Evaluation addresses effects to fisheries resources for all alternatives presented in the Waucoma Environmental Assessment (EA). In the No Action alternative, none of the proposed projects would be implemented and there would be no immediate effect to aquatic habitat or species. However, an increased risk of fine sediment input to area streams would be due primarily to roads not maintained/repaired, and thus, the chance for erosion and subsequent sedimentation would be greater. If proposed silvicultural treatments did not occur, forested riparian stands would have smaller and shorter trees and, eventually, fewer live trees per acre but more snags. Although, increased levels of down wood in the short-term would likely occur, the small size of the down material would decay quickly and not provide the same habitat benefit as larger wood, especially in larger streams.

The Proposed Action would result in short-term disturbance that could result in localized increases in fine sediment (road decommissioning, road maintenance, and log hauling) and some decrease in in-stream large wood (except associated with tree falling in skyline corridors) and large wood recruitment potential (Riparian Reserve thinning). These effects would be minimal and not result in an irreversible or irretrievable loss of aquatic habitat or species. In fact, the amount of erosion and subsequent sedimentation into streams would be reduced due to road treatments, Riparian Reserve forest conditions would improve leading to increased

growth rates, less susceptibility to disease and fire, and larger down wood over time compared to the No Action scenario. Due to the project design, including PDCs, cumulative effects would be minimal.

None of the anticipated impacts summarized above would impact ESA-listed fish or their habitat as they are not present in the action area. Project activities, especially culvert removals**, may impact, but will not likely contribute to a trend towards federal listing or loss of viability to the population or species** for Basalt Juga or Rocky Mountain duskysnail individuals or habitat. Impacts to these species related primarily to increased sedimentation from some activities (e.g. culvert removal), and potentially direct effects from construction activities during culvert removal projects in perennial streams. Cutthroat trout, a Region 6 sensitive species, may also be affected similarly to the aquatic macroinvertebrates described above. However, population viability would be maintained as potential impacts would be site-specific and cutthroat trout have a wide distribution across the Forest (Table 1). Resident rainbow and brook trout may be impacted by some project activities the impacts would be minimal and localized therefore the EA is consistent with the Forest Plan and the Aquatic Conservation Strategy.

Table 1. Waucoma Project effects determination summary for Region 6 Regional Forester's Sensitive & Special Status Species

Region 6 Sensitive Aquatic Species	Location	No Action	Proposed Action
Coastal Cutthroat Trout	Greenpoint & North Fork Greenpoint sub-watersheds	May Impact Individuals or Habitat	May Impact Individuals or Habitat
Basalt Juga	Mill Creek	May Impact Individuals or Habitat	May Impact Individuals or Habitat
Rocky Mountain Duskysnail	East Fork Hood River Watershed	May Impact Individuals or Habitat	May Impact Individuals or Habitat

1.2 Proposed Action

The Forest proposes vegetation treatments to enhance existing huckleberry plants and increase huckleberry development and productivity across the Waucoma planning area. Elements of the project include road maintenance & reconstruction, temporary road construction and obliteration, access management, and vegetation treatments. The proposed action includes sapling thinning, variable density thinning from below, and intermediate thinning in some units that are within riparian reserves, as shown on the proposed action map. Riparian Reserve treatments in the Greenpoint Creek sub-basin will only occur in sapling thin units. Riparian Reserve treatment in the North Fork Mill Creek will include both intermediate thinning and variable density thinning from below.

There are approximately 129 acres of treatments proposed within Riparian Reserves. The primary goals of the Riparian Reserve treatments include improving understory species composition, enhancing structural diversity, and improving future quality of downed wood and

in-stream large wood. The riparian stands that are being proposed for treatment are currently highly stocked stands. The stands exhibit little growth and lack snags and downed wood suitable for riparian and wildlife needs. In addition, some stands have low tree and understory diversity, are single-canopied, or have trees that are insufficient in size to provide quality snags or downed wood.

Riparian treatments would be designed to protect waterbodies in the project area. Perennial streams, wetlands, and springs would have a minimum of 60-foot protection buffer and intermittent streams would have a minimum 30-foot protection buffer. Protection buffers would serve to maintain current shade conditions, maintain small wood recruitment, maintain snags for standing and down wood recruitment, and protect all waterbodies from sediment generated from proposed action activities. Where variable density and intermediate timber harvest would be applied within Riparian Reserves, trees would not be cut within the protection buffers. To avoid impacts to soil and prevent sediment delivery to waterbodies, no mechanized equipment will operate within 100 feet of any waterbody. To prevent reduction in stream-shade and minimize large wood recruitment loss within riparian reserves where vegetation management will occur, a minimum of 50% canopy cover will be maintained.

1.3 Existing Condition

The project area is located in the Mt. Hood National Forest (Forest), Hood River County, in the Greenpoint Creek 12th Field Watershed and in the North Fork Greenpoint, Gate Creek, and Cabin Creek 14th Field sub watersheds.

Greenpoint Creek is a principal tributary to the West Fork Hood River. The watershed includes Long branch Creek, Green Point Creek, North Fork Green Point Creek, and Dead Point Creek. Much of Greenpoint Creek is located outside of National Forest System Lands and is managed for timber production. Stream surveys document a range of stream channel conditions on Forest Service Land (see Hydrology Specialist Report). The upper limits of salmon and steelhead use in Greenpoint is near the Forest Boundary which is well below the project area. Cutthroat, rainbow, and non-native Brooke trout are present throughout Greenpoint Creek. Pacific lamprey have never been documented in Green Point.

North Fork Greenpoint Creek emanates from Black Lake (elevation 3770 feet) and flows for 4.5 miles to its confluence with Greenpoint Creek (elevation 1500 feet). Rainy Lake, Black Lake and numerous springs act as the headwaters while Gate Creek and Cabin Creek contribute to the flow of the North Fork of Greenpoint Creek. Watershed size is approximately 2460 acres. Surveys completed in 1979 and 1991 documented populations of rainbow and cutthroat trout throughout this tributary. The presence of an irrigation diversion structure and a steep gradient falls at River Mile 0.1 just upstream of the confluence with Greenpoint is considered to be an anadromous fish barrier. (ODFW personal communication 2018) (USFS Stream Survey 1979, 1991). The surveyors noted the stream channels exhibited a moderate sinuosity, fair cover (primarily substrate) and a good pool to riffle ratio.

Gate Creek is a tributary to North Fork Greenpoint and is considered a perennial channel from the headwaters to its confluence with North Fork Greenpoint. During the summer months, most of Gate Creek is diverted at river mile 0.6 (between 0.28 to 2.0 cfs) by Farmers Irrigation District via the Stanley Smith pipeline, to provide water for customers of Farmer Irrigation District (FID). Secondary tributaries provide enough flow for resident trout to survive the flows in residual pools. Non-native Brook trout have been documented occupying the entire length of Gate Creek (USFS 1991).

Rainy Creek is a small tributary to Gate Creek which originates from Rainy Lake. Limited data is available for Rainy Creek, but a 1991 stream survey described the quality of the fish habitat in the survey reach as "poor." The survey noted that only species observed, eastern brook trout, may have been limited by lack of mobility in channel, available food, cover, and dissolved oxygen. Perhaps the most significant of these limiting factors was the aqueduct at RM 0.48. The amount of diverted flow significantly decreased suitable habitat units for any resident populations below the structure, while simultaneously limiting mobility of the fish. The average temperature was 15.7^{o}Celcius, which may have presented the trout with further complications in regards to the suitability of their environment. The instream habitat was composed of 8.7% pools and 91.3% riffles. The low pool to riffle ratio, 1:10 acted to lower the overall habitat rating. No side channels were observed during the survey. Unstratified habitat units such as plunge pools, lateral scour pools or pocket water were not identified as significant habitat. The average channel width was 4.4 feet. The dominant substrate in Rainy Creek was bedrock. Gravel found in the pool habitat units were consistently embedded in high amounts of silt and exhibited low value for spawning

Cabin creek is another tributary to North Fork Greenpoint and is smaller in size than Gate creek, but otherwise very similar in flow regime. Cabin creek is diverted at around river mile 0.8 by the Farmers Irrigation District via the Stanley Smith pipeline. Brook trout have been documented above and below the point of diversion and resident rainbow trout are known to occur below the diversion. Cabin Creek is considered a perennial stream but in some water years, flows intermittently below the diversion due to water withdrawal. Below the diversion, the gradient averages 19% and is comprised of mostly a pool / step formation.

Fish migration and habitat use are likely impaired in the North Fork Greenpoint sub-watershed as a result of summer low-flow caused by irrigation diversions, however resident trout species are present in all the perennial streams in that sub basin.

There is limited stream survey available for the project area. Generally, riparian and channel conditions are not considered to be in an unimpaired, fully functioning status, nor are they considered to be impaired, or functioning at risk (WCF 2016). There are reaches where in-stream large woody debris and log jams are abundant, and reaches where it is not. There are reaches where substrate, pool quantity/quality, and width-to-depth ratios appear in good condition, and then there are some reaches where fine sediment has been observed as the dominant substrate (Hydrology Specialist Report).

Overall, channel stability within the project area is considered to be good. It is inherently high anyway. Where floodplain features occur, complexity and bank stability seem to be developing and remain connected with the main channel. Nearly the entire length of the main channel of North Fork Green Point remains inaccessible and undisturbed, as there are no roads that encroach into the canyon. The main stem of Green Point Creek however, is much different. The main arterial road access is in the valley bottom. While a majority of the road segments in the project area are buffered by a distance from the main channel, certain ones have impacted tributary configurations at crossings. These are highly localized sites (Hydrology Specialist Report).

Vegetative structure in riparian zones is dominantly mid and early-seral stands. There is a lack of older-forest structure and complexity. But the inner and outer streamside riparian zones throughout the project area are nearly entirely forested, with the exception of naturally occurring talus slopes. Recruitment potential of riparian woody debris is high. Organic inputs are not lacking (Hydrology Specialist Report).

There have been some in-stream restoration projects within specific reaches in the project area. Treatments occurred in upper segments of main Green Point Creek and Gate Creek in the early 1990s. Additionally, the FID developed a fisheries habitat enhancement program, which identified some gravel augmentation and in-stream large wood projects intended to benefit Gate Creek and other tributaries where their facilities are located (Hydrology Specialist Report).

2.0 – Analysis Framework

2.1 - Methodology

This effects analysis utilizes research, relevant monitoring, field data, previous experience and professional judgment, as well as GIS information, to provide the context, amount, and duration of potential effects on aquatic resources from the proposed project. The physical scientist reports on Hydrology and Soils provide the basis for the analysis for effects to aquatic habitat and were used to determine the potential effects to aquatic species. The analysis method utilized to determine potential impact to fish, aquatic invertebrates, and their associated habitat are listed below.

- Determine known and suspected locations of federally listed or proposed aquatic species, designated critical habitat, essential fish habitat, Region 6 Regional Forester's sensitive species and survey and manage species in relation to proposed project activities.

- Assess proposed project activities and determine the aquatic habitat elements potentially impacted and the geographic area where effects could occur (i.e., the action area).

- Overlap the species/habitat locations with the action area and determine which species/habitat could be affected by project activities.

- When species/habitat overlaps with the action area; impacts are predicted from proposed project activities to individuals and their associated habitat.

Where impacts to individuals or habitat parameters discussed above result from proposed project activities, the potential impacts to aquatic species/habitat were analyzed and then the effects to the biological resource were determined based on professional experience, applicable surveys/studies, and available literature/research.

Assumptions associated with this methodology are listed below.

- Aquatic faunal and habitat survey data utilized is the latest available and utilized standard survey protocols. It is assumed that this information is representative of current conditions unless otherwise noted.

- All Best Management Practices (BMP) and Project Design Criteria (PDC) listed in the EA, Chapter 2 would be fully implemented and effective.

- The areas of impact outlined in the EA are the actual areas of disturbance.

- A large chemical spill (gas, oil, or other material) would not occur during project implementation thus it will not be analyzed.

2.2 – Action Area

The action area, is defined as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action. For the purposes of this analysis, the action area does not extend beyond the project area.

Temporal scales will be both short- and long-term. Short-term effects would be considered temporary, and generally refers to a time immediately following an activity, up to about 10 years. Long-term effects would typically refer to lasting chronic impacts expected to linger at least 20 years or longer.

2.3 - Resource Indicators and Measures

The following resource indicators and measures were identified in the physical scientist analysis and were, therefore used here to determine potential effects to aquatic fauna and habitat:

Direct and/or indirect effects to individual aquatic species from proposed activities;

Potential reductions in stream shade and subsequent increases in water temperature compared to existing levels;

Potential increases in erosion and fine sediment input to streams and wetlands compared to existing levels;

Potential impacts to existing and future levels of large wood in stream channels and Riparian Reserves, including any impacts to large wood recruitment;

Potential impacts to the quantity and quality of pool habitat; and,

Cumulative effects associated with ongoing or proposed projects in the action area or close enough so that cumulative effects could occur.

3.0 – Affected Environment

The affected environment discussion is divided into two main sections: aquatic species presence, distribution and basic life history; and existing aquatic habitat conditions. Only those species and associated habitat that are found within the action area are discussed and analyzed since there would be no effect/impact to species/habitat outside the action area.

3.1 Presence of Proposed, Endangered, Threatened, and Sensitive Fish Species within the Action Area

All of the perennial streams within the action area are fish-bearing. Salmon, steelhead and Pacific lamprey are not present in the action area but are present downstream in Greenpoint Creek and the West Fork Hood River. The uppermost extend of designated critical habitat for ESA Salmon and Steelhead is approximately 4.6 miles downstream of the action area in Greenpoint Creek. Steelhead are not present in North Fork Greenpoint due to a waterfall barrier near the mouth. Designated Critical Habitat for LCR Chinook and LCR Coho are further downstream than LCR Steelhead and therefore, are not present in the action area. Pacific lamprey distribution in the West Fork Hood River 10th Field Watershed is not well understood but the upper limit for Pacific lamprey is presumed to be the lower reach of West Fork Hood River near moving falls (Rod French, ODFW, personal communication, 2017) which is outside of the action area. Since salmon, steelhead and lamprey don't occur in the action area, they will not be discussed further in this report.

Native fish species include Resident rainbow trout (*O. mykiss*) and resident cutthroat trout (*O. clarki*). Brook trout (*Salvelinus fontinalis*), a non-native salmonid were introduced into the action area by ODFW via stocking of Black Lake, Rainy Lake, and Ottertail Lake (ODFW Stocking Records). All three resident fish species share habitat within Gate Creek, Cabin Creek, North Fork Greenpoint and Greenpoint Creek.

Resident Rainbow Trout - Rainbow trout are present throughout the Forest and are widely distributed within the action area. They are present in North Fork Greenpoint, Gate Creek, Cabin Creek, and Greenpoint Creek although population density and maximum upper limits are not known but are likely to extend into the headwaters of most of those streams.

Prime rainbow trout waters are clear, clean and cold. Good trout stream habitat is complex, consisting of an array of riffles and pools, submerged wood, boulders, undercut banks, and aquatic vegetation (USFWS 2000). The ability to swim to and from different habitats from ocean

to headwaters, or from tributary confluence to headwaters, increases the value of individual habitat components. Rainbow trout are opportunistic feeders that rely on a wide variety of food items ranging from small insects to crayfish. Trout inhabiting streams with a significant amount of riparian vegetation often feed heavily on terrestrial insects, such as grasshoppers and ants that fall into the stream. Rocky stream riffles produce bottom-dwelling aquatic invertebrates, such as insects and crustaceans, which are also fed upon. (USFWS 2000). Rainbow trout spawn in spring and early summer in main river channels and their tributaries, and inlet or outlet streams of lakes. Generally spawning in stream riffles located downstream from pools and utilizing gravels between one-half and three-inches in size are the most suitable resident trout spawning habitats.

Population estimates within the West Fork 5th field Watershed are not known although they are found to occur in most of the perennial streams in the basin. Rainbow trout and cutthroat trout share very similar life history patterns and spawn timing and can hybridize when they co-occur.

Brook Trout – Non-native brook trout were stocked in Black Lake, Ottertail Lake, and Rainy Lake for several decades. Even after stocking ceased, these trout have been successful at surviving and perpetuating themselves because they adapt well to cool water temperatures and limited spawning habitat prevalent in high lakes (Hutchinson, 2011). Consequently, brook trout often outcompete and displace other trout. Brook trout have been documented in most of the action area drainages, likely migrating downstream from the lakes during suitable waterflows. Brook trout spawn in the fall and therefore do not hybridize with native cutthroat or rainbow trout.

Map contents – Perennial and ephemeral channels. Include the Stanley smith pipeline location and include the diversion locations, waterfall, and highlight the removal of the two tributaries to Deadpoint Creek. Show species presence in the area.

3.1.1 Regional Forester's Sensitive and Special Status Species

As part of the NEPA process, the Forest Service reviews programs and activities to determine their potential effect on sensitive species. Only sensitive species are required to be addressed in a biological evaluation (Forest Service Manual 2670). Distribution, life history, etc. for many strategic species are poorly understood; thus when they are found while conducting surveys for other species, the Forest Service requires recording location(s) in corporate databases established by the agency.

Cutthroat trout are a Region 6 Regional Forester sensitive species. They are present throughout the Forest and are widely distributed within the action area. They have been documented in North Fork Greenpoint, Gate Creek, Cabin Creek, and Greenpoint Creek (USFS, 1990, 2018, MHNF, unpublished data). Interestingly, they have never been documented in the main-stem West Fork Hood River above its confluence with Greenpoint Creek.

The life history of coastal cutthroat trout may be one of the most complex of any Pacific salmonid (USFWS 2010). Three general life-history forms of coastal cutthroat trout have been recognized however, the salt-water migratory life history is assumed to be present only within

Greenpoint Creek as the waterfall near the mouth of North Fork Greenpoint is assumed to be a passage -barrier.

- No migratory Coastal Cutthroat Trout - This life history form includes fish generally found in small streams and headwater tributaries. These non-migratory coastal cutthroat trout, in general, appear to grow more slowly than other life-history forms of trout, are smaller at maturity, and generally do not live as long as migratory forms (USFWS 2010). This life-history form is likely present within the action area.

- Freshwater-Migratory Coastal Cutthroat Trout - This freshwater, or potamodromous, life-history form includes fish that migrate entirely within fresh water. This includes populations that migrate from large tributaries to small tributaries to spawn (fluvial-adfluvial), populations that inhabit lakes and migrate upstream to spawn in the lake's tributaries (lacustrine-adfluvial), and populations that live in lakes and migrate downstream to spawn in the lake outlet (allucustrine). These freshwater-migratory populations are best documented in rivers and lakes with physical barriers to anadromous fish, such as above waterfalls (USFWS 2010). This life-history form is likely present within the action area.

- Saltwater-Migratory Coastal Cutthroat Trout - Juvenile fish typically spend 2 to 5 years rearing in fresh water before making their initial seaward migration in the late winter and spring to feed in marine environments (estuarine or nearshore) during the summer. They then enter fresh water in the winter to feed, seek refuge, or spawn, sometimes returning to seawater in the spring (USFWS 2010). Unlike other anadromous salmonids, the saltwater migratory form of coastal cutthroat trout does not overwinter in the ocean and only rarely makes extended migrations across large bodies of water. This life-history form is likely only present in Greenpoint Creek and Indian Creek where passage into the main-stem Hood River is unimpeded.

Cutthroat trout typically spawn from December through June. Eggs begin to hatch within 6 to 7 weeks of spawning, depending on temperature; fry emerge between March and June, with peak emergence in mid-April (USFWS 2010). There are approximately 1,290 miles of stream habitat used by resident trout (including cutthroat) on the Mt. Hood National Forest.

Aquatic Macroinvertebrate Presence/Absence

There are three aquatic mollusks and two caddisflies known or suspected to occur on the Forest included on the Region 6 Regional Forester's Sensitive Species list (Table 2). In addition, there are four mollusks and three caddisflies considered strategic species by the Regional Forester. None of the aquatic mollusk or caddisfly species are known to occur within the Action Area. Two of the strategic mollusks (Basalt Juga and Rocky Mountain duskysnail) were also listed as Survey and Manage Category A species requiring management of known sites and minimizing inadvertent loss of undiscovered sites (USFS and BLM 2001). For the purposes of this report/biological evaluation, the only two strategic species discussed further are the Columbia duskysnail and Basalt Juga since they are Survey and Manage species as described above.

Columbia Duskysnail and Basalt Juga - The Columbia duskysnail and Basalt Juga have been documented on the MHNF. Prior to summer of 2015 the Columbia duskysnails found on MHNF were believed to be (Colligyrus sp. nov.), but after DNA analysis was conducted in 2015 by Liu H-P, Hershler R., Rossel C (2015), specimens collected were determined to be Rocky Mountain duskysnail (Colligyrus greggi), which are not on the 2015 Regional Forester's Special Status Species List therefore, they will not be discussed further in this report. Basalt Juga has only been found on MHNF in the North Fork Mill Creek drainage and are therefore not assumed to be present in the action area and will therefore, not be discussed further in this document.

Table 2. Region 6 (R6) special status species either documented or suspected to occur within the Mt. Hood National Forest and within the Waucoma Project action area (Yes, No, Assumed, Unknown). The two species in bold are also Survey and Manage species as outlined in Forest Service et al. 2001.

Scientific Name	Common Name	Forest Presence	Action Area Presence	
			Greenpoint	NF Greenpoint
Sensitive Species				
Entosphenus tridentatus	Pacific lamprey	Documented	No	No
Onchorynchus mykiss gairdneri	Redband trout	Documented	No	No
Onchorynchus clarki	Cutthroat trout	Documented	Yes	Yes
Juga hemphilli dallesensis	Dalles juga	Documented	No	No
Juga hemphilli	Barren juga –	Documented	No	No
Juga hemphilli maupinensis	Purple-lipped juga	Suspected	No	No
Allomyia scotti	Scott's apatanian caddisfly	Documented	No	No
Namamyia plutonis	Caddisfly (no common name)	Suspected	No	No
Strategic Species				
Fluminicola sp. nov. (Pinhead)	Pinhead pebblesnail	Suspected	No	No
***Juga* sp. nov. (Basalt)**	**Basalt juga**	**Documented**	**No**	**No**
Juga sp. nov. (Brown)	Brown juga	Suspected	No	No
***Lyogyrus (Colligyrus)* sp. nov.(Columbia)**	**Rockymountain duskysnail (formerly Columbia duskysnail)**	**Suspected**	**No**	**No**
Pristinicola hemphilli	Pristine springsnail	Suspected	No	No
Lepania cascada	A caddisfly (no common name)	Suspected	No	No
Moselyana comosa	A caddisfly (no common name)	Suspected	No	No
Rhyacophila unipunctata	One-spot rhyacophilan caddisfly	Documented	No	No

3.2 Existing Aquatic Habitat Conditions within the Action Area

The project area has been impacted over the past century by timber harvest, road building, floods, fires, fires suppression activities, irrigation, and recreational activities. All these actions have had an effect on the condition of the quality and quantity of habitat for fish and other aquatic species in the action area. As previously stated, there is no Listed Fish Habitat within the action area.

Proposed treatments, unit boundaries, temporary road locations, and PDCs have all been designed to minimize impacts to aquatic habitat across the action area. Some impacts are possible, and the following habitat parameters are the most likely to be impacted: stream shade and subsequently water temperature; substrate fine sediment levels in streams and wetlands; pool quantity and quality; future large wood recruitment potential; and existing in-stream large wood levels. *Because other habitat parameters and/or fluvial processes are either analyzed in the Hydrology Specialist Report or proposed activities would not impact them, only those habitat parameters listed above will be discussed below and in the effects sections that follow.*

A baseline determination of functioning, functioning at risk, or not properly functioning based on desired future conditions is given to each habitat element that may be effected by the project.

3.2.1 Stream Temperature

Water temperature is a key predictor of survivability for salmon and trout and is often used to describe the suitability of stream habitat as overly warm waters can be lethal. Warm temperatures can reduce fecundity, decrease egg survival, retard growth of fry and smolts, reduce rearing densities, increase susceptibility to disease, and decrease the ability of young salmon and trout to compete with other species for food and to avoid predation (Spence et al., 1996; McCullough, 1999). Oregon State has temperature requirements which are designated to protect salmon and trout at each life cycle stage in waters of the State (ODEQ web link).

There is limited stream temperature data available for the action area. Monitoring conducted in reaches that flow across FS lands in Green Point Creek from 2003 to 2005 indicated that the 7-day maximum stream temperature never exceed 10 degrees Celsius (Cite). Spot samples taken in late July, 1979 and again in August 1991, from North Fork Green Point Creek suggest that water temperatures were also within standards for spawning (13 deg C). Observations taken from Gate Creek exceeded the spawning standard, but were within the rearing and migration standard (18 deg. C). Spot sampling in Rainy Creek in August of 1991 though the data is not rigorous, sampling from the late-summer months indicate that stream temperatures in perennial reaches have not been markedly elevated. (Hydrology Specialist Report).

Streamside shade within the project area is primarily intact and shade quality is not considered to be diminished. Near-stream openings in the project area occur naturally, primarily as talus slopes, which are abundant along certain reaches (Hydrology Specialist Report).

Baseline Determination: *Functioning at Risk*

3.2.2 Stream Sediment

Fine sediment deposition in streams can adversely affect fish and fish habitat, particularly for salmonids, by reducing the quantity and/or quality of spawning habitat, reducing food supply by impacting invertebrate habitat, reducing interstitial habitat, thereby decreasing fry survival, and reducing pool quality and quantity. Both past and on-going land use activities can contribute fine sediment in streams. The Mt. Hood National Forest Land and Resource Management Plan (Forest Plan) states that salmonid spawning habitat shall maintain less than 20 percent fine sediments less than 1 mm (FW-096).

Sedimentation impacts to water quality are not known to have been measured in the project area; data is lacking (Hydrologist Specialist Report). The natural sediment regime has been altered; principally by the existing road system and past timber practices. Within the action area, the primary arterial routes of the 2810 and 2820 roads cross the stream network in the Lower West Fork sub watershed, where the potential delivery of road-related sediment directly to a stream reach is high. Some crossings exhibit a greater potential than others.

The potential is greatest during high runoff events when the road tread is exposed to erosive forces, and concentrated intercepted flow is diverted from the road surface to the stream network. So there remains the potential for road-related sediment to impact water quality, but only for a short duration when runoff events of sufficient magnitude occur. Sediment delivery would be pulse inputs at a small, and local scale (Hydrology Specialist Report).

Baseline Determination: *Functioning at Risk*

3.2.3 Pool Quantity and Quality

Pool habitat is a critical component of healthy stream habitat for salmonid populations. The Forest Plan requires that pool habitat be maintained or increased resulting from a given project (FW-088) and that streams contain one or more primary pools per 5 to7 channel widths in low gradient streams (less than 3 percent slope) and one per 3 channel widths in steeper channels (FW-090/091). A primary pool is defined as a pool at least 3 feet deep, which occupies at least half of the low water flow channel. Pool frequency is often related to the occurrence of large wood or other channel obstructions (Montgomery et al. 1995) and pool depth is a function of a variety of factors including sediment input and the ability of the stream at that site to scour, and maintain, a pool. Fine sediment above natural background levels can fill pools and increase bed mobility, resulting in shallower scour depths (Buffington et al. 2002).

Pool frequency in all streams within the action area is below Forest Plan standards. Very few streams across the entire Forest meet the standard and those that do tend to be the larger rivers. This is because the pools per mile standard only applies to primary pools as defined

above and pools of this size are not common in the smaller, steeper streams common across the Forest and in the action area. The fact that primary pools are not prevalent does not mean that pool habitat is absent in action area streams but may be associated with the high gradient of these headwater streams which are either transport reaches with little wood to form and maintain pools, and/or are in steeper canyons that are riffle dominated.

In North Fork Greenpoint Creek, a 1991 stream survey found that the quantity of pools was close to meeting Forest Standards in most of the reach. The headwaters lacked pool habitat but was observed as largely being a function of the steep gradient. In Cabin Creek, a 1990 Stream Survey found that pools comprised 2% and riffles 97%. Most pools were created by woody debris jams. Pools were generally small and shallow, the deepest being 4.5 feet, with an average residual depth of l.3 feet (USFS 1990). In Gate Creek, a stream survey found that pools comprise only 4.3% of the wetted habitat although many lateral scour pools and plunge pools were present but not identified due to lack of width or other limiting factor.

There are steam reaches that have been impacted by land management activities, including a reduction of pool forming large wood, across the action area that may have fewer pools now than in the past. All in all, although the Forest Plan standard is not met in any action area stream, most streams in the action area have at least some reaches within the range of natural conditions given stream size, gradient, and valley type in the action area.

Pool quality is a descriptive measure of their “attractiveness” and suitability for fish and other aquatic fauna. Pools of higher quality are deeper and contain some form of cover for fish (i.e. large wood, undercover bank, water turbulence bubbles). Pools of this type aren’t common in the action area but are present, even if the pool isn’t classified as a primary pool.

Baseline Determination: *Functioning at Risk*

3.2.4 Large Wood Recruitment Potential

The ability of forested stream-side riparian areas to provide a continual source of large wood to the channel and floodplain is dependent on a variety of factors including tree species, tree sizes, stand health, and susceptibility to natural disturbance events such as wind throw, wildfires, or floods. Large wood recruitment potential is not a Forest Plan standard and there is no objective protocol to measure it. Despite the subjective nature surrounding this process the ability of forested riparian stands to provide down wood at present and in the future is an important component of this analysis because silvicultural treatments are proposed in riparian areas as part of this project. The following is a summary of known conditions in the action area.

The ability of riparian stands in the action area to provide large wood now and in the future varies depending on the stream and area. Several of the streamside stands in the action area were clear-cut prior to 1990 and are characterized by dense stands with an abundance of smaller trees (<15 inch dbh). In some areas these stands are beginning to decay and down

wood, albeit smaller sized, is abundant. In other areas there is little down wood and the capacity of the stand to provide large wood in the immediate future is limited. Most of the action area streams have sections where relatively large trees are present that could provide down large wood in the future.

In short, riparian conditions and pathways for recruitment are at various stages of recovery in much of the action area; however, short-term large wood recruitment is limited because most trees are not yet of an age and/or size to fall in great numbers on their own.

3.2.5 In-stream Large Wood

Large wood plays an important role in stream ecosystems. Large wood modifies both hydrologic, sediment and nutrient transport by slowing, storing, and redirecting stream water, sediments, and particulate organic matter (Montgomery et al. 2003). Additionally, large wood creates and enhances stream habitat for fish, other vertebrates, and invertebrates by providing physical cover, pools, backwaters, secondary channels, and creating stream flow refugia. Having adequate levels of large woody debris is critical for healthy streams in forested ecosystems.

The Forest Plan has a standard of 106 pieces of suitable large wood per mile of stream (FW-095). To be counted towards this standard in eastside streams, all pieces of large wood shall be at least 35 feet long with 80 percent at least 12 inches in mean diameter, and at least 20 percent over 20 inches in mean diameter. None of the surveyed stream reaches in the action area met the standard based on the stream survey data that is available. However most channels had numerous pieces of “channel forming” wood. Channel forming wood is smaller in length and diameter than pieces meeting the Forest plan, but is large enough to store sediment, reduce erosion, and maintain channel stability.

Baseline Determination: *Functioning at Risk*

3.3 – Proposed Action Environmental Consequences

3.3.1 No Action

None of the proposed activities would be implemented if this alternative were chosen. In the near term habitat conditions for aquatic fauna would remain essentially unchanged from existing conditions unless natural events, such as floods or fire, occurred.

Stream Temperature

As outlined in the Water Quality Specialist Report stream temperature would not be affected under the No Action Alternative. Action area stream temperatures would remain cold, rarely exceeding water quality standards for temperature, and meeting the ODEQ requirements for fish and aquatic life beneficial uses (Hydrologist Specialist Report). Under the No Action Alternative, existing effects to the water quality would remain unchanged. There would continue to be no impairments to the designated beneficial uses.

Stream Sediment

Because no ground disturbing actions would occur, the existing condition in regards to fine sediment levels would remain. The currant sources of fine sediment are roads and natural sources such as eroding stream banks, and these would remain unchanged. Since roads proposed for closure/maintenance would remain unchanged, there would be an increased risk of erosion and thus increased levels of fine sediment input to area streams in the headwater and/or tributary areas of North Fork Greenpoint Creek and Greenpoint Creek.

Although road maintenance would occur as budgets and priorities allow the overall level of maintenance would be less than if the Proposed Action were implemented (see Transportation Specialist Report for more details). In some areas, this could result in an increased risk of erosion and fine sediment input over time. The likelihood of this occurring is difficult to estimate exactly because log hauling would not occur and the act of maintenance in and of itself can cause a spike in erosion and thus fine sediment.

In summary, the risk of increased erosion and thus sediment input to streams from roads would be increased under the No Action alternative. However, since other proposed activities that could also increase erosion, including logging operations and log hauling, would not occur the overall impact in the action area from a sediment perspective under the No Action alternative would be negligible.

Pool Quantity and Quality

The amount and quality of pool habitat would be unaltered under the No Action alternative in the short-term (next 10 to 20 years). Beyond that time a slight decrease in pool quantity would be expected in North Fork Greenpoint given reductions in larger down wood and reduced wood inputs. However, in the sapling thin units in Greenpoint Creek, there could actually be an increase in wood created pool habitat as more small trees fall. These conditions would manifest themselves over decades given the anticipated riparian stand response without treatment.

Large Wood Recruitment Potential

If proposed silvicultural treatments did not occur, forested riparian stands would have smaller and shorter trees and, eventually, fewer live trees per acre but more snags. The difference between untreated and proposed treatment conditions, except in trees per acre (especially after year 40), is relatively slight. However, smaller trees would not last as long once on-the-ground as they would decay faster and, depending on the stream they fall into or adjacent to, may be moved downstream faster and would also tend to break apart more readily.

Over the next 50 years there would be more trees dying and then falling to the ground in Riparian Reserves as the stands decay. As such, there would be an increase in the amount of down wood, but this wood would generally be smaller in diameter and thus would decay faster both in and out of stream channels. The down trees would increase fuel loading that would in turn increase the risk of stand replacing fire in riparian areas with the potential for hotter, more

destructive burns. Fewer trees would grow to a larger size that would last longer once on-the-ground and in larger streams provide more stable habitat creating characteristics. There would also be a trade-off in the health of the riparian stand, as discussed in the Silviculture Specialist Report, which would increase the likelihood of disease, susceptibility to fire and other natural events, and result in stand composition and structure outside the desired future condition.

In-stream Large Wood

There would be no change in the amount of in-stream and floodplain large wood if the No Action alternative were selected. No activities would occur that would directly reduce the amount of large wood. Many streams in the action area are small and thus smaller sized large wood provides habitat and channel stability benefits as described above. In larger streams within the action area, however, smaller large wood would not provide the same benefit and would not remain in the system as long as larger wood.

3.3.2 – Proposed Action Effects

Direct Effects

Direct effects are those that directly impact aquatic species/habitat. Commonly the activity needs to be in close proximity to the water body where they reside, often within the water body itself. From an aquatic perspective, direct effects most often result in disturbance to aquatic organisms—forcing movement or a flight response. Depending on the activity, it is possible that individuals can be injured or killed; this is almost always a result of people or equipment working directly in water. The only components of the Proposed Action that have a risk of direct effects on aquatic organisms or habitats are tree falling and culvert removal or replacement.

Tree Falling

No-cut buffers of 60-feet for perennial and 30-feet for intermittent streams, springs, and seeps are in place in part to protect aquatic organisms and habitat from the direct effects of logging activities. Project Design Criteria/Mitigation Measures (PDC) include directional tree falling away from no-cut buffers as well as leaving any portion of a tree that falls within a no-cut buffer. Despite this PDC, directional falling is not always possible and trees occasionally fall within the no-cut buffer. Depending on the location and tree size the falling tree could hit a stream channel, seep, or spring and at the least disturb aquatic animals, and at worst result in injury or death. The latter possibilities are remote and the risk is low.

An exception to the above discussion is in units where skyline logging corridors would cross stream channels, including perennial fish bearing channels. In these skyline corridors felled trees could land in the stream channel causing aquatic fauna disturbance, injury, or possibly death. The number of trees to be felled into channels is unknown (if any) and the risk of direct effects is low, especially death of individuals, but not completely discountable.

Danger tree falling associated with road maintenance would also occur as part of the proposed action and some of these trees may be located within one site potential tree height of streams. Any danger trees felled towards streams could potentially impact aquatic fauna individuals as described above but the risk is low.

Culvert Removal/Replacement

Culvert removal and/or replacement involves in-stream work with large equipment, usually an excavator or backhoe, and past experience indicates aquatic organisms could be disturbed and forced to move at the least, and injury or death is a real possibility. Several culvert replacements are planned on FSR 1720. Because aquatic macroinvertebrates are relatively immobile, especially mollusks, it is likely such organisms would be injured or killed during construction if they are present at the site. This impact would occur at the site scale and not across the range of any aquatic macroinvertebrate species thus the effects would be localized.

Direct effects from sediment deposition during culvert removal/replacement are unlikely, especially for juvenile and adult fish. Enough sediment would have to be deposited in a short period of time to bury individuals and either crush or suffocate them. Since adult and juvenile fish are mobile this is extremely unlikely. Smothering of aquatic macroinvertebrates, especially snails or other relatively immobile creatures, is somewhat more likely and could occur immediately below the culvert removal/construction sites. The potential increase in insect drift resulting from increased sedimentation (Waters 1995) would alleviate to some degree the incidence of smothering for caddisflies and other insects, but it is unknown whether snails also drift as insects do in response to habitat perturbation. The sediment that could smother individuals would settle relatively rapidly and not extend a great distance down the channel.

Indirect Effects

Indirect effects are effects caused by or resulting from the proposed actions, are later in time, and are reasonably certain to occur. For example, when streamside forests are removed, an indirect effect associated with shade reduction could be an increase in water temperature. The magnitude of such an effect, if it occurred, would depend on the amount of vegetation removed, location and elevation of the stream, amount of stream flow, etc. In this case, indirect effects may affect resident trout present within close proximity to the proposed actions but will have no effect on ESA species or LFH present farther downstream. The following analysis evaluate potential indirect effects on habitat indicators that result from the no action alternative and the proposed action alternative.

Stream Temperature

This alternative proposes to thin vegetation within Riparian Reserves. Vegetation removal near water bodies has the potential of increasing solar radiation to surface water which in turn may increase water temperature. To reduce potential impacts to temperature, perennial streams in treatment units would have a 60 foot “no entry” area next to them and any riparian treatment outside of the 60 foot “no entry” buffer would retain a minimum canopy cover of 50%.

Moreover, the number of acres treated within North Fork Greenpoint Creek was limited to ensure that the linear distance of riparian treatment would not result in measureable daylighting of the channel.

Skyline yarding corridors crossing North Fork Greenpoint Creek could result in some shade removal along this perennial stream. No more than five corridors per 1,000 lineal feet of perennial stream are allowed and limited to a width of 15 feet. From a perennial stream length perspective, the created opening in North Fork Greenpoint Creek would make up a small percent of the total stream length.

Summary of Indirect Effects - Stream Temperature. Due to project design and the existence of additional factors that help protect stream temperature, treatments associated with the proposed action are expected to have neutral effect to existing stream temperatures.

Sediment/Turbidity

Fine sediment deposited on the stream bottom can impact aquatic creatures directly or in-directly depending on the location of the sediment source in relation to aquatic life, amount of sedimentation, and timing of sedimentation. Indirect effects are possible if sediment fills pools and reduces living space, decreases food availability, and covers fish spawning areas thereby reducing spawning success. All of these elements will be discussed below.

Turbidity

Few activities outlined in the Proposed Action would result in an increase in turbidity because actions would occur well away from water, including silvicultural treatments. Tree falling into stream channels associated with skyline corridor creation could cause very slight increases in turbidity in North Fork Greenpoint. Road maintenance, especially blading and ditch cleaning could increase turbidity in streams, but only after the first significant precipitation event as that is when disturbed soil would be mobilized downstream and potentially into stream channels. In either case, the turbid conditions would last a relatively short period of time and would dissipate further downstream as particulate matter settles. As described in the Hydrology Specialist Report various PDC and BMP are in place to minimize the amount of sediment entering surface water resulting from these activities.

Increased turbidity resulting from the activities described above would be limited both in space and time because of the small amounts of fine sediment introduced at each site. Turbidity monitoring in streams below instream construction activities indicated turbidity increases were not be detectable 0.5 to 1 mile downstream of the worksite (Bengt Coffin, hydrologist, Gifford Pinchot National Forest, personal communication, 2009). Increased turbidity resulting from road maintenance is expected to follow this finding.

The first “flush” after road maintenance could increase turbidity in fish bearing streams, but the level of turbidity would likely be quite low given the small amount of suspended sediment and short duration. Impacts to feeding could occur, but unless the turbidity event was prolonged

this would be a slight effect that could be mitigated to some degree by fish moving out of the area. Overall, the impact on fish from increased turbidity is expected to be negligible. The impact on aquatic invertebrates would be minimal although slightly impaired feeding and possibly respiration are possible. Increased turbidity has little to no effect on habitat conditions.

Sedimentation

The soil erosion and delivery potential of proposed activities is detailed in the Soil Productivity and Hydrology Specialist Reports. PDC and BMP are in place to greatly minimize, if not eliminate, the chance of increased sedimentation in action area streams and other water bodies resulting from proposed activities. Potential source of increased sedimentation in action area streams could result from road maintenance and log hauling.

Indirect effects of fine sediment deposition on fish and fish habitat, particularly salmonids, relates primarily to the following: reduction in the quantity and/or quality of spawning habitat for fish, reduction in food supply, reduction in fry survival in riffles, and reductions in living space.

Roads proposed for hauling, most of which would receive some sort of maintenance (see Transportation Specialist Report), are generally located outside Riparian Reserves and, with the exception of Deadpoint Road and Greenpoint Road are not close to LFH/EFH.

Road maintenance has a higher likelihood of some sediment contribution to nearby streams compared to log hauling. Large amounts of sediment input are unlikely (Water Quality Specialist Report), but some increase in fine sediment could occur, especially during the first few precipitation events following the maintenance. Of course the highest likelihood of erosion and sediment introduction would be associated with native surface roads, followed by aggregate roads and then paved roads. Ditch cleaning, culvert cleaning and blading are the activities most likely to result in some sediment introduction.

The roads, or road segments, where maintenance and/or haul activities would result in the highest risk of sediment introduction include the 2820, 2820-630, 2810, and possibly the 2810-630. To reduce the risk that road maintenance and/or haul activities could result in sediment delivery to LFH/EFH in Greenpoint or the West Fork Hood River. No road maintenance or haul activities will occur in wet conditions.

In all cases, PDCs would ensure that a minimal amount of sediment would reach streams and that the chance for such sediment introduction would be of a short duration.

Given the location of potential sediment producing activities (road maintenance, log haul, etc.) in relation to aquatic macroinvertebrate populations, which are located in all perennial streams, there is much greater potential for impacts to macroinvertebrates. Stream reaches directly below sediment sources are the most susceptible to impact. Small amounts of fine sediment, such as is expected from road maintenance and log hauling, would likely have little effect on

macroinvertebrate abundance given the findings in natural streams described by Bjornn et al. (1974 and 1977).

The small amount of fine sediment making its way to fish bearing stream reaches and/or most LFH/EFH would be immeasurable against background levels, primarily due to the distance between potential sediment producing activities and those stream areas. Short duration pulses of sediment directly following precipitation events could slightly fill pools but not to the degree that rearing space would be reduced. Similarly, there could be some sediment deposition on riffles and spawning habitat (pool tails) but the amount would be negligible. No negative effect to spawning is anticipated; some localized impact to macroinvertebrate levels could occur and thus the amount of forage could be slightly reduced for a short time until upstream drift rebuilds the population.

Log haul and road maintenance can increase sediment into stream reaches. Road maintenance would reduce erosion and potential sediment introduction as compared to unmaintained roads. Thus, the overall effect of road maintenance is beneficial despite the potential short-term impacts. The beneficial effects of road maintenance would last varying amounts of time depending on the type of maintenance performed, road surfacing, traffic, and weather. It is difficult to predict how long erosion rates would be reduced on a given road because, over time, the road would revert back to a condition similar to the existing condition. It is anticipated that benefits would last from one to five years beyond implementation but the inevitable degradation of the road and associated ditch lines depends on a variety of factors and how these factors interact.

Summary of Effects of the Proposed Action on Sediment/Turbidity. Log haul and road maintenance can increase sediment into stream reaches. Road maintenance would reduce erosion and potential sediment introduction as compared to unmaintained roads. Thus, the overall effect of road maintenance is beneficial despite the potential short-term impacts. Haul would only occur in dry weather on roads that cross or are in proximity to LFH/EFH. And PDC are in place to effectively prevent measurable sediment from routing into LFH/EFH from the action area. Therefore, sediment and turbidity are will have a negligible effect on aquatic species/habitat in the action area.

Pool Quantity and Quality

The Proposed Action would have little effect on pool habitat quantity and quality because proposed silvicultural treatments include protection buffers and all existing down large wood, the primary pool forming habitat feature in the action area, would remain. A decrease in potential large wood resulting from silviculture treatments in Riparian Reserves is possible but the units where treatment is occurring are already impaired and will not provide quality downed wood for many decades. As existing pool forming wood decays there could be a gap in time where relatively fewer trees are falling into channels to replace this wood in those areas where treatment occurs. Whether this potential decrease in large wood could result in less pool habitat depends on the site and local conditions; some decrease in pool habitat in these small, steep streams is possible, but not likely to extend beyond the site scale.

While large increases in fine sediment to a stream can reduce pool volume and thus pool quality, this is unexpected as described above in the Sediment section. Both the quantity and quality of pool habitat in the action area is expected to be maintained or improved in the future from the long-term improvements in large wood recruitment potential and erosion risk reduction.

Summary of Effects on Pool Quantity and Quality. Reductions in pool habitat quantity in fish bearing streams due to reductions in LWD input are expected to be minimal because much of the proposed riparian thinning would not reduce the existing amounts of LWD except at the local scale.

Large Wood Recruitment Potential

Riparian silviculture has the greatest potential to affect large wood recruitment potential compared to any other proposed project element. Thinning removes standing wood volume from the recruitment zone and reduces exclusion-phase mortality, which can contribute wood to the stream. In small streams, relatively small diameter pieces of woody debris can contribute to pool formation (Beechie and Sibley 1997). In recovering riparian areas, small trees in close proximity to the stream can help provide geomorphic and biotic benefits in the short-term, especially during the stem-exclusion phase (Beechie et al. 2000). As the source distance increases, the likelihood of the tree entering the stream decreases and becomes dependent also on the size of the tree (Meleason et al. 2002; Spies et al. 2013). When all stand ages and types are considered then 95 percent of total instream wood comes from distances of 82 to 148 feet (Spies et al. 2013); shorter distances come from younger stands, longer distances from older stands.

The desired future condition for the previously managed riparian stands proposed for treatment is to move them toward historical conditions so they are more resistant to large scale disturbances. To accomplish this tree density levels must be reduced. Immediately after treatment the stands would be in a more open mature condition with the largest, most dominate trees retained creating favorable growing conditions by removing both above (light) and below (nutrient availability) ground competitions. Canopies would no longer interlock conditions would favor establishment of a third and/or forth age class that within 20 years would begin influencing stand densities (QMD and height). These younger age classes would continue to influence stand QMD and height over the next century. Resulting in low QMD and tree heights as compared to the no action proposal.

All of the Riparian Reserve treatment areas are located adjacent to resident fish bearing streams with minimum protection buffers of 60 feet for perennial streams and 30 feet along intermittent streams and a 50% canopy cover retention in the treated portion of the riparian stand Proposed silvicultural treatment outside protection buffers in Riparian Reserve would reduce the trees per acre and thus reduce the number of trees available as potential down large wood for a period of about 70 years compared to the No Action alternative. However, all larger trees would be retained and over time a diverse mix of tree sizes would be available for large wood recruitment. There would be no effect on large wood recruitment to the EFHR due to protection

buffers meeting or exceeding the height of site potential trees. There could be a slight decrease in large wood recruitment potential in other streams as a result of riparian silvicultural treatment, but the decrease would be slight if realized at all for several reasons:

- Protection buffers would maintain an untreated source of potential large wood.
- Treated areas would retain all of the largest size classes of existing trees and a good mix of other tree sizes that can provide large wood.

In-Stream Large Wood

As described above, large wood recruitment potential would be minimally affected across the action area, even in proposed treatment units adjacent to perennial streams, there would be little to no effect on in-stream large wood levels. In those units there could be a slight reduction in the amount of instream and floodplain over time; however, the actual reduction in down large wood, if it occurs at all as described above, is difficult to predict. Natural events such as wind storms could result in large amounts of down large wood even in in streams along thinned areas due to protection buffers, which would provide a sustained source of large wood (Meleason et al. 2002; Spies et al. 2013) for the foreseeable future. In general, the processes that currently support large wood recruitment in the action area will remain unchanged except at the unit scale. In the short term, in-stream large wood could be reduced within the treatment units but will result in higher quality wood recruitment over the long term.

Summary of Effects of the Proposed Action on Large Wood Recruitment Potential & Instream Large Wood. The desired future condition for the previously managed riparian stands proposed for treatment is to move them toward historical conditions so they are more resistant to large scale disturbances. To accomplish this tree density levels must be reduced. Of the Riparian Reserve acres within proposed blocks only 129 acres would actually be treated.

The processes that currently support large wood recruitment in the action area will remain unchanged except at the unit scale. The slight reduction in large wood is not expected to result in a reduction in large wood at the action area scale because very few riparian acres would be treated in the action area.

Cumulative Effects

Past, Present, and Reasonably Foreseeable Activities Relevant to Cumulative Effects Analysis

Cumulative effects are impacts on the environment that result from the incremental impact of the proposed action when added to other past, present and reasonably foreseeable future actions.

Cumulative effects evaluated in this analysis include the effects of past, present, and reasonably foreseeable future state, tribal, local or private actions that overlap in time and space within the action area as described above. Past and present impacts are incorporated as part of the environmental baseline and previously discussed here in the effects discussion.

Only those indicators that are effected by the project are included in the cumulative effects analysis (if the action has no direct/indirect effects there would be no effects to accumulate). In this case, the aquatic habitat indicators that could be affected by the project were all found to have no effect or negligible effect. Since even a negligible effect could become greater when accumulated over space and time, those habitat indicators will be addressed below. The spatial context for the following cumulative effects analysis is the action area as described previously. The temporal context depends on the existing or future project/activity. If there is an overlap in time from an effects perspective; then it is included.

Cumulative effects from an aquatic species and habitat perspective overlap considerably with water quality (sediment delivery, temperature) cumulative effects because most of the attributes analyzed by the hydrologist are directly related to aquatic habitat conditions and are discussed in the Hydrology Specialist Report.

Table 3. Summary of past, present, and reasonably foreseeable future actions which may contribute to cumulative effects to aquatic fauna and habitat.

Project	**Potential** Effects	Overlap in Time	Overlap in Space	Measurable Cumulative Effect?	Extent, Detectable?	Aquatic Species or Stream Habitat Effects
Eagle Creek Fire Suppression	Sediment	Yes	Yes	Possible	During the Eagle Creek fire, several decommissioned roads were actively used to help with fire suppression. While all the roads were re-decommissioned after the fire, several are not hydrologically stable and are contributing sediment into the headwaters for NF Greenpoint Creek. The proposed project will result in road maintenance and log haul that	The habitat indicators for this project were negligible. There is the potential for some effects to individual resident trout and/or aquatic mollusks during project implementation at the site scale but those will be limited to isolated locations (such as road crossings) that would have no causal relationship to accumulate measurable effects stabilized as part of the road maintenance completed for this

Project	**Potential** Effects	Overlap in Time	Overlap in Space	Measurable Cumulative Effect?	Extent, Detectable?	Aquatic Species or Stream Habitat Effects
					could elevate sediment and turbidity in localized areas and has the potential to enter stream channels. Sediment/turbidity levels may be detectable at the site scale within resident fish only streams. PDCs will minimize sediment mobilization.	project. Thereby reducing potential turbidity and fine sediment at the site scale that will benefit resident fish species and habitat.
Past In-stream restoration	Pool Quality/ Quantity	No	Yes	No	Previous stream restoration work focused on Large Wood additions to Green Point Creek outside of the project area.	NA
Past Timber harvests on Federal Land	Pool quality & Quantity	Yes	Yes	No	No	NA
	Large Wood Recruitment Potential	Yes	Yes	No	Projects completed. Removing large wood from stream channels was a common practice into the 1970's thus the amount of large	A reduction of large wood recruitment could result in fewer pools and because one of the major roughness elements that forms and

Project	**Potential** Effects	Overlap in Time	Overlap in Space	Measurable Cumulative Effect?	Extent, Detectable?	Aquatic Species or Stream Habitat Effects
	Pool Quality/ Quantity				wood in many streams within the action area have less large wood than historic conditions. None of the actions proposed in this EA would directly remove large wood in any stream. Indirect effects, associated with slight reductions in large wood recruitment potential, could result in localized reduction in recruitment within the units which are treating riparian reserves in North Fork Greenpoint. This may result in less large wood recruitment and thus less in stream wood for the next 50 years or more within those reaches.	maintains habitat is large wood. All the habitat indicators for this project negligible. Some impact is possible in terms of habitat to resident trout and aquatic invertebrates in reaches in NF Greenpoint.

Project	**Potential** Effects	Overlap in Time	Overlap in Space	Measurable Cumulative Effect?	Extent, Detectable?	Aquatic Species or Stream Habitat Effects
Past Timber harvests on private and county land (Standards based on DSL forestry requirements)	Sediment Large wood recruitment, Pool quality & Quantity In-stream Wood	Yes	No	No	NA	NA
Past Road Decommissioning on USFS lands	Sediment & Turbidity	Yes	Yes	No	NA	NA

Project	**Potential** Effects	Overlap in Time	Overlap in Space	Measurable Cumulative Effect?	Extent, Detectable?	Aquatic Species or Stream Habitat Effects
Current Timber Management on Private and County Lands (managed by DSL)	Sediment Large wood recruitment, Pool quality & Quantity In-stream Wood	Yes	No	No	NA	NA
Past and ongoing recreation on USFS Lands	Sediment Large wood recruitment, Pool quality & Quantity In-stream Wood	Yes	Yes	No	NA	NA

Cumulative Effects Summary

Sediment - The only cumulative effects that may occur in regards to sediment and turbidity are associated with haul operations and road maintenance (including culvert replacement). The amount of sediment generated should be limited and localized due to PDC's. As such cumulative effect is expected to be very small and localized due to the small amount of sediment expected to be generated during log-haul and to the reduction in sediment delivered as a result of the road maintenance.

Large Wood Recruitment Potential & In-Stream Wood - No detrimental cumulative effects are expected in large wood recruitment potential and none of the actions proposed in this EA would directly reduce existing levels of large wood in any stream. Indirect effects, associated with slight reductions in large wood recruitment potential, could result in localized reduction in recruitment along the North Fork Greenpoint which may result in less in-stream wood for the next 50 years or more within those reaches which could impact rearing habitat to resident salmonids and aquatic macroinvertebrates.

Stream Temperature **-** No detrimental cumulative effects are expected as a result of increase water temperature due to PDC that maintain existing primary shade vegetation adjacent to stream. As described in the Water Quality Specialist Report, this project would maintain existing water temperatures. The few trees felled to install the new pipe would not decrease shade enough to increase water temperature. As such, there are no temperature cumulative effects on aquatic species or habitat.

3.4 - Consistency with Management Direction

The Waucoma Project is consistent with all applicable fish/aquatic related federal law, plans and guidelines as outlined below.

Law, Regulation & Policy

The Mt. Hood National Forest Plan and the Northwest Forest Plan provide guidance for projects in the form of Standards and Guidelines and recommended Best Management Practices (BMP). There is overlap between aquatics and water quality in terms of applicable standards and guidelines; therefore, those listed below are directly related to fisheries, or other aquatic special status species. The other water quality standards can be found in the Hydrology Specialist Report.

Mt. Hood Forest Plan Standards and Guidelines include (pages Four-64, Four-69, Four-257–258):

Fisheries: FW-137, -138, -139, -145, -147

Threatened, Endangered and Sensitive Plants and Animals: FW-174, -175, -176

B7 General Riparian Area: B7-028, -030, -031, -032, -033, -037, -038, -059

Northwest Forest Plan Standards and Guidelines include:

- Riparian Reserve Standard and Guides and Aquatic Conservation Strategy (ACS)

In addition to the above, the Forest Service is required to assess and disclose the effects of any Federal action on Regional Forester's special status species, as outlined in the Endangered Species Act of 1973 and National Forest Management Act of 1976 (see effects determination section). The Magnuson-Stevens Fishery Conservation and Management Act of 1976 requires the Forest Service to assess and disclose the affects to Essential Fish Habitat. Clean Water Act

compliance and consistency with the standard and guidelines outlined in the Northwest Forest Plan Aquatic Conservation Strategy objectives determination is provided for in this analysis and is also discussed in the Hydrology specialist report.

Desired Future Condition

The desired future condition (DFC) for streams and associated riparian areas within the Waucoma Project is summarized in several sources as outlined below:

The NWFP Aquatic Conservation Strategy (ACS) was developed"…to restore and maintain the ecological health of watersheds and aquatic ecosystems contained within them on public lands." Within the strategy are nine ACS objectives that give direction regarding maintenance and/or restoration of aquatic processes key to watershed health. These objectives can be considered desired future conditions from an aquatics perspective for the project area and are described and discussed below.

Finally, the Forest Plan presents desired future conditions for all management areas, including General Riparian Areas. The list of DFC can be found on page Four-254 in the LRMP, and the General Riparian Area management goal is to "…achieve and maintain riparian and aquatic habitat conditions for the sustained, long-term production of fish, selected wildlife and plant species, and high quality water for the full spectrum of the Forest's riparian and aquatic areas.

Survey and Manage

This project is consistent with the survey requirements in the 2001 Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines (USDA and BLM).

Aquatic Conservation Strategy

In order for a project to proceed, "a decision maker must find that the proposed management activity is consistent with the Aquatic Conservation Strategy objectives" (ROD B-10) from the Northwest Forest Plan Record of Decision. The nine objectives are listed on page B-11 of the ROD. Portions of the effects analysis in this document focus on key parameters or indicators that make up elements of the nine Aquatic Conservation Strategy objectives, to determine if the project would restore, maintain, or degrade these indicators. Once this determination is made, the indicators are examined together with the Range of Natural Variability to ascertain whether the project is consistent with the objectives. A description of the range of natural variability of the "important physical and biological components" (ROD B-10) is necessary for determining whether a project "meets" or "does not prevent attainment" of the Aquatic Conservation Strategy objectives (ROD B-10). Relevant portions of the range of natural variability from the Watershed Analysis are included in the Existing Conditions section of this report and the Hydrology Specialist Report.

The following table displays the individual indicators and the effect the alternatives have on those indicators at the subwatershed scale.

Table 4. ACS Objective Indicators for each Alternative. The abbreviations in the table are defined as: R="Restore" which means the action(s) would result in acceleration of the recovery rate of that indicator; M="Maintain" which means that the function of an indicator does not change by implementing the action(s) or recovery would continue at its current rate; and, D="Degrade" which means changing the function of an indicator for the worse

Indicators	**Effects of the Actions by Alternative**	
	No Action	**Proposed Action**
Water Quality: Temperature	M	M
Sediment	M	M
Chemical Contamination	M	M
Habitat Access: Physical Barriers	M	Slight Restore over Long-term
Habitat Elements: Substrate	M	M
Large Woody Debris	Slight Degrade over Long- term	Slight Restore over Long-term
Pool Frequency	M	Slight Restore over Long-term
Pool Quality	M	M
Off-channel Habitat	M	M
Refugia	M	M
Channel Conditions and Dynamics: Width/Depth Ratio	M	Slight Restore over Long-term
Streambank Condition	M	M
Floodplain Connectivity	M	M
Flow/Hydrology: Peak/Base Flows	M	M

Indicators	Effects of the Actions by Alternative	
	No Action	**Proposed Action**
Drainage Network Increase	M	Slight Restore over Long-term
Watershed Conditions: Riparian Reserves	M	Slight Restore over Long-term

3.4.1 Effects Determination

Because there would be no federal action if No Action was chosen there would be no effect to Region 6 Foresters sensitive or special status species or habitat, although some habitat conditions would continue to degrade under this scenario – particularly riparian forest stand health. Activities in the Proposed Action could impact species that reside in the action area, as well as habitat conditions. Depending on the species and/or habitat direct, indirect, and cumulative effects are possible. PDC would greatly minimize potential effects, but not eliminate them altogether.

Potential effects center on potential disturbance, increased sedimentation, and potential reductions in large wood potential and in-stream levels. The potential direct effects would be associated with riparian tree falling, culvert removal/replacement, and cable yarding across streams which could result in direct mortality of resident fish and macroinvertebrates, alterations or movement in behavior, or could force drift or bury aquatic macroinvertebrates due to the expected sediment pulse during culvert project work.

Indirect and cumulative effects center on slight increases in fine sediment and reducing future levels of large wood. In localized areas associated with culvert removal/culvert replacement, road maintenance, and log hauling, there is the possibility of increased levels of fine sediment. In any given location, the increase is expected to be quite small, even associated with culvert replacement/removal. However, some localized filling of pool habitat could occur and sediment deposition could also impact aquatic macroinvertebrate feeding and survival. This, in turn, could lead to slight reductions in resident trout rearing habitat and food supply, respectively. There would be no impact to trout survival or reproductive success resulting from fine sediment increases because the amount of sediment would be very low and localized.

Proposed projects would have no immediate impact on in-stream levels of large wood. However, thinning conducted within one site potential tree height of stream channels may reduce the large wood recruitment potential in adjacent stream segments until remaining trees begin to fall naturally and replace those that were harvested. This future reduction in large wood could locally reduce the amount of pool habitat and the other benefits associated with in-stream large wood (gravel collection, floodplain connection, etc.).

None of the anticipated impacts summarized above would impact ESA-listed fish or their habitat as they are not present in the action area. Cutthroat trout may be affected but population viability would be maintained as potential impacts would be site-specific and cutthroat trout have a wide distribution across the Forest. Resident rainbow and brook trout may be impacted by some project activities the impacts would be minimal and localized therefore the project is consistent with the Forest Plan and the Aquatic Conservation Strategy.

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Links to websites

State of Oregon Department of Environmental Quality Appendix A: Oregon Temperature Standard (OAR 340-041-0028) 2017 Revision to 2001 Western Hood Subbasin TMDL. https://www.oregon.gov/deq/FilterDocs/whoodAppendixA.pdf

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