Taneum Restoration Project

BIOLOGICAL ASSESSMENT
CLE ELUM RANGER DISTRICT
OKANOGAN – WENATCHEE NATIONAL FORESTS

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DISTRICT RANGER

- Watershed Analysis
  2017 Manastash-Taneum Resilient Landscapes: Supplemental Aquatic and Riparian Landscape Evaluation for North Fork Taneum Creek
  1995 Taneum/Manastash Watershed Analysis

❖ HUC – 8:	17030001	Upper Yakima
❖ HUC – 10:	1703000105	Taneum Creek, Yakima River
❖ HUC – 12:	170300010503	North Fork Taneum Creek, Taneum Creek

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Effect Determination (Wildlife)

- May Affect, Likely to Adversely Affect
    - northern spotted owl (*Strix occidentalis caurina*)
    - northern spotted owl Critical Habitat

- May Affect, Not Likely to Adversely Affect
    - gray wolf (*Canis lupus*)

- No Effect
    - marbled murrelet (*Brachyramphus marmoratus*)
    - marbled murrelet Critical Habitat
    - Canada lynx (*Lynx canadensis*)
    - Canada lynx Critical Habitat
    - grizzly bear (*Ursus arctos horribilis*)
    - Mount Rainier white-tailed ptarmigan (*Lagopus leucura rainierensis*)

Effect Determination (Plants)

- No Effect
    - whitebark pine (*Pinus albicaulis*)
    - showy stickseed (*Hackelia venusta*)
    - Wenatchee Mountains checkermallow (*Sidalcea oregana calva*)

Effect Determination (Fisheries)

- Likely to Adversely Affect
    - middle Columbia River steelhead (*Oncorhynchus mykiss*)
    - middle Columbia River steelhead Critical Habitat
    - Columbia River bull trout (*Salvelinus confluentus*)
    - Columbia River bull trout Critical Habitat

- Not Adversely Affect
    - essential fish habitat for chinook (*Oncorhynchus tshawytscha*) and coho (*Oncorhynchus kisutch*) salmon

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Introduction

The purpose of this Draft Biological Assessment (BA) is to present an analysis of effects for the Taneum Restoration Project on the Cle Elum Ranger District on federally listed endangered, threatened, candidate and proposed wildlife species and their designated Critical Habitat. The analysis is conducted to determine whether formal consultation or conference is required with the United States Department of Interior Fish and Wildlife Service, pursuant to the Endangered Species Act. This Biological Assessment is prepared in accordance with legal requirements set forth under Section 7 of the Endangered Species Act (16 U.S.C. 1536 (c)) and with the requirements of Forest Service Manual 2670 and provides for compliance with Code of Federal Regulations (CFR) 50-402.12.

Consultation History

- The Taneum Restoration Project IDT employed an “early and often” philosophy for engaging partners and regulatory agencies in project design. Field trips and meetings, with invitations to the Level 1 team, in 2018: February 15, March 20, April 11 (Aquatic specific), May 3 (LSR Workgroup), June 4 (Aquatic specific), June 5, July 11 (Level 1 specific), and Oct. 17 (LSR WG); in 2019: May 23 (Aquatic specific), June 10 (LSR WG), June 21 (Aquatic specific), July 11 (Level 1 specific), July 21 (Aquatic specific), Aug. 1 (LSR WG), and Aug. 29.
- The LSR Working Group concurred with the Taneum Restoration Project proposal (REO 2019; RIEC 2020).
- A pre-Level 1 meeting with the OWNF Level 1 team occurred on 10/30/2019, a Level 1 meeting occurred on 2/27/2020, 7/21/2020, 7/15/2021, and 2/17/2022. A terrestrial Level 1 field trip occurred on 9/25/2020, a proposed action Level 1 meeting occurred on 2/17/2022, and an effects meeting occurred on 3/17/2022.

Proposed Action

Purpose

The Cle Elum Ranger District, of the Okanogan-Wenatchee National Forest, has developed a proposed action for the Taneum Restoration Project that integrates aquatic and terrestrial restoration actions with human uses and values in the project area. The primary purposes of this project are to:

1. Reduce the risk of habitat loss to uncharacteristically severe wildfire by making habitat more resilient and restoring native disturbance regimes influenced by past management and a changing climate.
2. Restore habitat to contribute to the recovery of listed wildlife species (northern spotted owl) and improve the viability of late-successional and old forest associated species.
3. Integrate aquatic and terrestrial restoration actions to restore watershed functions, restore native plant diversity, and build more resilient and sustainable ecosystems.
4. Improve riparian, stream, and upland processes influencing stream and watershed functioning and resiliency, and substantially contribute to the recovery of listed fish species (steelhead and bull trout) and their critical habitats.
5. Provide a transportation system (roads and trails) and recreational facilities that are affordable, safe, and efficient for administration, public use, and protection of National Forest System lands and water resources while also providing high quality recreation experiences and access for forest management.

Need

Vegetation (Composition and Structure)

There is a need to change the composition, structure, and pattern of forest vegetation according to guidance provided in the Wenatchee National Forest Land and Resource Management Plan (WNFP 1990), amended by the Northwest Forest Plan Record of Decision (NWFP ROD 1994), and the Okanogan-Wenatchee National Forest Large and Old Tree policy (Heath 2010; USFS 2010).

Wildlife Habitat (Functions and Patterns; Recovery of Listed Wildlife Species)

There is a need to meet late successional and old forest habitat desired conditions and management objectives established in the 1990 Forest Plan (WNFP 1990), amended by the NWFP (NWFP ROD 1994), and by guidance provided for Late-Successional Reserves (LSR) (NWFP S&G 1994). There is also a need to contribute to the recovery of the northern spotted owl as identified in the above documents, the northern spotted owl recovery plan (USFWS 2011), and the Critical Habitat final rule (USFWS 2012b).

Watershed (Aquatics - Processes, Functions, Patterns, and Recovery of Listed Fish Species)

There is a need to meet aquatic and riparian desired conditions and management objectives as established in the 1990 Forest Plan (WNFP 1990), amended by the NWFP (NWFP ROD 1994) and including the Aquatic Conservation Strategy (ACS 1994). There is also a need to contribute to the recovery of listed fish species as identified in the above documents, and the 2009 Yakima Steelhead recovery plan (Conley et al. 2009b), the Recovery Plan for the Conterminous United States Population of bull trout (USFWS 2015c), and Mid-Columbia Recovery Unit Implementation Plan for Bull Trout (USFWS 2015a). A Watershed Analysis (USFS 1995) was completed to describe conditions on the landscape and identify general issues in need of restoration. A landscape evaluation (Haugo et al. 2016; Gaines, Begley, and Lyons 2017) was used to identify specific restoration opportunities that would move watershed conditions towards aquatic objectives and substantially contribute towards the recovery of listed fish species and critical habitat.

Fuels and Disturbance Regimes

There is a need to reduce the risk of stand replacing wildfires as established in the Forest Plan (1990), amended by the NWFP Standards and Guidelines (1994, C–13), the Okanogan-Wenatchee National Forest Fire Management Plan, the northern spotted owl recovery plan (USFWS 2011), and the Critical Habitat final rule (USFWS 2012b).

Access and recreation infrastructure

There is a need to close roads and trails to protect soil, water, and wildlife habitat; to construct new roads and trails to provide additional recreational opportunities; and to improve trailheads to provide safe and sanitary conditions and meet recreational needs.

Location

The Taneum Restoration Project Area is located 10 miles south of the town of Cle Elum in Kittitas County, Washington. The legal location of the Project Area is as follows: T19N, R14E, S24, T19N, R15E, Sections 13-16, 20-29, and 31-36; T19N, R16E, Section 28; T18N, R15E, Sections 2, 3 and 10, and T18N, R14E, Section 2. The Taneum Restoration Project area includes the South Fork Taneum Creek and North Fork

Taneum Creek drainages, and a portion of USFS land in the main Taneum Creek drainage. The Taneum Restoration Project area is 27,662 acres in size (Figure 66).

Description

The Taneum Restoration Project proposed actions were developed to meet the stated needs (Table 1). A variety of vegetation treatments within LSR, matrix, and Riparian Reserves are proposed to address desired vegetation composition and structure, wildlife habitats, and fuels and disturbance regimes. Road and trail actions are also proposed to address watershed conditions, access, and recreation. Hazard tree mitigation is proposed for public safety.

Table 1. Proposed action driven by Purpose and Need categories.

PURPOSE and NEED	PROPOSED ACTION
Vegetation (Composition and Structure)	Commercial, non-commercial thinning, vegetation treatments
Wildlife Habitat (Functions and Patterns; Recovery of Listed Wildlife Species)	Commercial, non-commercial thinning, vegetation treatments, road/trail actions
Watershed (Aquatics - Processes, Functions, Patterns, and Recovery of Listed Fish Species)	Commercial and non-commercial thinning, vegetation treatments in Riparian Reserves, various road/trail actions
Fuels and Disturbance Regimes	Commercial, non-commercial thinning, vegetation treatments, and shaded fuelbreaks
Access and Recreation	Road/trail actions and hazard tree removal from developed campgrounds, danger tree removal

Vegetation Treatments

The proposed vegetation treatments specifically address the late successional reserve (LSR) objectives of silviculture (habitat restoration) and risk reduction on 5,802 acres (Table 2). This includes 42 non-commercial treatment units totaling 1,020 acres with treatment tools including hand cutting or cutting/chipping by a masticator. Also included are 41 commercial harvest units totaling 1,672 acres with treatment tools including ground-based, skyline, and helicopter logging systems. Approximately one year after treatment of commercial and non-commercial treatments, slash/fuels would be reduced through a combination of machine piling, hand slashing and piling, lopping, mastication, and/or prescribed burning. Lastly, sixteen prescribed burning only units totaling 3,110 acres are proposed. All treatment types are developed to leave an individual and clumpy distribution of trees. Based on specific commercial thinning vegetative prescriptions, complex patches will be left in stands, as prescribed, to mimic historic fire patterns. Figure 67, Figure 69, Appendix B, and Table 53 display all treatment types proposed in LSR and Matrix by individual stand.

Of the total vegetation treatment areas, 1,036 acres are proposed within Riparian Reserves which have a primary objective of maintaining and restoring riparian habitats and ecological processes. The overall Riparian Reserve actions were designed to enhance Objective Nine of the Aquatic Conservation Strategy (i.e., maintain and restore habitat to support well-distributed populations of native plant, invertebrate, and vertebrate riparian-dependent species). All treatment types In Riparian Reserves, except shaded fuelbreaks (not mapped), would be subject to the treatment descriptions and equipment restrictions displayed in Table 3. Figure 71 displays all vegetation treatment types and connected actions proposed in Riparian Reserves. Shaded fuel break treatments have specific treatments prescribed to accomplish fuel loading objectives and are described separately.

Table 2. All proposed Late Successional Reserve, Matrix, and Riparian Reserve vegetation treatments.

Treatment Type	Acres	LUA	Acres	Riparian Reserve Acres*	
Non-commercial Thinning	1,020	LSR	842	73	89
		Matrix	178	15	
Commercial Thinning	1,673	LSR	1,501	108	114
		Matrix	172	6	
Prescribed Burning Only	3,110	LSR	2,706	774	833
		Matrix	404	59	
SUM	5,803				1,036

*Riparian Reserve overlaps Matrix and LSR.

Project Specific Forest Plan Amendment

The proposed action includes a project-specific amendment (RIEC 2020) to allow commercial thinning in stands over 80 years old to silviculturally enhance habitat for late-successional wildlife species. The current condition of these stands is the result of past timber harvests removing the largest trees (Henderson 1990; 2001). A dense understory has developed with > 100 years of fire exclusion (Agee 1993). These stands do not currently have the structural characteristics (large trees, large snags, etc.) associated with late-successional and old forests. This would amend the silvicultural enhancement standard that prohibits commercial harvest of trees in stands over 80 years old in Late-Successional Reserves (NWFP S&G 1994, C–12). The plan amendment is limited to the Taneum Restoration project on 510 acres, a subset of which acres are included in this proposed action. The amendment is limited to the duration of project implementation.

Table 3. Design criteria vegetation treatments and connected actions described above specifically for actions in Riparian Reserves.

Water Type*	Treatment Description**	Equipment Restrictions	Treatment Type	Acres
Wetland <1 acre 150-foot Riparian Reserve	No tree cutting within inner 50 ft of edge of bankfull channel. From 50-150 ft. trees under 10 in. may be hand cut and left in place. Canopy cover would be maintained at 40-60%. No pile burning would occur. For commercial harvest, from 75-150 ft., trees between 7 and 15 in. may be cut and removed by equipment. Canopy cover would be maintained at 30-60%.	No equipment within 75 feet of the water/bankfull channel	Commercial/Fire	0.0
			Non-commercial/Fire	0.0
			Fire Only	0.2
Intermittent Stream 150-foot Riparian Reserve		Slopes <30%: no equipment within 75 ft. where rock type is resistant sediment, serpentine, intermediate sediment or other resistant rock. Slopes >30%: no equipment within 75-150 ft. depending upon rock type (ACS B-29, Fig. B6-1).	Commercial/Fire	100.0
			Non-commercial/Fire	61.0
			Fire Only	522.1
Non fish-bearing perennial streams 150-foot Riparian Reserve	No tree cutting within 100 ft. of edge of bankfull channel. From 100-150 ft. trees under 10 inches may be cut and left in place. Canopy cover would be maintained at 40-60%. Trees over 10 in. would not be cut.	No equipment within 150 feet of any perennial non-fish bearing stream or wetland > 1 ac	Commercial/Fire	0.0
			Non-commercial/Fire	0.0
			Fire Only	19.8
Wetland >1 acre 150-foot Riparian Reserve			Commercial/Fire	1.4
			Non-commercial/Fire	0.7
			Fire Only	54.1
Fish-bearing perennial streams 300-foot Riparian Reserve	No tree cutting within 300 ft. of edge of bankfull channel.	No equipment within 300 feet of a permanently flowing fish-bearing stream or natural pond.	Commercial/Fire	11.5
			Non-commercial/Fire	24.1
			Fire Only	225.4
Natural ponds >0.05 acre 300-foot Riparian Reserve			Commercial/Fire	1.0
			Non-commercial/Fire	2.7
			Fire Only	11.5
			SUM	1,035.5

*All treatments must maintain or help attain ACS Objectives in NWFP designated Riparian Reserve management zones.

** In all water types, prescribed fire in Riparian Reserves will follow design criteria for ARBO2 in addition to other design criteria listed in this document.

Non-commercial Thinning

Stand Condition 1: Previous clear cuts including offsite pine plantations – 817 acres

Non-commercial thinning is proposed in 20 – 35-year-old clear cuts found on all aspects and moisture regimes on 817 acres. These stands are reforested, generally containing a mix of site-adapted Douglas-fir, ponderosa pine, and larch. Some stands are pure offsite ponderosa pine (Figure 1), and some include lodgepole and western white pine. Although thinned in the past, these stands are not on a developmental trajectory consistent with LSR objectives in that tree density is too high and spatial pattern is too uniform to become late successional old forest.

Figure 1. Ponderosa pine plantation in the Taneum Project.

Non-commercial thinning of trees ≤ 11” diameter at breast height (DBH) (USFS 2019, 51) would be completed either by hand thinning or with a masticator. Masticators come in a variety of sizes and are often more economical than hand thinning. Operators can put a masticating head on the equipment on site or use smaller equipment like bobcats (Figure 2). The result is a layer of smaller slash pieces spread across the stands. After thinning, slash would be hand piled and burned or jackpot/broadcast burn. Hand piles are higher than wider (6-7 feet tall) and can be spread throughout the unit where slash is concentrated. Hand piles would be burned in the late fall or winter.

Figure 2: Masticator in operation, Okanogan-Wenatchee NF.

One stand (N22 - 5 acres) comprised of trees over 80 years old has a "silviculture" LSR objective. Non-commercial thinning is proposed specifically to restore the structure and composition of late-successional habitats (wildlife habitat restoration) impacted by previous logging and fire suppression. Two other stands (N8, N42 – 103 acres) comprised of trees over 80 years old have a "risk" LSR objective. Non-commercial thinning is proposed specifically to reduce the risk of large-scale loss of existing and future late successional old forest habitat from uncharacteristically severe wildfires. Table 4, Table 53, and Figure 67 display acres of non-commercial thinning within LSR and matrix management areas.

Stand Prescription: Non-commercial thinning

- *Preferred retention species:* western white pine, ponderosa pine, larch, and Douglas-fir
- *Canopy cover*: 10 – 20 percent.
- *Trees per acres (TPA)*: overstory density 40-70 trees per acre.
- *Tree Distribution:* individual and clumpy distribution of trees
- *Complex patches:* N/A
- *Openings:* up to ¼ acre

Stand Condition 4: Early Seral-Young Forest Multi-Story (ES YFMS) – 176 acres

Non-commercial thinning of conifer trees ≤ 11" DBH (USFS 2019, 51) is proposed in these types of stands on 176 acres completed either by hand thinning or with a masticator. See a full description of this stand type below.

Six of these stands (N14, N15, N27, N39, N40, N41 – 141 acres) comprised of trees over 80 years old, have a "risk" LSR objective to reduce the risk of large-scale loss of existing and future late successional old forest habitat from uncharacteristically severe wildfires.

Stand Prescription: Non-commercial thinning

- *Preferred retention species:* western white pine, ponderosa pine, larch, and Douglas-fir
- *Canopy cover*: 10 – 40 percent.
- *Trees per acres (TPA)*: overstory density 10-40 trees per acre.
- *Tree Distribution:* individual and clumpy distribution of trees
- *Complex patches:* N/A
- *Openings:* up to ¼ acre

Stand Condition 5: Grand Fir-Young Forest Multi-Story (GF YFMS) – 27 acres

Non-commercial thinning of conifer trees ≤ 11” DBH (USFS 2019, 51) is proposed in these types of stands on 27 acres completed either by hand thinning or with a masticator. None of the proposals in this stand condition are in stands over 80 years old. See a full description of this stand type below.

Stand Prescription: Non-commercial thinning

- *Preferred retention species:* western white pine, ponderosa pine, larch, and Douglas-fir
- *Canopy cover*: 0 – 20 percent.
- *Trees per acres (TPA)*: overstory density 20-50 trees per acre.
- *Tree Distribution:* individual and clumpy distribution of trees
- *Complex patches:* N/A
- *Openings:* up to ¼ acre

Table 4. Non-commercial vegetation treatments in Late Successional Reserve and Matrix land use allocations, excludes prescribed fire only.

Management Area	Stand Type	Acres
Late Successional Reserve (LSR)	Previous Clear Cut, plantation pine	649
	Early Seral - Young Forest Multi-story (ES YFMS)	166
	Grand Fir - Young Forest Multi-story (GF YFMS)	27
Total LSR Treatment		842
Matrix	Previous Clear Cut, plantation pine	168
	Early Seral - Young Forest Multi-story (ES YFMS)	10
Total Matrix Treatment		178
Total Non-commercial Vegetation Treatment		1,020

Riparian Reserves

Of the stands described above, 89 acres fall within Riparian Reserves (Table 2, Table 3, Figure 71). There are 24.1 acres in fish bearing streams, 0.0 acres in perennial non fish bearing streams, and 64.4 acres in intermittent/wetlands. Again, these non-commercial treatments within the Riparian Reserves would be subject to treatment descriptions and equipment restrictions for mastication activities (Table 3). Treatment descriptions specify tree cutting buffers, which are field verified. Mastication is the preferred treatment type where the terrain allows, however hand thinning is used where necessary. No mastication would occur in Riparian Reserves of perennial streams.

Commercial Thinning

Thinning from below is proposed in all commercial harvest units (1,673 acres). Commercial thinning would be accomplished by ground-based yarding (1,308 acres), skyline (149 acres), and helicopter (216 acres) harvest systems. Logging slash would be treated by whole tree yarding to landings where it would be machine piled and burned in the late fall or winter. Machine piling would be done with a tracked or wheeled piece of equipment. All piles would be allowed to cure for a period of 1-3 years, and then would be ignited by hand using a drip torch, propane torch, or fuse. In ground-based units slash mats would be utilized on main skid trails when feasible. The advantage of slash mats is they distribute the weight of the heavy equipment over a larger area on skid trails, thereby reducing direct contact between the machine tires and the soil surface. In addition, this can minimize soil rutting by using slash to reinforce skid trails and protect against soil compaction (Eliasson and Wästerlund 2007). Other protections include using designated skid trails, existing trails whenever possible, and no crossing of streams. Skid trails would be rehabilitated with features like water bars, slash, etc. See Table 15 and Table 17 for BMPs and project specific design criteria. Figure 69 displays these actions within LSR and Matrix while Table 5 and Figure 72 display these actions within Riparian Reserves.

Stand Condition 2: Off-site Pine (OSP) – 356 acres

These stands consist of ponderosa pine planted in clearcuts from the late 1950's and early 60's. Occasionally stands contain a significant component of Douglas-fir and western larch. Generally, tree density is too high for ponderosa pine to do well as there is considerable in-growth of grand fir in most of these stands. In some cases, the grand fir understory exceeds 500 trees per acre. Surface woody fuel/coarse woody debris is minimal in all stands. Proposed treatments consist of commercial harvest, hand slashing, lopping, machine piling and burning, underburning, and mastication. In this stand type, a total of 356 acres of commercial thinning would be accomplished by ground-based yarding systems (332 acres) and skyline harvest systems (24 acres). None of these proposed stands are over 80 years old.

Figure 3. Off-site ponderosa pine plantation in the Taneum Project.

Stand Prescription: Thin from Below

- *Target Species for Removal:* Cut all lodgepole pine and grand fir.
- *Retention:*
    - Retain all western hemlock, western red cedar, larch, and western white pine, trees ≥ 24.9" DBH (excluding lodgepole pine and grand fir), and all hardwoods.
- *Preferred species retention order*: Douglas-fir, Ponderosa pine
- *Remaining basal area:*

    - Generally, leave 20 – 40 ft^2 BA.
    - Leave 20 ft^2 BA where only pine is left, leaving the best formed trees.
    - Stocking may exceed 40 ft^2 BA if there are numerous western larch, western white pine, western red cedar, or trees ≥ 24.9" DBH.
- *Canopy cover* (excluding complex patches): 10 – 40 percent.
- *Trees per acres (TPA*): Minimum of 15 – 25 (overstory density)
- *Tree Distribution:* individual and clumpy distribution of trees
- *Complex patches:*
    - 10 – 15 % in units ≥ 10 acres
    - No complex patches required in units < 10 acres
    - Riparian Reserves, water features, swales with elk wallows, and swales with willow or cottonwood are planned to function as complex patches.
- *Openings:* Natural openings may be expanded up to 3 acres
- *Planting*
    - Natural regeneration is expected to occur, however if after three growing seasons stands are not stocked to at least 50 TPA, planting would occur.
        - Species, number of trees to be planted, and spacing requirements would be based on surveys and site-specific conditions.

Stand Condition 3: Early Seral-Stem Exclusion Closed Canopy (ES SECC) – 535 acres

This stand type currently consists of single story, Douglas-fir dominated stands that occur on dry aspects (Figure 4). These stands established beneath an overstory of large, old ponderosa pine, larch, and Douglas-fir, growing at a density of 10-40 trees per acre. Today, less than 1 large, old tree per 5-15 acres remains in these stand types. Grand fir was, and is, a very minor component except on more mesic sites. On the drier upper slopes, due to competition mortality, there are pockets of smaller down wood. Dwarf mistletoe is common in widely scattered larch and at varying degrees in the Douglas-fir. In this stand type, a total of 535 acres of commercial thinning would be completed using ground-based yarding systems (300 acres), skyline (124 acres), and helicopter (111 acres) harvest systems.

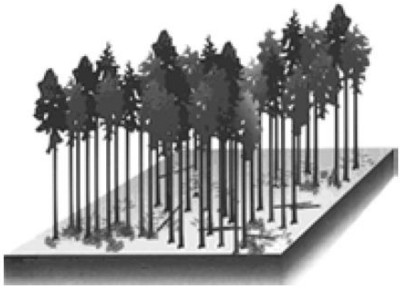


Figure 4. Stem exclusion closed canopy forest structure (USFS 2012a, 13).

Five stands (L5, L19, L21, L42, L43 - 243 acres) comprised of trees over 80 years old, have a "silviculture" LSR objective. Commercial thinning is proposed specifically to restore the structure and composition of late-successional habitats (wildlife habitat restoration) impacted by previous logging and fire suppression.

Five other stands (L17, L22, L23, L45, L46 – 271 acres) comprised of trees over 80 years old have a "risk" LSR objective. Non-commercial thinning is proposed specifically to reduce the risk of large-scale loss of existing and future late successional old forest habitat from uncharacteristically severe wildfires. These acres do not count for the "silviculture" amendment, as they are in the "risk" category.

Figure 5. Stem exclusion closed canopy stand in the Taneum Project.

Stand Prescription: Thin from Below

- *Target Species for Removal:*
    - Cut all grand fir and lodgepole pine (if found)
    - Cut all conifers < 24.9” DBH (except ponderosa pine > 19.9”) in a 25’ radius around ponderosa pine ≥ 24.9" DBH.
- *Retention:*
    - Retain all western larch, western red cedar, western white pine, and large trees ≥ 24.9” DBH (excluding lodgepole pine and grand fir), at any stocking level.
    - Retain all ponderosa pine > 19.9” DBH
    - Retain old small diameter trees classified according to Van Pelt (2008)
    - If possible, mark interior mistletoe infection centers in harvest units (ground based only) for retention, depending on the patchiness of the stand.
- *Preferred species retention order*: Douglas-fir, western hemlock, ponderosa pine
- *Remaining basal area:*
    - Retain an average of 60 – 80 ft2 BA
    - Stocking may exceed 80 ft2 BA where numerous western larch, western red cedar, western white pine, trees ≥ 24.9” DBH or ponderosa pine > 19.9” DBH are present
- *Canopy cover* (excluding complex patches): 10 – 50 percent.
- *Trees per acres (TPA)*: Minimum of 5 – 40
- *Tree Distribution:* individual and clumpy distribution of trees
- *Complex patches:*
    - 20%, +/-5%
    - Stand L-5 requires no complex patches
    - Emphasize complex patch retention over mistletoe infected Douglas-fir groups, without a pine or larch component.
- *Openings:* ¼ acre up to 2 acres to address severe mistletoe infestations

Stand Condition 4: Early Seral-Young Forest Multi-Story (ES YFMS) – 453 acres

This stand condition is found on moist-dry and moist sites and is characterized by an overstory of Douglas-fir, ponderosa pine, western larch, and grand fir. There are relic “very large” (>25” DBH) old ponderosa pine and “large” (20”-25” DBH) old Douglas-fir, ponderosa pine, and larch as well as some old, medium diameter trees. These stands are infected with dwarf mistletoe and are growing in poor form. Grand fir (moist sites) and Douglas-fir (drier sites) dominate the lower canopies where, they have outcompeted early seral tree species however they are typically diseased and damaged by spruce budworm. In this stand type, a total of 435 acres of commercial would be accomplished by ground-based yarding harvest systems.

Figure 6. Young forest multi-story structure (USFS 2012a, 13).

Figure 7. Early seral young forest multi story stand in the Taneum Project.

Stand Prescription: Thin from Below

- *Target Species for Removal:*
    - Cut all grand fir and lodgepole pine (if found)
    - Cut all conifers < 24.9” DBH in a 25’ radius around ponderosa pine ≥ 24.9" DBH.
- *Retention:*
    - Ponderosa pine, larch, and vigorous/mistletoe-free Douglas-fir, western red cedar, western white pine
    - Large trees ≥ 24.9" DBH (excluding lodgepole pine and grand fir), at any stocking level
- *Preferred species retention order*: Douglas-fir, western hemlock, ponderosa pine
- *Remaining basal area:*
    - Leave on average 60 ft^2 BA, ranging from 40 - 80 ft^2 BA
    - Stocking may exceed 80 ft2 BA/ac if numerous western larch, western red cedar, western white pine, trees ≥ 24.9" DBH are present.
- *Canopy cover* (excluding complex patches): 10 – 40 percent.
    - as low as 10% in low density early seral overstory stands
    - < 20% in stands with severe Douglas-fir dwarf mistletoe infection
    - < 30% in white headed woodpecker habitat
    - ≥ 40% in future northern spotted owl habitat
- *Trees per acres (TPA)*: Minimum of 10 – 40 (overstory density)
- *Complex patches:*
    - 10-15% in units > 25 acres
    - Up to 10% in units < 25 acres
    - Stand L-28 requires no complex patches
    - Riparian Reserves, inoperable thinning acres in treatment stands, buffers on trails, heritage, and botany sites can function as complex patches.
- *Planting*
    - Natural regeneration is expected to occur, however if after three growing seasons stands are not stocked to at least 50 TPA, planting would occur (Stand L16).
    - Species, number of trees to be planted, and spacing requirements would be based on surveys and site-specific conditions.
- *Openings:*
    - natural openings up to 3 acres
    - pine savannah type openings may be created from 1-5 acres

Stand Condition 5: Grand Fir-Young Forest Multi-Story (GF YFMS) – 328 acres

This stand condition is found on northerly aspects and other moist sites. Historically, overstory species consisted of Douglas-fir, larch, and in some cases, western hemlock, western white pine, and ponderosa pine. Most of the overstory was logged resulting in today’s, 120–200-year-old, early seral relicts, such as ponderosa pine and western larch (approximately <1 per acre). The understory consists of 80-100 percent grand fir under 15 inches DBH at densities of > 500 trees per acre. Spruce budworm, root and stem decay, and intense competition have left most grand fir trees in poor condition. Larch and Douglas-fir dwarf mistletoe are also common. In this stand type, a total of 328 acres of commercial thinning would be accomplished by ground-based yarding systems (223 acres) and helicopter (105 acres) harvest systems. Reforestation with early seral species, such as ponderosa pine and western larch would be constrained by their limited seed source.

Stand Prescription: Thin from Below

- *Target Species for Removal:*
    - Cut all lodgepole pine and grand fir.
    - Remove and cut other conifers within 25 feet of Ponderosa pine or larch ≥ 24.9” DBH.
- *Retention:*
    - Retain all western hemlock, western red cedar, western white pine, larch, and large trees ≥ 24.9” DBH (excluding lodgepole pine and grand fir).
    - Retain old small diameter trees classified according to Van Pelt (2008)
- *Preferred species retention order*: ponderosa pine, Douglas-fir
- *Remaining basal area:*
    - Leave from 40 - 60 ft^2 BA
    - Below 40 ft^2 BA/ac is acceptable especially in annosus root rot centers.
    - Above 40 ft^2 BA is acceptable if numerous western larch, western red cedar, western white pine, trees > 24.9” DBH
- *Canopy cover:* (excluding complex patches): 0 – 20 percent.
- *Trees per acres (TPA)*:
    - Minimum of 20 – 50 (overstory density) in dense patches of Douglas-fir on drier sites
- *Complex patches:*
    - Riparian Reserves, inoperable thinning acres in treatment stands, buffers on trails, heritage, and botany sites can function as complex patches.
- *Planting*
    - Natural regeneration is expected to occur, however if after three growing seasons stands are not stocked to at least 50 TPA, planting would occur (Stand L15).
- *Openings:*
    - 1 - 5 acres
    - pine savannah type openings may be created from 1-5 acres if numerous large ponderosa pine (≥ 24.9” DBH) exist

Table 5. Commercial vegetation treatments by harvest system in Riparian Reserves.

Harvest System	Acres
Ground	26.2
Helicopter	81.8
Skyline	5.9
Total Harvest in Riparian Reserves	113.9

As with non-commercial thinning, in Riparian Reserves, commercial thinning would be subject to treatment descriptions and equipment restrictions, displayed in Table 3. Treatment descriptions specify tree cutting buffers, canopy cover requirements, and equipment restrictions by slope and distance. There are 12 acres that are exceptions to this table for commercial thinning activities. Field verification in 2020 by the hydrologist and soils scientist identified small areas, ranging from 0.004-4.17 acres for a total of 11.5 acres overall in areas where the Riparian Reserve was disconnected from the functional Riparian Reserve by either topographic boundaries or roads and the unit went into the Riparian Reserve slightly (Table 7). Not all unit boundaries have been field verified so there could be some additional intrusions but based on the current samples shown in Table 7 it is likely they will be less than an acre.

Table 6. Commercial vegetation treatments by stand type, harvest system, and land use allocation.

Land Use Allocation	LSR Objective	Stand Type	Harvest System	Acres				
Late Successional Reserve	Risk	Early Seral – Stem Exclusion Closed Canopy (ES SECC)	Ground	108	231	1,095	1,501	1,673
			Skyline	123				
		Early Seral - Young Forest Multi-story (ES YFMS)	Ground		401			
		Grand Fir - Young Forest Multi-story (GF YFMS)	Ground	223	328			
			Helicopter	105				
		Off-site Pine (OSP)	Ground		136			
	Silviculture	Early Seral – Stem Exclusion Closed Canopy (ES SECC)	Ground	169	263	406		
			Helicopter	94				
		Off-site Pine (OSP)	Ground	118	143			
			Skyline	25				
Matrix - Risk		Early Seral – Stem Exclusion Closed Canopy (ES SECC)	Ground	23	41	172		
			Helicopter	17				
			Skyline	1				
		Early Seral - Young Forest Multi-story (ES YFMS)	Ground		52			
		Off-site Pine (OSP)	Ground		78			

Riparian Reserves

Of the stands described above, 113.9 acres fall within Riparian Reserves (Table 5, Figure 72). In terms of harvest systems, these acres include 26.2 acres ground-based, 81.8 acres helicopter, and 5.9 acres skyline.

Table 7. Units with commercial thinning proposed in Riparian Reserves, including Designated Critical Habitat (DCH) for both Mid-Columbia River (MCR) steelhead and Columbia River bull trout. In the units with DCH below, critical habitat for both species overlap with each other.

Stand Number	Acres					
	DCH	Other Fish Bearing	Intermittent	Pond	Wetland	SUM
L10			0.2			0.2
L11			1.1	0.8		2.0
L14			0.8			0.8
L15			0.2		0.2	0.5
L16			0.1			0.1
L17			0.3			0.3
L18			43.1			43.1
L19	0.0		0.0			0.0
L2			1.4			1.4
L21	0.0		0.2		0.0	0.3
L22			1.8			1.8
L23	0.3		4.0			4.3
L27			0.6			0.6
L28			0.3			0.3
L29					1.0	1.0
L30			0.5		0.1	0.6
L31			3.8			3.8
L34			0.7			0.7
L38			2.7			2.7
L39			2.8			2.8
L40			4.6			4.6
L41			0.2			0.2
L42	0.1		0.1			0.2
L43	0.1		4.6			4.7
L45	1.0			0.2		1.1
L46	0.2		4.6		0.0	4.7
L5	9.0		20.3			29.3
L6	0.9		1.2			2.0
SUM	11.5		100.1	1.0	1.4	113.9

Northern Spotted Owl

Critical Habitat

There are 18,634 acres of Critical Habitat in the 27,662-acre Taneum Project Area (8.3% of the 223,282-acre East Cascades North subunit 4). Commercial thinning is proposed in 1,430 acres (0.6%) of ECN-4 Critical Habitat, of which 1,249 acres are proposed in Dispersal-only habitat and 181 acres in non-habitat

(Table 8). Table 10 and Figure 23 display the harvest systems proposed to complete commercial thinning in Critical Habitat.

Habitat

There are 7,457 acres of suitable habitat and an additional 13,879 acres of dispersal-only habitat which totals 21,337 acres of northern spotted owl habitat within the Taneum Project Area. Commercial thinning (1,673 acres) is proposed in 1,384 acres of dispersal habitat and 288 acres of non-habitat (Table 9, Figure 24).

Table 8. Proposed commercial thinning within northern spotted owl habitat and Critical Habitat.

Northern Spotted Owl Habitat		Stand Type	Acres			
Non-critical Habitat	Dispersal	ES SECC	1	135	242	1,673
		ES YFMS	127			
		OSP	7			
	Non-Habitat	ES YFMS	11	107		
		OSP	96			
Critical Habitat	Dispersal	ES SECC	509	1,249	1,430	
		ES YFMS	310			
		GF YFMS	303			
		OSP	127			
	Non-Habitat	ES SECC	25	181		
		ES YFMS	5			
		GF YFMS	24			
		OSP	126			

Three types of harvest systems are proposed for commercial thinning: ground-based systems, helicopter, and skyline. Within northern spotted owl dispersal habitat, 1,066 acres of ground based, 203 acres of helicopter, and 115 acres of skyline are proposed. (Table 9, Figure 73).

Table 9. Proposed harvest systems for commercial thinning stands within northern spotted owl habitat and Critical Habitat.

Northern Spotted Owl Habitat		Harvest System	Acres			
Non-critical Habitat	Dispersal	Ground	134	135	242	1,673
		Skyline	1			
	Non-Habitat	Ground	107			
Critical Habitat	Dispersal	Ground	932	1,249	1,430	
		Helicopter	203			
		Skyline	114			
	Non-Habitat	Ground	135	181		
		Helicopter	13			
		Skyline	33			

Prescribed Fire

Prescribed fire would be used to restore fuel patterns and fuel loads to desired conditions, restore understory plant diversity and composition, and re-introduce fire to the landscape. Based on landscape fire modeling, treatments were strategically located to interrupt anticipated fire movement. Prescribed fire would be used to reduce both surface and ladder fuels at a meaningful scale.

Prescribed fire would be used following mechanical treatment on 2,693 acres (commercial: 1,673 acres and non-commercial thinning: 1,020 acres) to accomplish stand condition objectives. In other areas, prescribed fire would be the primary tool to achieve restoration objectives (3,110 acres) (Table 10). Overall, prescribed fire would be used on up to 5,802 acres. Burns would be designed according to the prescriptions listed below to prevent high severity fire in Riparian Reserves and northern spotted owl habitat. Underburning treatments in Riparian Reserves will use passive fire, without active lighting. “Backing” fire behavior is the desired tool to use, with the outcome of a mosaic pattern.

Underburning objectives include reducing surface fuels and to some degree increasing canopy base heights through some minor tree scorching. Prescribed fires are strategically set during times of when flame lengths are expected to be low, fire residence times are expected to be short, soil heating is expected to be low, and the effects of prescribed fires on soil properties are limited in severity and extent. Underburning would retain at least 90 percent of live trees 20 inches DBH and larger in areas where prescribed burning is conducted (Wright, Troyer, and Vihnanek 2003). Tree bole char, crown scorch, or root damage would be minimized. These are all actions that would achieve desired fire effects of light to moderate. Underburns would be ignited by hand or with aerial devices such as a heli-torch or plastic sphere dispenser.

Prescribed Fire Prescriptions

- A variety of tools, such as hand and aerial ignition, would be used to complete the burning.
- General burn seasons are spring and fall. Time of year and condition under which burns occur are built into burn prescriptions and plans to manage burn intensity to meet vegetation objectives.
- Pre-treatment work with hand tools/chainsaws may be used in the Riparian Reserves to thin, re-arrange fuels, limb/prune trees, or pull back fuels to achieve desired fuel loadings to produce light/moderate fire effects.
    - Do not treat inner riparian areas adjacent to stream channels (i.e., inner gorge) unless approved on a site-by-site basis by hydrologist/fish biologist and is needed to meet vegetation objectives.
- Hand piling/burning activity fuels may be necessary prior to underburning to achieve desired vegetative outcomes.
- Fireline would consist of handline, existing roads and roadbeds, natural barriers such as rock outcrops, streams, and rock slopes (talus).
    - Handline is constructed with hand tools and cleared to mineral soil. The depth varies based on soil type but typically 2-6 inches of the top duff layer is pulled back to a width of 18-24 inches.
    - Fireline would utilize erosion control measures during construction and rehabilitation.
    - Post burn, handline is rehabbed by pulling material back into the fireline and placing water bars, as needed.

- Burn units would be pre-treated (see below) by hand to create a continuous fuel bed for a cleaner burn along handlines and perimeters.
    - limb to remove lower branches
    - thin trees ≤ 8” DBH
    - rearranging fuels around legacy trees
    - pulling back fuels
    - lopping and scattering fuels

Table 10. Prescribed burn only treatments by land use allocation.

Land Use Allocation	Acres
Late Successional Reserve (LSR)	2,706
Matrix	404
TOTAL	**3,110**

Riparian Reserves

Of the stands described above, 833 acres could have fire back down into Riparian Reserves (Figure 76). Light and moderate fire effects are needed to protect shade, downed wood, snags, and large trees in riparian reserves. As with the other actions in Riparian Reserves, prescribed burning would be subject to treatment descriptions displayed in Table 3. Treatment descriptions specify tree cutting buffers, and canopy cover requirements. No equipment would travel off-road in Riparian Reserves during prescribed burning activities.

Northern Spotted Owl

Critical Habitat

There are 18,634 acres of Critical Habitat in the 27,662-acre Taneum Project Area (8.3% of the 223,282-acre East Cascades North subunit 4). Prescribed burning, as the primary treatment type, is proposed in 2,905 acres (1.3%) of ECN-4 (Table 8, Figure 73).

Habitat

There are 7,457 acres of suitable habitat and 13,879 acres of dispersal-only habitat which totals 21,337 acres of northern spotted owl habitat within the 27,662-acre Taneum Project Area. Prescribed burning, as the primary treatment type, is proposed on 44 acres (1%) of suitable habitat and 2,667 acres (19%) of dispersal habitat, totaling 2,711 acres (13%) of northern spotted owl habitat affected by prescribed burning as the primary treatment type (Table 11, Figure 74).

Table 11. Proposed prescribed burning only within northern spotted owl habitat and Critical Habitat.

Northern Spotted Owl Habitat		Acres		
Non-critical Habitat	Dispersal	139	205	3,110
	Non-habitat	65		
Critical Habitat	Suitable	44	2,905	
	Dispersal	2,528		
	Non-habitat	334		

Connected Actions for Commercial Harvest

A set of connected actions (Table 12) would be needed to complete commercial harvest proposals. They include road maintenance and use for log hauling, constructed temporary roads and landings, danger tree removal, and bridge repair (Figure 72).

Table 12. Summary of commercial harvest connected actions.

Commercial Harvest Connected Actions	Amount
Haul Routes – maintenance, use, and danger tree removal	41 mi.
Temporary Roads	3.1 mi.
Landings	97 ea.
Bridge Repair – NF Taneum Creek	1 ea.

Haul Routes: Road Maintenance, Use, and Danger Tree Felling

Commercial removal of timber would require 41 miles of haul route on a variety of maintenance level roads. Although most haul routes are on maintained, heavily travelled gravel and paved roads, some are temporary, motorized trails, or unauthorized (Table 13). Log hauling and closure of ML-1 roads would be scheduled for completion within a single season. Timber haul would happen during most of the year, outside of spring break-up. Maintenance level (ML) 1 roads reopened for timber harvest would be hydrologically stabilized and closed to motorized use by the timber purchaser after project activities are completed.

Opening closed roads will require a range of road treatment, ranging from little to no work to up to heavy maintenance or reconstruction. Some closed roads have workable running surfaces and will just need opened and just some removal of downed wood. Most roads will need normal road maintenance that includes surface blading, cleaning ditches, cleaning culverts, and shaping road surfaces to meet current BMPs. Some roads will need “heavy maintenance” or reconstruction, which means they have not been used for many years. The mileage of this heavy maintenance need is not identified. Heavy maintenance or reconstruction would include vegetation removal on road surface, reshaping the road surface, removing cut-slope slide material, grading or blading, adding rock surface, installing drainage dips and cross-drains, and spot rock placement. See Table 15 and Table 17 for road construction BMPs and project specific design criteria.

Road closure work (changing roads to Maintenance Level 1 status) may include but is not limited to pulling stream and cross drainpipes (where they exist), sloping stream crossings back to natural gradients, blading and shaping the road surface to restore proper cross-slope, reinstalling drain dips and installing waterbars, spreading slash or debris over the road surface, and blocking the road with an earthen berm. Road closure treatments would include pulling all culverts and stream crossings, constructing waterbars, constructing an earthen barrier at the road start. Road closure work would occur during the dry seasons. See Table 15 and Table 17 for road closure BMPs and project specific design criteria. Lignin and water drafted from Taneum Creek would be used for dust abatement on 17 miles of non-paved roads, but not within 100 feet of streams.

Water drafting/pumping for dust abatement along haul routes would maintain a continuous surface flow of the stream and would not alter the original wetted width. Intakes or draft suction would take place in Taneum Creek, due to the lack of other suitable sites. Sites will be identified prior to drafting by a fish biologist/hydrologist to avoid dewatering effects to fish. Any draft suction hose will be screened with mesh no larger than 3/32 inch, and intake flow would be less than 1 cubic foot per second to prevent entraining juvenile fish. These BMPs would prevent direct impacts to individual steelhead and bull trout from exceeding the level of insignificant effects.

Danger trees would be felled along 41 miles of haul routes (Figure 72) when found to be a safety concern. They will be left where they fall with no cutting or bucking unless it is interfering with public use (e.g., in a dispersed site) or a safety hazard (e.g., across a road).

Table 13. Proposed haul routes described by operational maintenance level and distance.

Road Maintenance Level	Description	Miles
1	1 – Basic custodial care - closed	5.2
2	2 – High clearance vehicles	7.0
3	3 – Suitable for passenger cars	18.5
3-4	3-4	1.8
4	4 – Moderate degree of user comfort	8.0
Temp	Temporary Road	0.1
Trail	Existing Motorized Trail	0.4
UA	Unauthorized Route	0.2
	Grand Total	41.0

Riparian Reserves

Of the 41 miles of haul route identified for commercial thinning connected actions of this project, a combined total of 12.4 miles are in Riparian Reserve These 12.4 miles consist of 5.92 in Riparian Reserve along fish-bearing streams, 0.1 miles along non-fish-bearing perennial streams, 5.28 miles along intermittent streams, 1.06 miles along wetlands, and none along ponds. As noted above, felled danger trees will be left where they fall with no cutting or bucking unless blocking a route.

Northern Spotted

Critical Habitat

A total of 306 acres of road impacts would occur in northern spotted owl Critical Habitat (Figure 75) due to danger tree management (USDA 2016) of ≤ 2 trees per acre per year.

Habitat

A total of 357 acres of road impacts would occur in northern spotted owl habitat (422 acres of total impact including non-habitat) (Figure 75) due to danger tree management (USDA 2016) of ≤ 2 trees per acre per year.

Temporary Road

3.1 miles of temporary roads would be used for project implementation; 2.9 miles on existing road prisms and 0.2 miles of new construction (Table 14, Figure 72). Existing road prisms consist of unauthorized routes, system trails, and abandoned roads. The Region 6 Temporary Road Guidance (USFS 2020b, 6) addresses a concern that we may over represent impacts from temp roads that occur on previously disturbed ground. Our analysis breaks out fresh disturbance from existing disturbance to clarify the impacts (USFS 2020b, 6). At project completion, 2.2 miles of these temporary roads would be decommissioned to a standard which prevents use by all motorized vehicles, including OHVs. Temporary road built on existing system trails (0.7 miles) would be rehabilitated back to system trails, and 0.2 miles of unauthorized routes used as temporary road would be added to the system as a gated, open to administrative use only, high clearance vehicle road (ML-2A). The timber purchaser is responsible for following Forest Service guidelines for temporary road decommission / rehabilitation (USFS 2020b) and it would be scheduled for completion within a single operating season.

Decommissioning would be accomplished by a host of treatments that include some or all the following techniques: decompacting the surface of the road, partial re-contour, removal of all existing stream culverts and cross-drain culverts, sloping the stream channel exposed by culvert removal to adjacent natural slopes, as well as seeding and planting raw streambanks to minimize soil erosion. The actual treatments to each decommissioned road segment would be commensurate with the site conditions of the road and how it influences hydrologic process. Roads will be decommissioned during the dry time of the year. See Table 15 and Table 17 for road decommissioning BMPs and project specific design criteria.

Table 14. Temporary roads, road prism type and post-treatment status.

Road/Trail Prism Status	Road/Trail Prism Type	Post-treatment Status	Length (mi.)
Existing	Unauthorized Route	Decommission	0.4
		Gated road (ML-2A)	0.2
	System Trail	Rehabilitate system trail	0.7
	Abandoned Roads	Decommission	1.6
New	New Construction	Decommission	0.2
		TOTAL	**3.1**

Roads to be Decommissioned Prior to the implementation of the Proposed Action

Two segments of existing unauthorized road, totaling 0.24 miles in length, will be decommissioned, and fully closed prior to implementation of the Proposed Action. This action will offset the increase of new temporary road construction (0.2 mi), so that there will not be a net increase in new temporary roads during the proposed action timeline (Table 14).

Additionally, there are 42.57 miles of NFS and non-NFS (unauthorized) roads, as well as 14.93 miles of NFS roads, to be hydrologically restored then decommissioned or placed in storage as a part of the ARBOII proposed actions for the Taneum Restoration Project (Table 55).

Riparian Reserves

Of the temporary road described above, there are a total of 11 segments in Riparian Reserve (Figure 8, Figure 9, Figure 10, Figure 11) for a combined total of 0.206 miles (1088 ft). Three segments are within the 300-foot Riparian Reserve associated with critical habitat for steelhead and bull trout (Figure 8, Figure 9) for a combined total of 0.025 miles. There are no other temp roads proposed in Riparian Reserves of fish-bearing streams. In Riparian Reserves of perennial non-fish-bearing streams there is one temp road segment proposed at 0.012 miles, and in Riparian Reserves of intermittent streams there are seven segments proposed totaling 0.17 miles. Temporary roads would be reconstructed to minimal standards necessary for safe use and would be decommissioned/rehabilitated upon completion of harvest activities and effectively returned to a stable hydrologic state. No temp roads would cross streams.

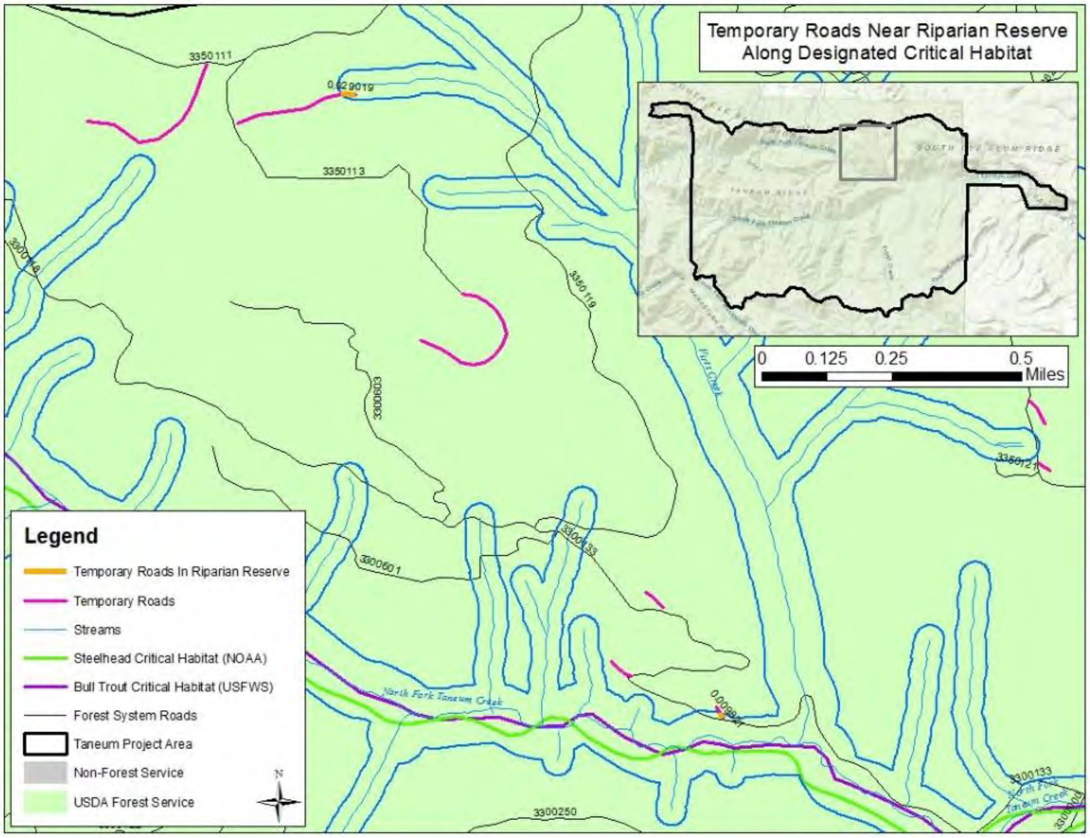


Figure 8. Temporary roads in Riparian Reserves.

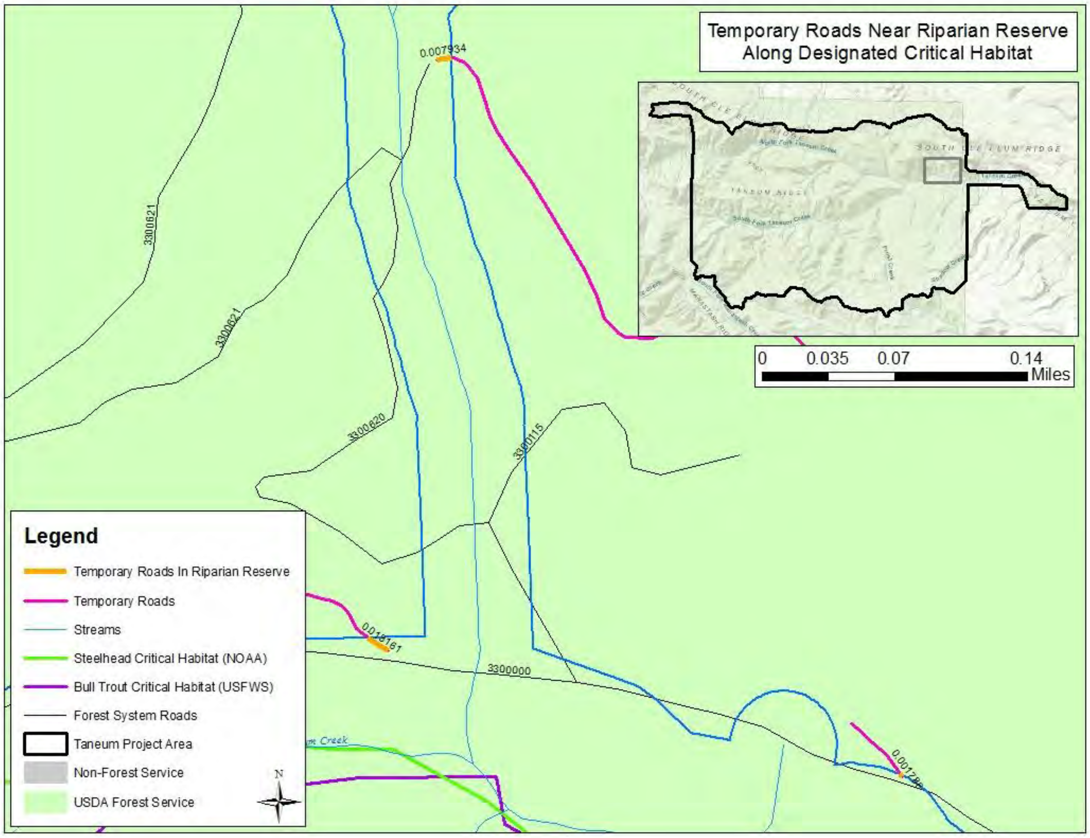


Figure 9. Temporary roads in Riparian Reserves.

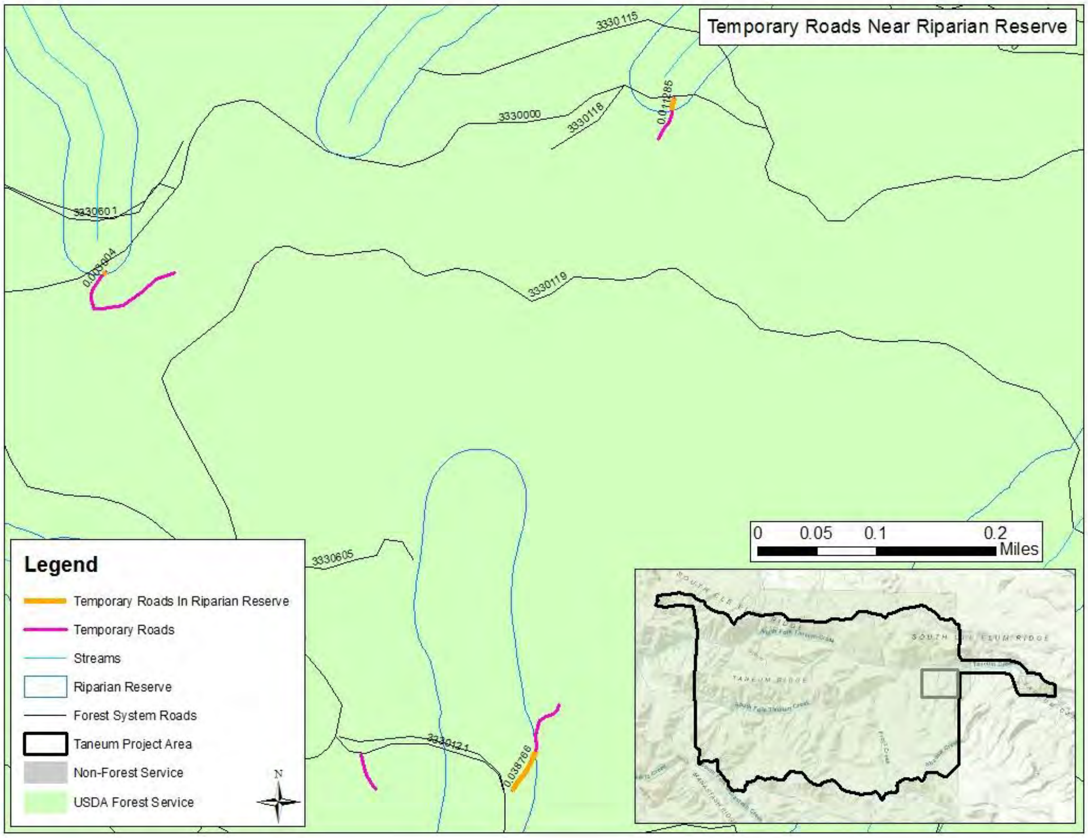


Figure 10. Temporary Roads in Riparian Reserves

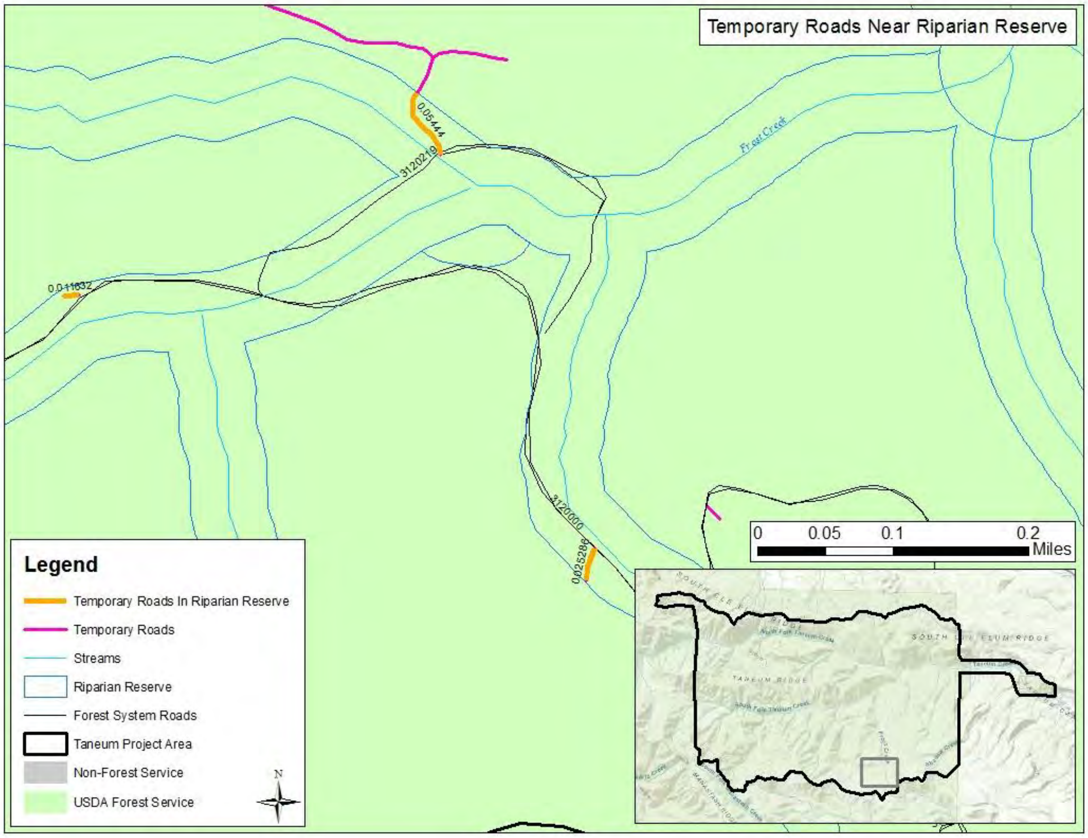


Figure 11. Temporary Roads in Riparian Reserves

Northern Spotted Owl Habitat

Critical Habitat

A total of 2.5 miles of temporary roads are proposed to be built/used through northern spotted owl Critical Habitat (Figure 75). Of those, 2.3 miles would be built on existing road prisms and 0.2 miles would be on new temporary road impact.

Habitat

2.66 miles of temporary roads would be built/used through northern spotted owl habitat. A total of 2.64 miles of temporary roads are proposed to be built/used through dispersal habitat (2.53 miles on existing prism, 0.11 miles new impact) and 0.02 miles are proposed to be built/used through suitable habitat (new impact).

Landings

Construct 97 landings (Figure 72), between ½ - 1 acres, of which three would be in Riparian Reserves. Prior to use, existing landings would be hydrologically stabilized. Heavy equipment is used to construct landings and waterbars and erosion control is applied as necessary. Post-harvest, all landings would be decommissioned. Decommissioning consists of decompacting the landing to a depth of 20" and recontouring and seeding. Drainage (i.e., waterbars and slash dispersal) is constructed as needed. Firewood cutting can occur at landings if coarse woody debris desired conditions are met. If allowed, firewood cutting can occur for one season post-harvest once units are released from the purchaser. Burning of landing piles will occur after firewood collection and to allow for a season to dry out for 90% consumption of piled material. Pile burning is completed in the fall after moisture levels reach a point to limit spread outside the footprint of the pile.

Riparian Reserves

Only three of the 97 landings would be constructed within Riparian Reserves. Two of these landing locations would be near the origins of intermittent streams (Figure 12, Figure 14), while the third landing location would be in Riparian Reserve of an isolated fishless wetland (Figure 16).

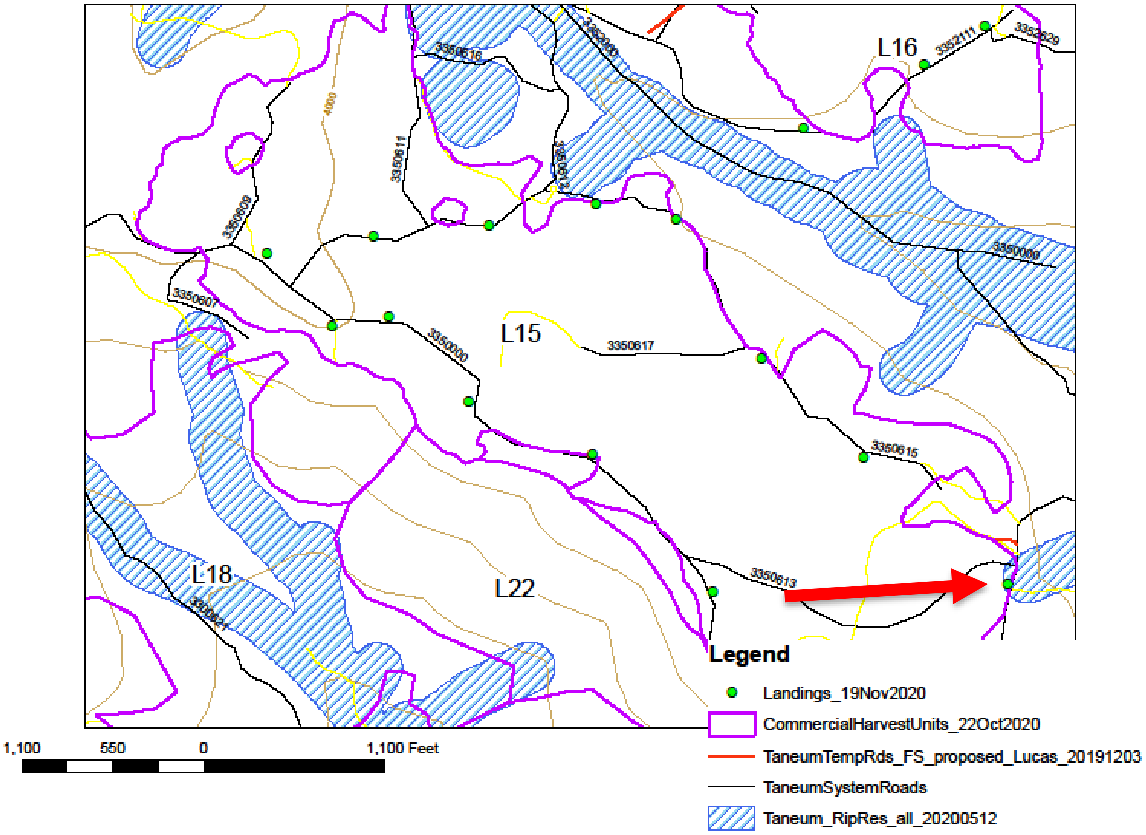


Figure 12. First landing in Riparian Reserve indicated by the red arrow.

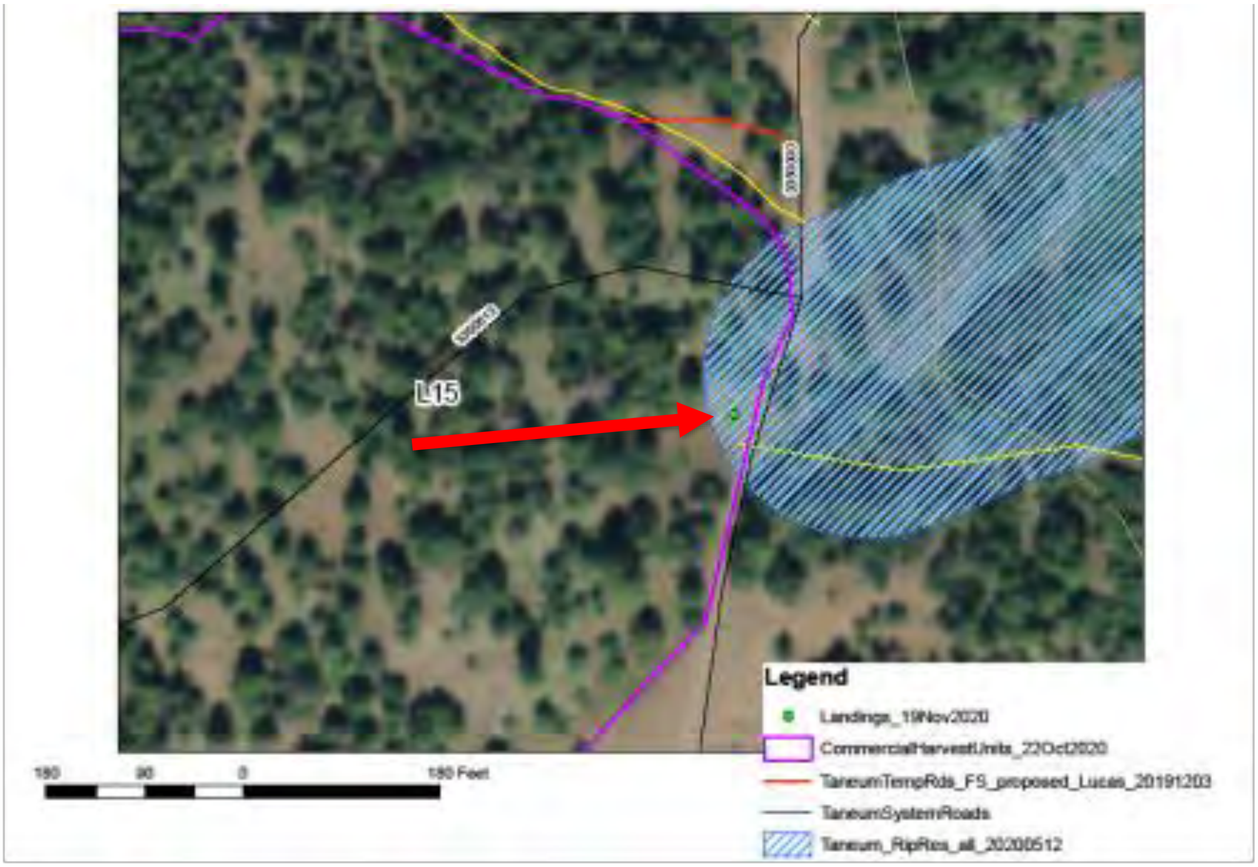


Figure 13. First landing in Riparian Reserve indicated by the red arrow. The landing location would be on the upslope side of the road above the origin of an intermittent stream.

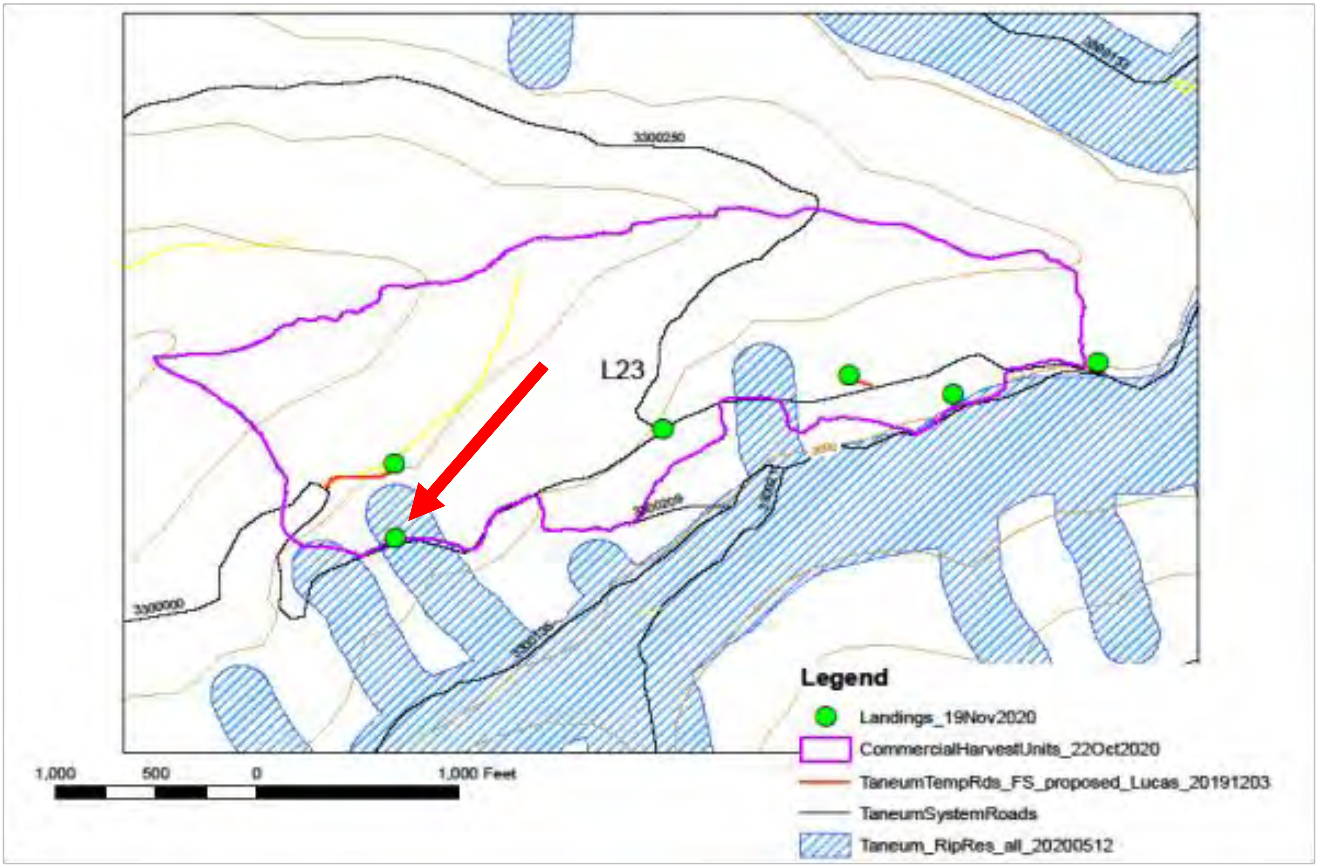


Figure 14. Second landing in Riparian Reserve indicated by the red arrow.

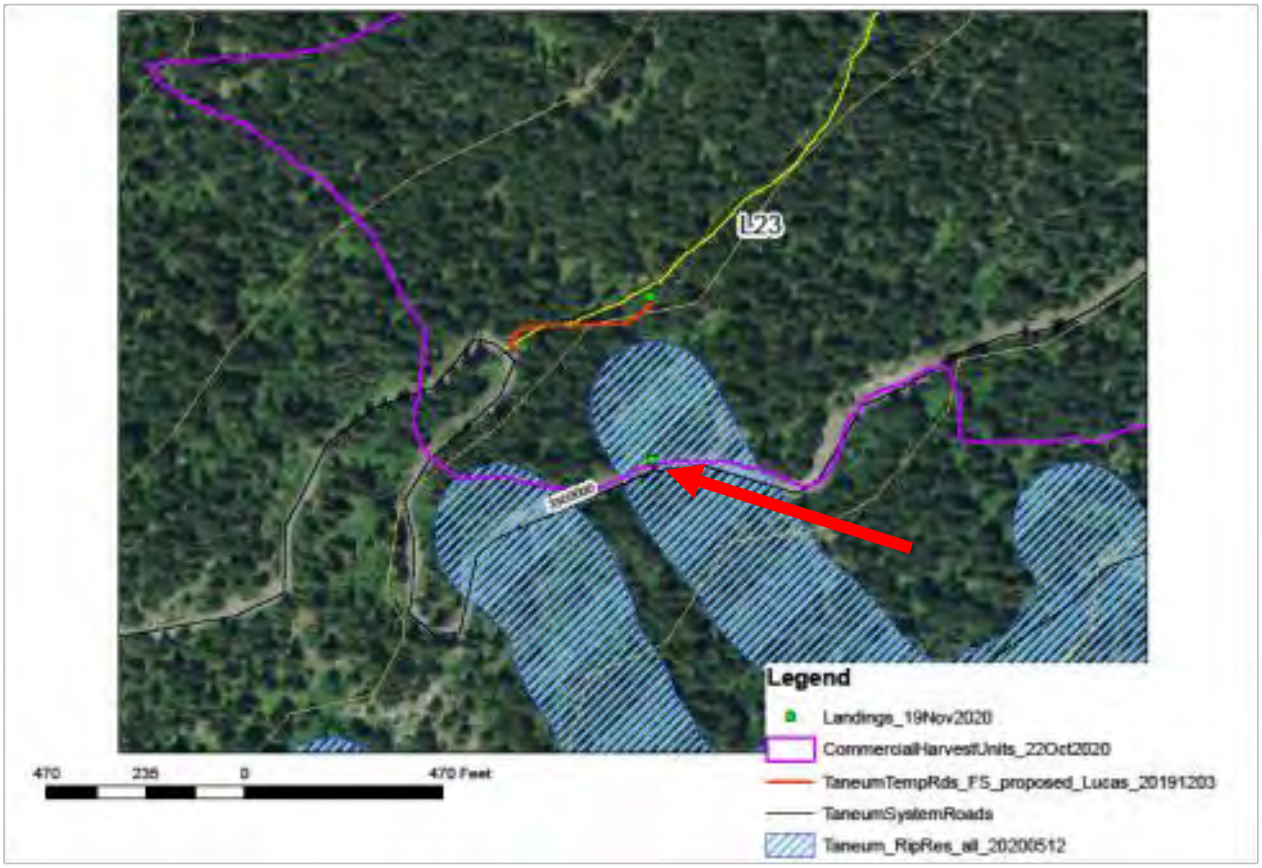


Figure 15. Second landing in Riparian Reserve indicated by the red arrow. The landing location would be on the upslope side of the road near the origin of an intermittent stream.

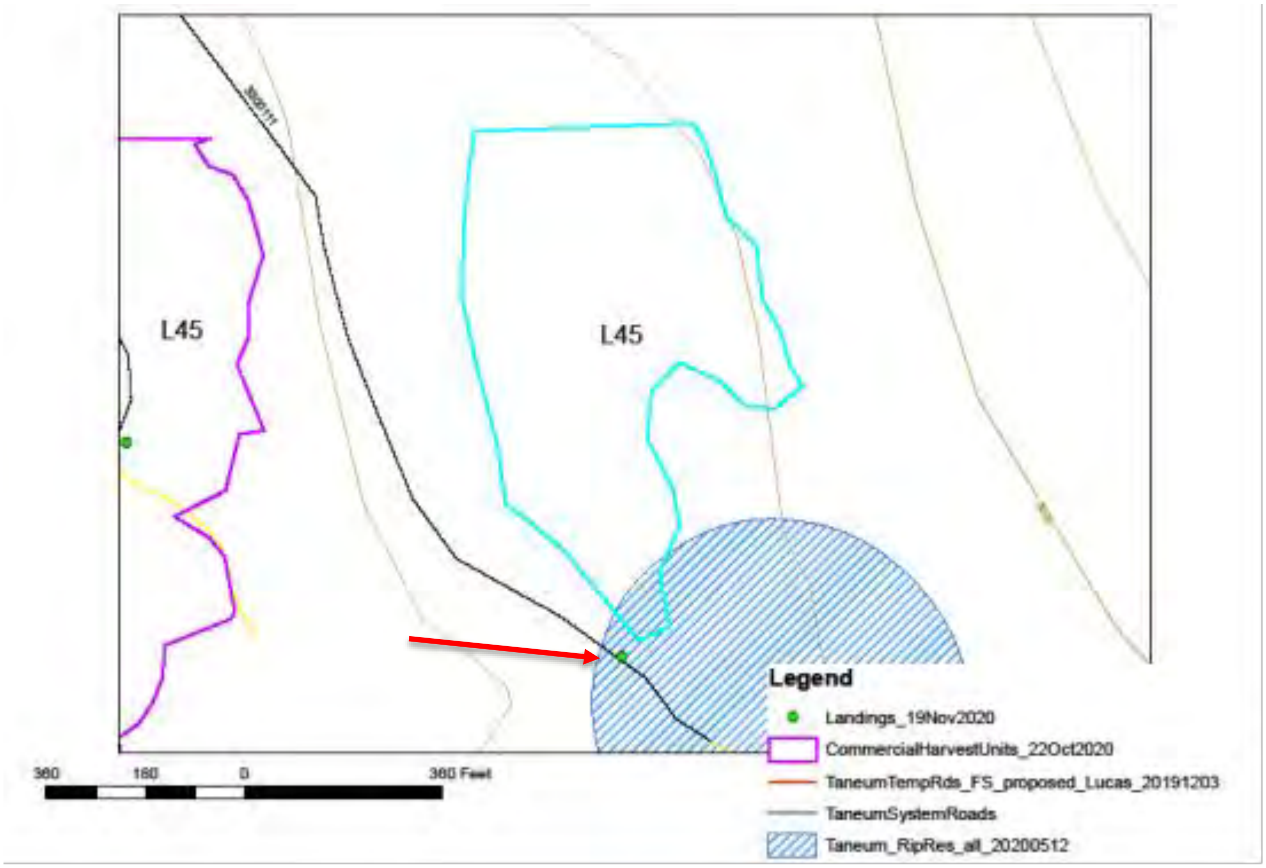


Figure 16. Third landing in Riparian Reserve indicated by the red arrow.

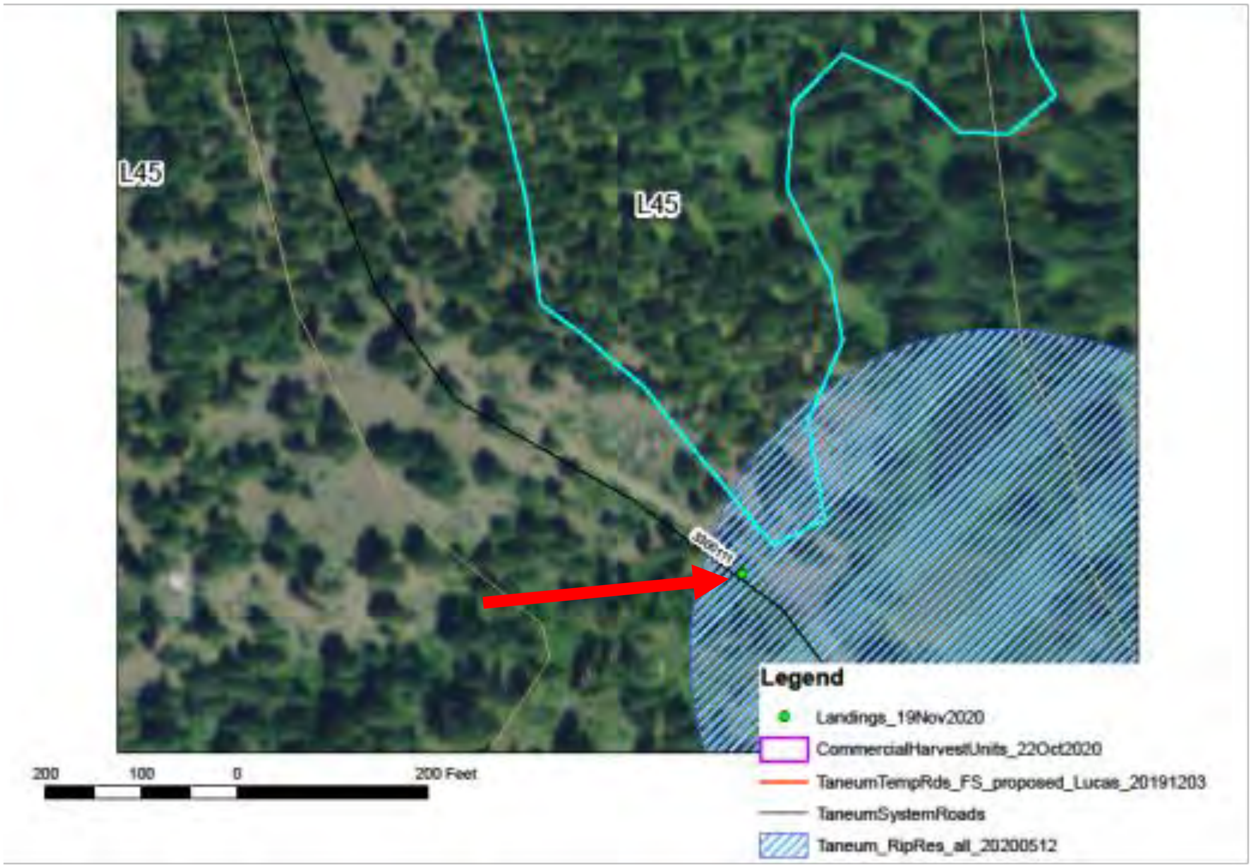


Figure 17. Third landing in Riparian Reserve indicated by the red arrow. The landing location would be near an isolated fishless wetland.

Northern Spotted Owl

Critical Habitat

Of the 97 proposed landings, 83 are proposed in ECN-4 Critical Habitat (Figure 75).

Habitat

Of the 97 proposed landings, 76 are proposed in northern spotted owl habitat, 74 in dispersal habitat and 2 are at the edge of suitable habitat (Figure 75).

Invasive Plant Treatments

Complete pre- and post-treatment herbicide invasive plant abatement treatment along haul roads, temp roads, landings, and known infestation sites. Okanogan-Wenatchee National Forest Forest-wide Site-Specific Invasive Plant Management Environmental Impact Statement and Record of Decision (USFS 2016a; 2016b). These BMPs and standards are implemented to prevent the spread and establishment of invasive plants. Although this is part of the proposed action, this treatment is covered under a programmatic BA, the Forest Invasive Plant Treatment Project, FWS Consultation # 01EWFW00-2017-I-0708 (USFWS 2017), and the 2013 Aquatic Restoration Activities in States of Oregon and Washington Programmatic Biological Opinions (USFWS ARBO II 2013; NMFS ARBO II 2013) for weed treatments in Riparian Reserves; all design features would be followed. This action will not be analyzed further in this document.

Design Criteria and Best Management Practices for Vegetation Treatments and Connected Actions:

Design Criteria and Best Management Practices would be implemented to eliminate or reduce the impacts of vegetation treatments, including prescribed fire and connected actions specifically on soils, wildlife, aquatics, hydrology, and to prevent or limit the spread of invasive species and are described in Table 15 and Table 16, which displays BMPs pertinent to the proposed action and where to find them in the National Best Management Practices for Water Quality Management on National Forest System Lands, Volume 1: National Core BMP Technical Guide (2012b).

Table 15. Pertinent BMP page references (USFS 2012b) commercial harvest and connected actions.

Activity Type	Page
Veg-1. Vegetation Management Planning	128
Veg-2. Erosion Prevention and Control	131
Veg-3. Aquatic Management Zones	132
Veg-4. Ground-Based Skidding and Yarding Operations	134
Veg-6. Landings	136
Veg-8. Mechanical Site Treatment	138
Road-2. Road Location and Design	107
Road-3. Road Construction and Reconstruction	110
Road-4. Road Operations and Maintenance	111
Road-5. Temporary Roads	114
Road-6. Road Storage and Decommissioning	115
Road-9. Parking and Staging Areas	122
Plan-3. Aquatic Management Zone	17

Table 16. Pertinent BMP page references (USDA, Forest Service 2012) for prescribed fire.

Activity Type	Page
Plan-3. Aquatic Management Zone	17
AqEco-2. Operations in Aquatic Ecosystems	21
Fire-1. Wildland Fire Management Planning	52
Fire-2. Use of Prescribed Fire	54
Fire-3. Wildland Fire Control and Suppression	57
Fire-4. Wildland Fire Suppression Damage	58
Rec-4. Motorized and Nonmotorized Trails	91
Road-2. Road Location and Design	107
Road-3. Road Construction and Reconstruction	110
Road-4. Road Operations and Maintenance	111
Road-5. Temporary Roads	114
Road-6. Road Storage and Decommissioning	115
Road-9. Parking and Staging Areas	122
Road-10. Equipment Refueling and Servicing	132
WatUses-1. Water Uses Planning	142

Table 17. Design criteria for vegetation treatments and connected actions.

All actions

- Operation of tracked machinery, heavy equipment, and chainsaws within 0.7 miles of active northern spotted owl nests will be seasonally restricted between March 1 and July 31. These actions within ¼ mile of northern spotted owl nesting habitat will also be seasonally restricted unless annual field surveys (Lint et al. 1999; USFWS 2012a; 2021a) indicate that owls are not nesting.
- In the event that a gray wolf den or rendezvous site is discovered, a 1-mile operations buffer (excluding haul) would be implemented. This could be adjusted or reduced depending on consultation with USFWS with considerations for timing and topography.
- Prior to implementation, the Forest Service must approve final temporary road locations landings, skid trails and concentrated use-site locations to minimize potential damage to soils.

Landings

- Minimize the size and number of landings as practicable to accommodate safe, economical, and efficient operations.
- Avoid locating landings near any type of likely flow or sediment transport conduit during storms, such as ephemeral channels and swales, where practicable. During project implementation, a soil scientist or hydrologist will monitor the effectiveness of runoff and erosion control measures and recommend corrective actions that may need to be applied to reduce sediment transport.
- During landing use in Riparian Reserves (3 landings), water and erosion control measures would be installed prior to landing construction and would remain in place during harvest operations. Prior to construction of these 3 landings, contact district soil scientist and hydrologist. All landings with heavily disturbed soils and all landings within Riparian Reserves would be scarified, seeded, and organic debris would be scattered over them after harvest activities are complete.

- Locate landings to minimize the number of required skid roads.
- Re-use existing landings where their location is compatible with management objectives and water quality protection.
- Restore and stabilize landings after use. Examples are:
    - Remove all logging machinery refuse (e.g., tires, chains, chokers, cable, and miscellaneous discarded parts) and contaminated soil to a proper disposal site.
    - Reshape the surface to promote dispersed drainage.
    - Install suitable drainage features.
    - Mitigate soil compaction to improve infiltration and revegetation conditions – this can be done by bucket or scarification.
    - Apply soil protective cover on disturbed areas where natural revegetation is inadequate to prevent accelerated erosion before the next growing season.
    - Use suitable measures to promote rapid revegetation.
    - Use suitable species and establishment techniques to cover or revegetate disturbed areas in compliance with local direction and requirements per FSM 2070 and FSM 2080 for vegetation ecology and prevention and control of invasive species.
- No firewood removal would be allowed in the three landings within Riparian Reserves.

Felling and Yarding

- No tree-cutting buffers of 50 feet on intermittent streams, 100 feet on wetlands and non-fish bearing perennial streams, and 300 feet on fish bearing perennial streams, including those within designated critical habitat. (Table 3)
- Skidding and yarding would not occur in Riparian Reserves except at the three identified landings (Figure 12, Figure 14, Figure 16, Table 3).
- Avoid downhill yarding and skid trail layout converging into Riparian Reserves, particularly where skid trails converge onto a road surface within the reserve. This action increases the risk of capturing and concentrating overland flow and storm runoff and delivering it to streams, which affects peak flows downstream
- Avoid downhill yarding and skidding onto landings on roads located in Riparian Reserves, to prevent soil movement into Riparian Reserves.
- No equipment (heavy or tracked) would be allowed within 300 feet of a fish bearing stream, except on roads.
- No mastication would occur in Riparian Reserves of perennial streams.
- Mastication could occur in Riparian Reserves of intermittent streams within 75-150' of the stream edge.
- Designate skid trails at a minimum of 100 foot spacing to minimize risk of overland flow.
- No logging equipment within the no treatment portions of Riparian Reserves.
- Install water bars on all skidding corridors upon completion of yarding operations.
- Meet Forest Plan coarse woody debris requirements in all treatment units (Table 18).
- Meet or exceed Forest Plan ground cover requirements in all treatment units at project completion. Use Table IV-20 on page IV-97 in WNF Land and Resource Management Plan (1990) for minimum effective ground cover.

Soil Erosion Hazard Class	Minimum Effective Ground Cover (%)	
	1st year	2nd year
Low	20-30	30-40
Medium	30-45	40-60
High	45-60	60-75
Very high	60-75	75-90

- Assure that water control structures are installed and maintained on skid trails that have grades ≥ 10%. Ensure erosion control structures are stabilized and working effectively.
- All perennial, intermittent, and ephemeral streams potentially affected by project implementation will be identified on the Sale Area Map as “Protected Stream Courses” and that wetlands or saturated swales be identified as “Protected Areas.”
- Operation of helicopters within 0.7 miles of active northern spotted owl nests will be seasonally restricted between March 1 and July 31. These actions within ¼ mile of northern spotted owl nesting habitat will also be seasonally restricted unless annual field surveys (Lint et al. 1999; USFWS 2012a; 2021a) indicate that owls are not nesting.
- Burning operations during the northern spotted owl breeding season will not occur in the breeding range of recently active (pair in previous 5-years) northern spotted owl sites. Burning conditions must be such that smoke trajectories will not fall within 45 degrees of active nests. A test fire will be lit to verify smoke trajectory. These actions within ¼ mile of northern spotted owl nesting habitat will also be seasonally restricted unless annual field surveys (Lint et al. 1999; USFWS 2012a; 2021a) indicate that owls are not nesting.

Temporary Road Construction/Reconstruction/Decommission/Rehabilitation

- Temporary roads would be constructed no sooner than necessary.
- Prior to use all temporary roads, including those on existing footprints, would be hydrologically stabilized (USFS 2020b).
  - Place a culvert on temporary road numbered 0025288 in the existing FS 3120 road ditch at the thick yellow line, waterbar near the thin yellow line, and silt fence near the thin black line (Figure 18).
  - The north central temp road numbered 005444 would have a new beginning near the thin red line below, waterbars near the thick yellow lines, and wood obstructions near the brown lines (Figure 19).
- Temporary roads would be reconstructed to minimal standards necessary for safe use and would be decommissioned/rehabilitated upon completion of harvest activities and effectively returned to a stable hydrologic state (USFS 2020b).
- Roads utilized for implementation would be generally out-sloped and constructed with drainage structures.
- Temporary roads would not be open to the public except in some cases when access for firewood cutting is allowed temporarily (no longer than two weeks).
- No new temporary roads would be constructed in Riparian Reserves with designated critical habitat.

- No temporary roads would cross streams of any type.
- Temporary road alignments should be located to minimize disturbance to wetlands, streams, and groundwater emergence and recharge.
- New or reconstructed road segments originating from existing roads within Riparian Reserves (Figure 8, Figure 9, Figure 10, Figure 11) should not exceed a 10% slope gradient within the first 200 ft. of the road segment in order to avoid or minimize the risk of concentrating and channeling runoff and sediment down road surfaces and into streams.
- Cross drain road surfaces through a vegetative filter strip prior to the road approach reaching a stream crossing structure.
- When temporary roads used for logging would be built on system trail locations:
    - The trail tread would be re-established with appropriate drainage after logging.
    - The remaining road template would be de-compacted, contoured, and seeded.
- When decommissioning, pull slash onto temporary roads to protect from soil displacement and erosion.
- Rehabilitation activities would include de-compaction, re-contouring, and seeding. Entrances would be blocked to prevent all motorized use.
- Rehabilitate temporary roads and landings by installing water bars, ripping soil to 18" deep, and seeding with native vegetation.
- The south-central temp road numbered 0025288 would have a culvert placed in the existing FS 3120 road ditch at the thick yellow line below, waterbar near the thin yellow line, and silt fence near the thin black line (Figure 18).

The north central temp road numbered 005444 would have a new beginning near the thin red line below, waterbars near the thick yellow lines, and wood obstructions near the brown lines (Figure 18).

Road Management

- Appropriate erosion control measures such as: seasonal closures, gravelling, maintenance, ditching water routing structures, sediment traps, water bars, and drivable dips would be employed to minimize erosion. Route water off road prisms and fills and disperse across a vegetated slope.
- Cross drain and ditch cleanout would be used to remove sediment, debris, and other blockages which impede surface water routing.
- Road edge berms would not be left after cleanout. Mechanized cross drain and ditch cleanout would not occur within 25 feet of stream channels or crossings.
- Avoid cutting the toe of cut slopes when grading roads or pulling ditches.
- Minimize the width brushed and area cleared around roads.
- To control dust from roads during log haul, lignin or water would be applied to the road surface as needed.
- Water drafting for dust abatement and road compacting would be identified by a fish biologist and/or hydrologist to avoid dewatering effects to fish, and would maintain a continuous surface flow of the stream without altering the original wetted width. Any draft suction hose used in fish-bearing waters would be equipped with a screen of 3/32 inch mesh or less and would have an intake flow of less than 1 cubic foot/second to prevent entraining juvenile fish. Drafting would occur from sites occupied by MCR steelhead, due to lack of other suitable sites.

- Do not draft water from water bodies into trucks after lignin load has been dumped if tanks have not yet been cleaned.
- Lignin will not be stored, loaded, or mixed in a Riparian Reserve. Unused lignin will be disposed of in a designated location outside of the Riparian Reserve. Refueling will also occur outside of Riparian Reserve.
- Lignin will not be applied within 100 feet of any stream crossings.

Fuels Management/Slash Disposal

- Prescribed fire in Riparian Reserves would follow all design criteria listed in ARBO2 and those listed here, whichever is more restrictive.
- Slash would not be piled or concentrated within the no treatment portions of the Riparian Reserves.
- No pile burning, of any type, would occur in Riparian Reserves, except at the three landings in the Riparian Reserves (Figure 12, Figure 14, Figure 16).
- Prescribed fires would not be ignited under weather/moisture conditions expected to lead to high fire intensity in Riparian Reserves. If Riparian Reserve burn objectives are unexpectedly exceeded no further ignitions would occur until conditions are amenable.
- Use existing features such as roads and streams for fireline when possible.
- Construct fireline by hand.
- Use minimum suppression tactics needed to maintain control for prescribed burn operations. For example, burn high-intensity sites when soil moisture is >20% by volume and forest floor layers are >65% moist by volume. Also follow prescriptions noted above.
- A mosaic burn pattern is the desired outcome from underburning natural fuels. Reduce surface fuels in the 0-3” size class by approximately 70-100% across the identified burn units. Encourage burn-out of stumps and root systems through active ignition (approximately 50% of stumps), however, some residual “punky” stumps should be left for habitat.
- Monitor soil for detrimental burning as defined by the Forest Plan on the units first burned, to aid in prescribing other burns. Keep detrimental burning to a minimum which maintains 90% of effective ground cover within 150’ of stream channels and riparian areas (page IV-97, Table IV-20 in the WNF Forest Plan Field Guide, 1990).
- Retain ground cover >45% (rocks, debris, duff, etc.) over analysis area.
- After burning slash piles seed with native species if necessary.
- Firelines would have waterbars (small ditches or dips built into the fireline) constructed to divert surface water off the line and onto vegetative surfaces. Waterbars would be constructed at the time of fireline construction.
- Wherever possible, fireline within 100 feet of streams should be avoided. No handline would be constructed within 50 feet of intermittent streams, 150 feet of perennial streams and 300 feet of fish bearing streams with designated critical habitat, unless it is needed to tie in anchor points, in which case a Forest Service hydrologist and/or fish biologist will be consulted. Such intrusions are expected to occur no more than five times.
- Fireline would be rehabilitated using methods that prevent public use as hiking trails, bike routes, motorcycle routes, etc.
- Locate re-fueling and fuel storage areas outside of Riparian Reserves or on a road, away from water and drainage areas, in locations where the largest possible spill can be contained before entering water. In the event of a fuel spill during a burn project, the

Forest Hazardous Materials Coordinator would be contacted to coordinate clean up.

- Fuel would be in containment basins, and hazard materials spill kits would be available for spill containment.
- No surfactants or foams would be used within 100 feet of the edge of wetted channels or wetlands. Engines which have had surfactant would not draft from fish-bearing waters. The deployment of hose will not require any ground disturbance, and in many cases the use of hose for wetline could reduce the need for hand fireline construction.
- Pump locations would be identified by a fish biologist and/or hydrologist to avoid adverse dewatering effects to fish. Coordination of pump locations will occur with resource specialists. Water drafting/pumping would maintain a continuous surface flow of the stream without altering the original wetted width. Any draft suction hose used in fish-bearing waters would be equipped with a screen of 3/32 inch mesh or less and would have an intake flow of less than 1 cubic foot/second to prevent entraining juvenile fish.
- The use of pumps would not involve any streambed alteration, and pump chances would not pose any barrier to fish movement. Intake screens would be used on all pumps.
- Avoid pockets of high soil moisture, such as natural depressions and seepage areas.
- Operation of helicopters within 0.7 miles of active northern spotted owl nests will be seasonally restricted between March 1 and July 31. These actions within ¼ mile of northern spotted owl nesting habitat will also be seasonally restricted unless annual field surveys (Lint et al. 1999; USFWS 2012a; 2021a) indicate that owls are not nesting.
- Burning operations during the northern spotted owl breeding season will not occur in the breeding range of recently active (pair in previous 5-years) northern spotted owl sites. Burning conditions must be such that smoke trajectories will not fall within 45 degrees of active nests. A test fire will be lit to verify smoke trajectory. These actions within ¼ mile of northern spotted owl nesting habitat will also be seasonally restricted unless annual field surveys (Lint et al. 1999; USFWS 2012a; 2021a) indicate that owls are not nesting.

Table 18. Snag and coarse woody debris desired conditions (LSRA 1997a; 1997b; REO 1997).

Forest Vegetation Group	Snag Diameter Class	Number Per Acre			
		Areas with Green Tree Recruitment		Areas with No Green Tree Recruitment	
		Snag	Log	Snags	Logs
Dry	10”-14”	1.6-3	3-7	1-3	3-10
	15-19”	1.0-2		4-8	
	20”+	1.1-1.5		6-14	
	TOTALS	3.7-6.5		11-25	
Mixed-Mesic	10”-14”	4-10	5-10	3-9	5-10
	15-19”	2-2		2-4	
	20”+	0.75-2		4-8	
	All	6.75-14		9-21	

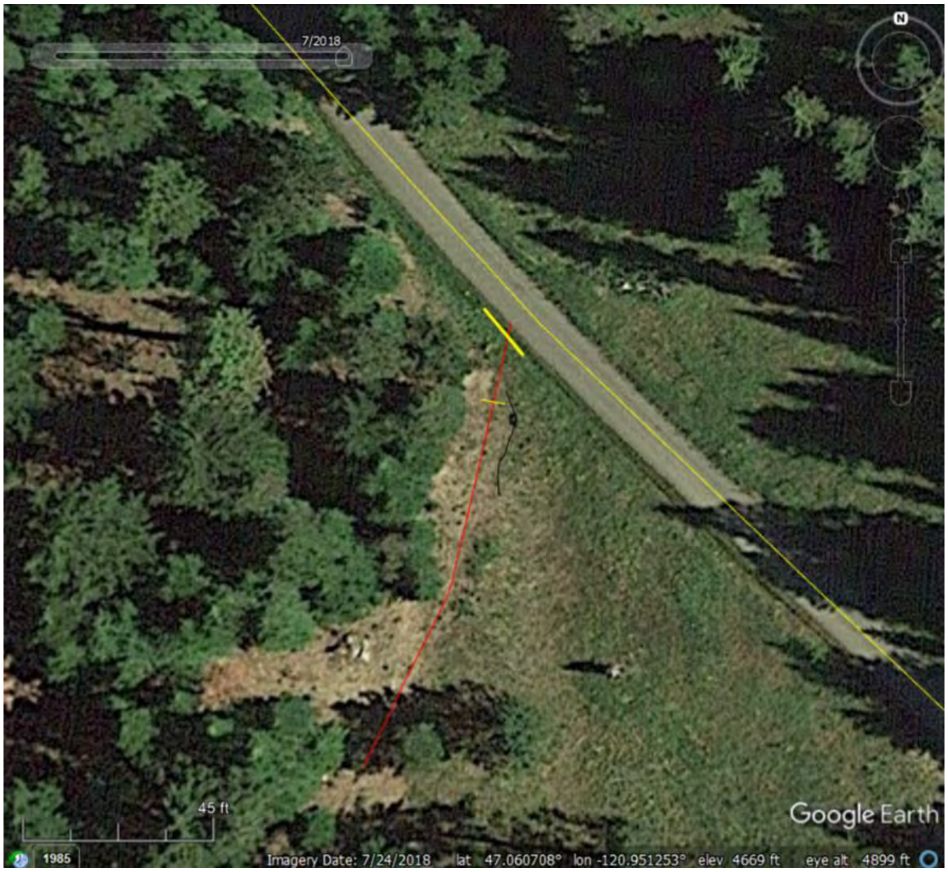


Figure 18. Temp road 0025288 (red line) aquatic design features. Thin yellow line= waterbar, thin black line=silt fence

Figure 19. Temp road 005444 (red line) aquatic design features. Thick yellow lines = waterbars, thin brown lines = wood obstructions.

Bridge Repair

The North Fork Taneum Bridge crosses the North Fork Taneum Creek on USFS road 3300 near milepost 8.0. The 3300-road would be used as one of the main haul routes for proposed commercial activities. The existing NF Taneum Bridge is not structurally sound for heavy equipment or log trucks and would be repaired in place by removing and replacing the rotten posts and wingwalls (Appendix D). Retain existing timber decking and stringers but replace ten posts and caps (six along the wing walls and four abutments) on each side of the bridge (twenty total). In the long term, it is the Forest's intent to replace the entire bridge and increase the span, but that major cost will be deferred until deterioration makes it necessary for safety reasons. The current structure meets Forest Plan standards, as determined by FS fish biologists and hydrologists.

Post replacement includes:

- Install erosion control measures (silt fence, straw bales, sandbags, etc.) along shorelines to isolate the stream from earthwork ground disturbing activities.
- Clear vegetation to access the bridge site. All trees and slash will be stockpiled and used for post-project remediation. Area to be cleared will be 0.5 acres, just enough to get heavy equipment to the construction site.
- Temporarily shore and stabilize the existing bridge and abutments with steel pipes or wood posts.
- Divert stream flow around the construction site via a coffer dam or culvert and isolate site with sandbags or other non-porous material to minimize seepage into the construction site.
- Cut the asphalt overlay on the north side of the bridge and remove the bridge decking and superstructure (girders) via crane or excavator.
- Excavate material in front of the abutments down to the treated timber sill (approximately 4-5') and behind the abutment to the tie rods/concrete deadman (used to stabilize the wingwall and prevent from tipping outward) (approximately 15-20 ft.).
- Backfill and compact the disturbed road prism behind the abutment and earth sections in front of the abutment and patch the asphalt wearing surface where needed.
- Stag equipment and stockpile supplies at the turnout on the east side of the existing bridge or at the trailhead parking on the west side of the existing bridge (outside of the Riparian Reserve).
- Close the bridge to public traffic while replacement occurs.
- A road paver will be used but there will be no rock drilling, blasting, or impact hammer used.
- Due to the load limits of the bridge, heavy equipment will have to cross the creek to replace the pilings on the far side. The number of crossings will be kept to the minimum possible.
- Heavy equipment will work from shore to the extent possible. In-stream excavation will occur during low water conditions in late summer, but no later than October 15th. This work window extension was reviewed and approved by the WDFW Habitat Biologist, Scott Downes, via personal communications and email correspondence on February 3, 2022.
- No new roads will be constructed for bridge repair during the in-water work window for Taneum Creek (July 16 - September 30), or during the two-week extension. All work within the stream channel will be completed as soon as possible within this timeframe.

Total duration of activity (i.e., crane, mini-excavator, backhoe) is estimated to be four to five weeks during the low flow periods for Taneum Creek in late summer. All work within the stream channel will be completed as soon as possible within this timeframe. Road paving would follow the in-stream work and should take one day.

Northern Spotted Owl Habitat

The proposed bridge is within northern spotted owl Critical Habitat and more specifically, Dispersal habitat.

Design Criteria and Best Management Practices for Bridge Repair:

Design Criteria and Best Management Practices would be implemented to eliminate or reduce the impacts of bridge repair specifically on soils, wildlife, aquatics, and hydrology (Table 19, Table 20). Table 19 displays BMPs pertinent to the proposed action and where to find them in the National Best Management Practices for Water Quality Management on National Forest System Lands, Volume 1: National Core BMP Technical Guide (2012b).

Table 19. Pertinent BMP page references for bridge repair (USFS 2012b).

Activity Type	Page
AqEco-1. Aquatic Ecosystem Improvement and Restoration Planning	19
AqEco-2. Operations in Aquatic Ecosystems	21
AqEco-3. Ponds and Wetlands	23
AqEco-4. Stream Channels and Shorelines	26
Road-2. Road Location and Design	107
Road-3. Road Construction and Reconstruction	110
Road-4. Road Operations and Maintenance	111
Road-5. Temporary Roads	114
Road-6. Road Storage and Decommissioning	115
Road-9. Parking and Staging Areas	122
Veg-3. Aquatic Management Zones	132
WatUses-1. Water Uses Planning	142
WatUses-3. Administrative Water Developments	144

Table 20. Design criteria for bridge repair.

General

- If an unanticipated fish kill occurs or fish are observed in distress because of an extraordinary circumstance relating to water quality degradation due to project activities, immediately stop all activities causing harm. Immediately notify the local WDFW Habitat Biologist or the appropriate Regional Habitat Program Manager and the Washington Military Department Emergency Management Division at 1-800-258-5990.
- Accumulations of soil or debris shall be removed from drive mechanisms (wheels, tires, tracks, etc.) and undercarriage of all heavy equipment prior to its working within the bankfull channel in streams or below the ordinary high-water line in lakes.

Erosion Control Measures

- Alteration or disturbance of the bed, banks, and bank vegetation of waterbodies shall be minimized and limited to that necessary to construct the project.
- Confine, remove and dispose of construction waste off NFS lands
- Vegetation and soil disturbance will be confined to those areas needed for heavy equipment to access the construction site; staging/stockpiling of materials will occur on previously compacted areas outside the Riparian Reserves.
- Temporary erosion control measures will be in place prior to any construction and will be removed once the site has been stabilized.

- Use erosion prevention and control methods as necessary during and immediately after project implementation to minimize loss or displacement of soils and to prevent delivery of sediment into waterbody. These may include, but are not limited to, operational techniques, straw bales, silt fencing, erosion control blankets, temporary sediment ponds, and/or immediate mulching of exposed areas. Revegetate or protect disturbed ground with the potential to deliver sediment into waterbodies by seeding, mulching, or other methods prior to the fall rainy season.

Pollution Control

- Hazardous Materials Spill plan and all necessary materials will be in place prior to construction
- Vegetable oil will be used for heavy equipment working in and around waterbodies.
- Fueling and Storage of equipment will occur outside of Riparian Reserves

De-watering and site isolation

- Dewatering will be achieved by diverting stream flow from one side of the creek to the other with construction occurring opposite the flow diversion channel or pipe.
- Site isolation will occur using sandbags or other non-porous material to minimize seepage into the construction site. Seepage water will be pumped into upland areas and allowed to filter through vegetation before reentering the stream channel.
- Temporary Diversion channel/pipe will be placed in the NF Taneum to divert flow away from the construction site.
- Channel/pipe will be installed at a maximum grade of 5% to accommodate fish passage during construction
- Pumps used to divert water will be screened according to NMFS fish screen criteria (round or square screen mesh that is no larger than 2.38 mm (0.094 inches) in the narrow dimension, or any other shape that is no larger than 1.75 mm (0.069 inches) in the narrow dimension.)
- Once project is complete construction site will be slowly re-watered to prevent a sudden release of suspended sediment.
    - Minimize the number of streambed crossings with equipment; one wet crossing in each direction is anticipated.

Fish Salvage during de-watering

- As de-watering of isolated area is occurring, fish biologist will dip net or electroshock the isolated area.
- Large buckets with cold water will be used to transfer captured fish upstream of the construction zone above block nets where they will be released after they have recovered sufficiently from handling.
- All captured fish will be documented by species and length.
- NMFS electrofishing guidelines will be followed during fish salvage (NMFS 2000)

Bank Restoration/disturbed areas

- Decompact soils, seed with native plant species and spread native stockpiled material (soil, boulders, large wood, shrubs, etc.) removed during construction.
- Alteration or disturbance of the bed, banks, and bank vegetation of waterbodies shall be minimized and limited to that necessary to construct the project.
- Revegetate disturbed streambanks and lakeshores with site-appropriate vegetation to maintain soil stability and provide shade and future sources of large wood after project completion. Revegetation can be accomplished by planting or natural reproduction, depending on site conditions.

Seasonal Restrictions

- Operation of tracked machinery, heavy equipment, and chainsaws within 0.7 miles of active northern spotted owl nests will be seasonally restricted between March 1 and July 31. These actions within ¼ mile of northern spotted owl nesting habitat will also be seasonally restricted unless annual field surveys (Lint et al. 1999; USFWS 2012a; 2021a) indicate that owls are not nesting.

Shaded Fuel Breaks

Shaded fuel breaks are designated areas where fuels are modified to help prevent and manage wildland fire, as well as assist with wildland fire suppression in strategic locations, established using non-commercial thinning activities. Treatments would include removal of trees, preferably grand fir, up to 8 inches DBH along 6.1 miles of the following existing roads: 3300, 3350-119, 3330, and 3350-111. The width of the fuel breaks would be up to 150' both sides of the road, for a total buffer width of 300'. Thinning would be accomplished either by hand cutting with chainsaws or with a masticator.

- *Exclusions:*
  - Northern spotted owl suitable habitat.
  - Riparian Reserves for fish bearing streams with designated critical habitat for steelhead or bull trout.

Slash/Fuels Treatment

Slash created from fuel break implementation may be treated with a combination of chipping, or hand piling and burning, or removed as personal use firewood. Slash/fuels would be dragged to the chipper, which would stay on the road. Chipped debris would be widely scattered on forest floor. Public vehicles would be confined to roads when collecting firewood.

Down wood levels would meet the desired conditions described in the Wenatchee National Forest Late Successional Reserve Assessment (1997a) (Table 18) before firewood collection would be authorized.

Riparian Reserves

Of the area described above some areas fall within Riparian Reserves. As with the other actions in Riparian Reserves, shaded fuelbreaks would be subject to treatment descriptions displayed in Table 3. Treatment descriptions specify tree cutting buffers, and canopy cover requirements. No equipment would travel off-road in Riparian Reserves during shaded fuel break implementation. Locate re-fueling and fuel storage areas outside of Riparian Reserves or on a road, away from water and drainage areas, in locations where the largest possible spill can be contained before entering water. In the event of a fuel spill during a burn project, the Forest Hazardous Materials Coordinator would be contacted to coordinate clean up.

Northern Spotted Owl

Critical Habitat

There are 18,634 acres of Critical Habitat in the Taneum Project Area which is 8% of Critical Habitat Unit 7 (ECN-4). Shaded fuel breaks are proposed in Critical Habitat outside of suitable habitat in the Taneum project area. Figure 20 displays a sample completed fuel break in the same watershed.

Figure 20. A shaded fuel break on the Okanogan-Wenatchee NF.

Developed/Dispersed Recreation

Hazard Tree Removal from Developed Recreation Sites

Hazard trees scored 7 or 8 with the USDA (2014) hazard tree field guide or as identified for safety considerations would be felled for up to 10 years in developed recreation sites. Hazard trees would be felled within 50 acres that have strike-zone potential (i.e., within 150 ft) of the developed recreation sites at Taneum, Taneum Junction, and Icewater Campgrounds.

Prescription:

- Hazard trees, not to exceed a yearly average of 5 per acre, would be identified and cut down from developed recreation sites, as needed.
- Within Riparian Reserves, fell hazard trees toward the stream and leave in place with no cutting or bucking to make them smaller, unless impeding access to recreation facilities. If amounts exceed downed floodplain wood objectives and are needed, felled hazard trees would be used as large wood for instream restoration projects.
- Locate re-fueling and fuel storage areas outside of Riparian Reserves or on a road, away from water and drainage areas, in locations where the largest possible spill can be contained before entering water. In the event of a fuel spill during a burn project, the Forest Hazardous Materials Coordinator would be contacted to coordinate clean up.

Riparian Reserves

Of the 50 acres identified for hazard tree mitigation in and around developed recreation sites of three different campgrounds, a total of 40 acres fall within Riparian Reserves. These 40 acres are adjacent to 0.56 mi of Designated Critical Habitat for both MCR steelhead and Columbia River bull trout.

Northern Spotted Owl

Critical Habitat

The three developed recreation sites where hazard trees would be mitigated on 50 acres are all within Critical Habitat. There are 3 acres of suitable habitat, 44 acres of dispersal habitat, and 3 acres of non-habitat.

Road/Trail Actions

In 2015 a travel analysis was conducted and documented in the Okanogan-Wenatchee National Forest Forest-wide Travel Analysis Report. A newer, complete inventory of NFS and unauthorized roads in the Taneum Project Area was compiled. Most roads were field checked, and data updated to reflect existing conditions. Data came from field surveys, geographic information systems, and historical records on file.

The Taneum Restoration project incorporated updated field data and more site-specific detail for completing the Travel Analysis Process (TAP). This process analyzes road specifications and resource concerns and makes recommendations on road management and maintenance levels, closure, and decommissioning. A total of 26.9 miles of road actions including downgrading road maintenance levels, removing private roads from the system, and adding system roads and trails (Table 21, Figure 77) is proposed in this project. Table 54 displays individual road actions. There are also 61.9 miles of road actions including decommissioning and road closures which will be covered under the ARBOII process (Table 57).

Table 21. Road and trail actions proposed in the Taneum Project. See Table 54 for maintenance levels associated with each road/trail actions.

Road/Trail Actions	Miles	Miles in Riparian Reserves
Upgrade from closed (ML1) to open (ML2)	0.2	0.00
Downgrade Maintenance Level	19.6	9.12
Remove Private Roads from FS System	5.4	3.30
Add Unauthorized Routes to System	0.4	0.20
Add Unauthorized Trail to System	1.3	0.06
Total	26.9	12.69

Roads to be Upgraded

Closed road 3352-113 (0.2 mi.) is open on the ground and being used frequently. It is a short road on a saddle leading to a popular viewpoint. The decision to keep it open was based on a recreation need (Table 54). This road is 0.3 miles from the closest Riparian Reserve.

Roads to be Downgraded

The Travel Analysis Process recommended 19.6 miles of system road be downgraded to a lower maintenance level. These proposed changes would update the existing conditions and reflect the actual use on the ground. Of the total, 5.6 miles are proposed to be gated and used only for administrative access.

Roads to be Removed from the System

This proposal is an administrative change. Currently 5.4 miles of NFS system roads are identified on private lands. The Forest Service has no authority on roads on private lands. The proposal will take these roads off the NFS system, but they would continue to provide private access.

Roads/Trails to be Added to the System

There is a desire to connect camp sites to the existing motorized trail system. There are 1.3 miles of user created trail proposed to be added to the trail system. Adopting these trails will serve the access need and they would be managed to Forest Service standards. There are three trail segments that would be managed as Trail Class 3, single track, managed and designed for motorcycles, and open to hikers, horses, and mountain bikes. Trails are maintained to a 24" tread, brushed corridor to 8ft by 10ft, grades 10% - 20-% max. Annual maintenance includes logout, drainage, and brushing. Bridges or puncheons across major waterways could also be built or maintained; determined by need.

Additionally, 0.4 miles of unauthorized routes would be added to the NFS system. These would become maintenance level 2A roads (gated and used for authorized access only). Two (3330000-7.83R-2 and 3330121-0.16L-3) are for range permittee access and the other one (3330119-1.18R-1) provides access to a rock source (Figure 77).

Riparian Reserves

The 0.2 miles of road to be upgraded from ML1 to ML2 is completely outside Riparian Reserve, the 19.6 miles to be downgraded in maintenance level includes 9.12 in Riparian Reserve, the 5.4 miles of private roads to be removed from the NFS system include 3.3 in Riparian Reserves, the 0.4 miles of unauthorized roads to be added as NFS system roads includes 0.21 miles in Riparian Reserve, and the 1.3 miles of unauthorized trails to be added as NFS trails includes 0.06 in Riparian Reserve (Table 21, Figure 77).

In the Action Area, there are 407 miles of road and 852 stream crossings. There are 170 miles of road system and 317 stream crossings in the North Fork Taneum Creek subwatershed, 237 miles of road system and 535 stream crossings in the Taneum Creek subwatershed. The motorized trail system in the Action Area is 83 miles and has 181 stream crossings. The portion of the Action Area that is in the North Fork Taneum Creek subwatershed has 78 miles of motorized trails and 169 stream crossings. The portion of the Action Area in the Taneum Creek subwatershed has 5 miles of motorized trails and 12 stream crossings. In the Action Area there are 3.9 miles of road per square mile and 1.2 miles of motorized trail per square mile.

Timing and Implementation of Project Activities

The mechanical and prescribed fire treatments proposed to reduce the risk of uncharacteristically severe wildfires and restore late-successional wildlife habitats would occur within three to five years of a signed Decision Notice for the Taneum Restoration Project. Mechanical treatments would be accomplished through sales of timber and service contracts. Prescribed fire treatments would be conducted by Forest Service crew starting possibly in year 2. Roads or trails used for mechanical treatments would be restored upon completion of treatments within a single season (Table 22).

Table 22. Timeline for proposed actions.

Treatment		Implementation Year									
		1	2	3	4	5	6	7	8	9	10
Treatments	Road Maintenance	■	■	■	▒	▒					
	Bridge Repair	■	■	▒	▒	▒	▒	▒	▒	▒	▒
	New Temporary Roads	■	■	■	■	▒	▒				
	Commercial Thinning/Log Haul/Landings	■	■	■	■	▒	▒				
	Non-Commercial Thinning	■	■	■	■	▒	▒				
	Prescribed Fire		▒	▒	▒	▒	▒	▒	▒	▒	▒
	Tree Planting				▒	▒	▒	▒	▒	▒	▒
	Danger Tree Removal	■	■	■	■	▒	▒				
	Shaded Fuel Breaks	■	■	■	▒	▒					
	Hazard Tree Removal – Developed Recreation	■	■	■	▒	▒					
	South Fork Meadow Developed and Dispersed Site Improvement	▒	▒	▒	▒	▒	▒	▒	▒	▒	▒
	Road/Trail Actions	▒	▒	▒	▒	▒	▒	▒	▒	▒	▒
■	Definite Treatment Years										
▒	Anticipated Treatment Range										

Wildlife and Plant Species Considered and Effects Analysis

This section analyzes the effects of the Taneum Restoration Project on wildlife resources. The following ESA (1973) listed wildlife species are considered in this assessment (Table 23):

Table 23. Listed and proposed wildlife species for the Taneum Project.

ESA Designation	Wildlife Species	Known In Project Area	Miles to Closest Verified Detection	Year	Analyzed Further	ESA Determination
Endangered	Gray Wolf - *Canis lupus*		5	2022	X	MANLAA
Threatened	Northern Spotted Owl - *Strix occidentalis caurina*	X		2021	X	MALAA
	Northern Spotted Owl Critical Habitat	X			X	MALAA
	Grizzly Bear - *Ursus arctos*		145	2017		NE
	North Cascades Grizzly Bear Recovery Zone		To Recovery Zone - 8			
	Canada Lynx - *Lynx canadensis*		75	2017		NE
	Canada Lynx Critical Habitat		To Critical Habitat - 70			NE
	Marbled Murrelet - *Brachyramphus marmoratus*		To Salt Water - 60			NE
	Marbled Murrelet Critical Habitat		To Critical habitat - 15			NE
Proposed	Mount Rainier White-tailed Ptarmigan - *Lagopus leucura rainierensis*		25	2021		NE

The determination is May Affect, Likely to Adversely Affect for northern spotted owl and northern spotted owl Critical Habitat and are analyzed further in this assessment. The determination is May Affect, Not Likely to Adversely Affect for gray wolf and is analyzed further in this assessment. The determination is No Effect for grizzly bear, Canada lynx, marbled murrelet, whitebark pine, showy stickseed, and Wenatchee Mountains checkermallow because no activities are proposed where these species are expected to occur or where Critical Habitat for these species occur and they will not be analyzed further in this assessment. The proposed threatened Mount Rainier white-tailed ptarmigan also does not occur in the project area and this project is No Effect for the Mount Rainier white-tailed ptarmigan, the assumed subspecies (Langin et al. 2018, 1482; Braun 2019, 1; Hoffman 2020, 4; WDFW 2020a, 1) will not be analyzed further.

Gray Wolf

Status of Gray Wolf

Gray wolves were classified as an endangered species in Washington under the provisions of the Endangered Species Act in 1973. In 2011, wolves in the eastern third of Washington were removed from federal protections under the ESA. Wolves in the western two-thirds of Washington continued to be protected under the ESA and were classified as an endangered species under federal law. The gray wolf was federally delisted on January 4th, 2021 (USFWS 2020b). The United States District Court of Northern California vacated and remanded this delisting on February 10th, 2022 (White 2022).

A Federal recovery plan for wolves was completed for the Northern Rocky Mountains (USFWS 1987). A similar plan for the North Cascades has not been completed. The Washington Department of Fish and Wildlife has published a wolf conservation and management plan (Wiles, Allen, and Hayes 2011). The plan identifies goals for down-listing wolves from State Endangered to Threatened and finally what will need to be met for wolves to be removed from the State list altogether.

Gray wolves historically occurred throughout the Cascade Mountains in Washington and Oregon. Aggressive predator control efforts in the early 1900s nearly extirpated wolves from Washington by the 1940s. In the 1980s, Laufer and Jenkins (1989) documented several reports of gray wolves in the Washington Cascades, and in the 1990s gray wolves were documented at several sites, including two sites with pups. In 2020 the wolf population in Washington was steadily increasing. As of December 31st, 2020, WDFW counted 134 wolves in 24 packs. Thirteen of these were successful breeding pairs. This is a minimum count, the total number of wolves in Washington is likely higher (WDFW 2021). Of these state-wide totals; 7 packs totaling 30 individuals were west of the Northern Rocky Mountains Distinct Population Segment legal boundary (USFWS 2022; WDFW 2021, 16).

Given the proximity of confirmed detections, there is a possibility that wolves make transient use of the project area.

Gray wolves are generalists that use a broad range of elevations and habitats. In the western United States, they are primarily associated with forested habitats. They require a year-round prey base and protection from excessive human-caused mortality.

Wolves generally den in areas near forest cover and ungulates for prey that are away from human activity. Denning is from mid-April to July and wolves are sensitive to disturbance during that time. They use rendezvous sites for resting and gathering areas after the pups are mobile enough to leave the den. Rendezvous sites are often around meadows near forested stands that provide resting areas under trees. Home ranges have been estimated at 19-687 square miles, and depend on the availability of ungulates for food (Wisdom et al. 2000). The estimated mean territory size of 14 packs in Washington with known territories was approximately 285 square miles and ranged from 97 square miles to 656 square miles (WDFW 2021, 14). Ungulates comprise 85-95% of their diet, although beaver, snowshoe hare, and other small animals may make up the remainder. Carrion may additionally be a food source (Mech and Peterson 2003; Witmer, Martin, and Sayler 1998). Roads and trails can alter wolf movement and use of the landscape (Whittington, St. Clair, and Mercer 2004). Although low-use roads and low-use trails may be used as travel pathways for wolves, they tend to avoid contact with humans near high-use roads/trails. Mortality is higher for wolves when road densities are >1 mile per square mile because of potential conflicts with the increased human presence in those areas (Thiel 1985; Wisdom et al. 2000). However, they may inhabit areas with greater road densities if those habitats are adjacent to relatively unroaded areas (Mech 1989). Roads may also influence the effectiveness of habitat for ungulates and prey availability to wolves (Mladenoff, Sickley, and Wydeven 1999).

Singleton, Gaines, and Lehmkuhl (2002) assessed landscape permeability for wolves in Washington State and portions of northern Idaho and southern British Columbia. They reported that landscapes in the Cascades, northcentral and northeastern Washington, and parts of the interior lowlands of British Columbia were broadly conducive to dispersal by wolves. Habitat association models identified 3 habitat concentration areas across the Okanogan-Wenatchee National Forest for wolves (North Cascades, Central Cascades, and South Cascades), separated by landscapes of varying permeability for animal movement. Three "fracture zones", defined as areas of reduced landscape permeability between habitat concentrations for wolves, were identified within or near forest boundaries in the Okanogan Valley, Stevens Pass-Lake Chelan, and Snoqualmie Pass areas (Singleton, Gaines, and Lehmkuhl 2002). These zones generally represent developed valley bottoms with discontinuous forest cover, sizeable human populations, high road densities, or reservoirs.

In Washington State, restriction on timber harvest is not considered to be necessary to maintain or promote wolf habitat. Washington Department of Fish and Wildlife's Wolf Conservation Plan (Wiles, Allen, and Hayes 2011) states that wolves are adaptable, and will enter and forage in towns and farms, cross highways and open environments, and den near sites heavily disturbed by people such as logging sites and military firing ranges. It goes on to state that wolves are also fairly tolerant of moderate amounts of human disturbance, even in the vicinity of active wolf dens (Thiel, Merrill, and Mech 1998; Frame, Cluff, and Hik 2007) and that restrictions on land use practices have not been necessary to achieve wolf conservation in Idaho, Montana, and Wyoming (USFWS 2009). The Conservation Plan concluded that "*wolf reestablishment in Washington is not expected to result in the imposition of any land use restrictions to protect and conserve wolves other than those that occasionally may be needed to temporarily protect den sites from malicious or careless destruction during the denning period (see Chapter 8). In neighboring states with wolves, no restrictions have been placed on the forest products industry regarding timber management and logging to protect wolves.*"

Strategies for wolf conservation include limiting accidental or intentional shooting, allowing for seclusion at den and rendezvous sites, maintaining a dependable yearlong source of available prey, and providing sufficient space with minimal exposure to human activities (USFWS 1987).

Scale of Analysis

An assessment of the effects of roads and trails on gray wolves should be based on an area that approximates their extensive home ranges (Boyd et al. 1995, Mech 1970 *in* Gaines, Singleton, and Ross 2003). Gaines et al. (2003) recommends BMUs for analysis of effects to wolves within the grizzly bear recovery zone and 4th field subbasins for areas outside of the grizzly bear recovery zone. Because this project area is outside of the North Cascades Grizzly Bear Recovery Area the analysis area is the two subwatersheds (North Fork Taneum and Taneum) that contain the Taneum Restoration Project Area.

Effects to wolves were analyzed based on immediate and short-lived impacts (short-term) vs impacts that would have a longer impact (long-term).

Duration of Impacts:

- Short-term: Up to 5 years
- Long-term: >5 years

Analysis Methods

A moving windows (GIS) road and motorized trail density analysis was used to compare the amount of security habitat for this action by subwatershed (Gaines, Singleton, and Ross 2003). This analysis classified areas as follows: areas with no open roads or motorized trails, areas with densities from >0 to 1.6 km/0.9-km-radius circle (>0 to 1.0 mi/mi2), and areas with densities that are >1.6 km/0.9-km-radius circle (>1 mi/mi2) within the two subwatersheds. Outputs of this model include (1) the amount and location of areas with no open roads or motorized trails, (2) the amount and location of areas with open road and motorized trail densities >0 to 1.6 km/0.9-km-radius circle (>0 to 1.0 mi/mi2), and (3) the amount and location of areas with open road and motorized trail densities >1.6 km/0.9-km-radius circle (>1 mi/mi2). Areas with open road densities <1.6 km/0.9 km (<1 mi/mi2) are referred to as security habitats.

The interspersion of forage and cover and proximity to open roads are better indicators of overall habitat effectiveness for elk, than simple cover-to-forage ratios. A radio telemetry study of elk cows and calves on the Starkey experimental unit in Oregon indicates that open roads are the single greatest factor affecting elk use of habitat (Rowland et al. 2000; 2018). The authors reported a strong relationship between elk habitat selection and distance from open roads, with the probability of elk use increasing with distance from roads. Rowland et al. (2000) developed a Habitat Effectiveness (HE) index based on distance to road. The HE index ranges from zero to 1.0, with 1.0 indicating no influence from open roads on elk selection of habitat.

High use open roads also influence deer use of habitat, although Wisdom et al. (2004) observed that the pattern of mule deer response to open roads and varying levels of traffic is different from that of elk, and that mule deer response may also be influenced by presence of moderate to high densities of elk, as occurs in the Taneum Restoration Project Area. In the Starkey study, mule deer generally remained closer to open roads than elk, and avoided areas used by elk. For comparison across the Okanogan-Wenatchee National Forest, Gaines, Singleton, and Ross (2003) developed methodology to assess the proportion of deer and elk summer habitat within a watershed that is influenced by roads and motorized trails, using buffer widths that vary according to type of road or trail and level of motorized use.

Existing Condition

Wolves

The Teanaway wolf pack is located ~10 miles north of the Project Area. Breeding was confirmed in each of the last five years. The Teanaway pack had a minimum of 5 individuals in December 2020 (WDFW 2021). Unconfirmed wolf sightings have been documented in the Analysis Area (defined on page 55) (WDFW 2020b).

In the Analysis Area, the motorized route (roads and trails) density is 5 miles per square mile. In the Project Area, the open motorized route (roads and trails) density is 4 miles per square mile. Security habitat currently comprises about 7% of the Analysis Area and 13% of the Project Area. There is a high level of human influence on wolf habitat.

Deer and Elk

Deer and elk are found across the project area in the summer and in the lower elevations during winter. Deer and elk concentrate in the eastern part of the watershed in April and May. As snowpack recedes and human use increases, many elk and deer disperse westward to higher elevation areas with less disturbance from motorized use. Functional winter range is considered the most critical habitat for maintaining populations of both mule deer and elk across the Wenatchee National Forest (Youkey 2011, 29 & 33).

Grazing by wild ungulates on National Forest lands is supported by a spring and summer forage base that has declined since the early 1900s as a result of tree encroachment into meadows (Haugo and

Halpern 2007; Lehmkuhl et al. 2013), development of dense forests due to fire suppression (Everett et al. 2000; Wright and Agee 2004; Hessburg, Agee, and Franklin 2005; Proffitt et al. 2019), regrowth of pre-1990 clearcuts, and little forest clearcut harvest as a result of regulatory changes during the last 30 years (E. A. Miller and Halpern 1998; Lehmkuhl et al. 2001; 2013). 38% of the Taneum Analysis Area is classified as early successional forest and/or forest openings (meadows, grasslands, shrublands or open forest stands) that may provide foraging habitat for both deer and elk. About 60% of the Taneum Analysis Area supports dense forest structure that provides cover. The remaining 2% of the landscape is unvegetated (i.e. bare ground or rock). The current ratio of cover to forage in the Project Area is 77% cover to 23% forage.

In the Taneum Analysis Area, the estimated habitat effectiveness (HE) index for elk based solely on distance from open roads is currently 0.21. Within the Project Area the HE is 0.24. Eighty-three percent of the analysis area and 73% of the Project Area are within 394 yards of an open road—the distance band closest to roads and associated with the lowest probability of elk use. Total habitat effectiveness (based on the geometric mean of the road index and interspersion of cover and forage, quantity and quality of forage, and cover quality) was not calculated in this analysis, due to lack of data on the quantity and quality of forage.

The deer-elk summer human disturbance index for the Taneum Analysis Area is currently 97%--indicating that 97% of the available deer and elk habitat is within the potential zone of influence from a motorized route. Within the Project Area, 94% of the available deer and elk habitat is within the potential zone of influence from a motorized route. On the Okanogan-Wenatchee National forest, levels above 70% indicate a high level of human influence on deer and elk habitat (Gaines, Singleton, and Ross 2003). The low Habitat Effectiveness value (0.21) and high disturbance index (97%) indicate that mule deer and elk habitat in both the Analysis Area and the Project Area is probably not as well utilized by ungulates as it could be due to disturbance from open roads and/or the combination of high use motorized roads and trails. The magnitude of this effect may be slightly lower for deer, which can utilize smaller patches of cover near roads.

Direct and Indirect Effects

Roads and Disturbance

Although neither dens nor rendezvous sites have been observed in the Project or Analysis Area, timing and distance restrictions would be implemented if a den or rendezvous site is found within 1-mile of project actions. Planned construction and use of temporary roads under this action would temporarily reduce security habitat in the short-term during project activities. Construction and use of these roads will result in brief and localized displacement of any wide-ranging carnivores that may be present (as well as their prey), slightly reducing prey abundance for wide-ranging carnivores. The loss would be inconsequential for affected animals and would not affect wolf population levels. The project would implement proposed road closures prior to temporary road construction. The additional temporary road miles would not increase anticipated effects.

Implementation Disturbance

Operation of helicopters, chainsaws, heavy equipment, engines, and portable pumps in mechanical thinning and burning areas would result in noise above ambient conditions and disturbance to wildlife, including wide-ranging carnivores and their prey. Affected animals would be temporarily displaced from these areas. Only a small number of animals would be affected, however, and there would be no lasting effect on carnivore populations.

Habitat

Restoration treatments would open the forest canopy and result in a substantial increase in understory vegetation. This would improve foraging opportunities for ungulates. The cover to forage ratio would change to 68% cover to 32% forage. The Forest Plan Standards and Guidelines indicate optimum cover of 40% and optimum forage of 60% in managed forests. About 2,200 acres of this treatment would almost double the acres of improved forage within the Project Area. The associated loss of cover could increase vulnerability to disturbance in some parts of the Project Area.

By adding nitrogen to the soil, planned burning would, in the short-term, produce highly palatable herbaceous forage for deer and elk. The effect would persist for only a few years following treatments. The open conditions resulting from burning may also result in slightly earlier spring green up—a boon to deer and elk moving off winter range, when human disturbance is relatively low. The patchy nature and variable intensity of the planned natural fuels underburn would also provide high quality forage for deer in the short- and mid-term (Lehmkuhl et al. 2013). In the noncommercial thinning treatment, the effects of increased forage are expected to last 10 to 15 years. For commercial thinning, the effects of increased forage are expected to last 30 years in the dry mixed conifer forest types and 20 years in the moist mixed to cool moist forest types. As the treated stands reach the end of these time periods, stand structure is expected to change due to tree growth which would reduce deer and elk forage.

Road closures/decommissioning - changes to road density/security and disturbance

Open motorized route (roads and trails) densities in the Project Area would decrease 0.5 miles per square mile thereby potentially decreasing opportunities to disturb both carnivores and their prey. Security habitat would increase to 8% of the North Fork Taneum Creek and Taneum Creek subwatersheds and 15% of the Project Area. There would continue to be a high level of human influence on wolf habitat.

Several closed roads (ML 1) would be re-opened for treatment implementation. Decommissioning of roads, opening of closed roads for administrative use, and changes in maintenance levels would occur. Disturbance associated with these activities would be as described above and the same mitigation measures would apply. Although it would not quantitatively increase security habitat, all wide-ranging carnivores would benefit from reduced disturbance associated with planned road closures. As such effects to wolves would be similar and would not change the effects determination.

Deer and Elk

In the Taneum Analysis Area, the estimated habitat effectiveness (HE) index for elk based solely on distance from open roads is currently low at 0.21 and would not change at this scale. Within the Project Area, project implementation and road decommissioning/closure would increase habitat effectiveness slightly by 0.01. The amount of the area within 394 yards of an open road (the distance band closest to roads and associated with the lowest probability of elk use) would decrease from 83% of the Analysis Area to 82% and 73% of the Project Area to 71%.

Closing roads would slightly decrease road density and the proportion of deer and elk summer habitat that is influenced by roads. The deer-elk summer human disturbance index for the Taneum Analysis Area would decrease from the current value of 97% to 96%. Within the Project Area the Zone of Influence index would decrease from 94% to 93%. This would still be considered a high level of human influence on deer and elk habitat (Gaines, Singleton, and Ross 2003).

Cumulative Effects to Gray Wolves - Disturbance

Other foreseeable federally connected actions in the Taneum Project Area are USFS permitee sheep grazing. Actions in the Little Crow Restoration Project (01EWFW00-2019-F-1563), Walter Springs

Restoration Project (01EWFW00-2019-F-1598), and the proposed Little Naches Watershed Restoration Project (http://www.tapash.org/projects/little-naches-watershed-restoration/) south of the Taneum Project Area, would likely occur at the same time.

Other foreseeable non-federal cumulative effects in the project area with possibility to cause disturbance include motorized and non-motorized travel and recreation in all seasons, summer and fall dispersed camping, and spring and fall hunting. The Nature Conservancy owns land in the west portion of the North Fork Taneum subwatershed. The Nature Conservancy is planning to thin 1,000 acres of stand initiation forest (old clear cuts) to reduce tree densities and accelerate development of larger tree structure, contributing to late and old structure forest in the long-term and habitat for Late-successional old forest associated species, such as northern spotted owls. These stands are located west of the Project Area in more mesic and moist parts of the analysis area. Effects from these vegetation treatments would be similar to those described for the Taneum Project. There are no foreseeable planned actions that in combination with the Proposed Action would change the influence of roads.

Summary of Effects

Construction of temporary roads would minimally decrease habitat effectiveness temporarily as the area has a high road density. Construction and use of temporary roads will cause short-term displacement of individual deer and elk. Deer and elk would be temporarily displaced during thinning and burning operations, due to noise disturbance associated with equipment, traffic, and human presence, as well as heat, flames, and smoke associated with fuel treatments. Deer and elk use of lightly burned forest would resume quickly, particularly in areas away from roads. Temporary displacement of these individuals would not impact deer and elk populations or their long-term use of the area in the proposed action.

Increased forage through vegetation treatments and changes to the road and trail network would combine to have a beneficial impact on deer and elk. Planned closure and decommissioning of roads would benefit deer and elk by reducing motorized disturbance locally, but nearby open roads would continue to influence use of these areas. Habitat effectiveness would remain low. Disturbance and vegetation changes from treatments would not be expected to negatively affect wolves, although predators and prey will be temporarily displaced during activities.

Any affected gray wolves would be using the Project Area on an incidental basis, due to high levels of human disturbance associated with roads. Reduction in road density would be a beneficial effect for wide-ranging carnivores and deer and elk.

Determination of Effect for Gray Wolf

The determination for gray wolf is May Affect Not Likely to Adversely Affect due to temporary and short-term disturbance. Reduction in open roads would be a beneficial effect for wolves and their prey. Den sites and rendezvous sites, if discovered in the vicinity of the project, would be given an automatic 1-mile disturbance buffer during the reproductive season while reinitiation of formal consultation is pursued which may result in a smaller disturbance buffer.

Northern Spotted Owl

Status of Northern Spotted Owl

The northern spotted owl was listed as threatened in 1990 because of widespread loss of suitable habitat across the subspecies' range and the inadequacy of existing regulatory mechanisms to conserve the subspecies (USFWS 1990, 26114). The northern spotted owl was found to be warranted for uplisting to Endangered status but precluded by work on higher-priority actions (USFWS 2020c, 81146). All populations of northern spotted owls continue to decline, especially in the northern parts of the subspecies' range, where populations have declined by as much as 94 percent since 1992 on the Cle Elum Study Area (Lesmeister, Sovern, and Mikkelsen 2021; Franklin et al. 2021, Ashlee Mikkelsen personal communication 9/7/2021). Past and current habitat loss continues to threaten northern spotted owl populations, loss of habitat due to timber harvest has been greatly reduced on Federal lands for the past 3 decades, the primary source of habitat loss is wildfire (USFWS 2011, vi, I–7). Increasing competition from the congeneric, invasive barred owl (*Strix varia*) is now recognized as the primary threat to the continued existence of the northern spotted owl (Taylor and Forsman 1976; Lesmeister et al. 2018, 272; Dunk et al. 2019, 2; USFWS 2020c, 81145; A. B. Franklin et al. 2021, 19; Wiens et al. 2021, 7).

There are no current estimates of the total population size of northern spotted owls because many areas across the range of the subspecies remain unsurveyed (USFWS 2011, A-2). Northern spotted owl demography studies use estimates of fecundity (reproduction) and apparent survival to determine if populations within discrete study areas in California (3), Oregon (5), and Washington (3) are increasing, stationary, or decreasing. Northern spotted owl populations are declining range-wide at an estimated rate of 6-9% annually on 6 study areas and 2-5% annually on 5 other study areas, these declines translate to ≤ 35% of the populations remaining on 7 study areas 1993-2018 (A. B. Franklin et al. 2021, 1). Northern spotted owl experienced ~12% per year declines on the control portions of a barred owl removal study (Wiens et al. 2021, 7). More recent declines in Washington are observed (Figure 21, Figure 22, Figure 23). On the Cle Elum study area northern spotted owl pairs have declined by 98% since 1992 with 1 remaining pair (Ashlee Mikkelsen personal communication 9/7/2021), there are no pairs remaining in the Rainier study area (Rossi 2021).

The rates of population decline vary by study area, with the greatest rates of decline occurring in Washington and northern Oregon (A. B. Franklin et al. 2021, 13). The factors that influence northern spotted owl demography are not fully understood, but habitat quality and quantity, annual weather patterns, and the presence of barred owls are all factors that affect spotted owl survival, reproduction, and local population trends (Forsman et al. 2011; Dugger et al. 2016; A. B. Franklin et al. 2021). An overall decline in apparent survival rates (the probability that an owl will survive from one year to the next) is the most substantial factor driving the declining population trends across the range of the subspecies (Forsman et al. 2011, 63), an accelerating range-wide decline in apparent survival is observed, most pronounced in Cle Elum (A. B. Franklin et al. 2021, 12). There is now strong evidence that barred owls have negatively affected northern spotted owl populations, primarily by decreasing apparent survival and increasing rates of local territory abandonment (Dugger et al. 2016; A. B. Franklin et al. 2021; Wiens et al. 2021).

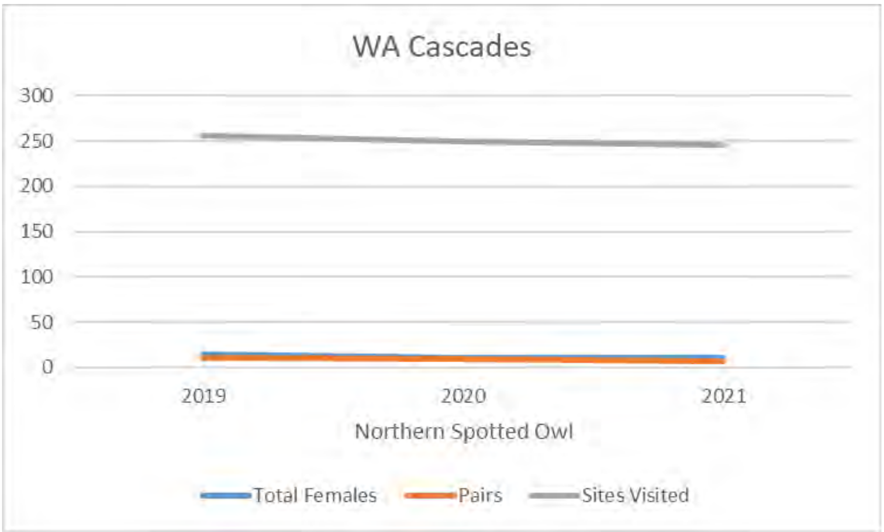


Figure 21. Washington Cascades-wide northern spotted owl survey effort, 2019-2021.

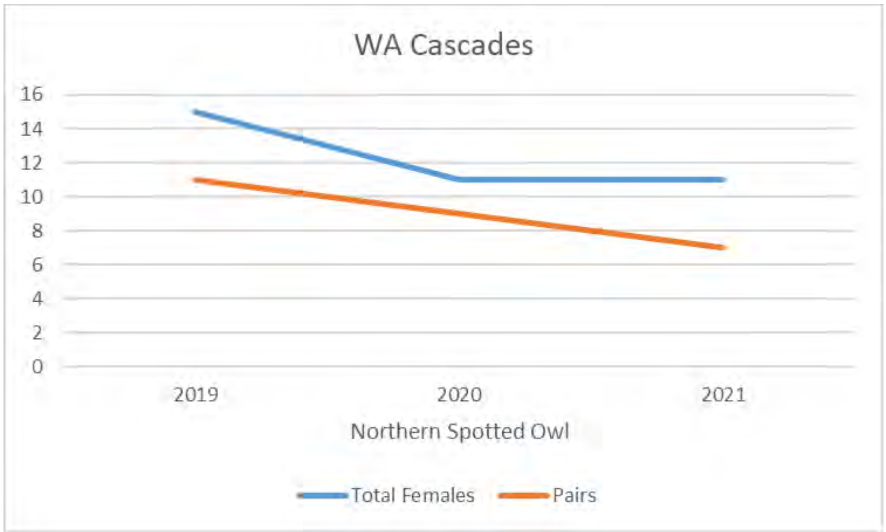


Figure 22. Washington Cascades-wide northern spotted owl survey results, 2019-2021.

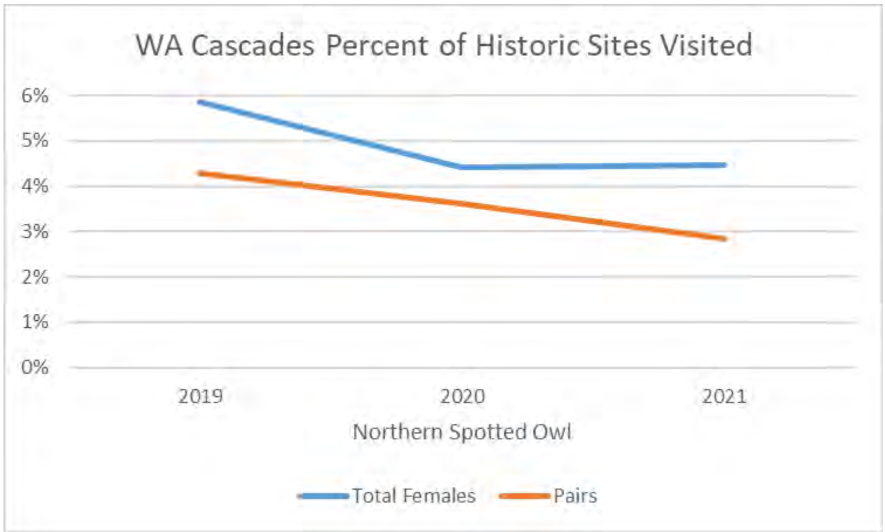


Figure 23. Washington Cascades-wide northern spotted owl survey results, percent of historic sites visited, 2019-2021.

The loss of suitable habitat was a major cause of the northern spotted owl's decline over the past century. Habitat loss is still considered a threat to the northern spotted owl, as habitat continues to be lost to wildfires, timber harvest, and other natural disturbances (R. J. Davis et al. 2016, 36). Monitoring of northern spotted owl habitat in the NWFP area from 1993 to 2012 indicated nesting-roosting habitat declined from 9.09 million acres to 8.95 million acres on Federal lands during the monitoring period, a loss of about 1.5 percent (R. J. Davis et al. 2016, 5). Across all lands (Federal and non-federal), habitat declined from approximately 12.5 million acres to 12.1 million acres, a loss of 3.4 percent (R. J. Davis et al. 2016, 22). More up to date information is produced (Hansen 2019) but not yet published. Wildfire has been the major cause of habitat loss on Federal lands, while timber harvest is the primary cause of habitat loss on non-federal lands. Although the maintenance, enhancement, and restoration of suitable habitat is a key element in the conservation of northern spotted owls, it is no longer the primary factor affecting population stability due to the steady increasing trend of barred owl populations (A. B. Franklin et al. 2021). Without removal or reduction of barred owl populations in the short-term, the northern spotted owl will likely become extirpated from portions of their range and possibly linger on as small populations in other areas until those populations are eliminated because of catastrophic events, resulting in the extinction of the subspecies (A. B. Franklin et al. 2021, 19).

Biology and Habitat

Northern spotted owls are territorial and usually monogamous. Home-range sizes vary geographically, generally increasing from south to north (USFWS 1990). Estimates of median size of their annual home range vary from 2,955 acres in the Oregon Cascades (Thomas et al. 1990) to 14,211 acres on the Olympic Peninsula (Forsman et al. 2001). Zabel et al. (1995) showed that northern spotted owl home ranges are larger where flying squirrels are the predominant prey and smaller where wood rats are the predominant prey. Home ranges of adjacent pairs overlap (Forsman, Meslow, and Wight 1984; Solis and Gutiérrez 1990), suggesting that the defended area is smaller than the area used for foraging. The portion of the home range used during the breeding season is smaller than that used in the remainder of the year (Forsman, Meslow, and Wight 1984). The northern spotted owl is relatively long-lived, has a long reproductive life span, invests significantly in parental care (Alston et al. 2018), and exhibits high adult survivorship relative to other North American owls (Forsman, Meslow, and Wight 1984). Northern spotted owls are sexually mature at 1-year of age, but rarely breed until they are 2 to 5 years of age (Forsman et al. 2002). Breeding females lay one to four eggs per clutch, with the average clutch size being two eggs; however, most northern spotted owl pairs do not nest every year, nor are nesting pairs successful every year (Forsman, Meslow, and Wight 1984; USFWS 1990; Anthony et al. 2006). The small clutch size, temporal variability in nesting success, and delayed onset of breeding all contribute to the relatively low fecundity of this species. Courtship behavior usually begins in February or March, and females typically lay eggs in late March or April. The timing of nesting and fledging varies with latitude and elevation (Forsman, Meslow, and Wight 1984). After they leave the nest in late May or June, juvenile northern spotted owls depend on their parents until they are able to fly and hunt on their own. Parental care continues after fledging into September (Forsman, Meslow, and Wight 1984; USFWS 1990). During the first few weeks after the young leave the nest, the adults often roost with them during the day. By late summer, the adults are rarely found roosting with their young and usually only visit the juveniles to feed them at night (Forsman, Meslow, and Wight 1984).

Natal dispersal of northern spotted owls typically begins in September and October with a few individuals dispersing in November and December (G. S. Miller, Small, and Meslow 1997; Forsman et al. 2002). Natal dispersal occurs in stages. Juveniles will settle for up to seven months at temporary locations between larger movements (G. S. Miller, Small, and Meslow 1997; Forsman et al. 2002) and may do this multiple times before establishing a territory. The median natal dispersal distance from fledging to “permanent” settlement was about 10 miles for males and 15.5 miles for females (Forsman et al. 2002). More recent study has found mean net natal dispersal distance of 14.8 miles with females dispersing ~50% farther than males with little directionality observed in the Washington Eastern Cascades (Hollenbeck et al. 2018). Breeding dispersal rates are climbing due to competition with barred owls with annual rates increasing ~3.6x from ~7% to ~25% (Jenkins et al. 2021).

During the transience (movement) phase, dispersers used mature and old-growth forest more than its availability (Forsman et al. 2002; G. S. Miller, Small, and Meslow 1997). Habitat supporting the transience phase of dispersal contains stands with adequate tree size and canopy cover to provide protection from avian predators and minimal foraging opportunities. Northern spotted owl can disperse through highly fragmented forested areas, the stand-level and landscape-level attributes of forests needed to facilitate successful dispersal have not been thoroughly evaluated or described (USFWS 2011, vi). A generic ≥ 40% canopy cover of trees with an average DBH ≥ 11” or ≥ 73’ tall in this area (Smith 2002) dispersal cover type definition is often used by federal action and regulatory agencies at the 1-acre scale but the study of roosting dispersing juveniles in this area indicate selection of cover that more closely fits common Nesting-Roosting cover type definitions (Sovern et al. 2015, 260). The source definition of dispersal cover type is: 50 percent of each quarter-township has forest of a mean DBH of at least 11 inches and a canopy closure of at least 40 percent (the 50-11-40 rule) (Thomas et al. 1990, 4; USFWS 2011, A-8).

During the colonization phase, mature and old growth forest was used at nearly twice its availability (G. S. Miller, Small, and Meslow 1997). Closed pole-sapling-saw timber habitat was used roughly in proportion to availability in both phases and may represent the minimum condition for movement. Open sapling and clearcuts were used less than expected based on availability during colonization (G. S. Miller, Small, and Meslow 1997). Habitat supporting the colonization phase of dispersal is generally equivalent to roosting and foraging habitat, although it may be in smaller amounts than needed to support nesting pairs. Successful juvenile dispersal may depend on locating unoccupied suitable habitat in close proximity to other occupied sites (USFWS 2011, A-8).

Dispersing juvenile northern spotted owls experience high mortality rates with more than 70 percent in some studies (G. S. Miller 1989; A. B. Franklin et al. 1999; USFWS 1990) from starvation, predation, and accidents. Juvenile dispersal survival probability has decreased by ~70%, 2002-2017 (Mikkelsen 2021, 78). Juvenile dispersal is thus a highly vulnerable life stage for northern spotted owls, enhancing the survivorship of juveniles during this period would play an important role in recovering populations of northern spotted owls (USFWS 2011, p. A-8).

Nesting and roosting habitat provides structural features for nesting, protection from adverse weather conditions, and cover to reduce predation risks for adults and young. Stand structures at nest sites tend to vary little across the northern spotted owl’s range. Nesting-roosting stands typically include an average 70-79 percent multi-layer multi-species conifer cover, 18-21” average DBH, 3-6 very large (≥ 30” DBH) trees per acres, a higher diameter diversity index, a higher old-growth structure index, an average stand height of 72-91’, an average stand age of 125-155 years, and a high incidence of large trees with various deformities (e.g., large cavities, broken tops, mistletoe infections, and other evidence of decadence), large snags, large accumulations of fallen trees and other woody debris on the ground, and sufficient open space below the canopy for northern spotted owls to fly (USFWS 2012b, 71905; R. J. Davis et al. 2016, 17).

Studies have found that northern spotted owl nest stands tend to have greater tree basal area, number of canopy layers, density of broken-top trees, number or basal area of snags, and volume of logs (Courtney et al. 2004) than non-nest stands. In some forest types, northern spotted owls nest in younger forest stands that contain structural characteristics of older forests (legacy features from previous stands before disturbance). In the portions of the northern spotted owl's range where Douglas-fir dwarf mistletoe occurs, infected trees provide an important source of nesting platforms (Buchanan, Irwin, and McCutchen 1993; Sovern and Taylor 2011). Nesting California spotted owls consistently occupy stands having a high degree of canopy cover that may provide thermoregulatory benefits (Weathers, Hodum, and Blakesley 2001, 686), allowing California spotted owls a wider range of choices for locating thermally neutral roosts near the nest site. A high degree of canopy cover may also conceal northern spotted owls, reducing potential predation. Studies of roosting locations found that northern spotted owls tended to use stands with greater vertical canopy layering, canopy cover, snag diameter, diameter of large trees, and amounts of large woody debris (Courtney et al. 2004). Northern spotted owls use the same habitat for both nesting and roosting; the characteristics of roosting habitat differ from those of nesting habitat only in that roosting habitat need not contain the specific structural features used for nesting (Thomas et al. 1990, 62). Aside from the presence of the nest structure, nesting and roosting habitat are generally inseparable (USFWS 2012b, 71905).

Foraging habitat is positively associated with tall trees (North et al. 2017) tree height diversity (North et al. 1999, 524), canopy cover (Irwin, Rock, and Miller 2000, 180; Courtney et al. 2004, 5), snag volume, density of snags greater than 20 in DBH (North et al. 1999, 524; Irwin, Rock, and Miller 2000, 179; Courtney et al. 2004, 5), density of trees greater than or equal to 31 in DBH (North et al. 1999, 524) density of trees 20 to 31 in DBH (Irwin, Rock, and Miller 2000, 179), and volume of woody debris (Irwin, Rock, and Miller 2000, 179). While the majority of studies reported strong associations with old-forest characteristics, younger forests with some structural characteristics (legacy features) of old forests (Carey, Horton, and Biswell 1992, 245; Irwin, Rock, and Miller 2000, 178), hardwood forest patches, and edges between old forest and hardwoods (Glenn, Hansen, and Anthony 2004, 47) are also used by foraging northern spotted owls. Within the East Cascades Dry Forest systems foraging habitat can also encompass forest stands that exhibit somewhat lower mean tree sizes (quadratic mean diameter 16 to 22 in (Irwin, Rock, and Rock 2012, 207) and basal area down to 39 square feet per acre (Irwin, Rock, and Rock 2013, 1031). However, foraging activity is still positively associated with densities of large trees (greater than 26 in) and increasing basal area (Irwin, Rock, and Rock 2012, 206). Stands dominated by Douglas-fir and white fir/Douglas-fir, or grand fir/Douglas-fir were preferred in some regions, whereas stands dominated by ponderosa pine were generally avoided (USFWS 2012b, 71905). Forsman et al. (2015, 118) found foraging northern spotted owls in this area selected for canopy cover ≥ 80% and lower slope positions.

Dispersal frequently refers to post-fledgling movements of juveniles, however this habitat type is described to include all movement during both the transience and colonization phase, and to encompass important concepts of linkage and connectivity among owl subpopulations. Population growth can only occur if there is adequate habitat in an appropriate configuration to allow for the dispersal of owls across the landscape. Although habitat that allows for dispersal may currently be marginal or unsuitable for nesting, roosting, or foraging, it provides an important linkage function among blocks of nesting habitat both locally and over the owl's range that is essential to its conservation. However, it is expected that dispersal success is highest when dispersers move through forests that have the characteristics of nesting-roosting and foraging habitats. Although northern spotted owls may be able to move through forests with less complex structure, survivorship is likely decreased. Dispersal habitat, at a minimum, consists of stands with adequate tree size and canopy cover to provide protection from avian predators and at least minimal foraging opportunities; there may be variations over the owl's range (e.g., drier site in the east Cascades or northern California). This may include younger and less diverse forest stands than foraging habitat, such as even-aged, pole-sized stands, but such stands should contain some roosting structures and foraging habitat to allow for temporary resting and feeding during the transience phase. Habitat supporting nonbreeding northern spotted owls, or the colonization phase of dispersal, is generally equivalent to nesting, roosting, and foraging habitat and is described above, although it may be in smaller amounts than that needed to support nesting pairs (USFWS 2012b, 71906). The study of roosting dispersing juveniles in this area indicate selection of cover that most closely fits common Nesting-Roosting cover type definitions (Sovern et al. 2015, 260)

Prey

The composition of the northern spotted owl's diet varies geographically and by forest type. Generally, flying squirrels are the most prominent prey for spotted owls in Douglas-fir and western hemlock forests (Forsman, Meslow, and Wight 1984) in Washington and Oregon, while dusky-footed wood rats are a major part of the diet in the Oregon Klamath, California Klamath, and California Coastal Provinces (Forsman, Meslow, and Wight 1984; Forsman et al. 2001; 2004; Ward, Gutierrez, and Noon 1998; Hamer et al. 2001). Depending on location, other important prey include deer mice, tree voles, red-backed voles, gophers, snowshoe hare, bushy-tailed wood rats, birds, and insects, although these species comprise a small portion of the northern spotted owl diet (USFWS 2011, A-9). It is likely that within the Taneum project area both flying squirrels and woodrats play an important part in northern spotted owl diets (Bevis et al. 1997, 72; Forsman et al. 2001, 144; USFWS 2012b, 71903). Recent study on California spotted owl found they consumed proportionally more flying squirrels (*Glaucomys oregonensis*) when their territories experienced more extensive and frequent fire within a long-standing (40+ year) fire management program and suggest restored fire regimes may increase the biomass and diversity of California spotted owl prey species (Hobart et al. 2020).

Threats

The northern spotted owl was listed as threatened throughout its range due to loss and adverse modification of northern spotted owl habitat as a result of timber harvesting and exacerbated by catastrophic events such as fire, volcanic eruption, and wind storms (USFWS 1990, 26114). In 1992 recognized threats that continue today included low populations, declining populations, limited habitat, declining habitat, inadequate distribution of habitat or populations, isolation of populations within physiographic provinces, predation, competition, and vulnerability to natural disturbance (USFWS 1992). Threats recognized presently include limited realized niche space (Jenkins et al. 2019, 4), limited landscape space (Schumaker et al. 2014, 587), time-lag impacts (G. M. Jones et al. 2017, 7), loss of genetic diversity (Funk et al. 2010, 1018; M. P. Miller et al. 2018, 828), secondary poisoning (Wiens et al. 2019, 4), and climate-driven disturbance (G. M. Jones et al. 2021; 2016, 303; 2019, 43; Peery et al. 2019a; 2019b; G. M. Jones, Kramer, et al. 2020, 17; G. M. Jones, Gutiérrez, et al. 2020, 23; Wan, Cushman, and Ganey 2019, 6).

Accelerating northern spotted owl habitat loss from uncharacteristic wildfire is occurring range wide (Figure 24). Loss rates in late-successional reserves are increasing (Figure 25). Loss rates in Okanogan-Wenatchee NF late-successional reserves are almost 5x higher than the entire network (Figure 26).

Barred owl presence on northern spotted owl territories is the primary factor negatively affecting apparent survival, recruitment, and ultimately, rates of population change (A. B. Franklin et al. 2021; Wiens et al. 2021). Current trends and the predictability about future trends in northern spotted owl populations suggests that these populations will face extirpation if competition from bared owls is not ameliorated in the short term (A. B. Franklin et al. 2021). A barred owl management plan (USFWS 2011, Recovery Action 30) is not produced. The Washington northern spotted owl population may be in an extinction vortex (Urness 2020).

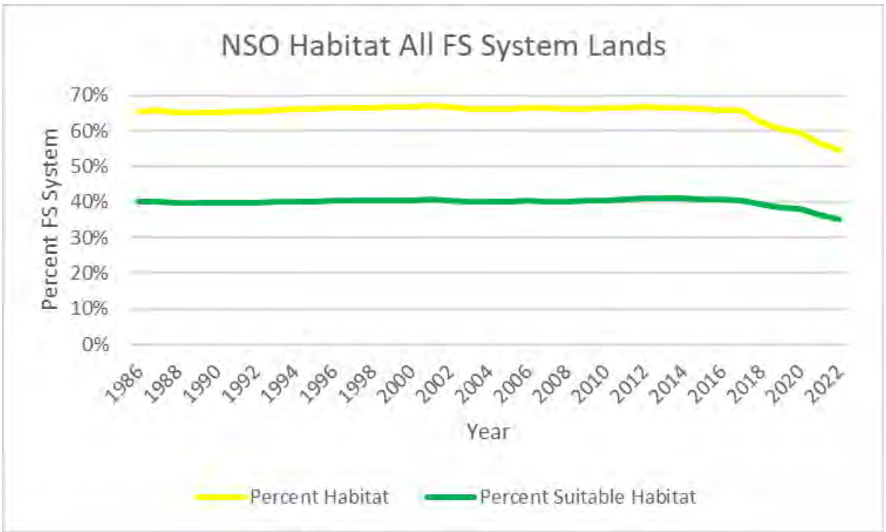


Figure 24. Northern spotted owl habitat, 1986-2022, all National Forest System lands. Habitat -17%, suitable habitat -12% since 1994.

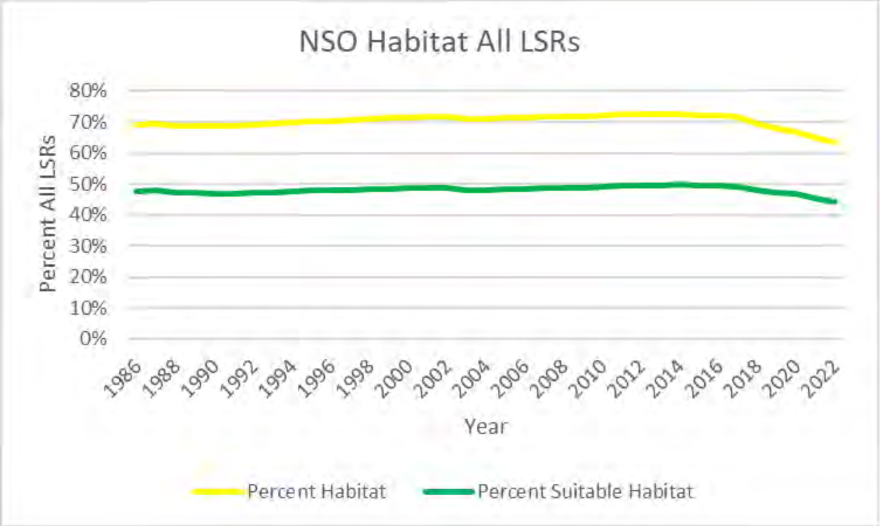


Figure 25. Northern spotted owl habitat, 1986-2022, entire Late-Successional Reserve network scale. Habitat -9%, suitable habitat -7% since 1994.

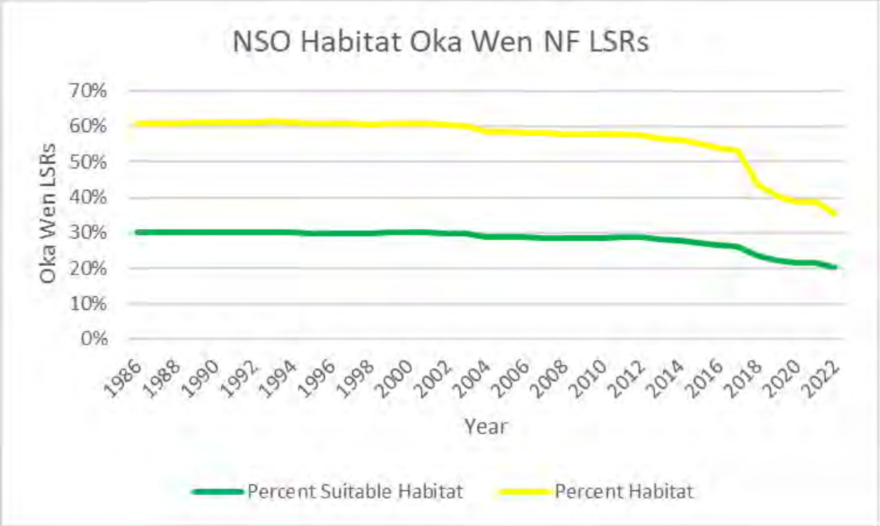


Figure 26. Northern spotted owl habitat, 1986-2022, Okanogan-Wenatchee NF Late-Successional Reserve scale. Habitat -42%, suitable habitat -33% since 1994.

Environmental Baseline

Northern spotted owl habitat was mapped within the Analysis Area using high-resolution aerial photography and a peer-reviewed set of definitions for dispersal and suitable habitat. Quality Assurance – Quality Control field visits occurred across the broader Project Area prior to alternative development to derive accuracy, and each action area was visited multiple times to ensure map accuracy in these locations (Figure 27). A regional northern spotted owl habitat layer (R. J. Davis et al. 2016) was used in a small portion of the Analysis Area outside of the Project Area where high-resolution aerial photography was unavailable.

Within the Project Area there are 21,337 acres (77%) of northern spotted owl habitat, 7,457 acres (27%) are suitable habitat, and 13,879 acres (50%) are dispersal-only habitat (Table 24). Habitat amounts in breeding- and home-ranges of 15 home-ranges intersecting the project area are shown in Table 25.

Table 24. Taneum Project northern spotted owl habitat.

NWFP Land Use Allocation	Northern Spotted Owl Habitat - Acres			
	Suitable	Dispersal	Non-habitat	SUM
Manastash Ridge LSR	6,027	10,233	1,975	18,235
Matrix	1,430	3,647	4,350	9,427
SUM	7,457	13,879	6,325	27,662

Taneum Project Area - Acres		
Northern Spotted Owl Habitat		
Suitable	7,457	21,337
Dispersal	13,879	
Non-habitat	6,325	
SUM	27,662	

Taneum Project Area - Percent		
Northern Spotted Owl Habitat		
Suitable	27%	77%
Dispersal	50%	
Non-habitat	23%	
SUM	100%	

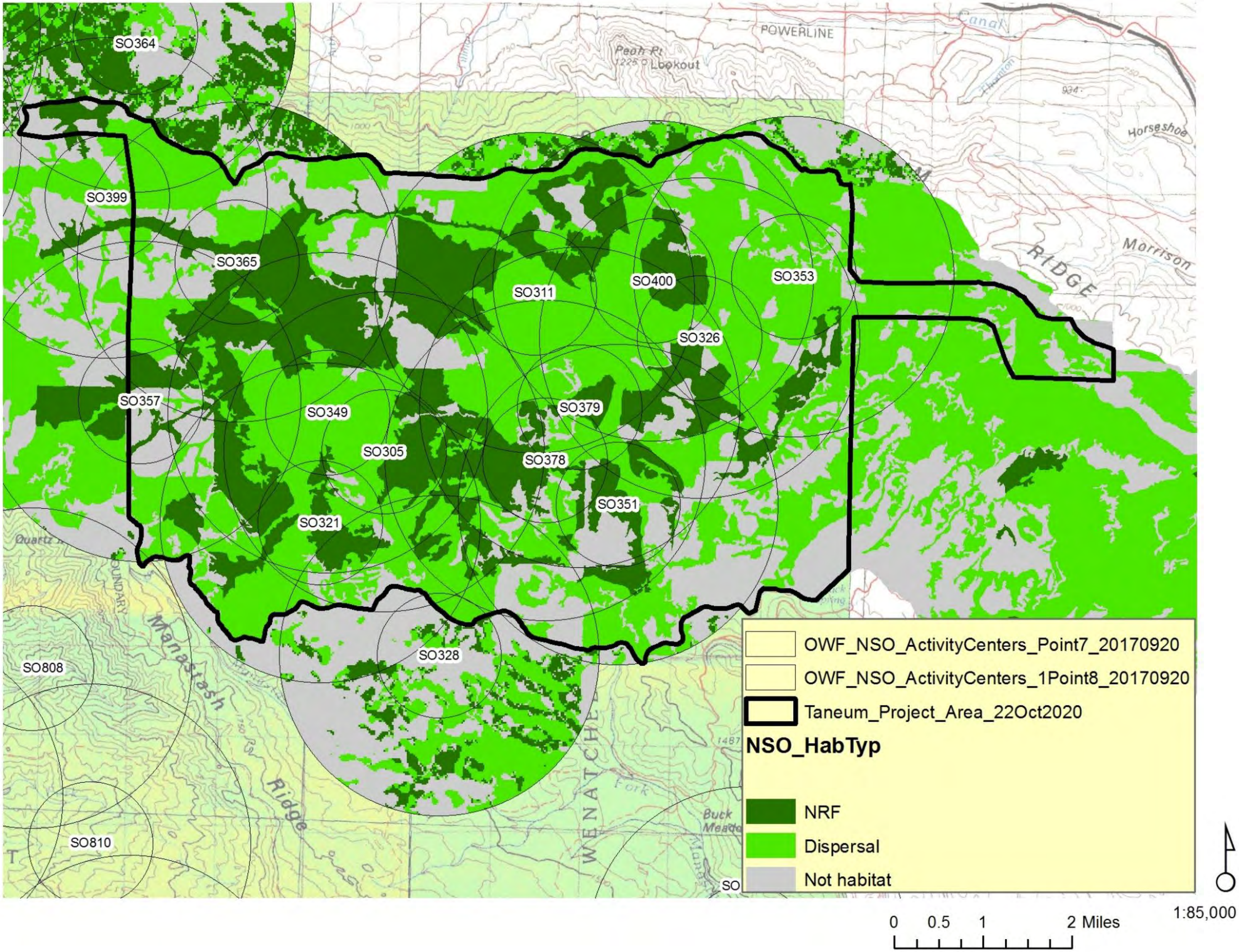


Figure 27. Northern spotted owl habitat and ranges in the Taneum Project.

Table 25. Northern spotted owl habitat amounts in breeding- and home-ranges of 15 home-ranges intersecting the project area.

Breeding-Range				
Northern Spotted Owl Habitat	Acres		Percent	
305 - Caseknife West Fork				
Suitable	365	938	37%	95%
Dispersal	573		58%	
Non-habitat		47		5%
SUM		985		100%
311- Taneum North Fork				
Suitable	242	985	25%	100%
Dispersal	742		75%	
Non-habitat		0		0%
SUM		985		100%
321 - Mole Mountain				
Suitable	399	895	41%	91%
Dispersal	495		50%	
Non-habitat		90		9%
SUM		985		100%
326 - Gooseberry Flat				
Suitable	319	893	32%	91%
Dispersal	574		58%	
Non-habitat		92		9%
SUM		985		100%
328 - Frost Meadows				
Suitable	90	417	9%	42%
Dispersal	327		33%	
Non-habitat		568		58%
SUM		985		100%
349 - Taneum South Fork				
Suitable	94	966	10%	98%
Dispersal	872		89%	
Non-habitat		19		2%
SUM		985		100%
351 - Frost Creek				
Suitable	361	651	37%	66%
Dispersal	290		29%	
Non-habitat		334		34%
SUM		985		100%
353 - Osborn Point				
Suitable	22	831	2%	84%
Dispersal	809		82%	
Non-habitat		154		16%
SUM		985		100%
357 - Taneum Creek Upper				
Suitable	409	556	41%	56%
Dispersal	148		15%	
Non-habitat		429		44%
SUM		985		100%
364 - South Cle Elum Ridge				
Suitable	369	554	37%	56%
Dispersal	185		19%	
Non-habitat		431		44%
SUM		985		100%
365 - Taneum Ridge East				
Suitable	559	785	57%	80%
Dispersal	225		23%	
Non-habitat		200		20%
SUM		985		100%
378 - Caseknife East Fork				
Suitable	470	801	48%	81%
Dispersal	332		34%	
Non-habitat		184		19%
SUM		985		100%
379 - Caseknife Lower				
Suitable	274	876	28%	89%
Dispersal	601		61%	
Non-habitat		110		11%
SUM		985		100%
399 - Butte Creek				
Suitable	105	657	11%	67%
Dispersal	552		56%	
Non-habitat		328		33%
SUM		985		100%
400 - Taneum First Creek				
Suitable	352	956	36%	97%
Dispersal	604		61%	
Non-habitat		29		3%
SUM		985		100%

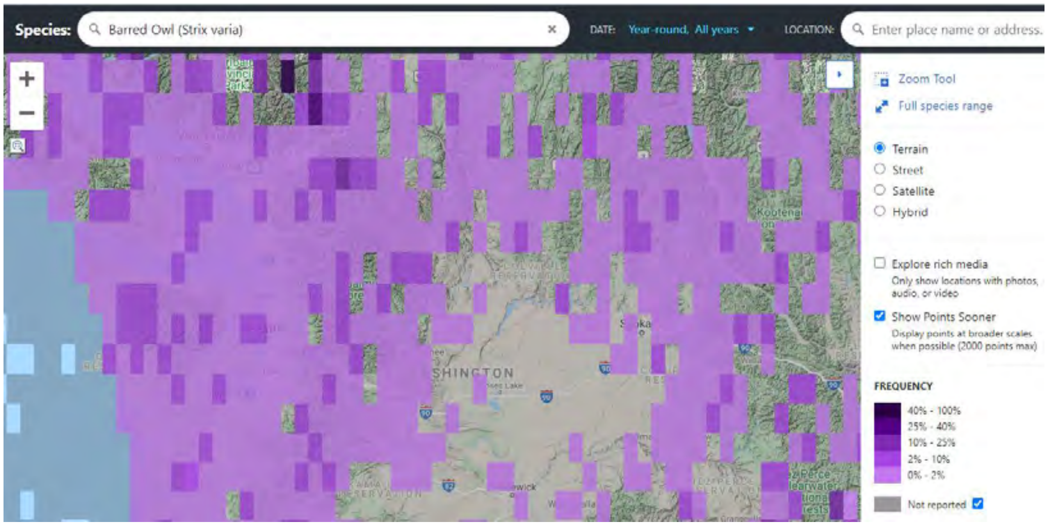
Home-Range				
Northern Spotted Owl Habitat	Acres		Percent	
305 - Caseknife West Fork				
Suitable	2,620	5,719	40%	88%
Dispersal	3,098		48%	
Non-habitat		795		12%
SUM		6,514		100%
311- Taneum North Fork				
Suitable	2,348	5,723	36%	88%
Dispersal	3,375		52%	
Non-habitat		791		12%
SUM		6,514		100%
321 - Mole Mountain				
Suitable	1,700	4,990	26%	77%
Dispersal	3,290		51%	
Non-habitat		1,525		23%
SUM		6,514		100%
326 - Gooseberry Flat				
Suitable	1,537	5,512	24%	85%
Dispersal	3,975		61%	
Non-habitat		1,003		15%
SUM		6,514		100%
328 - Frost Meadows				
Suitable	977	3,472	15%	53%
Dispersal	2,494		38%	
Non-habitat		3,042		47%
SUM		6,514		100%
349 - Taneum South Fork				
Suitable	3,058	5,682	47%	87%
Dispersal	2,624		40%	
Non-habitat		832		13%
SUM		6,514		100%
351 - Frost Creek				
Suitable	1,684	4,281	26%	66%
Dispersal	2,597		40%	
Non-habitat		2,233		34%
SUM		6,514		100%
353 - Osborn Point				
Suitable	894	5,266	14%	81%
Dispersal	4,372		67%	
Non-habitat		1,248		19%
SUM		6,514		100%
357 - Taneum Creek Upper				
Suitable	1,587	4,409	24%	68%
Dispersal	2,822		43%	
Non-habitat		2,105		32%
SUM		6,514		100%
364 - South Cle Elum Ridge				
Suitable	1,905	3,513	29%	54%
Dispersal	1,609		25%	
Non-habitat		3,001		46%
SUM		6,514		100%
365 - Taneum Ridge East				
Suitable	2,326	4,644	36%	71%
Dispersal	2,318		36%	
Non-habitat		1,870		29%
SUM		6,514		100%
378 - Caseknife East Fork				
Suitable	2,148	5,221	33%	80%
Dispersal	3,073		47%	
Non-habitat		1,293		20%
SUM		6,514		100%
379 - Caseknife Lower				
Suitable	2,134	5,470	33%	84%
Dispersal	3,336		51%	
Non-habitat		1,044		16%
SUM		6,514		100%
399 - Butte Creek				
Suitable	1,269	3,772	19%	58%
Dispersal	2,503		38%	
Non-habitat		2,743		42%
SUM		6,514		100%
400 - Taneum First Creek				
Suitable	1,641	5,757	25%	88%
Dispersal	4,116		63%	
Non-habitat		757		12%
SUM		6,514		100%

Contemporary northern spotted owl surveys began in the area in the 1980s (Richards 1989) with comprehensive surveys on the Cle Elum Ranger District starting in 1989 (Lint et al. 1999) (Table 26). Comprehensive survey in 2021 indicates 5 singles males and 1 pair on the Cle Elum Demography Study Area (Ashlee Mikkelsen personal communication 9/7/2021) and 1 single male and 1 single female on the adjoining Rainier Demography Study Area (Rossi 2021).

Table 26. Northern spotted owl survey results for 15 home-ranges intersecting the project area, 1989-2022.

Site Number	Site Name	Northern Spotted Owl Site Status																																
		Year																																
		1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
305	Caseknife West Fork	No Survey	Nest Located	Nest Located	Pair	Pair	Nest Located	Nest Failed	Nest Located	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant
311	Taneum North Fork	Pair	Nest Failed	Nest Failed	Nest Failed	Pair	Nest Failed	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant
321	Mole Mountain	Nest Located	Nest Located	Nest Located	Nest Located	Single Male	Nest Located	Nest Located	Single Female	Pair	Nest Located	Pair	Single Female	Vacant	Vacant	Pair	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant
326	Gooseberry Flat	Nest Located	Nest Failed	Nest Located	Nest Located	2 Owls (MF) Pair Status Not	Pair	2 Owls (MF) Pair Status Not	Vacant	Vacant	Single Female	Vacant	Vacant	Vacant	Owl(s) Present, Status Unknow	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant
328	Frost Meadows	No Survey	Nest Located	Pair	Nest Located	Pair	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant
349	Taneum South Fork	No Survey	No Survey	Pair Nested, Nest not Located	Nest Located	2 Owls (MF) Pair Status Not	Vacant	Vacant	Vacant	Vacant	Vacant	2 Owls (MF) Pair Status Not	Vacant	Nest Located	Vacant	Vacant	Nest Located	Nest Located	Nest Located	Nest Located	Nest Located	Single Male	Pair	Nest Located	Pair Nested, Nest not Located	Nest Located	Nest Located	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant
351	Frost Creek	No Survey	Nest Located	Nest Located	Nest Located	Pair	Nest Located	Single Male	Single Female	Single Female	Single Female	Pair	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant
353	Osborn Point	No Survey	Pair	Pair	Nest Located	Vacant	Vacant	Vacant	Single Female	Vacant	Vacant	Owl(s) Present, Status Unknow	Vacant	Single Female	Vacant	Vacant	Vacant	Owl(s) Present, Status Unknow	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant
357	Taneum Creek Upper	No Survey	Nest Located	Nest Located	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Owl(s) Present, Status Unknow	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant
364	South Cle Elum Ridge	No Survey	Single Male	Pair	Nest Located	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	No Survey	No Survey	No Survey	No Survey	No Survey	No Survey	No Survey	No Survey	No Survey	No Survey	No Survey	No Survey	No Survey	No Survey	No Survey	No Survey	No Survey	No Survey	No Survey	No Survey	No Survey	No Survey	No Survey
365	Taneum Ridge East	Nest Located	Nest Located	Pair Nested, Nest not Located	Pair Nested, Nest not Located	Pair	Pair Nested, Nest not Located	Nest Located	Nest Located	Pair	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant
378	Caseknife East Fork	No Survey	No Survey	No Survey	Nest Located	Pair	Nest Located	Pair Nested, Nest not Located	Nest Located	Pair	Single Female	Pair	Nest Located	Nest Located	Single Female	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant
379	Caseknife Lower	No Survey	No Survey	No Survey	Pair Nested, Nest not Located	Pair	Nest Located	Pair	Nest Located	Single Female	Nest Located	Pair Nested, Nest not Located	Nest Located	Pair	Single Female	Single Female	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Owl(s) Present, Status Unknow	Vacant	Pair	Nest Located	Pair Nested, Nest not Located	Nest Failed	Nest Located	Single Male	Single Male
399	Butte Creek	No Survey	No Survey	No Survey	No Survey	No Survey	No Survey	No Survey	No Survey	No Survey	No Survey	Single Female	Single Female	No Survey	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant
400	Taneum First Creek	No Survey	No Survey	No Survey	No Survey	No Survey	No Survey	No Survey	No Survey	No Survey	No Survey	No Survey	Pair	Single Female	Nest Located	Nest Located	Nest Located	Nest Located	Nest Located	Pair	Nest Located	Nest Located	Nest Located	Pair	Single Female	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant	Vacant

Barred owls are ubiquitous across the forested landscapes of Washington (Figure 28) and the Project Area (Figure 29). Lesmeister et al. (2022, 23) reports 70% barred owl occupancy in the Cle Elum study area in 2020, some of these sample hexagons occur in areas of recent large-scale high-severity fire with very low remaining habitat suitability.



Species: Barred Owl (Strix varia)

DATE: Year-round, All years

LOCATION: Enter place name or address.

Figure 28. Barred owl distribution and frequency in Washington (eBird 2022).

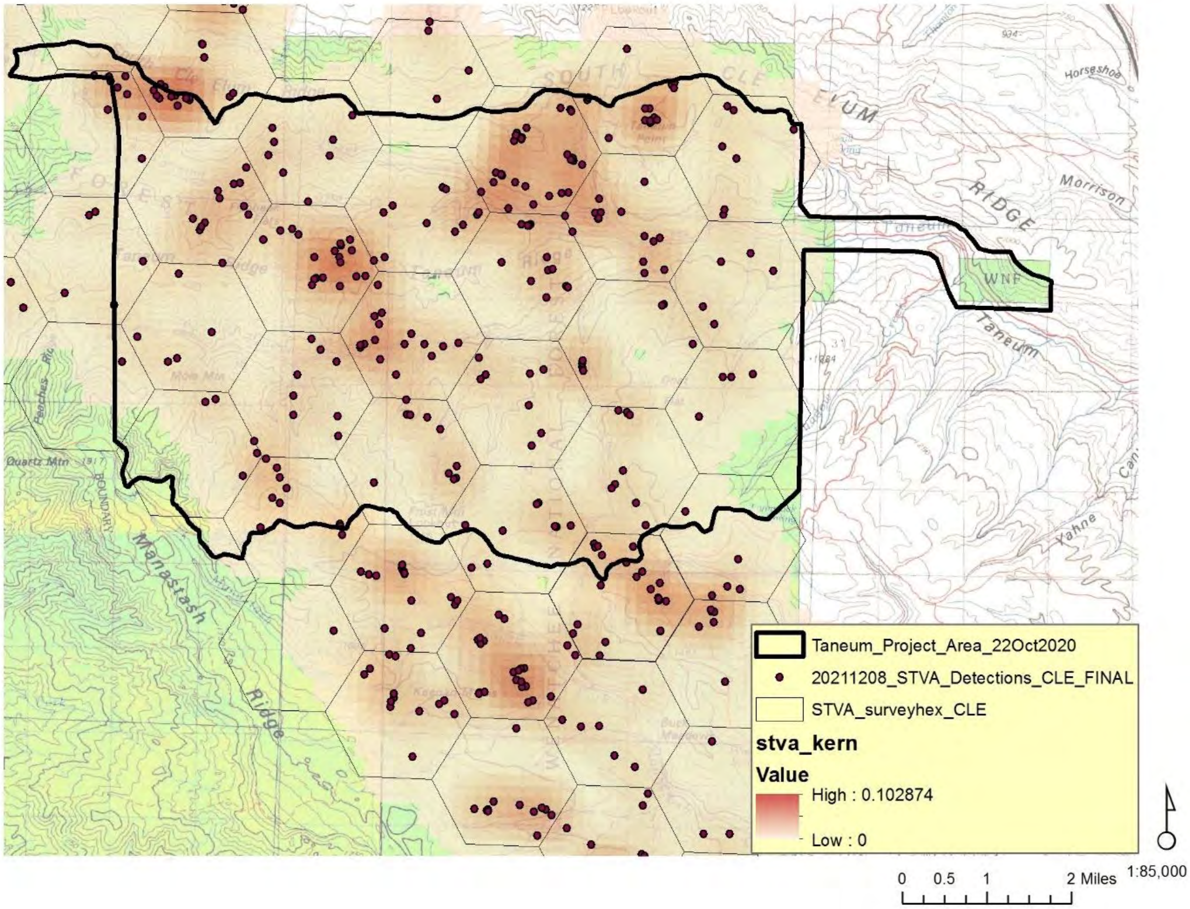


Figure 29. Barred owl distribution in the vicinity of the Taneum Project Area concurrent with barred owl removal efforts in the same area (Wiens et al. 2021).

Effects of the Proposed Action on Northern Spotted Owl

For the purpose of the following discussion of effects to northern spotted owl habitat, the degree of change to habitat function has been categorized using the following terms: removal, downgrade, and degrade. The term removal represents a complete loss of habitat function following an effect. Downgrade refers to a reduction in the function of habitat (i.e., an area that functioned as suitable habitat before the action provides only dispersal habitat following the action). Dispersal habitat cannot be downgraded, only degraded, or removed, because it is already the lowest functional class of habitat described for the northern spotted owl. Degrade indicates a reduction in habitat quality but not habitat function following the action. Table 27 shows a summary of effects of all actions in the project on northern spotted owl habitat as further explained below.

Table 27. Effects to northern spotted owl habitat by land use allocation and action type.

Taneum Project Area									
Land Use Allocation	Northern Spotted Owl Habitat Effect	Treatment – Acres*							
		ES SECC	ES YFMS	GF YFMS	OSP	Admin Site	RX Fire Only	Road	SUM
LSR	Suitable Degrade	0	0	0	0	0	44	103	146
	Suitable Downgrade	0	0	0	0	3	0	0	3
	Suitable Removal	0	0	0	0	0	0	0	0
	Dispersal Degrade	0	0	0	0	0	2,439	149	2,588
	Dispersal Removal	471	535	330	255	19	0	0	1,611
	Non-habitat TX	22	33	24	672	3	219	10	983
	SUM	494	567	355	927	25	2,702	262	5,332
Matrix	Suitable Degrade	0	0	0	0	0	0	0	0
	Suitable Downgrade	0	0	0	0	0	0	0	0
	Suitable Removal	0	0	0	0	0	0	0	0
	Dispersal Degrade	0	0	0	0	0	220	105	325
	Dispersal Removal	38	59	0	42	21	0	0	161
	Non-habitat TX	3	3	0	204	0	180	55	445
	SUM	41	62	0	246	21	400	160	931
Total SUM		535	630	355	1,173	46	3,102	422	6,263

*For impacts that overlap, the highest impact column is reported.

Terrestrial Vegetation Treatments

The Taneum Restoration project would implement restoration treatments that meet the purpose and need for late-successional wildlife species, implement actions identified in the Manastash Ridge LSRA (1997b), and meet stand and landscape level risk reduction and silviculture (habitat restoration) objectives. The Taneum Restoration Project was designed to be consistent with the objectives, landscape criteria, and stand criteria contained within the Northwest Forest Plan (1994), Wenatchee Forest Wide LSRA (1997a) and Manastash Ridge LSRA (1997b) and is focused on the creation and/or maintenance of late successional forest habitats, including open forest habitat dominated by large, old ponderosa pine and Douglas-fir trees, and dense multi-layered forest with a mix of conifer species (NWFP S&G 1994, B-2). Commercial and non-commercial thinning would occur outside of existing late-successional old forest habitats, which includes northern spotted owl nesting, roosting, and foraging habitat, as current habitat amounts, and connectivity are below desired conditions (upper end of the historic range of variability - HRV). Collectively, these actions would enhance the sustainability of existing northern spotted owl suitable habitat at the stand and landscape scales by restoring stand conditions conducive to low severity fire and strategically locate treatments to interrupt fire flow. In addition, the proposed treatments would create stand conditions that would promote the development of future northern spotted owl suitable habitat, moving landscape conditions closer to the desired conditions for the amount and connectivity of northern spotted owl suitable habitat. Ultimately, this proposal creates a balance between providing late successional habitat that supports the recovery and viability of associated species, while also enhancing the resiliency of Manastash Ridge LSR in the Project Area to a changing climate and the inevitable wildfire (The 2021 Windy Pass 75-acre fire burned in the Taneum Restoration Project Analysis Area and the twin start 2021 Schneider Springs 101,633-acre fire burned in the nearby Naches River drainage. Forest-wide fire in 2021 impacted 43 northern spotted owl home-ranges and 1 of 6 remaining pair home-ranges).

Risk Reduction Treatments (4,967 acres, Table 28): Risk Reduction Objectives are strategically designed to reduce fire risk and movement across the watershed and LSR, thereby reducing the risk of large-scale loss of existing and future northern spotted owl habitat. A secondary outcome of the risk reduction treatments would result in habitat for late-successional wildlife species (example: northern spotted owl or white-headed woodpecker) and bird species of continental importance: Cassin’s finch, pine siskin, flammulated owl, olive-sided flycatcher, evening grosbeak, and rufous hummingbird (PIF 2016).

Silvicultural Enhancement Treatments (828 acres, Table 28): The goal for the Manastash LSR is to increase the sustainability of late successional habitat by reducing fuel loading and restoring stand characteristics so that landscapes are capable of functioning within their inherent disturbance regimes. The proposed treatments (including landings and haul routes) are designed to avoid stands currently identified as late-successional habitat (suitable habitat for northern spotted owls) and to leave complex patches within treated stands. Therefore, implementation of treatments would not decrease northern spotted owl suitable habitat and would accelerate the trajectory of future northern spotted owl habitat by thinning around larger trees, including biological legacies (J. F. Franklin et al. 2000), and reducing tree density in younger stands to accelerate tree growth. Treatments would accelerate the development of large trees. As the trees in these areas grow, less forest would be in the early successional structure class and would better mimic historical reference conditions. Treatments would also reduce forest fragmentation in the Project Area. Because it takes such a long time to actually grow northern spotted owl habitat, the direct short-term effect to the amount or connectivity of northern spotted owl habitat is neutral. However, over the long-term these stands will develop into larger, contiguous patches of structurally complex mixed and montane conifer forests with a dense overstory canopy and greater number of large trees and snags in the overstory. Over the long-term, habitat would be within the desired condition (upper end of HRV) and connectivity would be enhanced.

Table 28. Effects to northern spotted owl habitat by vegetation treatment.

Taneum Project Area								
Land Use Allocation		Northern Spotted Owl Habitat Effect	Vegetation Treatment - Acres					
			ES SECC	ES YFMS	GF YFMS	OSP	RX Fire Only	SUM
LSR	Risk Reduction	Suitable Degrade	0	0	0	0	44	44
		Suitable Downgrade	0	0	0	0	0	0
		Suitable Removal	0	0	0	0	0	0
		Dispersal Degrade	0	0	0	0	2,436	2,436
		Dispersal Removal	209	535	330	178	0	1,252
		Non-habitat TX	22	33	24	187	219	485
		SUM	231	567	355	365	2,699	4,217
	Silvicultural Enhancement	Suitable Degrade	0	0	0	0	0	0
		Suitable Downgrade	0	0	0	0	0	0
		Suitable Removal	0	0	0	0	0	0
		Dispersal Degrade	0	0	0	0	3	3
		Dispersal Removal	262	0	0	77	0	339
		Non-habitat TX	1	0	0	485	0	486
		SUM	263	0	0	562	3	828
Matrix - Restoration		Suitable Degrade	0	0	0	0	0	0
		Suitable Downgrade	0	0	0	0	0	0
		Suitable Removal	0	0	0	0	0	0
		Dispersal Degrade	0	0	0	0	220	220
		Dispersal Removal	38	59	0	42	0	140
		Non-habitat TX	3	3	0	204	180	390
		SUM	41	62	0	246	400	749
		Total SUM	272	630	355	611	3,099	5,795

The revised northern spotted owl recovery plan (2011) recommends that dynamic, disturbance-prone forests of the eastern Cascades be actively managed in a way that reconciles the overlapping goals of northern spotted owl conservation, response to climate change, and restoration of dry forest ecological structure, composition and process. Specifically, the Taneum Restoration Project is consistent with Recovery Actions 6, 10 and 32.

Recovery Action 6 (USFWS 2011, III–19) recommends silvicultural treatments in younger forest that occurs between and around the older stands in order to accelerate the development of these stands into future northern spotted owl nesting habitat, even if doing so temporarily degrades existing dispersal habitat. By treating areas that are not currently providing suitable habitat, we create opportunities to protect existing suitable habitat from large scale, high-severity fires and to set appropriate stands on an accelerated trajectory to become suitable habitat in the future.

The goal of Recovery Action 10 is to conserve northern spotted owl sites and high value habitat within moist forest types. The Taneum Project would protect 7,454 acres of suitable habitat. As described previously, treatment outside of suitable habitat would improve ecological conditions. USFWS has supported projects such as the Taneum Restoration Project, *'whose intent is to provide long-term benefits to forest resiliency and restore natural forest dynamic process, when this management is implemented in a landscape context and with carefully applied prescriptions to promote long term forest health'* (USFWS 2011, III–44; 2019).

Recovery Action 32 specifically points to the Okanogan-Wenatchee National Forest Restoration Strategy (USFS 2012a) as an example of a site-specific plan that could be used to meet the northern spotted owl recovery plan goals (USFWS 2011, III–68). The Taneum Landscape Evaluation used the OWNF Restoration Strategy to identify priorities and map habitat within the Taneum Project Area. As such, for this project, RA 32 habitat is embedded within suitable northern spotted owl habitat. This project is designed to avoid existing suitable habitat across the LSR and within the lone occupied northern spotted owl site (site #379) within the Taneum Project Area to be consistent with Recovery Action 32. No vegetation treatments would occur within the 100-acre core area of site #379.

In addition to the information provided by the landscape evaluation, we used the Forest Vegetation Simulator (FVS) to simulate the anticipated results of treatments on a representative selection of stands. The FVS runs were designed to describe/capture the expected diversity in treatment units and to illustrate the variability anticipated with these treatments. FVS results provided an examination of whether silvicultural treatments would result in the desired outcome under the time period in question. This helped us answer the question of why here, why now?

We applied FVS to stands with the following habitat restoration objectives within the associate stand conditions:

Objective: Development of northern spotted owl suitable habitat in the long-term
  a. Stand Condition 2: Off-site Pine
  b. Stand Condition 3: Early Seral--Stem Exclusion Closed Canopy
  c. Stands Treated with Rx Fire only (mix of stand conditions)

FVS simulations were run over 100 years following treatment and summarized for 30-, 60-, and 100-years post treatment. FVS output is summarized in the following section. The results from the FVS simulations provide additional evidence of consistency with the 1997 LSRA in that those treatments would encourage late-successional characteristics within stands that would otherwise not happen or do so at a slower pace, thereby increasing susceptibility to wildfire risk.

Objective: Old-Forest Multi Story, northern spotted owl suitable habitat (long-term)
Stand Condition 2: Off-site Pine, Stand Condition 3: Early Seral--Stem Exclusion Closed Canopy, Stand Condition 3: Early Seral--Stem Exclusion Closed Canopy, Stands Treated with Rx Fire only (mix of stand conditions).

The stands selected for long-term development of northern spotted owl suitable habitat were strategically located in places with suitable growing conditions in locations that would create larger patches of habitat or improve connectivity between habitat patches for late-successional species. Existing conditions varied from dense, small structure grand-fir stands that are very susceptible to fire to more open stands with good potential to release and create large tree structure. Developing northern spotted owl suitable habitat is a long-term prospect. As such these simulations represent expected outcomes within 100 years and depend on the initial age of the stand (example: younger stands would take longer to develop). Developing late-successional characteristics would continue over the next 100+ years.

Treatment: Prescribed Fire
FVS results indicated proposed treatments within these stand types would result in:

1. An initial decrease in stand canopy cover, from a range of ~55 to 76% to ~14 to 50% immediately post-treatment and ~52 to 60% after 100 years,
2. a shift in species composition from grand fir dominated stands to stands with more fire resilient species composition, consisting of Douglas-fir and western larch,
3. a substantial shift in size class distribution, from densely stocked small diameter stands to stands with more trees in the medium to large size classes (>24" DBH),
4. an increase in overall tree height,
5. an increase in the size (DBH) of standing snags and down wood.
6. Development of multi-layer structure.

In contrast, FVS results indicated that if these stands were not treated then we might expect the following:

1. canopy cover would gradually increase from a range of ~55 to 76% to ~70 to 85%,
2. species composition would be dominated by grand fir.
3. tree diameters would be concentrated within the small to medium classes over the first 60 years. In the final 40 years we would see some larger tree growth but a substantial increase in the proportion of standing and down dead trees in smaller size classes.
4. Lack of multiple canopy layers.

If these stands were left untreated, the lack of large tree structure and multiple canopy layers would not contribute to suitable habitat for northern spotted owls or develop late-successional habitat characteristics. In addition, the substantial increase in small diameter snags and downed wood would increase fuel loads and wildfire risk making the longevity of these stands questionable.

Treatment: Mechanical Thinning
FVS results indicated proposed treatments within these stand types would result in:

1. An initial decrease in stand canopy cover, from a range of ~62 to 66% to ~22 to 25% immediately post-treatment and ~44 to 55% after 100 years,
2. species composition dominated by Douglas-fir,
3. a substantial shift in size class distribution, from densely packed small diameter stands (ie. <20" DBH) to stands with substantially more trees in the large size classes (>40" DBH),
4. an increase in overall tree height,
5. an increase in the size (DBH) and density of standing snags and down wood.
6. Development of multi-layer structure.

In contrast, FVS results indicated that if these stands were not treated then we might expect the following:

1. Stands would deteriorate over time as a result of density-related mortality,
2. In some cases, canopy cover would decrease from ~66 to 37%, while in others it would decrease slightly from ~62 to 58%,
3. species composition would shift from Douglas-fir to stands dominated by grand fir

4. tree diameters would be concentrated within the small to medium classes over the first 60 years. In the final 40 years we would see minimal larger tree growth and a substantial increase in the proportion of standing and down dead trees in smaller size classes.
5. No development of multiple canopy layers.

The lack of large tree structure, multiple canopy layers and canopy cover would not contribute to suitable habitat for northern spotted owls or the development of late-successional habitat characteristics. In addition, the substantial increase in small snags and downed wood would increase fuel loads and wildfire risk making the longevity of these stands questionable.

We also employed FVS analysis (over a 100-year time period) within a sample of dispersal habitat stands that were classified as Stand Condition 3: Early Seral--Stem Exclusion Closed Canopy and results indicated proposed treatments within these stand types would result in:

1. An immediate and sustained decrease in stand canopy cover, from ~64% to ~36%,
2. a shift in species composition from Douglas-fir dominated stands to a much larger proportion of ponderosa pine,
3. a shift in size class distribution, with substantially more trees in the medium to large size classes (>24” DBH),
4. an increase in tree height,
5. an increase in the size (DBH) of standing snags and down wood.

In the short term, these stands would provide habitat for white-headed woodpeckers (late-successional forest associated species), as well as create more resilient stands that may interrupt fire flow in proximity to existing northern spotted owl suitable habitat. They would also contribute to dispersal habitat as canopy cover returns in the short/mid-term and complex patches provide connectivity.

In contrast, FVS results indicated that if these stands were not treated then we might expect the following:

1. canopy cover would gradually decrease from 64% to 47%,
2. species composition would be dominated by Douglas-fir
3. tree diameters would be concentrated within the small to medium classes over the first 60 years. In the final 40 years we would see some larger tree growth but a substantial increase in the proportion of standing and down dead trees in smaller size classes.

The lack of large tree structure and moderate canopy cover would not contribute to suitable habitat for northern spotted owls or white-headed woodpecker. Additionally, an increase in small diameter snags and downed wood would increase fuel loads and wildfire risk. These results support the need for treatment to increase large tree structure in dry and mesic forest types along the drier eastern portion of the LSR.

Road/Trail Actions

Routine maintenance of roads and trails would have no effect on northern spotted owl habitat. In addition to potential noise impacts to northern spotted owl from road/trail actions (Table 21), danger tree mitigation (USDA 2016) of ≤ 2 trees per acre associated with commercial haul and related temporary road construction would degrade 254 acres of dispersal habitat and 103 acres of suitable habitat (Table 27). Mitigated danger trees would be left on site.

Administrative Site Management

Hazard tree mitigation in 3 developed recreation sites would downgrade 3 acres of suitable habitat and remove 40 acres of dispersal habitat over 10 years (Table 27).

Connectivity

The limited dispersal-capable landscape (R. J. Davis et al. 2016, 12) connectivity that the project area provides would be maintained. Total dispersal acres in the project area would be reduced from 77% pre-treatment to 71% post-treatment (Table 29), still well above a 50-11-40 threshold (Thomas et al. 1990, 4; USFWS 2011, A-8). Dispersal capability within the project area would be maintained (Figure 30). Also, please see the dispersal-capable landscape discussion on page 86.

Table 29. Taneum Project total effect on northern spotted owl habitat.

Taneum Project Area - Acres							
Pre-Treatment			Treatment Effect on Northern Spotted Owl Habitat		Post-Treatment		
77%	27%	7,457	Suitable no TX	7,308	7,454	27%	71%
			Suitable Degrade	147			
			Suitable Downgrade	3			
			Suitable Removed	0			
	50%	13,879	Dispersal no TX	9,195	12,111	44%	
			Dispersal Degrade	2,913			
			Dispersal Removed	1,772			
23%		6,325	Non-habitat no TX	4,896	8,096	29%	
			Non-habitat TX	1,428			
100%		27,662	SUM	27,662	27,662	100%	

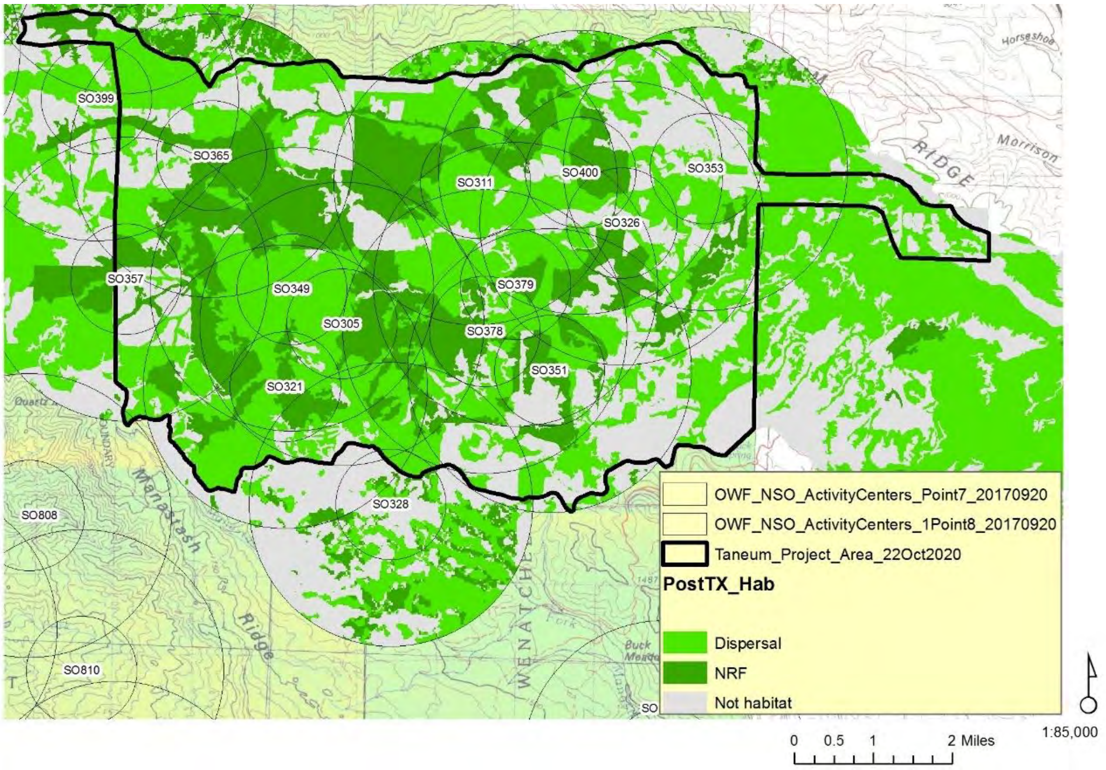


Figure 30. Post treatment northern spotted owl habitat.

Effects within Northern Spotted Owl Breeding- and Home-Ranges

Impacts of actions described above are applied to individual northern spotted owl breeding- and home-ranges in Table 30.

Table 30. Effect of treatment on breeding- and home-ranges of 15 northern spotted owl home-ranges intersecting the project area.

Breeding Range								Home Range							
Pre-Treatment Acres			Treatment Effect on Northern Spotted Owl Habitat - Acres		Post-Treatment Acres			Pre-Treatment Acres			Treatment Effect on Northern Spotted Owl Habitat - Acres		Post-Treatment Acres		
305 - Caseknife West Fork															
95%	37%	365	Suitable No TX	365	365	37%	95%	88%	40%	2,620	Suitable No TX	2,619	2,619	40%	88%
			Suitable Degrade	0							Suitable Degrade	0			
			Suitable Downgrade	0							Suitable Downgrade	2			
			Suitable Removed	0							Suitable Removed	0			
	58%	573	Dispersal No TX	573	573	58%			48%	3,098	Dispersal No TX	2,794	3,093	47%	
			Dispersal Degrade	0							Dispersal Degrade	297			
			Dispersal Removed	0							Dispersal Removed	7			
5%		47	Non-habitat No TX	47	47	5%		12%		795	Non-habitat No TX	645	802	12%	
			Non-habitat TX	0							Non-habitat TX	151			
100%		985	SUM	985	985	100%		100%		6,514	SUM	6,514	6,514	100%	
311- Taneum North Fork															
75%	0%	0	Suitable No TX	0	0	0%	68%	88%	36%	2,348	Suitable No TX	2,226	2,346	36%	81%
			Suitable Degrade	0							Suitable Degrade	120			
			Suitable Downgrade	0							Suitable Downgrade	2			
			Suitable Removed	0							Suitable Removed	0			
	75%	742	Dispersal No TX	368	671	68%			52%	3,375	Dispersal No TX	1,610	2,955	45%	
			Dispersal Degrade	303							Dispersal Degrade	1,343			
			Dispersal Removed	72							Dispersal Removed	422			
25%		243	Non-habitat No TX	0	315	32%		12%		791	Non-habitat No TX	475	1,213	19%	
			Non-habitat TX	242							Non-habitat TX	316			
100%		985	SUM	985	985	100%		100%		6,514	SUM	6,514	6,514	100%	
321 - Mole Mountain															
91%	41%	399	Suitable No TX	399	399	41%	91%	77%	26%	1,700	Suitable No TX	1,700	1,700	26%	77%
			Suitable Degrade	0							Suitable Degrade	0			
			Suitable Downgrade	0							Suitable Downgrade	0			
			Suitable Removed	0							Suitable Removed	0			
	50%	495	Dispersal No TX	495	495	50%			51%	3,290	Dispersal No TX	3,290	3,290	51%	
			Dispersal Degrade	0							Dispersal Degrade	0			
			Dispersal Removed	0							Dispersal Removed	0			
9%		90	Non-habitat No TX	90	90	9%		23%		1,525	Non-habitat No TX	1,525	1,525	23%	
			Non-habitat TX	0							Non-habitat TX	0			
100%		985	SUM	985	985	100%		100%		6,514	SUM	6,514	6,514	100%	
326 - Gooseberry Flat															
91%	32%	319	Suitable No TX	305	318	32%	71%	85%	24%	1,537	Suitable No TX	1,478	1,535	24%	67%
			Suitable Degrade	14							Suitable Degrade	57			
			Suitable Downgrade	0							Suitable Downgrade	2			
			Suitable Removed	0							Suitable Removed	0			
	58%	574	Dispersal No TX	71	382	39%			61%	3,975	Dispersal No TX	1,341	2,812	43%	
			Dispersal Degrade	310							Dispersal Degrade	1,469			
			Dispersal Removed	193							Dispersal Removed	1,165			
9%		92	Non-habitat No TX	13	285	29%		15%		1,003	Non-habitat No TX	368	2,167	33%	
			Non-habitat TX	80							Non-habitat TX	634			
100%		985	SUM	985	985	100%		100%		6,514	SUM	6,514	6,514	100%	
328 - Frost Meadows															
42%	9%	90	Suitable No TX	90	90	9%	42%	53%	15%	977	Suitable No TX	977	977	15%	53%
			Suitable Degrade	0							Suitable Degrade	0			
			Suitable Downgrade	0							Suitable Downgrade	0			
			Suitable Removed	0							Suitable Removed	0			
	33%	327	Dispersal No TX	327	327	33%			38%	2,494	Dispersal No TX	2,486	2,494	38%	
			Dispersal Degrade	0							Dispersal Degrade	7			
			Dispersal Removed	0							Dispersal Removed	1			
58%		568	Non-habitat No TX	568	568	58%		47%		3,042	Non-habitat No TX	3,036	3,043	47%	
			Non-habitat TX	0							Non-habitat TX	7			
100%		985	SUM	985	985	100%		100%		6,514	SUM	6,514	6,514	100%	
349 - Taneum South Fork															
98%	10%	94	Suitable No TX	94	94	10%	98%	87%	47%	3,058	Suitable No TX	3,056	3,056	47%	87%
			Suitable Degrade	0							Suitable Degrade	0			
			Suitable Downgrade	0							Suitable Downgrade	2			
			Suitable Removed	0							Suitable Removed	0			
	89%	872	Dispersal No TX	872	872	89%			40%	2,624	Dispersal No TX	2,525	2,626	40%	
			Dispersal Degrade	0							Dispersal Degrade	100			
			Dispersal Removed	0							Dispersal Removed	0			
2%		19	Non-habitat No TX	19	19	2%		13%		832	Non-habitat No TX	689	832	13%	
			Non-habitat TX	0							Non-habitat TX	142			
100%		985	SUM	985	985	100%		100%		6,514	SUM	6,514	6,514	100%	

Breeding Range								Home Range							
Pre-Treatment Acres			Treatment Effect on Northern Spotted Owl Habitat - Acres		Post-Treatment Acres			Pre-Treatment Acres			Treatment Effect on Northern Spotted Owl Habitat - Acres		Post-Treatment Acres		
351 - Frost Creek															
66%	37%	361	Suitable No TX	361	361	37%	66%	66%	26%	1,684	Suitable No TX	1,669	1,684	26%	61%
			Suitable Degrade	0							Suitable Degrade	15			
			Suitable Downgrade	0							Suitable Downgrade	0			
			Suitable Removed	0							Suitable Removed	0			
	29%	290	Dispersal No TX	290	290	29%			40%	2,597	Dispersal No TX	1,835	2,318	36%	
			Dispersal Degrade	1							Dispersal Degrade	483			
			Dispersal Removed	0							Dispersal Removed	279			
34%		334	Non-habitat No TX	334	334	34%		34%		2,233	Non-habitat No TX	1,772	2,512	39%	
			Non-habitat TX	0							Non-habitat TX	461			
100%		985	SUM	985	985	100%		100%		6,514	SUM	6,514	6,514	100%	
353 - Osborn Point															
84%	2%	22	Suitable No TX	18	21	2%	46%	81%	14%	894	Suitable No TX	0	34	1%	51%
			Suitable Degrade	3							Suitable Degrade	34			
			Suitable Downgrade	1							Suitable Downgrade	2			
			Suitable Removed	0							Suitable Removed	858			
	82%	809	Dispersal No TX	115	428	43%			67%	4,372	Dispersal No TX	2,022	3,299	51%	
			Dispersal Degrade	311							Dispersal Degrade	1,275			
			Dispersal Removed	382							Dispersal Removed	1,075			
16%		154	Non-habitat No TX	31	536	54%		19%		1,248	Non-habitat No TX	712	3,181	49%	
			Non-habitat TX	123							Non-habitat TX	536			
100%		985	SUM	985	985	100%		100%		6,514	SUM	6,514	6,514	100%	
357 - Taneum Creek Upper															
56%	41%	409	Suitable No TX	409	409	41%	56%	68%	24%	1,587	Suitable No TX	1,587	1,587	24%	68%
			Suitable Degrade	0							Suitable Degrade	0			
			Suitable Downgrade	0							Suitable Downgrade	0			
			Suitable Removed	0							Suitable Removed	0			
	15%	148	Dispersal No TX	148	148	15%			43%	2,822	Dispersal No TX	2,822	2,822	43%	
			Dispersal Degrade	0							Dispersal Degrade	0			
			Dispersal Removed	0							Dispersal Removed	0			
44%		429	Non-habitat No TX	429	429	44%		32%		2,105	Non-habitat No TX	2,105	2,105	32%	
			Non-habitat TX	0							Non-habitat TX	0			
100%		985	SUM	985	985	100%		100%		6,514	SUM	6,514	6,514	100%	
364 - South Cle Elum Ridge															
56%	37%	369	Suitable No TX	369	369	37%	56%	54%	29%	1,905	Suitable No TX	1,905	1,905	29%	54%
			Suitable Degrade	0							Suitable Degrade	0			
			Suitable Downgrade	0							Suitable Downgrade	0			
			Suitable Removed	0							Suitable Removed	0			
	19%	185	Dispersal No TX	185	185	19%			25%	1,609	Dispersal No TX	1,609	1,609	25%	
			Dispersal Degrade	0							Dispersal Degrade	0			
			Dispersal Removed	0							Dispersal Removed	0			
44%		431	Non-habitat No TX	431	431	44%		46%		3,001	Non-habitat No TX	3,001	3,001	46%	
			Non-habitat TX	0							Non-habitat TX	0			
100%		985	SUM	985	985	100%		100%		6,514	SUM	6,514	6,514	100%	
365 - Taneum Ridge East															
80%	57%	559	Suitable No TX	559	559	57%	80%	71%	36%	2,326	Suitable No TX	2,326	2,326	36%	71%
			Suitable Degrade	0							Suitable Degrade	0			
			Suitable Downgrade	0							Suitable Downgrade	0			
			Suitable Removed	0							Suitable Removed	0			
	23%	225	Dispersal No TX	225	225	23%			36%	2,318	Dispersal No TX	2,318	2,318	36%	
			Dispersal Degrade	0							Dispersal Degrade	0			
			Dispersal Removed	0							Dispersal Removed	0			
20%		200	Non-habitat No TX	200	200	20%		29%		1,870	Non-habitat No TX	1,870	1,870	29%	
			Non-habitat TX	0							Non-habitat TX	0			
100%		985	SUM	985	985	100%		100%		6,514	SUM	6,514	6,514	100%	
378 - Caseknife East Fork															
81%	48%	470	Suitable No TX	470	470	48%	81%	80%	33%	2,148	Suitable No TX	2,142	2,146	33%	77%
			Suitable Degrade	0							Suitable Degrade	4			
			Suitable Downgrade	0							Suitable Downgrade	2			
			Suitable Removed	0							Suitable Removed	0			
	34%	332	Dispersal No TX	318	332	34%			47%	3,073	Dispersal No TX	1,909	2,837	44%	
			Dispersal Degrade	14							Dispersal Degrade	927			
			Dispersal Removed	0							Dispersal Removed	237			
19%		184	Non-habitat No TX	184	184	19%		20%		1,293	Non-habitat No TX	1,039	1,530	23%	
			Non-habitat TX	0							Non-habitat TX	254			
100%		985	SUM	985	985	100%		100%		6,514	SUM	6,514	6,514	100%	

Breeding Range								Home Range							
Pre-Treatment Acres			Treatment Effect on Northern Spotted Owl Habitat - Acres		Post-Treatment Acres			Pre-Treatment Acres			Treatment Effect on Northern Spotted Owl Habitat - Acres		Post-Treatment Acres		
379 - Caseknife Lower															
89%	28%	274	Suitable No TX	274	274	28%	87%	84%	33%	2,134	Suitable No TX	2,104	2,133	33%	78%
			Suitable Degrade	0							Suitable Degrade	29			
			Suitable Downgrade	0							Suitable Downgrade	2			
			Suitable Removed	0							Suitable Removed				
	61%	601	Dispersal No TX	364	579	59%			51%	3,336	Dispersal No TX	1,708	2,934	45%	
			Dispersal Degrade	214							Dispersal Degrade	1,225			
			Dispersal Removed	22							Dispersal Removed	403			
11%		110	Non-habitat No TX	69	132	13%		16%		1,044	Non-habitat No TX	736	1,447	22%	
			Non-habitat TX	40							Non-habitat TX	307			
100%		985	SUM	985	985	100%		100%		6,514	SUM	6,514	6,514	100%	
399 - Butte Creek															
67%	11%	105	Suitable No TX	105	105	11%	67%	58%	19%	1,269	Suitable No TX	1,269	1,269	19%	58%
			Suitable Degrade	0							Suitable Degrade	0			
			Suitable Downgrade	0							Suitable Downgrade	0			
			Suitable Removed	0							Suitable Removed	0			
	56%	552	Dispersal No TX	552	552	56%			38%	2,503	Dispersal No TX	2,503	2,503	38%	
			Dispersal Degrade	0							Dispersal Degrade	0			
			Dispersal Removed	0							Dispersal Removed	0			
33%		328	Non-habitat No TX	328	328	33%		42%		2,743	Non-habitat No TX	2,743	2,743	42%	
			Non-habitat TX	0							Non-habitat TX	0			
100%		985	SUM	985	985	100%		100%		6,514	SUM	6,514	6,514	100%	
400 - Taneum First Creek															
97%	36%	352	Suitable No TX	330	352	36%	76%	88%	25%	1,641	Suitable No TX	1,547	1,641	25%	70%
			Suitable Degrade	22							Suitable Degrade	94			
			Suitable Downgrade	0							Suitable Downgrade	0			
			Suitable Removed	0							Suitable Removed	0			
	61%	604	Dispersal No TX	151	399	41%			63%	4,116	Dispersal No TX	1,136	2,926	45%	
			Dispersal Degrade	248							Dispersal Degrade	1,790			
			Dispersal Removed	205							Dispersal Removed	1,190			
3%		29	Non-habitat No TX	11	234	24%		12%		757	Non-habitat No TX	162	1,947	30%	
			Non-habitat TX	18							Non-habitat TX	595			
100%		985	SUM	985	985	100%		100%		6,514	SUM	6,514	6,514	100%	

Determination of Effect for Northern Spotted Owl

Considering the direct, indirect, and cumulative effects, and interrelated and interdependent actions associated with the proposed action, the Taneum project May Affect, and Likely Adversely Affect the northern spotted owl. This determination is made based on the following: degrade of 147 acres of suitable habitat, downgrade of 3 acres of suitable habitat, degrade of 2,913 acres of dispersal habitat plus additional acres from shaded fuel breaks, and removal of 1,772 acres of dispersal habitat at the dry eastern edge of the subspecies range in the vicinity of an 8-year-old single male (2021) with extremely low odds of female recruitment. Small patch (≥ 1-acre) complexity within commercial thinning units was identified with Sovern et al. (2019) methodology APPENDIX E – SMALL COMPLEX PATCHES. These areas will be no harvest skips unless unit wildlife biologist field visit indicates patches are not low-quality foraging habitat. Direct effects to northern spotted owl would be unlikely because of project design features and the extremely low and declining density of northern spotted owl in Washington. The Regional Ecosystem Office has concurred with the Taneum Restoration Project (REO 2019). The area is recognized to be a fire-shed of National priority for this type of landscape restoration effort (USFS 2022). This project provides a means whereby the ecosystem upon which the northern spotted owl depends may be conserved (ESA 1973, Section 2b).

Northern Spotted Owl Critical Habitat

On December 4, 2012, the final rule for Critical Habitat for northern spotted owls was published (USFWS 2012b) and became effective on January 3rd, 2013. The recently-reduced-revised Critical Habitat network currently includes approximately 9,373,675 acres in in California, Oregon, and Washington (USFWS 2021b).

Conservation Role of Critical Habitat

The role of northern spotted owl Critical Habitat is:

- To ensure sufficient habitat to support stable, healthy populations of northern spotted owls across the range and within each of the 11 recovery units,
- To ensure distribution of northern spotted owl habitat across the range of habitat conditions used by the species, and
- Incorporate uncertainty, including potential effects of barred owls, climate change, and wildfire-disturbance risk.

Critical Habitat protections are also meant to work in concert with other recovery actions such as barred owl management (USFWS 2012b, 71879). Recovery actions include:

1. Conserve the older, high-quality, and occupied forest habitat as necessary to meet recovery goals. This includes conserving old growth trees and forests on Federal lands wherever they are found and undertake appropriate restoration treatment in the threatened forest types.
2. Implement science-based, active vegetation management to restore forest health, especially in drier forests in the eastern and southern portions of the northern spotted owl's range. This includes managing Pacific Northwest forests as dynamic ecosystems that conserve all stages of forest development, and where tradeoffs between short-term and long-term risks are better balanced. The 1994 NWFP as informed by the recommendations of the 2011 revised recovery plan should be recognized as an integrated conservation strategy that contributes to all components of sustainability across Federal lands.

3. Encourage landscape-level planning and vegetation management that allow historical ecological processes, such as characteristic fire regimes and natural forest succession, to occur on these landscapes throughout the range of the northern spotted owl. This approach has the best chance of resulting in forests that are resilient to future changes that may arise due to climate change (USFWS 2012b, 71881).

Physical or Biological Features and Primary Constituent Elements

The designation of Critical Habitat for northern spotted owl uses the term primary constituent element. The new Critical Habitat regulations (USFWS and NOAA 2016) replace this term with physical or biological features (PBFs). This shift in terminology does not change the approach used in conducting analysis, whether the original designation identified primary constituent elements, physical or biological features, or essential features. In this consultation, the term PBF means primary constituent element.

The Critical Habitat rule identified four PBFs needed for the conservation of the northern spotted owl. The PBFs are the forested areas that are used or likely to be used by the northern spotted owl for nesting, roosting, foraging, or dispersing (USFWS 2012b, 71904). The PBFs are the specific characteristics that make habitat areas suitable for nesting, roosting, foraging, and dispersal (USFWS 2012b, 71906–8). The PBFs include forest types in early-, mid-, or late-seral stages; in concert with specific habitat that provides for nesting/roosting, foraging, and transience and colonization phases of dispersal.

PBF 1 are the forest types that support northern spotted owl across its geological range. PBF 2 is the habitat that provides for nesting and roosting. PBF 3 is the habitat that provides for foraging. PBF 3 is northern spotted owl USFWS suitable habitat. PBF 4 is the habitat that supports the transient and colonizing phases of dispersal. Any activity occurring within Critical Habitat that impacts any of these PBFs may affect spotted owl Critical Habitat.

Analysis Scales

The consultation process evaluates how a proposed action is likely to affect the capability of the Critical Habitat to support the northern spotted owl by considering the action area and scales at which life-history requirements are based (USFWS 2012b, 71940). Such alterations may include, but are not limited to, those that alter the physical or biological features essential to the conservation of a species or that preclude or significantly delay development of such features (USFWS and NOAA 2016, 7216).

Action Area

The impact of the proposed action on the ability of the affected Critical Habitat to continue to support the life history functions supplied by the PBFs.

Critical Habitat Subunit

- The extent of the proposed action, both its temporal and spatial scale, relative to the Critical Habitat subunit within which it occurs.
- The specific purpose for which the affected subunit was identified and designated as Critical Habitat.
- The impact of the proposed action on the subunit’s value for conservation of northern spotted owl.
- The overall consistency of the proposed action with the intent of the recovery plan or other landscape-level conservation plans.

- The special importance of project scale and context in evaluating the potential effects of timber harvest to northern spotted owl Critical Habitat.

Critical Habitat Unit

- The extent of the proposed action, both its temporal and spatial scale, relative to the Critical Habitat unit within which it occurs.
- The aggregate effects of all completed activities in the Critical Habitat unit.
- The impact of the proposed action on the unit’s value for conservation of northern spotted owls.

Range-wide Critical Habitat

The extent of the proposed action, both its temporal and spatial scale, relative to the entire Critical Habitat network’s value for the conservation of northern spotted owls.

Environmental Baseline

The Eastern Cascades North (ECN) region consists of the eastern slopes of the Cascade Range, extending from the Canadian border south to the Deschutes National Forest near Bend, OR. Terrain in portions of this region is glaciated and steeply dissected. This region is characterized by a continental climate (cold, snowy winters and dry summers) and a historical high-frequency / low-mixed severity fire regime. Increased precipitation from marine air passing east through Snoqualmie Pass and the Columbia River results in extensions of moist forest conditions into this region. Forest composition, particularly the presence of grand fir and western larch, distinguishes this region from the southern section of the eastern Cascades. While ponderosa pine forest dominates lower and middle elevations in both this and the southern section, the northern section supports grand fir and Douglas-fir cover at middle elevations. Dwarf mistletoe provides an important component of nesting cover type, enabling northern spotted owls to nest within stands of relatively younger, small trees.

In early 2022 range-wide Critical Habitat contains 3,202,192 acres of non-habitat and 6,414,911 acres of habitat. Dispersal-only habitat totals 1,948,883 acres, foraging (suitable) habitat totals 4,466,028 acres of which 2,808,131 acres is also nesting-roosting habitat. In early 2022 the East Cascades North Unit contains 609,263 acres of non-habitat and 729,030 acres of habitat. Dispersal-only habitat totals 293,258 acres, foraging (suitable) habitat totals 435,772 acres of which 214,384 is also nesting-roosting habitat. In early 2022 East Cascades North Subunit 4 (ECN-4) contains 96,277 acres of non-habitat and 126,460 acres of habitat. Dispersal-only habitat totals 46,397 acres, foraging (suitable) habitat totals 80,063 acres of which 50,862 is also nesting-roosting habitat. A portion of the project area (18,634 acres, 67%, Table 31) occurs within the 222,738-acre ECN-4.

Table 31. Taneum Project northern spotted owl Critical Habitat.

Taneum Project Critical Habitat - Acres		
Northern Spotted Owl Habitat		
Suitable	6,374	16,417
Dispersal	10,043	
Non-habitat		2,217
SUM		18,634

Taneum Project Critical Habitat - Percent		
Northern Spotted Owl Habitat		
Suitable	34%	88%
Dispersal	54%	
Non-habitat		12%
SUM		100%

Northern spotted owl suitable Critical Habitat is in decline at the network scale (Figure 31), at the East Cascades North Unit scale (Figure 32), and at the ECN-4 scale (Figure 33). This wildfire-driven loss is occurring at an increasing rate with increasing specificity to the project area (Figure 34). The ECN-4 suitable Critical Habitat loss rate is 2.4x that of the entire Critical Habitat network.

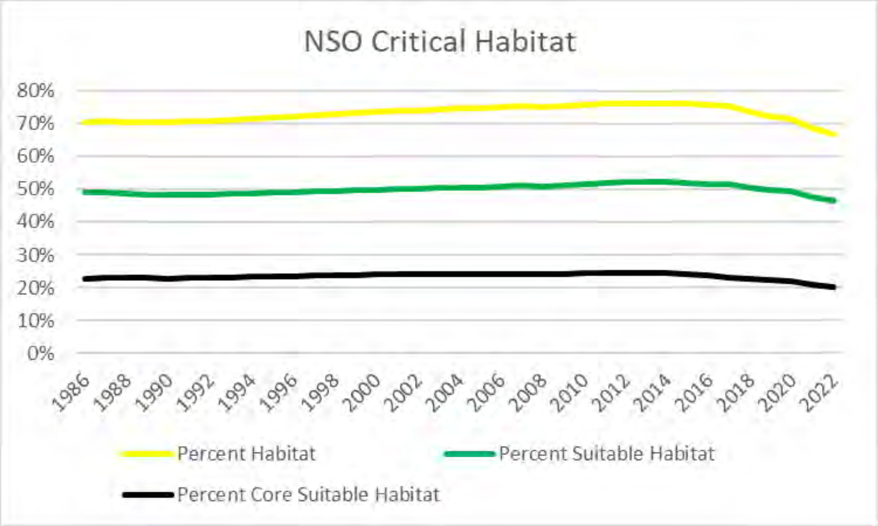


Figure 31. Northern spotted owl habitat, 1986-2022, entire Critical Habitat scale (9,617,103-acre scale, 2012 network extent). Habitat -12%, suitable habitat -11%, core suitable habitat -17% since 2012.

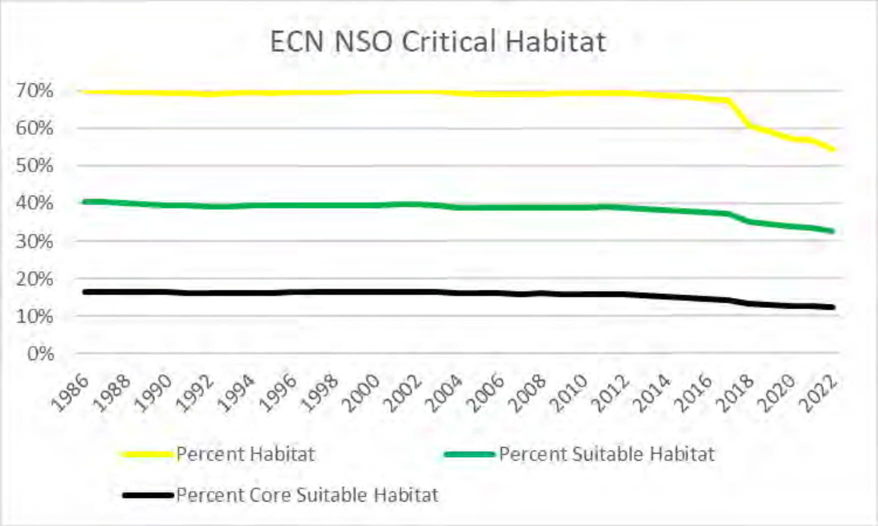


Figure 32. Northern spotted owl habitat, 1986-2022, East Cascades North Unit scale (1,338,293-acre). Habitat -22%, suitable habitat -16%, core suitable habitat -20% since 2012.

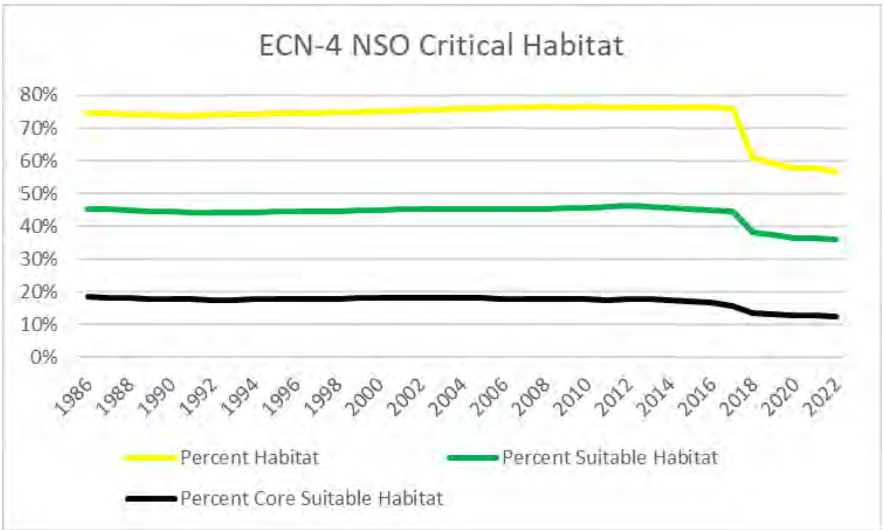


Figure 33. Northern spotted owl habitat, 1986-2022, East Cascades North Subunit 4 scale (222,738-acre). Habitat -26%, suitable habitat -22%, and core suitable habitat -29% since 2012.

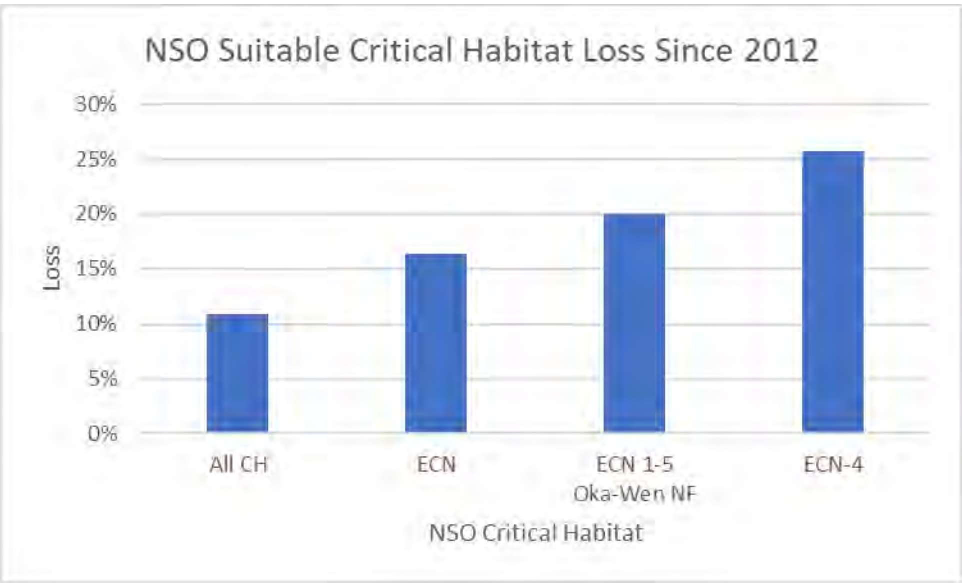


Figure 34. Northern spotted owl suitable Critical Habitat loss since 2012 at four scales.

The project area occurs at the dry eastern edge of the northern spotted owl range. The project area contributes little to the North-South dispersal-capable landscape and contributes even less to the East-West dispersal-capable landscape (Figure 35, Figure 36) (R. J. Davis et al. 2016, 12). Wildfires 2012-2021 have further reduced the dispersal-capable landscape in the East Cascades North Critical Habitat Unit (Ray Davis, personal communication, 1/5/2022). These losses are expected to accelerate with a forecast 10-fold increase in percent area burned in the range of the northern spotted owl by 2080s (Wan, Cushman, and Ganey 2019, 6).

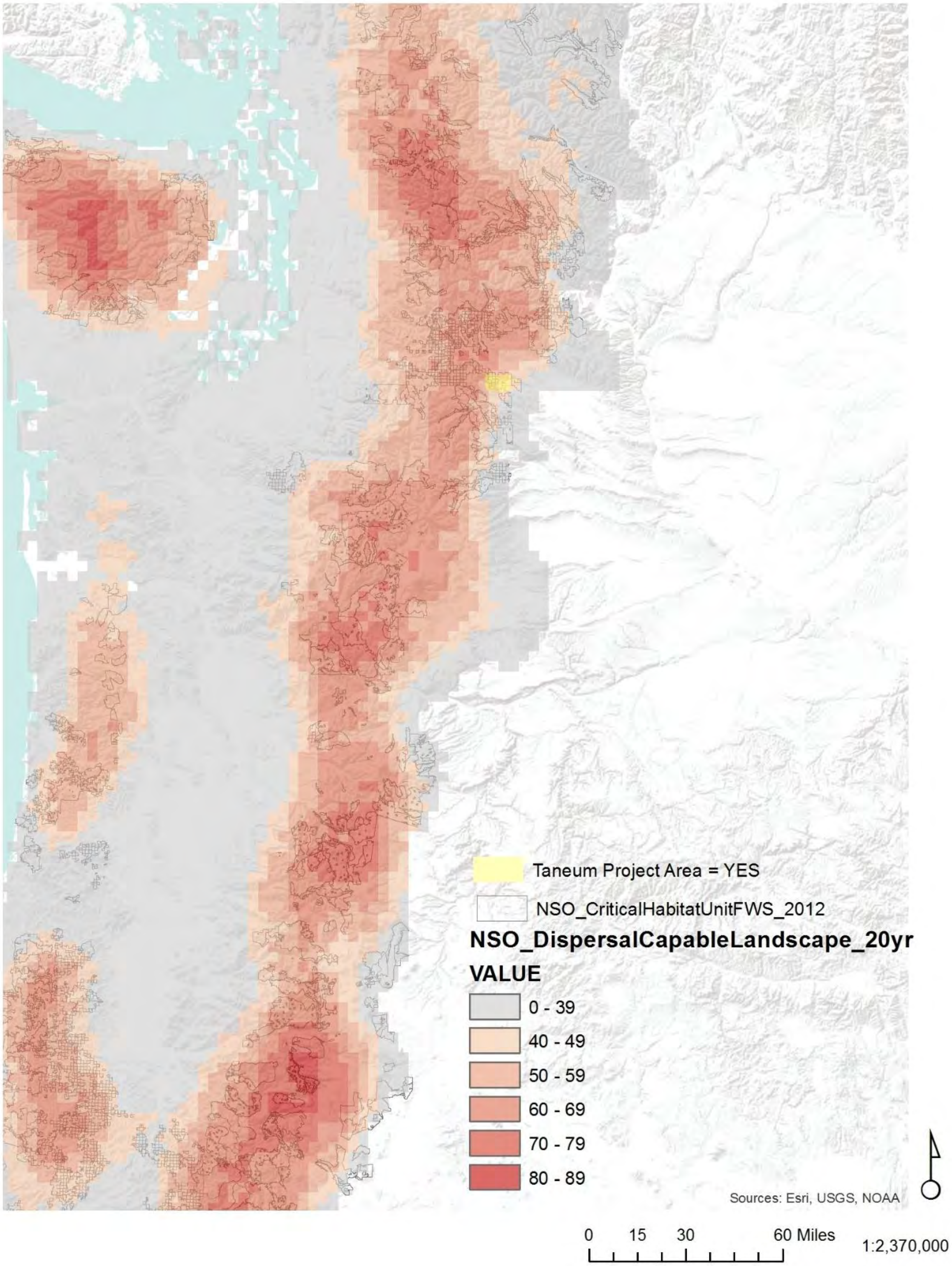


Figure 35. Northern spotted owl dispersal-capable landscape (R. J. Davis et al. 2016, 12), ECN scale.

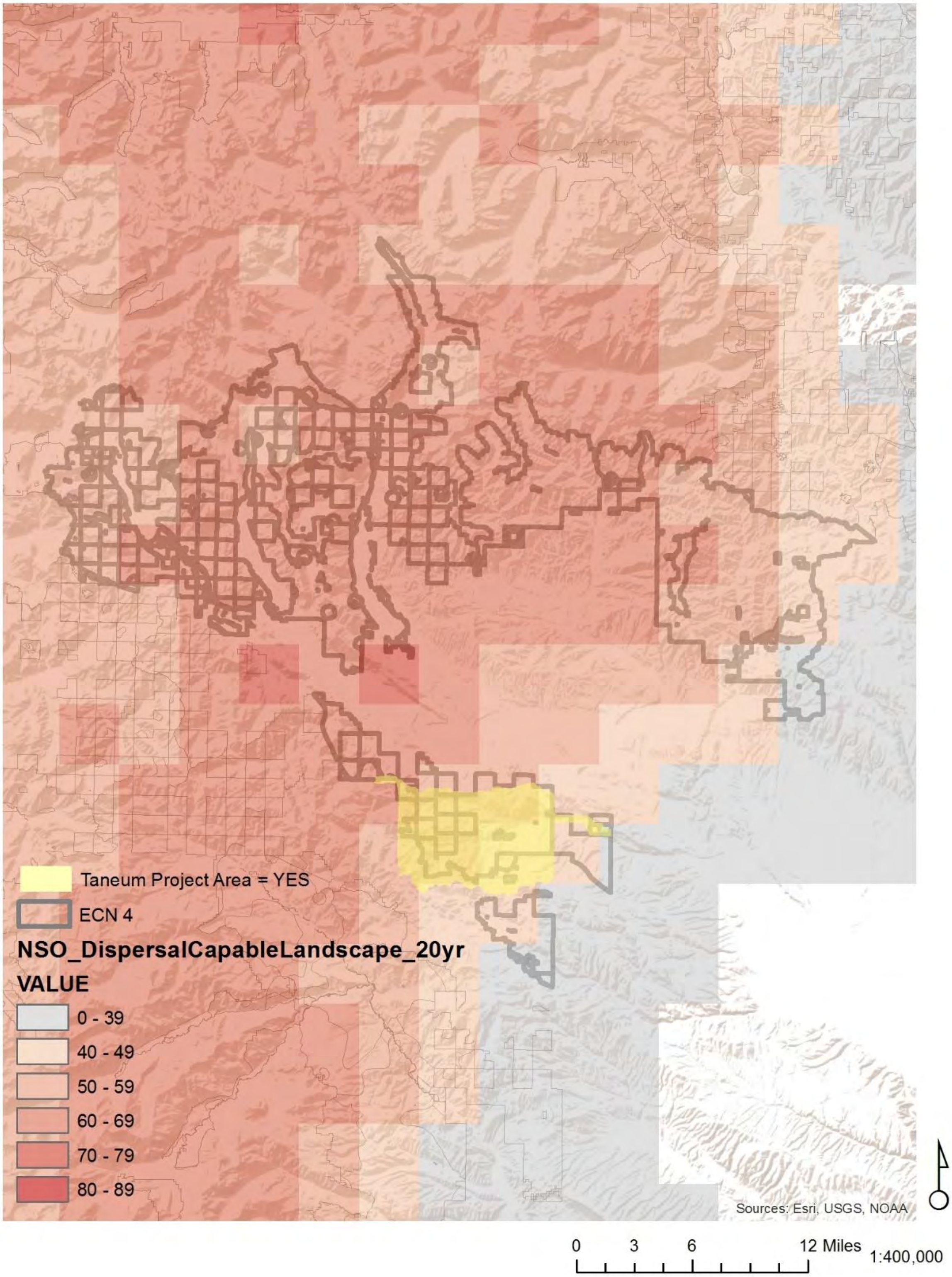


Figure 36. Northern spotted owl dispersal-capable landscape (Davis et al. 2016, 12), ECN-4 scale.

Effects to ECN-4 Critical Habitat

The majority of the lands in the project area, 18,634 of 27,662 acres (67%), are within ECN-4 Critical Habitat. Table 32 quantifies the effects of treatments within Critical Habitat for the PBFs. At the ECN-4 scale, there are 80,063 acres of suitable habitat and another 46,397 acres of dispersal-only habitat. At the ECN-4 scale, this project would reduce dispersal Critical Habitat by 1.25% at the dry eastern edge of the range of northern spotted owl and would reduce ECN-4 suitable Critical Habitat by 0.0037%. At the project scale, this project would reduce dispersal Critical Habitat by 9.6% and suitable Critical Habitat by 0.047% in the short-term. Dispersal Critical Habitat connectivity would be maintained well above the 50-11-40 rule (Thomas et al. 1990, 4; USFWS 2012b, 71902) at the project scale (Table 33, Figure 30).

Table 32. Effects to northern spotted owl ECN-4 Critical Habitat by action type.

ECN-4 Critical Habitat								
Northern Spotted Owl Habitat Effect	Treatment – Acres*							
	ES SECC	ES YFMS	GF YFMS	OSP	Admin Site	RX Fire Only	Road	SUM
Suitable Degrade	0	0	0	0	0	44	103	146
Suitable Downgrade	0	0	0	0	3	0	0	3
Suitable Removal	0	0	0	0	0	0	0	0
Dispersal Degrade	0	0	0	0	0	2,519	190	2,709
Dispersal Removal	509	448	330	255	41	0	0	1,583
Non-habitat TX	25	22	24	733	3	334	13	1,155
SUM	534	470	355	988	46	2,897	306	5,596

*For impacts that overlap, the highest impact column is reported.

Table 33. Taneum Project total effect on northern spotted owl ECN-4 Critical Habitat.

<table>
<tr><th colspan="8">Taneum Project Critical Habitat - Acres</th></tr>
<tr><th colspan="3">Pre-Treatment</th><th colspan="2">Treatment Effect on Northern Spotted Owl Habitat</th><th colspan="3">Post-Treatment</th></tr>
<tr><td rowspan="7">88%</td><td rowspan="4">34%</td><td rowspan="4">6,374</td><td>Suitable no TX</td><td>6,224</td><td rowspan="4">6,371</td><td rowspan="4">34%</td><td rowspan="7">80%</td></tr>
<tr><td>Suitable Degrade</td><td>146</td></tr>
<tr><td>Suitable Downgrade</td><td>3</td></tr>
<tr><td>Suitable Removed</td><td>0</td></tr>
<tr><td rowspan="3">54%</td><td rowspan="3">10,043</td><td>Dispersal no TX</td><td>5,751</td><td rowspan="3">8,463</td><td rowspan="3">45%</td></tr>
<tr><td>Dispersal Degrade</td><td>2,709</td></tr>
<tr><td>Dispersal Removed</td><td>1,583</td></tr>
<tr><td colspan="2" rowspan="2">12%</td><td rowspan="2">2,217</td><td>Non-habitat no TX</td><td>1,063</td><td rowspan="2">3,800</td><td colspan="2" rowspan="2">20%</td></tr>
<tr><td>Non-habitat TX</td><td>1,155</td></tr>
<tr><td colspan="2">100%</td><td>18,634</td><td>SUM</td><td>18,634</td><td>18,634</td><td colspan="2">100%</td></tr>
</table>

Beneficial Effects to Critical Habitat

The northern spotted owl Critical Habitat final rule points to the Okanogan-Wenatchee NF Restoration Strategy as a type of planning that may be emulated or referenced in coordinated strategic landscape restorations efforts (USFWS 2012b, 71910). The Taneum Project follows the Okanogan-Wenatchee NF Restoration Strategy, the 8 dry forest restoration principles listed in the Critical Habitat final rule (USFWS 2012b, 71910), and the fire-prone landscape restoration 7 core principles listed in Hessburg et al. (2015). The northern spotted owl Critical Habitat final rule recommends these restoration actions in or outside of 1994 NWFP reserves in dry forest that are most at-risk of experiencing uncharacteristic disturbances [like the Taneum Restoration Project area (USFS 2022, 3)], and where the landscape management goal is to restore more natural or resilient forest ecosystems (USFWS 2012b, 71883).

The Taneum Project provides a means whereby the ecosystem upon which the northern spotted owl depends may be conserved (ESA 1973, Section 2b). The northern spotted owl Critical Habitat network is meant to work in concert with other recovery actions, specifically barred owl management (USFWS 2012b, 71877). Without barred owl management, suitable habitat retention and risk reduction projects like the Taneum Restoration Project will likely fail to advance northern spotted owl conservation. Barred owl encounter rates of 50% in Dunk et al. (2019, 27) resulted in model northern spotted owl populations falling below quasi-extinction (250 individuals) in 100% of replicates in 96% of network / habitat scenarios. The current barred owl encounter rate of 29.6% used for the East Cascades North modeling region in Dunk et al. (2019) was derived from information in Forsman et al. (2011) with that data range ending in 2008. From 2008 to 2014 (last year before barred owl removal commenced), barred owl response rates and estimated territories more than doubled on the Cle Elum study area. More recent local survey (R. J. Davis and Lesmeister 2020) indicates 70% barred owl occupancy in the Cle Elum study area (Lesmeister et al. 2022, 23), much higher than the highest encounter rate modeled by Dunk et al. (2019) which resulted in northern spotted owl quasi-extinction. This 70% barred owl occupancy occurs in a landscape where only 27% of the area sampled is northern spotted owl suitable habitat and only 47% is habitat. Over half of the sample hexes (*n* = 72) contain < 30% suitable habitat. Forty percent of the sample hexes contain < 20% suitable habitat. The 2020 mean barred owl occupancy rate across 4 study areas reported in Lesmeister et al. (2022, 23) is 90% with an increasing trend. A study in California saw barred owl occupancy increase 2.6-fold between 2017 and 2018 (Wood et al. 2020, 4) and recommended immediate barred owl management as the California spotted owl would likely go extinct otherwise (Long and Wolfe 2019). Hofstadter et al. (2022) shows this early intervention approach to be effective in the insular Sierra Nevada.

Critical Habitat represents the areas within the geographic area occupied by a species listed under the ESA that contain the physical and biological features that are essential to conservation of the species and that may need special management or protection (ESA 1973, Section 3-5-A).

Dunk et al. (2019, 2) defines northern spotted owl habitat as:

> *…areas that possess features of the environment that, on average, allow a species to experience a positive growth rate, and thus must allow for occupancy, survival, and reproduction.*
>
> *…*
>
> *Thus, habitat is a specific combination of both biotic and abiotic components and processes that allow continuing occupancy of the environment by an organism.*

Lesmeister et al. (2018, 250) defines northern spotted owl habitat as:

> *…those areas with the full suite of resources (e.g., abundant prey, available nest structures) and environmental conditions (e.g., appropriate climate, suitable forest structure, and infrequent presence of barred owls) suitable for occupancy, reproduction, and survival of the subspecies.*

Dunk et al. (2019, 2) and Franklin et al. (2021, 2) found that when barred owl encounter rates were high, amount and suitability of habitat had minimal impacts on northern spotted owl population performance. With a Grinnellian (1917) view of species niche-space, due to ubiquitous barred owl presence and lacking a barred owl removal mechanism (USFWS 2011, Recovery Action 30), northern spotted owl habitat may not exist.

The northern spotted owl Critical Habitat final rule (USFWS 2012b, 71939) states:

> *Northern spotted owl critical habitat PCE 4 (habitat to support the transience and colonization phases of dispersal) provides a life-history need that functions at a landscape-level scale and should be assessed at a larger scale than the other PCEs.*
>
> …
>
> *Wholly beneficial effects include those that actively promote the development or improve the functionality of critical habitat for the northern spotted owl without causing adverse effects to the PCEs. Such actions might involve variable-density thinning in forest stands that do not currently support nesting, roosting, or foraging habitat for the northern spotted owl, which would speed the development of these types of habitats, while maintaining dispersal habitat function. Thinning or other treatments in young plantations that are specifically designed to accelerate the development of owl habitat, and either are in areas that do not provide dispersal habitat or where the effects to dispersal capability would be insignificant or discountable, would also fall into the "not likely to adversely affect" category.*
>
> …
>
> *Examples of such actions may include: Pre-commercial or commercial thinning that does not delay the development of essential physical or biological features; fuel-reduction treatments that have a negligible effect on northern spotted owl foraging habitat within the stand; and the removal of hazard trees, where the removal has an insignificant effect on the capability of the stand to provide northern spotted owl nesting opportunities.*

The Taneum Restoration Project may meet this generic “not likely to adversely affect” category though there are many variables to be considered when determining whether the effects to critical habitat are adverse or not. The 1,155 acres of treatment (21% of impacts) in non-habitat Critical Habitat and the 2,709 acres of dispersal degrade (48% of impacts) in Critical Habitat are wholly beneficial effects (69% of impacts).

Determination of Effect for Northern Spotted Owl Critical Habitat

Removal of a PBF of northern spotted owl Critical Habitat is almost always a likely to adversely affect determination, exceptions may include removal of small linear strips of habitat or isolated patches of habitat, especially those on the extreme of the subspecies range or where long-term quality would be very low (Vince Harke personal communication 8/28/2019). Due to the degrade of 2,709 acres of dispersal Critical Habitat plus additional dispersal degrade acres from shaded fuel breaks, removal of 1,583 acres of dispersal Critical Habitat, degrade of 146 acres of suitable Critical Habitat, and downgrade of 3 acres of suitable Critical Habitat at the dry eastern edge of the range of the northern spotted owl, this project May Affect, and will Likely Adversely Affect ECN-4 Critical Habitat.

Aquatic Species Considered

Status of Listed Fish Species

Two ESA listed fish species are considered in this assessment. Middle Columbia River (MCR) steelhead and Columbia River bull trout are expected to utilize habitat or have potential habitat in the Taneum watershed and are federally listed as threatened (NMFS 2018b; USFWS 2018b). The steelhead listing does not include rainbow trout/interior redband rainbow trout, the non-anadromous freshwater form of *Oncorhynchus mykiss spp.*, which are under the jurisdiction of USFWS. However, if there are no barriers (waterfalls) that would restrict access by steelhead, the assumption is that all *O. mykiss spp.* have the potential to be steelhead.

Designated critical habitat for steelhead and bull trout includes portions of the mainstem Taneum and North and South Fork Taneum Creeks (NMFS 2018c; USFWS 2018a). Essential Fish Habitat (EFH) designated under the Magnuson-Stevens Fishery Conservation and Management Act (MSA 2007), exists in the Project Area for Chinook and coho salmon (NMFS 2018a).

The listed species, their population, and their critical habitat and federal status are shown in Table 34. Designated critical habitat for MCR steelhead and bull trout is shown in Figure 37 and Figure 38, respectively.

Critical Habitat

Critical habitat is defined in Section 3(5)(A) of the ESA (1973) as "the specific areas within the geographical area occupied by the species ... on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection." NOAA designated critical habitat for Middle Columbia River steelhead on September 2, 2005 (70 FR 52630). The USFWS designated critical habitat for critical habitat for bull trout throughout their U.S. range on September 30, 2010 (75 FR 63897).

There are 13.6 miles of Critical Habitat designated for Middle Columbia River steelhead and 18 miles of Critical Habitat Designated for Columbia River bull trout in the Project Area. Taneum Creek mainstem contains 5.4 miles of critical habitat for steelhead and 5.4 miles for bull trout. North Fork Taneum Creek contains 5.9 miles of critical habitat for steelhead and 7.2 miles for bull trout. South Fork Taneum Creek contains 2.3 miles of critical habitat for steelhead and 5.4 miles for bull trout (Figure 37 and Figure 38).

Adult and juvenile steelhead have been detected throughout mainstem Taneum Creek and are expected to be found in the North Fork and South Fork Taneum Creeks and tributaries (Temple et al. 2017; Monk 2015) (2015; Jim Matthews, Yakama Nation Fisheries personal communication with S. Duncan). The Taneum Creek steelhead population abundance is highly variable from year to year (Temple et al. 2017).

While there is Designated Critical Habitat in the Project Area for bull trout, there are no historical or recent observations on record that confirm their natural occurrence in Taneum Creek (Matala, Newsome, and Fast 2020; BPA, WDFW, and YIN 1996; USFWS 2010). The best available evidence of bull trout presence or absence in Taneum Creek is derived from extensive electrofishing by the Washington Dept. of Fish and Wildlife, which has resulted in no bull trout detections during all sample years (1990-2021). Table 36 displays the most recent electrofishing data from Taneum Creek from 2021.

Furthermore, environmental DNA (eDNA) sampling, which is a highly sensitive method for detecting fish presence in lotic systems, was conducted throughout the Yakima Basin, including Taneum Creek. eDNA samples were collected at 15 locations near the upper reaches of the North Fork of Taneum Creek in

2017, resulting in no positive detections of bull trout (Young et al. 2017). A map of the WDFW long term electrofishing survey locations and the eDNA sampling sites in Taneum Creek are shown in Figure 39. The closest river system where bull trout were detected, during the Range-Wide Bull Trout eDNA Project, was in Cooper River, 48 river miles away from the Project Area. The next closest location was in Box Canyon, which is 54 river miles away from the Project Area (Table 35).

Personal communications with the WDFW Fisheries Research Biologist, Gabe Temple, and the Yakama Nation Fisheries Research Scientist, Todd Newsome, confirmed these results on 2/28/2022. It is in both Biologists' professional judgement that bull trout would have been detected during the 31 years of surveying, where ~20,000 fish were sampled, and that it is highly unlikely bull trout occupy Taneum Creek.

More information on Critical Habitat is provided in the Aquatic Habitat Baseline Conditions section of this Biological Assessment.

Essential Fish Habitat

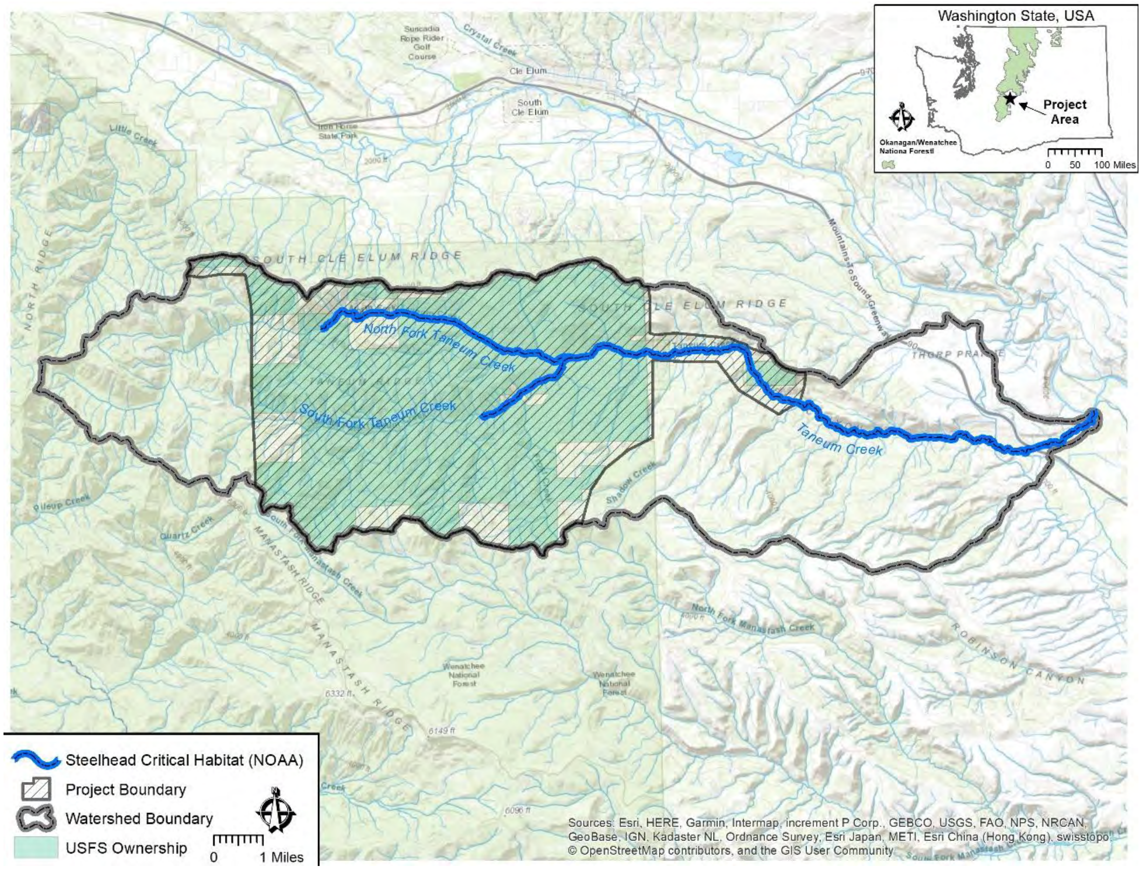
The Magnuson-Stevens Fishery Conservation and Management Act of 1976, as amended in 2007, mandates the identification of EFH for federally managed species and the consideration of recommendations to conserve and enhance the habitat necessary for these freshwater, estuarine, and marine species to carry out their life cycles. Essential Fish Habitat includes those waters and substrates necessary to fish for spawning, breeding, feeding, or growing to maturity. "Waters" include aquatic areas and their associated physical, chemical, and biological properties. "Substrate" includes sediment underlying the waters. "Necessary" means the habitat required to support a sustainable fishery and the contributions of "managed species" to a healthy ecosystem. "Spawning, breeding, feeding, or growing to maturity" includes all habitat types used by a species throughout its lifecycle (NMFS 2002; 2018a)

The amended Magnuson-Stevens Act requires NOAA to minimize damage to EFH from fishing practices to the extent practicable. Additionally, the Act requires Federal agencies that authorize, fund, or conduct activities that "may adversely affect" EFH to work with NMFS to develop measures that minimize damage to EFH.

Essential Fish Habitat for Chinook salmon and coho salmon exists in the Project Area in North Fork, South Fork, and mainstem Taneum Creeks. Essential Fish Habitat exists in Taneum Creek mainstem for Chinook salmon and for coho salmon. Essential Fish Habitat for coho salmon also exists in North Fork Taneum Creek and South Fork Taneum Creek. More information on Essential Fish Habitat and documented and presumed distribution is provided in the Aquatic Habitat Baseline Conditions section of this Biological Assessment.

Table 34. Federal Endangered, Threatened, and Species of Concern in the Upper Yakima River.

Common Name	Scientific Name	Population	Critical Habitat	Regulatory Agency Status
Bull trout	*Salvelinus confluentus*	Columbia River	Yes	USFWS / Threatened
Steelhead	*Oncorhynchus mykiss*	Middle Columbia River Distinct Population Segment	Yes	NOAA / Threatened



Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community

Figure 37. Designated critical habitat for steelhead.

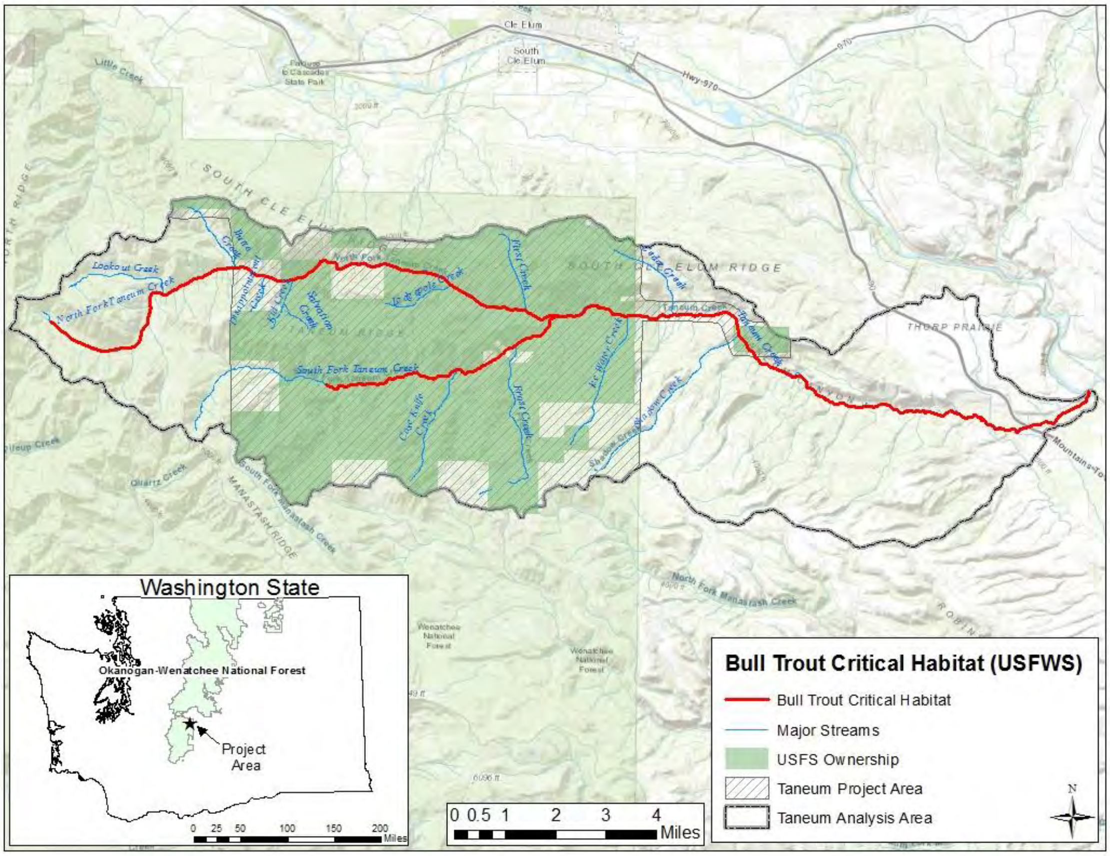


Figure 38. Designated critical habitat for bull trout.

Bull Trout (Salvelinus confluentus)

The historical distribution of bull trout extends from northern California to Alaska. In Washington, bull trout are found throughout coastal and inland streams and lakes (WDFW 2004). Bull trout have a complex life history, with two primary life-history types: a resident form and a migratory form. Bull trout that are considered migratory may be stream-dwelling (fluvial), lake-dwelling (adfluvial), and resident in the Yakima Basin (Behnke 2002; USFWS 2020a). Individuals of each form may be represented in a single population, although migratory populations may dominate where migration corridors and subadult rearing habitats are in good condition (USFWS 2020a).

As opportunistic feeders, juvenile anadromous bull trout migrate to estuaries in the summer months, when salmon fry and smolts become plentiful. Most inland populations of bull trout are either fluvial or adfluvial, migrating from larger rivers and lakes to spawn in smaller tributary streams from August through October (Wydoski and Whitney 2003). Bull trout spawn in streams with clean gravel substrates and cold (less than 9°C) water temperatures (Behnke 2002). Spawn timing is relatively short, occurring from late October through early November. Redds are dug by females in water 8 to 24 inches in depth in substrate gravel 0.2 to 2 inches in diameter (Wydoski and Whitney 2003); emergence generally occurs in the spring. Bull trout are opportunistic feeders, consuming fish in the water column and insects on the bottom (WDFW 2004).

Bull trout exhibiting fluvial life history forms occur in the upper mainstem of the Yakima River but are encountered infrequently. WDFW is uncertain of when or where these fluvial bull trout spawn but suspect that spawning occurs in upper tributaries during the fall months. Bull trout populations identified in the Yakima River basin by USFWS include: mainstem upper Yakima River (Keechelus to Easton Reach), Ahtanum Creek; Naches River tributaries, Rimrock Lake tributaries, Bumping Lake, North Fork Teanaway River, Kachess Lake tributaries, Keechelus Lake; and the upper Cle Elum River. Only the Rimrock Lake subpopulation was considered stable when the species was listed as threatened in 1998.

While historically it is expected that bull trout migrated from the upper tributaries to the mainstem Yakima River and downstream to the Columbia River to overwinter and forage, this type of migration has been severely impacted due to fish passage impediments. None of the large dams on the five lakes listed above have fish ladders. Migration between the lower Yakima River and upper Yakima River, including tributaries, is expected to be isolated due to fish passage impediments (including thermal barriers), habitat fragmentation, and water quality.

As stated above, there is Designated Critical Habitat in the Project Area but bull trout have never been encountered during any surveys that have been conducted on Taneum Creek (Personal communications with the WDFW Fisheries Research Biologist, Gabe Temple, and the Yakama Nation Fisheries Research Scientist, Todd Newsome, on 7/24/2018 and 2/28/2022) It is in both Biologists' professional judgement that bull trout would have been detected during the 31 project years, where ~20,000 fish were sampled, and that it is highly unlikely bull trout currently occupy the Taneum watershed.

To protect designated critical habitat, the USFWS has identified physical and biological features (PBF's) that are essential for the conservation of bull trout. The PBFs are related to water quality; migration habitat; food availability; instream habitat; water temperature; substrate characteristics; stream flow; water quantity; and nonnative species.

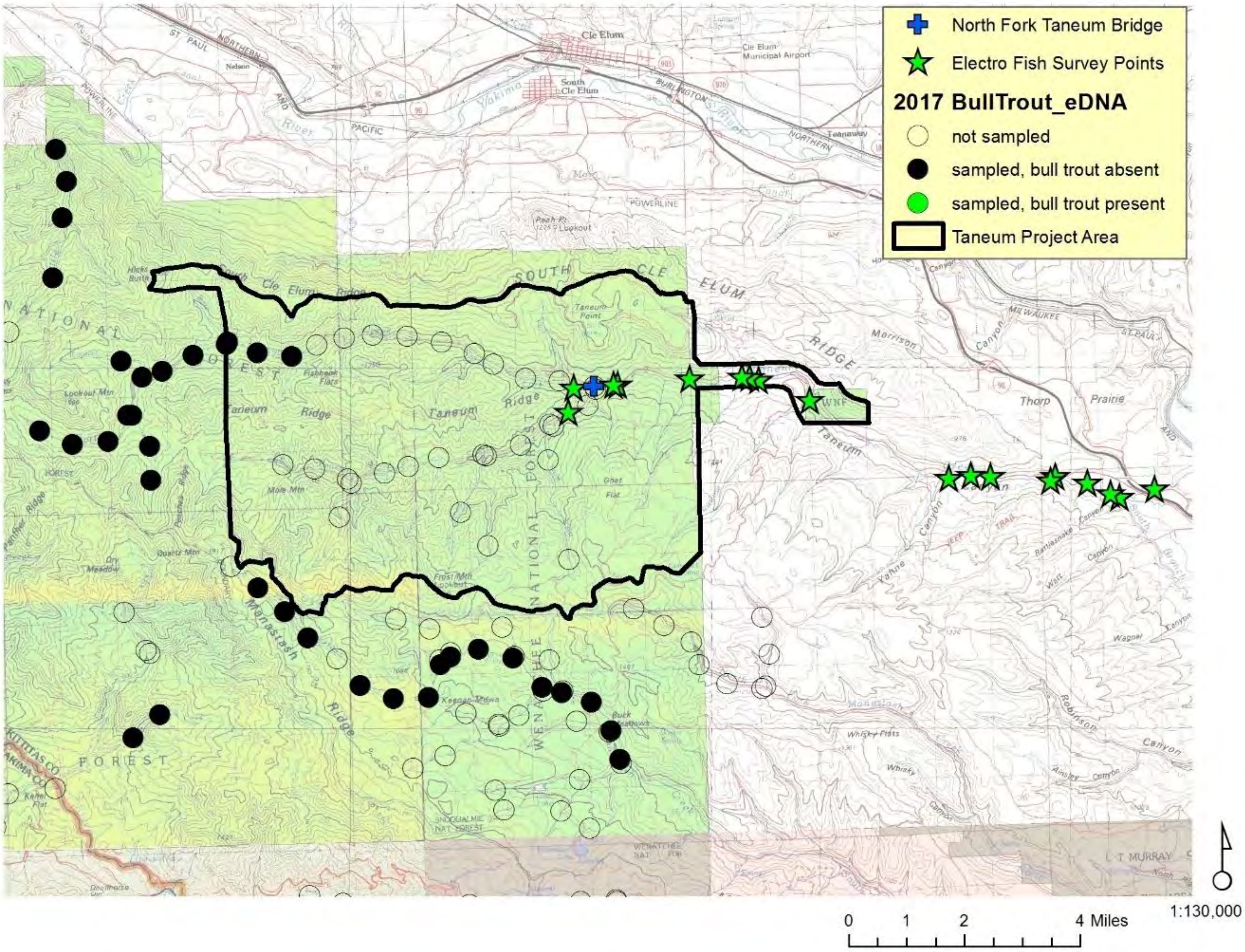


Figure 39. Map displaying WDFW electrofishing survey points (1990-2021), and 2017 environmental DNA (eDNA) sampling locations, in relation to the project area.

Table 35. Distance from the Project Area to the nearest streams (Box Canyon Ck. And Cooper River), where bull trout were detected; during the Range-Wide Bull Trout eDNA Project (2017).

Stream Segments to Project Area	Miles
Box Canyon Creek to Kachess Dam	7
Kachess Dam to Yakima River	2
Yakima River to Taneum Creek Confluence	37
Taneum Creek Confluence to Project Area	9
Sum	54

Stream Segments to Project Area	Miles
Cooper River to Cle Elum Dam	11
Cle Elum Dam to Yakima River	8
Yakima River to Taneum Creek Confluence	20
Taneum Creek Confluence to Project Area	9
Sum	48

Table 36. WDFW 2021 electrofishing results in Taneum Creek.

Stream	Collection Site	Latitude	Longitude	Effort	Date	RBT	MWF	CUT	DACE	CHINOOK	COHO	RSS	EBT	SUK	SCU	NPM	LAMP	BULL T.	STB	LMB	SMB	YP
Taneum	TAN51	47.10716	-120.856	1197	7/12/2021	85	0	0	0	0	0	0	0	0	100	0	0	0	0	0	0	0
Taneum	TAN59	47.11332	-120.878	1379	7/12/2021	90	5	0	0	0	0	0	0	0	115	0	0	0	0	0	0	0
Taneum	TAN8	47.08266	-120.731	955	7/14/2021	85	0	0	30	10	10	5	0	0	50	0	0	0	0	0	0	0
Taneum	TAN58	47.11263	-120.874	1870	7/20/2021	100	0	0	5	0	35	0	0	0	60	0	0	0	0	0	0	0
Taneum	TAN74	47.1124	-120.926	2430	7/20/2021	95	10	0	0	0	400	0	0	0	75	0	0	0	0	0	0	0
Taneum	TAN20	47.08644	-120.767	2400	7/21/2021	200	0	0	250	0	25	0	0	0	300	0	0	0	0	0	0	0
Taneum	TAN27	47.08692	-120.791	1158	7/22/2021	100	0	0	60	50	30	0	0	0	150	0	0	0	0	0	0	0
Taneum	TAN29	47.08737	-120.798	620	7/22/2021	40	0	0	30	10	15	0	0	0	65	0	0	0	0	0	0	0
Taneum	TAN12	47.08091	-120.744	1368	7/26/2021	65	0	0	20	15	10	0	0	0	50	0	0	0	0	0	0	0
Taneum	TAN13	47.08187	-120.747	1206	7/26/2021	25	0	0	20	10	0	0	0	0	35	0	0	0	0	0	0	0
Taneum	TAN16	47.0846	-120.755	939	7/26/2021	110	0	0	40	30	10	0	0	0	100	0	0	0	0	0	0	0
Taneum	TAN66	47.11331	-120.9	2486	7/26/2021	150	5	0	25	50	75	0	0	0	100	0	0	0	0	0	0	0

Steelhead (Oncorhynchus mykiss)

Steelhead are considered by many to have the greatest diversity of life history patterns of any Pacific salmonid species, including varying degrees of anadromy, differences in reproductive biology, and plasticity of life history between generations (Busby et al. 1996). Steelhead spend one to four years in freshwater and one to four years at sea; in Washington, a two/two life history is most common (Steelquist 1992). Because they can survive spawning, some can spawn a second or third time (Steelquist 1992). Juvenile steelhead utilize estuaries as rearing and foraging habitat.

Historically, steelhead populations in the Yakima River basin were robust. However, the Upper Yakima River population viability is considered at “high risk” due to several limiting factors. The limiting factors in the basin include: adverse effects due to hatchery practices; stream flow alterations due to irrigation practices; fish passage barriers in the form of large to small irrigation diversion dams, culverts, and storage/reservoirs; loss of floodplain and riparian habitat due to diking and land use practices; lack of channel complexity and diversity; and other factors including reduced beaver populations, introduction of nonnative species, and increased predation (Conley et al. 2009a).

The Yakima River and its tributaries provides steelhead with a wide range of habitats including the large mainstem channels, small intermittent streams, and channelized activated floodplain habitat. Steelhead spawn in the mainstream of the upper Yakima River and upper Yakima tributaries generally from January through early June (Conley et al. 2009a; Cramer 2012).

The Taneum watershed supports rearing of steelhead throughout the watershed and in the Project Area and spawning in the lower reaches of Taneum Creek. With recent removal of fish passage barriers in the lower reaches of Taneum Creek, and the removal of Bruton dam in 2009, spawning is expected to occur in more areas of the Taneum watershed. Based on monitoring, Taneum Creek steelhead populations are variable from year to year but appear to be stable at low numbers (Temple et al. 2017).

Steelhead spawn and rear throughout the Yakima River basin including in the Taneum watershed. While historically it is expected that steelhead migrated from the upper tributaries to the mainstem Yakima River and downstream to the Columbia River to overwinter and forage, this type of migration has been severely impacted due to fish passage impediments. Migration between the lower Yakima River and upper Yakima River, including tributaries, is expected to be isolated due to fish passage impediments (including thermal barriers), habitat fragmentation, and water quality. Currently, only the very lowest reaches of Taneum Creek within this subwatershed are known steelhead rearing habitats. However, there are 36 miles of potential habitat in the Project Area; 16 miles of potential habitat has a rating of 75 percent, and 20 miles of the potential habitat has a rating of 50 percent. Potential habitat for steelhead has been identified in both the North Fork Taneum and South Fork Taneum Creeks. Additionally, over 54 miles of potential thermal refugia from high water temperatures were identified in the North Fork Taneum Creek subwatershed.

To protect designated critical habitat, NOAA Fisheries has identified six physical and biological requirements or physical and biological features (PBFs) that are essential for the conservation of steelhead. Three PBFs related to freshwater spawning, rearing, and migration apply to the Taneum Restoration Project.

Aquatic Habitat Baseline Conditions

This section summarizes the aquatic habitat baseline conditions of the Taneum Restoration Project. Baseline conditions were compared to the NOAA Fisheries and USFWS Matrix of Diagnostics/Pathways and Indicators (NMFS 1996; USFWS 1998) to assess baseline conditions of the Taneum Watershed and Project Area. Of the 25 indicators, 1 was found to be functioning properly or appropriately, 12 were found to be functioning at risk and 12 were found to be not functioning properly or functioning at unacceptable risk. A summary of baseline conditions and the results of the assessment are summarized at the end of this section.

Analysis Methods

Stream Flow and Water Storage

To assess the influence of vegetation condition and potential restoration at the watershed scale (HUC 10), data from the vegetation inventory (Structure and Cover) were used to describe the current condition and compare to a set of reference conditions, historical and future, based on landscape reconstructions described in (Hessburg et al. 1999). Additional assessments at the catchment scale were conducted to assess impacts on stream flows. The Road Drainage Connectivity Diversion Potential tool (NetMap 2017) was used to assess the influences that a road network has on water flow across a subwatershed. This tool uses a 10-meter resolution digital elevation model (DEM) to identify road segments that may be hydrologically connected to the stream drainage network. The tool provides an index of potential road drainage diversion during periods of high-water flow, such as may occur during large storms or following wildfires when secondary drainage structures may be compromised or not working properly.

Erosion and Sediment Supply

The Geomorphic Road Analysis and Inventory Package (GRAIP) Lite tool (NetMap 2017) was used to identify road segments that have the highest potential to deliver fine sediments to streams. In addition, field surveys of road conditions identified areas with visual evidence of erosion of the road surface and to identify other erosion issues (e.g., failed culverts, gullies, landslides). Field data were then used in combination with GRAIP Lite to identify and prioritize areas for road related rehabilitation and restoration opportunities.

Integration of a General Erosion Potential Delivered (GEPdel) dataset with landslide hazard ratings for Land Type Associations (LTAs) resulted in a digital surface helpful for identifying landscape conditions that are prone to landslides and slope failures (NetMap 2017; Davis et al. 2004). An overlay with the roads data layer identified road segments at risk of failure and/or that may interrupt the delivery of wood and coarse sediment to streams.

Additionally, road field surveys identified 327 field points that were recorded and stored in an ArcGIS file geodatabase. Data recorded from roads included: erosion severity, culvert condition, drainage ditch condition, road surface condition, road surface type, and fish barrier. Photos were taken at most locations to accompany field data. The data and photos contained within the file geodatabase were used to identify roads and locations for aquatic restoration, erosion control, and more intensive field surveys in the Project Area (see separate report on field surveys by J. Begley and S. Duncan, 2017).

Riparian Dynamics and Conditions

To assess the current condition of forested riparian habitats within Riparian Reserves, data from the terrestrial vegetation inventory was used to map several structural attributes associated with key riparian ecosystem processes: tree size, canopy closure, and the amount of late successional and old forest (LSOF) and hardwoods. A set of reference conditions, analogous to those used in the terrestrial landscape evaluation, were developed for two channel classes: confined channels (limited floodplains) and unconfined channels (more extensive floodplains) based on previous classification systems (Beechie and Imaki 2014; Kasprak et al. 2016).

Channel, Floodplain, and Habitat Dynamics

The floodplain mapping tool in NetMap (Benda and Miller 2017) was used to approximate the floodplain area. Roads inventory data and remote imagery were used to identify roads that intersect floodplains and portions of the floodplains that are no longer connected to the main-stream channel.

Habitat Connectivity

Road and stream data were used to identify road stream crossings that intersect current or potential habitat for listed fish species. In addition, during field surveys of road conditions, a preliminary assessment of the road-stream crossings was made. Finally, the Thermal Refugia tool in NetMap (2017) was used to identify where cold water or thermal refuge is most likely to persist in the subwatershed based on current shade and thermal energy conditions. The field and spatial data were used to identify barriers to fish passage with the greatest potential to access additional habitat and cold water.

Current and Potential Habitat for Listed Fish Species

The current distribution of listed fish species and the identification of areas that are potential habitat, provide one assessment of the ability of streams to contribute to the recovery of listed fish species (NMFS 2009; USFWS 2015b). In addition, site specific data from fish surveys, monitoring, or research was used to identify spawning reaches or other attributes that may be important in determining restoration opportunities and priorities, or areas of particularly high sensitivity that are in need of protections.

For this assessment, the steelhead and bull trout specific intrinsic habitat potential tools in NetMap (2017) were used to identify the distribution of potential habitat within the North Fork Taneum Creek and Taneum Creek subwatersheds. Survey data from WDFW, USFS, Yakama Nation and others further informed distribution of listed fish species and critical habitat designations.

Environmental Baseline and Action Area

The project is located south of the city of Cle Elum, WA in the North Fork Taneum Creek and Taneum Creek sub-watersheds. The North Fork Taneum Creek subwatershed covers 46.2 square miles (29,545 acres) of land owned by federal, state, and private entities. The Taneum Creek subwatershed covers 40.25 square miles (25,730 acres) with similar land ownership. The Project Area is predominantly located within the North Fork Taneum Creek subwatershed (see Figure 40) with 21,529 acres in the North Fork Taneum Creek subwatershed and 6,121 acres in the Taneum Creek subwatershed. An additional 10.6 acres are at the edge of the Crystal Creek – Yakima River subwatershed; these 10.6 acres do not include any Riparian Reserve and are not considered further. Both subwatersheds lie within the larger Taneum watershed, which encompasses 86.4 square miles (55,275 acres) of the Upper Yakima subbasin, a part of the larger Yakima River basin as shown in

Table 37 and Figure 40. All 27,662 acres of the project area completely fall within the Taneum Creek-Yakima River 10th field watershed within the larger Upper Yakima 8th field subbasin (hydrologic unit code, HUC 17030001). The Taneum Restoration Project Area includes 27,662 acres covering no more than 50 percent of the entire Taneum Watershed. There are 570 miles of perennial streams and 867 miles of intermittent streams within the Taneum Creek – Yakima River 10 field watershed. The Action

Area for analysis of effects extends downstream from the Project Area and is 55,275 acres; this area is shown in Figure 41 labeled as Analysis Boundary.

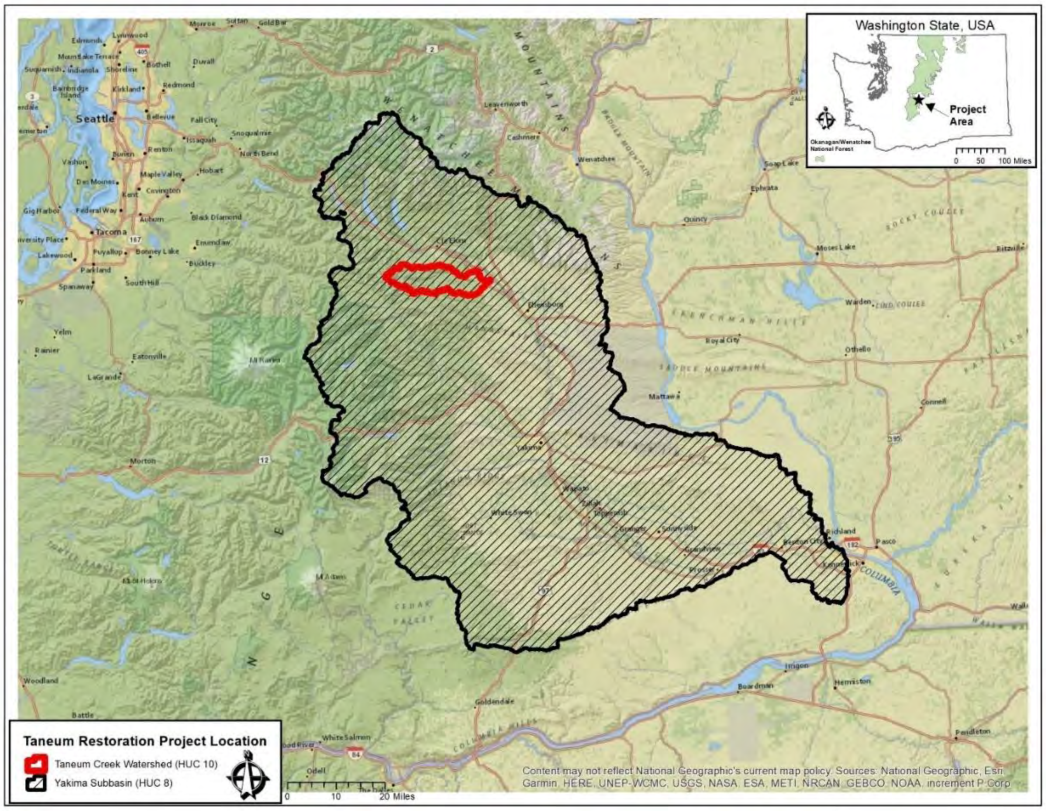


Figure 40. Location of Taneum Creek watershed within the Yakima subbasin.

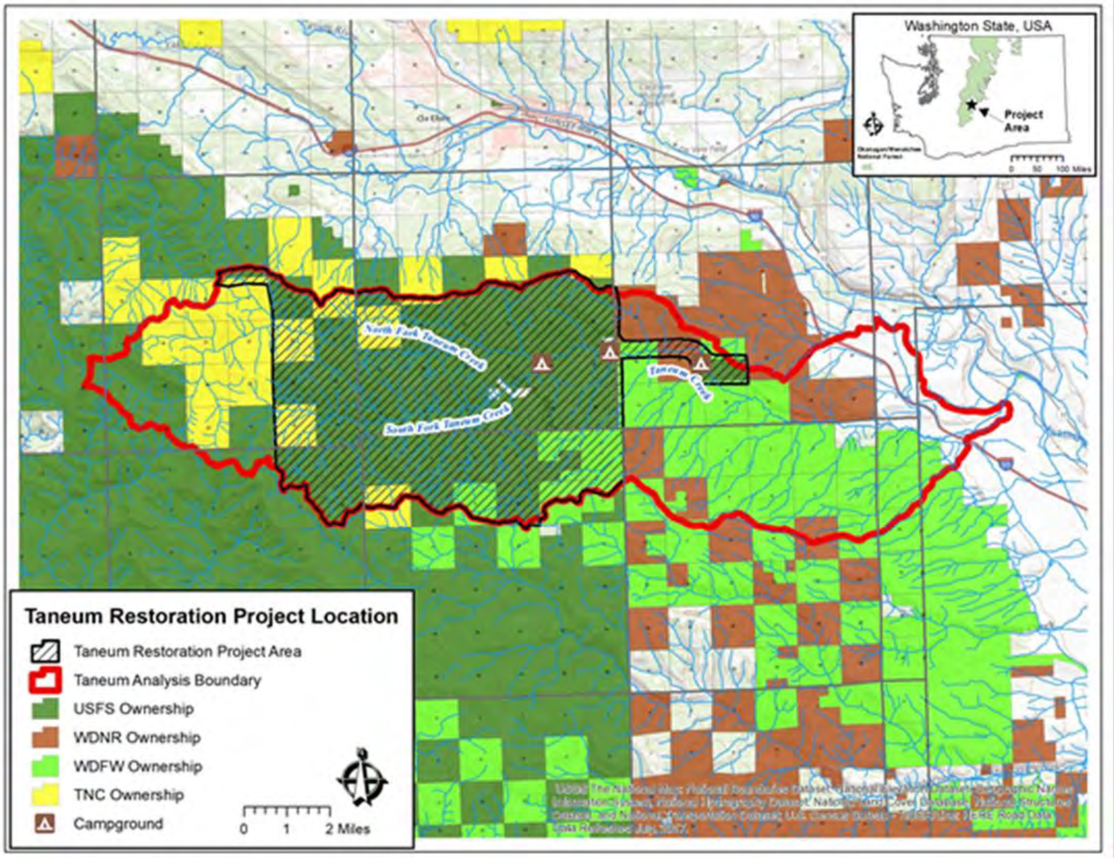


Figure 41. Map of the Taneum Restoration Action Area for fish analysis in red, and ownership boundaries.

Table 37. Drainage system hierarchy within the Taneum Restoration Project Area.

River Basin	Subbasin	Watershed HUC 10	Subwatershed HUC 12
Yakima 170300	Upper Yakima 17030001	Taneum 1703000105	Taneum Creek 1700300010504
			North Fork Taneum Creek 170300010503

Originating in the upper elevations of the Taneum watershed, the North Fork and South Fork Taneum Creeks flow through a forested landscape for 12 and 9 miles, respectively, before merging to form the mainstem Taneum Creek, which flows through forested to shrub-steppe habitat and agricultural lands for 12.7 miles to its confluence with the Yakima River. Elevations in the basin range from 6,280 feet to 1,690 feet. The majority of the system flows through forested and undeveloped lands until it reaches the lower portions. Meadows, wetlands, and riparian habitats are found at all elevations throughout the watershed. There are no more than 5,828 acres of Riparian Reserve in the Project Area and 1,036 acres of Riparian Reserve within the Action Area.

Bankfull widths in the Taneum watershed range from 33 to 43 feet in the mainstem and 0.33 to 7 feet in the headwater tributaries. The mainstem Taneum Creek is a sixth order stream and the North and South Forks of Taneum Creek are mostly fifth order streams characterized by stream gradients ranging from 0 to 7 percent with fourth to first order tributaries having stream gradients ranging from 7 to more than 10 percent.

Annual precipitation (rain and snow) in the area ranges from greater than 64 inches in the upper portions of the watershed to 9 inches in the lower portions near the confluence with the Yakima River. The Taneum watershed has 34 miles of contiguous stream channels, and a mean annual flow of 66 cubic feet per second (cfs) with flows generally peaking during spring runoff and low flows occurring during hot summer/early fall months. Peak flows can also occur in late fall/early winter with heavy precipitation and rain on snow events with flows reaching 600 cfs. Typical summertime flows in Taneum Creek range from 5 to 15 cfs (DOE 2016).

Taneum Creek supports several anadromous salmonid and resident fish species (discussed in more detail in the following section). These species include Chinook and coho salmon (reintroduced) as well as steelhead, bull trout, rainbow trout, and Westslope cutthroat trout. Historically, coho were found throughout the Yakima River. They were reintroduced to the Yakima River in the 1980s and generally spawn and rear in the mainstem of the upper Yakima River, primarily in the Ellensburg and Thorp reaches of the Yakima River, the Naches River, and the Ahtanum River (BOR and DOE 2011; 2012). Figure 42, Figure 43, and Figure 44 show selected fish distribution in the Taneum Watershed as identified by WDFW Open Data Statewide Washington Integrated Fish Distribution dataset. In some cases, the dataset may differ from observations made in the field, such as steelhead spawning that has been observed in Taneum Creek above Taneum Campground. During steelhead migration and spawning periods, vehicle access beyond Taneum Campground is often limited due to impassable snow on forest roads, resulting in limited ability to document the upper extent of steelhead distribution in many areas of the North Fork and South Fork Taneum Creeks and tributaries in the Taneum Creek system. Aside from the falls on the South Fork Taneum Creek at river mile 2, no natural barriers or habitat conditions exist that would prevent steelhead from migrating up the North Fork and South Fork Taneum Creeks and it is expected that they do access the area (Jim Matthews, Yakama Nation Fisheries personal communication with S. Duncan).

In the 1980s, the Yakima River Basin Water Enhancement Project and Yakima Basin Integrated Plan identified Taneum Creek as a high priority tributary for fish enhancement projects (BOR and DOE 2012).

Taneum Creek is also identified as important in the Steelhead Recovery Plan (Conley et al. 2009a), the Bull Trout Recovery Plan and Yakima Bull Trout Action Plan (Reiss et al. 2012; USFWS 2015b).

The upper Taneum watershed is important for water quality and as a source of cold water for salmonids. Taneum watershed provides water supply and current or potential salmon and steelhead spawning, rearing, and foraging habitat. Over the past two decades, several restoration projects have been conducted in Taneum Creek which included: enhancing fish passage, screening irrigation diversion intakes, removing diversion dams, reducing water loss in unlined irrigation infrastructure and restoring instream flows, restoring floodplain connection and riparian habitat, and restoring instream habitat complexity with the addition of large wood (Temple, Mays, and Frederiksen 2015; Monk 2015). Acquisitions of private land in the upper Taneum watershed have also occurred to protect and enhance water quantity and cold-water sources.

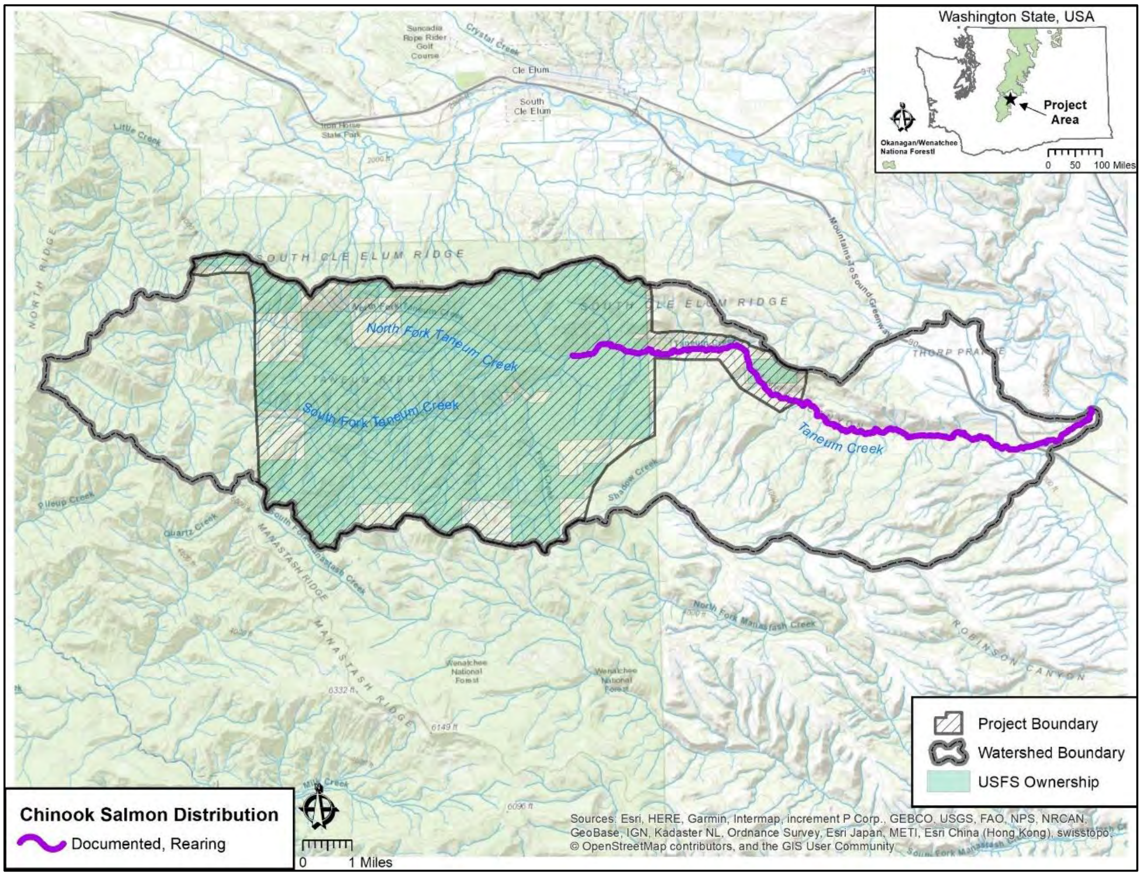


Figure 42**.** Chinook salmon distribution.

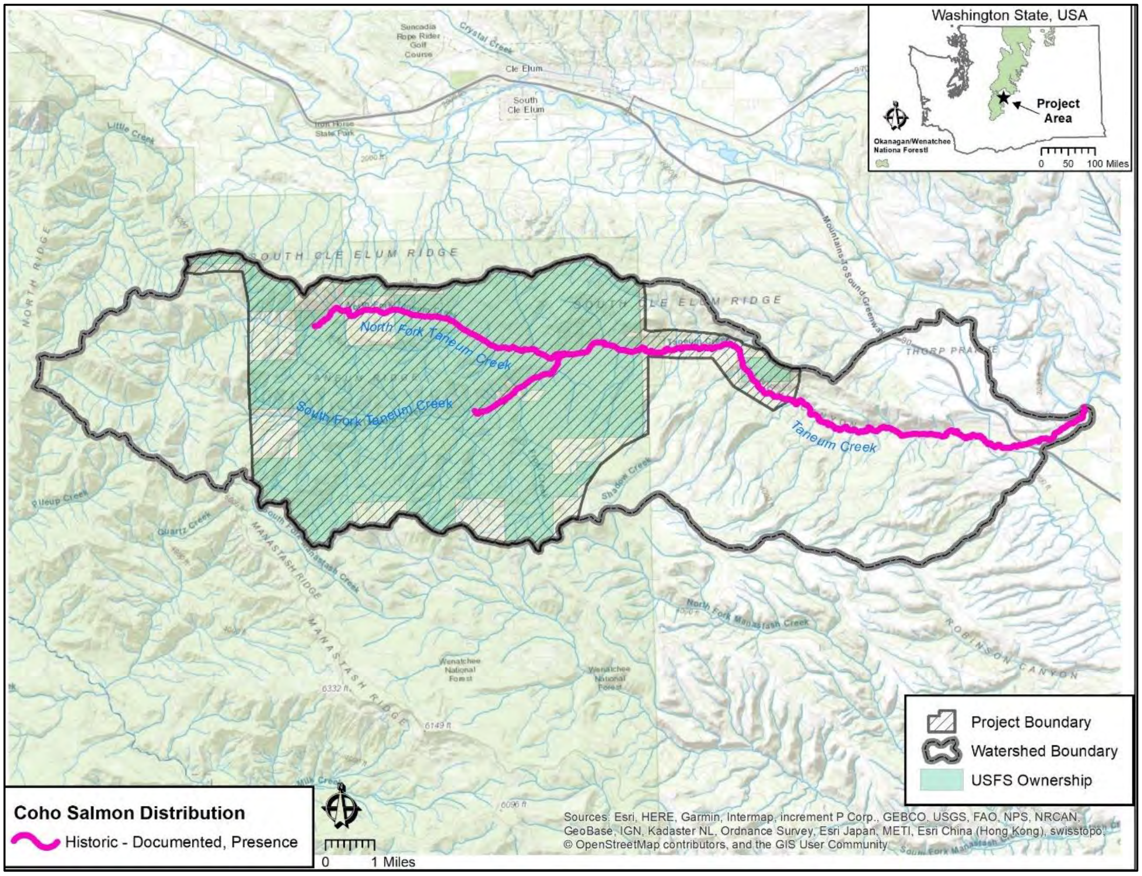


Figure 43. Coho salmon distribution.

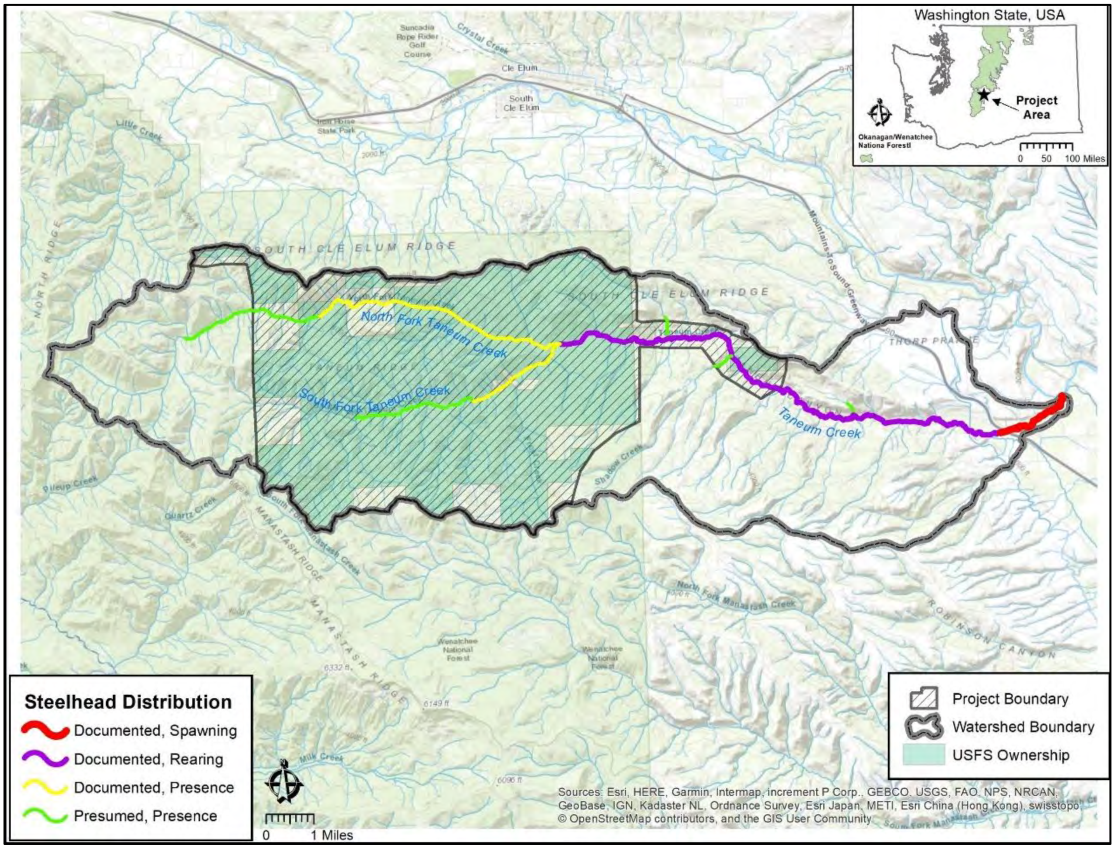


Figure 44. Steelhead distribution.

Present and On-going Actions

The following USFS actions are ongoing in the watershed. Activities include livestock grazing, invasive plant treatments, recreation, landscape restoration, and other actions described below.

Transportation System: Maintenance of system roads continues, as scheduled, and includes danger tree removal along roads when needed.

Livestock Grazing: A portion of a permitted grazing allotment is located within the Project Area. An Environmental Assessment and decision for the Allotment Management Plan (AMP) was completed in 2014. The management of the grazing allotment is achieved through the use of roads, water developments, movement and protection of grazing animals, and monitoring of forage utilization. Annual coordination meetings between District Range Specialists and the permittee occur to allow adaptive changes to allotment management.

Invasive Plant Treatments: Invasive plant populations continue to be treated annually by spot-spraying with herbicide, hand-pulling, or bio-control agents. The action area is covered under the Okanogan-Wenatchee National Forest Invasive Plant Management Final Environmental Impact Statement (USFS 2016b).

Recreation: Activities include campground management, hazard tree removal, road and trail maintenance, other infrastructure maintenance, snowmobiling and snowmobile trail grooming, hunting, fishing, camping in dispersed sites and developed campgrounds, Off-Highway Vehicle (OHV) use, pleasure driving, mountain biking, hiking, foraging, and horseback riding. There is an extensive system of motorized trails that are maintained and used.

Manastash-Taneum Resilient Landscapes Project: The agencies involved in the TAPASH Collaborative have several ongoing actions within the analysis area, all with the objective of “improving ecosystem health and natural functions of the landscape through active restoration backed by the best available science, community input, and adaptive management” (Haugo et al. 2016). The projects include placement of wood in Taneum Creek to enhance aquatic habitats; forest thinning on 500 acres in the North Fork Taneum subwatershed (primarily on The Nature Conservancy lands), and 3,500 acres of forest thinning in the Taneum subwatershed (primarily on Washington Department of Fish and Wildlife and Washington Department of Natural Resources lands) to restore fire regimes and wildlife habitats.

Reasonably Foreseeable Future Actions

Reasonably foreseeable future actions are those proposed and scheduled for planning and/or implementation. Future projects that are not yet covered by a decision will be thoroughly analyzed and documented in separate, future environmental analyses.

Bull trout reintroductions: The Yakama Nation is in the planning phases of reintroducing bull trout in to the Taneum watershed. A feasibility study was finalized and submitted to the Yakima River Bull Trout Working Group in 2020. The first of 5 years of reintroductions is planned for 2025.

Transportation System: Maintenance of system roads continues and includes danger tree removal along roads when needed. The Forest is conducting environmental analyses for travel management planning that will designate motorized access routes for public use across the Forest. Decision pending.

Livestock Grazing: Grazing will continue within the permitted grazing allotment. Annual coordination meetings between District Range Specialists and the permittee will occur to allow adaptive changes to allotment management.

Invasive Plant Treatments: Integrated weed management will continue to occur with an emphasis on early-detection, rapid treatment response, and prompt re-vegetation. The analysis area is covered under the Okanogan-Wenatchee National Forest Invasive Plant Management Final Environmental Impact Statement (USFS 2017).

Recreation: Recreational activities that are expected to continue to occur include: campground management, hazard tree removal, road, trail, and other infrastructure maintenance, snowmobiling and snowmobile trail grooming, hunting, fishing, camping in dispersed sites and developed campgrounds, Off-Highway Vehicle (OHV) use, pleasure driving, mountain biking, hiking, foraging, and horseback riding. There is an extensive system of motorized trails that are maintained and used.

Manastash-Taneum Resilient Landscapes Project: The agencies involved in the TAPASH Collaborative have several foreseeable actions within the analysis area, all with the objective of "improving ecosystem health and natural functions of the landscape through active restoration backed by the best available science, community input, and adaptive management". The projects include: placement of wood in Taneum Creek to enhance aquatic habitats, forest thinning on 1,500 acres in the North Fork Taneum subwatershed (primarily on The Nature Conservancy lands), and 1,000 acres of forest thinning in the Taneum subwatershed (primarily on Washington Department of Fish and Wildlife and Washington Department of Natural Resources lands) to restore fire regimes and wildlife habitats.

Baseline Habitat Indicators

The following section addresses NOAA/USFWS Matrix of Pathways and Indicators (MPI) (Table 52). The general organization of the NOAA Fisheries MPI is presented first, followed by the USFWS MPI pathways for Species and Habitat.

Water Quality

Temperature and Chemical Contamination and Nutrients:

Taneum Creek is listed on Washington State Department of Ecology's (Ecology) 303d list for impaired waterbodies for high temperatures that can be lethal to salmonids, and a Total Maximum Daily Load (TMDL) project has been implemented which includes restoring riparian habitat (Figure 45). Historic mean August stream temperatures (1993-2011) range from 63 degrees Fahrenheit in the lower reaches of mainstem Taneum Creek to 45 degrees Fahrenheit in the upper tributaries of North Fork and South Fork Taneum Creeks (Figure 46; NorWeST 2020). Department of Ecology designated aquatic life uses for Taneum Creek include core summer salmonid habitat and salmonid spawning, rearing and migration (Creech and Tighe 2016). Taneum Creek is considered to be **functioning at risk** for water temperature. Because there are no 303(d) listings for chemical contaminants or nutrients and the area has little to no major development, the Taneum watershed is considered to be **functioning properly or appropriately** relative to temperature and chemical contamination and nutrients.

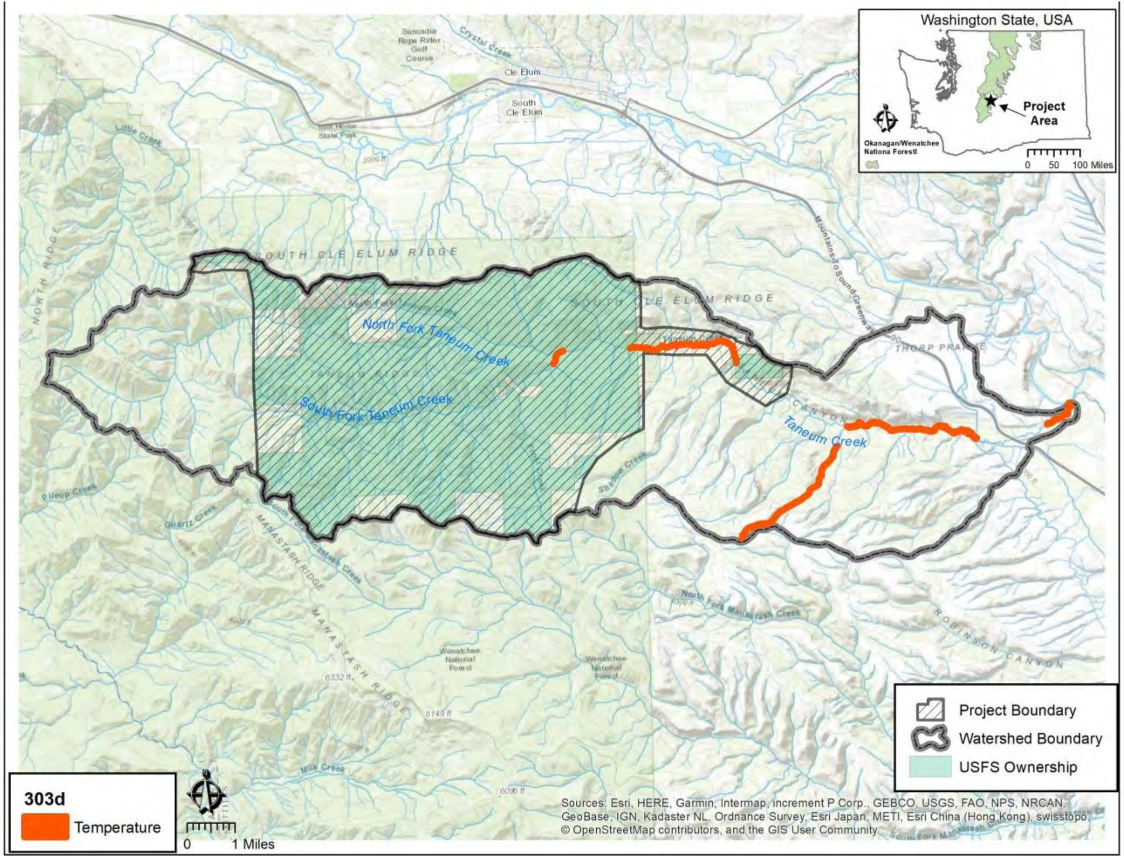


Figure 45. 303d list.

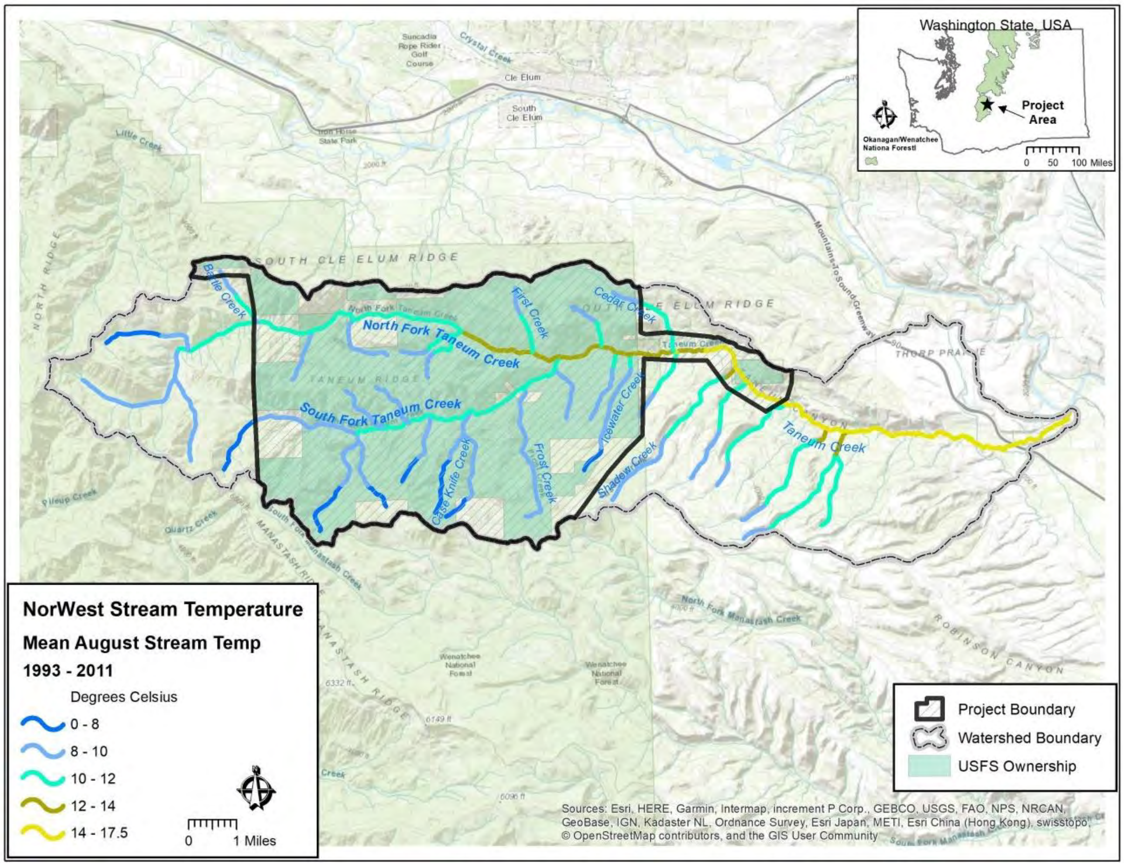


Figure 46. Mean August stream temperature 1993-2011.

Habitat Access

Physical Barriers:

With recent removal of fish passage barriers in the lower reaches of Taneum Creek, habitat connectivity within the Taneum drainage was considered to be generally good (Haugo et al. 2016). Field surveys of road stream crossings in the initial evaluation were limited to the mainstems of Taneum, North Fork Taneum and South Fork Taneum Creeks because of the current distribution of current and potential steelhead habitat in these subwatersheds. One undersized culvert on the North Fork Taneum Creek and two vehicle fords on the South Fork Taneum Creek were identified as needing further field surveys to evaluate their potential to be barriers to fish passage during low flows; and the culvert on North Fork Taneum Creek appeared to be undersized to pass predicted 100-year flow and associated debris with predicted climate change flows (Raymond, Peterson, and Rochefort 2014).

During the 2018 road surveys, numerous culverts were observed and assessed in the Taneum Watershed and Action Area (APPENDIX C – ARBO II AQUATIC RESTORATION) resulting in some being identified as impacting fish migration; 11 full or partial fish passage barrier culverts or aquatic organism passage barriers were inventoried in the Taneum Watershed on fish bearing streams. Seven of the 11 inventoried fish passage barrier culverts or aquatic organism passage barriers were found on five streams in the Project Area: 1 on Cedar Creek; 1 on Kid Creek; 3 on Ice Water Creek; 1 on First Creek; and 1 on Frost Creek (APPENDIX C – ARBO II AQUATIC RESTORATION). None of the fish passage barrier culverts are on streams with designated critical habitat for steelhead or bull trout. One ford that was inventoried as a fish passage barrier due to water surface drops is on Ice Water Creek. Two fords that are likely barriers to juvenile salmonids at low flows were identified on South Fork Taneum Creek and mainstem Taneum Creek. These two fords are in areas with designated critical habitat for steelhead and bull trout and Essential Fish Habitat (EFH) for Chinook and coho salmon. Additionally, 327 field points documenting erosion severity included many roads with damaged or undersized culverts at several stream crossings throughout the watershed. The area is considered to be **functioning at risk** for physical barriers

Habitat Elements

Sediment, Turbidity and Substrate:

There are 203 miles of roads that have the potential to deliver sediment to a stream in the North Fork Taneum Creek subwatershed. Five of those 203 miles are ranked as having high, 32 miles are ranked as having medium-high to medium, and 167 miles are ranked as having low-medium to low potential to deliver sediment to a stream. Of the road network, Maintenance Level 2 roads have the potential to deliver 60 percent of the overall sediment delivery budget to streams, followed by 38 percent from Maintenance Leve 1 roads and just over 1 percent from passenger car roads. There are 1.8 miles of road segments that occur in high erosion potential areas, 74 miles of roads that occur in moderate erosion potential areas, and 126 miles that occur in low erosion potential areas. Additionally, the road field surveys identified 327 field points documenting erosion severity and culvert, drainage ditch, and road surface conditions. Many of the roads have damaged or undersized culverts at several stream crossings throughout the watershed.

From 1990 to 1994 McNeil bulk gravel sampling surveys were conducted in the mainstem of Taneum Creek and North Fork Taneum Creek using the methodology outlined in the Timber, Fish, Wildlife Ambient Monitoring Program Manual (1993). The lower mainstem Taneum subwatershed averaged between 12 and 20% fines and the North Fork averaged 24% fines; no data are available for other areas. Wenatchee Forest Plan standard requirements for fine sediment levels are 20% and lower. Regarding embeddedness, surveys conducted for the Quartz Mountain watershed analysis found embeddedness levels ranging from 25-50% in six of nine sampled reaches and 50-75% in two reaches (USFS 2018b); these values indicate poor substrate conditions.

Based on the modeled data, results of road surveys and personal communication with the District Fish Biologist, the Taneum Watershed is **not functioning properly or functioning at unacceptable risk** for sediment, turbidity, and substrate metrics.

Large Wood and Pools:

Instream large wood is lacking across the Project Area and is considered to **not be properly functioning or functioning at unacceptable risk**. Sources of large wood for recruitment to streams have been limited by logging, roads, and fire suppression. Surveys by USFS staff between 1995 and 2015 identified less than 15 pieces of large wood (20 inches diameter and 35-foot-long) per mile in all areas except a portion of South Fork Taneum Creek (USFS 2020a). Stream surveys conducted across 24.4 stream miles during summer of 2018 in portions of Taneum Creek, North Fork and South Fork Taneum Creeks and eight tributaries (including Frost Creek, First Creek, and Ice Water Creek) documented 809 pieces of large wood, which is 33 pieces of large wood per mile. Within the Project Area, 23.4 stream miles were surveyed, and 775 pieces of large wood were documented, resulting in 33 pieces of large wood per mile.

Instream large wood is instrumental in forming pools and providing habitat diversity and complexity. In the Taneum watershed there have been past observations of pools filling with fine sediment (USFS 2018b). Regarding large pools, average pool depths in South Fork Taneum subwatershed range from 1 to 3 feet. Data from the USFS aquatic database showed pool frequencies in the Taneum subwatershed to be in the poor range (USFS 2020a). Pool quality, depth and frequency are considered to be **functioning at risk**.

According to Fox and Bolton (2007), large wood densities are lacking and should be increased to support development of complex habitat by enhancing watershed processes such as pool formation, sediment retention and sorting of gravels, bank stability, and functional interactions between water and the ecosystem by reconnecting side channel and floodplain habitats important for spawning, rearing, and refugia during high flows.

Table 38 presents wood quantities that would be expected in a natural, unmanaged forest subject to a natural disturbance regime (Fox and Bolton 2007) based on the identified reaches in the Taneum Creek basin according to the bankfull width classes for Taneum Creek, North Fork Taneum Creek and South Fork Taneum Creek. These values are based on the 75th percentile of the natural ranges of wood loads, which is a reasonable restoration target in reaches that have been degraded, such as in these streams. Providing above the median range (75th percentile) will help restore heterogeneity in the stream, since the degraded reaches are much less than the median (50th percentile) for wood loads based on existing data (1995-2015). Table 39 presents total combined wood quantities observed in 2018 summer surveys in larger salmonid streams in the Project Area: Taneum Creek, North Fork Creek, and South Fork Creek.

Table 40 presents wood quantities observed in individual creeks, including smaller tributaries surveyed in 2018 summer surveys. Figure 47 shows large wood distribution observed across the Project Area in 2018 summer surveys. This figure can be used along with the 1995-2015 surveys (Figure 48) to prioritize placement of large wood in areas that have been previously surveyed, and in other areas, such as intermittent streams, where wood may be found to be lacking and identified as needing wood replenishment. Adding wood to intermittent streams would increase roughness and restore processes of sediment storage and flow modulation. At present the area is considered to be **functioning at risk** for disturbance regime, based upon the types of disturbance present, their frequency, and magnitude of change in habitat quality. Some of these disturbances and changes have resulted from large wildfires (2014) and emergency bridge repairs (2018) on the Cle Elum Ranger District.

Table 38. Expected wood quantities in a natural, unmanaged forest subject to a natural disturbance regime based on the identified reaches in the Taneum Creek basin (Martin Fox personal communication with S. Duncan).

Bank Full Width Class (feet)	Number of wood pieces/mi	Volume of Wood pieces/mi (cubic feet)	Qualifying Key Piece Volume (cubic feet)	Number of Key pieces/mi
33-43	563	8,532	212	32
27-33	563	8,532	88	32
20-26	563	8,532	88	32
13-20	467	8,532	35	32

Table 39**.** Existing total combined wood quantities observed in Project Area in 2018 summer surveys in larger salmonid streams: Taneum Creek, North Fork Creek, and South Fork Creek.

Bank Full Width Class (feet)	Stream Miles Surveyed	Number of wood pieces/mi	Volume of Wood pieces/mi (cubic feet)	Qualifying Key Piece Volume (cubic feet)	Number of Key Pieces/mi
33-43	2.3	190	4,261	59.6	3.2
27-33	4.2	734	14,620	240.0	14.5
20-26	2.2	871	21,893	348.4	17.7
13-20	-	-	-	-	-

Table 40. Existing wood quantities observed in Project Area in 2018 summer surveys in individual creeks for bank full widths where large wood was observed.

Bank Full Width Class (feet)	Stream Miles Surveyed	Number of wood Pieces/mi	Volume of Wood Pieces/mi (cubic feet)	Qualifying Key Piece Volume (cubic feet)	Number of Key Pieces/ mi
Taneum Creek					
33-43	2.3	190	4,261	59.6	3.2
North Fork Taneum					
27-33	3.3	723	15,673	273.5	16.1
South Fork Taneum					
27-33	0.9	774	1,248	121.8	8.0
20-26	2.2	871	21,893	348.4	17.7
Frost Creek					
<12.9	5	240	4,277	39.3	3.2
First Creek					
<12.9	0.3	1890	33,095	376.2	17.7
Ice Water Creek					
<12.9	0.6	613	7,366	0	0

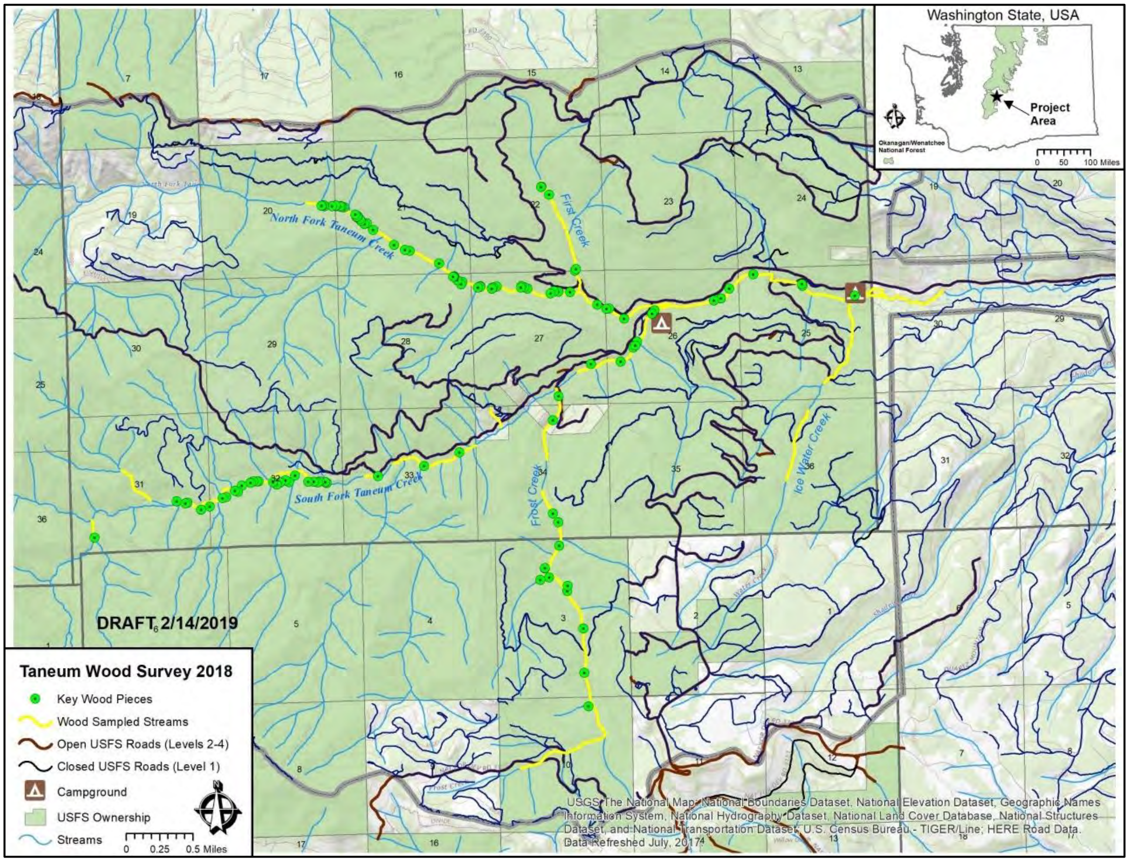


Figure 47. Taneum wood survey 2018 (to be consistent with previous surveys, research and agency guidance, large wood in this case is 20 inches in diameter and 35 foot in length).

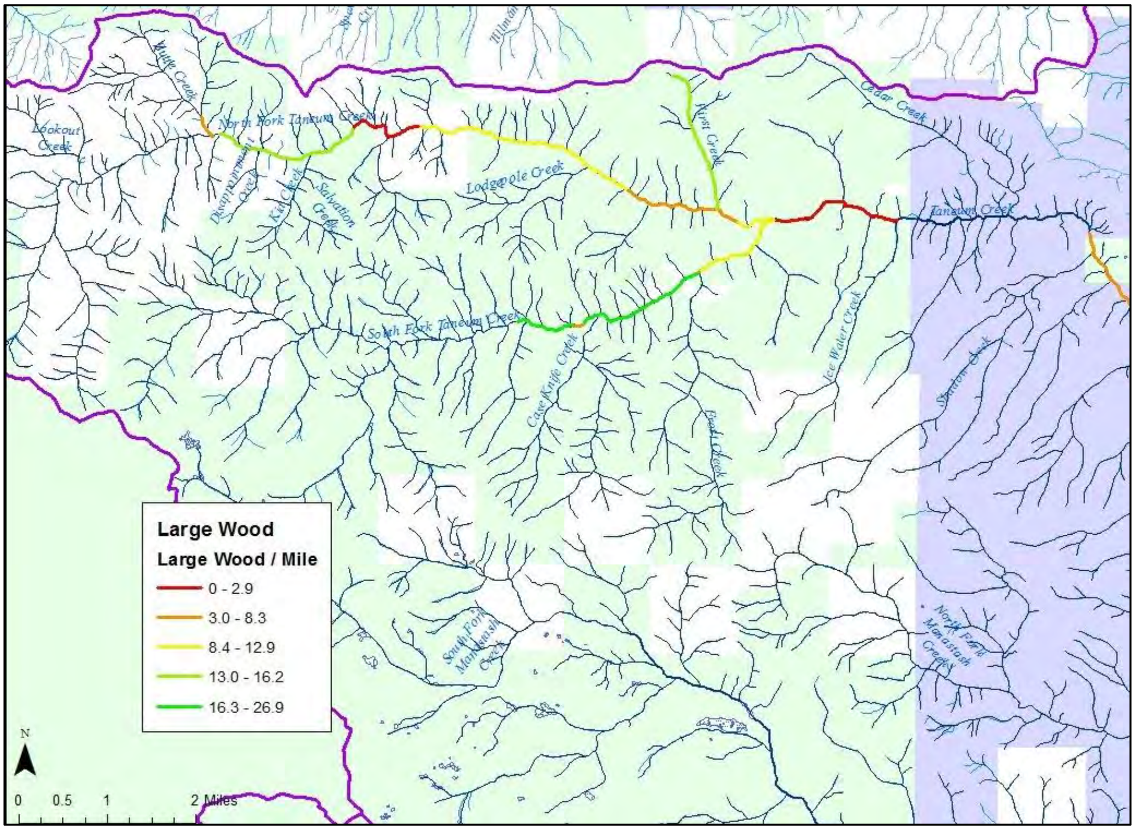


Figure 48. Large wood survey 1995-2015 (large wood in this case is 20 inches in diameter and 35 foot in length).

__Floodplain Connectivity, Off-channel Habitat, and Refugia:__
Based on NetMap, High Resolution Stereo Imagery (NAIP) and LiDAR for Taneum Campground area, there are 332 acres of floodplains in the Project Area and 10 miles of roads that intersect the floodplains. There are 5.8 miles of trails that intersect the floodplains in the Project Area. Construction of roads and trails within the floodplains has resulted in a reduction of 64 acres of floodplain habitat. Roads have interrupted floodplain functions most substantially in the northeast portion of the watershed. See Figure 49, Figure 50, and Table 41. Floodplain connectivity and off-channel habitat metrics are considered to be **functioning at risk**. Refugia were assessed for the upper Yakima 4th order watershed. Throughout most of the watershed, habitat refugia are limited due to the presence of major roads within or adjacent to floodplains and the number of at risk or unacceptable risk elements. This metric is considered to be **functioning at unacceptable risk or not properly functioning**.

Table 41. Taneum Project Area road and trail miles in floodplain areas.

Acres	Miles		Acres
Floodplain in Project Area	Project Area	Floodplain	Floodplain Intersected
332	Roads		
	170.2	4.8	29
	Trails		
	62.9	5.8	35

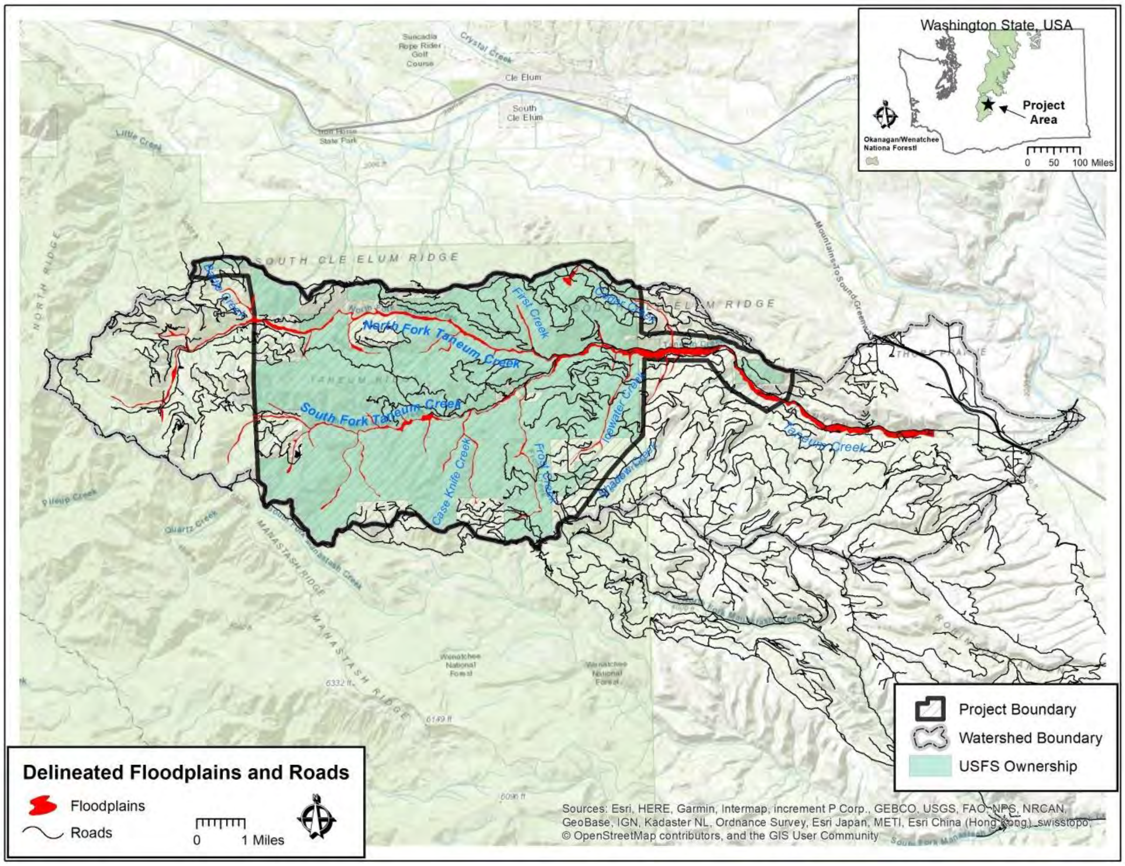


Figure 49. Delineated floodplains and roads.

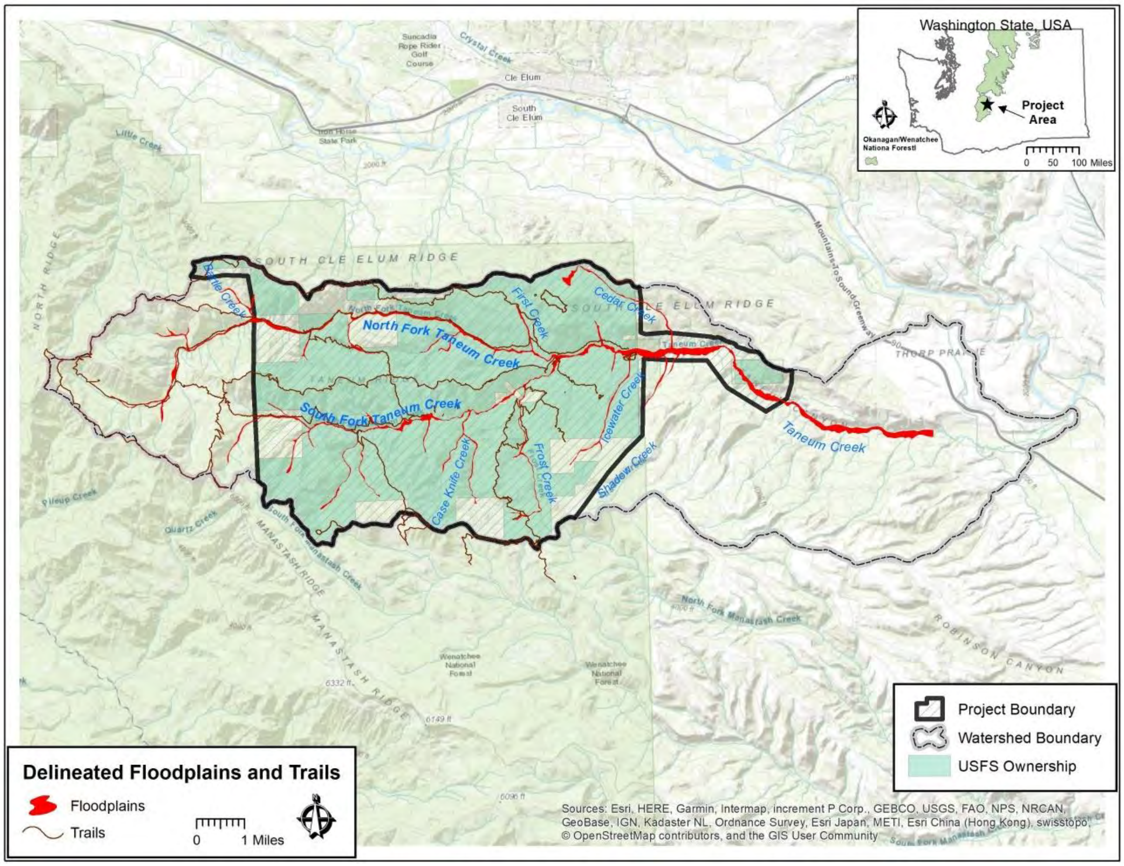


Figure 50. Delineated floodplains and motorized trails.

Channel Condition and Dynamics

Bankfull Width to Depth and Streambank Condition:

According to the 2018 Cle Elum District Emergency Fire BA (USFS 2018), bankfull width/depth ratios in the area are considered to be functioning at risk (Table 42). There are areas of disturbance in the watersheds associated with dispersed camping and timber harvest in which width/ratios are greater than natural conditions.

Roads, timber harvest, and recreation have resulted in impacts to streambanks in the Taneum watershed. For example, a survey of streambank condition found 32% of the total length of streambank for North Fork Taneum Creek was eroding and 34% for South Fork Taneum Creek, due to a combination of natural causes and recreation (YRMC and CWU 1993). Data from the Forest Service database indicated high rates of erosion in South Fork Taneum Creek, First Creek and Butte Creek, with moderate rates of erosion elsewhere (USFS 2018). Overall, stream bank condition is **functioning at risk** (Figure 51).

Table 42**.** Morphological characteristics of streams within the Taneum subwatershed (USFS 2020a).

Survey Year	**Stream Name**	**Reach**	**Entrench**	**Width/Depth**	**Rosgen Reach Class**	**Protocol Name**
1993	First Creek	01-01		5		R6 East Pre96 AI_AB Presence
1993	First Creek	01-01		5		R6 East Pre96 AI_AB Presence
1993	First Creek	01-02		7		R6 East Pre96 AI_AB Presence
1993	First Creek	01-02		7		R6 East Pre96 AI_AB Presence
1995	First Creek	02-01	1.9	24	B	R6 East Pre96 AI_AB Presence
1995	First Creek	02-01	1.9	24	B	R6 East Pre96 AI_AB Presence
1995	First Creek	02-02	1.7	20	B	R6 East Pre96 AI_AB Presence
1995	First Creek	02-02	1.7	20	B	R6 East Pre96 AI_AB Presence
1996	South Fork Taneum Creek	01-02	1.5	23	B	R6 Westside AI_AB Presence
1996	South Fork Taneum Creek	01-02	1.5	23	B	R6 Westside AI_AB Presence
1996	South Fork Taneum Creek	01-04	1.8	28	C	R6 Westside AI_AB Presence
1996	South Fork Taneum Creek	01-04	1.8	28	C	R6 Westside AI_AB Presence
1996	South Fork Taneum Creek	01-03			A	R6 Westside AI_AB Presence
1996	South Fork Taneum Creek	01-03			A	R6 Westside AI_AB Presence

1996	South Fork Taneum Creek	01-01	2.2	25	C	R6 Westside AI_AB Presence
1996	South Fork Taneum Creek	01-01	2.2	25	C	R6 Westside AI_AB Presence
2012	Taneum Creek	1	2.5	26	C3	R6 East AI_AB Presence
2012	Taneum Creek	1	2.5	26	C3	R6 East AI_AB Presence
2012	Taneum Creek	2	1.8	26	B3c	R6 East AI_AB Presence
2012	Taneum Creek	2	1.8	26	B3c	R6 East AI_AB Presence
2014	North Fork Taneum Creek	2	3.5	22	C4	R6 East AI_AB Presence
2014	North Fork Taneum Creek	2	3.5	22	C4	R6 East AI_AB Presence
2014	Butte Creek	-	1.3	19	B4	R6 Eastside AI_AB Presence
2014	Butte Creek	-	1.3	19	B4	R6 Eastside AI_AB Presence
2014	North Fork Taneum Creek	5	2.0	25	B3	R6 East AI_AB Presence
2014	North Fork Taneum Creek	5	2.0	25	B3	R6 East AI_AB Presence
2014	North Fork Taneum Creek	3	2.1	24	B3	R6 East AI_AB Presence
2014	North Fork Taneum Creek	3	2.1	24	B3	R6 East AI_AB Presence
2014	North Fork Taneum Creek	1	1.4	19	F3b	R6 East AI_AB Presence
2014	North Fork Taneum Creek	1	1.4	19	F3b	R6 East AI_AB Presence
2014	North Fork Taneum Creek	4	1.3	15	G3	R6 East AI_AB Presence
2014	North Fork Taneum Creek	4	1.3	15	G3	R6 East AI_AB Presence
2015	South Fork Taneum Creek	3	1.2	16	A2	R6 Eastside AI_AB Presence
2015	South Fork Taneum Creek	3	1.2	16	A2	R6 Eastside AI_AB Presence
2015	South Fork Taneum Creek	2	1.7	20	B3	R6 Eastside AI_AB Presence
2015	South Fork Taneum Creek	2	1.7	20	B3	R6 Eastside AI_AB Presence
2015	South Fork Taneum Creek	1	1.6	25	B3	R6 Eastside AI_AB Presence
2015	South Fork Taneum Creek	1	1.6	25	B3	R6 Eastside AI_AB Presence

.

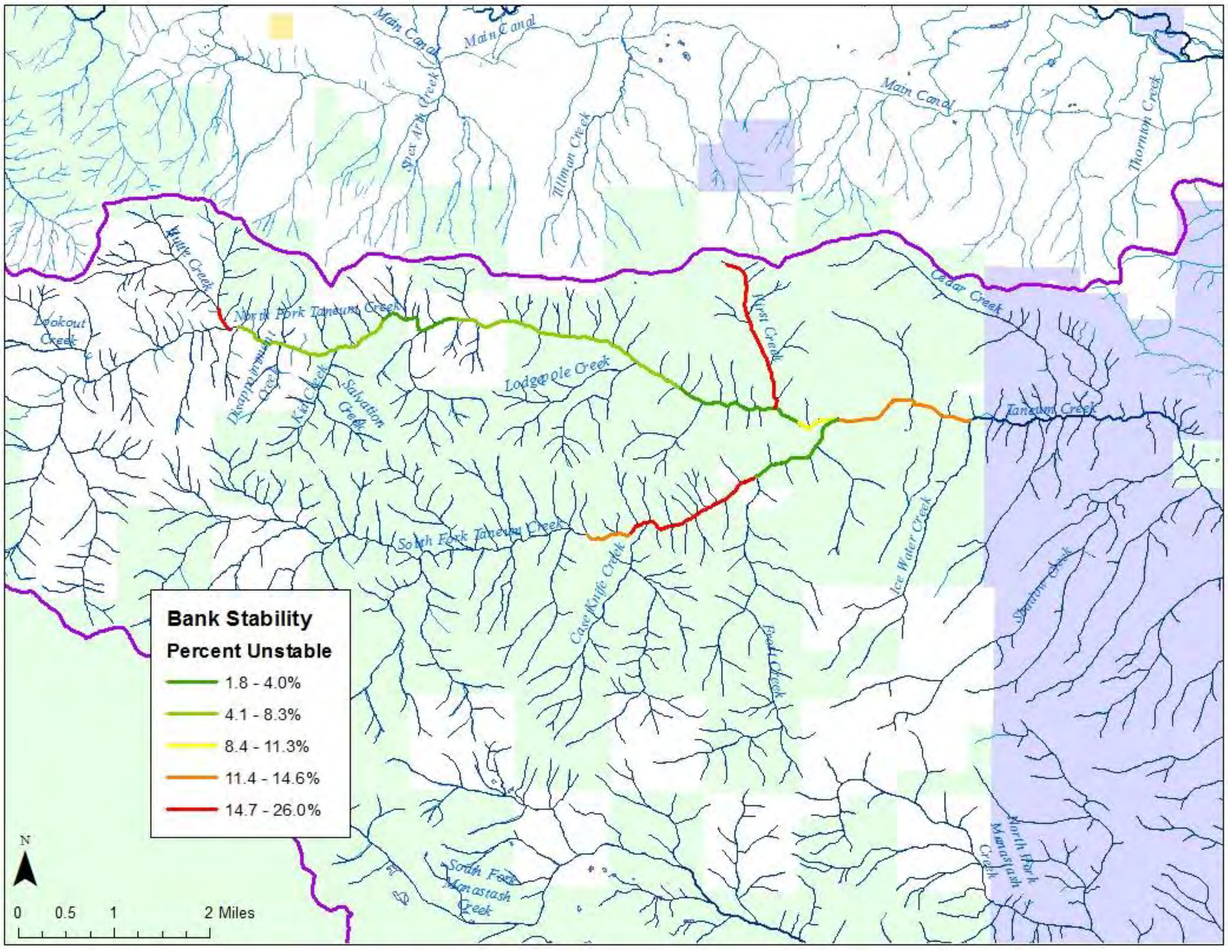


Figure 51**.** Percent of unstable banks per reach in the Taneum subwatershed (USFS 2020a).

Floodplain Connectivity:
Floodplain connectivity and off-channel habitat metrics are considered to be **functioning at risk**. See discussion above in Habitat Elements for Floodplain Connectivity, Off-channel Habitat, and Refugia.

Flow and Hydrology
Change in Peak/Base Flows and Increase in Drainage Network:
Forested areas are generally overly fragmented compared to both the historic and future reference conditions, and the abundance of mid-successional (YFMS) and early-successional (SI) forests are overabundant compared to reference conditions. This could have considerable influence on both stream flows and snow retention. In addition, the crown fire potential "high" category is considerably above reference conditions, indicating a considerable risk of large-scale fire, making the North Fork Taneum Creek subwatershed susceptible to large-scale disturbances and increased risk of effects to hydrologic and watershed functions.

The Drainage Diversion Index showed that within the North Fork Taneum Creek subwatershed, 194 road miles were identified as being connected to the 213 stream miles identified in the area. Results identified substantial increases in the drainage network within catchments across the subwatershed; ranging from an increase of 41 to 267 percent. The total drainage network increase for the North Fork Taneum Creek subwatershed was 91 percent. According to the NOAA and USFWS MPI, both subwatersheds are **not functioning properly** or **functioning at unacceptable risk** for drainage network increase and change in peak/base flows indicators.

Watershed Conditions

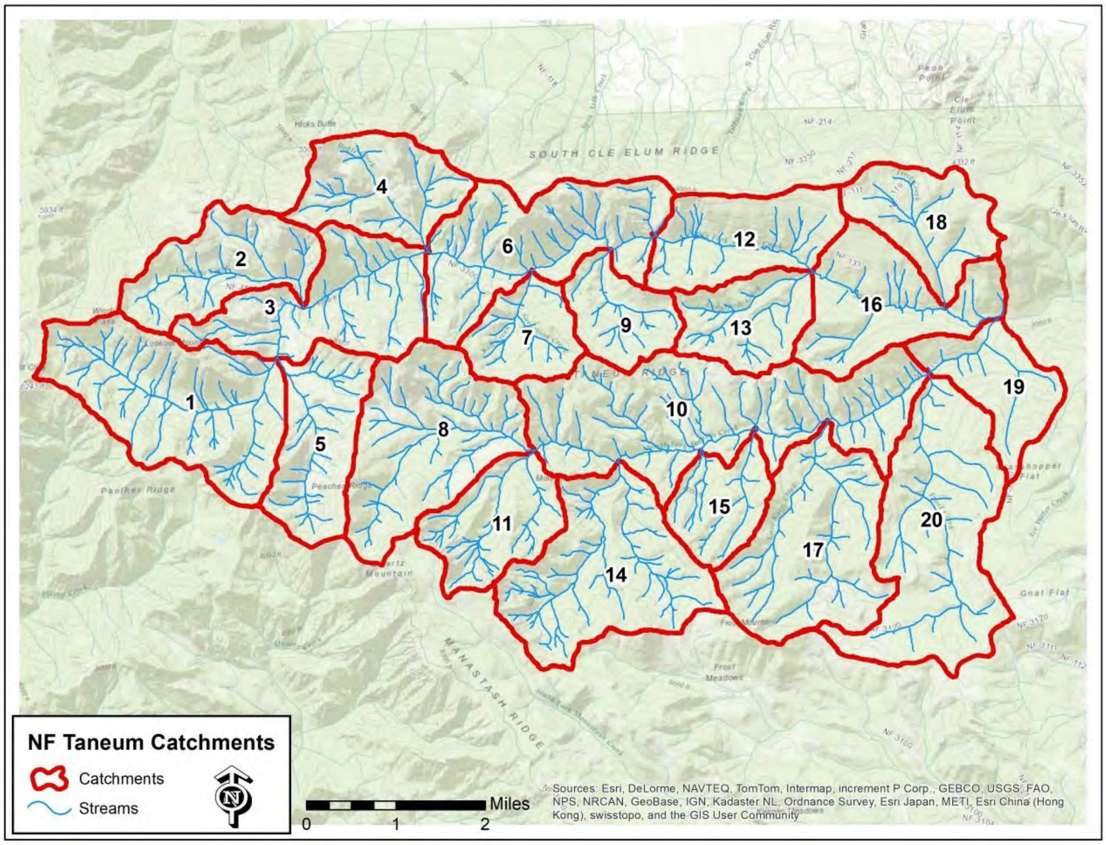
Road Density and Location:

In the Taneum Watershed, there are 407 miles of roads with a road density of 4.7 miles per square mile. The Taneum Watershed has 83 miles of motorized trails with 0.96 miles of motorized trail per square mile. In the Action Area, there are about 407 miles of road and 852 stream crossings. There are about 170 miles of road system and 317 stream crossings in the North Fork Taneum Creek subwatershed; and 237 miles of road system and 535 stream crossings in the Taneum Creek subwatershed. The motorized trail system in the Action Area is approximately 83 miles and has 181 stream crossings. The portion of the Action Area that is in the North Fork Taneum Creek subwatershed has 78 miles of motorized trails and 169 stream crossings. The portion of the Action Area in the Taneum Creek subwatershed has 5 miles of motorized trails and 12 stream crossings. In the Action Area there are 3.94 miles of road per square mile (of which 0.9 are closed ML1 roads) and 1.2 miles of motorized trail per square mile. See Table 43 for road and trail miles, density and stream crossings in the Taneum Watershed and Project Area. Figure 52 shows North Fork Taneum catchments.

Table 43. Summary of road and trail network in Project Area.

Catchments*	Acres	Road		Trail		SUM	
		Miles	Stream Crossings	Miles	Stream Crossings	Miles	Stream Crossings
3	7	0.2	0	0.0	0	0.2	0
4	525	3.8	4	1.9	2	5.7	6
6	1,894	13.6	32	5.3	24	18.9	56
7	741	1.8	4	1.1	3	2.9	7
8	900	4.4	9	3.1	6	7.5	15
9	722	3.8	5	2.2	5	6.0	10
10	3,037	13.9	40	11.1	21	25.0	61
11	989	2.5	2	0.0	0	2.5	2
12	1,218	8.2	22	4.7	15	12.9	37
13	883	2.4	0	1.2	0	3.6	0
14	2,105	3.0	4	3.3	11	6.3	15
15	727	0.0	0	0.2	0	0.2	0
16	1,450	11.6	13	2.9	7	14.5	20
17	1,981	4.9	5	1.4	0	6.3	5
18	1,008	8.3	10	3.9	9	12.2	19
19	894	10.2	10	3.8	1	14.0	11
20	2,430	17.4	23	8.9	10	26.3	33
North Fork Total	21,513	110.0	183	55.0	114	165.0	297
Taneum Total	6,122	60.1	89	4.9	12	65.0	101
Project Area Total	27,635	170.1	272	59.9	20	230.0	292

*****Individual catchments for North Fork Taneum Creek subwatershed. Individual catchments for Taneum Creek subwatershed are shown as a total.



Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, and the GIS User Community

Figure 52**.** North Fork Taneum catchments.

The 2011 Forest Service Watershed Condition Classification Technical Guide (Potyondy and Geier 2011) uses a road density of less than 1 mile per square mile as a threshold indicating a watershed's hydrologic regime is substantially intact and unaltered and is functioning properly or has a good rating. A road density of 1 to 2.4 miles per square mile indicates a moderate probability where a watershed is functioning at risk with a fair rating. A road density of greater than 2.4 miles per square mile is used as a threshold indicating a likely impaired watershed function with a poor rating where the probability is high that the hydrologic regime (timing, magnitude, duration, and spatial distribution of runoff flows) is substantially altered.

According to the NOAA Fisheries Matrix of Population and Habitat Indicators (NMFS 1996), a properly functioning watershed has a road density of less than 2 miles per square mile and no valley bottom roads. The USFWS MPI uses a road density of 1 mile per square mile with no valley bottom roads to identify watersheds that are functioning appropriately. Recent assessments determined baseline conditions for the Taneum watershed were **not functioning properly or at functioning at unacceptable risk** for road density and location when compared to the NOAA Fisheries and USFWS Matrix of Population and Habitat Indicators (NMFS 1996; USFWS 1998).

Disturbance History and Disturbance Regime:

The Taneum watershed has supported forestry, mining, grazing and recreation for decades. Several roads, trails and recreation areas occur within the valley bottoms in floodplain and riparian habitats along the mainstem Taneum and North Fork and South Fork Taneum Creeks. In the late 1930s and early 1940s, railroad tracks were laid in the mainstem valley bottom and extended up through floodplain and riparian areas along South Fork Taneum Creek to South Fork Meadows. Roads were also constructed during this time by the Civilian Conservation Corps. Several roads and trails crisscross tributary and headwater streams and meadows in higher elevations of the watershed. Many of the roads have damaged or undersized culverts at several stream crossings throughout the watershed. Recreational facilities including campgrounds, dispersed campsites, day use sites and trail heads are found throughout the watershed along streams in floodplain and Riparian Reserve areas.

The roads, trails, stream crossings and recreation areas degrade and disconnect floodplains from streams, artificially increase drainage networks, confine channels, contribute chronic delivery of fine sediments impairing water quality and instream habitat, reduce large wood and coarse sediment input, alter natural high and low stream flow regimes, intercept subsurface and overland flow, compact riparian soils reducing infiltration, reduce vegetation in riparian habitats, reduce shade and increase stream temperature, and block passage to critical habitats required by listed fish species and other aquatic species. Other major disturbances across the landscape include landslides and wildfire. Fire suppression over the years has resulted in high fuel loading and the watershed is at risk for a high intensity fire.

The 2021 Windy Pass Fire was the most recent wildfire to occur in the Taneum Watershed. Suppression activities associated with the 75-acre fire included: building dozer lines and hand lines, water draws, and rehabilitation activities (USFS 2021).

Because of this disturbance history and forest condition, the Taneum Watershed is considered to be **not functioning properly or functioning at unacceptable risk**. Additionally, the area is considered to be **functioning at risk** for disturbance regime, based upon the types of disturbance present, their frequency, and magnitude of change in habitat quality.

Riparian Reserves:

Riparian vegetation in the North Fork Taneum Creek subwatershed includes deciduous species such as quaking aspen, black cottonwood, red alder, willow, dogwood and snowberry, as well as coniferous species such as ponderosa pine, grand fir, Douglas-fir, Engelmann spruce, and western red cedar. The average height of a site potential tree is 150 feet. In the Project Area, there are 5,828 acres of Riparian Reserve habitat. In the Action Area, there are 407 miles of road and 83 miles of trail, with 25.9 and 20.4 of them in official Riparian Reserve and have removed 195.1 acres of vegetation from official Riparian Reserves (Table 44). This acreage was determined using a road width of 15 meters and trail width of 5 meters.

Table 44. Road and trail miles in Riparian Reserves, Taneum Project Area.

Acres	Miles		Acres
Riparian Reserve in Project Area	Project Area	Riparian Reserve	Riparian Reserve Intersected
5,828	Roads		
	407	25.9	154.5
	Trails		
	83	20.4	40.6

In addition, particularly in the upper reaches of the North Fork Taneum Creek subwatershed, there has been considerable historical timber harvest within riparian habitats that has resulted in the removal of forested cover for shade and large trees that provide a source of future large wood as well as detrital material, such as leaf litter comprised of deciduous broadleaf and coniferous needle inputs, which provides the primary food source that the rest of the aquatic food web relies upon (Gaines, Begley, and Lyons 2017). The overall condition of Riparian Reserves in the Taneum Watershed is considered to be **functioning at risk**.

Species and Habitat

Subpopulation size, Growth and Survival, Life History Diversity and Isolation, Persistence and Genetic Integrity, and Integration of Species and Habitat Conditions:

As described above, the Project Area contains habitat for fish species listed under the Endangered Species Act (ESA) and species for which Essential Fish Habitat (EFH) has been designated under the Magnuson-Stevens Fishery Conservation and Management Act. Two fish species, steelhead and bull trout, that are expected to utilize habitat or have potential habitat in the Taneum watershed are federally listed as threatened (NMFS 2018b; USFWS 2018b). The species and designations are provided in Table 34. Essential Fish Habitat exists in the Project Area for Chinook and coho salmon.

The North Fork Taneum and Taneum Creek subwatersheds supports these salmonid and resident fish species by providing them with habitat for spawning, incubation, rearing, foraging, migration, and refugia. Additionally, the North Fork Taneum and Taneum Creek subwatersheds and their tributaries, provide a rich source of prey resources, such as aquatic and terrestrial invertebrates and resident fish, for adult and rearing juvenile salmonids. The instream, floodplain and riparian habitat provided by the North Fork Taneum and Taneum Creek subwatersheds are critical for salmonid growth, resilience, and survival.

The steelhead listing does not include rainbow trout/interior redband rainbow trout, the non-anadromous freshwater form of *Oncorhynchus mykiss spp.*, which are under the jurisdiction of USFWS. Designated critical habitat for steelhead and bull trout includes portions of the mainstem Taneum and North and South Fork Taneum Creeks (NMFS 2018c; USFWS 2018a). The listed species, their population, and their critical habitat and federal status are shown in Table 34. Essential Fish Habitat for Chinook and coho salmon exists in the Project Area (NMFS 2018a).

The Washington Department of Fish and Wildlife (WDFW) has been conducting fish surveys in Taneum Watershed for several decades and has never encountered bull trout(Personal communications with the WDFW Fisheries Research Biologist, Gabe Temple, and the Yakama Nation Fisheries Research Biologist, Todd Newsome, on 7/24/2018 and 2/28/2022). Westslope cutthroat, rainbow trout and Eastern brook trout are expected to be found throughout the Taneum watershed. Adult and juvenile spring Chinook, coho, rainbow trout, steelhead , and Westslope cutthroat trout have been detected in the mainstem Taneum Creek in studies conducted to determine the effectiveness of restoration efforts, including the enhancement of fish passage and screening at diversion dams, in the lower Taneum Creek (Monk 2015).

Bull Trout (Salvelinus confluentus)

While there is Designated Critical Habitat in the Project Area for bull trout, there are no historical or recent observations on record that confirm their natural occurrence in Taneum Creek, although their existence there at one time seems likely (Matala, Newsome, and Fast 2020; BPA, WDFW, and YIN 1996; USFWS 2010). Historically it was expected that bull trout migrated from the upper tributaries to the mainstem of Yakima River, and downstream to the Columbia River, to overwinter and forage. Irrigation and logging activities during the settlement of Kittias Valley altered the landscape in Taneum Creek significantly. Construction of irrigation diversion dams in the 1900's greatly restricted fish migration in Taneum Creek, and in some locations the creek had been completely dewaterd (McIntosh et. al. 1990). Past dam construction and unscreened irrigation diversions disrupted connectivity between Taneum

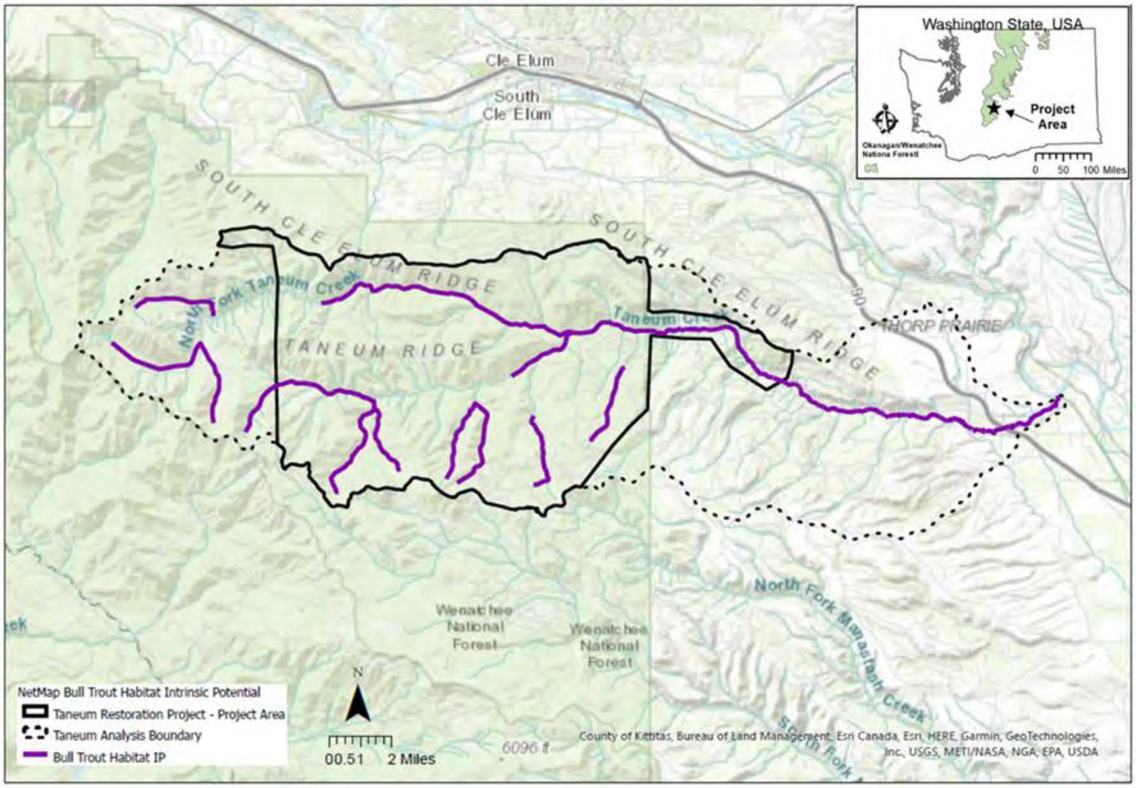
Creek and the main stem of the Yakima River for decades. This type of migration has been severely impacted due to fish passage impediments as well. Furthermore, migration between the lower and upper Yakima River, including tributaries, is expected to be isolated due to fish passage impediments (including thermal barriers), habitat fragmentation, and water quality (Matala, Newsome, and Fast 2020).

Because of the extensive logging there was riparian vegetation damage, as well as heavy unregulated angling, any bull trout in Taneum Creek were probably heavily impacted. None of the large dams had fish ladders, until the late 1980's when watershed restoration efforts began with the construction of fish ladders and the placement of screens on diversion dams. In 1994 tributary enhancement projects in Taneum Creek were identified as high priority (Monk 2015). While past actions extirpated anadromous fish from most of Taneum Creek, quality habitat persisted in the upper watershed where it was still forested. The demolition of the Bruton dam and the rebuilding of the TCC dam and fishway greatly improved fish passage (Gerth 2011). Currently in the Taneum watershed there is 18 miles of Designated Critical Habitat for bull trout in the project area. The mainstem of Taneum creek has 5.4 miles of critical habitat. The North Fork and South Fork of Taneum Creek have 7.2 miles and 5.4 miles of critical habitat respectively (Figure 53).

Steelhead (Oncorhynchus mykiss)

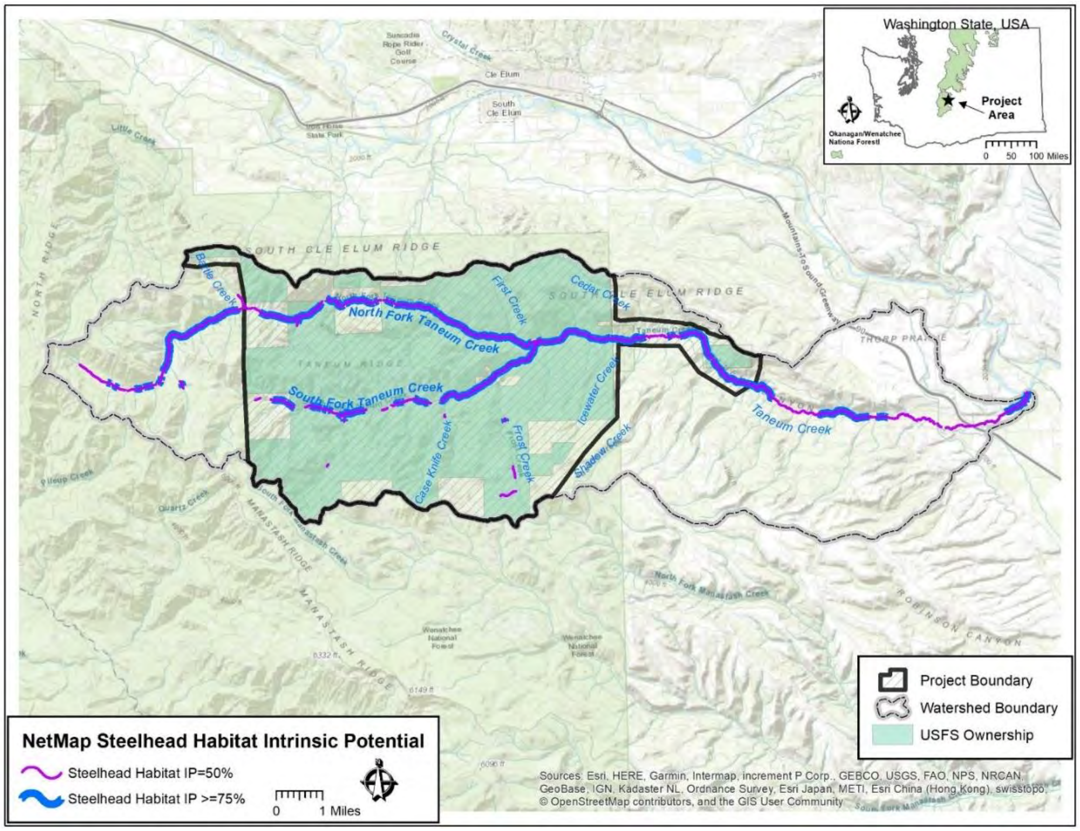
The Taneum Watershed supports rearing of steelhead throughout the watershed and in the Project Area and spawning in the lower reaches of Taneum Creek. With recent removal of fish passage barriers in the lower reaches of Taneum Creek, spawning is expected to occur in more areas of the Taneum watershed. Taneum Creek steelhead populations are variable from year to year, but appear to be stable (Temple et al. 2017).

Steelhead spawn and rear throughout the Yakima River basin including in the Taneum Watershed. While historically it is expected that steelhead migrated from the upper tributaries to the mainstem Yakima River and downstream to the Columbia River to overwinter and forage, this type of migration has been severely impacted due to fish passage impediments. Migration between the lower Yakima River and upper Yakima River, including tributaries, is expected to be isolated due to fish passage impediments (including thermal barriers), habitat fragmentation and water quality. Currently, only the very lowest reaches of Taneum Creek within this subwatershed are known steelhead rearing habitats. However, there are 36 miles of potential habitat in the Project Area; 16 miles of potential habitat has a rating of 75 percent, and 20 miles of the potential habitat has a rating of 50 percent. Potential habitat for steelhead has been identified in both the North Fork Taneum and South Fork Taneum Creeks. Additionally, over 54 miles of potential thermal refugia (low to low-moderate ranges shown in from high water temperatures were identified in the North Fork Taneum Creek subwatershed. See (Figure 55).



County of Kittitas, Bureau of Land Management, Esri Canada, Esri, HERE, Garmin, GeoTechnologies, Inc, USGS, METI/NASA, NGA, EPA, USDA

Figure 53. NetMap bull trout habitat intrinsic potential.



Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community

Figure 54. NetMap steelhead habitat intrinsic potential.

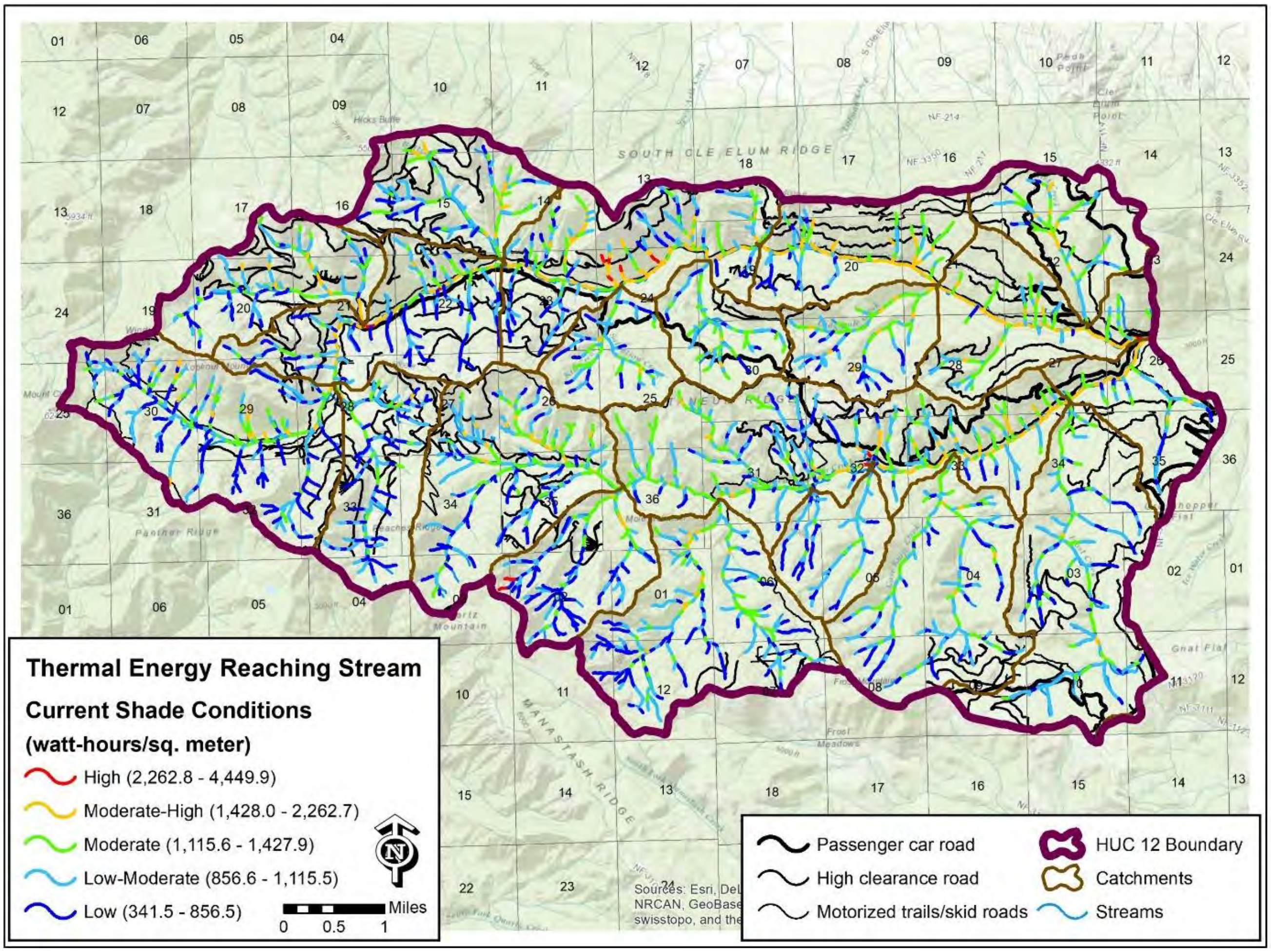


Figure 55. Potential thermal energy/current shade refuge conditions.

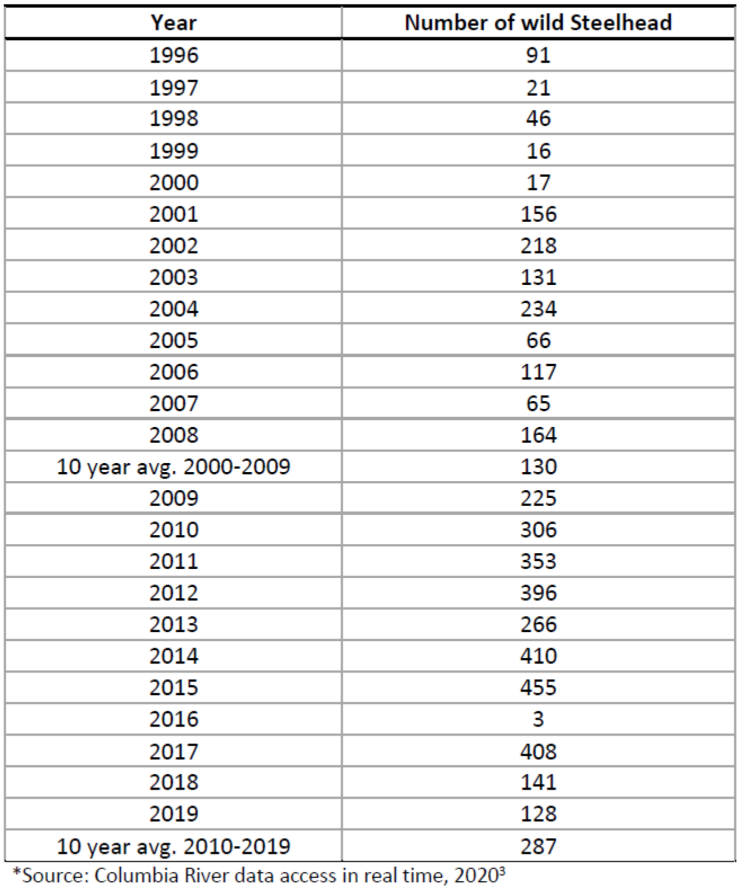
Subpopulation Characteristics

<u>*Subpopulation Size*</u>

Steelhead and bull trout in the upper Yakima basin as a whole are **functioning at unacceptable risk**. Access to the upper Yakima River was either blocked or greatly impeded until the late 1980s by Roza Dam downstream from the Cle Elum Ranger District. Numbers of steelhead passing the dam remain low. Bruton dam on Taneum Creek was removed in 2009. Prior to removal it had a fish ladder that somewhat functioned.

Steelhead were historically abundant in the Yakima River basin. . Bull trout were expected to be abundant historically because suitable habitat conditions are present, although there is no evidence to confirm this. Historical steelhead runs for the entire Yakima basin were estimated by Bonneville Power Administration to range between 80,000 and 100,000 adult fish (Frederiksen et al. 2019). Loss of spawning and rearing habitat, dam construction, land development, and irrigation diversions have severely depressed the population in the upper Yakima River drainage. The most recent 10-year (2010 to 2019) average of annual steelhead passage counts at Roza Dam is 287 steelhead (Table 45).

The Taneum Watershed supports rearing of steelhead throughout the watershed and in the Project Area and spawning in the lower reaches of Taneum Creek. With recent removal of fish passage barriers in the lower reaches of Taneum Creek, spawning is expected to occur in more areas of the Taneum watershed. Table 45. Roza Dam steelhead annual passage counts (DART 2020).



Year	Number of wild Steelhead
1996	91
1997	21
1998	46
1999	16
2000	17
2001	156
2002	218
2003	131
2004	234
2005	66
2006	117
2007	65
2008	164
10 year avg. 2000-2009	130
2009	225
2010	306
2011	353
2012	396
2013	266
2014	410
2015	455
2016	3
2017	408
2018	141
2019	128
10 year avg. 2010-2019	287

*Source: Columbia River data access in real time, 2020[3]

Growth and Survival

Steelhead and bull trout in the upper Yakima basin as a whole are **functioning at unacceptable risk**. Limiting factors in the upper Yakima basin include stream flow issues related to irrigation, flood control and hydropower, floodplain constriction and development, degraded riparian vegetation, and impassable and unstable stream crossings. The migration corridor in the lower Yakima River is generally degraded with habitat problems that are detrimental to salmonids and favor native (e.g., northern pikeminnow) and non-native predators (e.g., smallmouth bass).

Life History Diversity/Isolation

Steelhead and bull trout in the upper Yakima basin as a whole are **functioning at unacceptable risk**. Although access is now possible to most areas of the Taneum drainage, numbers of steelhead are low, and bull trout have never been encountered. Dams and culverts prevent access to many areas of the Yakima basin. NMFS abundance thresholds for the upper Yakima River is 1500 steelhead. The last 10-year average count at Roza Dam was 287 steelhead.

Persistence/Genetic Integrity

Steelhead and bull trout in the upper Yakima basin as a whole are **functioning at unacceptable risk**. Steelhead numbers remain low and bull trout have not been encountered. Native redband trout may provide a genetic reservoir for the native steelhead population.

Integration of Species and Habitat Conditions

According to the USFWS MPI, a watershed with integration of species and habitat conditions functioning appropriately is characterized by having high habitat quality and connectivity among subpopulations; migratory form is present; disturbance has not altered channel equilibrium; fine sediments and other habitat characteristics influencing survival or growth are consistent with pristine habitat; subpopulation has a resilience to recover from short-term disturbance within one to two generations or five to ten years; and subpopulation fluctuating or around equilibrium or is growing. Based on the overall and combined ratings of the other indicators, the Taneum Watershed and Project Area is at best **functioning at risk** and potentially **functioning at unacceptable risk** when population characteristics and habitat conditions are integrated.

Table 46. Summary of baseline habitat in the Manastash and Taneum Watersheds using Matrix of Pathways and Indicators (NMFS 1996; USFWS 1998).

Diagnostic / Pathways	Indicators	Functioning Properly / Appropriately	Functioning at Risk	Not Functioning Properly/Functioning at Unacceptable Risk
Water Quality	Temperature		X	
	Sediment/Turbidity			X
	Chemical Contamination/Nutrients	X		
Habitat Access	Physical Barriers		X	
Habitat Elements	Substrate Embeddedness			X
	Large Woody Debris			X
	Pool Frequency		X	
	Pool Quality		X	
	Large Pools		X	
	Off -channel Habitat		X	
	Refugia			X
Channel Condition / Dynamics	Wetted Width/Depth Ratio		X	
	Streambank Condition		X	
	Floodplain Connectivity		X	
Flow / Hydrology	Change in Peak/Base Flows			X
	Drainage Network Increase			X
Watershed Conditions	Road Density/Location			X
	Disturbance History			X
	Riparian Reserves		X	
	Disturbance Regime		X	
Subpopulation Characteristics	Subpopulation Size			X
	Growth and Survival			X
	Life History Diversity/Isolation			X
	Persistence/Genetic Integrity			X
	Integration of Species/Habitat Conditions		X	

Effects on Listed Fish and Critical Habitat

The format from the Analytical Process for Developing Biological Assessments for Federal Actions Affecting Fish Within the Northwest Forest Plan Area (USFS et al. 2004) was used in preparing the project effects section. The analysis procedure involves looking at the following eight factors when considering effects: proximity, probability, magnitude, distribution, frequency, duration, timing, and nature.

Summary statements for each indicator use the terms positive; negative; or neutral to describe the effect of the project elements on the direction of the baseline indicator over time. A positive effect would improve the direction of the baseline indicator. Conversely, a negative effect would cause a decline in the direction of the baseline indicator. A neutral effect would not change the baseline indicator nor affect the direction of the baseline indicator, either positively or negatively. For the purposes of this specific assessment, a discountable effect (either positive or negative) is a qualitative statement indicating that there is an extremely unlikely probability of something occurring. An immeasurable effect (either positive or negative) is a qualitative statement indicating a potential effect but lacks sufficient magnitude to be meaningfully measured or affect resources.

The first three factors allow for a quick evaluation of project effects with insignificant, discountable, or no effects without further factor analysis. When assessing the Probability factor for an element, if the outcome is entirely discountable (extremely unlikely to occur), no further factor analysis is required for that element. If the outcome of the Probability analysis is not discountable, assess for Magnitude. Should the outcome for Magnitude result in insignificant effects, no further factor analysis is required for that project element. When the outcome to magnitude is significant or results in take, the remaining five factors were analyzed. Where some of the indicators needed little discussion to discount effects, the method above was not followed.

Some indicators will have mechanisms for effects, but they would not reasonably be affected due to proximity or to a lack of probability or would require effects to other indicators that were considered to be insignificant. For example, effects to pool habitat could occur from changes in wood levels, sediment loads, and alterations of streambanks. If each of the effects to each of these individual indicators would be insignificant, it’s logical their additive effects to pool habitat would be insignificant as well. In these cases, indicator effects were analyzed but in a condensed manner.

According to 50 CFR § 402.02, the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, will be described and any effects to the environmental baseline will be updated after implementation of the Proposed Action. Direct effects have immediate impacts, whereas indirect effects are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration.

The Taneum Restoration Project includes several proposed actions: commercial mechanical thinning; non-commercial thinning; prescribed fire including pile burning; infrastructure associated with these vegetation treatments such as temporary roads, landings, and bridge repair; and road management activities associated with vegetation treatments and prescribed burning. See Table 1 in the Proposed

Action for a summary. Effects from aquatic restoration activities consistent with ARBO2 (e.g., prescribed fire in Riparian Reserves) are not addressed here.

The following evaluation for proposed actions focuses on steelhead and designated critical habitat for steelhead and designated critical habitat for bull trout.

Project Elements

To be consistent with the 2004 Analytical Process for Developing Biological Assessments for Federal Actions Affecting Fish With-in the Northwest Forest Plan Area (USFS et al. 2004), the proposed actions were divided into the following Project Elements:

- Commercial mechanical thinning
- Non-commercial thinning (including mastication)
- Prescribed fire upland areas outside of Riparian Reserves
- Transportation Management and log hauling
- Harvest system temporary roads and landings (including decommissioning of temporary and unauthorized roads used for harvest)
- Hazard / Danger tree removal
- Shaded fuel breaks
- Bridge repair

Direct Effects

Direct effects are those affecting the Subpopulation Characteristics aspects of the MPI and are addressed here.

Water drafting will occur from areas of Taneum Creek, because suitable drafting sites are not available elsewhere. Drafting has the potential to entrain individuals, causing physical damage or mortality as they are drawn through equipment or impinged against screens. However, the Required Design Criteria and BMP's include specifications that drafting would not alter the original wetted width, intakes would be screened with mesh no larger than 3/32 inch, and intake flow would be less than 1 cubic foot per second. These BMPs would reduce the likelihood of effects to individual steelhead from exceeding the level of insignificant effects.

Log hauling on gravel and paved maintained roads would also occur, including areas of the haul route within Riparian Reserves. Although indirect effects to sediment may occur from log haul as described in that section, direct effects such as disturbance to individuals from haul-related noise or vibration are expected to be significant.

Most of the other proposed actions would not occur in or on the banks of streams occupied by listed fish species, or within 300 feet of designated critical habitat for steelhead and bull trout (Forest Service Roads and Kittitas County Road). No direct effects to steelhead, bull trout, or their designated critical habitat are expected to occur from most proposed actions. As stated above, some project elements (actions) are proposed within 50 feet (non-commercial thinning) and 75 feet (commercial mechanical thinning) of intermittent streams and wetlands under one acre, or within 100-150 ft of non-fish-bearing perennial streams. Those actions are at distances that would not result in any direct effects (e.g., noise or visual disturbance) to steelhead, bull trout, or to designated critical habitat. Unlike other project elements, bridge repair activities will involve a high degree of noise and disturbance. In-water work windows would be in place to reduce effects to adult steelhead, bull trout, and redds, by avoiding spawning periods and areas, juvenile steelhead are considered likely to be present in the area. Those juvenile steelhead may be exposed to high intensity noise disturbance during one day of paver operation, following several weeks of noise from other equipment. The proposed extension to the in-water work window, was approved by WDFW Habitat Biologist Scott Downes, so that implementation could occur during the low water periods of late summer and further reducing the effects of sediment input. Activities would also include high probability of visual and vibration disturbance, particularly when abutments are being removed and replaced, as well as two wet crossings by an excavator with high probability to disturb but discountable probability to crush individuals (due to the expectation that juveniles would avoid this loud, visible, slow-moving equipment). The disturbance from these activities is expected to produce startle and avoidance responses in juvenile fish, as well as exposure to stressors from dewatering and relocation. Because design criteria described in (NMFS ARBO II 2013) will be followed during coffer dam diversion activities and dewatering, and the disturbance from bridge repair activities is considered similar to that of a culvert replacement, the effects described below from (NMFS ARBO II 2013) are expected to occur.

Steelhead Direct Effects

Proximity: Bridge repair activities would occur directly in and adjacent to occupied steelhead habitat and Designated Critical Habitat in Taneum Creek. Individual fish within the project area are likely to experience short term direct negative effects from sediment delivery and increased turbidity during bridge repair actions. Heavy machinery may be in close proximity to fish, although the potential for short term noise disturbances to individuals during periods of equipment operation is low and is expected to produce a startle response, which is low in magnitude in terms of adverse effects but not discountable. Both of these noise disturbances are significant, but are expected to be sporadic and highly localized, thus lower in magnitude.

Dewatering/pumping of water would be conducted during project implementation. Two equipment crossings and the excavation of bridge pilings would also occur within the stream channel. Direct effects to fish from these actions would include smothering or crushing fish, blocked or disruption of natural movements or displacement. Direct effects to fish are also likely to be caused by the isolation of in-water work areas, although other combined lethal and sublethal effects would be greater without the isolation. These are expected to have significant negative effects during bridge repair. Project Design Criteria and BMP's mitigate for these effects by implementing in-stream work windows and working in low flow conditions, equipment crossing minimization, prior removal of fish, and implementation of sediment controls. Water diversion during bridge piling repairs, via a coffer dam, would allow for phased dewatering, where water would only be diverted away from one side of the bridge at a time. Which is expected to decrease effects to fish by allowing in-channel flow to continue during implementation, versus dewatering the entire site by diverting water around the work area. However, the disturbance from these activities is expected to increase exposure of stressors to juvenile steelhead. These direct effects to fish and DCH pose a significant negative effect.

Electrofishing to remove fish from the project area also has negative effects upon individuals. An effort will be made to capture all juvenile fish present within the work isolation area and to release them at a safe location, although some juvenile fish will likely evade capture and later die when the area is dewatered. Fish that are captured and transferred to holding tanks can experience trauma if care is not taken in the transfer process. Fish can also experience stress and injury from overcrowding in traps, if the traps are not emptied on a regular basis. Because juvenile fish in the project areas are already subject to stress as a result of degraded watershed conditions, it is likely that a small number of those individuals *will die due to increased competition, disease, and predation, and reduced ability to obtain food necessary for growth and maintenance*(Moberg 2000; Newcombe and Jensen 1996; Sprague and Drury 1969; Portz, 2007; NMFS ARBO II 2013).

Probability: Unlike adults, juvenile steelhead may be present throughout the year, and are likely to be exposed to negative direct effects during the proposed bridge repair activities. The probability of fish being exposed to visual and vibration disturbance during active bridge repair is likely. The probability of individual fish being injured or crushed during equipment crossings is low (due to the expectation that they would avoid this loud, visible, slow-moving equipment) but not discountable, because fish within the project area will be captured and moved away from the bridge repair site prior to implementation. Furthermore, the duration of equipment in-water time will be minimized to only 2 crossings and excavation of the bridge pilings would be completed as soon as possible. The probability that dewatering or diverting water via a coffer dam or pumping of water will have on individual fish or fish habitat is not discountable. The implementation of Project Design Criteria and BMP’s, such as pump intake limits and mesh size on intakes, would decrease direct negative effects for the proposed actions.

Water drafting would occur throughout the ten year project period, the probability for direct effects to steelhead is not considered discountable. Required Project Design Criteria for water drafting, such as mesh size and pump intake limits, as well as Fish Biologist/Hydrologist approval of drafting locations prior to any drafting, would reduce the probability of these effects.

Aspects of electrofishing and fish handling, such as dip netting, and time out of water, can cause physiological stress which may result in physical injury or death (Snyder 2003; Murphy and Willis 1996). The probability of the direct negative effects of electrofishing to individual fish is significant.

Magnitude: The magnitude of the effect of noise disturbance on Middle Columbia River steelhead is significant. The onset of heavy equipment noise near occupied habitat is expected to produce a startle response, which is low in magnitude in terms of adverse effects. Continuation of noise such as expended use of heavy equipment near occupied habitat is expected to produce an avoidance response, which is also low in magnitude in terms of adverse effects. Both of these noise disturbances are significant, but are expected to be sporadic and highly localized, thus lower in magnitude.

The magnitude of the effect of equipment crossings on MCR steelhead is expected to be significant. Juvenile steelhead are known to be occupy the area, therefore equipment crossings could result in take. Equipment crossings will be limited to two crossings and fish will be removed beforehand. Two wet crossings by an excavator would add to the disturbance but are not expected to increase the amount of sediment suspended from overall activities above those from a typical culvert replacement. The river crossings would occur during the low flow periods typical for Taneum Creek during the late summer months, reducing the magnitude of sediment inputs. Required Project Design Criteria would be implemented to further reduce effects.

The magnitude on the effect to MCR steelhead due to pumping of water is also expected to be insignificant because BMP’s and Design Criteria for water drafting/pumping would be in place. Water drafting/ pumping would maintain a continuous surface flow of the stream without altering the original wetted width. Any draft suction hose used in fish---bearing waters would be equipped with a screen of 3/32 inch mesh or less and would have an intake flow of less than 1 cubic foot/second to prevent entraining juvenile fish. The magnitude from isolation from in-water work areas would be significant to MCR steelhead but standard erosion control measures would reduce the amount of sediment from this source. The amount of sediment entering the stream is also expected to be significant but no more than from a typical culvert removal.   The rationale is that a typical culvert removal involves ground disturbance of the sediment covering the culvert, the sediment on both sides of the culvert, and the sediment under the culvert whereas proposed bridge repair activities will involve removal and disturbance of less sediment.

The magnitude of electrofishing and fish handling, such as dip netting and time out of water, can cause physiological stress and can result in physical injury or death (Snyder 2003). Because juvenile fish in the project areas are already subject to stress as a result of degraded watershed conditions, it is likely that a small number of those individuals would die due to increased competition, disease, and predation, and reduced ability to obtain food necessary for growth and maintenance. The magnitude of electrofishing on juvenile steelhead is significant (NMFS ARBO II 2013).

Distribution: The spatial distribution and the direct effect of elevated turbidity levels on fish and fish habitat from the bridge repair activities is expected to be uneven within the length of the turbidity plume. In a study based mainly on modelling the dynamics of sediment suspension and dispersion as affected by hydraulic properties, Courtice and Naser (2020) observed that the shape of a turbidity plume is partly dependent on the lateral origin of the initial disturbance. That is, disturbances such as mid-channel equipment operation resulted in a turbidity plume shaped differently than one from a lateral disturbance such as excavating an abutment. For mid-channel disturbances, the turbidity plume mixed laterally in both directions and thus reached a full bank-to-bank distribution relatively quickly, with unaffected margins disappearing a relatively short distance downstream. For near-bank lateral disturbances (on one side), the turbidity plume required a greater downstream distance before it reached a bank-to-bank distribution, meaning that the unaffected area of the stream extended farther downstream. Proposed activities will mainly result in near-bank lateral disturbance resulting from excavation around abutments, with a relatively long unaffected margin along the opposite side. Channel-spanning suspension of sediment will also occur during stream crossings by the excavator, although these will be minimized to two crossings.

Frequency: The bridge repair and associated sediment pulse would occur once. Electrofishing would occur prior to project implementation. Electrofishing may occur multiple times during the project which can have significant negative effects.

Duration: The duration of elevated turbidity levels from bridge repair activities is expected to be brief, based on a Forest Service study by(Foltz, Westfall, and Kopyscianski 2013). This study measured downstream turbidity over time at two locations where undersized culverts were removed and replaced with bridges. Although each situation is unique (due to variations in operators, soils, stream flow, weather, and so on) the work described in Foltz et al. (2013) for the current project is expected to result in no less disturbance than the proposed activities. Turbidity levels were found to remain elevated for the duration of heavy equipment movement on streambeds themselves but to reduce within 15 minutes thereafter as disturbed substrates were mobilized and diluted downstream (Foltz, Westfall, and Kopyscianski 2013); a similar duration is expected for the proposed activities when equipment crosses on the streambed.

Sediment concentrations at ~330 feet downstream of the culvert outlet remained above regulatory limits but were reduced by an order of magnitude. Sediment concentrations stabilized back to those found above the culvert at ~2,658 feet downstream (Foltz, Yanosek, and Brown 2008). Therefore, to describe the worst-case scenario, *the turbidity plume from proposed bridge repair activities would likely* *be visible no more than 2,600 ft downstream*. Design Criteria/BMPs of reducing areas of soil disturbance, minimizing crossings of heavy equipment, diverting the streamflow using coffer dams, and re-watering disturbed areas slowly will reduce the magnitude, along with others listed in Table 20.

Foltz et al. (2013) found that streambank disturbance from placing riprap and planting vegetation also resulted in brief elevations of turbidity, with duration less than 10 minutes. A longer duration of elevated turbidity, 60-105 minutes, was found when diversions or coffers were removed, and streamflow was allowed for the first time over newly disturbed soils. For the proposed activities, this longer duration is expected once the disturbed soils around the repaired abutments are exposed again to streamflow and sediment suspension occurs.

Timing: The timing of the bridge repair activity is estimated to be four to five weeks during the low flow periods for Taneum Creek. The majority of work will be conducted during the in-stream work window of July 16th -Sept 30th. However, a two week extension until October 15th was approved by WDFW Habitat Biologist, Scott Downes in order to take advantage of the low water conditions typical for Taneum Creek during that time. Bridge repair activities during low water flow periods is expected to have direct effects to fish and fish habitat by minimizing sediment inputs and erosion during excavation for bridge piling replacement. Timing of the work in the wetted stream channel would be minimized and completed during low water flow periods. Electrofishing would occur prior to project implementation. Electrofishing may occur multiple times during the project which can have significant negative effects that are not discountable.

Nature: Steelhead adults and their redds are not expected to occur in the area of the bridge repair. Steelhead typically spawn during the spring months, well before the bridge activities would occur. Furthermore, most of the bridge repair actions would take place during the in-water work window in late September. This timeframe is well outside the period where steelhead eggs are incubating in river gravels. Juvenile steelhead are expected to be present, however, and their abilities to naturally move upstream or downstream of the bridge site could be altered for short durations during stream isolation or during sediment inputs. As stated above, electrofishing and fish handling, such as dip netting and time out of water, can cause physiological stress and result in physical injury or death, which can alter the natural behavior of steelhead.

Summary: In summary, proposed activities are expected to result in **significant negative direct effects** to MCR steelhead and the DCH of ESA listed steelhead and bull trout, due to isolation and handling stress as well as noise and vibration disturbance in the immediate area associated with repair of the bridge on North Fork Taneum. Bridge repair activities are expected to have a high probability of causing a turbidity plume with high magnitude of effect. Although this effect is expected to be brief in duration, it represents a significant effect to this Indicator.

Bull Trout Direct Effects

Proximity: Although bull trout have been identified in the greater Yakama River basin, they have not been encountered in the Taneum watershed to date. The best available evidence of bull trout presence or absence in Taneum Creek is derived from extensive electrofishing (Figure 39) by the Washington Dept. of Fish and Wildlife, which has resulted in no bull trout detections during all sample years (1990-2021). Environmental DNA sampling, which is a highly sensitive method for detecting fish presence in lotic systems, was conducted throughout the Yakima Basin, including Taneum Creek, during the Range-Wide Bull Trout eDNA Project. eDNA samples were collected at 15 locations near the upper reaches of the North Fork of Taneum Creek in 2017, resulting in zero positive detections of bull trout (Young et al.

2017). The closest river system, where bull trout have been detected using eDNA, was in Cooper River, which is 48 river miles away from the Project Area. Personal communications with lead research Biologists from the Yakama Nation and the WDFW, for the Taneum area, have stated that the likelihood of bull trout currently inhabiting or spawning in Taneum Creek is extremely low to nonexistent (2/28/2022 Gabe Temple, WDFW, and Todd Newsome, Yakama Nation personal communication with J. Serio). The proposed action that has the highest level of risk for direct effects to fish, is the North Fork Taneum bridge repair. Designated Critical Habitat for bull trout spans upstream and downstream of the bridge repair site, but because of the lack of evidence of bull trout in Taneum Creek, it is highly unlikely that they would be encountered there during the repairs.

However, there are past and future actions that we considered when analyzing the potential for ESA listed bull trout to be in proximity to the Proposed Actions. Past actions, such as recent fish passage improvements, could lead to bull trout detection in Taneum Creek during the ten-year project timeline. Fish passage has been improved by removing barriers and a partially functioning fish ladder from the lower reaches of Taneum Creek in recent years. Because anadromous access was improved by these actions, there could be potential for undetected bull trout to occupy the Taneum watershed, or for colonization of bull trout from the Yakima River to occur during the project timeline. Although this is considered highly unlikely, if bull trout are in proximity to the bridge repair, direct effects from this action could harm individual fish, which would result in the potential for take.

A reasonably foreseeable future action that would have a positive effect on bull trout abundance, is the proposed reintroduction project in Taneum Creek by the Yakama Nation in 2025. Because of the Taneum Restoration Project timeline, after reintroductions, the proximity of bull trout to water drafting would be more significant. Future electrofishing survey data and any PIT tag array detection will be collected and shared, which will inform managers of abundance and spatial information on bull trout, so sensitive or occupied areas could be avoided.

Bridge repair activities would occur directly in and adjacent to Taneum Creek. In the unlikely event that individual bull trout are present within proximity to the project area, there is the slight exposure risk that bull trout could experience short term direct negative effects from sediment delivery and increased turbidity during bridge repair actions. Heavy machinery may be in proximity to fish which would produce a startle response and displacement effects to localized individuals. Two equipment crossings and the excavation of bridge pilings would also occur within the stream channel. Equipment crossings would have the potential to harm bull trout in the unlikely event that any were to occur in close proximity to the bridge repair area during water crossings.

Dewatering/pumping of water would be conducted during bridge repair implementation. Direct effects to bull trout could be caused by the isolation of in-water work areas, although other combined lethal and sublethal effects would be greater without the isolation. Water diversion during bridge piling repairs, via a coffer dam, would allow for phased dewatering, where water would only be diverted away from one side of the bridge at a time, which is expected to decrease effects to fish by allowing in-channel flow to continue during implementation, versus dewatering the entire site by diverting water around the work area. However, the disturbance from these activities is expected to increase exposure of stressors to fish.

Probability: The probability of project elements for the bridge repair having direct effects to bull trout in Taneum Creek is highly unlikely, but not discountable. The probability is unlikely because it is in our estimation that bull trout either currently do not inhabit Taneum Creek, or they occur at an extremely low abundance. The probability is not discountable because of the recent fish passage improvements and the possibility for a small abundance of bull trout to go undetected during surveys.

Project elements associated with bridge repair such as equipment crossings, stream isolation, sediment release, vibration/noise disturbances, and handling/electrofishing of individuals are expected to have a highly unlikely probability for direct effects to bull trout or redds. The unlikelihood of bull trout occupancy within the bridge repair zone increases when very low abundance, coupled with the small spatial and temporal footprint of the repair, is compared to the size and scale of the greater Taneum watershed. The probability to crush individuals during the two wet crossings is considered low (due to the expectation that bull trout would avoid this loud, visible, slow-moving equipment) but not discountable. Bridge repair is expected to occur prior to bull trout reintroductions in 2025. This is because the repairs are needed to be completed first, so other aspects of the proposed action, such as thinning or prescribed fire in areas beyond the bridge, can be implemented in the future. There would be a neutral effect from the bridge repair to bull trout introduced in to Taneum Creek from the reintroduction project.

Water drafting would occur throughout the ten-year project period, and after bull trout reintroductions are implemented, resulting in a higher probability for direct effects that also is not considered discountable. Required Project Design Criteria for water drafting, such as screen size and pump intake limits, as well as Fish Biologist/Hydrologist approval of drafting locations prior to any drafting, would reduce the probability of these effects. Future survey and new spawning data would be used to inform Biologists/Hydrologists of areas to avoid when selecting drafting locations. Suitable spawning habitat and areas with complex cover habitat, and in-stream areas with large wood structure would be avoided to reduce potential negative effects if bull trout are present.

Magnitude: The probability of disturbance to bull trout as a result of the project elements associated with bridge repair are expected to be low, due to zero to very low levels of occupancy. For this reason, we anticipate no direct effects to individual bull trout during bridge repair. Although, as stated above, there are past actions which could result in the occupancy of bull trout during the project timeline. Therefore, if bull trout are present the magnitude would not be insignificant.

The magnitude of the effect of noise disturbance on any bull trout present in the bridge repair area would be similar to those addressed for steelhead, which would be significant. The onset of heavy equipment noise near occupied habitat is expected to produce a startle response and displacement. Continuation of noise such as use of heavy equipment near occupied habitat is expected to produce an avoidance response and displacement as well. Both of these noise disturbances are significant, but are expected to be sporadic and highly localized, thus lower in magnitude.

The magnitude of the effect of equipment crossings to harm or harass any bull trout is significant. If bull trout are present within the bridge repair zone during equipment crossings, then the effects from the instream action increase the possibility of take. Wet crossings by an excavator would add to the disturbance and increase the magnitude of direct negative effects to fish; although it is considered highly unlikely a bull trout would be crushed by equipment, the magnitude of such an event would be significant. These effects would be reduced however, because equipment crossings will be limited to only two wet crossings during the duration of the repairs. The river crossings would occur during the low flow periods typical for Taneum Creek during the late summer months, reducing the magnitude of sediment inputs. Required Project Design Criteria would be implemented to further reduce effects.

The magnitude of the effect to bull trout from dewatering or stream isolation is also expected to be significant, but BMP's and Design Criteria for water drafting would reduce the magnitude of this project element. Water drafting/ pumping would maintain a continuous surface flow of the stream without altering the original wetted width. Any draft suction hose used in fish---bearing waters would be equipped with a screen of 3/32 inch mesh or less and would have an intake flow of less than 1 cubic foot/second to prevent entraining fish. The magnitude of stream isolation from in-water work areas would be significant to bull trout were any occur over the duration of the action, but standard erosion control measures would reduce the amount of sediment from this source. The amount of sediment entering the stream is also expected to be significant but no more than from a typical culvert removal. The rationale is that a typical culvert removal involves ground disturbance of the sediment covering the culvert, the sediment on both sides of the culvert, and the sediment under the culvert whereas proposed bridge repair activities will involve removal and disturbance of less sediment.

The magnitude of electrofishing and fish handling, such as dip netting and time out of water, can cause physiological stress and result in physical injury or death, and thus is significant (Snyder 2003; USFWS ARBO II 2013). For the reasons previously described, we do not anticipate bull trout being present during electrofishing. However, because of some uncertainty associated with fish passage improvement, reasonably foreseeable reintroduction efforts, and presence of suitable habitat, we are accounting for the minor possibility of a few individual bull trout being present. If, in this unlikely event that any bull trout are present during electrofishing, the magnitude of effects would not be insignificant.

Distribution: The spatial distribution and the direct effect of elevated turbidity levels on fish and fish habitat from the bridge repair activities is expected to be uneven within the length of the turbidity plume. In a study based mainly on modelling the dynamics of sediment suspension and dispersion as affected by hydraulic properties, Courtice and Naser (2020)observed that the shape of a turbidity plume is partly dependent on the lateral origin of the initial disturbance. That is, disturbances such as mid-channel equipment operation resulted in a turbidity plume shaped differently than one from a lateral disturbance such as excavating an abutment. For mid-channel disturbances, the turbidity plume mixed laterally in both directions and thus reached a full bank-to-bank distribution relatively quickly, with unaffected margins disappearing a relatively short distance downstream. For near-bank lateral disturbances (on one side), the turbidity plume required a greater downstream distance before it reached a bank-to-bank distribution, meaning that the unaffected area of the stream extended farther downstream. Proposed activities will mainly result in near-bank lateral disturbance resulting from excavation around abutments, with a relatively long unaffected margin along the opposite side. Channel-spanning suspension of sediment will also occur during stream crossings by the excavator, although these will be minimized to two crossings.

Frequency: The bridge repair and associated sediment pulse would occur once. Electrofishing would occur prior to project implementation. Electrofishing may occur multiple times during the project which can have significant negative effects.

Duration: The duration of elevated turbidity levels from bridge repair activities is expected to be brief, based on a Forest Service study by (Foltz, Westfall, and Kopyscianski 2013). This study measured downstream turbidity over time at two locations where undersized culverts were removed and replaced with bridges. Although each situation is unique (due to variations in operators, soils, stream flow, weather, and so on) the work described in Foltz et al. (2013) for the current project is expected to result in no more disturbance than the proposed activities. Turbidity levels were found to remain elevated for the duration of heavy equipment movement on streambeds themselves but to reduce within 15 minutes thereafter as disturbed substrates were mobilized and diluted downstream; a similar duration is expected for the proposed activities when equipment crosses on the streambed.

Sediment concentrations at ~330 feet downstream of the culvert outlet remained above regulatory limits but were reduced by an order of magnitude. Sediment concentrations stabilized back to those found above the culvert at ~2,658 feet downstream (Foltz et. al. 2008). Therefore, to describe the worst-case scenario, the turbidity plume from proposed bridge repair activities would likely be visible no more than 2,600 ft downstream. Design Criteria/BMPs of reducing areas of soil disturbance, minimizing crossings of heavy equipment, diverting the streamflow using coffer dams, and re-watering disturbed areas slowly will reduce the magnitude, along with others listed in Table 20.

Foltz et al. (2013) found that streambank disturbance from placing riprap and planting vegetation also resulted in brief elevations of turbidity, with duration less than 10 minutes. A longer duration of elevated turbidity, 60-105 minutes, was found when diversions or coffers were removed, and streamflow was allowed for the first time over newly disturbed soils. For the proposed activities, this longer duration is expected once the disturbed soils around the repaired abutments are exposed again to streamflow and sediment suspension occurs.

Timing: The timing of the bridge repair activity is estimated to be four to five weeks during the low flow periods for Taneum Creek. The majority of work will be conducted during the in-stream work window of July 16th -Sept 30th. However, a two week extension until October 15th was approved by WDFW Habitat Biologist, Scott Downes, in order to take advantage of the low water conditions typical for Taneum Creek that time of year. The timing of bridge repair activities during low water flow periods is expected to decrease the level of direct effects to fish and fish habitat by minimizing sediment inputs and erosion during excavation for bridge piling replacement. Timing of the work in the wetted stream channel would be minimized and completed during low water flow periods. Electrofishing would occur directly prior to equipment crossings.

Nature: Bull trout and their redds are not expected to occur in the area of the bridge repair. The bull trout spawning period is relatively short, and spans from October to November. It is suspected by the WDFW that bull trout tend to build redds and spawn in the upper tributaries during these fall months, where water temperatures tend to be less than 9°C (Behnke 2002). Bull trout redds are not expected to be encountered during the bridge repair because there is no evidence of bull trout in Taneum Creek, or the abundance is so low that likelihood of spawning pairs existing would be discountable to zero. However, the fish passage improvements and the possibility of undetected bull trout in Taneum Creek, render direct effects as significant. If evidence of bull trout presence is discovered during the project time frame, it would be expected that spawning would occur in the upper, colder tributaries. These locations and conditions are at distances >1 mile upstream of the bridge repair, rendering direct effects to redds insignificant. Furthermore, spawning would occur outside the timeline for most of the bridge repair. As a precautionary, the affected areas of the bridge repair will be inspected for redds by Fish Biologists prior to any in-stream work. As stated above, electrofishing and fish handling, such as dip netting and time out of water, can cause physiological stress and result in physical injury or death, which can alter the natural behavior of bull trout. Repair work would be reassessed if any redds are discovered, or if any bull trout are encountered prior to implementation, from electrofishing or otherwise.

Summary: In summary, proposed activities may result in significant negative direct effects to ESA listed bull trout. This result is due to stream isolation, equipment crossings, sediment inputs, handling stress, as well as noise and vibration disturbance in the immediate area associated with repair of the bridge on North Fork Taneum. Bridge repair activities are expected to have a high probability of causing a turbidity plume with high magnitude of effect. Although this effect is expected to be brief in duration, it represents a significant effect to this Indicator.

Indirect Effects for Steelhead and Bull Trout

The following evaluation will focus on potential indirect effects to steelhead, bull trout, and their designated critical habitat for steelhead and bull trout.

Project elements that are fully outside Riparian Reserves are at distances that are expected to have no indirect effect to individual steelhead or steelhead and bull trout designated critical habitat. Controlled burning, road actions, and vegetation treatments in the uplands, outside of Riparian Reserves, would have no effect to instream habitat indicators except as described below for flow. Because there would be no change or impact to instream habitat indicators the effects of these activities would be zero, aside from flow.

Along streams with designated critical habitat for steelhead and bull trout, some proposed actions would occur in upland areas outside of Riparian Reserves and away from instream habitat. Other proposed actions would occur in Riparian Reserves but outside no cut and equipment buffers, specifically commercial thin in 102 acres in Riparian Reserves of intermittent/wetlands, commercial thin 11.5 acres in Riparian Reserves of Designated Critical Habitat, and non-commercial thin in 62 acres in intermittent/wetlands. The 11.5 acres are an exception to Table 3 for commercial thinning activities. Field verification in 2020 by the hydrologist and soils scientist identified small areas, ranging from 0.004-4.17 acres for a total of 11.5 acres overall where this section of the Riparian Reserve was disconnected from the functional riparian area by either topographic boundaries or roads and the unit went into the Riparian Reserve slightly (Table 7). No trees would be removed within 50 feet (non-commercial thinning) and 75 feet (commercial mechanical thinning) of intermittent streams and wetlands under one acre, or 100 feet (non-commercial thinning) of non-fish bearing perennial streams and wetlands over one acre. Trees over 10 inches in diameter would not be cut during non-commercial thinning. All work in these Riparian Reserves would follow the no cut and equipment restriction zones outlined in Table 3. Prescribed burning and associated firelines in the upland areas located outside of Riparian Reserves are expected to have no effect on steelhead, bull trout, or their designated critical habitat, or other instream habitat indicators (USFS et al. 2004).

Three landings would be located within Riparian Reserves of a wetland or intermittent stream. Temporary roads, unauthorized roads, and landings used for vegetation treatments would be decommissioned and fully closed to motorized use after logging activities are completed or converted back to motorized trails if they were initially so. Logging and closure would be scheduled for completion within a single season. Prior to use, existing road prism in disrepair that would not meet design criteria intended to restrict erosion and protect water quality would be altered and brought into compliance. No temporary roads or landings would cross streams of any type. All haul routes are on existing maintained heavily travelled gravel and paved roads. Lignin may be used for dust control on non-paved roads.

Runoff and sediment delivery to streams typically increases the closer the activity is to the stream. Untreated areas that are well vegetated, including sloped areas, rarely result in sediment transport and runoff flowing more than 100 feet from its source (MacDonald and Coe 2007; Ketcheson and Megahan 1996). Additionally, there are a variety of Design Criteria and Best Management Practices that would be implemented to eliminate or reduce the impacts of the proposed actions on aquatics and hydrology (Table 16 and Table 17).

The following instream and channel condition and dynamics habitat indicators would not be affected by the proposed actions due to lack of a causal mechanism and the application of:

- BMPs and Design Criteria: Bankfull Width to Depth and Streambank Condition
- Off-channel habitat
- Refugia

Effects on Habitat Indicators

This section analyzes the indirect effects of the Taneum Restoration project on listed fish species and their designated critical habitat. The temporal scale for the effects analysis is up to 5 years for the short-term (when the proposed actions will be implemented) and 5 to 50 years or more for the long term (post proposed actions). This is the timeframe estimated that improvements from vegetation treatments would be measurable. Short term (up to 5 years) neutral to negative impacts related to proposed actions would be expected in isolated places of the watershed where the actions would occur. Long-term beneficial impacts in the watershed and upper Yakima Basin would be expected to last for more than 50 years as a result of the actions. Long term benefits would include a more natural disturbance regime and fire behavior and increased large tree availability.

Water Quality

__Temperature__

Removal of trees and vegetation along streams can result in reduced shading and thus increases in stream temperatures. The project elements of the proposed action that could result in reduction of shade along streams include non-commercial thinning, commercial mechanical thinning, temporary roads, haul routes, prescribed fire, hazard/danger tree removal, and shaded fuel breaks including firewood cutting. Portions of the mainstem Taneum Creek are on the WA Department of Ecology's 303d list for temperature within and downstream of the Project Area.

Proximity: Of the 1,673 acres of commercial mechanical thinning, 102 acres are proposed within Riparian Reserve (150 ft) of intermittent streams and wetlands under one acre, and 11.5 acres are proposed within Designated Critical Habitat within the treatment units. These 11.5 acres are an exception to Table 3 for commercial thinning activities. As stated above, field verification in 2020 by the hydrologist and soils scientist identified small areas, ranging from 0.004-4.17 acres for a total of 11.5 acres overall where this area of the Riparian Reserve was disconnected from the functional riparian area by either topographic boundaries or roads and the unit went into the Riparian Reserve slightly (Table 7). Non-commercial thinning activities would also occur (62 acres) in Riparian Reserve of intermittent streams, wetlands under one acre and wetlands over one acre (Table 3). Most of these units use existing roads and landings with only 3.1 miles of temporary roads being needed; 0.04 miles of temporary road (existing) would be in Riparian Reserve of a wetland over one acre that has no connection to streams of any type, 0.17 of intermittent streams, and 0.02 of fish-bearing streams. Three landings would be constructed in Riparian Reserve, including one near a fishless wetland and two near the origins of intermittent streams (Figure 12, Figure 13, Figure 14, Figure 15, Figure 16, Figure 17). No yarding would occur in Riparian Reserve except at the three landings identified. Site potential trees in the project area average 150 feet tall, so the Riparian Reserve widths on intermittent streams throughout this analysis were extended to 150 ft rather than 100 ft. Treatments would occur during dry months when intermittent streams lack water.

Hazard trees, not to exceed a yearly average of 5 per acre, would be identified and removed from developed recreation sites as needed to provide a safe recreational experience. Hazard trees and danger trees in Riparian Reserves would be felled toward the stream and left in place with no cutting or bucking. Exceptions would be hazard trees that when felled block access to developed recreation sites, which would be removed for firewood or restoration. Shaded fuel breaks would be created along 6.1 miles of existing roads (3300, 3350-119, 3330, and 3350-111) except where it intercepts a Riparian Reserve, or a fish bearing stream with designated critical habitat for steelhead or bull trout. Treatments would include removal of trees by hand with chainsaws, preferably grand fir, up to 8 inches DBH. Fuels would be chipped, piled, and burned, or made available for personal use firewood collection. Down wood levels would meet the desired conditions described in Table 38 before firewood collection would be authorized. The distance on either side of the road would be up to 150 ft which is 1 tree length equivalent. Firewood cutting (already downed trees) would occur along roads in designated areas such as shaded fuel breaks and at logging landings consistent with meeting coarse woody debris desired conditions.

Bridge repair activities would occur directly in and adjacent to North Fork Taneum Creek, in an area which is occupied by MCR steelhead, potentially occupied by bull trout, but has Designated Critical Habitat for both species.

Probability: The probability of non-commercial thinning, temporary roads, haul routes, shaded fuel breaks including firewood cutting, prescribed fire, and bridge repair activities affecting stream temperature in streams with ESA listed species or with Designated Critical Habitat is not discountable.

A scientific literature review concluded that buffer widths of at least 90 feet from the edge of the stream are sufficient to provide effective shade and prevent stream temperature increases (Sweeney and Newbold 2014). Thus, no temperature effects are expected from commercial or non-commercial thinning activities along perennial streams. Thinning to within 50 ft of intermittent streams, however, may produce a temperature effect by reducing shade during seasons when water is flowing; this probability is not discountable.

Temp roads are not expected to contribute to a loss of stream shade due to the short lengths of segments proposed in Riparian Reserves and avoidance of stream crossings. Haul routes may have a probability to affect temperature but would be insignificant in magnitude. Bridge repair activities will maintain overstory and involve too small a footprint to cause a temperature effect.

Shaded fuel breaks would occur along 6.1 miles of road but would avoid Riparian Reserves except in specific locations where an existing road is between the shaded fuel break and the stream. In those specific locations, only trees on the upland side of the road would be removed, and only trees up to 8” DBH. The probability of a temperature effect is considered discountable due to the small sizes of trees being felled and their distance from streams (i.e., at least one road width and usually much farther). Unlike most other elements, the probability of hazard/danger tree mitigation within Riparian Reserves affecting stream temperature is considered moderate. Hazard tree felling at recreation sites will not exceed five per acre per year and danger tree numbers along roads are unknown. It is considered a moderate probability that this hazard/danger trees felling would affect temperature, considering that some but not all hazard/danger trees are dead, understory, or positioned in a way that does not shade streams (e.g., far from the stream or on the north side).

Magnitude: The proposed no cut buffers would result in no non-commercial or commercial mechanical treatments occurring throughout most of the Riparian Reserves of streams with designated critical habitat. Although commercial and non-commercial thinning to within 50 ft of intermittent streams may increase solar radiation reaching those streams, such streams generally only flow during colder months when any slight warming that occurs would not be deleterious to fish and may in fact be beneficial (Kaylor et al. 2021). Shaded fuel breaks including firewood cutting would avoid areas that intersect streams with designated critical habitat - except at specific locations on upslope sides of roads – and would only remove trees under 8” DBH providing minimal shade at that distance. No pile burning would occur in Riparian Reserve except for at three landings. Large trees would not be cut in any Riparian Reserves, unless found to be dangerous or hazardous on haul routes or in developed campgrounds (where total numbers cut would not exceed 5/acre/year). Temperature effects from harvest and shaded fuel breaks are expected to be insignificant in magnitude.

Hazard trees cut from developed recreation sites in accordance with Design Criteria, danger trees along haul routes, and a small footprint around bridge repair activities and three landings are expected to have minimal effect on shade-producing vegetation, thus canopy cover affecting streams would not be significantly affected. Hazard trees would be felled within 50.2 acres that have strike-zone potential (i.e., within 150 ft) of the developed recreation sites at Taneum Campground, Taneum Junction, and Icewater Campground. Of those acres, 39.9 are within Riparian Reserve, and have the potential to reduce stream shading and thus increase temperatures if five hazard trees per acre per year are felled. In recent years between 5 and 40 total hazard trees have been felled in Riparian Reserves of Taneum Campground, Taneum Junction, and Icewater Campground, which is equivalent to 0.13 and 1 per acre, meaning that the magnitude of effect from trees felled is likely to be much less than that of five per acre per year. Although warming may occur, the magnitude of the effect is expected to be insignificant. A recent study in Oregon (Swartz et al. 2020) found that small 20-m canopy gaps were associated with an average 0.21°C increase in seven-day-maximum temperatures, while a recent study in North Carolina/Georgia (Coats and Jackson 2020) found that gaps ~50-250 meters long were associated with summer peak temperature increases of 0.4 °C or 2.5 °C depending on the set of streams. The warming from proposed hazard tree felling is expected to be similar or less than the Oregon study because 1) hazard trees are unlikely to all occur in a single clump, 2) hazard trees are unlikely to all occur within the streamside portion of Riparian Reserves, 3) trees at Taneum Campground are on the south side of the stream and may provide shade but those at Icewater Campground are on the north side and those at Taneum Junction are on the northwest side providing little shade, 4) many hazard trees are dead and providing little shade, and 5) the three campgrounds are on relatively large streams with more thermal inertia and less susceptibility to warming. Any minor warming that does occur would be attenuated downstream as the streams flow through shaded areas.

Danger tree felling along 41 miles of haul routes may also cause warming via shade reduction, specifically along the 12.4 miles of haul routes proposed in Riparian Reserves. However, recent observations of danger tree felling for the Walter Springs project in the adjacent Manastash watershed were that danger tree felling was sparse, and the same is expected to apply here. In addition, 6.3 of the 12.4 miles in Riparian Reserves are along intermittent streams or wetlands, where warming is unlikely to affect fish as addressed above. The determinations of insignificant magnitude for warming related to hazard trees and danger trees are also consistent with the professional judgement of FS Hydrologist Matt Karrer (personal communication).

In all project elements, including hazard/danger trees, the magnitude of effects to temperature is expected to be zero to insignificant.

Element Summary: Commercial mechanical thinning of trees from 7 inches to 15 inches in diameter 75 feet from intermittent streams and wetlands under one acre would not affect stream shade. Non-commercial thinning of trees 10 inches in diameter to within 50 feet of intermittent streams and wetlands under one acre would not have anything more than insignificant effects to stream shade. Although commercial thinning to within 75 ft of intermittent streams may increase solar radiation reaching those streams, such streams generally only flow during colder months when any slight warming that occurs would not be deleterious to fish. Hazard tree cutting, bridge repair site clearing, and construction of three landings are expected to cause minimal reductions to shade due to small footprints and Design Criteria. Temporary roads would remove very few trees from within Riparian Reserve of fish bearing streams including those with designated critical habitat. No pile burning would occur in Riparian Reserves except for at three landings. BMPs and design criteria would be applied. The highest magnitude of impacts expected to ESA listed fish species or their Designated Critical Habitat is insignificant.

Temperature Indicator Summary: The proposed treatments within Riparian Reserve are expected to have an insignificant negative effect to water temperature in the short term and would result in a neutral effect to stream temperature in the long term.

Habitat Access

Physical Barriers

Although the proposed activities do not include alterations of culverts on fish-bearing streams, there is potential for changes in habitat access during construction of the bridge repair project element.

Proximity: Repair activities for the North Fork Taneum bridge will occur directly in Designated Critical Habitat for bull trout and steelhead.

Probability: Repair activities for the North Fork Taneum bridge will work under dry conditions by use of coffer dams, as depicted in The Required Design Criteria and BMP's (Table 19 and Table 20). In this method, sandbags and bermed material would be used to isolate and dewater one side of the streambed; construction activities would occur on the dewatered side while the stream flow was continuous through the other side (and then sides would be switched). Because work will occur during low flow conditions it is considered unlikely but not a discountable probability that flow constriction will occur due to stormflows.

Regarding flow constriction from maintaining the post-construction span of the bridge itself, there is considered a discountable probability this will occur. The abutments currently span 29.5 ft whereas bankfull widths measured by FS Hydrologist Tom Matthews and Eric Merten on 3/16/18 ranged from 21-25 ft at representative locations within 100 ft upstream and downstream from the bridge. Bankfull width under the bridge was 23 ft when accounting for the existing riprap, which was within the range of conditions above and below.

Figure 56. North Fork Taneum bridge showing existing abutments, riprap, and bankfull widths.

Figure 57. Spatial locations of bankfull and abutment measurements at the North Fork Taneum site.

Magnitude: Habitat access may be impeded by temporary coffer dam constriction of streamflow causing faster velocity; if velocities are fast enough, they may present a passage barrier to fish for the duration of the coffer dam diversion. However, the magnitude of any effect whereby a velocity challenge would impede habitat access is expected to be insignificant because 1) this method of diversion uses flow over a naturally rough streambed which creates pockets of turbulence and dead zones in the lee of rocks which afford resting areas for juvenile fish or 2) streamflows are low during the work window thus no overbank flow would be forced to pass through the wetted area and velocities are not expected to become high. Steelhead migration would not be affected because they are not expected to be migrating during the bridge repair timeframe in late September. Steelhead migration and spawning typically occurs between March and late May. Bull trout migration towards upper tributary spawning areas typically occurs from August to October. The timing of the bridge repair could affect bull trout migration, but bull trout are not expected to be in the area or occur at an extremely low abundance. The unlikelihood of bull trout occupancy within the bridge repair zone increases when very low abundance, coupled with the small spatial and temporal footprint of the repair, is compared to the size and scale of the greater Taneum watershed.

Element Summary: The proposed activities are expected to have an insignificant negative effect to habitat access by slightly increasing velocity in the coffer dam diversion area for the duration of bridge repair activities.

Physical Barriers Indicator Summary: The proposed activities are expected to have an insignificant negative effect to habitat access by slightly increasing velocity in the coffer dam diversion area for the duration of bridge repair activities.

Habitat Elements

Sediment, Turbidity, and Substrate

Ground disturbance along streams can result in increases in fines, turbidity and embedded substrates. The project elements of the proposed action that could result in increased sediment, turbidity, and substrate include non-commercial thinning, commercial mechanical thinning, prescribed fire, temporary roads and haul routes.

Proximity: No trees would be cut on stream banks of any type of Riparian Reserve, with the exception of hazard trees at developed sites and danger trees along haul routes (which would be felled using chain saws or using equipment on the road prism). No heavy equipment would be allowed within 300 feet of fish bearing streams including those with designated critical habitat or natural ponds. No heavy equipment would be allowed within 150 feet of non-fish bearing perennial streams or wetlands over one acre. No heavy equipment would be allowed within 50 feet (non-commercial thinning) and 75 feet (commercial mechanical thinning) of intermittent streams or wetlands under one acre, depending on slope and sediment type. Minor exceptions to these heavy equipment exclusions are noted in Table 3. Ground disturbance would not occur as a result of non-commercial thinning because work would be done by hand or using masticators with low ground pressure less than 8 psi, and mastication would not occur in Riparian Reserves of any type except within 75-100 ft of intermittent streams where slopes are <30%. All commercial mechanical thinning and prescribed fire outside of Riparian Reserves (Table 3) have no mechanism to deliver sediment to streams, particularly due to Design Criteria for Soils such as moisture criteria at sites with high fuel loads and patchy burning to prevent excessive duff consumption. No equipment zones of 150 feet on non-fish bearing perennial streams and wetlands over one acre and 300 feet on fish bearing perennial streams including those with designated critical habitat would result in no ground disturbance which could result in fine sediment being transported to streams. Increased fine sediment can result in smothering of redds and juvenile salmon causing direct mortality or sub-lethal and behavioral effects similar to those caused by warm water temperatures. Soil disturbed by commercial mechanical thinning would remain at or near the ground disturbance activity due to undisturbed vegetative buffers that would function as filters. Vegetation treatments would occur in dry months when intermittent streams are dry, forcing fish to inhabit areas further downstream thus reducing their proximity further.

Although handlines will occur as close as 50 ft to intermittent streams no sediment is expected from these minor disturbances that could reach downstream fish-bearing areas. No handlines would be constructed within 150 feet of a non-fish bearing perennial stream or 300 feet of a fish bearing perennial stream including those with critical habitat. Shaded fuel breaks would cause no ground disturbance due to hand treatments and no anticipated effects to this Indicator.

Roads within the project area (road density is 3.94 miles per square mile) are considered the largest source of sediment to streams. Fine sediment and flow routing from roads can make streambeds and banks more susceptible to erosion during high flow events (Luce and Black 1999; Wondzell 2001). The most significant source of fine sediments to streams occur at stream crossings and along native surface roads that are within 300 feet of a stream (Ketcheson and Megahan 1996). No new permanent roads would be constructed as a result of the proposed project which would result in no permanent increase to road density. Temporary roads and landings would be outside of Riparian Reserve with the exception of eleven short sections, totaling 0.2 miles, and three landings. Short sections of temp road are >100 ft from streams, except for the north-central and south-central sections of the project area (Figure 8 and Figure 11). Temporary roads, unauthorized roads, and landings used for vegetation treatments would be decommissioned and fully closed to motorized use after project activities are completed, except those which were system motorized trails pre-project and would be returned to that state. Logging and closure would be scheduled for completion within a single season.

Haul routes are on existing and maintained gravel and paved roads with heavy traffic. About 12.4 miles of haul routes in Riparian Reserves would be along gravel and paved roads that are routinely maintained; 5.9 of these miles of haul route are in Riparian Reserve along fish-bearing streams. BMPs and design criteria would be employed to limit sediment from entering streams (Table 17 and Table 19). Additionally, hauling would not occur during heavy rain or snow melt events and dust would be controlled by applying water or lignin to the road surface.

Bridge repair activities would occur directly in and adjacent to occupied steelhead habitat and potentially occupied bull trout waters, and their Designated Critical Habitat.

Probability: The probability of commercial, non-commercial thinning, temporary roads, hazard/danger tree removal, and shaded fuel breaks including firewood cutting affecting sediment, turbidity, and substrate in streams with MCR steelhead, bull trout, or with designated critical habitat is discountable because PDC's would greatly reduce any impacts. Regarding perennial streams, generally no ground disturbance or yarding would occur in, and no trees would be cut or removed from Riparian Reserves of non-fish bearing perennial streams or fish bearing perennial streams including those with designated critical habitat. One exception would be 11 sections of new temp roads totaling 0.206 miles; most but not all of these are in the portion of Riparian Reserves farthest from the stream channel and would not be expected to deliver sediment (exceptions are addressed below, including three landings). Another exception is the 11.5 acres of commercial thinning which proposed in areas where the Riparian Reserve contains Designated Critical Habitat but were verified to be disconnected from the functional riparian area. These 11.5 acres are an exception to Table 3 for commercial thinning activities. Field verification in 2020 by the hydrologist and soils scientist identified small areas, ranging from 0.004-4.17 acres for a total of 11.5 acres overall where this area of the Riparian Reserve was disconnected from the functional riparian area by either topographic boundaries or roads and the unit went into the Riparian Reserve slightly (Table 7). No cut and no equipment buffers are at distances that would greatly reduce the probability of sediment entering perennial streams via surface runoff.

Regarding intermittent streams, a literature review concluded that buffer widths of at least 98 feet from the edge of a stream are sufficient to prevent fine sediments from reaching adjacent streams (Sweeney and Newbold 2014). Hand treatments as close as 50 ft to intermittent streams are expected to have zero probability of contributing sediment but thinning with heavy equipment as close as 75 ft to intermittent streams does have potential to contribute sediment. The probability of this sediment reaching fish bearing streams is considered to be discountable because 1) ground disturbing activities would occur during dry months when intermittent streams are dry and wet-soil-related erosion is less likely, 2) design criteria are more restrictive on steeper terrain to reduce erosion potential, and 3) any sediment reaching these intermittent streams would still need to be transported downstream into North or South Fork Taneum Creek, which is not a given.

Keeping nearly all temporary roads and landings outside of Riparian Reserves would render discountable the probability of sediment delivery to streams from erosion and sediment transport related to upland activities (Spies et al. 2018). Past studies have suggested that vegetated buffers 30m wide are generally sufficient to prevent sediment delivery from roads into streams (Clinnick 1985), which studies in a variety of regions continue to confirm (Ziegler et al. 2006; Kastridis 2020). The 11 sections of temp road totaling 0.206 miles incurring into Riparian Reserve are not expected to contribute sediment because most are >100 ft from streams (Sweeney and Newbold 2014). Exceptions are the north central and south-central sections in Figure 8 and Figure 11. The south central temp road is not expected to contribute toward a measurable increase in sediment delivery to fish bearing streams or Designated Critical Habitat because the road is proposed on an existing road disturbance (Figure 58 and Figure 59) and the Riparian Reserve is associated with a vegetated swale which is not connected to any fish-bearing stream. The south central temp road in Figure 11 is not expected to contribute toward a measurable increase in sediment delivery to fish bearing streams or Designated Critical Habitat because the proposed location is on the upslope side of an existing system gravel road which has an effective ditch on the upslope side that would route any runoff away from the stream - with the site-specific design criteria prescribed by hydrologist Matt Karrer (Figure 18) – and the downstream travel distance to a fish-bearing stream is 0.62 miles (Figure 11, Figure 60 and Figure 61). The north central temp road in Figure 8 is not expected to contribute toward a measurable increase in sediment delivery to fish bearing streams or Designated Critical Habitat because the Riparian Reserve is associated with a vegetated swale rather than a defined channel (Figure 62 and Figure 63), design criteria would interrupt flow paths from developing and flowing into the swale, and the downstream travel distance to a fish-bearing stream is 0.49 miles.

Figure 58. Edge of Riparian Reserve showing existing unauthorized road proposed for use as temp road.

Figure 59. Edge of Riparian Reserve showing existing unauthorized road proposed for use as temp road.

Figure 60. Proposed location for temp road in Riparian Reserve of an intermittent stream (not shown), with existing intervening system gravel road.

Figure 61. Effective ditch on upslope side of existing system gravel road. A temp road is proposed on the upslope side of the road and an intermittent stream is on the downslope side.

Figure 62. Proposed location for a temp road (right side of photo) near an ephemeral swale (left side of photo) looking upslope.

Figure 63. Proposed location for a temp road (left side of photo) near an ephemeral swale (right side of photo) looking downslope.

Three landings would be in Riparian Reserves but would be along a fishless wetland or near origins of intermittent streams, and there is expected to be a discountable probability of flow paths and sediment delivery developing due to 1) the distance from these landings to stream channels, 2) relatively flat terrain, 3) location of landings on the upslope side of road prism, and 4) the design of landings to be hydrologically stable. A recent study in eastern Washington (Robichaud et al. 2020) concurs that flow routing and sediment delivery from landings and skis trails would be prevented with a vegetated buffer >15m wide, under unburned conditions. BMPs and design criteria would be expected to restrict sediments from entering streams and remain within the normal range of existing levels.

All haul routes would occur on existing maintained gravel and paved roads. The probability of haul route use by logging trucks causing sediment delivery to streams would be reduced by prescribed erosion control measures, specifically seasonal closures, gravelling, maintenance, ditching water routing structures, sediment traps, water bars, and drivable dips employed to minimize erosion. Water would be routed off road prisms and fills and dispersed across a vegetated slope, and cross drain and ditch cleanout would be used to remove sediment, debris, and other blockages which impede surface water routing. Although these measures would be beneficial, the probability of sediment entering streams from the use of haul routes is not considered low enough to be discountable.

Most project elements would have zero to discountable probability of sediment entering streams including those with designated critical habitat, and if such erosion did occur it would only result in a short-term immeasurable increase of turbidity, substrate embeddedness, or aggradation of pools due to an increase in sedimentation. However, haul route use may cause sediment inputs, and bridge repair activities are likely to cause sediment delivery to fish bearing streams.

Magnitude: For most project elements, the probability of sediment entering streams would be discountable as described above, and those elements will not be discussed further. One exception is the use of haul routes; sediment may move from haul route surfaces into streams during use, but the magnitude of this effect is expected to be insignificant due to prescribed erosion control measures.

The other exception is that a localized pulse of sediment is expected to enter North Fork Taneum Creek as a result of proposed bridge repair activities; this pulse will be the focus of the remainder of this sediment analysis. Stream isolation and standard erosion control measures would reduce the amount of sediment from this source; the amount of sediment entering the stream is expected to be significant but no more than from a typical culvert removal. The rationale is that a typical culvert removal involves ground disturbance of the sediment covering the culvert, the sediment on both sides of the culvert, and the sediment under the culvert whereas proposed bridge repair activities will involve removal and disturbance of less sediment. Two wet crossings by an excavator would add to the disturbance but are not expected to increase the amount of sediment suspended from overall activities above those from a typical culvert replacement.

Because actual sediment inputs are expected to be less, a typical culvert removal is used here as a surrogate measure for the turbidity expected from the proposed bridge repair activities. The Forest Service studied sediment concentrations and turbidity in stream water during culvert removals and road obliteration to determine the short-term effects and found that at the 11 crossings studied, sediment yields ranged from 170 to <1kg in the 24-hour period following culvert removal. Turbidity exceeded the regulatory limits during culvert removal at all locations monitored and remained elevated above limits past 24-hrs at 36% of the monitored sites. Sediment concentrations at ~330 feet downstream of the culvert outlet remained above regulatory limits but were reduced by an order of magnitude. Sediment concentrations stabilized back to those found above the culvert at ~2,658 feet downstream (Foltz, Yanosek, and Brown 2008). Therefore, to describe the worst-case scenario, *the turbidity plume from proposed bridge repair activities would likely be visible no more than 2,600 ft downstream*. Design Criteria/BMPs of reducing areas of soil disturbance, minimizing crossings with heavy equipment, diverting the streamflow using coffer dams, and re-watering disturbed areas slowly will reduce the magnitude, along with others listed in Table 20.

Distribution: The spatial distribution of elevated turbidity levels from bridge repair activities is expected to be uneven within the length of the turbidity plume. In a study based mainly on modelling the dynamics of sediment suspension and dispersion as affected by hydraulic properties, Courtice and Naser (2020) observed that the shape of a turbidity plume is partly dependent on the lateral origin of the initial disturbance. That is, disturbances such as mid-channel equipment operation resulted in a turbidity plume shaped differently than one from a lateral disturbance such as excavating an abutment. For mid-channel disturbances, the turbidity plume mixed laterally in both directions and thus reached a full bank-to-bank distribution relatively quickly, with unaffected margins disappearing a relatively short distance downstream. For near-bank lateral disturbances (on one side), the turbidity plume required a greater downstream distance before it reached a bank-to-bank distribution, meaning that the unaffected area of the stream extended farther downstream. Proposed activities will mainly result in near-bank lateral disturbance resulting from excavation around abutments, with a relatively long unaffected margin along the opposite side. Channel-spanning suspension of sediment will also occur during stream crossings by the excavator, although these will be minimized to two crossings.

Frequency: The bridge repair and associated sediment pulse would occur once.

Duration: The duration of elevated turbidity levels from bridge repair activities is expected to be brief, based on a Forest Service study by Foltz et al. (2013). This study measured downstream turbidity over time at two locations where undersized culverts were removed and replaced with bridges. Although each situation is unique (due to variations in operators, soils, stream flow, weather, and so on) the work described in Foltz et al. (2013) is expected to result in no less disturbance than the proposed activities for the current project. Turbidity levels were found to remain elevated for the duration of heavy equipment movement on streambeds themselves but to reduce within 15 minutes thereafter as disturbed substrates were mobilized and diluted downstream; a similar duration is expected for the proposed activities when equipment crosses on the streambed.

Foltz et al. (2013) found that streambank disturbance from placing riprap and planting vegetation also resulted in brief elevations of turbidity, with duration less than 10 minutes. A longer duration of elevated turbidity, 60-105 minutes, was found when diversions or coffers were removed, and streamflow was allowed for the first time over newly disturbed soils. For the proposed activities, this longer duration is expected once the disturbed soils around the repaired abutments are exposed again to streamflow and sediment suspension occurs.

Timing: The pulse of sediment associated with bridge repair activities would be initiated during the approved fish work window (July 16 – September 30) but could extend into October. A work window extension was reviewed and approved by the WDFW Habitat Biologist, Scott Downes, via personal communications and email correspondence on February 3, 2022.

Nature: The nature of the particles composing the sediment pulse during bridge repair activities would be that of the existing substrate at the site. Aside from the armor layer of larger substrates in the streambed, composed of particles that would not saltate far downstream, the bulk of the particles would be sand, silt, or clay.

Sediment, Turbidity, and Substrate Indicator summary: Most proposed treatments within Riparian Reserve are not expected to measurably increase sediment delivery to streams, including those occupied by MCR steelhead, bull trout, or with Designated critical Habitat. Those project elements combine to create an insignificant negative effect to habitat indicators of sediment, turbidity, and substrate. However, bridge repair activities are an exception, and are expected to have a high probability of causing a turbidity plume with high magnitude of effect. Although this effect is expected to be brief in duration, it represents a significant effect to this Indicator.

Chemical Contaminants and Nutrients

Application of lignin on haul routes and refueling have the potential to introduce nutrients into streams in the project area. Bridge repair activities will use untreated wood and thus have no potential to introduce chemical contaminants.

Proximity: Design Criteria would prohibit drafting water from water bodies into trucks after a lignin load has been applied to the road surface, but tanks have not yet been cleaned, and would also prohibit lignin from being stored, loaded, or mixed in a Riparian Reserve. Unused lignin will be disposed of in a designated location outside of the Riparian Reserve. A spill plan will be developed and on hand during application. And finally, lignin will not be applied within 100 feet of any fish bearing stream crossings, a distance based on past practice and observations.

Refueling will also occur outside Riparian Reserve.

Probability: Because lignin will not be applied near fish-bearing streams, the probability that it will enter streams with MCR steelhead is discountable and it is not considered further. The probability of gasoline or other engine-related chemicals entering streams is also considered discountable due to refueling and maintenance occurring outside Riparian Reserve.

Chemical Contamination and Nutrients Indicator summary: Because lignin will not be applied within 100 feet of fish-bearing streams (Table 17), the probability that it will enter streams with MCR steelhead and bull trout is discountable. The probability of gasoline or other engine-related chemicals entering streams is also considered discountable due to refueling and maintenance occurring outside Riparian Reserve. Thus, there are no significant effects expected for this Indicator.

Large Wood and Pools

Large wood provides structure to build diverse habitat through influencing channel morphology, slowing of flows, routing and retention of sediments and organic matter, formation of pools, back eddies, side channels and floodplain habitats, and improvement of hyporheic exchange and increased prey production (Fox and Bolton 2007). Large wood also provides shade and refuge for salmonids and is integral in providing nutrients through retention of salmon carcasses and organic matter which support production of aquatic insects.

Ground disturbance along streams has the potential to result in reduction of available large wood and pools by causing erosion and wood burial or pool filling with sediment. The project elements of the proposed action that could result in reduction in large wood for recruitment and aggradation of pools or lack of pool formation thus include non-commercial thinning, commercial mechanical thinning, prescribed fire, temporary roads, hazard tree removal from recreation sites, danger tree removal from haul routes, and bridge repair. Instream habitat complexity in the Action Area is already reduced due to lack of large wood.

Proximity: For most project activities, design criteria specify that no large trees would be cut or removed from Riparian Reserves of non-fish bearing perennial streams or fish bearing perennial streams including those with designated critical habitat. No tree cutting buffers of 300 feet on fish bearing perennial streams, 100 feet on non-fish bearing perennial streams and 50 feet (non-commercial thinning) and 75 feet (commercial mechanical thinning) on intermittent streams would retain trees for large wood. Non-commercial thinning would only cut trees under 10 inches in diameter and these trees would be required to remain in place. Non-commercial thinning would be conducted by hand resulting in zero ground disturbance. For commercial mechanical thinning, only trees 7 inches to 15 inches in diameter can be removed within Riparian Reserve of intermittent streams. Intermittent streams generally do not have the flows and capacity to move large wood downstream to larger non-fish and fish bearing perennial streams except during high flow events. These events are rare in the Taneum Watershed. Large wood from intermittent streams would have to travel hundreds of feet to miles downstream, sometimes past road crossings, to reach streams with designated critical habitat.

Unlike most other project elements, hazard trees in recreation sites and danger trees along haul routes may occur in proximity to streams. Shaded fuel breaks would involve riparian tree removal at locations on the upslope side of roads. Bridge repair activities would also occur in very close proximity to North Fork Taneum Creek, including some activities within the stream channel.

Probability: For most project elements, the probability of commercial and non-commercial thinning, temporary roads, landings, shaded fuel breaks including firewood cutting, and prescribed fire affecting large wood and pools in intermittent streams and streams with designated critical habitat ranges from zero to discountable. No cut buffers of 150 ft are expected to have only discountable probability of reducing large wood inputs (McDade et al. 1990) by reducing rare circumstances such as “landslide effects” where landslides deliver trees from beyond 150 ft into streams (Gomi, Sidle, and Richardson 2002). No ground disturbance (thus no sediment inputs to bury wood or fill pools) would occur in and no trees would be cut or removed (for commercial harvest) from most of the Riparian Reserves of non-fish bearing perennial streams or fish bearing perennial streams including those with designated critical habitat. The treatment descriptions and equipment restrictions specify tree cutting buffers, canopy cover requirements, and equipment restrictions by slope and distance (Table 3). There are a total of 114 acres of commercial thinning proposed (Table 2), with 102 acres within the Riparian Reserve of intermittent streams and wetlands under one acre, and 11.5 acres in Riparian Reserves of Designated Critical Habitat. These 11.5 acres are an exception to Table 3 for commercial thinning activities. Field verification in 2020 by the hydrologist and soils scientist identified small areas, ranging from 0.004-4.17 acres for a total of 11.5 acres in an area where the Riparian Reserve is disconnected from the functional riparian area by either topographic boundaries or roads and the unit went into the Riparian Reserve slightly (Table 7). Shaded fuel breaks are not expected to affect wood inputs as the only riparian trees removed would be under 8” DBH and on the upslope side of roads, meaning they would be very unlikely to have become recruited to a stream. Although some reduction in wood inputs to intermittent streams may occur due to thinning as near as 75 ft from streams, such wood inputs to intermittent streams are very unlikely to have been transported downstream into fish bearing streams or Designated Critical Habitat. Thus, the probability of most activities affecting large wood in fish bearing streams is considered to be discountable due to buffers and design criteria.

Exceptions where the probability of reduced wood inputs is greater than discountable are hazard/danger tree felling and site clearing for bridge repair activities. Some hazard trees and danger trees are also expected to occur and be felled near streams, making some effect likely. Site clearing for bridge repair is expected to cause a very localized reduction in wood inputs to North Fork Taneum Creek.

Regarding pools, most project elements would have zero to discountable probability of sediment entering streams including those with designated critical habitat and are considered to have no probability of aggradation of pools due to sedimentation. However, bridge repair activities have a high probability of contributing sediment to North Fork Taneum Creek and causing local (though minor) aggradation of pools. Site clearing would occur in the immediate area around the bridge and would make the ground more susceptible to erosion, but PDC's such as the use of waddles and sediment control and seeding any disturbed soils with native seed mixes will greatly reduce sediment erosion. Removing and replacing abutments would also create localized ground disturbance, but no more than a typical culvert replacement.

Magnitude: The magnitude of effects to large wood recruitment in streams occupied by MCR steelhead and bull trout, or with Designated Critical Habitat is expected to be insignificant, due to the no-harvest buffers for most activities, the transport distance from intermittent streams to fish-bearing streams, and the small number of trees expected to be affected by bridge repair site clearing and danger tree felling. The footprint for bridge repair site clearing would be very small, and danger trees felled along the 12.4 miles of haul route proposed in Riparian Reserves would be left in place. Hazard trees would be felled within 50.2 acres that have strike-zone potential (i.e., within 150 ft) of the developed recreation sites at Taneum Campground, Taneum Junction, and Icewater Campground. Of those acres, 39.9 are within Riparian Reserve along a combined total of 2669 ft of perennial stream, which will reduce wood inputs when up to five hazard trees per acre per year are felled. However, felled hazard trees in Riparian Reserve will not be removed unless they are obstructing access to recreation facilities, so some number of them will remain as felled into streams or on the floodplain (thus representing no reduction). Approximately half the trees in these 300-ft Riparian Reserve are expected to be more than 150 ft from the stream meaning they would not have fallen into streams. Using the 2019 Programmatic Biological Assessment for Low Impact Management Activities for comparison, the magnitude of effects from proposed hazard tree felling is considered insignificant because, although the proposed activities involve felling up to five trees per acre per year rather than two, and some subset will be removed from Riparian Reserve, the activities are proposed for many less acres than were considered in that Programmatic. In recent years between 5 and 40 total hazard trees have been felled in Riparian Reserves of Taneum Campground, Taneum Junction, and Icewater Campground, which is equivalent to 0.13 and 1 per acre, meaning that the magnitude of effect from trees felled is likely to be much less than that of five per acre per year.

Regarding pools, the amount of sediment entering streams as associated with most project elements would be insignificant, thus so are effects to pools through aggradation. A localized and brief pulse of sediment is expected to enter North Fork Taneum Creek as a result of bridge repair activities; this may have insignificant effects to local pools via sedimentation. Stream isolation and standard erosion control measures are proposed to reduce the amount of sediment from this source.

Large Wood and Pools Indicator summary: Most proposed treatments within Riparian Reserve are not expected to measurably reduce pools or large wood recruitment to streams including those with designated critical habitat. Although localized effects are expected to occur from hazard/danger tree removal and bridge repair site clearing, the low magnitude would render those effects insignificant.

Flow and Hydrology

Floodplain Connectivity, Road Density and Location, Increase in Drainage Network, and Change in Peak/Base Flows:

Roads, dikes, trails and vegetation management in upland and riparian forests can influence the way water moves through a watershed and alter stream flow and snow retention (Kittredge 1953; Ambach 1974; Golding and Swanson 1978; Stednick 1996; Sicart et al. 2004; NRC 2008; Lawler and Link 2011; Lundquist et al. 2013). Research results vary, especially concerning how forest removal and thinning influence the timing and duration of snow melt (Lundquist et al. 2013). Climate change predictions show an increasing, and more frequent heavy rain or “atmospheric river” weather events, resulting in larger rain-on-snow events during winter months, exacerbating risks of flooding, which can increase scouring of spawning gravels and may result in death of eggs, premature flushing of juveniles downstream, and reducing egg and fry survival (Crozier and Siegel 2018). However, because the proposed action includes only 1,673 acres of commercial harvest in a watershed of 55,275 acres (i.e., <4% of the watershed), because that harvest involves only partial thinning, and because Design Criteria and BMPs are included to minimize effects, effects to hydrology from proposed vegetation management are expected to be minimal. Proposed road activities are thus the primary mechanism influencing stream flow and water quantity.

Table 47 summarizes road density in the Project Area before, during, and after the proposed activities. “Before” represents the existing condition in the Project Area, including system roads, private roads, and unauthorized roads. “During” adds the new temp roads that are proposed, and “After” removes those temp roads (including those that will be built upon existing unauthorized road prism). Motorized trails are not included.

Table 47**.** Metrics of road density before, during, and after proposed activities.

Status	Miles / Square Mile	Acres	Miles / Square Mile	Road Crossings / Stream Mile
	Road Density	300 ft Buffer Around Streams	300 ft Buffer Around Streams Road Density	
Before	3.94	11,951.55	9.13	1.49
*During	3.94	11,951.55	9.24	1.49
After	3.88	11,951.55	8.98	1.49

*Overall road density, during the ten-year project duration, are represented above. Because logging and road closure would be scheduled for a single season, temporary road segments would be created and closed throughout the project timeline and at various phases of the project. These temporary roads would not all occur at the same time. Some road segments will be decommissioned prior to project implementation as well (see p. 30)

Proximity: There are 5,828 acres of Riparian Reserve in the Project Area, including only official Riparian Reserves on Forest Service land. Of the 1,673 acres of commercial mechanical thinning, 102 acres are proposed within Riparian Reserve of intermittent streams and wetlands under one acre in the treatment units. 11.5 acres of commercial thinning is proposed in areas where the Riparian Reserve contains Designated Critical Habitat but have been verified to be disconnected from the functional riparian area by either topographic boundaries or roads. Non-commercial thinning activities would also occur (62 acres) in Riparian Reserve of intermittent streams, wetlands under one acre and wetlands over one acre (Table 3).

Under the proposed action, 3.1 miles of temporary roads including 97 landings related to vegetation treatment would be newly constructed or placed on existing road prism. All but three landings would be outside of Riparian Reserves, and all would be maintained or constructed to be hydrologically stable; 0.04 miles of temporary road (existing) would be in Riparian Reserves of a wetland over one acre with no connection to streams of any type, 0.17 would be in Riparian Reserves of intermittent streams, and 0.025 would be in Riparian Reserves of fish-bearing streams. The 11 sections of temp road totaling 0.206 miles incurring into Riparian Reserve are not expected to route flows into streams because most are >100 ft from streams and all will follow Design Criteria of minimizing disturbance to hydrologic features. Temporary roads that occur on existing road prism (i.e., unauthorized roads being used as temp roads) would be altered and brought into compliance and then decommissioned after use, except those which were system motorized trails pre-project and would be returned to that state. Skidding activities would occur outside of Riparian Reserves. If existing road prisms and landings were found to not meet design criteria intended to restrict erosion and protect water quality, they would be altered and brought into compliance or would not be used. Under the proposed action, no temporary roads or landings would cross streams of any type.

Probability: Changes to the road density and drainage network are considered unlikely due to decommissioning of roads before and throughout the proposed activities.

Because nearly all temporary roads would be outside of Riparian Reserves of non-fish bearing and fish bearing perennial streams, including those with designated critical habitat, the probability of other hydrologic changes is expected to be discountable. Three landings would be in Riparian Reserves but would be along a fishless wetland or near origins of intermittent streams, and there is expected to be a discountable probability of flow paths developing due to 1) the distance from these landings to stream channels, 2) relatively flat terrain, 3) location of landings on the upslope side of road prism, and 4) the design of landings to be hydrologically stable. Haul routes would be on existing maintained gravel and paved roads and hauling would not occur during heavy rain or snow melt events. Vegetation treatments in Riparian Reserve of intermittent streams and wetlands less than on acre are well away from designated critical habitat and not expected to result in effects to flow. Design Criteria and BMPs would be employed.

Additionally, temporary roads, unauthorized roads, and landings used for vegetation treatments would be decommissioned and fully closed to motorized use after project activities are completed, except those which were system motorized trails pre-project and would be returned to that state. Logging and closure would be scheduled for completion within a single season. The discountable probability of effects to surface flow and water storage would diminish further with vegetative regrowth.

Magnitude: The magnitude of effects to road density and drainage network is expected to be insignificant; the current road density is high at 3.94 miles per square mile and is expected to stay at that density during the height of project activities. The magnitude of effects to other hydrologic conditions is expected to be insignificant as well. The 1,673 acres of commercial harvest proposed represents 3% of the Action Area and is not expected to produce measurable changes to hydrology; other stand type treatments are similar in scope.

Regarding peak flow analysis, StreamStats was run for the Taneum watershed with pre and post treatment conditions. The modeled watershed for peak flow is shown in Figure 64, with both commercial and non-commercial treatment polygons. This modeled watershed begins at the Forest boundary.

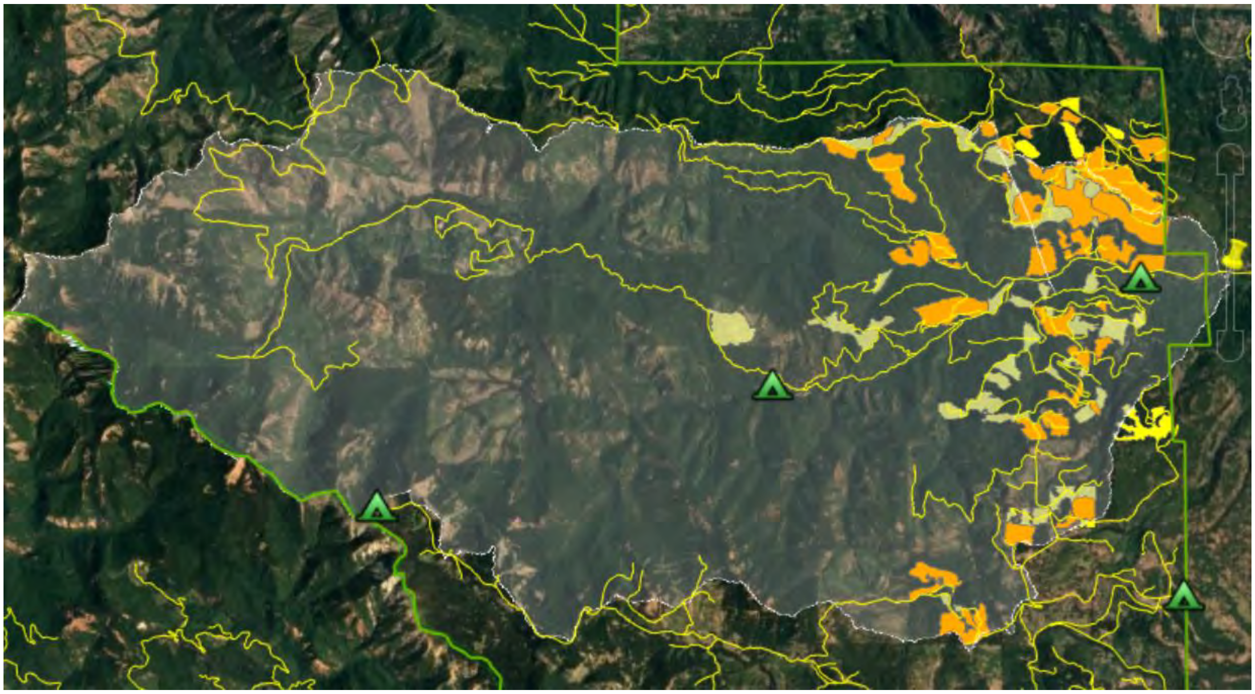


Figure 64. Taneum modeled basin for peak flow analysis.

StreamStats models canopy percentage by using the following categories from the National Land Cover Data Set (Table 48). So, any area forested area with greater than 20% vegetation cover is considered “Forest”. For conservative (largest magnitude) estimates of canopy cover reduction to input in StreamStats analysis, assume project treatments would reduce canopy cover to the lowest limit of the range for each stand treatment (Table 49). So, for example, in stand type 1, the treatment could reduce canopy cover to 10% for the stand, implying that 90% of the stand would not fall under the categories in Table 48. The resulting change in Forested acres is shown in Table 50.

Table 48. Forest definitions from National Land Cover Dataset.

Forest	
41	**Deciduous Forest**- areas dominated by trees generally greater than 5 meters tall, and greater than 20% of total vegetation cover. More than 75% of the tree species shed foliage simultaneously in response to seasonal change.
42	**Evergreen Forest**- areas dominated by trees generally greater than 5 meters tall, and greater than 20% of total vegetation cover. More than 75% of the tree species maintain their leaves all year. Canopy is never without green foliage.
43	**Mixed Forest**- areas dominated by trees generally greater than 5 meters tall, and greater than 20% of total vegetation cover. Neither deciduous nor evergreen species are greater than 75% of total tree cover.

Table 49. Maximum reduction in landcover categorized as "Forest" (i.e., canopy cover) in StreamStats model following implementation.

Table 50. StreamStat acreage and parameters used to estimate flood flows.

Drainage Area (sq. mi.)	Drainage Area (acres)	Pre project “Forest”	Post Project “Forest”
51.25	32800	21680.8 (66.1%)	19222.8 (58.6%)

Stream flows may increase slightly following project implementation as modeled by StreamStats. Removal of vegetation has the potential to increase flows due to reduction of interception, ground-cover, and evapotranspiration. To estimate the potential magnitude of effects on stream flow post project, treatment acres were assumed to remove the maximum amount of vegetation on the acres treated. For the project area project implementation would thus result in 2458 acres less of the “Forest” parameter used by the StreamStats regression equation (Table 50). However, as shown in Table 51, potential increases in flood flows are modest, particularly during high probability events (lower flood flows). Furthermore, the predicted Standard Error of flood events is quite large for both pre and post project implementation, suggesting that when compared to pre-implementation, differences in flood events post implementation may not be measurable (i.e. the predicted post treatment flow values fall well within the pre-treatment model error). Reducing the “Forested” acreage in the StreamStat model resulted in the predicted change in flood flows shown in Table 51 and Figure 65. The magnitude of these changes is considered insignificant, based on the size of the values relative to standard errors and professional judgement by FS Hydrologist Matt Karrer (personal communication). Much smaller areas affected by hazard trees, danger trees, and shaded fuel brakes are not anticipated to change the result.

Table 51. StreamStats modeled changes in flood flows.

Statistic	Pre-Implementation Values (ft^3/s)	Pre-Implantation Standard Error	Post Implementation Values (ft^3)	Post Implementation Standard Error
50% probability flood	1870	77.2	1940	77.2
20% probability flood	2020	69.1	2240	69.1
10% probability flood	2130	72.2	1450	72.2
4% probability flood	2260	81.2	2710	81.2
2% probability flood	2400	89.2	2950	89.2
1% probability flood	2500	96.9	3130	96.9

Stand Type	**Acres**	**Approximate Pre-treatment CC %**	**Approximate Post-treatment CC %**	**CC Reduction acres**
1	817	50	10-20	-735
2	356	60	10-40	-320
3	535	60	10-50	-482
4	629	50	10-40	-566
5	355	50	0-20	-355
Totals	2692			-2458

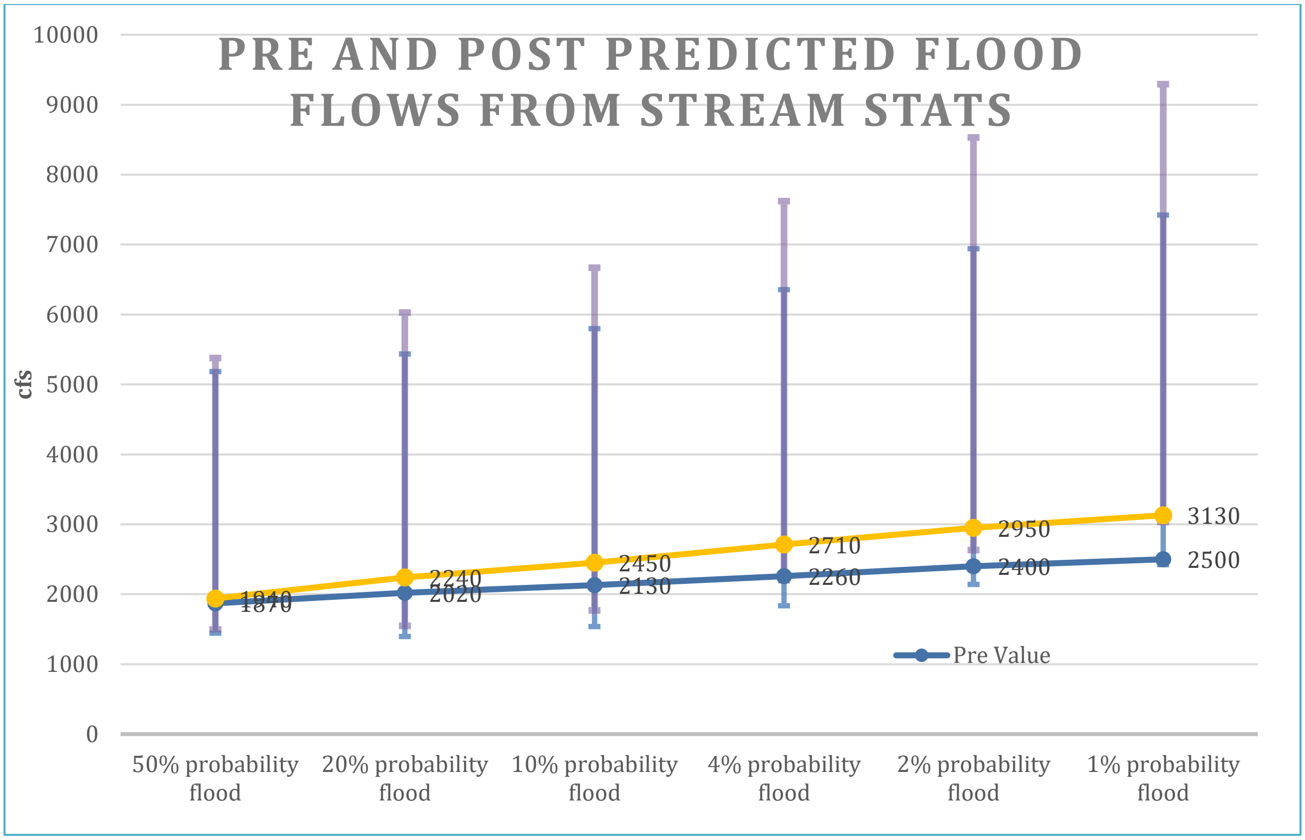


Figure 65**.** StreamStats pre- and post-implementation model results.

Element summary: Because the increase in road density and drainage network is not expected to occur, the magnitude of that effect is considered to be insignificant. New temporary roads would only last one season and would be followed by a slight decrease in road density and drainage network compared to the current condition.

As discussed above, 3.1 miles of temporary roads or landings related to vegetation treatment would be placed on existing road prisms (2.9 miles) or newly constructed (0.2 miles) under this proposed action; 0.04 miles of temporary road (existing) would be in Riparian Reserve of a wetland greater than one acre with no connection to streams, 0.17 of intermittent streams, and 0.025 of fish-bearing streams. Two temporary road segments (one on existing road prism and one on no prism) would begin at and move away from the 300-foot Riparian Reserve associated with critical habitat for steelhead and bull trout. These two temporary roads are on the north side (opposite side from stream bank) of the maintained main 3300 Taneum Creek road (gravel and paved) which runs along Taneum Creek. Although one landing would be in Riparian Reserve of a fishless wetland and two would be in Riparian Reserve near the origin of intermittent streams, no landings would be in Riparian Reserves or across streams with designated critical habitat for steelhead and bull trout. Temporary roads on existing road prism in disrepair that would not meet design criteria intended to restrict erosion and protect water quality would be altered and brought into compliance. Keeping temporary roads and landings outside of Riparian Reserves would render the probability discountable for flow routing to streams with MCR steelhead and bull trout or Designated Critical Habitat. The magnitude of effects to hydrologic conditions is expected to be insignificant as well.

Floodplain Connectivity, Road Density and Location, Increase in Drainage Network, and Change in Peak/Base Flows Indicator summary: The temporary roads would be decommissioned, except those which were system motorized trails pre-project and would be returned to that state. No new roads would be permanently added to the watershed as a result of the proposed action. Only 0.2 miles of newly constructed temporary roads would be required with only 0.02 miles being constructed in Riparian Reserves of fish-bearing streams. Haul routes would be on existing maintained gravel and paved roads and hauling would not occur during heavy rain or snow melt events. The proposed vegetation treatments within Riparian Reserve are not expected to increase stream flow and water storage indicators. Road density is not expected to increase, and changes in drainage network is expected be insignificant. The project elements are not expected to significantly affect Road Density and Location, drainage network, or change in peak/base flows.

Watershed Conditions

Disturbance History and Disturbance Regime:

The project proposes to conduct vegetation treatments including non-commercial thinning, commercial thinning, and prescribed fire on no more than 5,803 acres with 1,036 acres occurring in Riparian Reserve. The objective of the vegetation treatments is to improve conditions in overly stocked stands, restore habitat for late-successional species, increase species diversity, and reduce risks from wildfire. Prescribed fire for this analysis would generally occur outside of Riparian Reserves, however there are 833 acres could have fire backdown into the Riparian Reserve. Non-commercial thinning (102 acres near intermittent streams/wetlands) and commercial mechanical thinning (11.5 acres at edges of Riparian Reserve deemed geographically disconnected from the functional riparian area) would occur in the Riparian Reserve. No new permanent roads would be constructed. All temporary roads would be decommissioned after use, except those which were system motorized trails pre-project and would be returned to that state. Temporary roads, management and hauling activities would have an insignificant impact on the drainage network. Haul routes are along existing maintained heavily traveled gravel and paved roads that will continue to be used after the proposed activities. Vegetation treatments and related activities would have insignificant negative effects in the short term due to ground disturbance. No cut and no equipment buffers would protect streams and designated critical habitat. Peak and base flows would not be significantly changed. There would be an insignificant effect in the short term. In the long term, there would be an insignificant but positive effect on disturbance regime, particularly the fire regime. This improvement would benefit further from management activities by adjacent landowners (i.e., The Nature Conservancy and Washington Department of Natural Resources).

Riparian Reserves:

Under the proposed action, non-commercial and commercial mechanical thinning, and prescribed burning would occur in upland areas to restore forest structure and resiliency. Except where noted above, these treatments would occur outside of Riparian Reserves away from designated critical habitat at distances that would not be expected to impact streams (Table 3). No trees would be removed within 50 feet (non-commercial thinning) and 75 feet (commercial mechanical thinning) of intermittent streams, 100 feet of non-fish bearing perennial streams. Ecosystem functions such as root strength for bank stability, litterfall, shading to moderate water temperatures, and delivery of large wood to streams would not be significantly reduced. Reductions in allochthonous leaf and needle inputs to fish-bearing streams are expected to be minimal, because buffers of 82 feet in width are sufficient to maintain 95 percent of leaf litter inputs to streams under typical conditions of tree height, wind, and slope (Bilby and Heffner 2016) and reductions affecting non fish-bearing streams would be attenuated before affecting downstream fish-bearing areas. Trees over 10 inches in diameter would not be cut within 50 feet of intermittent streams and wetlands under one acre and this cutting would be done by hand. Commercial mechanical thinning can remove trees between 7 inches and 15 inches in diameter (wetlands under one acre and intermittent streams). No commercial mechanical thinning would occur within 75 feet of wetlands smaller than one acre and intermittent streams (Table 3).

No more than 62 acres of non-commercial thinning would occur in Riparian Reserves of wetlands greater than one acre, wetlands smaller than one acre, and intermittent streams (Table 3). No more than 102 acres of commercial mechanical thinning would occur in Riparian Reserves of wetlands smaller than one acre or intermittent streams. 11.5 acres of commercial thinning is proposed in areas where the Riparian Reserve contains Designated Critical Habitat but have been verified to be disconnected from the functional riparian area by either topographic boundaries or roads. No tree cutting buffers of 300 feet on fish bearing perennial streams, 100 feet on non-fish bearing perennial streams and 50 feet (non-commercial thinning) and 75 feet (commercial mechanical thinning) on intermittent streams would reduce potential impacts related to shade loss and large wood loss, rendering those effects insignificant. Non-commercial thinning would be conducted by hand or masticators with less than 8 psi and no ground disturbance would occur. No pile burning would occur within Riparian Reserve except for the three landing locations stated earlier.

Under the proposed action, 3.1 miles of temporary roads related to vegetation treatment would be newly constructed or placed on existing road prism. No temporary new roads would be constructed in Riparian Reserves with the exception of 0.04 miles on existing road prism in Riparian Reserves of a wetland that is larger than one acre that is not connected to streams, 0.17 in Riparian Reserves of intermittent streams, and 0.02 in Riparian Reserves of fish-bearing streams. All landings would be maintained or constructed to be hydrologically stable, including the one in Riparian Reserve of a fishless wetland and the two in Riparian Reserve near the origin of intermittent streams.

Overall, the proposed actions would be expected to have insignificant negative effects to Riparian Reserves in the short term where treatment and associated activities would occur.

ESA Effects Determination

Regarding bull trout, bull trout are considered absent from the Taneum Watershed, but because of the unlikely possibility for bull trout to occur in Taneaum Creek after recent fish passage improvements, and the foreseeable reintroduction of bull trout during the project timeline, we believe that significant negative effects could occur. Therefore the proposed project would result in a "**likely to adversely affect**" determination. While there is designated critical habitat for bull trout in the Action Area, most actions would not occur in designated critical habitat for bull trout. Some proposed actions are proposed in upland areas near but outside of Riparian Reserves of fish bearing perennial streams with designated critical habitat, and the majority of the actions are 300 feet to miles from critical habitat or are occurring on existing maintained roads that would not result in effects to designated critical habitat for bull trout. However, bridge repair activities would occur in designated critical habitat for bull trout and are expected to have a significant negative effect in the short term. Therefore the determination is "**likely to adversely affect**" for their designated critical habitat.

Regarding MCR steelhead, most of the proposed actions would not occur in streams occupied by steelhead or in their designated critical habitat. One exception is water drafting in Taneum Creek, which is expected to produce insignificant negative effects to steelhead. Another exception is bridge repair activities, which are expected to produce significant negative effects to steelhead and their designated critical habitat. Most other proposed actions would occur near the upland edge of Riparian Reserves, but those actions are at distances that would not result in any significant effects to steelhead or to designated critical habitat for steelhead. The proposed project would thus have significant negative effects and result in a "**likely to adversely affect**" determination for MCR steelhead and their designated critical habitat. These significant effects would be short term in duration whereas in the long term the project is expected to have positive effects, primarily through improvements to disturbance indicators.

Project Effects Determination Key – Taneum Restoration Project

Effects determinations for all indicators were similar across the Action Area. The project effects determination key will make a single determination for the Action Area and Taneum Watershed.

Project effects determination key for Middle Columbia River steelhead, bull trout, and their designated critical habitat (DCH).

1) Do any of the indicator summaries have a positive (+) or negative (-) conclusion?

Yes – Go to 2
No – No Effect – bull trout

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 – Bull trout, MCR Steelhead, and their DCH

Summary of Effects to Listed Fish, Critical Habitat and EFH

Overall, the Taneum Restoration Project would maintain the environmental baseline of Taneum Watershed. Project activities are not expected to result in long-term negative effects to steelhead and bull trout critical habitat. The proposed actions analyzed in this BA would have short-term significant negative effects and some long-term positive effects to steelhead, bull trout, and their designated critical habitat.

There are approximately 14 stream miles of designated critical habitat for steelhead and 18 miles for bull trout. Designated critical habitat for steelhead and bull trout includes portions of the mainstem Taneum and North and South Fork Taneum Creeks. To protect designated critical habitat, NOAA Fisheries has identified six physical and biological requirements that consist of physical and biological features (PBFs) that are essential for the conservation of steelhead. Three PBFs related to freshwater spawning, rearing, and migration apply to the Taneum Restoration Project. Similarly, USFWS has identified nine PBFs for bull trout and their critical habitat related to water quality, migration habitat, food availability, instream habitat, water temperature, substrate characteristics, stream flow, water quantity, and nonnative species. All of these PBFs are present within Taneum Watershed except for the marine shoreline component of the 'instream habitat' PBF. The following provides a discussion and crosswalk tables showing the three steelhead PBFs and nine bull trout PBFs and how they correspond to the NOAA/USFWS MPI habitat indicators for baseline conditions. Immediately following is a summary of how the Taneum Restoration Project elements are consistent with the Aquatic Conservation Strategy.

Steelhead PBFs

PBF 1. Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation, and larval development.

PBF 1 Criterion	MPI Habitat Indicator(s)
Water quantity	Change in peak/base flows
Water quality	Water temperature Sediment/turbidity Chemical contamination/nutrients
Substrate	Substrate

As discussed in previous sections, changes in peak/base flows due to proposed actions are expected to be insignificant. Sediment input and increased turbidity and water temperature are expected to be insignificant because nearly all of the temporary roads and landings would be outside of Riparian Reserves and vegetation treatments would not occur in no cut buffers described previously for Riparian Reserve. Vegetation treatments would follow cut and equipment restrictions and other applicable design criteria and BMPs. However, significant short-term effects are expected to sediment due to bridge repair activities, thus the proposed actions would adversely affect PBF 1.

PBF 2. Freshwater rearing sites with water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility; water quality and forage supporting juvenile development; and natural cover such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks.

PBF 2 Criterion	MPI Habitat Indicator(s)
Water quantity	Change in peak/base flows
Floodplain connectivity	Floodplain connectivity
Water quality	Water temperature Sediment/turbidity Chemical contamination/nutrients
Forage*	Water quality indicators Riparian Reserves Substrate Large woody debris
Natural cover	Water temperature (shade) Riparian Reserves Large woody debris Substrate Pool frequency Pool quality Width/depth ratio Floodplain connectivity Off-channel habitat Streambank condition

*There is no directly corresponding MPI habitat indicator for forage. Biological data is not typically collected to assess aquatic food webs and nutrient cycles; therefore "Forage" will be indirectly assessed by the following relevant/related MPI habitat indicators in this assessment.

The primary food items for juvenile anadromous salmonids are aquatic and terrestrial invertebrates. Production of aquatic invertebrates is influenced by water quality. Fine sediment and substrate embeddedness affect living space for aquatic invertebrates and sustained elevated turbidity may reduce aquatic invertebrate production and the ability of juvenile fish to find invertebrate food items. Chemical contamination may reduce or eliminate production of certain aquatic invertebrates and excess nutrient levels may lead to lethal or sublethal effects to aquatic invertebrates. “Forage” is also influenced by the extent and condition of riparian vegetation as evaluated by the MPI Riparian Reserve indicator. Shade provided by streamside vegetation influences water temperatures which, in turn, affects aquatic invertebrate production. Organic matter from riparian vegetation provides allochthonous inputs that sustain aquatic food webs. Woody debris provides substrate and a food source for aquatic invertebrates. Riparian vegetation provides food and substrate for terrestrial invertebrates which become a significant food source when they drop to the water below.

As discussed in previous sections, changes in peak/base flows due to proposed actions are expected to be insignificant. Sediment input and increased turbidity and water temperature are expected to be insignificant because nearly all of the temporary roads and landings would be outside of Riparian Reserves and vegetation treatments would not occur in no cut buffers of Riparian Reserve. Vegetation treatments would follow cut and equipment restrictions and other applicable design criteria and BMPs. Changes to natural cover and floodplain connectivity and large wood recruitment are expected to be insignificant and immeasurable because tree harvest would be excluded from the inner portions of Riparian Reserves, and effects to other instream habitat indicators are expected to be immeasurable. Because of this, changes to forage would be immeasurable. The proposed actions would not adversely affect PBF 2.

PBF 3. Freshwater migration corridors free of obstruction with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival.

PBF 3 Criterion	MPI Habitat Indicator(s)
Water quantity	Change in peak/base flows
Freshwater migration corridors free of excessive predation*	No corresponding habitat indicator
Water quality	Water temperature Sediment/turbidity Chemical contamination/nutrients
Freshwater migration corridors free of obstruction	Physical barriers
Natural cover	Water temperature (shade) Riparian Reserves Large woody debris Substrate Pool frequency Pool quality Width/depth ratio Floodplain connectivity Off-channel habitat Streambank condition

*Biological data is not typically collected to assess predator/prey interactions because excessive predation is a biological concern that is not influenced by Forest land management activities.

The proposed actions would not measurably change instream habitat conditions supporting migration. Therefore, there would be an insignificant effect to PBF 3.

Bull Trout PBFs

PBF 1. Springs, seeps, groundwater sources, and subsurface water connectivity (hyporheic flows) to contribute to water quality and quantity and provide thermal refugia.

PBF 1 Criterion	MPI Habitat Indicator(s)
Water quantity	Change in peak/base flows
Water quality	Water temperature Sediment/turbidity Chemical contamination/nutrients
Thermal refugia	Water temperature

PBF 1 would not be adversely affected because no changes to water quantity or stream temperature are expected. Short-term, insignificant increases in stream sediment levels in road related sediment delivery and water temperature are expected to be insignificant because nearly all of the temporary roads and landings would be outside of Riparian Reserves and vegetation treatments would not occur in no cut buffers described previously for Riparian Reserve. Vegetation treatments would follow cut and equipment restrictions and other applicable design criteria and BMPs. However, significant short-term effects are expected to sediment due to bridge repair activities, thus the proposed actions would adversely affect PBF 1.

PBF 2. Migration habitats with minimal physical, biological, or water quality impediments between spawning, rearing, overwintering, and freshwater and marine foraging habitats, including but not limited to permanent, partial, intermittent, or seasonal barriers.

PCE 2 Criterion	MPI Habitat Indicator(s)
Permanent, partial, intermittent, or seasonal barriers	Physical barriers Water temperature

Effect to PBF 2 would be neutral because migratory conditions within designated critical habitat or potential bull habitat would not be measurably changed or have no change and bull trout have not been documented in the Taneum Watershed.

PBF 3. An abundant food base, including terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish.

PCE 3 Criterion	MPI Habitat Indicator(s)
Food base*	All MPI habitat indicators

*There is no directly corresponding MPI habitat indicator for food base. Bull trout are opportunistic feeders that prey upon other organisms such as terrestrial and aquatic insects, macrozooplankton, and small fish and adult migratory bull trout feed almost exclusively on other fish. Habitat must provide the necessary aquatic and adjacent terrestrial conditions to harbor and maintain prey species in sufficient quantity and diversity to meet the physiological requirements necessary to maintain bull trout populations. We do not typically collect biological data to assess aquatic food webs. All the MPI habitat indicators influence the production of aquatic and terrestrial invertebrates and small native fish; therefore, “Food Base” will be indirectly assessed by all of the MPI habitat indicators.

Effects to this PBF 3 would not be adversely affected because no changes to water quantity or stream temperature are expected. Short-term, insignificant increases in stream sediment levels may occur. It is unlikely any measurable change would occur to bull trout’s prey base or prey habitat.

PBF 4. Complex river, stream, lake, reservoir, and marine shoreline aquatic environments, and processes that establish and maintain these aquatic environments, with features such as large wood, side channels, pools, undercut banks and unembedded substrates, to provide a variety of depths, gradients, velocities, and structure.

PCE 4 Criterion	MPI Habitat Indicator(s)
Complex aquatic environment*	Water temperature Substrates Large wood Off-channel habitat Pool frequency and quality Large pools Refugia Width/Depth ratio Streambank condition Floodplain connectivity

*There is no marine shoreline habitat in the Action Area therefore it would not apply.

PBF 4 would not be measurably affected because no measurable changes to water quantity or stream temperature are expected. Short-term increases in stream sediment levels may occur. In the long- term, less sediment delivery would improve existing rearing and foraging habitat.

PBF 5. Water temperatures ranging from 2 to 15 [deg]C (36 to 59 [deg]F), with adequate thermal refugia available for temperatures that exceed the upper end of this range. Specific temperatures within this range will depend on bull trout life-history stage and form; geography; elevation; diurnal and seasonal variation; shading, such as that provided by riparian habitat; streamflow; and local groundwater influence.

PCE 5 Criterion	MPI Habitat Indicator(s)
Thermal refugia	Water temperature

PBF 5 would not be measurably affected because stream shading would not be measurably changed by the project.

PBF 6. In spawning and rearing areas, substrate of sufficient amount, size, and composition to ensure success of egg and embryo overwinter survival, fry emergence, and young-of-the-year and juvenile survival. A minimal amount of fine sediment, generally ranging in size from silt to coarse sand, embedded in larger substrates, is characteristic of these conditions. The size and amounts of fine sediment suitable to bull trout will likely vary from system to system.

PCE 6 Criterion	MPI Habitat Indicator(s)
Substrate amount, size, and composition	Substrate

PBF 6 would not be adversely affected because the project design criteria and BMPs would limit changes to sediment to be short-term, immeasurable levels. Rearing and foraging habitat would not be measurably impacted.

PBF 7. A natural hydrograph, including peak, high, low, and base flows within historic and seasonal ranges or, if flows are controlled, minimal flow departure from a natural hydrograph.

PCE 7 Criterion	MPI Habitat Indicator(s)
Flow/hydrology	Change in peak/base flows Increase in drainage network

PBF 7 would not be adversely affected at the sub-watershed scale because no part of the proposed project would alter hydrology such that measurable changes to summer base flows or peak flows would occur.

PBF 8. Sufficient water quality and quantity such that normal reproduction, growth, and survival are not inhibited.

PCE 8 Criterion	MPI Habitat Indicator(s)
Water quality	Water temperature Sediment/turbidity Chemical contamination/nutrients
Water quantity	Change in peak/base flows Increase in drainage network

PBF 8 would not be measurably affected from most project elements because no changes to water quantity or stream temperature are expected. The artificial road drainage would have an inconsequential increase during the project and a larger decrease in the long-term. Additionally, no part of the project would put chemicals or other like materials into streams. However, short-term yet measurable increases in stream sediment and turbidity are expected to occur due to bridge repair activities. No bull trout have been documented in the Taneum Watershed, but if individuals were present, they and their critical habitat would be affected by this sediment and turbidity.

PBF 9. Sufficiently low levels of occurrence of non-native predatory (e.g., lake trout, walleye, northern pike, smallmouth bass); interbreeding (e.g., brook trout); or competing (e.g., brown trout) species that, if present, are adequately temporally and spatially isolated from bull trout.

PCE 9 Criterion	MPI Habitat Indicator(s)
Non-native fish species*	Summary/Integration of all Species and Habitat Indicators

*There is no directly corresponding MPI habitat indicator for non-native fish species that present risks to bull trout. Eastern brook trout is a non-native trout species stocked within the Upper Columbia Basin that poses the greatest risk to bull trout relating to predation, displacement, and interbreeding. Brook trout competes with bull trout for food and space, they can hybridize with bull trout and adult brook trout are known to feed on juvenile bull trout. Brook trout can also displace bull trout from rearing areas. In some streams, brook trout are so well established that they may have greatly reduced the number of bull trout in them (WDFW 2004). We do not collect data on brook trout population size but do have data on their distribution. Non-native fish species will be indirectly assessed by the Summary/Integration of all Species and Habitat Indicator.

PBF 9 would not be measurably affected.

In summary, some short, temporary increases in fine sediment delivery are expected to occur. Road maintenance and log hauling would occur under dry conditions and are in closer proximity to fish habitat.

As stated throughout this BA, the use of no cut and equipment restriction zones and following appropriate Design Criteria and BMPs would result in insignificant and immeasurable impacts from most project elements. Due to bridge repair activities, however, the proposed actions would result in a likely to adversely affect determination for steelhead, bull trout, and their critical habitat due to sediment inputs.

Table 52**.** Summary of baseline habitat and effects of proposed actions compared to Matrix of Pathways and Indicators for Taneum Watershed.

Diagnostic / Pathways	**Indicators**	**Existing Conditions**	**Restore**	**Maintain**	**Degrade**
Water Quality	Temperature	FAR		X	
	Sediment/Turbidity	NPF			X (Sig-St)
	Chemical Contamination/Nutrients	FP		X	
Habitat Access	Physical Barriers	FAR		X	
Habitat Elements	Substrate Embeddedness	NPF			X (Ins-St)
	Large Woody Debris	NPF			X (Ins-St)
	Pool Frequency	FAR			X (Ins-St)
	Pool Quality	FAR			X (Ins-St)
	Large Pools	FAR			X (Ins-St)
	Off -channel Habitat	FAR		X	
	Refugia	NPF		X	
Channel Condition / Dynamics	Wetted Width/Depth Ratio	FAR		X	
	Streambank Condition	FAR		X	
	Floodplain Connectivity	FAR		X	
Flow / Hydrology	Change in Peak/Base Flows	NPF			X (Ins-St)
	Drainage Network Increase	NPF			X (Ins-St)
Watershed Conditions	Road Density/Location	NPF		X	
	Disturbance History	NPF			X (Ins-St)
	Riparian Reserves	FAR			X (Ins-St)
	Disturbance Regime	FAR			X (Ins-St)
Subpopulation Characteristics	Subpopulation Size	NPF		X	
	Growth and Survival	NPF		X	
	Life History Diversity/Isolation	NPF		X	
	Persistence/Genetic Integrity	NPF		X	
	Integration of Species/Habitat Conditions	FAR		X	

FAR = functioning at risk; NPF = not properly functioning; FP = functioning properly
Sig = significant effect; Ins = insignificant effect; St = short-term

Essential Fish Habitat

Essential Fish Habitat for Chinook and Coho Salmon exists in the Project Area in the North Fork, South Fork, and mainstem of Taneum Creek. ESA determinations for non-ARBO II proposed actions resulted in *no effect or may affect not likely to adversely affect* for the majority of the habitat indicators. The bridge repair, however, resulted in a **likely to adversely affect** determination because of the significant short-term effects during the repair activities. Short term effects from this action include sediment pulses and increased turbidity. However, adverse effects would be mitigated and minimized by applying Forest Plan standards and guidelines, Project Design Criteria, and Best Management Practices during all phases of the project. Mitigation measures that will be taken in order to avoid impacts to EFH include minimizing in-stream equipment time, keeping riparian vegetation disturbance to a minimum, and enforcing BMP's and PDC's through contract specifications. No cut and equipment restriction zones for the proposed actions provide protection to EFH as well. There will be no short- or long-term adverse effects to EFH by implementing this project. Therefore, this project as proposed will **not adversely affect Essential Fish Habitat** in the Taneum Watershed.

Summary of Aquatic Conservation Strategy Consistency

The Taneum Restoration Project is intended to improve riparian and terrestrial vegetation that influence stream and watershed functions and resiliency and meet aquatic and riparian desired conditions and management objectives established in the Northwest Forest Plan (NWFP) Aquatic Conservation Strategy (ACS 1994), as amended in 2004.

Project Design Criteria and Best Management Practices for the proposed project are designed so the project would be consistent with the ACS at subwatershed and watershed scales. The project as proposed would not measurably retard or prevent attainment of the nine ACS Objectives. The following provides a list of the ACS objectives and a discussion addressing how the proposed action relate to these objectives.

1. *Maintain and restore the distribution, diversity, and complexity of watershed and landscape-scale features to ensure protection of the aquatic systems to which species, populations and communities are uniquely adapted.*

   Because of BMPS and design criteria, the proposed actions are intended to ultimately support the restoration of the Taneum Watershed and would not measurably retard or prevent attainment of this objective.

2. *Maintain and restore spatial and temporal connectivity within and between watersheds. Lateral, longitudinal, and drainage network connections include floodplains, wetlands, upslope areas, headwater tributaries, and intact refugia. These network connections must provide chemically and physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic and riparian-dependent species.*

   The proposed actions would not create any barriers to fish or other aquatic and riparian species in the action area. The proposed actions would not alter connectivity of aquatic and riparian habitats. The proposed activities would not measurably retard or prevent attainment of this objective. No effects are anticipated from proposed actions.

3. *Maintain and restore the physical integrity of the aquatic system, including shorelines, banks, and bottom configurations.*

Because the proposed actions for vegetation treatments and connected actions would follow harvest and equipment restrictions and other applicable design criteria and BMPs, no negative effects are expected that would measurably retard or prevent attainment of this objective.

4. *Maintain and restore water quality necessary to support healthy riparian, aquatic, and wetland ecosystems. Water quality must remain within the range that maintains the biological, physical, and chemical integrity of the system and benefits survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities.*

   Because proposed actions for vegetation treatments and supporting infrastructure would follow harvest and equipment restrictions and other applicable design criteria and BMPs, no negative effects to water quality would be expected. Water quality would be maintained and ultimately improved if the proposed project is implemented. The proposed project does not measurably retard or prevent attainment of this objective.

5. *Maintain and restore the sediment regime under which aquatic ecosystems evolved. Elements of the sediment regime include the timing, volume, rate, and character of sediment input, storage, and transport.*

   Proposed actions for vegetation treatments and supporting infrastructure would follow harvest and equipment restrictions and other applicable design criteria and BMPs. Prior to use temporary roads on existing road prisms would be altered and brought into compliance and decommissioned after use. No temporary new roads would be constructed in Riparian Reserves with the exception of 0.04 miles on existing road prism in Riparian Reserve of a wetland that is larger than one acre that is not connected to streams, 0.17 in Riparian Reserves of intermittent streams, and 0.02 in Riparian Reserves of fish-bearing streams. Two temporary road segments would start at and move away from the 300-foot buffer of Riparian Reserve with designated critical on the north side of Taneum Creek in the lower project area occur on the north side of a maintained road (3300; gravel and paved) which, in addition to BMPs and design criteria, would act as an additional barrier or levee further impeding project effects to mainstem Taneum Creek. Additionally, no landings would be in any Riparian Reserves, except one landing near a fishless wetland and two near the origins of intermittent streams. As a result, no negative effects to sediment regimes would be expected. Conversely sediment regimes would be maintained and slightly improved when the temporary roads are decommissioned. The proposed project does not measurably retard or prevent attainment of this objective.

6. *Maintain and restore in-stream flows sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of sediment, nutrient, and wood routing. The timing, magnitude, duration, and spatial distribution of peak, high, and low flows must be protected.*

   Proposed actions for vegetation treatments and supporting infrastructure would follow harvest and equipment restrictions and other applicable design criteria and BMPs. No negative effects to instream flow regimes would be expected (see discussions above). The proposed project does not measurably retard or prevent attainment of this objective.

7. *Maintain and restore the timing, variability, and duration of floodplain inundation and water table elevation in meadows and wetlands.*

   Proposed actions for vegetation treatments and supporting infrastructure would follow harvest and equipment restrictions and other applicable design criteria and BMPs. All temporary roads will be decommissioned. Additionally, no temporary new roads would be constructed in Riparian Reserves with the exception of 0.04 miles on existing road prism in Riparian Reserve of a wetland that is larger than one acre that is not connected to streams, 0.17 of intermittent streams, and 0.02 of fish-bearing streams. As a result, no negative effects to timing, variability and duration of floodplain inundation and water table elevations in meadows and wetlands would be expected. The proposed project does not measurably retard or prevent attainment of this objective.

8. *Maintain and restore the species composition and structural diversity of plant communities in riparian areas and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration and to supply amounts and distributions of coarse woody debris sufficient to sustain physical complexity and stability.*

   Proposed actions for vegetation treatments (including cutting mid- and understory grand fir within the complex patches surrounding a two-acre wetland) and supporting infrastructure would follow harvest and equipment restrictions and other applicable design criteria and BMPs. Prior to use as temporary roads, existing roadbeds would be altered and brought into compliance and decommissioned after use. Additionally, no landings would be in any Riparian Reserves, except one near a fishless wetland and two near the origins of intermittent streams. As a result, no negative effects to species composition and structural diversity of plant communities in Riparian Reserves would be expected. Conversely species composition and structural diversity of plant communities would be maintained and ultimately improved if the proposed project is implemented. The proposed project does not measurably retard or prevent attainment of this objective.

9. *Maintain and restore habitat to support well-distributed populations of native plant, invertebrate, and vertebrate riparian-dependent species.*

   Proposed actions for vegetation treatments (including cutting mid- and understory grand fir within the complex patches surrounding a two-acre wetland) and supporting infrastructure would follow harvest and equipment restrictions and other applicable design criteria and BMPs. 3.1 miles of temporary roads or landings related to vegetation treatment would be placed on existing road prisms (2.9 miles) or newly constructed (0.2 miles) under this proposed action; 0.04 miles of temporary road (existing) would be in Riparian Reserve of a wetland greater than one acre with no connection to streams, 0.17 of intermittent streams, and 0.02 of fish-bearing streams. Two temporary road segments (one on existing road prism and one on no prism) would begin at and move away from the 300-foot Riparian Reserve associated with critical habitat for steelhead and bull trout. These two temporary roads are on the north side (opposite side from stream bank) of the maintained main 3300 Taneum Creek road (gravel and paved) which runs along Taneum Creek. No landings would be in Riparian Reserves of streams with designated critical habitat for steelhead or bull trout. Temporary roads on existing road prisms in disrepair that would not meet design criteria intended to restrict erosion and protect water quality would be altered and brought into compliance. The rest of the temporary roads would be in Riparian Reserves of intermittent streams and wetlands in areas well away from designated critical habitat (300 feet to miles). Additionally, no landings would be in any Riparian Reserves, except one near a fishless wetland and two near origins or intermittent streams. As a result, no negative effects to native plant, invertebrate and vertebrate species dependent on riparian habitat would be expected. The proposed project does not measurably retard or prevent attainment of this objective and is expected to provide benefits to terrestrial disturbance processes by restoring fire regimes at the landscape scale.

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APPENDIX A – PROJECT MAPS

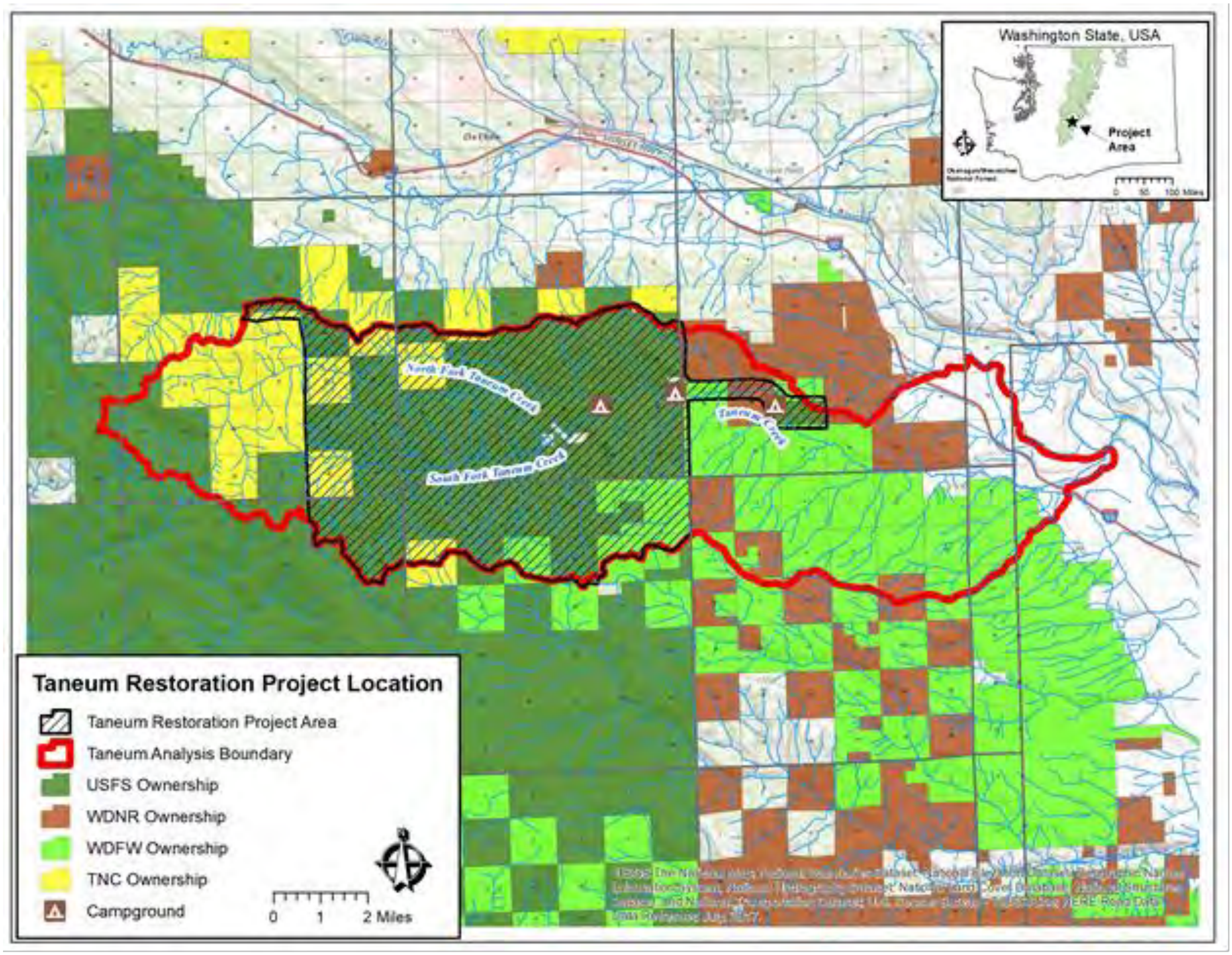
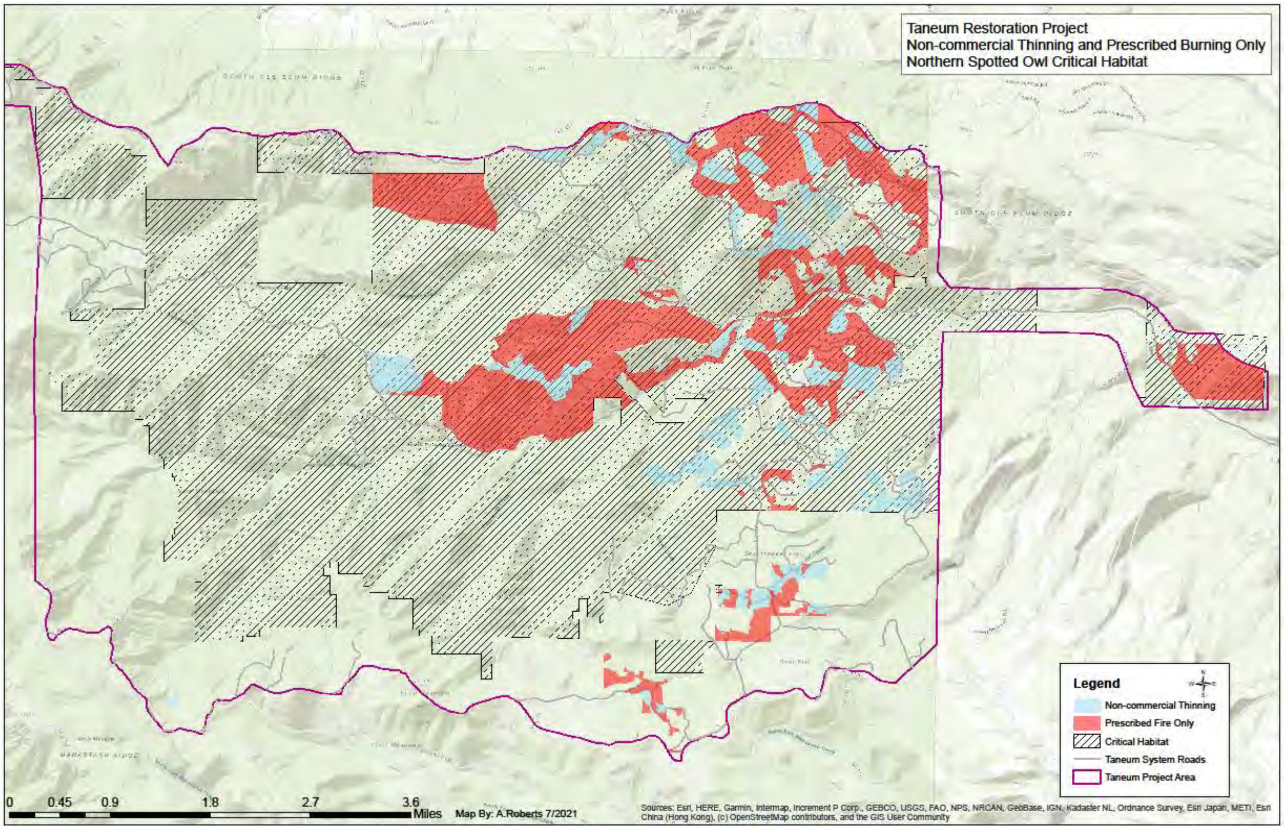


Figure 66. Taneum Project vicinity map.



Sources: Esri, HERE, Garmin, Intermap, Increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Figure 67. All non-commercial thinning and prescribed burning only proposed in northern spotted owl Critical Habitat.

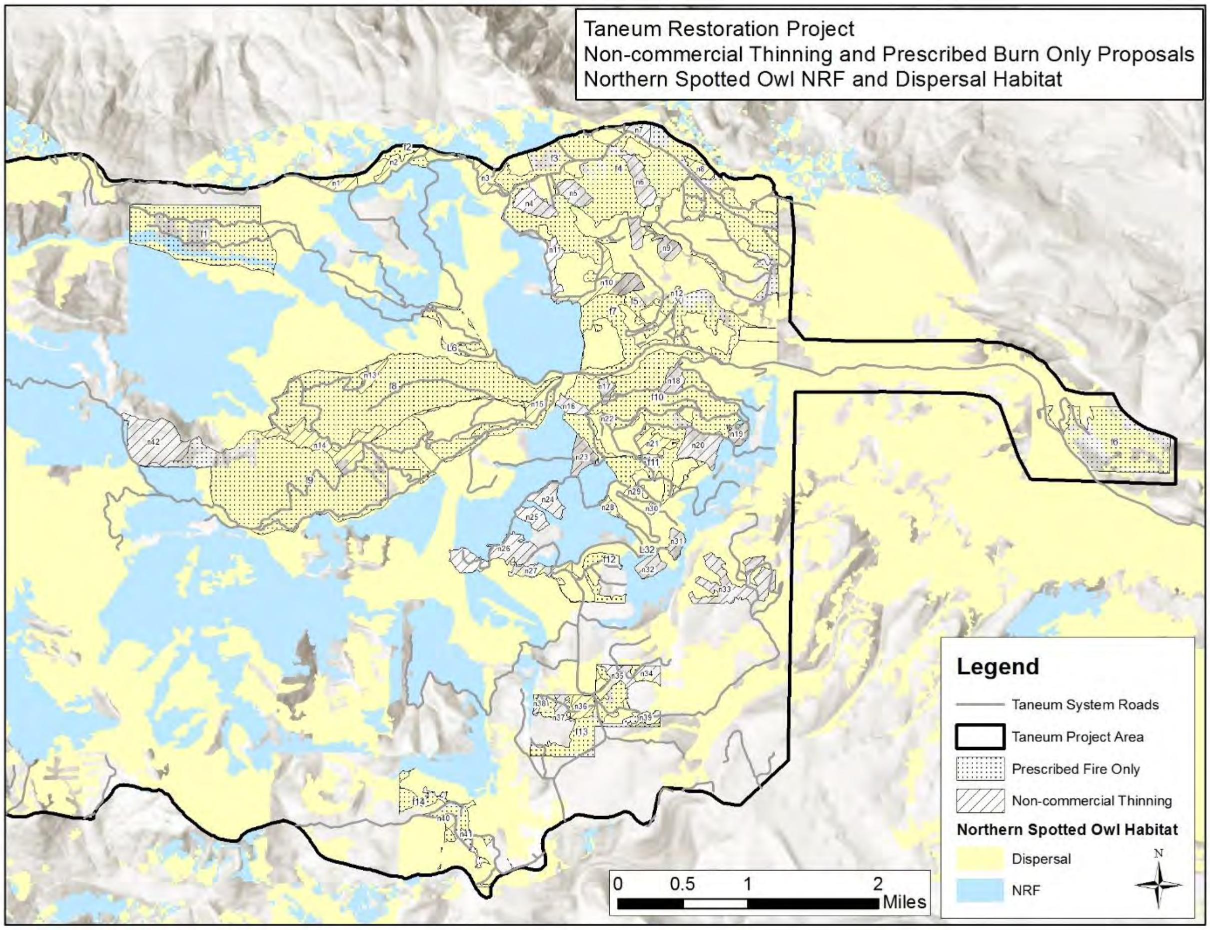


Figure 68. All non-commercial thinning and prescribed burning only proposed in northern spotted owl habitat.

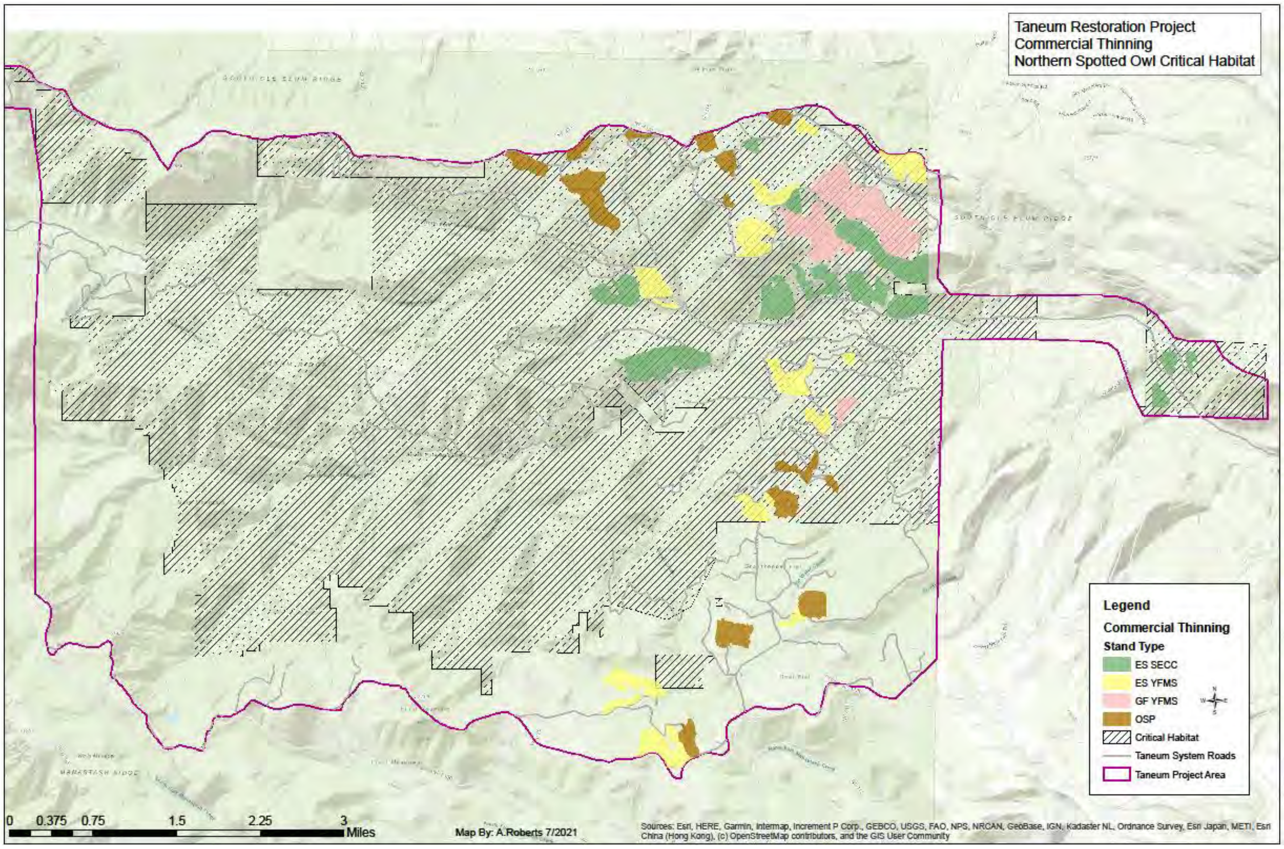


Figure 69. All commercial thinning by stand type proposed in northern spotted owl Critical Habitat.

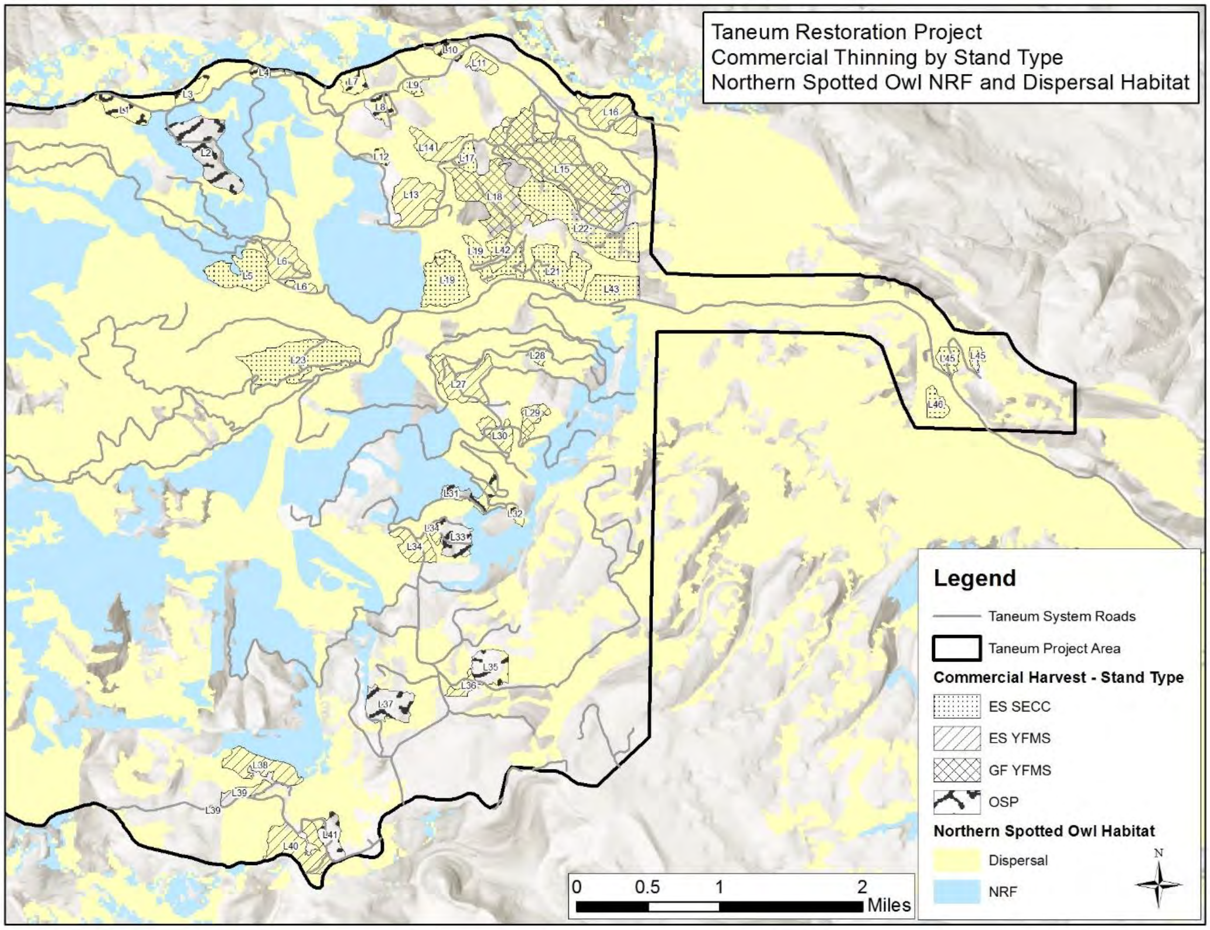


Figure 70. All commercial thinning by stand type proposed in northern spotted owl habitat.

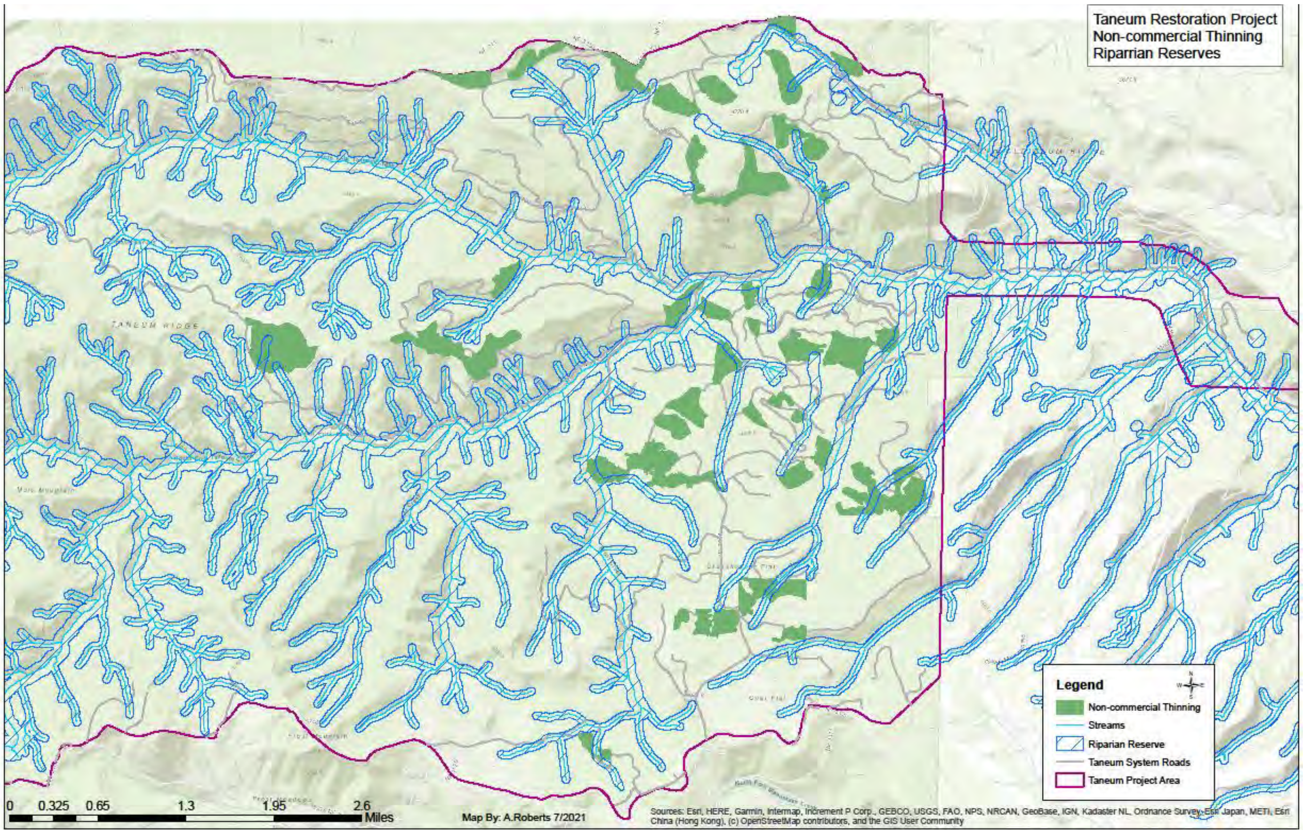


Figure 71. Non-commercial treatment proposed in Riparian Reserves.

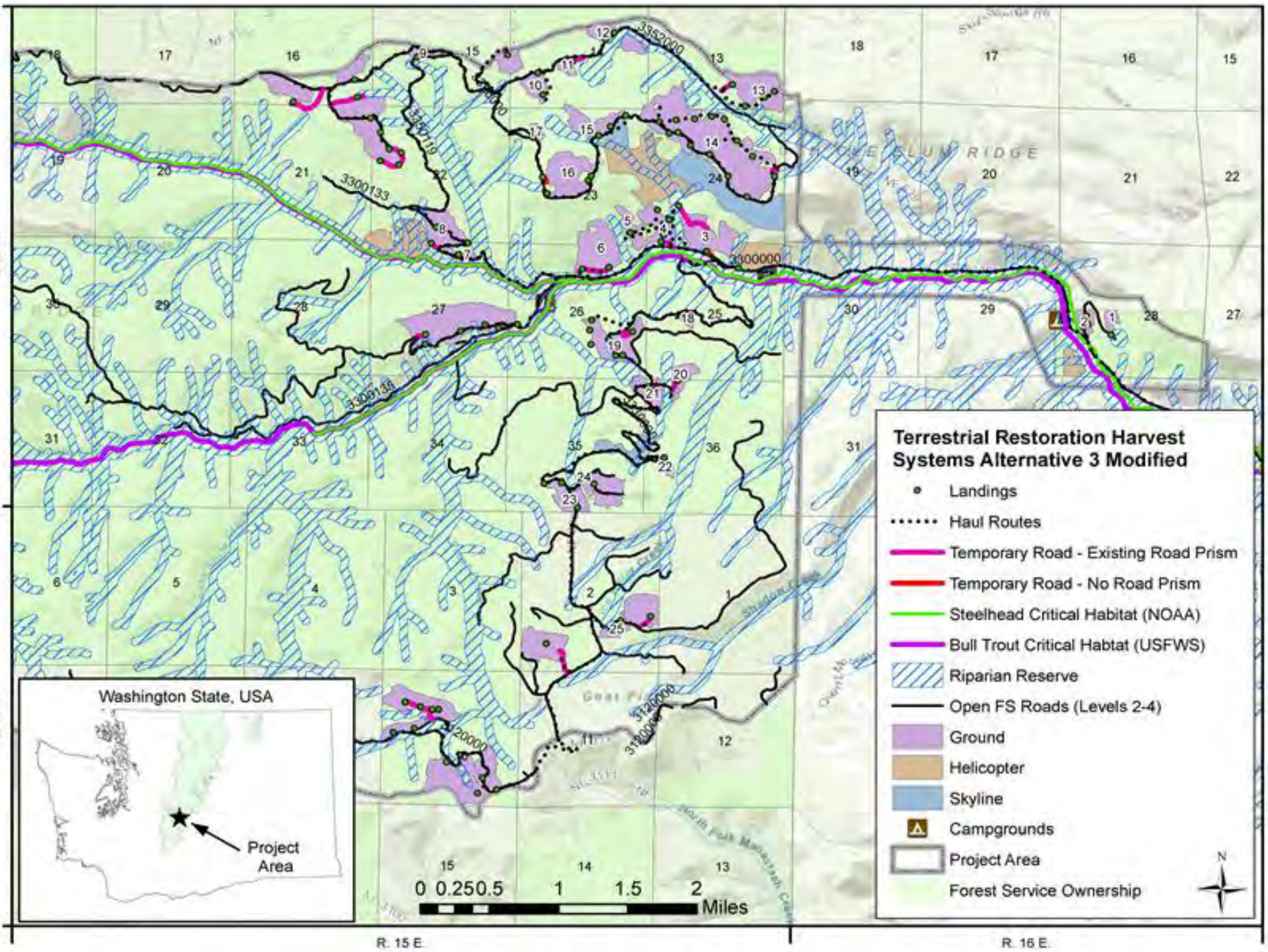


Figure 72. Commercial harvest and connected actions proposed and Riparian Reserves. Helicopter harvest systems near Riparian Reserve would follow the prescription requirements and buffers outlined in Table 3.

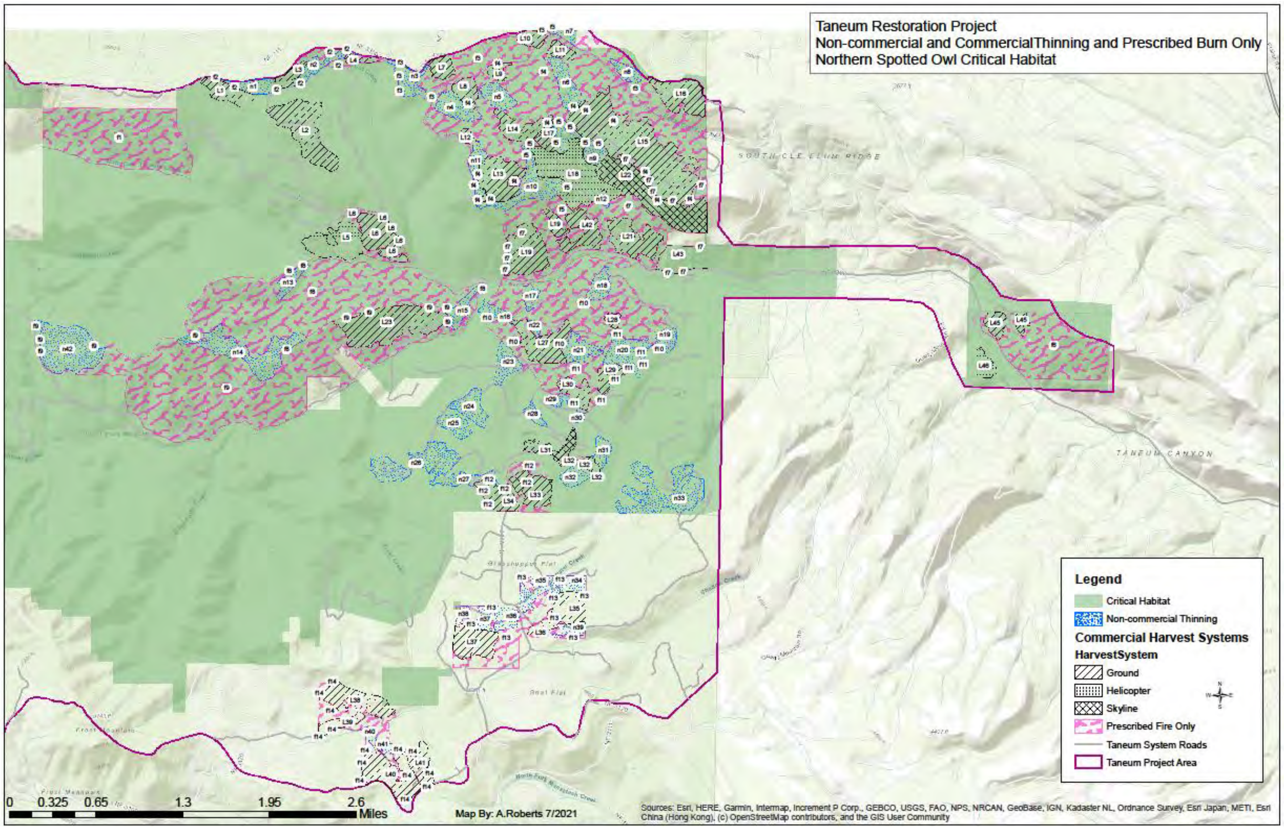


Figure 73. Non-commercial, commercial, and prescribed burning only proposed and northern spotted owl Critical Habitat.

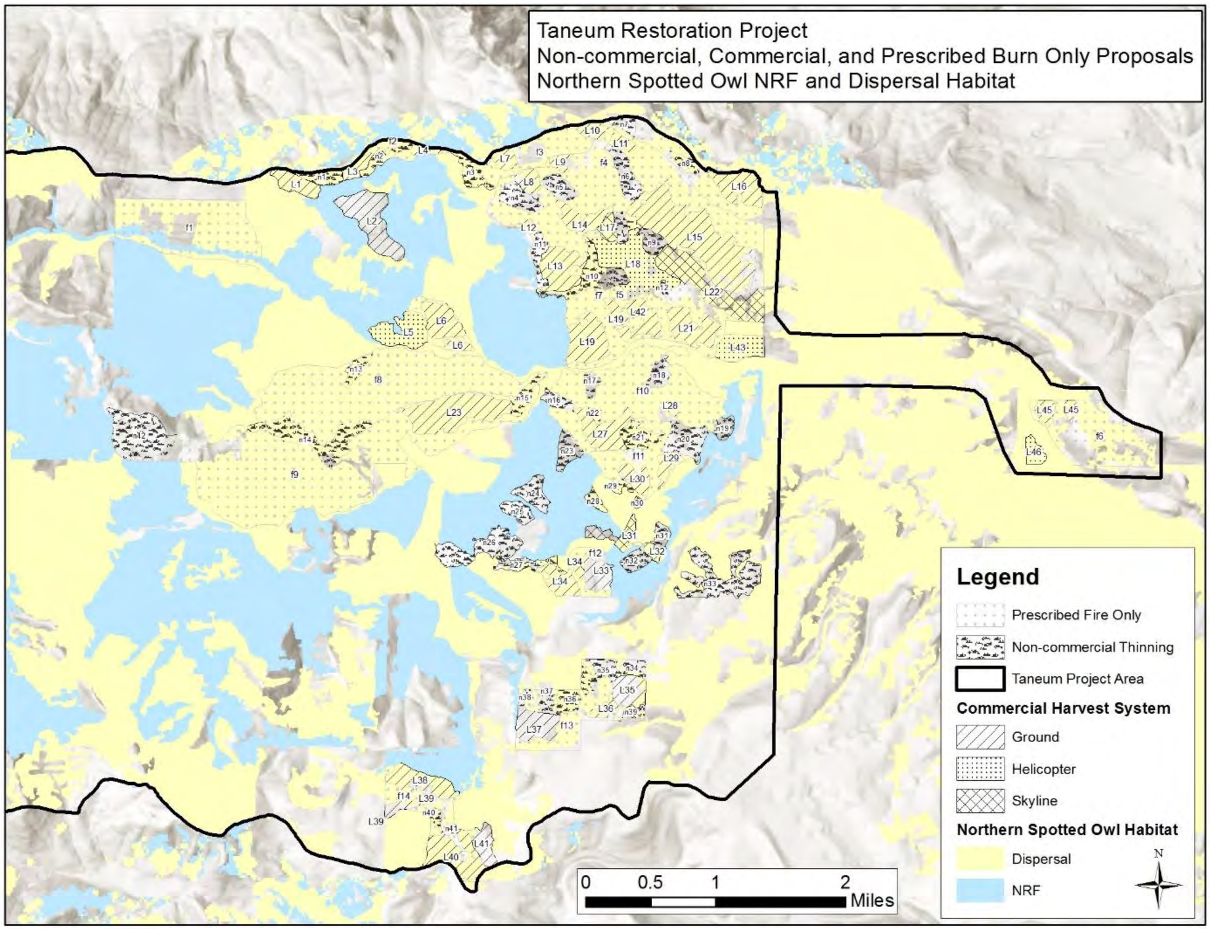


Figure 74. Non-commercial, commercial, and prescribed burning only proposed and northern spotted owl habitat.

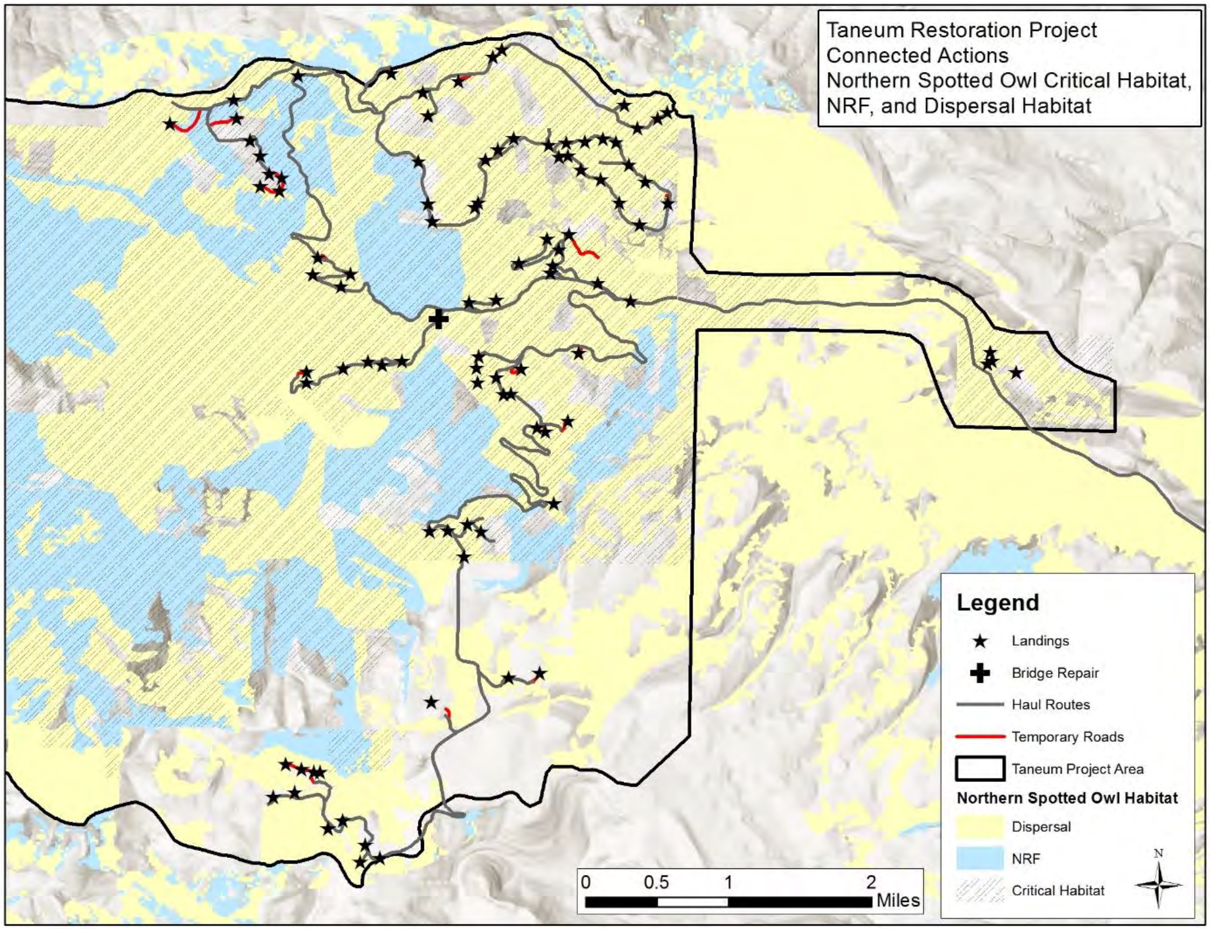


Figure 75. Connected actions proposed and northern spotted owl habitat.

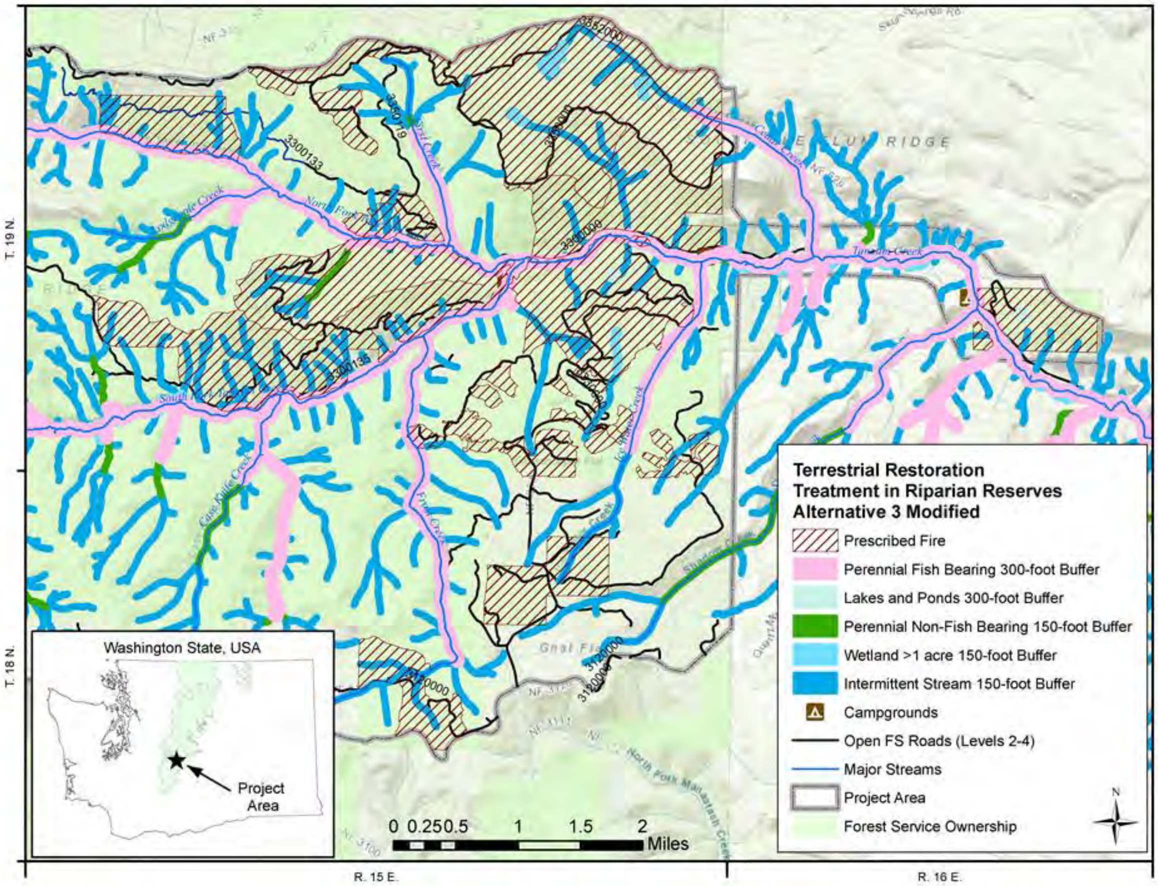


Figure 76. Prescribed burn areas allowed to back into Riparian Reserves.

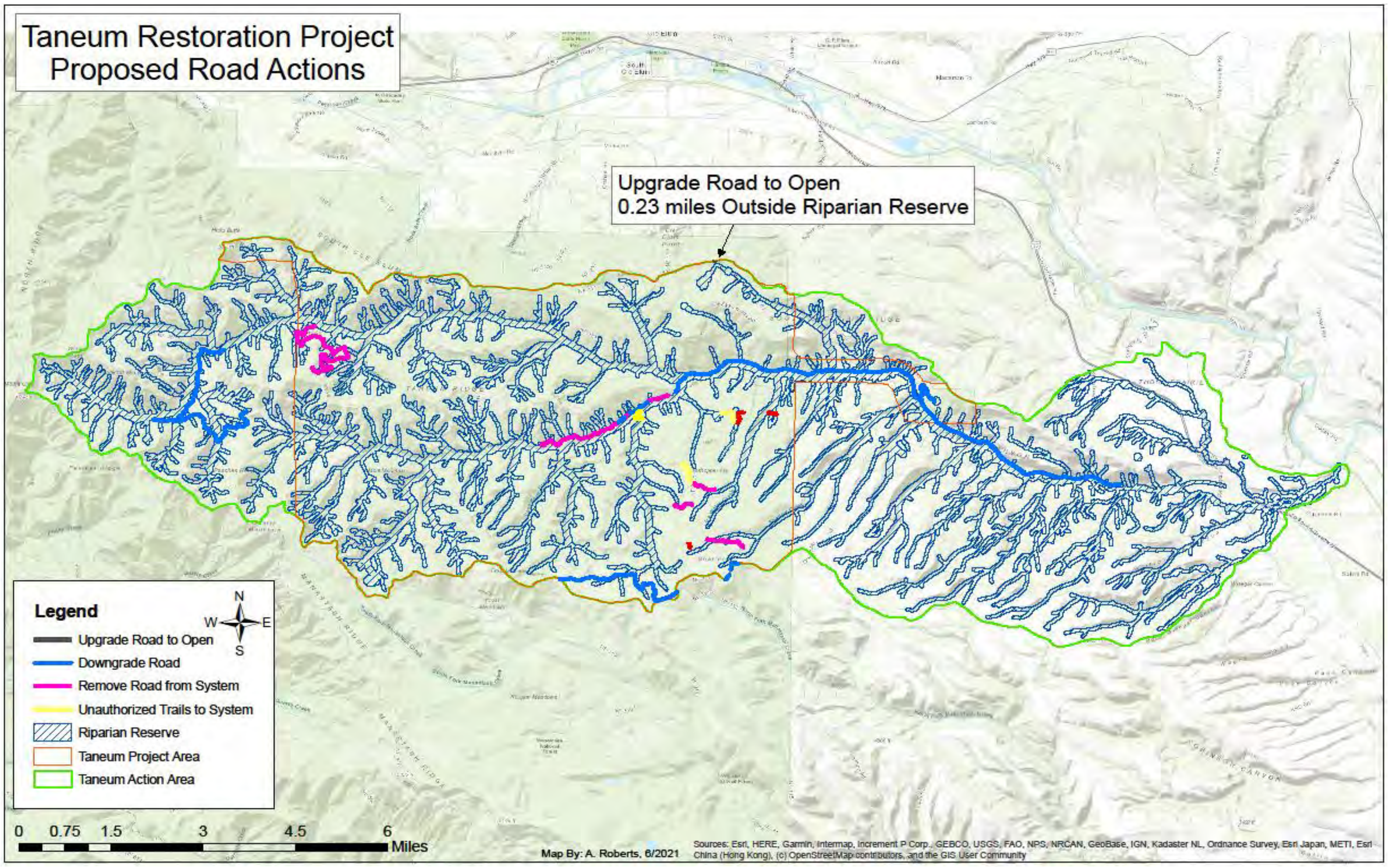


Figure 77. Proposed road and trail actions in Riparian Reserves.

APPENDIX B – PROJECT SPECIFICS

Table 53. Non-commercial, commercial, and prescribed burn only proposed stands within Late Successional Reserve and Matrix land use allocations.

Stand Number	Mgnt. Area	Activity Type	Harvest System	LSR Objective	Stand Over 80	Stand Type	Acres
n1	LSR	Non-commercial Thin	PCT	Risk	NO	CC	20.4
n2	LSR	Non-commercial Thin	NA	Risk	NO	ES YFMS	20.0
n3	LSR	Non-commercial Thin	PCT	Risk	NO	GF YFMS	27.1
n4	LSR	Non-commercial Thin	PCT	Silviculture	NO	CC	29.5
n5	LSR	Non-commercial Thin	PCT	Silviculture	NO	CC	22.8
n6	LSR	Non-commercial Thin	PCT	Silviculture	NO	CC	31.8
n7	LSR	Non-commercial Thin	NA	Risk	NO	CC	12.6
n8	LSR	Non-commercial Thin	NA	Risk	YES	CC	13.1
n9	LSR	Non-commercial Thin	PCT	Risk	NO	CC	34.5
n10	LSR	Non-commercial Thin	PCT	Risk	NO	CC	55.9
n11	LSR	Non-commercial Thin	PCT	Risk	NO	CC	19.2
n12	LSR	Non-commercial Thin	PCT	Silviculture	NO	CC	4.0
n13	LSR	Non-commercial Thin	PCT	Risk	NO	ES YFMS	15.3
n14	LSR	Non-commercial Thin	NA	Risk	YES	ES YFMS	76.6
n15	LSR	Non-commercial Thin	PCT	Risk	YES	ES YFMS	20.5
n16	LSR	Non-commercial Thin	PCT	Silviculture	NO	CC	14.2
n17	LSR	Non-commercial Thin	PCT	Silviculture	NO	CC	10.6
n18	LSR	Non-commercial Thin	PCT	Silviculture	NO	CC	18.8
n19	LSR	Non-commercial Thin	PCT	Silviculture	NO	CC	14.7
n20	LSR	Non-commercial Thin	PCT	Risk	NO	CC	44.2
n21	LSR	Non-commercial Thin	PCT	Risk	NO	CC	27.1
n22	LSR	Non-commercial Thin	NA	Silviculture	YES	CC	5.2
n23	LSR	Non-commercial Thin	PCT	Silviculture	NO	CC	24.3
n24	LSR	Non-commercial Thin	PCT	Silviculture	NO	CC	27.0
n25	LSR	Non-commercial Thin	PCT	Silviculture	NO	CC	18.7
n26	LSR	Non-commercial Thin	PCT	Silviculture	NO	CC	61.1
n27	LSR	Non-commercial Thin	PCT	Risk	YES	ES YFMS	22.6
n28	LSR	Non-commercial Thin	PCT	Silviculture	NO	CC	9.0
n29	LSR	Non-commercial Thin	PCT	Silviculture	NO	CC	7.3
n30	LSR	Non-commercial Thin	PCT	Silviculture	NO	CC	4.0
n31	LSR	Non-commercial Thin	PCT	Silviculture	NO	CC	13.9
n32	LSR	Non-commercial Thin	PCT	Silviculture	NO	CC	18.0
n33	LSR	Non-commercial Thin	PCT	Silviculture	NO	CC	83.1
n34	Matrix	Non-commercial Thin	PCT	Silviculture	NO	CC	14.9
n35	Matrix	Non-commercial Thin	PCT	Silviculture	NO	CC	30.0

n36	Matrix	Non-commercial Thin	PCT	Silviculture	NO	CC	18.7
n37	Matrix	Non-commercial Thin	PCT	Silviculture	NO	CC	12.1
n38	Matrix	Non-commercial Thin	PCT	Silviculture	NO	CC	6.4
n39	LSR	Non-commercial Thin	PCT	Risk	YES	ES YFMS	10.2
n40	LSR	Non-commercial Thin	PCT	Risk	YES	ES YFMS	7.4
n41	LSR	Non-commercial Thin	PCT	Risk	YES	ES YFMS	3.8
n42	LSR	Non-commercial Thin	PCT	Risk	YES	CC	89.7
						Non-commercial Thinning Subtotal	**1,020.4**
L1	LSR	Commercial Thinning	Ground	Silviculture	NO	OSP	29.0
L2	LSR	Commercial Thinning	Ground	Silviculture	NO	OSP	81.8
L3	LSR	Commercial Thinning	Ground	Risk	NO	OSP	14.8
L4	LSR	Commercial Thinning	Ground	Risk	NO	OSP	7.6
L5	LSR	Commercial Thinning	Helicopter	Silviculture	YES	ES SECC	53.3
L6	LSR	Commercial Thinning	Ground	Risk	YES	ES YFMS	6.0
L6	LSR	Commercial Thinning	Ground	Risk	YES	ES YFMS	41.6
L7	LSR	Commercial Thinning	Ground	Risk	NO	OSP	16.8
L8	LSR	Commercial Thinning	Ground	Risk	NO	OSP	18.8
L9	LSR	Commercial Thinning	Ground	Silviculture	NO	ES SECC	9.7
L10	LSR	Commercial Thinning	Ground	Risk	NO	OSP	14.5
L11	LSR	Commercial Thinning	Ground	Risk	YES	ES YFMS	12.5
L12	LSR	Commercial Thinning	Ground	Risk	NO	OSP	5.4
L13	LSR	Commercial Thinning	Ground	Risk	YES	ES YFMS	56.2
L14	LSR	Commercial Thinning	Ground	Risk	YES	ES YFMS	31.9
L15	LSR	Commercial Thinning	Ground	Risk	YES	GF YFMS	205.0
L16	LSR	Commercial Thinning	Ground	Risk	YES	ES YFMS	50.9
L17	LSR	Commercial Thinning	Skyline	Risk	YES	ES SECC	14.6
L18	LSR	Commercial Thinning	Helicopter	Risk	YES	GF YFMS	104.6
L19	LSR	Commercial Thinning	Ground	Silviculture	YES	ES SECC	11.6
L19	LSR	Commercial Thinning	Ground	Silviculture	YES	ES SECC	60.6
L21	LSR	Commercial Thinning	Ground	Silviculture	YES	ES SECC	51.2
L22	LSR	Commercial Thinning	Skyline	Risk	YES	ES SECC	109.3
L23	LSR	Commercial Thinning	Ground	Risk	YES	ES SECC	107.7
L27	LSR	Commercial Thinning	Ground	Risk	YES	ES YFMS	50.9
L28	LSR	Commercial Thinning	Ground	Risk	YES	ES YFMS	6.6
L29	LSR	Commercial Thinning	Ground	Risk	YES	GF YFMS	17.9
L30	LSR	Commercial Thinning	Ground	Risk	YES	ES YFMS	22.5
L31	LSR	Commercial Thinning	Skyline	Silviculture	NO	OSP	24.5
L32	LSR	Commercial Thinning	Ground	Silviculture	NO	OSP	7.3
L33	LSR	Commercial Thinning	Ground	Risk	NO	OSP	32.5
L34	LSR	Commercial Thinning	Ground	Risk	YES	ES YFMS	5.0

L34	LSR	Commercial Thinning	Ground	Risk	YES	ES YFMS	29.2
L35	Matrix	Commercial Thinning	Ground	Risk	NO	OSP	35.5
L36	Matrix	Commercial Thinning	Ground	Risk	YES	ES YFMS	11.9
L37	Matrix	Commercial Thinning	Ground	Risk	NO	OSP	42.8
L38	LSR	Commercial Thinning	Ground	Risk	YES	ES YFMS	47.0
L39	LSR	Commercial Thinning	Ground	Risk	YES	ES YFMS	16.3
L40	LSR	Commercial Thinning	Ground	Risk	YES	ES YFMS	64.6
L41	LSR	Commercial Thinning	Ground	Risk	NO	OSP	25.0
L42	LSR	Commercial Thinning	Ground	Silviculture	YES	ES SECC	36.0
L43	LSR	Commercial Thinning	Helicopter	Silviculture	YES	ES SECC	41.8
L45	Matrix	Commercial Thinning	Ground	Risk	YES	ES SECC	8.0
L45	Matrix	Commercial Thinning	Ground	Risk	YES	ES SECC	15.3
L46	Matrix	Commercial Thinning	Helicopter	Risk	YES	ES SECC	16.1
						Commercial Thinning Subtotal	**1,672.4**
f1	LSR	Fire Only	RX	Risk	YES		287.5
f10	LSR	Fire Only	RX	Risk	YES AND NO		313.5
f11	LSR	Fire Only	RX	Risk	YES AND NO		85.5
f12	LSR	Fire Only	RX	Risk	YES		31.8
f13	Matrix	Fire Only	RX	Risk	YES AND NO		115.0
f14	LSR	Fire Only	RX	Risk	YES		65.5
f2	LSR	Fire Only	RX	Risk	YES AND NO		21.5
f3	LSR	Fire Only	RX	Risk	YES AND NO		184.1
f4	LSR	Fire Only	RX	Risk	YES		414.3
f5	LSR	Fire Only	RX	Risk	YES AND NO		20.5
f6	Matrix	Fire Only	RX	Risk	YES		205.5
f7	LSR	Fire Only	RX	Restoration	YES		197.9
f8	LSR	Fire Only	RX	Restoration	YES		487.4
f9	LSR	Fire Only	RX	Risk	YES		653.2
L32	LSR	Fire Only	L	Silviculture	NO		2.8
L6	LSR	Fire Only	L	Risk	YES		24.1
						Prescribed Burning Only Subtotal	**3,110.0**
						VEGETATION TREATMENTS GRAND TOTAL	**5,802.9**

Table 54. Individual road actions proposed.

Action	Road/Trail Number	ML	Description	Road/Trail Objective	Miles
UA road to system	3330000-7.83R-2	UA		ML2A - gated admn access only – range permittee access	0.11
UA road to system	3330119-1.18R-1	UA		ML2A - gated admn access only – access to rock source	0.17
UA road to system	3330121-0.16L-3	UA	old road open	ML2A - gated admn access only – range permittee access	0.09
Downgrade ML	3120-000	3	Make ML2	Admn change	5.77
Downgrade ML	3300-000	4	Change to ML 3	Admn change	8.20
Downgrade ML	3300-000	3	Change to ML 2A	Need gate - admin access only	2.70
Downgrade ML	3300-111	2	Change to ML 2A	Need gate - admin access only	0.90
Downgrade ML	3300-128	2	Change to ML 2A	Need gate - admin access only	1.50
Remove from System	3300-129	2	Remove from FS system	on private	3.20
Downgrade ML	3300-135	2	Change to ML 2A	Need gate - admin access only	0.50
Remove from System	3300-135	2	Private - remove from FS system	on private	0.40
Remove from System	3330-126	2	Remove from FS system	on private	0.80
Remove from System	3330-205	2	Remove from FS system	on private	0.40
Remove from System	3330-206	1	Remove from FS system	on private	0.60
Upgrade from closed to open	3352-113	1	Change to ML 2	Already open - viewpoint and being driven - no hydro issues	0.23
Add UA trail to system	1227/Gooseberry Flat Trail	N/A	Add to system - existing unauthorized trail from Road 3330-000 to Road 3330-121	Connect dispersed camps along Road 3330-121 to the trail system	0.30
Add UA trail to system	1236/Gnat Flat Trail	N/A	Add to system - Existing unauthorized trail from Road 3330 southeast to a dispersed camp in Section 35.	Connect dispersed camp to the trail system	0.70
Add UA trail to system	Taneum Ridge Tie Trail	N/A	Add to system - Existing unauthorized trail from Taneum Ridge Trail 1363 to Road 3330 at 3300-135 spur would be re-routed	Create a legal route for non-street legal motorcycles from Taneum Junction to the Hoyt Trail	0.30

APPENDIX C – ARBO II AQUATIC RESTORATION

The Taneum Restoration Project includes many restoration actions that are consistent with the 2013 Aquatic Restoration Activities in States of Oregon and Washington programmatic Biological Opinions (USFWS ARBO II 2013; NMFS ARBO II 2013) which covers road/trail hydrologic stabilization, road/trail erosion control, decommissioning and closing roads, bridge replacements, road/trail removal and/or relocation out of floodplain, instream large wood/boulder placement, floodplain large wood replenishment, beaver dam analog placement, fish passage restoration (culverts replaced/removed, road/trail bridges replaced, fords removed, reduce/remove recreation impacts, meadow restoration, and riparian vegetation treatment (hand thinning & prescribed burning). Because these restoration actions would be designed and implemented to follow the Project Design Criteria and Terms and Conditions in ARBO II, including approved work windows for freshwater, the effects to **steelhead and bull trout** would be consistent with those described in ARBO II – **May Affect, Likely to Adversely Affect**. The effects to wildlife resulting from the ARBO II proposed actions would be **May Affect, Not Likely to Adversely Affect northern spotted owl and Designated Critical Habitat** for the Northern Spotted Owl, and **No Effect to grizzly bear, marbled murrelet, and Canada lynx**. These restoration actions will occur later in time and undergo individual consultation under ARBO II and will not analyzed in this BA. However, to provide context for this consultation and the greater Taneum Restoration Project, the descriptions for ARBO II proposed actions are included here.

The ARBO II proposed actions following (Table 55, Figure 79, Figure 80, Figure 81, Figure 82), would restore watershed functions, build more resilient and sustainable ecosystems and contribute to the recovery of listed fish species (steelhead and bull trout) and their critical habitats.

Table 55. Summary of ARBO II proposed actions.

Treatment	Description	Amount
Culvert replacement	Fish passage restoration	7 culverts
	Replace/remove undersized culverts	~100 culverts
Forest System Road decommissioning	Roads being hydrologically restored and decommissioned	20.7 miles (ML1: 16.54, ML2: 4.14, ML4: 0.04)
Forest System Road Closures	Roads being hydrologically restored and put into storage	14.93 miles
Unauthorized road decommissioning	Unauthorized roads being decommissioned or closed to be hydrologically stable	21.87 miles
Unauthorized trail decom	Remove unauthorized trails	0.3 miles
Trail Bridge Construction	Construct 4 trail bridges: Frost Mountain, Hoyt trail, First Creek on NF trail, Ice Water Loop trail	4 bridges
Remove stream fords	Remove stream fords on South Fork Taneum Creek; the Taneum Campground on Taneum Creek; and Ice Water Loop Trail on Ice Water Creek	3 fords
Road reroute for floodplain restoration	Reroute a portion of the main road 3300 at Taneum Campground	0.7 miles

Trail re-route to reduce sediment delivery and restore floodplain	Re-route motorized trails to reduce erosion and sediment delivery and to restore floodplain function (NF Trail)	2.5 miles
Large Woody Debris/Beaver Dam analogs	Place wood in stream	~8 miles
Campsite removal and dispersed site restoration	Remove Taneum Campground sites on creek (11); remove Icewater Campground sites on creek (6); remove Taneum Junction site on creek (1); and restore riparian functions at dispersed sites (10)	28 sites
Meadow restoration	Restore native plant restore diversity, hydrologic function, reduce impacts (soil compaction and erosion) protect rare plant species, and manage invasive species	275 acres

Definitions:

- Closed = Maintenance Level 1 FS road that is hydrologically stable or hydrologically closed.
- Decommissioned System = FS road to be removed from system and completely restored or hydrologically closed.
- Decommissioned Unauthorized Road = User made roads decommissioned or hydrologically closed.
- Non-System Road = encumbered by an easement, Right of Way, and/or on non-Forest Service land.
- Riparian Reserve =as defined by the Northwest Forest Plan.

ARBOII projects will be completed over the next ten years as funding and resources become available. Table 56. Timeline for ARBO II proposed actions is the desired timing for project after a Decision Notice has been signed for the Taneum Restoration Project.

Table 56. Timeline for ARBO II proposed actions.

ARBOII Treatments	**Implementation Year**									
	1	2	3	4	5	6	7	8	9	10
Culvert Replacement		▨	▨	▨	▨	▨	▨	▨	▨	▨
Stream ford removal				▨	▨	▨	▨	▨		
Large Woody Habitat	▨	▨	▨							
Road/Trail Closure/Decommission/Relocation		▨	▨	▨	▨	▨	▨	▨	▨	▨
Recreation Improvements	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨
Meadow Restoration	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨
Watershed Restoration	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨

Anticipated Treatment Range ▨

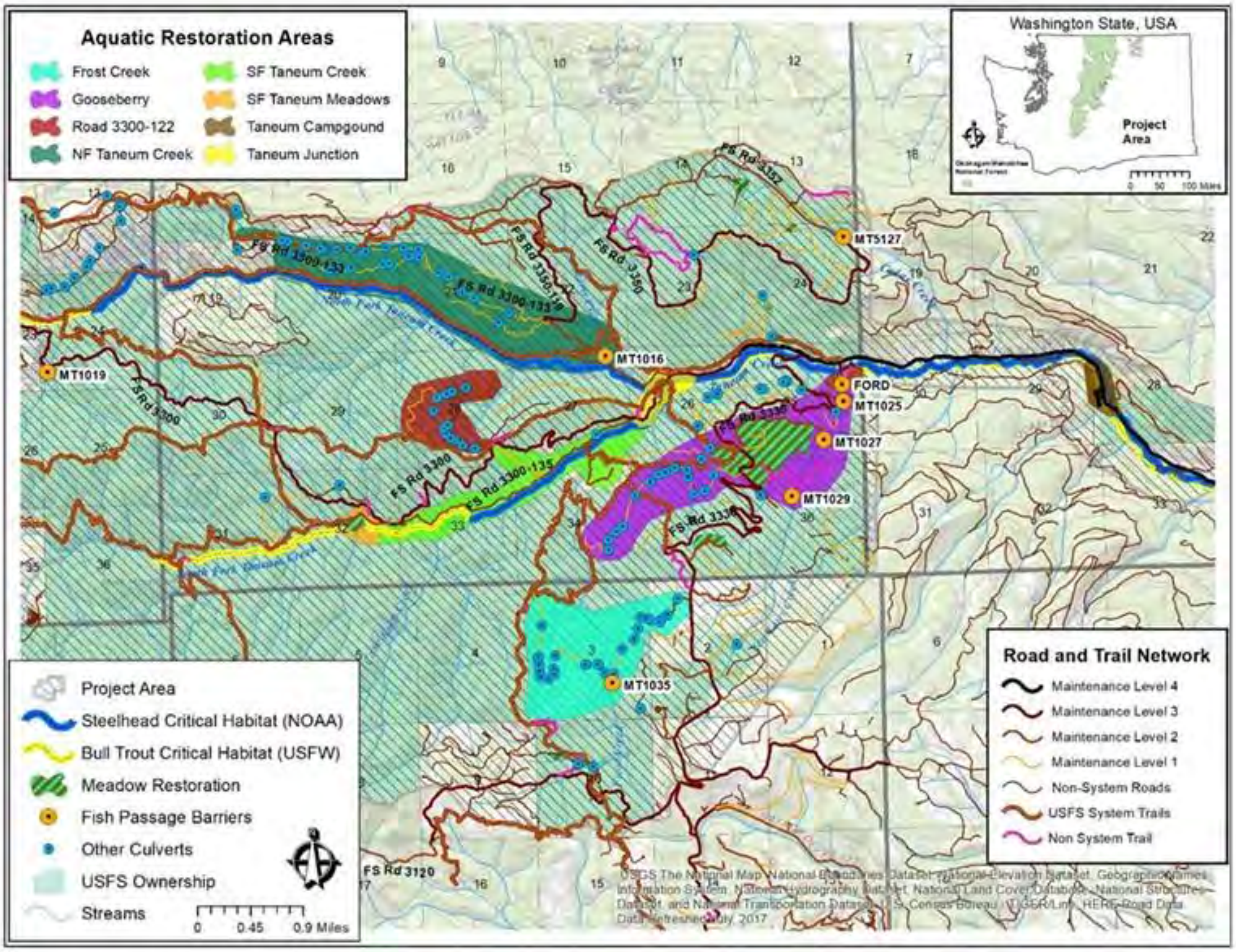


Figure 78. Map showing the location of the ARBO II aquatic restoration areas.

Riparian Underburning

Riparian underburning treatments will occur on 835 acres where proposed burn units overlap with Riparian Reserves. Riparian treatments will follow the same prescribed fire design criteria described in the proposed action section of this document, in addition to the design criteria listed in ARBO2.

Meadow Restoration

There are 275 acres of ARBO II meadow restoration activities identified (Figure 79). Treatment objectives are to restore native plant diversity, restore hydrologic function, reduce impacts (soil compaction and erosion) from recreational vehicles traveling through the meadows, protect rare plant species, and manage invasive species.

South Fork Meadow

Primary restoration objectives for the South Fork Meadow are to restore the hydrologic function, confine invasive species, and rejuvenate aspen. A variety of actions would be used to accomplish these objectives including installation of wood in the stream, beaver dam analogs, weed control, prescribed fire, thinning in aspen stands, and installation of barriers to restrict vehicle access into the meadow (Figure 79).

Cedar Creek Meadows

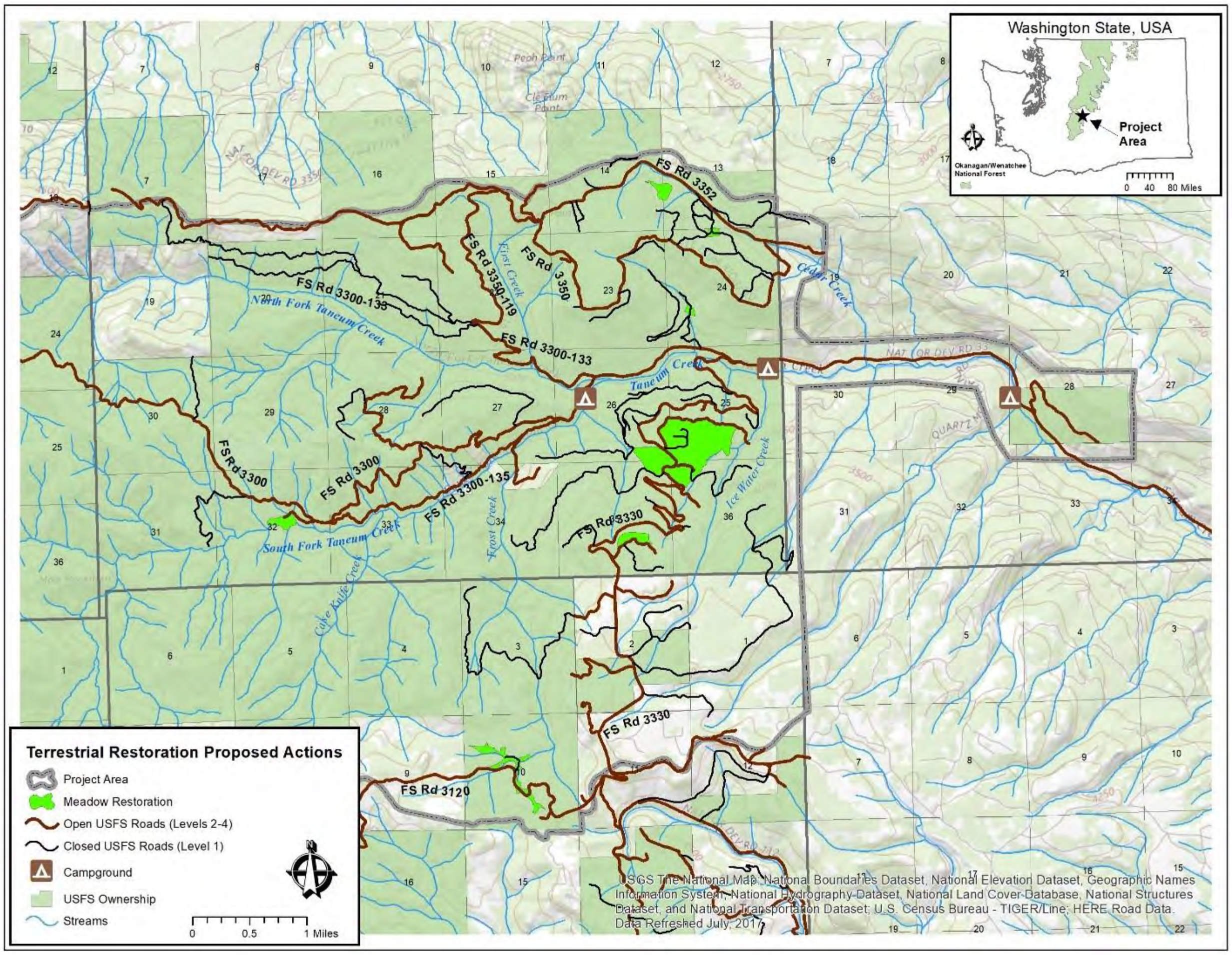
Restoration objectives for this meadow system are to protect rare plants, reduce conifer encroachment, reduce fire hazard, confine invasive species, and reduce the impacts from recreation. A combination of forest thinning, prescribed fire, weed control, and limits to vehicle access would be used to accomplish these objectives (Figure 79).

Gooseberry Flat Meadows

Restoration objectives for these meadow systems are to protect rare plants, reduce conifer encroachment, restore fire regime, restore hydrologic function, rejuvenate aspen, confine invasive species, and reduce the impacts of recreation. A combination of forest thinning, prescribed fire, weed control, access management, and stream and floodplain restoration would be used (Figure 79).

Frost Creek Meadow

Restoration objectives for Frost Meadow are to restore fire regime, confine invasive species, reduce the impacts of recreation, rejuvenate aspen, restore hydrologic function, and protect cultural resources. A combination of forest thinning, prescribed fire, weed control, stream and floodplain restoration, installation of wood in the stream, beaver dam analogs, and access management would be used (Figure 79).



USGS The National Map: National Boundaries Dataset, National Elevation Dataset, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; U.S. Census Bureau - TIGER/Line; HERE Road Data. Data Refreshed July, 2017.

Figure 79. Location of meadows proposed for treatment.

Watershed Restoration

Watershed restoration actions proposed for aquatic resources under ARBO II are intended to protect and restore geomorphic and biological processes and aquatic habitat conditions that steelhead, bull trout, and native aquatic and riparian species depend on (Figure 80). These actions would also benefit other aquatic and terrestrial species in the watershed. Treatments displayed in this section are approximate and final amounts may be adjusted based on field conditions.

Treatment actions may include decommissioning and closing roads, re-routing roads, hydrologically stabilizing roads, hardening recreational infrastructure including dispersed campsites and day use areas, removing unauthorized trails, re-routing NF System trails, berms, and roads from floodplain and riparian areas, replacing undersized bridges, replenishing large wood in floodplain areas, stabilizing streambanks, restoring instream habitat with large wood and boulders, installing beaver dam analogs, and removing vehicle fords across streams. It should be noted that additional aquatic restoration may occur throughout the project area if issues such as failing culverts, fords, bridges and roads or lack of large wood in stream reaches are identified outside of the aquatic restoration areas shown on Figure 80. These actions would be designed and implemented to follow the Project Design Criteria and Terms and Conditions in ARBO II.

South Fork Taneum Aquatic Restoration Area

Aquatic restoration proposed for the South Fork Taneum Creek area include a suite of actions and treatments that begin at the western end of Road 3300-135 near the South Fork Meadows area and end downstream of the South Fork Taneum Creek ford on Road 3300-211 (Figure 80). The proposed action is intended to reduce sediment delivery to the South Fork Taneum Creek and to protect and restore floodplain and riparian function by decommissioning and re-routing roads to the upland area. The project would:

- protect and restore instream habitat by removing the ford,
- reducing fine sediment delivery and restoring wood and sediment transport to the creek by
    - placing large wood and boulders upstream and downstream of the removed ford and throughout the project reach, as well as, and
    - constructing beaver dam analogues at the western end of the project area near the South Fork Meadow Area.

Road 3300-122 Aquatic Restoration Area

Proposed aquatic restoration actions here are intended to improve hydrologic conditions and reduce sediment transport and delivery to an unnamed tributary of North Fork Taneum Creek (Figure 80). Road 3300-122 would be hydrologically stored and managed as a gated ML-1 road (used for administrative purposes only) and road 3300-251 would be decommissioned (Table 58).

Gooseberry Flat Aquatic Restoration Area

Aquatic restoration actions proposed for the Gooseberry area include a suite of actions along three roads in the Gooseberry Flat Area (Figure 80). They are intended to improve hydrologic conditions and reduce sediment delivery to unnamed tributaries of South Fork Taneum Creek and Ice Water Creek, a tributary of Taneum Creek. Road 3300-116 would receive maintenance and be maintained as a gated ML-1 road. Roads 3330-118 and 3330-605 would be decommissioned. A culvert would be replaced on Road 3330-119 to allow for aquatic organism passage and the stream channel would be restored. Road 3330-119 would continue to be managed as an ML-2 road. Road 3330-121 would be made hydrologically stable and managed as a gated ML-1 road east of the existing rock barrier to the existing culvert and decommissioned east of this stream crossing (Table 58). The fish passage barrier culvert would be removed, and the stream bank and stream channel restored. A motorcycle ford on Ice Water Loops trail, inventoried as a fish passage barrier on Ice Water Creek, would be replaced with a trail bridge to allow for aquatic organism passage and the stream channel would be restored.

Frost Creek Aquatic Restoration Area

Aquatic restoration actions proposed for the Frost Creek area include, removing a damaged culvert, stabilizing an old roadbed, and improving drainage. These actions are intended to improve hydrologic conditions and reduce sediment transport and delivery to Frost Creek and ultimately to South Fork Taneum Creek (Figure 80). The 3330-122 road would remain an ML 1 closed road.

North Fork Taneum Aquatic Restoration Area

Aquatic restoration proposals to improve hydrologic conditions and reduce sediment delivery to the North Taneum Creek, include a suite of actions along three roads in the North Fork area (Figure 80). To stabilize the hydrology and restore fish passage, its proposed to remove 30 damaged culverts on the 3300-133, 3300-601, 3300-603 and 3300-118 roads. All or portions of these roads would be decommissioned (Table 58). In addition, placing large wood, boulders, and beaver dam analogs would support fish habitat forming instream flows and enhance and create complex/diverse instream habitat. A berm confining the northern floodplain just upstream from the FS3300 bridge would be removed.

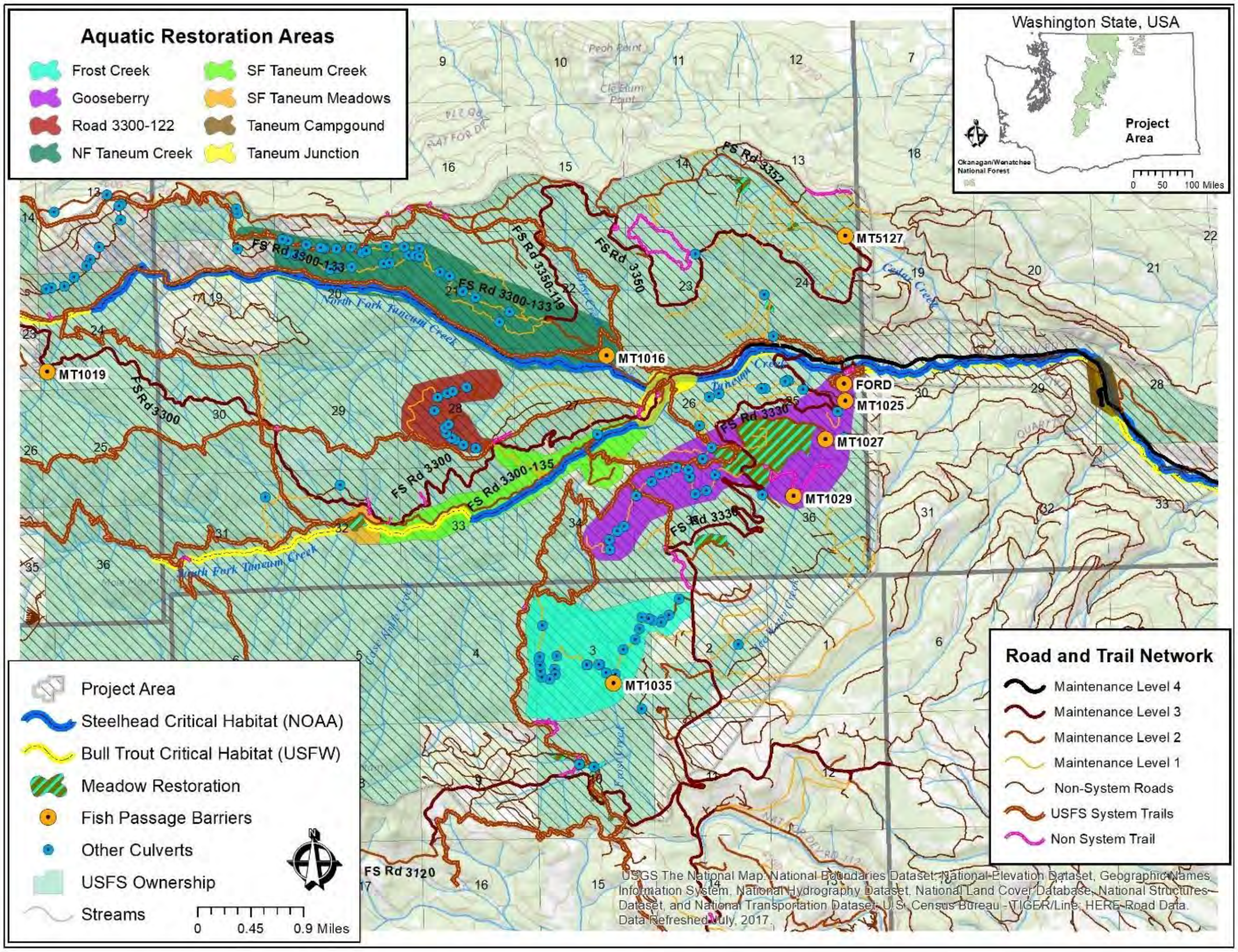


Figure 80**.** Location of the aquatic restoration areas.

Access and Recreation Infrastructure

The actions proposed would meet the following aquatic objectives: reduce sediment sources, reduce drainage networks, increase and restore riparian and floodplain function, enhance instream habitat, restore natural flow regimes (high and low), and restore fish passage. Actions include system and unauthorized road closures, reroutes, decommission, and conversions to trails as well as system and unauthorized motorized trail construction, reroutes, and decommission. Overall, motorized access would be reduced by 56.8 miles in the Taneum Project Area (Table 57) (Figure 81). Table 58 at the end of this section displays all individual road/trail proposed actions.

Table 57. Road and trail actions to be proposed under ARBO II.

Action	Miles
Roads	
Road Reroute	+ 0.7
Road Closures	-14.9
System Road Decommission	-20.7
Unauthorized Road Decommission	-21.9
Road to Motorized Trail Conversion	-/+0.8
Subtotal Roads	**-56.8**
Trails	
New Trail Construction	+ 0.1
System Trail Re-route	+ 2.5
Decommission UA Trails	- 0.3
Subtotal Trails	**+2.3**
Grand Total Motorized Actions	**-54.5**

Roads

Road Decommission

Decommissioned system (20.7 miles) and unauthorized roads (21.9 miles) would be fully rehabilitated and blocked (most often with a berm) to restrict all motorized use (Table 58, Figure 81). De-compacting and seeding the road surface, removing culverts, and installing waterbars would restore hydrologic functions. Decommissioned roads would be removed from the National Forest road system with the expectation they would not be used in the future.

Road Closure

Roads to be closed (14.9 miles) are currently open roads that would be blocked with a berm or gate to restrict motorized use (Table 58, Figure 81). Waterbars would be installed, culverts would be pulled, and grass seeded to restore hydrologic functions. They would be managed as Maintenance Level 1 roads.

Road Re-route

Three sections of road (3300 to Taneum Campground, 3300-207, 3322) would be reconstructed (0.7 miles) to improve hydrologic function, access and reduce erosion (Table 58, Figure 81).

Road to Trail Conversion

The 3300-211 road (0.81 miles) would be converted to a single-track trail (Table 58, Figure 81). A trail tread would be established with appropriate drainage structures and the remaining road prism would be de-compacted, contoured, and seeded.

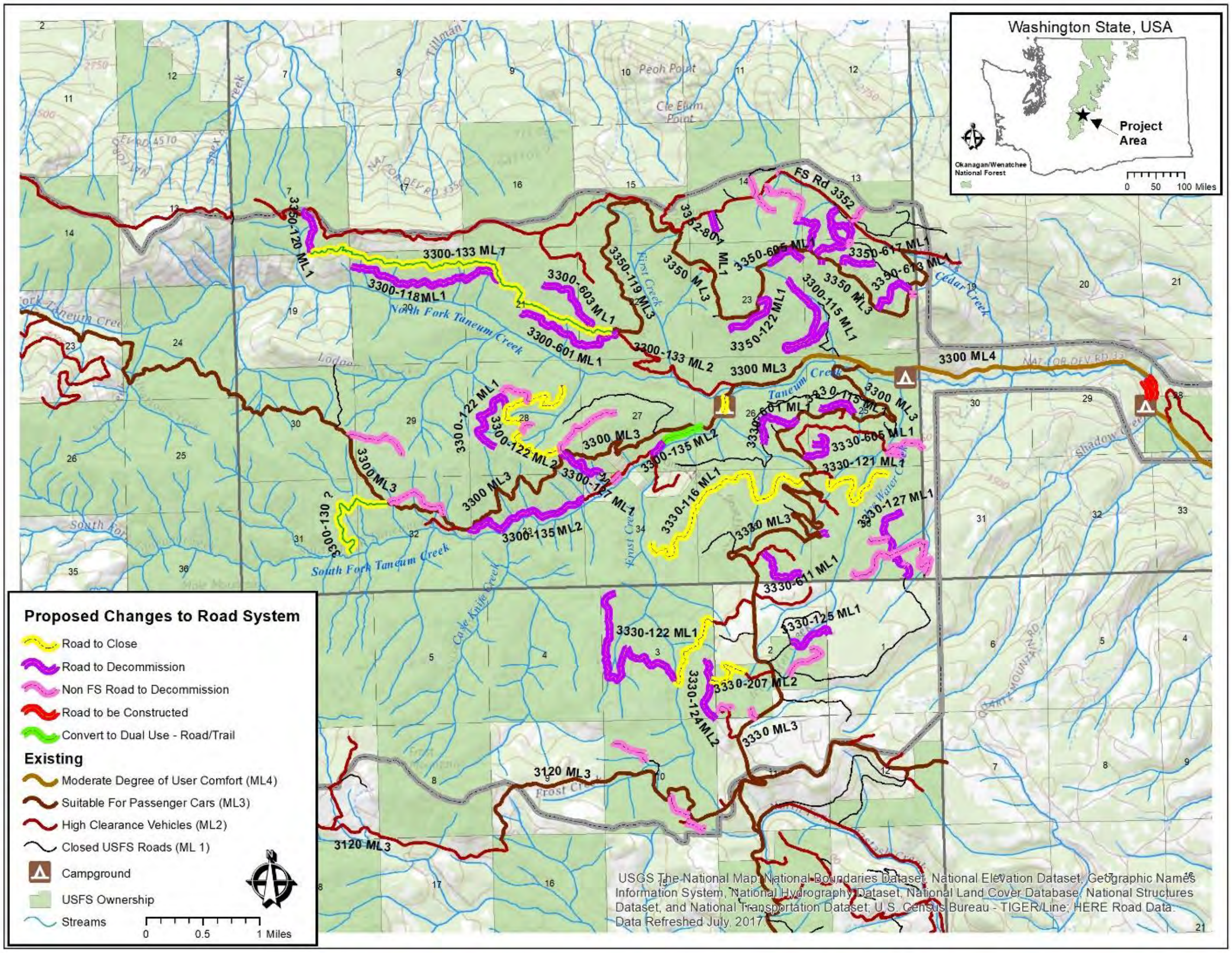


Figure 81. Road actions proposed in Taneum under ARBO II (these may not be the final placements/miles).

Trails

Unauthorized Trail Decommission

Unauthorized trails to be decommissioned (0.3 miles,
Table 21, Figure 82) would be blocked and covered with slash to restrict all use, any culverts would be removed, and water bars would be installed to restore hydrologic functions.

Trail Construction

A new section of the Hoyt Trail (#1347) would need to be built to the new trail bridge (replacing a ford). This trail (0.1 miles, Table 21, Figure 82) would be single-track, and managed as motorized, multi-use trail.

Trails to be Re-routed

Proposed trail re-routes (2.6 miles total) are short relocations of existing trails (Table 21, Figure 82) to move them out of the floodplain, resolve erosion problems, or make the trail sustainable. Re-routing a trail includes decommissioning and rehabilitating the old segment that is being replaced.

Trail Bridges to be Constructed

Three trail bridges are proposed to be constructed. A new trail bridge at the bottom of the Frost Mountain Trail would be replaced in the same location with log lattice abutments to pass 100-year floodwaters. This bridge would be designed for motorcycles and saddle stock. A second trail bridge would be built on the Hoyt trail just upstream from the existing ford of the South Fork Taneum Creek to replace that ford. This bridge would be designed for motorcycles, saddle stock, ATVs, and snowmobiles. A third trail bridge would be built on the North Fork Trail 1377 across First Creek to replace a deteriorating structure. This bridge would be designed for motorcycles and saddle stock. The ford on Ice Water Loops trail would be replaced with a trail bridge designed to pass 100-year floodwaters.

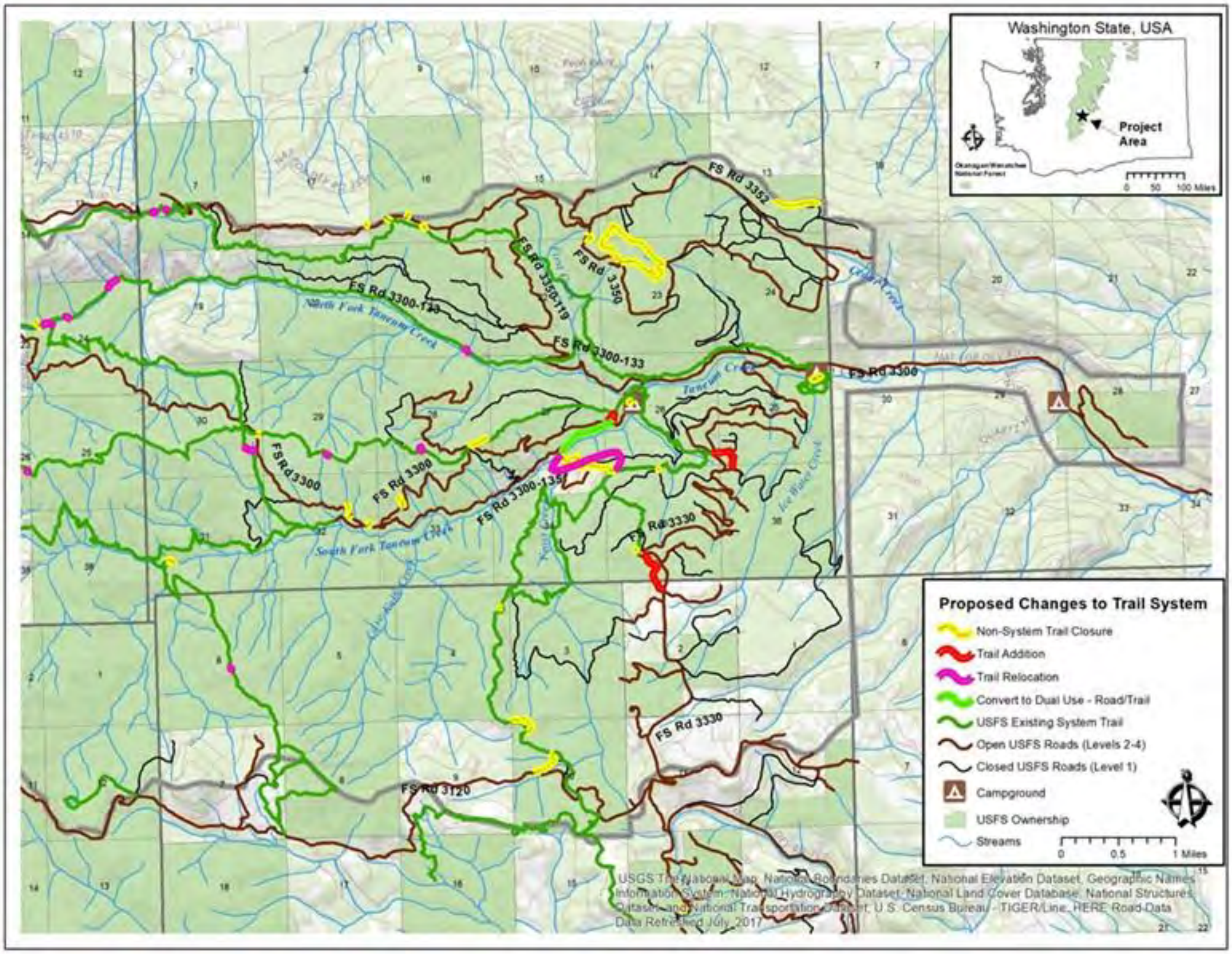


Figure 82. Trail actions proposed in Taneum under ARBO II (these may not be the final placements/miles).

Developed Recreation

Treatments for developed recreation would include modifying access to recreational facilities and hardening recreational sites in the floodplain and riparian habitat along the Taneum and South Fork Taneum Creeks. These restoration actions would have positive benefits for aquatic habitat, and for the public, by protecting and restoring floodplain and riparian function, enhancing instream habitat, reducing fine sediment delivery, and providing day use and group campsite facilities that are sustainable and safe for public recreation. Sites to be improved are: Taneum Campground, Icewater Campground, and Taneum Junction.

Dispersed Recreation

Dispersed campsites are campsites outside of developed campgrounds where recreationists have developed vehicle access off Forest System roads and cleared areas for campsites. Generally, these campsites would continue to be available for public use, however, due to resource issues, they can be closed. In this case, access to one large campsite along the access Road 3300-207 to Taneum Junction Campground, adjacent to South Fork Taneum Creek, would be decommissioned. This campsite is adjacent to the South Fork, and it is difficult to contain vehicle access, site disturbance, and sedimentation into the creek. Motorized vehicle access to this campsite would be restricted. Rocks, logs, or other barriers would be erected along the road to restrict vehicles from entering this campsite. The campsite would be planted with riparian plant species and have pedestrian access routes to the creek defined.

Table 58. ARBO II road actions.

Action	Road Number	ML	Description	Objective	Miles
System Road Decommission	3100-230	2	3100 Spur	Road drives into a spring	0.16
System Road Decommission	3100-234	2	Segment past existing dispersed camp	Increase road network efficiency - reduce road density	0.00
System Road Decommission	3100-236	2	3100 spur	Road drives into a meadow	0.00
System Road Decommission	3120-219	2	3120 spur	crosses RR many weeds present	0.00
System Road Decommission	3300-112	4	campground access	remove ford	0.00
System Road Decommission	3300-119	1	spurs off a trail	Increase road network efficiency - reduce road density	0.00
System Road Decommission	3300-127	1	from pvt land in sec34 up to 3300-00	reduce erosion from unsustainable road	0.00
System Road Decommission	3300-133	1	ML-1 section near junction with 3350-119	Increase road network efficiency. hydrologically restored and retained as a closed Level 1 road.	0.00
System Road Decommission	3300-135	2	Convert to a private road from FS system road	restore riparian and floodplain habitats - reroute or construction	0.00
System Road Decommission	3300-209	2	3300-135 spur	Increase road network efficiency - reduce road density	0.00

System Road Decommission	3300-251	1	"Road 3300-122 Aquatic Restoration Area" would be decommissioned.	improve hydrologic conditions and reduce sediment transport and delivery	0.60
System Road Decommission	3300-601	1	Lower NF Taneum Creek Restoration. Segment south of 3300-133	Enhance closure reduce erosion hydrologic stabilization	0.60
System Road Decommission	3300-603	1	Lower NF Taneum Creek Restoration. Segment south of 3300-133	Enhance closure reduce erosion hydrologic stabilization	0.00
System Road Decommission	3300-620	1	3300-115 spur	Increase road network efficiency - reduce road density	0.00
System Road Decommission	3300-621	1	3300-620 spur	Increase road network efficiency - reduce road density	0.00
System Road Decommission	3330-113	1	3330 spur	crosses RR	0.00
System Road Decommission	3330-115	1	closed spur off 3330	Enhance closure reduce erosion hydrologic stabilization	0.00
System Road Decommission	3330-118	1	Gooseberry Aquatic Restoration	Enhance closure reduce erosion hydrologic stabilization	0.00
System Road Decommission	3330-124	2	redundant spur to existing camp	Increase road network efficiency - only decom on FS lands - reduce road density	0.00
System Road Decommission	3330-125	2	spur off 3330-123	enhance closure	0.00
System Road Decommission	3330-131	1	3330 spur	Increase road network efficiency - reduce road density	0.00
System Road Decommission	3330-132	1	spur off 3330	Enhance closure	0.03
System Road Decommission	3330-601	1	closed spur off 3330	Enhance closure reduce erosion hydrologic stabilization	0.80
System Road Decommission	3330-605	1	Gooseberry Aquatic Restoration	Enhance closure reduce erosion hydrologic stabilization	0.60
System Road Decommission	3330-611	1	ML-1 road with ineffective closure being used by 4x4	reduce erosion from unstable road. Restore and protect meadow and rare plants	0.30
System Road Decommission	3330-801	1	ML-1 road with ineffective closure being used by 4x4	road crosses RR, decom portion in NFS land	0.00
System Road Decommission	3350-120	1	spur road from South Cle Elum Ridge connecting with 3300-133	Enhance closure	0.00
System Road Decommission	3350-122	1	south spur road off 3350. Osborne Point vicinity	Enhance closure	0.00
System Road Decommission	3350-203	2	3350 spur	crosses a spring	0.00
System Road Decommission	3350-605	1	north spur off 3350 road. Osborne Point vicinity	Enhance closure	0.30

System Road Decommission	3350-607	1	ML-1 road with ineffective closure being used by 4x4	reduce erosion from unstable road. Restore and protect meadow and rare plants	0.00
System Road Decommission	3350-609	1	ML-1 road with ineffective closure being used by 4x4	reduce erosion from unstable road. Restore and protect meadow and rare plants	0.30
System Road Decommission	3350-611	1	ML-1 road with ineffective closure	reduce erosion from unstable road. Restore and protect meadow and rare plants	0.00
System Road Decommission	3350-612	1	ML-1 road with ineffective closure being used by 4x4	reduce erosion from unstable road. Restore and protect meadow and rare plants	0.00
System Road Decommission	3350-613	1	ML-1 road with ineffective closure being used by 4x4	reduce erosion from unstable road. Restore and protect meadow and rare plants	0.50
System Road Decommission	3350-615	1	ML-1 road with ineffective closure being used by 4x4	reduce erosion from unstable road. Restore and protect meadow and rare plants	1.10
System Road Decommission	3350-616	1	ML-1 road with ineffective closure	reduce erosion from unstable road. Restore and protect meadow and rare plants	0.00
System Road Decommission	3350-617	1	ML-1 road with ineffective closure being used by 4x4	reduce erosion from unstable road. Restore and protect meadow and rare plants	0.00
System Road Decommission	3352-801	1	ML-1 road with ineffective closure	reduce erosion from unstable road. Restore and protect meadow and rare plants	0.00
System Road Decommission	3352-802	1	3352 spur	control invasive plants	0.00
System Road Decommission	4510-126	1	4510-1238 spur	Increase road network efficiency. Decom portion on NFS lands. Reduce road density	0.00
Unauthorized Road Decommission	3100000-16.93R-1	UA		Reduce road densities	0.07
Unauthorized Road Decommission	3100000-16.95R-1	UA	user built open	Reduce road densities	0.01
Unauthorized Road Decommission	3100000-17.07R-1	UA	user built open	Reduce road densities	0.01
Unauthorized Road Decommission	3100000-18.35R-1	UA	access rd	Reduce road densities	0.01
Unauthorized Road Decommission	3100000-19.1R-1	UA		Reduce road densities	0.24
Unauthorized Road Decommission	3100000-19.42R-1	UA		Reduce road densities	0.20
Unauthorized Road Decommission	3100234-0.09R-1	UA	old road	Reduce road densities	0.03
Unauthorized Road Decommission	3120000-2.82R-1	UA	user built open	Reduce road densities	0.04
Unauthorized Road Decommission	3120000-2.98L-1	UA	user built open	Reduce road densities	0.01
Unauthorized Road Decommission	3120000-3.28R-1	UA	user built open	Reduce road densities	0.03
Unauthorized Road Decommission	3120000-4.07R-1	UA		Reduce road densities	0.07

Unauthorized Road Decommission	3120219-0.60L-1	UA	ccc road	Reduce road densities	0.29
Unauthorized Road Decommission	3120632-0.08L-1	UA		Reduce road densities	0.20
Unauthorized Road Decommission	3120632-0.08L-2	UA		Reduce road densities	0.05
Unauthorized Road Decommission	3120632-0.09R-1	UA		Reduce road densities	0.10
Unauthorized Road Decommission	3120632-0.10L-1	UA		Reduce road densities	0.02
Unauthorized Road Decommission	3300000-0.70R-1	UA	3300 116	Reduce road densities	0.12
Unauthorized Road Decommission	3300000-10.01R-1	UA		Reduce road densities	0.68
Unauthorized Road Decommission	3300000-10.01R-2	UA		Reduce road densities	0.05
Unauthorized Road Decommission	3300000-11.79R-1	UA	user built road to disp camp	Reduce road densities	0.03
Unauthorized Road Decommission	3300000-11.83R-1	UA	user built road to disp camp	Reduce road densities	0.02
Unauthorized Road Decommission	3300000-12.05R-1	UA		Reduce road densities	0.66
Unauthorized Road Decommission	3300000-12.05R-2	UA	old road closed	Reduce road densities	0.25
Unauthorized Road Decommission	3300000-12.26R-1	UA	access to dispersed camp	Reduce road densities	0.05
Unauthorized Road Decommission	3300000-12.27R-1	UA		Reduce road densities	0.76
Unauthorized Road Decommission	3300000-12.27R-2	UA		Reduce road densities	0.28
Unauthorized Road Decommission	3300000-12.27R-4	UA		Reduce road densities	0.07
Unauthorized Road Decommission	3300000-12.27R-5	UA		Reduce road densities	0.01
Unauthorized Road Decommission	3300000-13.35R-2	UA	Traced over NAIP imagery 2020 CM	Reduce road densities	0.05
Unauthorized Road Decommission	3300000-13.35R-3	UA		Reduce road densities	0.06
Unauthorized Road Decommission	3300000-13.35R-4	UA		Reduce road densities	0.05
Unauthorized Road Decommission	3300000-2.30R-1	UA	old road closed light vegetation	Reduce road densities	1.26
Unauthorized Road Decommission	3300000-3.81L-1	UA		Reduce road densities	0.03
Unauthorized Road Decommission	3300000-9.38R-1	UA	old road vegetated closed	Reduce road densities	0.30
Unauthorized Road Decommission	3300111-0.14R-1	UA	Old road	Reduce road densities	0.09
Unauthorized Road Decommission	3300111-0.70L-1	UA	open road vegetated	Reduce road densities	0.47
Unauthorized Road Decommission	3300112-0.12R-1	UA		Reduce road densities	0.08
Unauthorized Road Decommission	3300118-1.50R-1	UA		Reduce road densities	0.12
Unauthorized Road Decommission	3300119-0.58L-2	UA		Reduce road densities	0.08

Unauthorized Road Decommission	3300119-0.58L-3	UA	dispersed camp spur	Reduce road densities	0.01
Unauthorized Road Decommission	3300119-0.63R-1	UA	old road open	Reduce road densities	0.05
Unauthorized Road Decommission	3300122-0.62L-1	UA	old road closed bermed vegetated	Reduce road densities	0.18
Unauthorized Road Decommission	3300122-0.62R-1	UA		Reduce road densities	0.16
Unauthorized Road Decommission	3300122-1.21L-1	UA	3300 251 open road 4x4	Reduce road densities	0.31
Unauthorized Road Decommission	3300122-1.21L-3	UA	user built 4x4 trail to dispersed camp	Reduce road densities	0.05
Unauthorized Road Decommission	3300128-1.5L-1	UA		Reduce road densities	0.53
Unauthorized Road Decommission	3300133-0.57L-2	UA	dispersed camp road	Reduce road densities	0.02
Unauthorized Road Decommission	3300133-0.66R-1	UA	old road closed vegetated	Reduce road densities	0.81
Unauthorized Road Decommission	3300211-0.19R-1	UA	access to dispersed camp	Reduce road densities	0.02
Unauthorized Road Decommission	3300601-0.86L-1	UA		Reduce road densities	0.19
Unauthorized Road Decommission	3300620-0.36L-1	UA	road to gravel/rock pit	Reduce road densities	0.07
Unauthorized Road Decommission	3300621-0.43L-1	UA	old road closed vegetated	Reduce road densities	0.79
Unauthorized Road Decommission	3330000-1.76L-1	UA	old road closed	Reduce road densities	0.10
Unauthorized Road Decommission	3330000-5.03L-1	UA	spur road closed breached	Reduce road densities	0.03
Unauthorized Road Decommission	3330000-7.73L-1	UA		Reduce road densities	0.04
Unauthorized Road Decommission	3330000-7.83R-1	UA		Reduce road densities	0.26
Unauthorized Road Decommission	3330000-7.83R-3	UA		Reduce road densities	0.04
Unauthorized Road Decommission	3330000-7.83R-4	UA		Reduce road densities	0.11
Unauthorized Road Decommission	3330116-1.37L-1	UA	spur road to landing	Reduce road densities	0.03
Unauthorized Road Decommission	3330121-0.16L-2	UA	access to dispersed camp	Reduce road densities	0.02
Unauthorized Road Decommission	3330121-0.16L-3	UA	old road open	Reduce road densities	0.21
Unauthorized Road Decommission	3330124-0.69R-1	UA	user built open 3330-207 rutted	Reduce road densities	0.22
Unauthorized Road Decommission	3330127-0.41L-2	UA	user built open	Reduce road densities	0.05
Unauthorized Road Decommission	3330127-0.41R-1	UA		Reduce road densities	0.15
Unauthorized Road Decommission	3330127-2.23R-1	UA		Reduce road densities	0.03
Unauthorized Road Decommission	3330127-2.38L-1	UA		Reduce road densities	0.54
Unauthorized Road Decommission	3330127-2.42L-1	UA		Reduce road densities	0.05

Unauthorized Road Decommission	3330127-2.42L-2	UA	user built access around berm	Reduce road densities	0.02
Unauthorized Road Decommission	3330127-2.53R-1	UA	spur road open to dispersed camps	Reduce road densities	0.09
Unauthorized Road Decommission	3330127-2.53R-2	UA	access to dispersed camp	Reduce road densities	0.01
Unauthorized Road Decommission	3330127-2.57L-1	UA		Reduce road densities	0.20
Unauthorized Road Decommission	3330127-2.74L-1	UA		Reduce road densities	0.05
Unauthorized Road Decommission	3330128-0.26R-1	UA		Reduce road densities	0.05
Unauthorized Road Decommission	3330128-0.28L-1	UA	user built open	Reduce road densities	0.07
Unauthorized Road Decommission	3330128-0.31L-1	UA	user built open	Reduce road densities	0.06
Unauthorized Road Decommission	3330128-0.32L-1	UA	user built open	Reduce road densities	0.04
Unauthorized Road Decommission	3330203-0.42L-1	UA		Reduce road densities	0.12
Unauthorized Road Decommission	3330207-0.28R-1	UA	user built open	Reduce road densities	0.07
Unauthorized Road Decommission	3330601-0.25R-1	UA		Reduce road densities	0.32
Unauthorized Road Decommission	3330601-0.25R-2	UA	0ld road vegetated closed	Reduce road densities	0.15
Unauthorized Road Decommission	3330605-0.17L-1	UA	old road closed	Reduce road densities	0.36
Unauthorized Road Decommission	3330611-0.14R-1	UA		Reduce road densities	0.40
Unauthorized Road Decommission	3330801-0.25L-1	UA		Reduce road densities	0.07
Unauthorized Road Decommission	3330801-0.25L-1	UA		Reduce road densities	0.08
Unauthorized Road Decommission	3350000-10.8R-1	UA		Reduce road densities	0.07
Unauthorized Road Decommission	3350000-6.58L-1	UA		Reduce road densities	0.01
Unauthorized Road Decommission	3350000-7.33R-1	UA	road to dispersed	Reduce road densities	0.02
Unauthorized Road Decommission	3350000-7.78R-1	UA	user built access thru meadow	Reduce road densities	0.07
Unauthorized Road Decommission	3350000-7.78R-2	UA	user built access thru meadow	Reduce road densities	0.02
Unauthorized Road Decommission	3350000-8.94L-1	UA	old spur road	Reduce road densities	0.02
Unauthorized Road Decommission	3350000-9.05R-1	UA	old road closed	Reduce road densities	0.49
Unauthorized Road Decommission	3350000-9.10L-1	UA		Reduce road densities	0.10
Unauthorized Road Decommission	3350000-9.49L-1	UA	berm breach	Reduce road densities	0.04
Unauthorized Road Decommission	3350111-3.66L-1	UA		Reduce road densities	0.05
Unauthorized Road Decommission	3350113-0.34R-1	UA	spur road off 3350 113	Reduce road densities	0.04

Unauthorized Road Decommission	3350113-0.83R-1	UA		Reduce road densities	0.08
Unauthorized Road Decommission	3350119-0.41R-1	UA	old road closed vegetated	Reduce road densities	0.28
Unauthorized Road Decommission	3350122-0.08L-1	UA	3350 122 spur road closed	Reduce road densities	0.19
Unauthorized Road Decommission	3350122-0.13R-1	UA	old spur road off 3350 122	Reduce road densities	0.14
Unauthorized Road Decommission	3350122-0.17L-1	UA		Reduce road densities	0.43
Unauthorized Road Decommission	3350609-0.10L-1	UA	route to camp	Reduce road densities	0.03
Unauthorized Road Decommission	3350611-0.19L-1	UA	old road not used vegetated	Reduce road densities	0.21
Unauthorized Road Decommission	3350615-0.18R-1	UA		Reduce road densities	0.39
Unauthorized Road Decommission	3350615-0.18R-2	UA		Reduce road densities	0.15
Unauthorized Road Decommission	3350615-0.32R-1	UA		Reduce road densities	0.05
Unauthorized Road Decommission	3350615-0.77L-1	UA	user built trail to dispersed camp	Reduce road densities	0.04
Unauthorized Road Decommission	3350615-0.97L-1	UA	4x4 trail	Reduce road densities	0.14
Unauthorized Road Decommission	3350617-0.20R-1	UA		Reduce road densities	0.16
Unauthorized Road Decommission	3352000-0.07R-1	UA	old road closed bermed vegetated	Reduce road densities	0.07
Unauthorized Road Decommission	3352000-0.65L-1	UA	access road to plantation	Reduce road densities	0.07
Unauthorized Road Decommission	3352000-0.76L-1	UA		Reduce road densities	0.20
Unauthorized Road Decommission	3352000-0.79R-1	UA	road to dispersed camp	Reduce road densities	0.03
Unauthorized Road Decommission	3352000-0.81R-1	UA		Reduce road densities	0.23
Unauthorized Road Decommission	3352000-0.92R-1	UA		Reduce road densities	0.84
Unauthorized Road Decommission	3352000-0.92R-2	UA		Reduce road densities	0.05
Unauthorized Road Decommission	3352000-1.10L-1	UA		Reduce road densities	0.02
Unauthorized Road Decommission	3352000-1.69L-1	UA	old road vegetated not used	Reduce road densities	0.08
Unauthorized Road Decommission	3352000-1.86R-1	UA		Reduce road densities	0.02
Unauthorized Road Decommission	3352111-0.02L-1	UA		Reduce road densities	0.15
Unauthorized Road Decommission	3352111-0.02L-2	UA	user built spur road	Reduce road densities	0.02
Unauthorized Road Decommission	3352111-0.63L-1	UA	open road	Reduce road densities	0.20
Unauthorized Road Decommission	3352111-0.63R-1	UA		Reduce road densities	0.02
Unauthorized Road Decommission	4510123-0.10L-1	UA		Reduce road densities	0.35

Unauthorized Road Decommission	3300000-0.82L-1	UA	dispersed camp	Reduce road densities	0.03
Unauthorized Road Decommission	3300000-0.82L-2	UA	dispersed camp	Reduce road densities	0.02
Unauthorized Road Decommission	3300133-0.25L-1	UA	dispersed campsite	Reduce road densities	0.03
Unauthorized Road Decommission	3300133-0.25L-2	UA	dispersed camp road	Reduce road densities	0.02
Unauthorized Road Decommission	3300133-0.57L-1	UA	dispersed camp road	Reduce road densities	0.04
Unauthorized Road Decommission	3300620-0.43L-1	UA	3300-115 above landing/rock pit	Reduce road densities	0.21
Unauthorized Road Decommission	3330000-0.05L-1	UA	user built open	Reduce road densities	0.05
Unauthorized Road Decommission	3330000-0.18R-1	UA	road to dispersed camp	Reduce road densities	0.01
Unauthorized Road Decommission	3330119-1.02L-1	UA	road to dispersed camp	Reduce road densities	0.05
Unauthorized Road Decommission	3330127-0.19L-1	UA	3330-127 existing temp vegetated	Reduce road densities	0.37
Unauthorized Road Decommission	3330127-0.41L-1	UA		Reduce road densities	0.40
Unauthorized Road Decommission	3350000-10.35L-1	UA		Reduce road densities	0.48
Unauthorized Road Decommission	3350000-7.38L-1	UA	dispersed camp road	Reduce road densities	0.04
Unauthorized Road Decommission	3350000-7.72R-1	UA	old road	Reduce road densities	0.13
Unauthorized Road Decommission	3350000-8.93L-1	UA	dispersed camp road	Reduce road densities	0.03
Unauthorized Road Decommission	3350113-0.36R-1	UA	spur road off 3350 113	Reduce road densities	0.07
Unauthorized Road Decommission	3352000-0.19L-1	UA	dispersed camp rd and area	Reduce road densities	0.04
Unauthorized Road Decommission	3352000-0.19R-1	UA	old road closed vegetated	Reduce road densities	0.06
Unauthorized Road Decommission	3352000-0.81R-2	UA	road to dispersed camp	Reduce road densities	0.04
Road Closures	3120-119	2	Change to ML 1	Road Closure	0.51
Road Closures	3300-122	2	close and make ML-1 - pull culvert waterbar	reduce erosion and enhance wildlife	1.80
Road Closures	3300-122	2	be improved and managed as a gated ML-1	to improve hydrologic conditions and reduce sediment transport and delivery	1.30
Road Closures	3300-130	2	close and make ML-1 - pull culvert waterbar	reduce erosion and enhance wildlife	0.38
Road Closures	3300-133	2	close and make ML-1 - pull culvert waterbar	reduce erosion and enhance wildlife	3.47
Road Closures	3330-116	2	receive maintenance and be maintained as a gated ML-1 road.	improve hydrologic conditions and reduce sediment transport and delivery	2.36
Road Closures	3330-121	2	close and make ML-1 - pull culvert waterbar hydrologically stable	improve hydrologic conditions and reduce sediment delivery, reduce erosion and enhance wildlife	0.90

Road Closures	3330-207	2	close and make ML-1 - pull culvert waterbar	reduce erosion and enhance wildlife	0.50
Road Closures	3330-123	2	Change to ML 1	Road Closure	0.90
Road Closures	3330-127	2	Change to ML 1	Road Closure	1.11
Road Closures	3330-203	2	Change to ML 1	Road Closure	0.30
Road Closures	3350-113	2	Change to ML 1	Road Closure	1.40
Road Reroute	3300	0	new road (rerouted) to access Taneum Campground	Improve hydrologic function - reroute roads crossing and within RR for Taneum Creek	0.20
Road Reroute	3300-207	2	road reconstructed	Improve access and reduce erosion	0.20
Road Reroute	3322		road reconstructed	Improve access and reduce erosion	0.30
Road to Trail Conversion	3300-211	2	road to trail conversion - Hoyt Area	To access new trail bridge over South Fork	0.81
Decommission UA Trails	Unauthorized trail loop across Taneum Creek from Icewater Campground	TR	decommission unauthorized trails	Improve riparian habitat	0.30
New Trail Construction	1347/Hoyt Trail	TR	Construct - In South Fork crossing area, new bridge and trail to access it.	Access new trail bridge	0.10
System Trail Re-route	1377 North Fork Trail	TR	re-route existing trail - short relocations	move them out of the floodplain, resolve erosion problems, or make the trail sustainable.	0.70
System Trail Re-route	1363 Taneum Ridge Tie to Road 3300-000	TR	re-route existing trail - short relocations	move them out of the floodplain, resolve erosion problems, or make the trail sustainable.	0.30
System Trail Re-route	1347 Hoyt Mining	TR	re-route existing trail - short relocations	move them out of the floodplain, resolve erosion problems, or make the trail sustainable.	0.90
System Trail Re-route	1363 Taneum Ridge	TR	re-route existing trail - short relocations	move them out of the floodplain, resolve erosion problems, or make the trail sustainable.	0.20
System Trail Re-route	1378 Fishhook Flat	TR	re-route existing trail - short relocations	move them out of the floodplain, resolve erosion problems, or make the trail sustainable.	0.20
System Trail Re-route	1366 Frost Mountain	TR	re-route existing trail - short relocations	move them out of the floodplain, resolve erosion problems, or make the trail sustainable.	0.10
System Trail Re-route	1326 Cle Elum Ridge	TR	re-route existing trail - short relocations	move them out of the floodplain, resolve erosion problems, or make the trail sustainable.	0.10

APPENDIX D – NORTH FORK TANEUM BRIDGE REPAIR PLANS

POST SCHEDULE

NORTHEAST SUBSTRUCTURE			SOUTHWEST SUBSTRUCTURE		
POST #	NOTE**	HEIGHT*	POST #	NOTE**	HEIGHT*
P01	REINFORCE WW POST	13'	P11	REINFORCE WW POST	13'
P02	REINFORCE WW POST	15'	P12	REINFORCE WW POST	15'
P03	REINFORCE WW POST	16'	P13	REINFORCE WW POST	16'
P04	REINFORCE AB POST	13'	P14	DO NOT DISTURB	N/A
P05	DO NOT DISTURB	N/A	P15	DO NOT DISTURB	N/A
P06	DO NOT DISTURB	N/A	P16	DO NOT DISTURB	N/A
P07	REINFORCE AB POST	13'	P17	DO NOT DISTURB	N/A
P08	REINFORCE WW POST; REPLACE MISSING TIE ROD	16'	P18	REINFORCE WW POST	16'
P09	REINFORCE WW POST	15'	P19	REINFORCE WW POST; REPLACE MISSING TIE ROD	15'
P10	REINFORCE WW POST	13'	P20	REINFORCE WW POST	13'

*LENGTHS WERE CONSERVATIVELY APPROXIMATED FROM SCALING DRAWINGS. CONTRACTOR SHOULD EXPECT TO FIELD CUT NEW REINFORCING POSTS TO FIELD VERIFIED LENGTHS, PRE–DRILL HOLES AS NEEDED AND ACCOUNT FOR IT IN THEIR BID PRICE AS PART OF 55706. FURNISHING & INSTALLING TIE–RODS, ANGLES, CHANNELS, LAG BOLTS, STITCH BOLTS AND OTHER CONNECTION HARDWARE AS INDICATED ARE FOR PAY ITEM 55706. COST FOR FURNISHING POSTS SHALL BE ACCOUNTED FOR IN CONTRACTOR'S BID PRICE FOR PAY ITEM 55704A OR 55704B (AS APPROPRIATE)

**AB – ABUTMENT; WW – WINGWALL; # – NUMBER

GENERAL NOTES:

DESIGN

1. ORIGINAL DESIGN IN ACCORDANCE WITH ALLOWABLE STRESS DESIGN. REPAIR IN ACCORDANCE WITH AASHTO STANDARD SPECIFICATIONS 17TH EDITION. CONSTRUCT IN ACCORDANCE WITH FEDERAL PROCUREMENT SPECIFICATIONS FOR ROADS AND BRIDGES, FP–14.

TIMBER AND LUMBER MATERIAL:

1. ALL TIMBER AND LUMBER SHALL BE OF PORT ORFORD CEDAR OR ALASKAN YELLOW CEDAR; GRADE NO. 2 OR BETTER, ACCORDING TO THE CURRENT WWPA GRADING RULES FOR WESTERN LUMBER OR CURRENT WCLIB STANDARD GRADING FOR WEST COAST LUMBER.

STEEL AND HARDWARE MATERIAL:

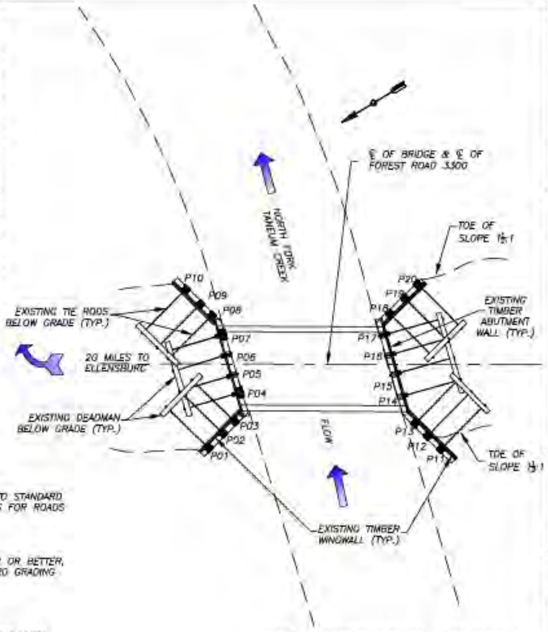
1. ALL STEEL SECTIONS SHALL CONFORM TO ASTM A572, GRADE A AND SHALL REMAIN UNCOATED.
2. BOLTS SHALL CONFORM TO ASTM A307, GRADE A, AND SHALL BE GALVANIZED IN ACCORDANCE WITH AASHTO M232.
3. NUTS SHALL CONFORM TO ASTM A563, AND SHALL BE GALVANIZED IN ACCORDANCE WITH AASHTO M232.
4. WASHERS SHALL CONFORM TO ASTM A47 AND SHALL BE MALLEABLE IRON WHEN USED AGAINST WOOD.

LAG BOLT INSTALLATION:

1. PREBORE LAG BOLT HOLES USING TWO DIAMETERS, ONE FOR THE SHANK AND ONE FOR THE THREADS. THE LEAD HOLE FOR THE SHANK IS TO BE 1/16" LARGER THAN THE SHANK DIAMETER AND IS TO BE BORED TO THE DEPTH OF PENETRATION OF THE SHANK. THE LEAD HOLE FOR THE THREADED PORTION IS TO BE 70% OF THE BOLT DIAMETER AS SHOWN ON THE PLANS AND IS TO BE BORED AT LEAST TO THE LENGTH OF THE THREADS. DO NOT DRIVE LAG BOLTS WITH A HAMMER.

DISPOSAL:

1. ALL REMOVED MATERIAL AND REMAINS FROM WORK SHALL BE DISPOSED OF OFF GOVERNMENT LANDS IN ACCORDANCE WITH EXISTING LOCAL, STATE AND FEDERAL REGULATIONS. DO NOT CUT TREATED TIMBER.



POST STRENGTHENING KEY PLAN

Scale: 1/16" = 1'–0"

ABBREVIATIONS:

AC = ASPHALT CONCRETE
DBH = DIAMETER BREAST HEIGHT
FT – FOOT/FEET
GAL – GALLON(S)
HMA = HOT MIX ASPHALT
MIN – MINIMUM
MP – MILE POST
LB/LBS = POUND/POUNDS
PI = PAY ITEM
SY – SQUARE YARD
TYP – TYPICAL
USFS = UNITED STATES FOREST SERVICE
WSDOT – WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

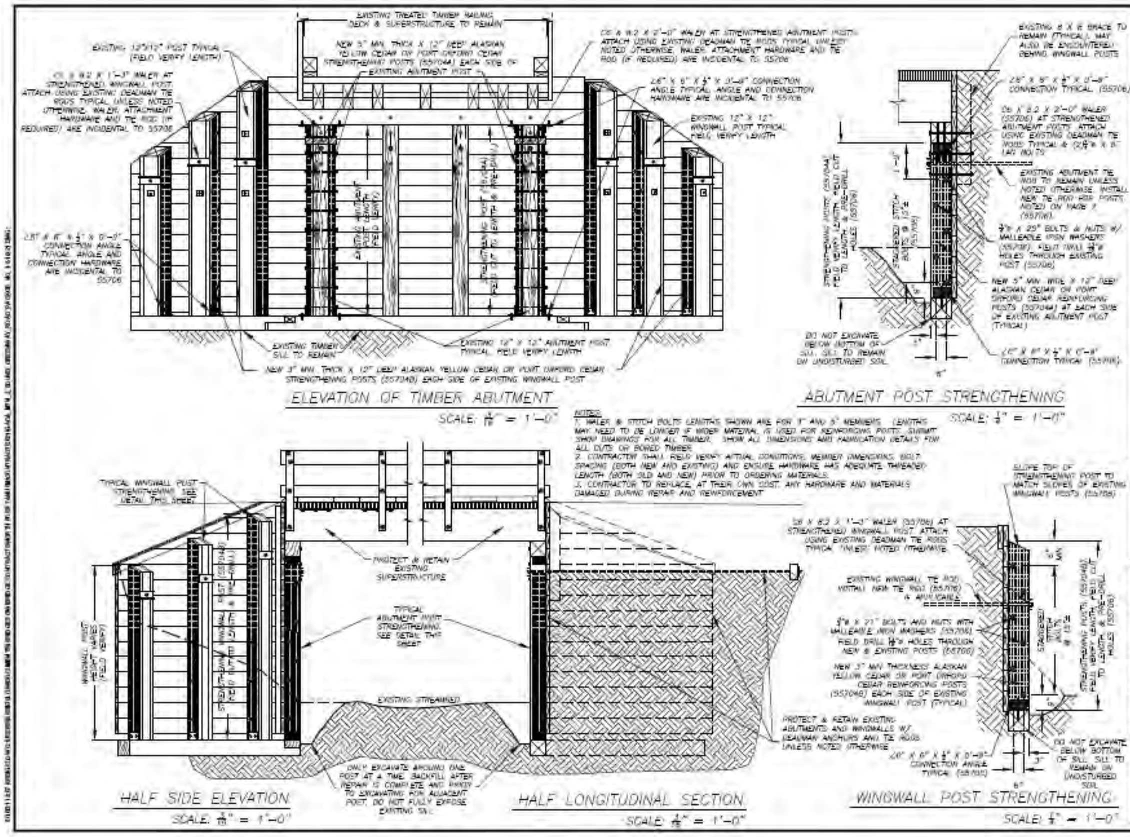
USDA
United States Department of Agriculture
Forest Service

(R6)
PACIFIC NORTHWEST REGION

PROJECT NAME
GAOA MTN TO SOUND GREENWAY - HERITAGE AREA - ROAD IMPROVEMENTS PACKAGE NO 1
OKANOGAN-WENATCHEE NATIONAL FOREST
CLE ELUM RANGER DISTRICT

DRAWING TITLE
POST REINFORCEMENT KEY PLAN

DATE
01/20/2021
ARCHIVE NO.
DESIGNER
K.BIGELOW
DRAWN
K.BIGELOW
CHECKED
K. BARBER
PROJECT NO.
DWG SHEET NO.
7
SHEET 7 OF 22



NOTES:

1. WALER & STITCH BOLTS LENGTHS SHOWN ARE FOR 3" AND 5" MEMBERS. LENGTHS MAY NEED TO BE LONGER IF WIDER MATERIAL IS USED FOR REINFORCING POSTS. SUBMIT SHOP DRAWINGS FOR ALL TIMBER. SHOW ALL DIMENSIONS AND FABRICATION DETAILS FOR ALL CUTS OR BORED TIMBER.
2. CONTRACTOR SHALL FIELD VERIFY ACTUAL CONDITIONS, MEMBER DIMENSIONS, BOLT SPACING (BOTH NEW AND EXISTING) AND ENSURE HARDWARE HAS ADEQUATE THREADED LENGTH (BOTH OLD AND NEW) PRIOR TO ORDERING MATERIALS.
3. CONTRACTOR TO REPLACE, AT THEIR OWN COST, ANY HARDWARE AND MATERIALS DAMAGED DURING REPAIR AND REINFORCEMENT.

USDA
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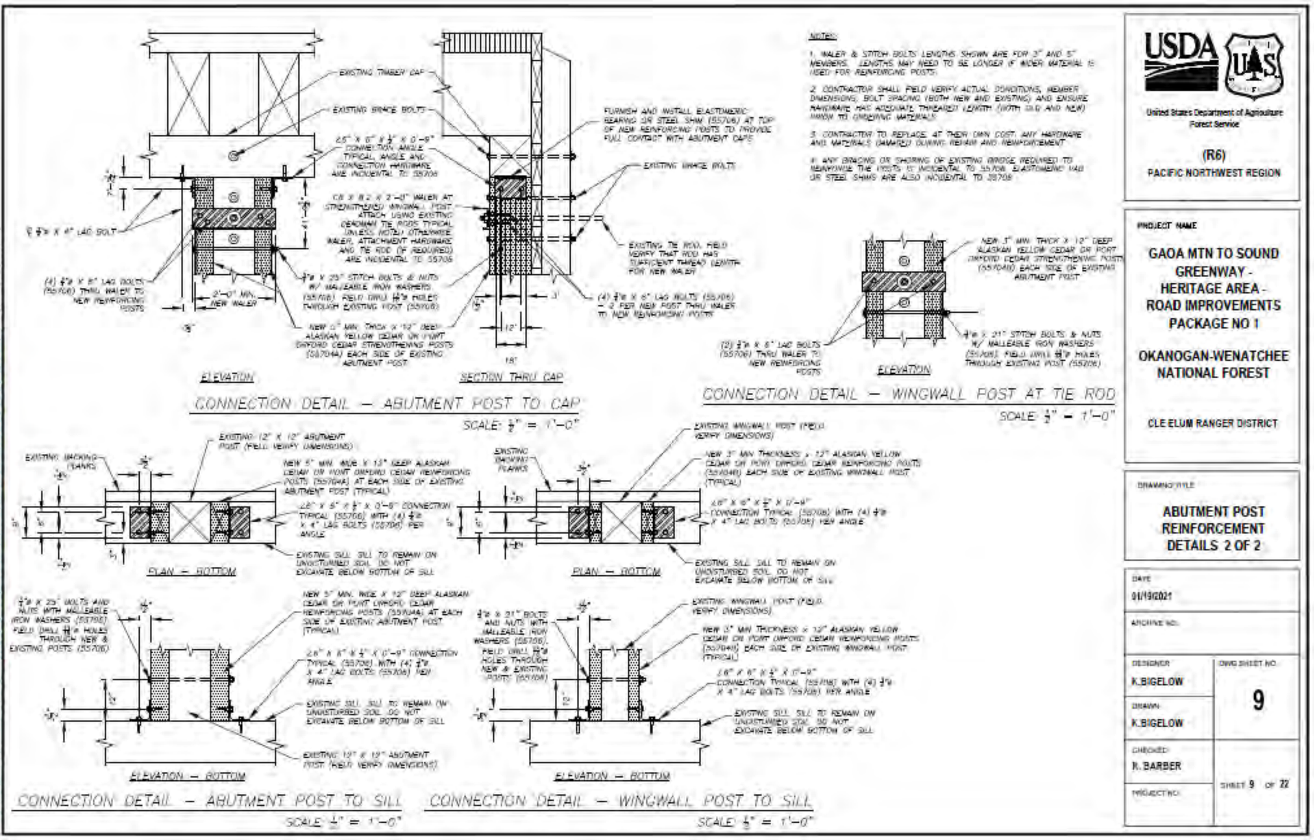
(R6)
PACIFIC NORTHWEST REGION

PROJECT NAME
GAOA MTN TO SOUND GREENWAY - HERITAGE AREA - ROAD IMPROVEMENTS PACKAGE NO 1
OKANOGAN-WENATCHEE NATIONAL FOREST
CLE ELUM RANGER DISTRICT

DRAWING TITLE
ABUTMENT POST REINFORCEMENT DETAILS 1 OF 2

DATE
01/19/2021
ARCHIVE NO.
DESIGNER
K.BIGELOW
DRAWN
K.BIGELOW
CHECKED
K. BARBER
PROJECT NO.
DWG SHEET NO.
8
SHEET 8 OF 22



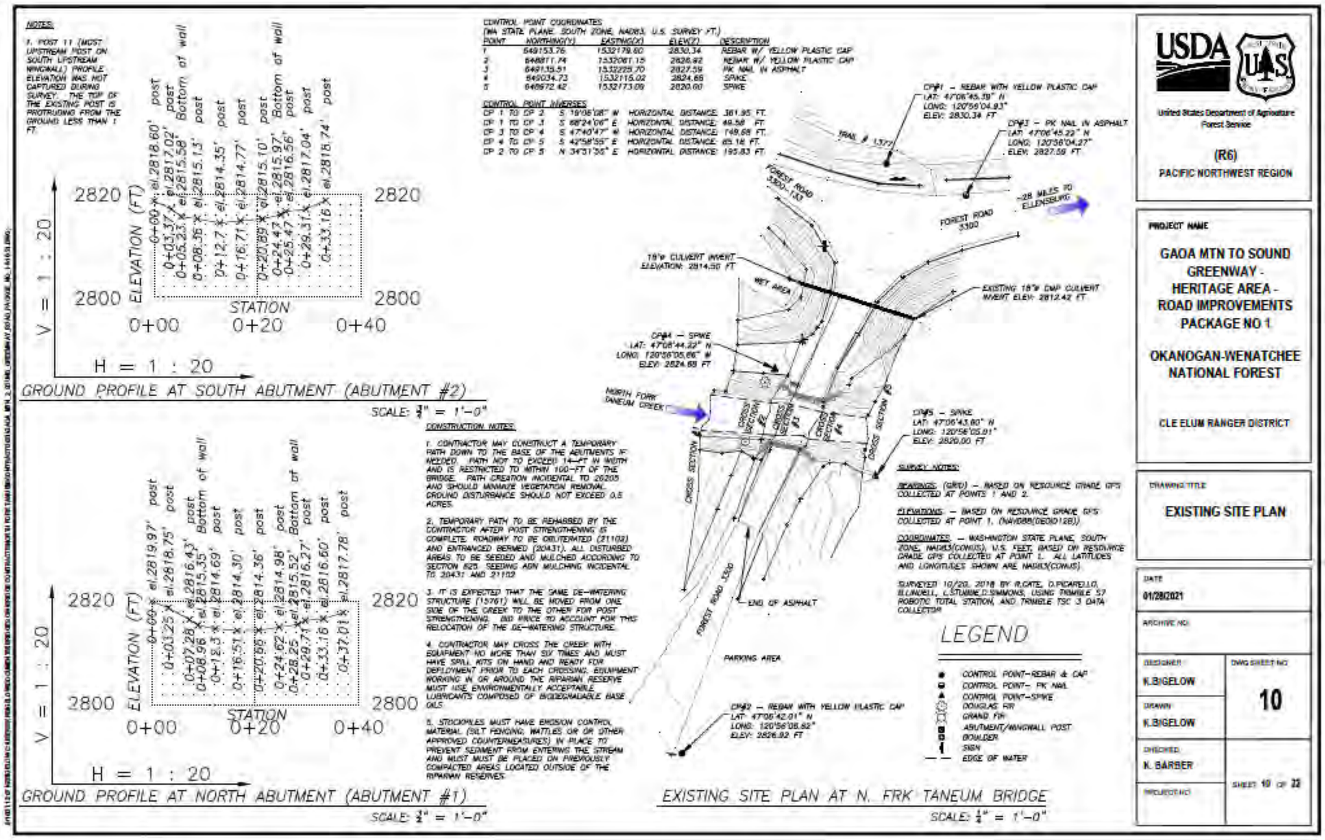
NOTES:

1. WALER & STITCH BOLTS LENGTHS SHOWN ARE FOR 3" AND 5" MEMBERS. LENGTHS MAY NEED TO BE LONGER IF WIDER MATERIAL IS USED FOR REINFORCING POSTS.

2. CONTRACTOR SHALL FIELD VERIFY ACTUAL CONDITIONS, MEMBER DIMENSIONS, BOLT SPACING (BOTH NEW AND EXISTING) AND ENSURE HARDWARE HAS ADEQUATE THREADED LENGTH (BOTH OLD AND NEW) PRIOR TO ORDERING MATERIALS.

3. CONTRACTOR TO REPLACE, AT THEIR OWN COST, ANY HARDWARE AND MATERIALS DAMAGED DURING REPAIR AND REINFORCEMENT.

4. ANY BRACING OR SHORING OF EXISTING BRIDGE REQUIRED TO REINFORCE THE POSTS IS INCIDENTAL TO 55706. ELASTOMERIC PAD OR STEEL SHIMS ARE ALSO INCIDENTAL TO 55706.



NOTES:

1. POST 11 (MOST UPSTREAM POST ON SOUTH UPSTREAM WINGWALL) PROFILE ELEVATION WAS NOT CAPTURED DURING SURVEY. THE TOP OF THE EXISTING POST IS PROTRUDING FROM THE GROUND LESS THAN 1 FT.

CONTROL POINT COORDINATES
(WA STATE PLANE, SOUTH ZONE, NAD83, U.S. SURVEY FT.)

POINT	NORTHING(Y)	EASTING(X)	ELEV(Z)	DESCRIPTION
1	649153.76	1532179.60	2830.34	REBAR W/ YELLOW PLASTIC CAP
2	648811.74	1532061.15	2826.92	REBAR W/ YELLOW PLASTIC CAP
3	649135.51	1532225.70	2827.59	PK NAIL IN ASPHALT
4	649034.73	1532115.02	2824.65	SPIKE
5	648972.42	1532173.09	2820.00	SPIKE

CONTROL POINT INVERSES

CP 1 TO CP 2	S 19°06'08" W	HORIZONTAL DISTANCE:	361.95 FT.
CP 1 TO CP 3	S 68°24'06" E	HORIZONTAL DISTANCE:	49.58 FT.
CP 3 TO CP 4	S 47°40'47" W	HORIZONTAL DISTANCE:	149.68 FT.
CP 4 TO CP 5	S 42°58'55" E	HORIZONTAL DISTANCE:	85.18 FT.
CP 2 TO CP 5	N 34°51'35" E	HORIZONTAL DISTANCE:	195.83 FT.

CONSTRUCTION NOTES:

1. CONTRACTOR MAY CONSTRUCT A TEMPORARY PATH DOWN TO THE BASE OF THE ABUTMENTS IF NEEDED. PATH NOT TO EXCEED 14–FT IN WIDTH AND IS RESTRICTED TO WITHIN 100–FT OF THE BRIDGE. PATH CREATION INCIDENTAL TO 20205 AND SHOULD MINIMIZE VEGETATION REMOVAL. GROUND DISTURBANCE SHOULD NOT EXCEED 0.5 ACRES.

2. TEMPORARY PATH TO BE REHABBED BY THE CONTRACTOR AFTER POST STRENGTHENING IS COMPLETE. ROADWAY TO BE OBLITERATED (21102) AND ENTRANCED BERMED (20431). ALL DISTURBED AREAS TO BE SEEDED AND MULCHED ACCORDING TO SECTION 625. SEEDING AON MULCHING INCIDENTAL TO 20431 AND 21102.

3. IT IS EXPECTED THAT THE SAME DE–WATERING STRUCTURE (15761) WILL BE MOVED FROM ONE SIDE OF THE CREEK TO THE OTHER FOR POST STRENGTHENING. BID PRICE TO ACCOUNT FOR THIS RELOCATION OF THE DE–WATERING STRUCTURE.

4. CONTRACTOR MAY CROSS THE CREEK WITH EQUIPMENT NO MORE THAN SIX TIMES AND MUST HAVE SPILL KITS ON HAND AND READY FOR DEPLOYMENT PRIOR TO EACH CROSSING. EQUIPMENT WORKING IN OR AROUND THE RIPARIAN RESERVE MUST USE ENVIRONMENTALLY ACCEPTABLE LUBRICANTS COMPOSED OF BIODEGRADABLE BASE OILS.

5. STOCKPILES MUST HAVE EROSION CONTROL MATERIAL (SILT FENCING, WATTLES OR OR OTHER APPROVED COUNTERMEASURES) IN PLACE TO PREVENT SEDIMENT FROM ENTERING THE STREAM AND MUST MUST BE PLACED ON PREVIOUSLY COMPACTED AREAS LOCATED OUTSIDE OF THE RIPARIAN RESERVES.

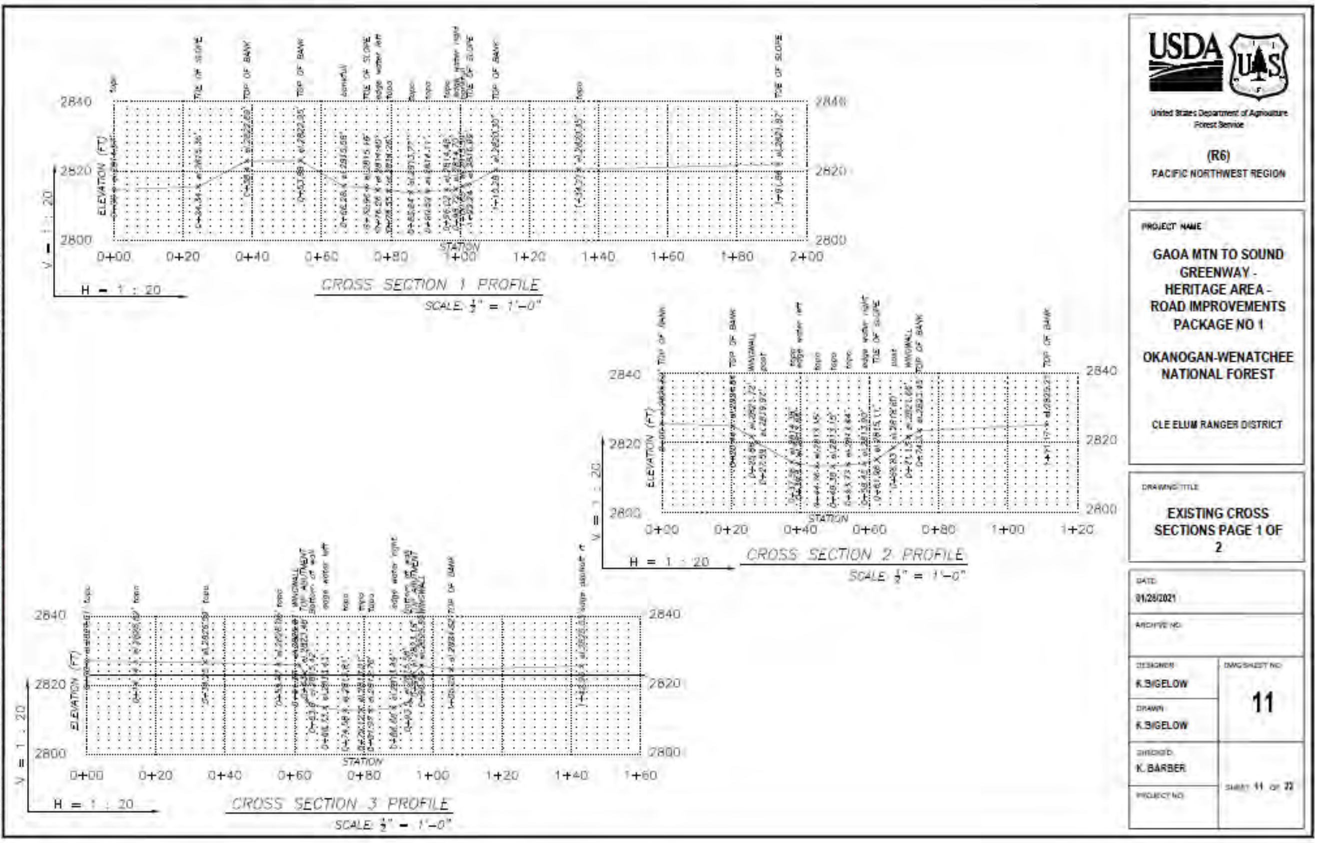
SURVEY NOTES:

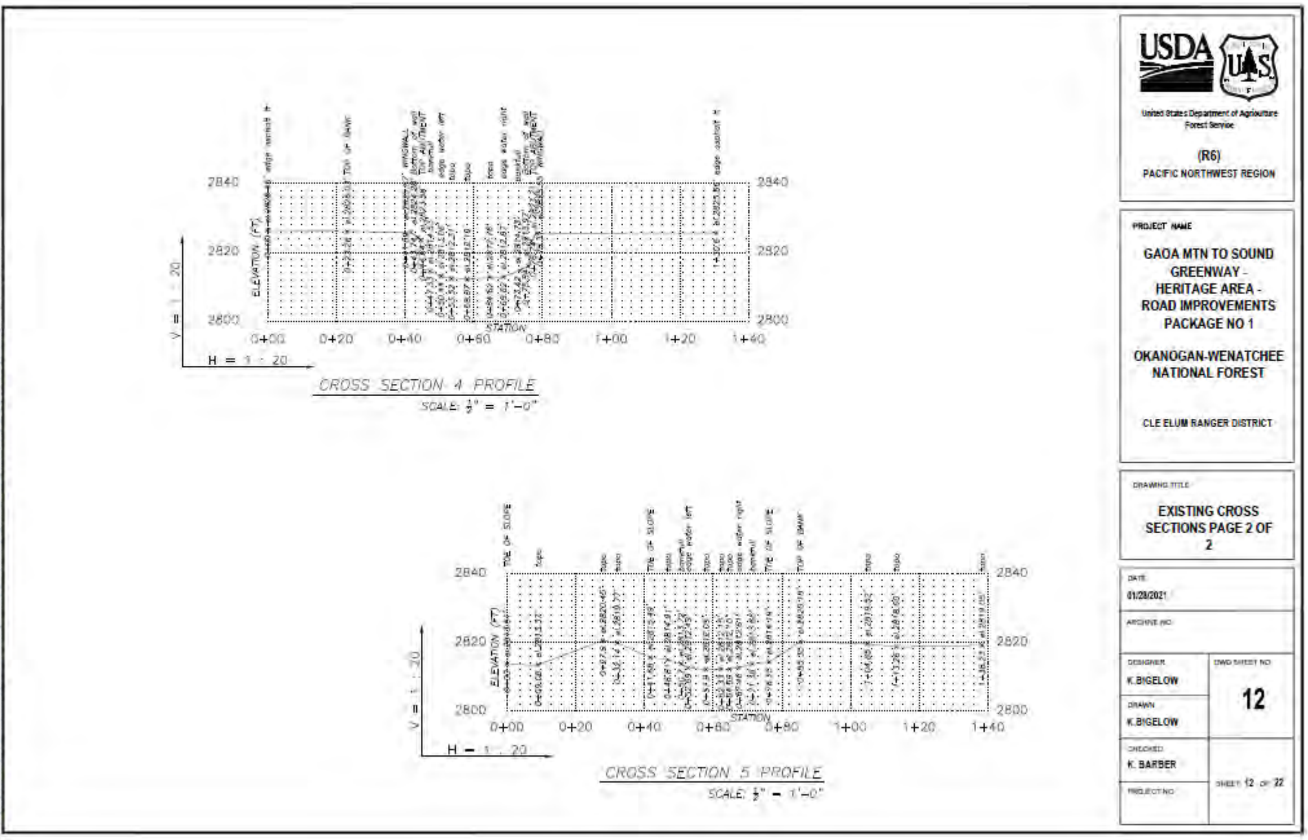
BEARINGS: (GRID) – BASED ON RESOURCE GRADE GPS COLLECTED AT POINTS 1 AND 2.

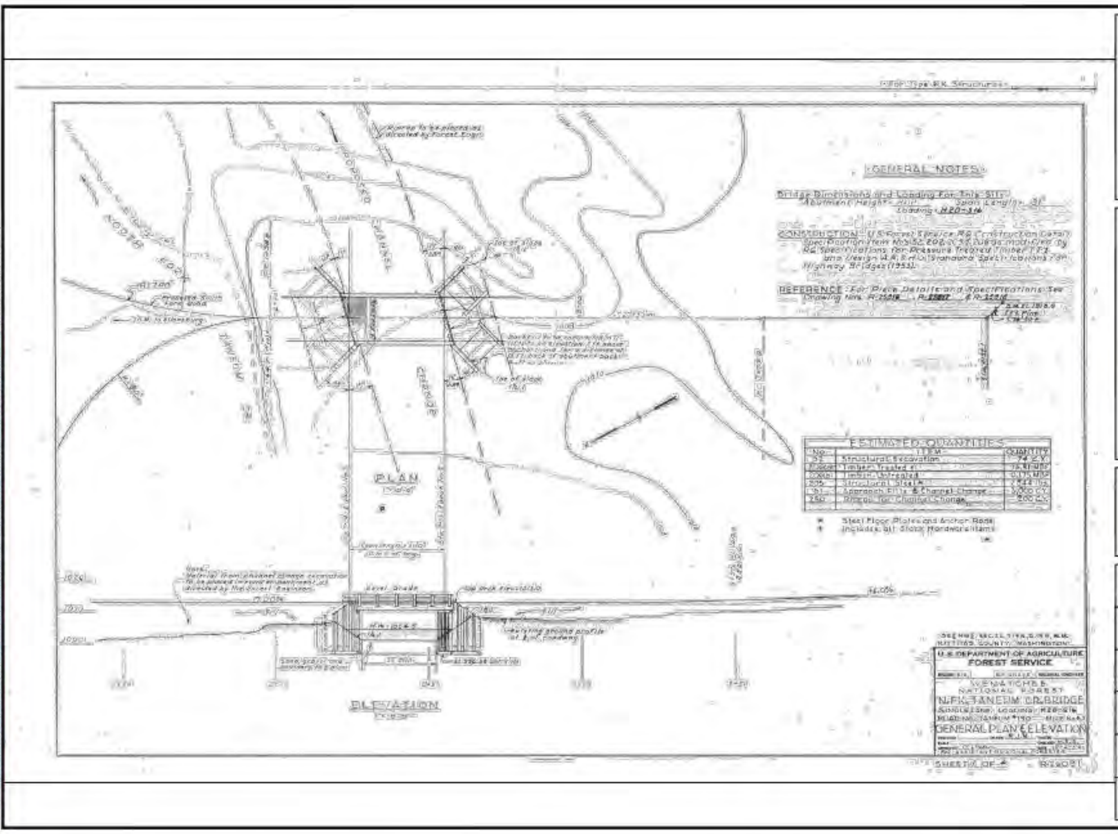
ELEVATIONS: – BASED ON RESOURCE GRADE GPS COLLECTED AT POINT 1. (NAVD88(GEOID12B))

COORDINATES: – WASHINGTON STATE PLANE, SOUTH ZONE, NAD83(CONUS), U.S. FEET, BASED ON RESOURCE GRADE GPS COLLECTED AT POINT 1. ALL LATITUDES AND LONGITUDES SHOWN ARE NAD83(CONUS).

SURVEYED 10/20, 2018 BY R.CATE, D.PICARELLO, B.LINDELL, L.STUBBE,D.SIMMONS, USING TRIMBLE S7 ROBOTIC TOTAL STATION, AND TRIMBLE TSC 3 DATA COLLECTOR.


CROSS SECTION 1 PROFILE
SCALE: ½" = 1'–0"
CROSS SECTION 2 PROFILE
SCALE: ½" = 1'–0"
CROSS SECTION 3 PROFILE
SCALE: ½" = 1'–0"
ELEVATION (FT)
STATION
V = 1 : 20
H = 1 : 20
2840
2820
2800
0+00
0+20
0+40
0+60
0+80
1+00
1+20
1+40
1+60
1+80
2+00
TOE OF SLOPE
TOP OF BANK
topo
edge water left
edge water right
WINGWALL
TOP ABUTMENT
edge asphalt rt
USDA
United States Department of Agriculture Forest Service
(R6)
PACIFIC NORTHWEST REGION
PROJECT NAME
GAOA MTN TO SOUND GREENWAY - HERITAGE AREA - ROAD IMPROVEMENTS PACKAGE NO 1
OKANOGAN-WENATCHEE NATIONAL FOREST
CLE ELUM RANGER DISTRICT
DRAWING TITLE
EXISTING CROSS SECTIONS PAGE 1 OF 2
DATE
01/28/2021
ARCHIVE NO.
DESIGNER
K.BIGELOW
DRAWN
K.BIGELOW
CHECKED
K. BARBER
PROJECT NO.
DWG SHEET NO.
11
SHEET 11 OF 22


CROSS SECTION 4 PROFILE
SCALE: ½" = 1'–0"
CROSS SECTION 5 PROFILE
SCALE: ½" = 1'–0"
ELEVATION (FT)
STATION
V = 1 : 20
H = 1 : 20
2840
2820
2800
0+00
0+20
0+40
0+60
0+80
1+00
1+20
1+40
TOE OF SLOPE
TOP OF BANK
topo
edge water left
edge water right
WINGWALL
TOP ABUTMENT
edge asphalt rt
USDA
United States Department of Agriculture Forest Service
(R6)
PACIFIC NORTHWEST REGION
PROJECT NAME
GAOA MTN TO SOUND GREENWAY - HERITAGE AREA - ROAD IMPROVEMENTS PACKAGE NO 1
OKANOGAN-WENATCHEE NATIONAL FOREST
CLE ELUM RANGER DISTRICT
DRAWING TITLE
EXISTING CROSS SECTIONS PAGE 2 OF 2
DATE
01/28/2021
ARCHIVE NO.
DESIGNER
K.BIGELOW
DRAWN
K.BIGELOW
CHECKED
K. BARBER
PROJECT NO.
DWG SHEET NO.
12
SHEET 12 OF 22



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OKANOGAN-WENATCHEE NATIONAL FOREST

CLE ELUM RANGER DISTRICT

DRAWING TITLE

EXISTING BRIDGE PLAN AND ELEVATION FOR REFERENCE

DATE 01/20/2021

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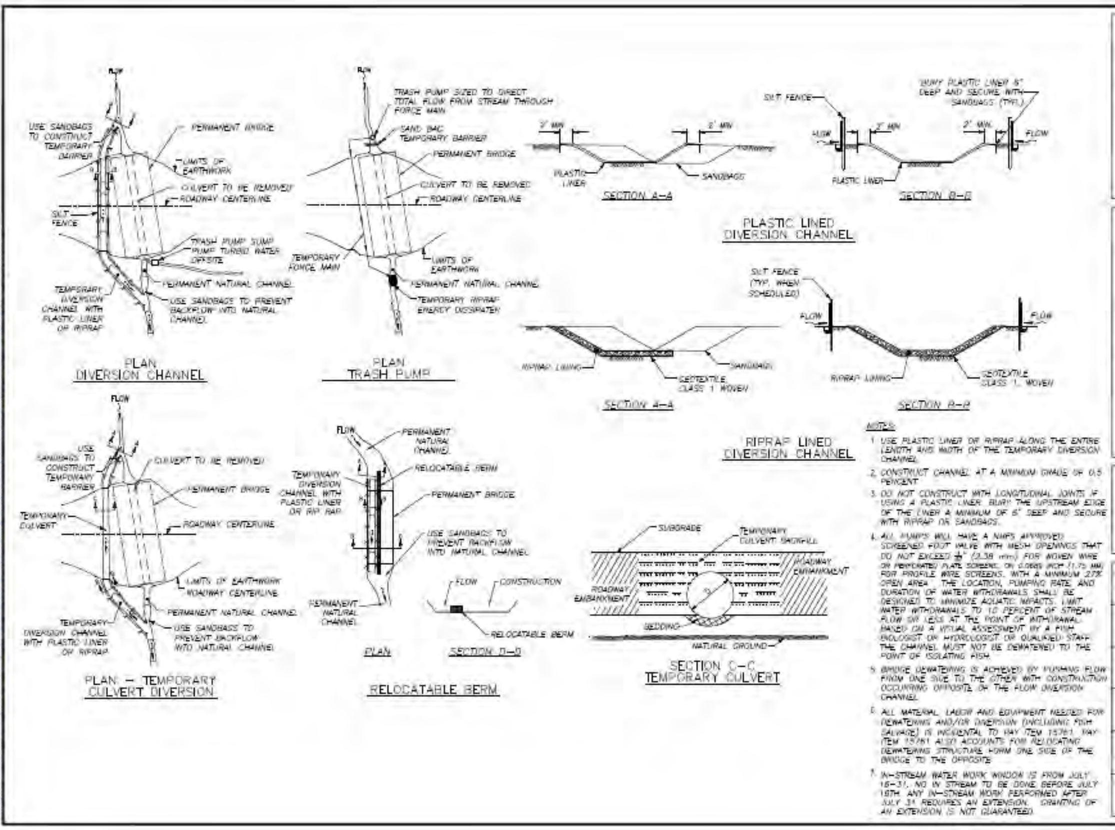
DWG SHEET NO. 13

SHEET 13 OF 22



NOTES:

1. USE PLASTIC LINER OR RIPRAP ALONG THE ENTIRE LENGTH AND WIDTH OF THE TEMPORARY DIVERSION CHANNEL.
2. CONSTRUCT CHANNEL AT A MINIMUM GRADE OF 0.5 PERCENT.
3. DO NOT CONSTRUCT WITH LONGITUDINAL JOINTS IF USING A PLASTIC LINER. BURY THE UPSTREAM EDGE OF THE LINER A MINIMUM OF 6" DEEP AND SECURE WITH RIPRAP OR SANDBAGS.
4. ALL PUMPS WILL HAVE A NMFS APPROVED SCREENED FOOT VALVE WITH MESH OPENINGS THAT DO NOT EXCEED $\frac{3}{32}$" (2.38 mm) FOR WOVEN WIRE OR PERFORATED PLATE SCREENS, OR 0.0689 INCH (1.75 MM) FOR PROFILE WIRE SCREENS, WITH A MINIMUM 27% OPEN AREA. THE LOCATION, PUMPING RATE, AND DURATION OF WATER WITHDRAWALS SHALL BE DESIGNED TO MINIMIZE AQUATIC IMPACTS. LIMIT WATER WITHDRAWALS TO 10 PERCENT OF STREAM FLOW OR LESS AT THE POINT OF WITHDRAWAL BASED ON A VISUAL ASSESSMENT BY A FISH BIOLOGIST OR HYDROLOGIST OR QUALIFIED STAFF. THE CHANNEL MUST NOT BE DEWATERED TO THE POINT OF ISOLATING FISH.
5. BRIDGE DEWATERING IS ACHIEVED BY PUSHING FLOW FROM ONE SIDE TO THE OTHER WITH CONSTRUCTION OCCURRING OPPOSITE OF THE FLOW DIVERSION CHANNEL.
6. ALL MATERIAL, LABOR AND EQUIPMENT NEEDED FOR DEWATERING AND/OR DIVERSION (INCLUDING FISH SALVAGE) IS INCIDENTAL TO PAY ITEM 15761. PAY ITEM 15761 ALSO ACCOUNTS FOR RELOCATING DEWATERING STRUCTURE FORM ONE SIDE OF THE BRIDGE TO THE OPPOSITE.
7. IN-STREAM WATER WORK WINDOW IS FROM JULY 16-31. NO IN STREAM TO BE DONE BEFORE JULY 15TH. ANY IN-STREAM WORK PERFORMED AFTER JULY 31 REQUIRES AN EXTENSION. GRANTING OF AN EXTENSION IS NOT GUARANTEED.

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DE-WATERING DETAILS

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DWG SHEET NO. 14

SHEET 14 OF 22

APPENDIX E – SMALL COMPLEX PATCHES

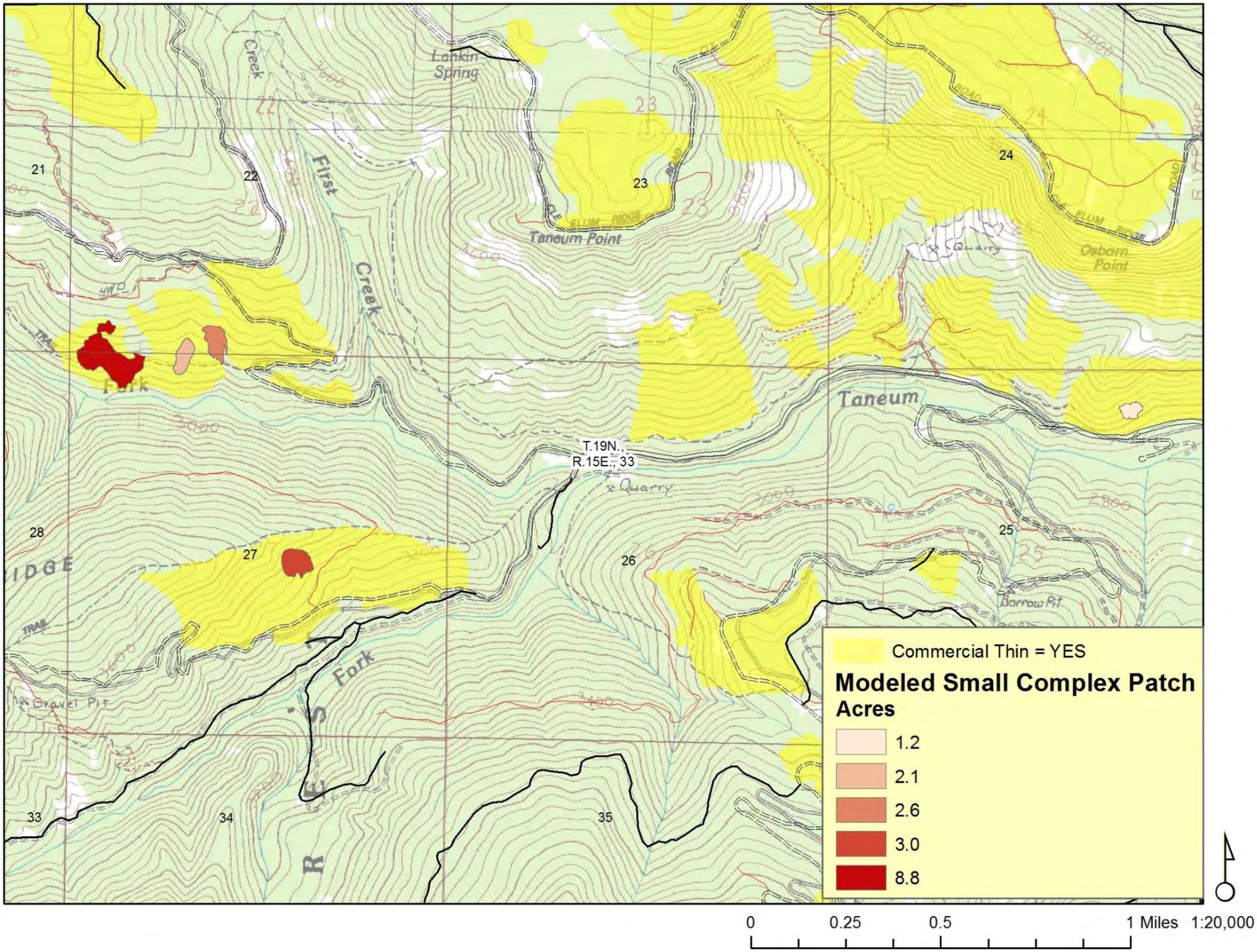

Figure 83. Small complex patches ≥ 1-acre in commercial thin units as identified with a LiDAR canopy height model and Sovern et al. (2019) methodology.