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North Clack Integrated Resource Project

Botany Biological Evaluation and Specialist Report

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for:
Clackamas River Ranger District
Mt. Hood National Forest

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BIOLOGICAL EVALUATION – For Federally Listed and Proposed Species and for Sensitive Species on the Region 6 Regional Forester and OR/WA State Director Special Status Species List

INTRODUCTION

Section 7 of the Endangered Species Act of 1973 provides the legal framework for the management of federally listed (i.e., threatened or endangered) species and for species proposed for federal listing. It "directs federal departments and agencies to ensure that actions authorized, funded, or carried out by them are not likely to jeopardize the continued existence of any threatened or endangered species or result in the destruction or adverse modification of their critical habitats" (FSM 2670.11, September 2005). The Act also requires federal agencies to consult with the Secretary of Interior (for non- marine species) or the Secretary of Commerce (for marine species) "whenever an action is likely to jeopardize the continued existence of any species *proposed* for listing as threatened or endangered, or whenever an action might result in destruction or adverse modification of critical habitat *proposed* for listing (16 U.S.C. 1536(a)4)" (FSM 2670.11).

A biological evaluation reviews "all Forest Service planned, funded, executed, or permitted programs and activities for possible effects on endangered, threatened, proposed, or sensitive species" and documents the findings (FSM 2672.4, July 2009). Its objectives are "(1) to ensure that Forest Service actions do not contribute to the loss of viability of any native or desired non-native plant or contribute to animal species or trends toward Federal listing of any species; (2) to comply with the requirements of the Endangered Species Act that actions of Federal agencies not jeopardize or adversely modify critical habitat of Federally listed species; and (3) to provide a process and standard by which to ensure that threatened, endangered, proposed, and sensitive species receive full consideration in the decisionmaking process" (FSM 2672.41). A biological evaluation must include the following (FSM 2672.42):

1. An identification of all listed, proposed, and sensitive species known or expected to be in the project area or that the project potentially affects.
2. An identification and description of all occupied and unoccupied habitat recognized as essential for listed or proposed species recovery, or to meet Forest Service objectives for sensitive species.
3. An analysis of the effects of the proposed action on species or their occupied habitat or on any unoccupied habitat required for recovery.
4. A discussion of cumulative effects resulting from the planned project in relationship to existing conditions and other related projects.
5. A determination of no effect, beneficial effect, or "may" effect on the species and the process and rationale for the determination, documented in the environmental assessment or the environmental impact statement.
6. Recommendations for removing, avoiding, or compensating for any adverse effects.
7. A reference of any informal consultation with the Fish and Wildlife Service as well as a list of contacts, contributors, sources of data, and literature

references used in developing the biological evaluation.

Sensitive species are defined as “those plant and animal species identified by a regional forester for which population viability is a concern, as evidenced by (a) significant current or predicted downward trends in population numbers or density” and/or “(b) significant current or predicted downward trends in habitat capability that would reduce a species’ existing distribution” (FSM 2670.5). The website for the Interagency Special Status Sensitive Species Program (ISSSSP) summarizes the management of sensitive species as follows: “Management of sensitive species ‘must not result in a loss of species viability or create significant trends toward federal listing’ (FSM 2670.32). The Regional Forester is responsible for identifying sensitive species and shall coordinate with federal and state agencies and other sources, as appropriate, in order to focus conservation management strategies and to avert the need for Federal or State listing as a result of National Forest management activities.” Sensitive botanical species include vascular (flowering) plants, bryophytes (mosses and liverworts), lichens, and fungi.

Further clarification on sensitive species policy is provided by FSM 2670.32 (September 2005). Use the biological evaluation to “review programs and activities as part of the National Environmental Policy Act of 1969…to determine their potential effect on sensitive species. Avoid or minimize impacts to species whose viability has been identified as a concern. Analyze, if impacts cannot be avoided, the significance of potential adverse effects on the population or its habitat within the area of concern and on the species as a whole. (The line officer, with project approval authority, makes the decision to allow or disallow impact, but the decision must not result in loss of species viability or create significant trends toward federal listing.)”

A transmittal letter (July 21, 2015) from the Regional Forester explains that “the Interagency Special Status Species Program (ISSSSP) and development of the Special Status Species list are proactive approaches for meeting our obligations under the Endangered Species Act (ESA), the National Forest Management Act, and our National policy direction as stated in Forest Service Manual (FSM) 2670 and the U.S. Department of Agriculture Regulation 9500-4. The primary policy objectives are to recover federally listed and proposed species and, for sensitive species, to ensure that actions do not contribute to a loss of viability or cause a significant trend toward listing under the ESA. The effects of any action authorized, funded, or carried out by the Forest Service on a federally listed, federally proposed, or sensitive species will be analyzed in a Biological Evaluation or project NEPA analysis.”

The letter continues: “Strategic species are **not** considered ‘sensitive’ under FSM 2670 and do not need to be addressed in Biological Evaluations. Many strategic species are poorly known (i.e., distribution, habitat, threats, or taxonomy), so conservation status is unclear. ISSSSP staff in the Regional Office (RO) will coordinate with field units to compile information to improve understanding and clarify status of the strategic species. To this end, the only management direction for strategic species requires field units to record survey and locality information in the agency’s corporate Natural Resource Information System (NRIS) databases (NRIS TESP for vascular plants, non-vascular plants, and fungi); NRIS Wildlife for vertebrates, including amphibians and invertebrates (aquatic and terrestrial); and NRIS Aquatic Surveys for fish).”

The following is a suggested procedure for conducting and documenting findings of a biological evaluation (FSM 2672.43, July 2009):

Step 1: A prefield review of available information and identification of a threatened, endangered, proposed, or sensitive species' known or potentially occurring habitat (i.e., to determine if there is evidence for the species or its habitat being present)
Step 2: A field reconnaissance (survey) to determine if a species is present or expected to occur
Step 3: An evaluation of any adverse effects on a species
Step 4: An analysis of the significance of any adverse effects on a species
Step 5: If existing information/data are insufficient to determine the significance of any adverse effects on a species' conservation and population viability, initiate a biological/botanical investigation.

The process outlined above is used to summarize assessment procedures for species on the Region 6 Regional Forester and OR/WA State Director Special Status Species List that are documented or suspected on the Mt. Hood National Forest (FSM 2672.4).

Species assessed in this process are based on the most recent Region 6 Regional Forester and OR/WA State Director Special Status Species List (July 13, 2015) and the current U.S. Fish and Wildlife Service Federal Species List.

No federally listed (i.e., threatened or endangered) or federally proposed botanical species are *documented* (i.e., known) to occur on the Mt. Hood National Forest (MTH). Only one federally listed threatened species is *suspected* to occur on the MTH, water howellia (*Howellia aquatilis* var. *aquatilis*), but it has never been found. Whitebark pine (*Pinus albicaulis*) is a candidate species for federal listing for which the U.S. Fish and Wildlife Service has sufficient information on its biological status and threats to propose it as endangered or threatened under the Endangered Species Act (ESA), but currently the development of a proposed listing regulation for the species is precluded by other higher priority listing activities. Candidate species receive no statutory protection under the ESA. The U.S. Fish and Wildlife Service encourages cooperative conservation efforts for candidate species because they are, by definition, species that may warrant future protection under the ESA.

There are 54 sensitive botanical species *documented* as occurring and 48 sensitive botanical species *suspected* to occur on the MTH (July 13, 2015 list). They include 44 vascular plants, 31 bryophytes, 9 lichens, and 18 fungi, altogether totaling 102 species. These numbers may vary slightly from year to year as sensitive species are added to or dropped from the Region 6 Regional Forester and OR/WA State Director Special Status Species List.

Table 1 - Special Status (Sensitive and Strategic) Botanical Species on the Mt. Hood National Forest

Type	Documented	Suspected	Total
Sensitive Vascular Plants	30	14	44
Sensitive Bryophytes	11	20	31
Sensitive Lichens	3	6	9
Sensitive Fungi	10	8	18
Strategic Vascular Plants	1	0	1
Strategic Bryophytes	7	13	20
Strategic Lichens	1	3	4
Strategic Fungi	31	24	55
Total	94	88	182

The following biological evaluation assesses the potential effects of the North Clack Integrated Resource Project on sensitive botanical species (vascular plants, bryophytes, lichens, and fungi) in accordance with The National Environmental Policy Act (42 USC 4321 et seq.), the federal Endangered Species Act (16 USC 1531 et seq.), and the National Forest Management Act (16 USC 1604 et seq.).

PROPOSED PROJECT

The North Clack Integrated Resource Project area is located at the northern end of the Clackamas River Ranger District on the Mt. Hood National Forest. The project area is about 25,000 acres in size and is located in three sixth-field watersheds: North Fork of the Clackamas, Helion Creek-Clackamas River, and Roaring River. Most of the proposed project area is within the North Fork of the Clackamas.

A number of activities are being proposed in the proposed project area to improve forest conditions, provide wood products, manage recreation, enhance aquatic/riparian habitat, manage wildlife habitats, reduce fire hazards, and make changes to the transportation system within the project area. The proposed vegetation management actions are summarized below and the acres affected are the focus of this botanical biological evaluation.

Table 2 - Summary - Proposed Vegetation Management Actions

Purpose & Need	Proposed Action	Acres	Notes
Improve Forest Health, Growth, and Diversity while Providing Forest Products	Variable-density thinning with "skips" (no harvest areas) and "gaps" (small harvest openings)	4,532	• 2,080 acres in matrix forest, with two-acre gaps and heavy thins for forage enhancement • 191 acres in LSR • 934 acres in Riparian Reserves • 202 acres of matrix forest with an emphasis of improving owl habitat in the home range • 88 acres of thinning with a huckleberry enhancement emphasis • 985 acres of young-stand thinning and brushing • 52 acres of young-stand thinning and brushing and the removal trees in diseased areas followed by planting
Improve Northern Spotted Owl Habitat	Create gaps	60	Cut and leave trees in small gaps to improve northern spotted owl habitat in matrix forest
Provide Forest Products and Create Early-Seral Habitat	• Regeneration Harvest with Reserves • Site Preparation and Planning	255	In matrix forest
Enhance Forage	Meadow Burn	2	
Fire Hazard Reduction	Burning Fuel Break	541	• 150 acres of piling and burning of slash along Road 4610 and property lines • 136 acres of under-burning of thinned stands • 255 acres of under-burning and grapple- piling in regeneration harvest units
TOTAL		**5,390**	

Current Forest Conditions

Past disturbance has created a landscape of second-growth forest in the North Clack project area: (a) traditional-looking Douglas-fir plantations intermixed with western hemlock, many 65 to 85 years old and some 100 to 120 years old; and (b) stands originating from multiple wildfires that burned through the area (e.g., in 1902, 1929, 1939), ranging from 110 to 140 years old. Some stands have been commercially thinned and some have not. The combination of wildfires and thinning has left its imprint on the forested landscape in the North Clack project area. Many of the fire-originated stands (roughly units 106 to 140 and 184 to 212) share characteristics of stem-exclusion stands (high tree density, a closed canopy, and relatively open understory with a

sparse to moderate cover of vegetation on the forest floor). Some contain a number of biological legacies: (a) older, large trees that survived fire and (b) large snags. Legacy trees are scattered throughout the proposed units, but particularly in riparian reserves, where wildfire did not burn or burned less intensely. Somewhat different in structure, the plantation stands are characterized by high tree density that is more uniform in spacing, a more open canopy (allowing sunlight to reach the forest floor), and a dense, and in many cases, continuous ground cover of vegetation dominated by salal (*Gaultheria shallon*), sword fern (*Polystichum munitum*), dwarf Oregon grape (*Mahonia nervosa*), bracken fern (*Pteridium aquilinum*), scattered to aggregated (dense) Pacific rhododendron (*Rhododendron macrophyllum*), and scattered to aggregated vine maple (*Acer circinatum*). Huckleberry (*Vaccinium parvifolium*, *V. ovalifolium*, and *V. alaskaense*) is scattered throughout the project area, but never dominant or abundant. The dense understory vegetation in these plantation stands is probably a result of thinning entries in the past that opened up the stands, allowing sunlight to reach the forest floor and initiate understory growth. The understory of waist-high shrubs and ferns is so dense and continuous (of such high occupancy) in some areas that it probably effectively inhibits/suppresses/prevents the establishment and growth of rare vascular plant species. The plantation stands, for the most part, are uniform (homogeneous) in forest composition, forest structure, and understory plant community composition.

A model consisting of four stages is used widely to describe forest development in young, even-aged stands (Oliver and Larson 1990): (1) stand initiation, (2) stem exclusion, (3) understory reinitiation, and (4) old growth. During the understory reinitiation stage, suppressed trees in stem-exclusion stands die (mortality resulting from competition for light, soil nutrients, and water), creating gaps in the canopy, allowing sunlight to reach the forest floor, initiating the growth of understory shrubs and forbs. Canopy gaps add horizontal and vertical spatial complexity to young forests and create ecological niches that foster greater animal and plant diversity. “Thinning from below” can reduce the duration of the stem-exclusion stage, in effect accelerating the natural processes that occur during the transitional phase from stem exclusion to understory reinitiation (He & Barclay 2000).

Forested Plant Associations

The proposed units in the North Clack project area occur between 2,000 and 3,000 feet elevation and lie within the western hemlock and Pacific silver fir zones. The western hemlock zone ranges from sea level to 4,000 feet elevation and the Pacific silver fir zone ranges from about 2,500 to 5,000 feet elevation (Hemstrom *et al.* 1982), so there is some overlap between the two zones depending on biophysical factors such as climate (temperature and moisture), topography, and soils. For some proposed units, the plant associations, based on potential natural vegetation (climax) communities, key out to the western hemlock series, others to the Pacific silver fir series. Some units lie within a transitional zone/band where the western hemlock and Pacific silver fir zones merge or intergrade and may key out in either series based on the percent cover of western hemlock or Pacific silver fir regeneration (seedlings and saplings) in the understory. The stem-exclusion character of the intermediate or lower canopy in a number of plantation and fire-originated stands in many proposed units can make it

challenging to “shoehorn” the current forested plant communities into a particular association because of the sparse understory and scarcity of indicator plant species. Forested plant associations in the area include the following (McCain and Diaz 2002):

Western hemlock

TSHE/RHMA3-MANE2-NWO Cascades (CHS356) - western hemlock/Pacific rhododendron- dwarf Oregon grape – range 1,500-4,500 feet elevation; nearly absent in the highest precipitation area in the northwestern Mt. Hood National Forest

TSHE/RHMA3-GASH-NWO Cascades (CHS350) - western hemlock/Pacific rhododendron- salal – range 1,050-4,400 feet elevation

TSHE/MANE2-GASH NWO Cascades (CHS160) - western hemlock/dwarf Oregon grape-salal – range 905-3,640 feet elevation

TSHE/MANE2/POMU NWO Cascades (CHS164) - western hemlock/dwarf Oregon grape/swordfern – range 190-3,980 feet elevation

TSHE/MANE2 NWO Cascades (CHS161) - western hemlock/dwarf Oregon grape – range 1,000-4,000 feet elevation

TSHE/GASH-NWO Cascades (CHS110) - western hemlock/salal – range 800-3,700 feet elevation; almost absent on the Mt. Hood National Forest

TSHE/ACCI-GASH/POMU NWO Cascades (CHS232) - western hemlock/vine maple- salal/sword fern – range 820-3,040 feet elevation; dwarf Oregon grape (MANE) 88% constancy

TSHE/ACCI/POMU NWO Cascades (CHS228) - western hemlock/vine maple/swordfern – range 700-2,640 feet elevation; dwarf Oregon grape (MANE) 88% constancy

TSHE/VAAL/GASH (CHS614) - western hemlock/Alaska huckleberry-salal – 1,950-3,000 feet elevation; uncommon plant association in the high precipitation zone of the northwest portion of the Mt. Hood National Forest; red huckleberry (VAPA) 75% constancy

TSHE/VAAL/OXOR-NWO Cascades (CHS613) - western hemlock/Alaska huckleberry/oxalis – range 1,160-3,900 feet elevation; red huckleberry (VAPA) 82%

TSHE/RHMA3-VAAL/COCA13 (CHS326) - western hemlock/rhododendron-Alaska huckleberry/bunchberry dogwood– range 2,300-3,900 feet elevation; occurs in the transition between the Pacific silver fir and western hemlock zones

TSHE/POMU NWO Cascades (CHF150) - western hemlock/swordfern – range 650-4,140 feet elevation

Pacific silver fir

ABAM-TSHE/RHMA3-GASH (CFC251) - Pacific silver fir-western hemlock/Pacific rhododendron-salal – range 2,100-4,100 feet elevation; one of the warmest, driest associations in the series; one of the most shrubby and least herbaceous plant associations in the series

ABAM/MANE2 (CFS151) – Pacific silver fir/dwarf Oregon grape – range 2,580-4,800 feet elevation

ABAM/RHMA3-MANE2 (CFS652) – Pacific silver fir/rhododendron-dwarf Oregon grape – range 2,500-5,300 feet elevation

ABAM/RHMA3-VAAL/COCA13 (CFS654) - Pacific silver fir/rhododendron-Alaska huckleberry/bunchberry dogwood – range 2,580-4,500 feet elevation

ABAM/RHMA3/XETE (CFS653) – Pacific silver fir/Pacific rhododendron/beargrass – range 2,880-5,300 feet elevation

See Appendix A for a plant list compiled during field surveys of the proposed project units.

Step 1. Pre-field Review of Existing Information

Management proposals are investigated to determine if potential habitat for special status species may exist within or adjacent to the project area. Sources include the Natural Resources Inventory System (NRIS) TES Plants database, the Mt. Hood National Forest TES plant database, Oregon Biodiversity Information System (ORBIC), species habitat and range information, scientific literature, technical manuals, species factsheets, plant atlases, herbarium records, topographic maps, aerial photos, and knowledge provided by individuals familiar with the project area. Sensitive species on the Region 6 Regional Forester and OR/WA State Director Special Status Species List that are known or suspected to occur on the Mt. Hood National Forest are listed in Table 3 below. (*Note*: Pre-disturbance surveys are not required for strategic species listed on the Region 6 Regional Forester and OR/WA State Director Special Status Species List [July 2015].)

Table 3 - Sensitive Species on the Region 6 Regional Forester and OR/WA State Director Special Status Species List (July 2015) Documented or Suspected on the Mt. Hood National Forest.

Type	Species	Common Name	Documented or Suspected	Habitat in Project Area?
Vascular Plant	*Agoseris elata*	tall agoseris	Documented	No
Vascular Plant	*Astragalus tyghensis*	Tygh Valley milkvetch	Documented	No
Vascular Plant	*Boechera atrorubens*	sicklepod rockcress	Documented	No
Vascular Plant	*Botrychium lunaria*	common moonwort	Suspected	Yes
Vascular Plant	*Botrychium montanum*	mountain grape fern	Documented	Yes
Vascular Plant	*Calamagrostis breweri*	Brewer's reedgrass	Documented	No
Vascular Plant	*Carex capitata*	capitate sedge	Suspected	Yes

Type	Species	Common Name	Documented or Suspected	Habitat in Project Area?
Vascular Plant	*Carex comosa*	bristly sedge	Suspected	No
Vascular Plant	*Carex diandra*	lesser panicled sedge	Suspected	Yes
Vascular Plant	*Carex lasiocarpa* var. *americana*	slender sedge	Documented	Yes
Vascular Plant	*Carex livida*	pale sedge	Documented	No
Vascular Plant	*Carex nardina*	spikenard sedge	Suspected	No
Vascular Plant	*Carex retrorsa*	retrorse sedge	Suspected	Yes
Vascular Plant	*Carex vernacula*	native sedge	Documented	Yes
Vascular Plant	*Castilleja thompsonii*	Thompson's paintbrush	Documented	No
Vascular Plant	*Coptis trifolia*	three-leaf goldthread	Documented	Yes
Vascular Plant	*Corydalis aquae-gelidae*	coldwater corydalis	Documented	Yes
Vascular Plant	*Delphinium nuttallii*	Nutall's larkspur	Documented	Yes
Vascular Plant	*Elatine brachysperma*	short-seeded waterwort	Suspected	Yes
Vascular Plant	*Erigeron howellii*	Howell's daisy	Documented	Yes
Vascular Plant	*Eucephalus gormanii*	Gorman's aster	Documented	Yes
Vascular Plant	*Fritillaria camschatcensis*	black lily	Documented	Yes
Vascular Plant	*Howellia aquatilis* var. *howellii* (THREATENED SPECIES)	howellia	Suspected	Possibly
Vascular Plant	*Lewisia columbiana* var. *columbiana*	Columbia lewisia	Suspected	Yes
Vascular Plant	*Lomatium watsonii*	Wastson's desert parsley	Documented	No
Vascular Plant	*Luzula arcuata* ssp. *unalaschcensis*	Alaska curved woodrush	Documented	No
Vascular Plant	*Lycopodiella inundata*	bog clubmoss	Documented	No
Vascular Plant	*Lycopodium complanatum*	ground cedar	Documented	Yes
Vascular Plant	*Ophioglossum pusillum*	adder's-tongue	Documented	Yes

Type	Species	Common Name	Documented or Suspected	Habitat in Project Area?
Vascular Plant	*Phlox hendersonii*	Henderson's phlox	Documented	No
Vascular Plant	*Pinus albicaulis*	whitebark pine	Documented	No
Vascular Plant	*Potentilla villosa*	villous cinquefoil	Documented	No
Vascular Plant	*Ranunculus triternatus* (=*R. reconditus*)	Dallas Mt. buttercup	Suspected	No
Vascular Plant	*Romanzoffia thompsonii*	Thompson's mistmaiden	Suspected	No
Vascular Plant	*Rorippa columbiae*	Columbia cress	Suspected	Yes
Vascular Plant	*Rotala ramosior*	lowland toothcup	Suspected	Yes
Vascular Plant	*Scheuchzeria palustris* ssp. *americana*	scheuchzeria	Documented	Yes
Vascular Plant	*Sisyrinchium sarmentosum*	pale blue-eyed grass	Documented	Yes
Vascular Plant	*Streptopus streptopoides*	kruhsea, small twistedstalk	Documented	Yes
Vascular Plant	*Suksdorfia violacea*	violet suksdorfia	Documented	No
Vascular Plant	*Sullivantia oregana*	Oregon sullivantia	Suspected	No
Vascular Plant	*Tauschia stricklandii*	Strickland's tauschia	Documented	Yes
Vascular Plant	*Utricularia minor*	lesser bladderwort	Documented	Yes
Vascular Plant	*Utricularia ochroleuca*	northern bladderwort	Documented	Yes
Vascular Plant	*Wolffia borealis*	dotted water-meal	Suspected	Yes
Vascular Plant	*Wolffia columbiana*	Columbia water-meal	Documented	Yes
Bryophyte	*Anastrophyllum minutum*	tiny notchwort (liverwort)	Documented	No
Bryophyte	*Andreaea schofieldiana*	broad-leaved lantern moss	Suspected	Yes
Bryophyte	*Anthelia julacea*	alpine silverwort (liverwort)	Documented	No
Bryophyte	*Barbilophozia lycopodioides*	giant fourpoint, maple liverwort	Suspected	No
Bryophyte	*Blepharostoma arachnoideum*	spidery threadwort (liverwort)	Documented	No
Bryophyte	*Brachydontium olympicum*	Olympic brachydontium moss	Documented	No
Bryophyte	*Bryum calobryoides*	beautiful bryum (moss)	Suspected	No

Type	Species	Common Name	Documented or Suspected	Habitat in Project Area?
Bryophyte	*Calypogeia sphagnicola*	bog pouchwort (liverwort)	Documented	No
Bryophyte	*Cephaloziella spinigera*	spiny threadwort (liverwort)	Suspected	No
Bryophyte	*Conostomum tetragonum*	ribbed mountain moss, helmet moss	Documented	No
Bryophyte	*Encalypta brevicollis*	extinguisher moss	Suspected	Yes
Bryophyte	*Encalypta brevipes*	candle snuffer moss, stubby extinguisher moss	Suspected	Yes
Bryophyte	*Entosthodon fascicularis*	banded cord-moss	Suspected	No
Bryophyte	*Gymnomitrion concinnatum*	braided frostwort, pointy whiteworm (liverwort)	Documented	No
Bryophyte	*Haplomitrium hookeri*	Hooker's flapwort (liverwort)	Suspected	Yes
Bryophyte	*Harpanthus flotovianus*	great mountain flapwort (liverwort)	Suspected	No
Bryophyte	*Herbertus aduncus* ssp. *aduncus*	common scissorleaf (liverwort)	Suspected	Yes
Bryophyte	*Lophozia gillmanii*	Gillman's pawwort (liverwort)	Suspected	No
Bryophyte	*Lophozia laxa*	bog pilewort (liverwort)	Suspected	No
Bryophyte	*Marsupella condensata*	compact rustwort (liverwort)	Documented	No
Bryophyte	*Marsupella emarginata* var. *aquatica*	stream ladderwort (liverwort)	Suspected	No
Bryophyte	*Marsupella sparsifolia*	sharp ladderwort (liverwort)	Documented	No
Bryophyte	*Nardia japonica*	Pacific spikewort (liverwort)	Documented	No
Bryophyte	*Polytrichastrum sexangulare* var. *vulcanicum*	dwarf rock haircap	Documented	No
Bryophyte	*Polytrichum strictum*	slender haircap moss	Suspected	No
Bryophyte	*Preissia quadrata*	blister ribbon (liverwort)	Suspected	No
Bryophyte	*Rivulariella gemmipara*	liverwort	Suspected	Yes
Bryophyte	*Scapania obscura*	scorched spadewort	Suspected	Yes
Bryophyte	*Schistidium cinclidodonteum*	schistidium moss	Suspected	No
Bryophyte	*Schofieldia monticola*	alpine masterwort (liverwort)	Suspected	Yes
Bryophyte	*Splachnum ampullaceum*	purple-vased stink moss, small capsule dung moss	Suspected	No
Bryophyte	*Tetraphis geniculata*	four-tooth bent knee moss	Documented	Yes
Bryophyte	*Trematodon asanoi* (= *T. boasii*)	Asano's trematodon moss	Suspected	No

Type	Species	Common Name	Documented or Suspected	Habitat in Project Area?
Lichen	*Hypotrachyna riparia*	riparian loop lichen	Suspected	Yes
Lichen	*Leptogium cyanescens*	blue jellyskin lichen	Suspected	Yes
Lichen	*Lobaria linita*	cabbage lungwort	Suspected	Yes
Lichen	*Pannaria rubiginella*	petalled mouse	Suspected	Yes
Lichen	*Pilophorus nigricaulis*	matchstick lichen	Suspected	Yes
Lichen	*Ramalina pollinaria*	chalky ramalina	Suspected	Yes
Lichen	*Stereocaulon spathuliferum*	chalk foam, snow lichen	Suspected	No
Lichen	*Texosporium sancti-jacobi*	woven spore lichen	Documented	No
Lichen	*Tholurna dissimilis*	urn lichen	Documented	No
Fungus	*Albatrellus avellaneus*		Suspected	Yes
Fungus	*Bridgeoporus nobilissmus*	noble polypore	Documented	Yes
Fungus	*Choiromyces venosus*		Suspected	Yes
Fungus	*Cortinarius barlowensis*		Documented	Yes
Fungus	*Cystangium idahoensis*		Suspected	Yes
Fungus	*Helvella crassitunicata*		Documented	Yes
Fungus	*Macowanites mollis*		Documented	Yes
Fungus	*Mythicomyces corneipes*		Documented	Yes
Fungus	*Phaeocollybia californica*		Documented	Yes
Fungus	*Phaeocollybia oregonensis*		Documented	Yes
Fungus	*Pseudorhizina* (=*Gyromitra*) *californica*		Documented	Yes
Fungus	*Ramaria amyloidea*		Documented	Yes
Fungus	*Rhizopogon alexsmithii*		Documented	Yes
Fungus	*Rhizopogon brunneifibrillosus*		Documented	Yes
Fungus	*Rhizopogon ellipsosporus*		Documented	Yes
Fungus	*Rhizopogon exiguus*		Suspected	Yes
Fungus	*Rhizopogon inquinatus*		Suspected	Yes
Fungus	*Stagnicola perplexa*		Documented	Yes

Step 2: Field Reconnaissance & Surveys

The North Clack units were surveyed for rare botanical species (vascular plants, bryophytes, and lichens) listed on both the Region 6 Regional Forester and OR/WA State Director Special Status Species List (July 2015) and the Survey and Manage list (December 2003 list) during the summer of 2017 and spring of 2018. Intuitive-controlled surveys were conducted: a botanist meanders

through forest stands, compiling a plant list as he/she goes, looking for rare botanical species, with a focus on special habitats (e.g., streamsides, seeps, springs, meadows/openings, rock outcrops, large snags) that may support an assemblage of uncommon species, where species diversity may be higher, and where there may be a higher probability of finding a rare species. Substrates surveyed included the forest floor, decaying logs, the base of snags, lower tree boles and branches, rocks, and moss growing on the forest floor, decaying logs, rocks, and lower tree boles.

Step 3: Risk Assessment - Survey Results for Rare Botanical Species

Federally Proposed, Threatened, or Endangered Species

There are no vascular plants, bryophytes, lichens, or fungi in the Pacific Northwest region (Region 6) that are federally listed as *endangered* by the U.S. Fish and Wildlife Service.

There is one federally listed *threatened* botanical species suspected to occur on the Mt. Hood National Forest: *Howellia aquatilis* var. *aquatilis*. There are no documented sites for this vascular plant on the Mt. Hood National Forest. *H. aquatilis* is generally confined to the edges of low-elevation palustrine wetlands, lakes, and ponds.

It is possible that *H. aquatilis* could be present in wetlands or ponds within or near the proposed project area. Wetlands and ponds would be protected in riparian reserves. The riparian reserve widths below are based on a site-potential tree height of 180 feet.

Table 4 - Riparian Reserve Widths in North Clack

Condition	**Reserve Width**
Fish-Bearing Streams	360 ft. slope distance (both sides of stream)
Non-Fish-Bearing Perennial Streams	180 ft. slope distance (both sides of stream)
Intermittent Streams and Wetlands Greater than 1 acre	180 ft. slope distance (both sides of stream)
Wetlands less than 1 acre and natural ponds	Extent of riparian vegetation from the edge of the wetland

It is quite likely that very small wetlands or ponds less than 0.1 acre in size were overlooked during botanical surveys since intuitive-controlled surveys, due to their meandering nature, are not 100% surveys.

It is unlikely that the proposed project area contains *H. aquatilis* because former and current botanists working on the Mt. Hood National Forest have been on the lookout for it for over three decades and never found it. The proposed action, therefore, should have **NO EFFECT** on this federally listed threatened species.

Sensitive Species

Cold Water Corydalis (*Corydalis aquae-gelidae*)

The North Fork of the Clackamas and its tributaries are home to a number of documented sites for cold water corydalis. The Forest Service's NRIS TESP and Oregon Biodiversity Information System (ORBIC) databases document occurrences of cold water corydalis (*Corydalis aquae-gelidae*) throughout the proposed project area. Cold water corydalis is both a sensitive species on the Region 6 Regional Forester and OR/WA State Director Special Status Species List and a Survey and Manage Category A species (manage all known sites). No coldwater corydalis was found in any of the proposed units or management activity areas during botany field surveys in the summer of 2017 and the spring of 2018, but streams and rivers were not surveyed because riparian areas, especially those along edges of proposed units, are typically excluded from management actions (e.g., thinning operations and other logging disturbance).

***Figure 1 - Corydalis aquae-gelidae* growth form (Photo by Andrea Ruchty Montgomery).**

It is highly likely that there are more cold water corydalis sites than those currently documented in the proposed project area. Corydalis seed is transported in flowing water, enabling new populations to establish downstream from upstream populations, making the probability of there being additional populations, not yet detected/documented, downstream from upstream populations highly likely.

Cold water corydalis can occur in headwater seeps, streams, and rivers. To conserve all known and all unknown cold water corydalis populations in the proposed project area, avoid all logging-related disturbance in headwater seeps, streams, and rivers.

Cold water corydalis is a narrow Pacific Northwest endemic. It is documented only on the Gifford Pinchot, Mt. Hood, Willamette, and Rogue River-Siskiyou National Forests. The Mt. Hood National Forest is the epicenter for the geographical distribution/range of coldwater corydalis in the Pacific Northwest with extensive populations in the upper Clackamas River, the Oak Grove Fork of the Clackamas River, and the North Fork of the Clackamas River.

Coldwater corydalis is confined to stream courses and streambanks. The species requires some indeterminate (unquantifiable) combination of sunlight and shade for suitable habitat (Conservation Assessment, 2017). Coldwater corydalis can occur in or along headwater (first- and second-order) streams as well as in or along larger (higher order) streams. The North Fork of the Clackamas River is a sixth-order stream.

Survey and Manage Species

Methuselah's Beard (*Usnea longissima*; also referred to as *Dolichousnea longissima*)

Methuselah's beard (*Usnea longissima*) is neither a sensitive nor a strategic species on the Region 6 Regional Forester and OR/WA State Director Special Status Species List, but it is a Survey and Manage Category F species. Category F does not require the management of known sites. The Forest Service's NRIS TESP database documents a number of Methuselah's beard (*Usnea longissima*) sites in the proposed project area, and additional sites were found during field surveys in 2017 and 2018 (see Table 5). Other sites were identified by the public (see Table 6). Populations of Methuselah's beard occur predominantly in riparian reserves, hanging from trees growing along or nearby rivers and tributaries, but populations can also occur in upland forest. It is highly likely that many more Methuselah beard populations would be found/detected within riparian reserves if rivers and streams in the proposed project area were surveyed in a systematic fashion.

Figure 2 - *Usnea longissima* (also known as *Dolichousnea longissima*) (Methuselah's beard) draped on Pacific Northwest conifers. (Photo courtesy of iNaturalist).

Species of Interest Lacking Federal Status

Candystick, Sugarstick (*Allotropa virgata*)

The mycoheterotrophic plant known as candystick or sugarstick (*Allotropa virgata*) was found in units 194 and 198. The NRIS TESP database also documents *Allotropa virgata* in unit 138. Several other sites were identified by the public (see Table 6). *Allotropa virgata* has no federal status: it is neither a sensitive nor a strategic species on the Region 6 Regional Forester and OR/WA State Director Special Status Species List. It was listed in Table C-3 in the Northwest Forest Plan (1994) but has since been removed.

Figure 3 - *Allotropa virgata* (candystick, sugarstick) (Photo courtey of Burke Museum Herbarium).

Mycoheterotrophy (*myco* means fungus, *trophic* means nutrition) refers to the process by which fungi mediate the transfer of food and nutrients from photosynthetic plants to non-photosynthetic plants. Mycoheterotrophic plants do not have chlorophyll and, therefore, are incapable of producing their own food (photosynthesis); instead, they obtain nutrients and carbohydrates from fungi, whose mycelia (hyphae) link the roots of mycoheterotrophic plants with the roots of conifer and/or hardwood trees. Such fungi are known as mycorrhizae (or mycorrhizal fungi) because they transport nutrients and photosynthates (carbohydrates/food) from host trees to non-photosynthetic plants such as *Allotropa virgate.* More information is available at this site.[1]

[1] https://www.fs.fed.us/wildflowers/plant-of-the-week/allotropa_virgata.shtml

Surveys done in the late 1990s revealed *A. virgata* to be more common than previously thought; however, from what I can tell, it qualifies as an uncommon species on the west side of the Mt. Hood National Forest. Working as an ecologist and botanist on the Mt. Hood National Forest for seventeen years, I have come across *A. virgata* only in the North Clack project area. In all likelihood there are more *A. virgata* sites on the west side of the Mt. Hood National Forest other than those found in North Clack, but not finding *A. virgata* sites before, until now, points to how uncommon this plant species may be. Protection of *A. virgata* is not required. Post-disturbance monitoring of a sample of the known *A. virgata* sites in North Clack would be helpful to ascertain how this species may fare following ground- and habitat-disturbing activities, and locations of new sites, when found in the future, should be entered in the NRIS TESP database to get a better idea of how common or uncommon the species is.

Phantom Orchid (Cephalanthera austiniae)

The uncommon orchid called phantom orchid or snow orchid (*Cephalanthera austiniae*; formerly known as *Eburophyton austiniae*) was found in unit 198. Phantom orchid has no federal conservation status in Region 6: it is neither a sensitive or strategic species on the Region 6 Regional Forester and OR/WA State Director Special Status Species List (July 2015) nor is it a Survey and Manage species. *Cephalanthera austiniae*, however, is a species at risk in British Columbia (Environment and Climate Change Canada, 2018). Canada's recovery strategy[2] for this species sets out to arrest or reverse the decline of phantom orchid, including identifying critical habitat for it. A similar strategy as that employed for candystick (*A. virgata*) should probably be applied to the phantom orchid: locations of new sites should be entered in the NRIS TESP database to determine how common or uncommon this species is.

Figure 4 - *Cephalanthera austiniae* (Phantom Orchid) (Photo courtesy of Burke Museum Herbarium).

[2] https://www.registrelep-sararegistry.gc.ca/virtual_sara/files/plans/rs_phantom_orchid_e_proposed.pdf

Table 5 below lists the locations of rare species documented in the proposed project area. Figures 5 and 6 display the locations of those species. Some of this information is documented in the Natural Resource Information System - Threatened, Endangered, Sensitive Plants DataBase (NRIS TESP) and the Oregon Biodiversity Information Center (ORBC) formerly Oregon Natural Heritage Program

Table 5 - Rare Botanical Species Documented in North Clack Project Area

Location/Unit #	Species	Species Code	Taxa Group	Status	Site ID	Easting	Northing
138	*Allotropa virgata*	ALVI2	Plant	No federal status	USFS0600-EO- 01554_ 50300229	573245[3]	5006963
184	*Allotropa virgata*	ALVI2	Plant	No federal status	060605EO00418	567952	5008055
188	*Cephalanthera austiniae*	CEAU	Plant	No federal status		569324	5008496
198	*Allotropa virgata*	ALVI2	Plant	No federal status	060605EO00417	569324	5008496
N of 72 (S of 112)	*Corydalis aquae-gelidae*	COAQ	Plant	R6 Sensitive and S&M[4]	0606000182	570713	5006280
S of 112 & 123 (N of 72, 74 & 76)	*Corydalis aquae-gelidae*	COAQ	Plant	R6 Sensitive and S&M	ORBIC site - Karen Creek, roughly 5 acres (S of units 112 and 123; N of units 72, 74, and 76)	574298	4997004
½ mile east of 130	*Corydalis aquae-gelidae*	COAQ	Plant	R6 Sensitive and S&M	0606000151	571835	5007794
½ mile NE of 132	*Corydalis aquae-gelidae*	COAQ	Plant	R6 Sensitive and S&M	0606000150	572165	5007762
NW corner of 136	*Corydalis aquae-gelidae*	COAQ	Plant	R6 Sensitive and S&M	0606000171	573339	5007233
NW corner of 136	*Corydalis aquae-gelidae*	COAQ	Plant	R6 Sensitive and S&M	ORBIC site (in mossy seep above road)	575828	4997289
0.4 miles E of 138	*Corydalis aquae-gelidae*	COAQ	Plant	R6 Sensitive and S&M	USFS0600-EO-00639_50200161	574039	5006516
west of Tumala Mountain (1.25 miles NNE of unit 133)	*Corydalis aquae-gelidae*	COAQ	Plant	R6 Sensitive and S&M	ORBIC site	575988	4998435
east of 43	*Peltigera pacifica*	PEPA48	Lichen	S&M	060600E_PEPA48001_05	568542	5003622

[3] UTM coordinates are in NAD83

[4] S&M = Survey and Manage

Location/Unit #	Species	Species Code	Taxa Group	Status	Site ID	Easting	Northing
74	*Ramaria gelatiniaurantia*	RAGE3	Fungus	S&M	060605_ODELL4486_RAGE3_JEW	570991	5006454
10 (along 4610-011 road)	*Usnea longissima*	USLO50	Lichen	S&M	060605EO00420	561902	5007588
south of 85	*Usnea longissima*	USLO50	Lichen	S&M	060600E_USLO50010_05	566862	5005796
north of 85	*Usnea longissima*	USLO50	Lichen	S&M	060600E_USLO50015_05	567034	5006369
85	*Usnea longissima*	USLO50	Lichen	S&M	060600E_USLO50013_05	567091	5006167
north of 85	*Usnea longissima*	USLO50	Lichen	S&M	060600E_USLO50016_05	567097	5006349
SE of 85	*Usnea longissima*	USLO50	Lichen	S&M	060600E_USLO50014_05	567201	5008048
92	*Usnea longissima*	USLO50	Lichen	S&M	060600E_USLO50011_05	568094	5005796
96	*Usnea longissima*	USLO50	Lichen	S&M	060600E_USLO50012_05	568851	5005880
south of 106	*Usnea longissima*	USLO50	Lichen	S&M	060600E_USLO50003_05	569744	5005843
144	*Usnea longissima*	USLO50	Lichen	S&M	060600E_USLO50OO4_05	566300	5007120
164 (along river edge)	*Usnea longissima*	USLO50	Lichen	S&M	060605EO00419	561942	5007710
174	*Usnea longissima*	USLO50	Lichen	S&M	060600E_USLO50020_05	567297	5006543
174	*Usnea longissima*	USLO50	Lichen	S&M	060600E_USLO50021_05	567305	5006492
south of 174	*Usnea longissima*	USLO50	Lichen	S&M	060600E_USLO50006_05	567401	5006587
south of 174	*Usnea longissima*	USLO50	Lichen	S&M	060600E_USLO50008_05	567434	5006594
south of 174	*Usnea longissima*	USLO50	Lichen	S&M	060600E_USLO50009_05	567527	5006593
south of 174	*Usnea longissima*	USLO50	Lichen	S&M	060600E_USLO50018_05	567617	5006660
south of 174	*Usnea longissima*	USLO50	Lichen	S&M	060600E_USLO50017_05	567720	5006667
south of 174	*Usnea longissima*	USLO50	Lichen	S&M	060600E_USLO50019_05	567732	5006715

Table 6 - Sightings of Uncommon/Rare Botanical Species Reported by public

Unit	Species	Species Code	Taxa Group	Status	NAD83 Easting	NAD83 Northing
76	*Allotropa virgata*	ALVI2	Plant	No federal status	571196	5006040
79	*Allotropa virgata*	ALVI2	Plant	No federal status	571319	5005959
79	*Allotropa virgata*	ALVI2	Plant	No federal status	571330	5005971
112	*Allotropa virgata*	ALVI2	Plant	No federal status	570432	5006320
112	*Allotropa virgata*	ALVI2	Plant	No federal status	570505	5006394
114	*Allotropa virgata*	ALVI2	Plant	No federal status	570380	5006531
114	*Allotropa virgata*	ALVI2	Plant	No federal status	570485	5006497
118	*Allotropa virgata*	ALVI2	Plant	No federal status	570488	5006506

Unit	Species	Species Code	Taxa Group	Status	NAD83 Easting	NAD83 Northing
178	*Allotropa virgata*	ALVI2	Plant	No federal status	567256	5007047
179	*Allotropa virgata*	ALVI2	Plant	No federal status	567096	5007075
184	*Allotropa virgata*	ALVI2	Plant	No federal status	567798	5008127
191	*Allotropa virgata*	ALVI2	Plant	No federal status	568404	5007649
191	*Allotropa virgata*	ALVI2	Plant	No federal status	568411	5007674
192	*Allotropa virgata*	ALVI2	Plant	No federal status	568540	5007039
192	*Allotropa virgata*	ALVI2	Plant	No federal status	568546	5007078
192	*Allotropa virgata*	ALVI2	Plant	No federal status	568556	5007004
192	*Allotropa virgata*	ALVI2	Plant	No federal status	568319	5007032
192	*Allotropa virgata*	ALVI2	Plant	No federal status	568363	5007091
192	*Allotropa virgata*	ALVI2	Plant	No federal status	568393	5007052
192	*Allotropa virgata*	ALVI2	Plant	No federal status	568420	5007090
192	*Allotropa virgata*	ALVI2	Plant	No federal status	568436	5007093
192	*Allotropa virgata*	ALVI2	Plant	No federal status	568456	5007129
194	*Allotropa virgata*	ALVI2	Plant	No federal status	569116	5007574
198	*Allotropa virgata*	ALVI2	Plant	No federal status	569317	5008457
202	*Allotropa virgata*	ALVI2	Plant	No federal status	568684	5008624
202	*Allotropa virgata*	ALVI2	Plant	No federal status	568635	5008391
204	*Allotropa virgata*	ALVI2	Plant	No federal status	569237	5008763
70	*Usnea longissima*	USLO50	Lichen	S&M	571644	5005083
92	*Usnea longissima*	USLO50	Lichen	S&M	568084	5005832
92	*Usnea longissima*	USLO50	Lichen	S&M	568085	5005804
94	*Usnea longissima*	USLO50	Lichen	S&M	568492	5005744
96	*Usnea longissima*	USLO50	Lichen	S&M	568653	5005962
140	*Usnea longissima*	USLO50	Lichen	S&M	566612	5006435
191	*Usnea longissima*	USLO50	Lichen	S&M	568263	5007519
191	*Usnea longissima*	USLO50	Lichen	S&M	568263	5007520
202	*Usnea longissima*	USLO50	Lichen	S&M	568491	5008624

Figure 5 - Rare Botanical Species Documented in the West Half of the North Clack Project Area.

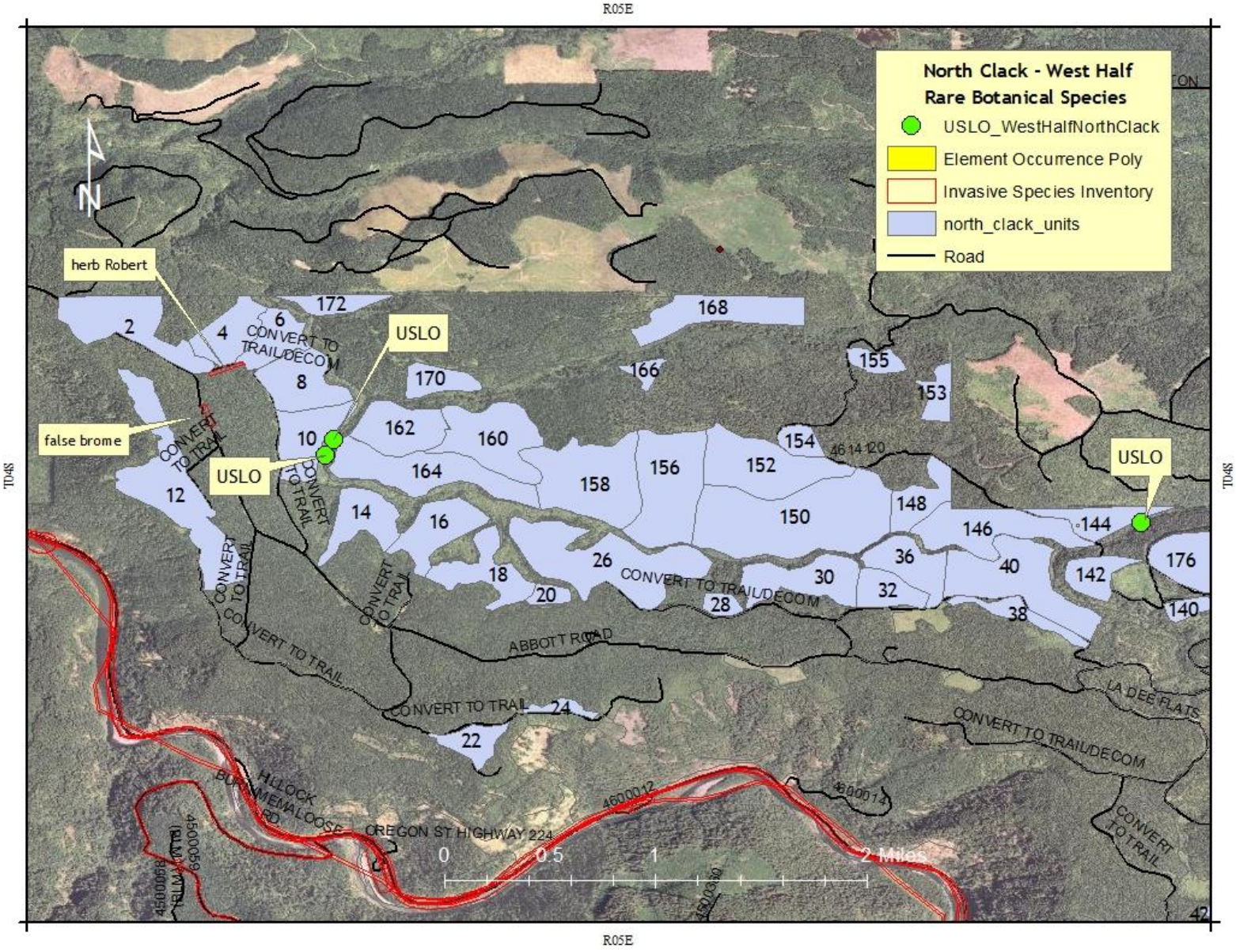


Figure 6 - Rare Botanical Species Documented in the East Half of the North Clack Project Area.

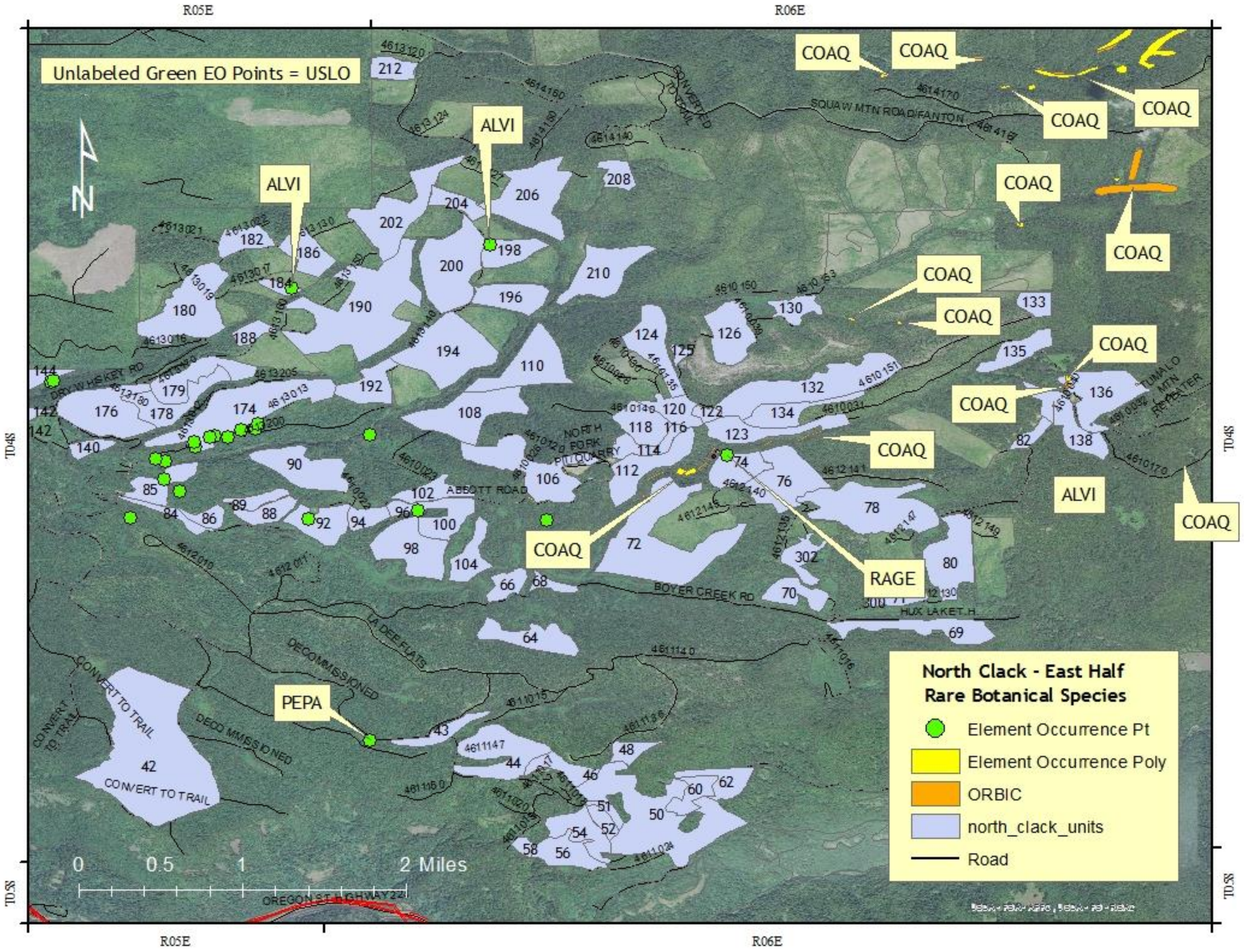
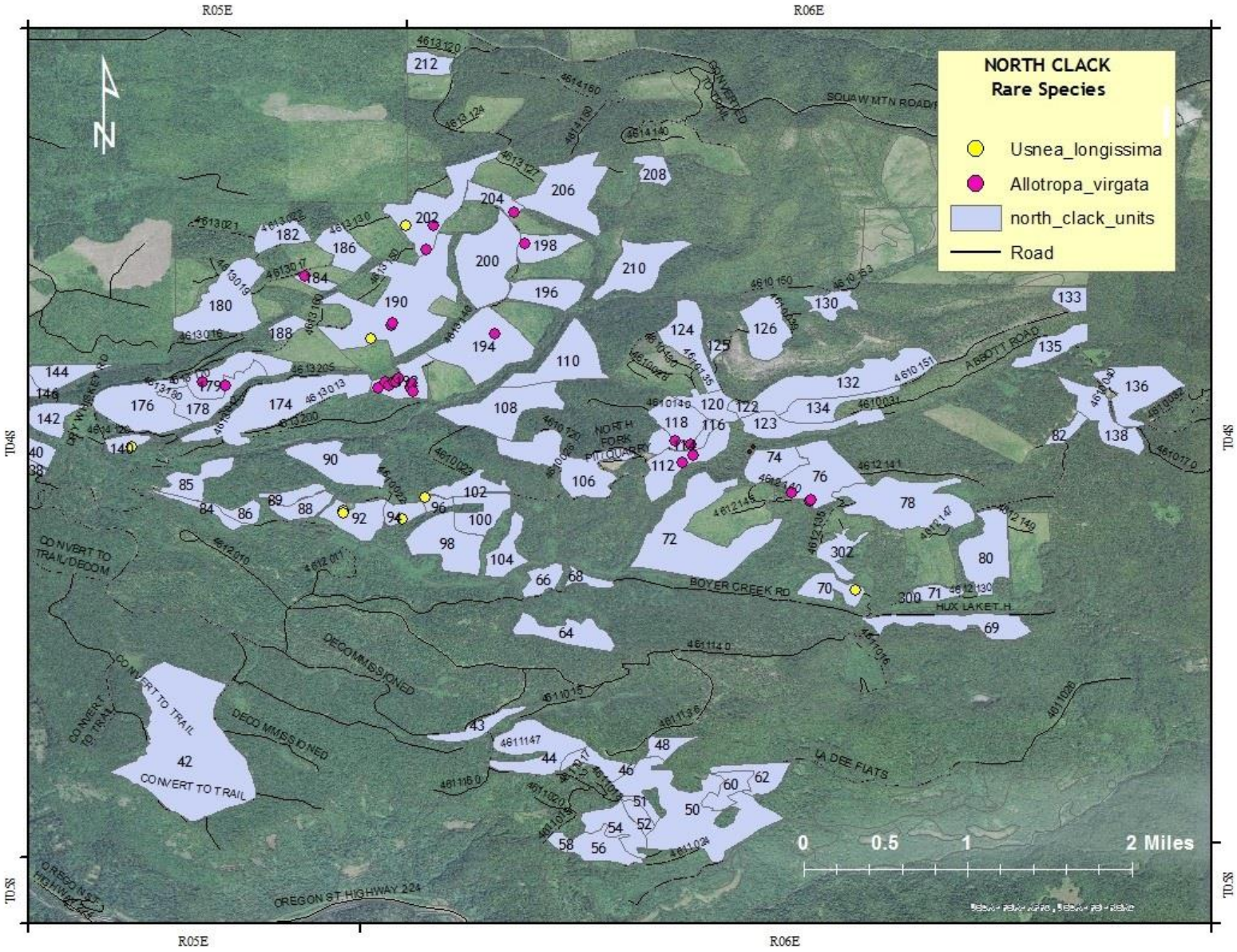


Figure 7 - Rare Botanical Species Found by the public.



Other Rare Plants and Lichens

No other sensitive botanical species on the Region 6 Regional Forester and OR/WA State Director Special Status Species List were found in the proposed project area. Surveys for vascular plants are best done during the growing season (May through September; mid-October at the latest). Surveys for bryophytes and lichens can be done year-round although the best time to survey for bryophytes is during spring to early summer when they are producing their sporophytes (reproductive structures), which can aid in species identification.

Fungi

No fungi on the the Region 6 Regional Forester and OR/WA State Director Special Status Species List were found in North Clack. Field surveys, however, were done outside the fall and spring mushroom fruiting seasons. The best time to survey for fall-fruiting fungi is late September or early October (after the first significant fall rains occur) through early November and for spring-fruiting fungi in early spring (mid-March through April). Some fall fungi can fruit earlier in the season (July to mid-September) before the fall rains arrive. Because of the difficulty of surveying for fungi and identifying species, surveys for sensitive fungi on the Region 6 Regional Forester and OR/WA State Director Special Status Species List are considered impractical.

The following 18 sensitive fungi on the Region 6 Regional Forester and OR/WA State Director Special Status Species List are either documented or suspected on the Mt. Hood National Forest and have a reasonable likelihood of occurring in the proposed project area. Unlike surveys for vascular plants, bryophytes, and lichens, surveys for these fungi are not considered practical because their fruitbodies are (a) ephemeral (short-lived); (b) they do not fruit every year; (c) some (*Cystangium, Macowanites, Rhizopogon*) are hypogeous fungi, only fruiting belowground; and (d) all are difficult to find and identify (except *Pseudorhizina californica*). So these fungi are simply assumed to be present in the proposed project area. A brief discussion is included below for each species. The proposed action may have an impact on individuals or their habitat, but is not expected to lead to a trend toward federal listing of any of these fungi.

1. *Albatrellus avellaneus* (Suspected)
2. *Bridgeoporus nobilissimus* (Documented)
3. *Choiromyces venosus* (Suspected)
4. *Cortinarius barlowensis* (Documented)
5. *Cystangium* (*= Martellia*) *idahoensis* (Suspected)
6. *Helvella crassitunicata* (Documented)
7. *Macowanites mollis* (Documented)
8. *Mythicomyces corneipes* (Documented)
9. *Phaeocollybia californica* (Documented)
10. *Phaeocollybia oregonensis* (Documented)
11. *Pseudorhizina* (*= Gyromitra*) *californica* (Documented)
12. *Ramaria amyloidea* (Documented)
13. *Rhizopogon alexsmithii* (Documented)
14. *Rhizopogon brunneifibrillosus* (Documented)
15. *Rhizopogon ellipsosporus* (Documented)
16. *Rhizopogon exiguus* (Suspected)

17. *Rhizopogon inquinatus* (Suspected)
18. *Stagnicola perplexa* (Documented)

Suspected means the species is suspected to occur on the Mt. Hood National Forest.

Documented means verified sites for the species are documented on the Mt. Hood National Forest.

1. ***Albatrellus avellaneus*** is primarily a coastal species with most collections of it from within 32 kilometers of the Pacific Coast associated with older Sitka spruce, western hemlock, and Pacific silver fir forest (Species Fact Sheet, Interagency Special Status/Sensitive Species Program). It is documented on the Olympic and Siuslaw National Forests but also inland on the Spokane BLM District. For that reason, it is suspected on the Mt. Hood National Forest and other inland national forests and BLM districts.

2. ***Bridgeoporus nobilissimus*** – Because *Bridgeoporus nobilissimus* conks (sporocarps) are perennial and, therefore, detectable year-round, surveys for this species are practical and required in areas with suitable habitat and hosts for the fungus. *B. nobilissimus* conks typically grow on noble fir and Pacific silver fir stumps, snags, and, occasionally, live trees in low- to mid-elevation forests on the west side of the Cascade Range. The North Clack project area contains suitable hosts (noble fir, Pacific silver fir, and western hemlock) for the species.

   B. nobilissimus is known from several sites on the Zigzag Ranger District (e.g., Larch Mountain, Wildcat Mountain, the Bull Run watershed), on the far west side of the Clackamas River Ranger District (e.g., Goat Mountain, South Fork Mountain, and in the vicinity of Memaloose Lake and Williams Lake), and on nearby Salem District BLM-administered lands. There are 12 known sites on the Mt. Hood National Forest (NRIS 2018).

   No *B. nobilissimus* conks were found in the proposed project area during field surveys, but the proposed action **may impact** undetected individuals or the habitat of this Region 6 sensitive fungus. *B. nobilissimus* is also a Survey and Manage (Category A) species on the Survey and Manage list (December 2003).

3. ***Choiromyces venosus***, in the true truffle group, forms fruiting bodies beneath the soil surface under Douglas-fir and western hemlock at low elevations. Only two known sites were reported for this species in the Northwest Forest Plan area in 1999 (Castellano et al.). No known sites are documented on the Mt. Hood National Forest (NRIS 2010), but the species is suspected to occur on the Forest.

4. ***Cortinarius barlowensis*** forms fruiting bodies on the forest floor and is associated with various conifers in the Pinaceae family. Known sites for this species are documented on the Mt. Hood National Forest (NRIS 2012).

5. ***Cystangium idahoensis*** (syn. ***Martellia idahoensis***) forms fruiting bodies beneath the soil surface and is associated with the roots of Pacific silver fir, subalpine fir, noble fir, Engelmann spruce, and mountain hemlock from 1,200 to 1,650 meters in elevation. No known sites are documented on the Mt. Hood National Forest (NRIS

2010), but the species is suspected to occur on the Forest.

6. ***Helvella crassitunicata*** is endemic to Oregon and Washington and grows scattered to gregarious on soil, especially along trails, in montane regions with Pacific silver fir, noble fir, grand fir, and subalpine fir. There are only two known sites documented on the Mt. Hood National Forest (NRIS 2010).

7. ***Macowanites mollis*** is endemic to Oregon and Washington. There is only one known site on the Mt. Hood National Forest (Larch Mountain). This mushroom looks like a disfigured specimen of *Russula* or *Lactarius* and is found in association with the roots of grand fir, Douglas- fir, and western hemlock above 1,000 meters elevation.

8. ***Mythicomyces corneipes*** is widespread across western North America and northern Europe and was reported on the Mt. Hood National Forest (Castellano et al. 2003); however, no known sites are documented on the Mt. Hood National Forest in the NRIS database (2010). This species is in the Cortinariaceae family, is solitary to gregarious in habit, and grows along margins of bogs among mosses or on wet soil under conifers and alder species.

9. ***Phaeocollybia californica*** is endemic to the Pacific Northwest with 34 sites known from western Washington, western Oregon, and northern California. There is one known site on the Mt. Hood National Forest (Larch Mountain) recorded in NRIS (2010). *P. californica* is terrestrial (mycorrhizal), fasciculate (growing in close bundles) to gregarious (growing in arcs) in habit, and occurs in humic soils of moist coniferous (true fir, hemlock, Douglas-fir) forest and mixed (true fir, Pacific madrone, oak, Douglas-fir, and hemlock) coastal and coastal montane forests.

10. ***Phaeocollybia oregonensis*** is endemic to the Pacific Northwest with 10 sites known from the Oregon Coast Range and the western Cascade Range. There are five known sites documented on the Mt. Hood National Forest (NRIS 2010). This mushroom species is terrestrial (mycorrhizal), occurring solitary to gregarious, and associated with the roots of true fir, western hemlock, and Douglas-fir.

11. ***Pseudorhizina californica*** (syn. ***Gyromitra californica***) is found from British Columbia south to northern California and east to Colorado, Montana, and Nevada. It is known in Washington, Oregon, and northern California from 35 sites, one of which is on the Mt. Hood National Forest (Hood River Ranger District). *P. californica* grows on well-rotted stumps and logs of conifers or in soil with rotted wood.

12. ***Ramaria amyloidea*** is endemic to the Pacific Northwest with 16 sites known from western Washington to northern California. There is one known site on the Mt. Hood National Forest (NRIS 2010). Habitat for the species is soil in coniferous forest.

13. ***Rhizopogon alexsmithii*** (formerly ***Alpova alexsmithii***), in the false truffle group, forms fruiting bodies beneath the soil surface and is associated with conifer trees in

the Pinaceae family, particularly western hemlock and mountain hemlock, from 1,200 to 3,200 meters in elevation. There are only four known sites on the Mt. Hood National Forest (NRIS 2010).

14. ***Rhizopogon brunneifibrillosus*** is a very rare false truffle with only one documented site in Region 6: in the former Bear Springs ranger district on the Mt. Hood National Forest (Trappe 2009). *R. brunneifibrillosus* has an obligate mycorrhizal association with Douglas-fir.
15. ***Rhizopogon ellispsosporus*** is a false truffle endemic to Oregon with three reported sites: the Bureau of Land Management Medford District, the Siskiyou National Forest, and the Mt. Hood National Forest. The species has been found in association with the roots of *Pseudotsuga menziesii* and scattered *Pinus lambertiana* at 850 m elevation. It fruits in October.
16. ***Rhizopogon exiguus*** is a false truffle known from seven sites in the Northwest Forest Plan area in Washington and Oregon (Okanogan-Wenatchee, Mt. Baker-Snoqualmie, Rogue River- Siskiyou, and Siuslaw National Forests, and the Medford District BLM). Four of the sites occur in the Douglas-fir series, one in the white fir/grand fir series, one in the western red cedar series, and one in the western hemlock series. The elevation of the sites ranges from near sea level to 3,850 ft. (USDA Forest Service Species Fact Sheet - February 2014).
17. ***Rhizopogon inquinatus***, a false truffle, is found in association with the roots of Douglas-fir and western hemlock from 500 to 1,400 meters elevation. There are no known sites on the Mt. Hood National Forest although the species is suspected to occur on the Forest. Castellano et al. (1999) report two sites on the Willamette National Forest.
18. ***Stagnicola perplexa***, in the Cortinariaceae family, grows in groups on rotten wood, occasionally buried deeply enough to appear "rooting" in wet (or recently) dried-up depressions in coniferous forest. One known site is reported for the Mt. Hood National Forest (Middle Fork of the Salmon River) by Castellano et al. (2003); however no known sites are listed in NRIS (2010) for the Forest.

Biological Evaluation

Table 7 below summarizes the effect of the proposed project on Region 6 sensitive species present or with potential habitat in the proposed project area. Individuals or the habitat of some sensitive species may be impacted (MIIH rating). A no effect/impact rating is given for species whose habitat is not present in the proposed project area. It is assumed there would be no effect on species whose habitats are not present in the proposed project area.

Table 7 - Biological Evaluation Process Summary by Species

Species	Step #1 Prefield Review, Is Habitat Present?	Step #2 Field Recon. Species Present?	Step #3 Conflict Determination, What is Conflict?	Step #4 Analysis of Effects, How Important?	Step #5 Biological Investigation, More Needed?
Agoseris elata	No	No	No Impact	N/A	N/A
Astragalus tyghensis	No	No	No Impact	N/A	N/A
Boechera atrorubens	No	No	No Impact	N/A	N/A
Botrychium lunaria	**Yes**	No	**MIIH**	N/A	N/A
Botrychium montanum	**Yes**	No	**MIIH**	N/A	N/A
Calamagrostis breweri	No	No	No Impact	N/A	N/A
Carex capitata	**Yes**	No	**MIIH**	N/A	N/A
Carex comosa	No	No	No Impact	N/A	N/A
Carex diandra	**Yes**	No	**MIIH**	N/A	N/A
Carex lasiocarpa var. *americana*	**Yes**	No	**MIIH**	N/A	N/A
Carex livida	No	No	No Impact	N/A	N/A
Carex nardina	No	No	No Impact	N/A	N/A
Carex retorsa	**Yes**	No	**MIIH**	N/A	N/A
Carex vernacula	**Yes**	No	**MIIH**	N/A	N/A
Castilleja thompsonii	No	No	No Impact	N/A	N/A
Coptis trifolia	**Yes**	No	**MIIH**	N/A	N/A
Corydalis aquae-gelidae	**Yes**	**Yes**	**MIIH**	**Yes**	N/A
Delphinium nuttallii	**Yes**	No	**MIIH**	N/A	N/A
Elatine brachysperma	**Yes**	No	**MIIH**	N/A	N/A
Erigeron howellii	**Yes**	No	**MIIH**	N/A	N/A
Eucephalus (=*Aster*) *gormanii*	**Yes**	No	**MIIH**	N/A	N/A
Fritillaria camschatcensis	**Yes**	No	**MIIH**	N/A	N/A
Howeliia aquatilis var. *howellii* (FEDERALLY THREATENED SPECIES)	**Possibly**	No	**MIIH**	N/A	N/A
Lewisia columbiana var. *columbiana*	**Yes**	No	**MIIH**	N/A	N/A
Lomatium watsonii	**Yes**	No	**MIIH**	N/A	N/A
Lycopodiella inundata	No	No	No Impact	N/A	N/A
Lycopodium complanatum	Yes	No	**MIIH**	N/A	N/A
Ophioglossum pusillum	**Yes**	No	**MIIH**	N/A	N/A
Phlox hendersonii	No	No	No Impact	N/A	N/A
Pinus albicaulis	No	No	No Impact	N/A	N/A
Potentilla villosa	No	No	No Impact	N/A	N/A
Ranunculus triternatus (=*R. reconditus*)	No	No	No Impact	N/A	N/A

Species	Step #1 Prefield Review, Is Habitat Present?	Step #2 Field Recon. Species Present?	Step #3 Conflict Determination, What is Conflict?	Step #4 Analysis of Effects, How Important?	Step #5 Biological Investigation, More Needed?
Romanzoffia thompsonii	No	No	No Impact	N/A	N/A
Rorippa columbiae	**Yes**	No	**MIIH**	N/A	N/A
Rotala ramosior	**Yes**	No	**MIIH**	N/A	N/A
Scheuchzeria palustris ssp. *americana*	**Yes**	No	**MIIH**	N/A	N/A
Sisyrinchium sarmentosum	**Yes**	No	**MIIH**	N/A	N/A
Streptopus streptopoides	**Yes**	No	**MIIH**	N/A	N/A
Sullivantia oregana	No	No	No Impact	N/A	N/A
Suksdorfia violacea	No	No	No Impact	N/A	N/A
Taushia stricklandii	**Yes**	No	**MIIH**	N/A	N/A
Utricularia minor	**Yes**	No	**MIIH**	N/A	N/A
Utricularia ochroleuca	**Yes**	No	**MIIH**	N/A	N/A
Wolfia borealis	**Yes**	No	**MIIH**	N/A	N/A
Wolfia columbiana	**Yes**	No	**MIIH**	N/A	N/A
Anastrophyllum minutum	No	No	No Impact	N/A	N/A
Andreaea schofieldiana	**Yes**	No	**MIIH**	N/A	N/A
Anthelia julacea	No	No	No Impact	N/A	N/A
Barbilophozia lycopodioides	No	No	No Impact	N/A	N/A
Blepharostoma arachnoideum	No	No	No Impact	N/A	N/A
Brachydontium olympicum	No	No	No Impact	N/A	N/A
Bryum calobryoides	No	No	No Impact	N/A	N/A
Calypogeia sphagnicola	No	No	No Impact	N/A	N/A
Cephaloziella spinigera	No	No	No Impact	N/A	N/A
Conostomum tetragonum	No	No	No Impact	N/A	N/A
Encalypta brevicollis	**Yes**	No	**MIIH**	N/A	N/A
Encalypta brevipes	**Yes**	No	**MIIH**	N/A	N/A
Entosthodon fascicularis	No	No	No Impact	N/A	N/A
Gymnomitrion concinnatum	No	No	No Impact	N/A	N/A
Haplomitrium hookeri	**Yes**	No	**MIIH**	N/A	N/A
Harpanthus flotovianus	No	No	No Impact	N/A	N/A
Herbertus aduncus ssp. aduncus	**Yes**	No	**MIIH**	N/A	N/A
Lophozia gillmanii	No	No	No Impact	N/A	N/A
Lophozia laxa	No	No	No Impact	N/A	N/A
Marsupella condensata	No	No	No Impact	N/A	N/A
Marsupella emarginata var. *aquatic*	No	No	No Impact	N/A	N/A
Marsupella sparsifolia	No	No	No Impact	N/A	N/A
Nardia japonica	No	No	No Impact	N/A	N/A

Species	Step #1 Prefield Review, Is Habitat Present?	Step #2 Field Recon. Species Present?	Step #3 Conflict Determination, What is Conflict?	Step #4 Analysis of Effects, How Important?	Step #5 Biological Investigation, More Needed?
Polytrichastrum sexangulare var. *vulcanicum*	No	No	No Impact	N/A	N/A
Polytrichum strictum	No	No	No Impact	N/A	N/A
Preissia quadrata	No	No	No Impact	N/A	N/A
Rivulariella gemmipara	**Yes**	No	**MIIH**	N/A	N/A
Scapania obscura	**Yes**	No	**MIIH**	N/A	N/A
Schistidium cinclidodonteum	No	No	No Impact	N/A	N/A
Schofieldia monticola	**Yes**	No	**MIIH**	N/A	N/A
Splachnum ampullaceum	No	No	No Impact	N/A	N/A
Tetraphis geniculata	**Yes**	No	**MIIH**	N/A	N/A
Trematodon asanoi (= *T. boasii*)	No	No	No Impact	N/A	N/A
Hypotrachyna riparia	**Yes**	No	**MIIH**	N/A	N/A
Leptogium cyanescens	**Yes**	No	**MIIH**	N/A	N/A
Lobaria linita	**Yes**	No	**MIIH**	N/A	N/A
Pannaria rubiginella	**Yes**	No	**MIIH**	N/A	N/A
Pilophorus nigricaulis	**Yes**	No	**MIIH**	N/A	N/A
Ramalina pollinaria	**Yes**	No	**MIIH**	N/A	N/A
Stereocaulon spathuliferum	No	No	No Impact	N/A	N/A
Texosporium sancti-jacobi	No	No	No Impact	N/A	N/A
Tholurna dissimilis	No	No	No Impact	N/A	N/A
Albatrellus avellaneus	**Yes**	Assumed Presence	**MIIH**	N/A	N/A
Bridgeoporus nobilissimus	**Yes**	Assumed Presence	**MIIH**	**Yes**	No
Choiromyces venosus	**Yes**	Assumed Presence	**MIIH**	N/A	N/A
Cortinarius barlowensis	**Yes**	Assumed Presence	**MIIH**	N/A	N/A
Cystangium idahoensis	**Yes**	Assumed Presence	**MIIH**	N/A	N/A
Helvella crassitunicata	**Yes**	Assumed Presence	**MIIH**	N/A	N/A
Macowanites mollis	**Yes**	Assumed Presence	**MIIH**	N/A	N/A
Mythicomyces corneipes	**Yes**	Assumed Presence	**MIIH**	N/A	N/A
Phaeocollybia californica	**Yes**	Assumed Presence	**MIIH**	N/A	N/A
Phaeocollybia oregonensis	**Yes**	Assumed	**MIIH**	N/A	N/A

Species	Step #1 Prefield Review, Is Habitat Present?	Step #2 Field Recon. Species Present?	Step #3 Conflict Determination, What is Conflict?	Step #4 Analysis of Effects, How Important?	Step #5 Biological Investigation, More Needed?
		Presence			
Pseudorhizina (= *Gyromitra*) *californica*	**Yes**	Assumed Presence	**MIIH**	N/A	N/A
Ramaria amyloidea	**Yes**	Assumed Presence	**MIIH**	N/A	N/A
Rhizopogon alexsmithiii	**Yes**	Assumed Presence	**MIIH**	N/A	N/A
Rhizopogon brunneifibrillosus	**Yes**	Assumed Presence	**MIIH**	N/A	N/A
Rhizopogon ellipsosporus	**Yes**	Assumed Presence	**MIIH**	N/A	N/A
Rhizopogon exiguus	**Yes**	Assumed Presence	**MIIH**	N/A	N/A
Rhizopogon inquinatus	**Yes**	Assumed Presence	**MIIH**	N/A	N/A
Stagnicola perplexa	**Yes**	Assumed Presence	**MIIH**	N/A	N/A

No Impact = A project or activity would have no environmental impacts on habitat, individuals, a population, or a species because the habitats where these species occur are not within the proposed project area.
MIIH = May impact individuals or their habitat, but would ***not*** likely contribute to a trend towards federal listing or loss of viability to the population or species.

DIRECT AND INDIRECT EFFECTS - ACTION ALTERNATIVES

Rare Species - Cold water corydalis (*Corydalis aquae-gelidae*): Logging-associated disturbance in riparian reserves (headwater seeps and springs, streams, and river corridors) can negatively affect cold water corydalis populations and suitable habitat if present. Cutting of trees in the vicinity of cold water corydalis populations could alter shading, sun exposure, and water temperature, environmental variables to which cold water corydalis is sensitive. The species requires some indeterminate (unquantifiable) combination of sunlight and shade for suitable habitat (Conservation Assessment and Management Recommendations, 2017). Sediment delivery into streams resulting from timber harvest, new road construction, and other ground-disturbing activities associated with the proposed vegetation management actions for the project could negatively affect cold water corydalis populations. Generated sediment could make its way into streams and be deposited along streamsides and gravel bars, impacting corydalis populations and suitable habitat. Factors such as type of road surface, amount of precipitation, rain-on-snow events, landslide potential, road construction vs. road decommissioning, and vegetation cover on sediment delivery were analyzed in the hydrologist's report and the conclusion was drawn that sediment delivery should be reduced given the project design criteria associated with new road construction.

Rare Species - Methuselah's beard (*Usnea longissima*): Methuselah's beard is primarily associated with riparian reserves although it can also occur in upland forest. Falling or limbing of trees on which Methuselah's beard is growing would destroy populations of the lichen. It cannot survive on fallen trees, branches, or the forest floor. Methuselah's beard is vulnerable to changes in tree density and canopy closure (Sillett and Goslin 1999, Dettki and Esseen 1998).

Development of Late-Successional/Old-Growth (LSOG) Characteristics: Thinning from below (i.e., removal of suppressed and intermediate trees) in forest stands can hasten the development of late-successional/old-growth (LSOG) characteristics (e.g., large trees, snags, and downed logs; a multi-layered canopy; vertical and horizontal spatial complexity; and species diversity) and foster the development of understory plant communities more similar to those found in old-growth forests (Poage & Tappeiner 2002, Bailey & Tappeiner 1998). LSOG characteristics can develop even in dense unthinned young forests (Winter *et al.* 2002); however, it takes much longer for young stands to develop through the stages of stem exclusion (high tree density, closed canopy, and a depauperate understory) and understory reinitiation (tree death resulting in the formation of canopy gaps and the growth of diverse shrubs and forbs in the understory) to old growth (large trees, snags, and downed logs; multi-layered canopy; structural and spatial complexity; high species diversity). Older forests have a variety of living and dead tree structures (e.g., trees with dead and/or multiple tops, bole and top decays, and cavities) as well as vertical (the distribution of branches and foliage) and horizontal (the distribution of trees, snags, and logs) spatial complexity (Franklin *et al*. 2002). Structural and spatial complexity creates a diversity of ecological niches for many forest species (animals, plants, lichens, and fungi) to occupy. Thinning from below is a forest management tool that has been demonstrated through research studies to hasten the development of structural and spatial complexity in young forests, which typically lack such complexity.

Understory Vegetation: Thinning can dramatically alter understory vegetation in young managed forests compared to unthinned forests by influencing canopy openness and because of ground disturbance (Davis & Puettmann 2009). A number of studies document that understory vegetation recovers over time following commercial thinning (Bailey *et al.* 1998, He & Barclay 2000, Thysell & Carey 2001, Lindh & Muir 2004, Davis & Puettmann 2009). For example, in 30- to 50-year-old even-aged Douglas-fir stands on the western slope of the central Oregon Cascade Range, initial declines of bryophytes, tall shrubs, and low shrubs occurred following thinning with subsequent recovery and growth in 5 to 7 years (Davis & Puettmann 2009). Although herbs displayed little initial response, a release of early seral species was evident in thinned stands 5 to 7 years following treatment (Davis & Puettmann 2009). Bailey *et al.* (1998) found herbaceous cover and species richness were greater in thinned than unthinned old-growth Douglas-fir/western hemlock stands in western Oregon, concluding that herbaceous communities are resilient to disturbance caused by past and current forest management; however, part of the increase in species richness that they documented was due, they acknowledge, to the introduction of non-native species in thinned stands (Bailey *et al.* 1998).

Thysell and Carey (2001) report that variable-density thinning in 60-to-75-year-old Douglas-fir stands in the Puget Trough in western Washington initially resulted in decreased understory

cover, but within three years understory cover recovered and species richness increased by >150%. Variable-density thinning, they concluded, shows promise as a technique to restore vegetative complexity in closed-canopy second-growth forests. No significant treatment effects on vascular or nonvascular understory species, except salal and Oregon beaked moss (*Kindbergia oregana* [Sull.] Ochyra; synonym *Eurhynchium oreganum*), were detected 27 years after thinning of a 51-year-old Douglas-fir forest on Vancouver Island, British Columbia (He & Barclay 2000). Heavy thinning led to high salal and Oregon beaked moss cover. The increase in percent cover of Oregon beaked moss documented by He & Barclay (2000) is not particularly surprising because this "weedy" native species and a handful of other pioneer moss species can dominate the forest floor in thinned as well as unthinned second-growth Douglas-fir/western hemlock stands in western Oregon (personal observation). He & Barclay (2000) conclude that an effective way to conserve species diversity is to protect specific substrate types (e.g., tree trunks, stumps, and coarse woody debris). They recommend commercial thinning to reduce the duration of stem exclusion in similar types of forests. Treefall gaps are the aspect of old-growth stand structure that is particularly critical for forest floor herbs and shrubs (Lindh & Muir 2004). Lindh & Muir (2004) conclude that a landscape-level patchwork of thinning intensities and timings may help speed post-disturbance increases in late-seral understory species.

Forbs (Non-Woody Plants): The response of the herbaceous layer on the forest floor to disturbance is more difficult to predict than the response of the tree or shrub layer because of the greater diversity of species and life-history strategies in the herbaceous layer (Roberts 2004). Shade-tolerant species that do better under partial or closed forest canopies may respond less favorably to canopy reduction. Halpern & Spies (1995) report that some plant taxa (e.g., Chimaphila umbellata, Goodyera oblongifolia, Orthilia secunda, Pyrola spp.) appear as sensitive to removal of the tree canopy as to fire in older Douglas-fir forests on the west side of the Cascade Range that have been clearcut and broadcast burned. These and other herbaceous taxa that occur in the North Clack project area (e.g., Anemone deltoidea, Anemone oregana, Clintonia uniflora, Trillium ovatum) may be similarly affected (set back) initially following thinning by opening the forest canopy. Typically, solar radiation, mean temperature, and temperature fluctuations at the forest floor level increase, and relative humidity and moisture at the soil surface decrease following canopy removal (Collins et al. 1985, Roberts 2004). The drier forest floor microclimate resulting from canopy removal can make it challenging for plants requiring partial or full shade to persist or to survive. Forb species capable of reproducing vegetatively as well as by seed are more likely to return following disturbance. How long-lived the seed of a forb species is in the soil seed bank (upper soil profile) also plays a major role in determining which forb species resprout following ground disturbance. Species whose seed bank is persistent (seeds living longer than one year), as opposed to transient (seeds living less than one year), are more likely to resprout and recolonize the area. Even then, some species may not resprout until more shade is once again restored in the developing stand.

The effects of canopy removal or physical soil disturbance can be potentially as severe as those of fire (Halpern & Spies 1996). Halpern & Spies (1996) report that in older Douglas-fir forests 70-90% of understory taxa survived logging and burning; of the 10-30% of species that initially disappeared, however, most eventually recolonized or reemerged. They attribute this

community-level resilience to a successional process driven by vegetative recovery: the regenerative structures (e.g., tubers, roots, rhizomes) of most plants are buried deeply enough to ensure survival, although species with aboveground perennating structures (e.g., *Linnaea borealis* and *Whipplea modesta*) are sensitive to burning and survive only in unburned microsites (Halpern & Spies 1996).

For a number of shrub and forb species, vegetative regeneration (as opposed to reproduction by seed) is often the dominant mode of regeneration following disturbance. Most of the shrub and forbs species found in the North Clack project area can regenerate (i.e., reproduce) vegetatively (asexually). See plant list in Appendix A for all botanical species found during field surveys and their mode of vegetatative regeneration. How well a particular shrub or forb responds to ground disturbance would vary by species. Rhizomatous species such as big huckleberry (*Vaccinium membranaeceum*) and beargrass (*Xerophyllum tenax*) will tolerate some ground disturbance and a more open forest environment. Populations of many PNW huckleberry species are maintained through lateral expansion of vegetative clones (FEIS). Beargrass reproduces vegetatively by offshoots of the rhizome (FEIS). Dwarf Oregon grape (*Mahonia nervosa*) is rhizomatous and gradually expands laterally in the absence of disturbance; it generally sprouts from rhizomes or creeping rootstocks after aboveground portions of the plant are destroyed (FEIS). *Anemone deltoidea, Anemone oregana, Clintonia uniflora,* and *Trillium ovatum* are examples of some common perennial herbs (forbs) found in the North Clack project area that can regenerate from rhizomes (Hitchcock and Cronquist 1973, FEIS, Burke Museum of Natural History and Culture Herbarium).

Lichens: Lichen diversity and abundance vary with forest age (Neitlich & McCune 1997). Old forests are generally considered to have greater lichen biomass and diversity than young forests because of more open canopies and diverse structures, which allow adequate penetration of light and humidity (Li *et al.* 2011). Excessively closed or open canopies may restrict lichen growth in relatively species-poor, homogeneous areas (Li *et al.* 2011, Neitlich & McCune 1997). Neitlich & McCune (1997) found that creation of canopy gaps and retention of hardwood trees and shrubs contribute to lichen diversity in young, thinned stands. Hardwoods, in particular, are focal points ("hotspots") for lichen diversity in conifer-dominated forests (Neitlich & McCune 1997). The biomass of epiphytic lichens (those growing on trees and shrubs) accumulates slowly in forest canopies (Sillett *et al.* 2000). Poor dispersal and establishment limit the development of cyanolichen populations (those containing cyanobacteria that fix atmospheric nitrogen) in Douglas-fir forests (Sillett *et al.* 2000). Retention of propagule sources for lichen reproduction in and near thinned forests promotes the accumulation of old-growth-associated epiphytic lichens (Sillett *et al.* 2000).

Lichen diversity, in general, tends to be much lower in young forests, whether thinned or unthinned, than in older forests in western Washington and Oregon (personal observation). A number of rare epiphytic lichen species (e.g., *Pseudocyphellaria rainierensis, Hypogymnia duplicata, Nephroma occultum, Usnea longissima*) are associated with older forests because their structural complexity (multiple-layered canopy, large trees, large snags, and large decaying logs) not only supports a stable microclimate in the forest interior over a long time period (for

decades or centuries) but creates a diversity of physical niches and substrates where lichens can live. Thinning can open up forest interiors to sunlight, heat, wind, and cold, resulting in abrupt changes in stand microclimate (moisture and temperature regimes) to the detriment of rare epiphytic lichens. Recently thinned stands (0 to 20 years or more following treatment), generally, are not good places to look for rare lichen species in western Washington and Oregon (personal observation).

Fungal Diversity: Lindh & Muir (2004) point out that many studies have focused on restoration of tree composition and structure following thinning, with the expectation that other components of biodiversity (e.g., understory vegetation, lichens, bryophytes, fungi) would follow. Thinning alters the community structure, diversity, and composition of ectomycorrhizal fungi in forest stands (Waters *et al.*1994, Colgan *et al.* 1999, Kannabetter & Kroeger 2001, Smith *et al.* 2002, Luoma *et al.* 2004, Trappe *et al.* 2009). Examining the effects of variable-density thinning on truffle production during the first years following thinning, Colgan et al. (1999) report a significant reduction in the total weight of truffles in thinned Douglas-fir stands compared to non-thinned stands. Initial effects of thinning appear to be that truffles become less common and shifts in abundance among species occur (Colgan *et al.* 1999). Total truffle production may recover 10 to 17 yrs. after thinning, but shifts in the relative abundance of species persist longer (Waters *et al.* 1994). The shifts in truffle species composition may affect mycophagous animals by altering the nutritional balance of their diets (Colgan *et al.* 1999). Kropp & Albee (1996) found that thinning in an even-aged 80-to-100-year-old forest reduced the total number of species of ectomycorrhizal fungi compared to an undisturbed stand. Some fungi (e.g., members of the Hygrophoraceae) were adversely affected by thinning while others (e.g., *Suillus brevipes*) were positively affected (Kropp & Albee 1996).

By contrast, Pilz *et al.* (2006) found that chanterelle productivity diminished for the first few years after thinning in 50-year-old Douglas-fir stands in the Cascade Range in Oregon, more so in heavily thinned stands than in lightly thinned stands, but then recovered within six years. If a forester wanted to maintain chanterelle fruiting in a stand targeted for repeated thinning, Pilz *et al.* (2006) conclude that frequent light thinning may impact chanterelle productivity less over time than infrequent heavy thinning. Unless mitigated, however, the additional soil compaction from frequent logging entries could impair the long-term health and fruiting of ectomycorrhizal fungi such as chanterelles (Amaranthus *et. al* 1996). Conditions on the forest floor that affect the development of mushrooms (such as light, temperature, and moisture regimes) are altered by slash disposal techniques and the increased growth of herb and shrub communities under a sparser canopy (Pilz *et al.* 2006). For example, the forest floor dries out more quickly when sunny weather returns following rain under a sparser canopy (Pilz *et al.* 2006). Egli *et al.* (2010) report from a thinning experiment in an old-growth forest in southwestern Switzerland consisting of beech, oak, spruce, fir, pine, and larch that ectomycorrhizal fruit body (mushroom) production appears to be stimulated by the growth of their associated tree hosts following stand thinning. They hypothesize that after thinning the released beech trees probably generated a carbohydrate surplus that mycorrhizal fungi, which are obligate saprotrophs, could exploit; in other words, increased growth of leave (residual) trees might enhance mushroom fruiting through greater tree vigor and photosynthetic activity.

Invasive Plants: Although commercial thinning can promote the development of understory tree and shrub layers, it can also facilitate the introduction of invasive non-native species (Bailey *et al.* 1998). Soil disturbance, an initial reduction in understory cover, and opening of the stand to greater sunlight facilitate the invasion of non-native species such as Canada thistle (*Cirsium arvense*), St. John's-wort (*Hypericum perforatum*), tansy ragwort (*Senecio jacobaea*), Scotch broom (*Cytisus scoparius*), hawkweeds (*Hieracium* spp.), knapweeds (*Centaurea* spp.), oxeye daisy (*Leucanthemum vulgare*), hairy cat's-ear (*Hypochaeris radicata*), wall lettuce (*Lactuca muralis*), and others (personal observation). Of greatest concern is the potential for introducing "ecosystem-altering" non-native species capable of invading forest understories, displacing native plants, and altering plant communities: e.g., garlic mustard (*Alliaria petiolata*), false brome (*Brachypodium sylvaticum*), herb Robert (*Geranium robertianum*), and shining geranium (*Geranium lucidum*). False brome, for example, has increased from only one known population on the Mt. Hood National Forest, eight to nine years ago, along FS road 70 along the Hot Springs Fork of the Collawash River to seven or eight known populations at the present (Hot Springs Fork, Three Lynx, Lolo Pass). In the last five years, herb Robert and shining geranium, previously scattered here and there across the landscape, have increased exponentially along roadsides (including Highway 224), in campgrounds (e.g., Lazy Bend, Indian Henry), and in skid roads and landings on the Clackamas River RD. A population of false brome was found and treated in the North Clack project area along the 4610 road (see Figure 5). Herb Robert and shining geranium are present in old logging and skid roads in some places in the North Clack project area (Figure 5). Non-native plants like these are capable of invading forested plant communities, altering native plant communities, and negatively affecting wildlife, beneficial insects (such as pollinators), fungal diversity (including mycorrhizal fungi that form beneficial associations with PNW conifers), and hydrologic regimes (e.g., snow interception; water absorption, retention, and release).

DIRECT AND INDIRECT EFFECTS of the NO-ACTION ALTERNATIVE

Development of Late-Successional/Old-Growth (LSOG) Characteristics: LSOG characteristics can develop even in dense unthinned young forests (Winter *et al.* 2002); however, it takes longer for young stands to develop through the stages of stem exclusion (high tree density, closed canopy, and a depauperate understory) to understory reinitiation (tree death leading to the formation of canopy gaps) to old growth (large trees, snags, and downed logs; structural and spatial complexity; high species diversity).

Understory Vegetation: Understory vegetation would remain sparse in stem-exclusion stands in the proposed project area until understory reinitation occurred (i.e., the mortality of less competitive trees over time opens the canopy and creates gaps, adding snags and downed logs, and increasing structural diversity and complexity and species diversity). Ground disturbance associated with timber harvest, pruning, and other vegetative management activities would not occur. There would be no disturbance to understory plant communities or soils, so there would be no period of recovery time for understory plant communities (5-10 years or even longer; 27 years or longer for some species as documented by He & Barclay 2000). Nor would there be

any risk of invasive plants being introduced and spread as there would be with the action alternatives.

Forbs (Non-Woody Plants): Understory herbaceous plant species that respond less favorably to canopy reduction (e.g., *Chimaphila umbellata, Goodyera oblongifolia, Orthilia secunda*, and *Pyrola* spp.) would not be affected (Halpern and Spies 1995). Other herbaceous taxa that occur in the North Clack area (e.g., *Anemone deltoidea*, *Anemone oregana*, *Clintonia uniflora*, *Trillium ovatum*), similarly, would not be affected (set back). There would be no negative effects from canopy removal or physical soil disturbance, which potentially can be as severe as fire on herbaceous vegetation (Halpern & Species 1996).

Lichens: Excessively closed or open canopies may restrict lichen growth in relatively species-poor, homogeneous areas (Li *et al.* 2011, Neitlich & McCune 1997). Some of the stem-exclusion stands in the proposed Goat Mountain project area have closed canopies that are probably restricting lichen diversity. Canopy gaps, which contribute to lichen diversity, would be created slowly over time. The biomass of epiphytic lichens (those growing on trees and shrubs) accumulates slowly in forest canopies (Sillett *et al.* 2000). Lichen diversity, in general, tends to be much lower in young forests, whether thinned or unthinned, than in older forests in western Washington and Oregon (personal observation).

Fungal Diversity: Under the no-action alternative, no ground would be disturbed from timber harvest, pruning, or other vegetative management activities. Ground disturbance can affect belowground organisms and processes, including the community structure, diversity, and composition of mycorrhizal fungi, which benefit trees (Waters et al.1994, Colgan et al. 1999, Kannabetter & Kroeger 2001, Smith et al. 2002, Luoma et al. 2004, Trappe et al. 2009). Some fungi respond favorably to commercial thinning, and some not. No action would not affect fungal biomass, mushroom production, and species diversity.

Invasive Plants: The risk of introducting and spreading invasive plants is reduced greatly or eliminated with the no-action alternative because there would be no ground disturbance.

SUMMARY – ACTION ALTERNATIVES

Commercial thinning, regeneration harvest, gap creation, and other proposed vegetative management activities in the North Clack project area would reduce botanical diversity (vascular plants, bryophytes, lichens, and fungi) in the short term (5-20 years), but diversity would likely recover in the long term (after 20 years). Reducing soil disturbance and the loss of biological legacies (large old trees and large old snags), already present in the fire-originated stands in North Clack, is key to maintaining structural diversity and complexity and developing biological diversity. “Skips” (no-harvest areas) can protect biological legacies, botanical hotspots, sites for rare botanical species, and unique habitats (e.g., areas with hardwood trees, seeps, springs, swales) that promote botanical diversity. The creation of small gaps through mechanized thinning that mimic the natural development of understory reinitiation gaps in forest stands can promote botanical diversity, allowing more sunlight to reach the forest floor, facilitating the colonization of less shade-tolerant shrubs and herbs. For example, creation of

canopy gaps and retention of hardwood trees and shrubs contribute to lichen diversity in young, thinned stands (Neitlich & McCune 1997).

Thinning in fire-originated stands could threaten biological legacies. Thinning could result in the loss of legacy snags, and highlead yarding could result in the damage or loss of legacy trees and snags. Occupational Safety and Health Administration (OSHA) regulations would require the felling of most or all of the legacy snags in order to provide a safe work environment for loggers. Yarding of logs bucked from harvested trees could damage legacy trees, banging or slicing into them, causing basal scarring, breaking off branches, breaking tops, or knocking trees over.

Commercial thinning can also increase the risk of introducing and spreading invasive nonnative plants in disturbed areas (particularly along system roads, in skid roads, in landings, and in gaps created by thinning). Non-native plants reduce biological diversity (native plants, wildlife, beneficial insects, fungi) and alter ecosystem functions (e.g., nutrient cycling, mycorrhizal associations, plant-animal interactions, hydrologic regimes). Some non-native plants are "ecosystem-altering" species, capable of overrunning and altering understory plant communities—even, in the case of some species (e.g., garlic mustard, false brome, herb Robert, shining geranium), preventing the establishment of tree seedlings and, thereby, thwarting forest development. Project design features (e.g., cleaning of log trucks and off-road vehicles before entry onto the Mt. Hood National Forest) would reduce, but not eliminate, the risk of introducing and spreading invasive plants.

The proposed action would create *quality* early seral habitat if biological legacies (remnant larger trees, snags, downed logs) and **some** hardwood clumps (e.g., vine maple, bigleaf maple, cottonwood) are retained/protected during harvest activities. During sale layout, "skips" could be employed to protect such resources.

The proposed action would provide opportunities to fell some second-growth trees into streams to add coarse woody debris and improve in-stream habitat complexity for fish.

The proposed action would generate funding to accomplish needed road work, including repair, stormproofing, closure, and decommissioning.

Table 8 below provides a shorthand display of the direct and indirect effects of proposed vegetation management actions of the no-action alternative and the action alternatives with its connected actions.

Table 8 - DIRECT AND INDIRECT EFFECTS

Alternatives	Forest Structure and Complexity	Biological Legacies (Large Trees and Snags)	Understory Plant Diversity	Bryophyte and Lichen Diversity	Fungal Diversity	Invasive Plants
NO-ACTION ALTERNATIVE	Forest structure and complexity would develop slowly	No loss of biological legacies would occur	Decrease until understory reinitiation stage occurs	No effect on bryophytes or lichens	No effect on fungi	Little risk of introducing or spreading invasive plants
Thinning	Development would be accelerated in plantations. It may be accelerated or may be set back if biological legacies are lost in Fire-origin stands	No loss if biological legacies are retained and protected	Decrease in the short term due to ground disturbance with Increase in 5-10 years or longer (27^{+} years) for some species	Decrease in the short term due to ground and habitat disturbance with recovery in ca. 20 years; Increase in the long run	Decrease in the short term due to ground disturbance with recovery in 6 to 17 years or longer, depending on species	Greatly increase risk of introducing and spreading invasive plants because of ground disturbance
Creation of Gaps to Improve Northern Spotted Owl Habitat	Development would be accelerated	No reduction or loss if gap creation avoids biological legacies	Increase	Small gaps would increase diversity, but large gaps would decrease diversity	Small gaps would increase diversity, but large gaps would decrease diversity	Increase risk of introducing and spreading invasive plants
Creation of Early Seral Habitat for Deer and Elk	Substantial decrease in forest structure and complexity due to regeneration harvest	Loss of biological legacies if any are present	Increase if cut areas grow back as native plant communities and are not invaded by non- native plants	Substantial decrease for many decades	Substantial decrease for many decades	Greatly increase risk of introducing and spreading invasive plants because of ground disturbance and creation of growing space opportunities
Enhancement of Forage for Deer and Elk (Meadow Burn)	N/A	N/A	N/A	Decrease for 1-5 years depending on fire severity	Little effect because most fungi of interest/concern are associated with forests	Decrease because of short-term setback of any invasive plants present and stimulation of native plant growth
Fire Hazard Reduction	Increase or decrease depending on fire severity and the areal extent to which fire is contained	No loss if biological legacies are not impacted	Increase with low fire severity but decrease with high fire severity	Decrease for 1 to 20 years depending on fire severity	Decrease for 1 to 20 years depending on fire severity	Increase risk of introducing and spreading invasive plants

CUMULATIVE EFFECTS - ACTION ALTERNATIVES

Scope of Analysis: The analysis area for assessing cumulative effects on botanical species includes (a) the proposed North Clack units, (b) areas directly adjacent to them, including riparian reserves, and (c) areas affected by the associated actions. Cumulative effects include the impacts of past, present, and future actions. Future actions that can be discussed in a cumulative-effects analysis are confined to "reasonably foreseeable future actions," defined as habitat-disturbing actions currently being planned and proposed in the area in addition to North Clack. ***Any discussion of future actions not being planned or proposed by the agency at the time of this analysis is considered speculative and outside the scope of this analysis.*** The cumulative effects discussion here is limited to past stand management actions that have shaped forest composition, structure, and understory vegetation in the analysis area and to the present proposed management actions and the foreseeable district-wide restoration EA that includes the rehabilitation and restoration of areas damaged by OHV (off-highway vehicle) use.

Background Discussion

Unlike in the disciplines of hydrology, fisheries biology, and wildlife biology, there are no modeling tools to quantify the risk (threat) of a downward trend in rare botanical species resulting from the cumulative effects of additional projects within the North Clack project area. Using computer modeling, a hydrologist can predict with some degree of confidence the cumulative effects of ground- and habitat-disturbing projects on the area's hydrology (e.g., the amount of increase in sediment delivery based on road surface type and maintenance level; changes in stream temperature) for every additional acre of ground disturbance. A hydrologist can quantitatively estimate sediment delivery in a given watershed as a result of the effects of timber harvest and road construction which could increase sediment, compared to the countervailing effects of culvert replacement, road closures, and road decommissioning which can decrease it. Botany, unlike hydrology, is not mathematical or computational. Similarly, a fisheries biologist can do fish counts and, in turn, use the same hydrologic data (e.g., projected sediment yield generated by the hydrology model, data collected on changes in stream temperature) to assess potential impacts to fish and fish habitat downstream. Similar modeling tools are available to wildlife biologists (e.g., DecAID predicts changes in coarse woody debris dynamics). Predictions about population sizes for certain species, habitat attributes (e.g., number of snags/acre for cavity nesters, tons of coarse woody debris/acre for animals), and number of acres of habitat types (e.g., forage habitat, hiding cover, nesting habitat, roosting habitat) can be made. Telemetry data can be used to track the movement of northern spotted owls and other wildlife species.

By contrast, a botanist has no real analytical or quantitative modeling tools at his/her disposal to predict the threat to many rare species (individuals or populations) or their habitat. The risk could be zero or at the other end of the spectrum; for most species, the risk factor lies somewhere between 0 and 100 percent. Risk assessment depends on the presence or absence of suitable habitat: is there suitable habitat for species *x, y,* or *z* in the planning area and, if so, how much? As simple as it might seem to determine the acres of suitable habitat, the problem

is that the habitat requirements of many rare species are only generally or broadly known. A botanist has access to plant databases (e.g., NRIS TESP, GeoBOB, Oregon Biodiversity Information Center) containing invaluable information on the numbers and locations of documented known sites for rare species, but a botanist cannot quantify (i.e., make quantitative predictions about) the potential increase in risk resulting from additional projects in a planning area. A botanist's evaluations, unlike those of a hydrologist, fisheries biologist, or wildlife biologist, are necessarily more qualitative and generalized.

Cumulative Effects

The cumulative effects resulting from an additional number of acres of disturbed ground or habitat (e.g., 50, 100, 500, or 1,000 acres) on rare or invasive species in the North Clack project area can only be broadly addressed by a botanist.

Rare Species: Ground- or habitat-disturbing activities can impact individuals or populations of rare botanical species on the Region 6 Regional Forester and OR/WA State Director Special Status Species List as well as their habitat, if present, in the planning area. Rare botanical species are challenging to find because their numbers are so few, and their distribution is scattered and, to some extent, random across vast landscapes. With additional acres of ground or habitat disturbed in a planning area such as North Clack, all a botanist can say with certainty is that, with each additional acre of disturbance, there is some likelihood of impacting individuals/populations or the habitat of a rare species if that species' habitat is present. What is the likelihood (probability) of an adverse effect? To quantify the increase in risk to a rare species requires knowing the number of acres of a species' potential suitable habitat in the planning area or, better, knowing or being able to predict where all unknown occurrences may be in the planning area. Habitat modeling has been done for the Survey and Manage (Category A) fungus Bridgeoporus nobilissimus and the Survey and Manage (Category C) lichen Hypogymnia duplicata with limited success, revealing the challenge of predicting where new occurrences might be across the landscape. These models delineate high-, moderate-, and low-likelihood habitat across a landscape. The high-likelihood areas can then be visited to see if the species is present. These habitat models have had limited success: a handful of new sites have been found. The consensus is that they need more fine-tuning to be more successful at predicting suitable habitat. Fine-tuning a habitat model requires having more data on the specific habitat requirements of a given species. The habitat requirements for some rare species can be defined somewhat narrowly (e.g., pale blue-eyed grass in wet to dry meadows; cold water corydalis in cold water streams in undisturbed older forest; B. nobilissimus in noble and Pacific silver fir snags, stumps, and occasionally trees), but the habitat requirements for many rare species are only broadly known (e.g., older forest; Douglas-fir/western hemlock forest; conifer forest above 3,500 ft. elevation; melting snowbanks), making predictions about the potential effects of forest management activities on rare species speculative and qualitative rather than quantitative.

Invasive Species: Introduced non-native plants can invade native plant communities and displace common and rare botanical species. Ground- or habitat-disturbing activities, whether

small (e.g., 1/4 acre) or large (e.g., 3,000 acres) in extent, increase the risk of introducing and spreading invasive non-native plants. It is difficult, however, to draw any precise correlations between the number of acres disturbed and the rate of spread of invasive plant species except that the fewer acres of disturbed ground or habitat, the less risk of introducing and spreading them. The risk of introducing and spreading an invasive plant varies from one species to another and depends on the proximity of infestations to project areas, a species' regeneration/reproduction ability, seed longevity in the soil seed bank, and the ease of seed dispersal or transport of vegetative propagules (e.g., stem or root fragments, rhizomes, stolons) by wind, water, wildlife, people, and/or vehicles.

Summary: Additional ground or habitat disturbance in the planning area can increase the risk of impacting individuals, populations, or the habitat of a rare botanical species, but the potential increase in risk is unknown for many species because their habitat requirements are only broadly known.

Additional ground or habitat disturbance in the planning area increases the risk of introducing and spreading invasive non-native plants. Invasive plants are adept at colonizing disturbed ground.

COMPLIANCE WITH FOREST PLAN STANDARDS AND GUIDELINES

No-Action Alternative

The no-action alternative would comply with all Forest Plan standards and guidelines related to forest diversity and threatened, endangered, and sensitive (TES) plants (Land and Resource Management Plan – Mt. Hood National Forest, 1990) because no action translates into zero ground or habitat disturbance except that effected by natural processes (e.g., windthrow, wildfire, forest diseases, insects, climate change).

Action Alternatives

The action alternatives would comply with Forest Plan standards and guidelines related to forest diversity (FW-148 through FW-169; chapter 4, pp. 67-68) if the diversity of plant communities is not compromised through the introduction and spread of invasive non-native plants, remnant biological legacies (i.e., large-diameter trees, large snags, and downed logs) are retained, and TES plant species, if found, are protected. The retention of biological legacies (forest structural diversity) promotes plant and animal diversity.

The action alternatives would comply with Forest Plan standards and guidelines related to TES plant species (FW-170 through FW-186; chapter 4, pp. 69-70) if any TES species found are protected.

The action alternatives would comply with Forest Plan standards and guidelines related to special forest products (FW-709 through FW-713; chapter 4, p. 131) if ground or habitat is not excessively disturbed (i.e., the disturbance footprint is kept to a minimum) and products such as

boughs, beargrass, mushrooms, forest greens (e.g., huckleberry, salal, Oregon grape), mosses and ferns, and medicinal forest products (derived from vascular plants, bryophytes, lichens, and fungi) are not overharvested.

RESULTS AND DISCUSSION

Cold water corydalis (*Corydalis aquae-gelidae*), both a sensitive species on the Region 6 Regional Forester and OR/WA State Director Special Status Species List and a Survey and Manage Category A species (manage all known sites), is documented in a number of locations within the proposed project area. See Tables 5 & 6 and Figures 5, 6 & 7 for locations. The North Fork of the Clackamas and its tributaries are home to a number of documented sites for cold water corydalis, and it is highly likely that there are more cold water corydalis sites than those documented in the NRIS TESP and ORBIC databases that have not yet been detected/found in the proposed project area. Stream and river corridors in the proposed project area were not surveyed because of (1) a lack of resources (only one botanist conducting surveys) and (2) riparian reserves, especially along edges of proposed units, are typically excluded from thinning operations and other logging disturbance. New cold water corydalis populations can establish downstream via seed in water flowing from upstream populations (seed is transported by water), making the probability of there being more populations downstream from documented upstream populations highly likely. Cold water corydalis can occur in headwater seeps, streams, and rivers. Avoid/minimize all disturbance in riparian reserves within the proposed project area. It is highly likely that more populations of cold water corydalis would be found in the North Fork Clackamas and its tributaries within the proposed project area if field surveys are done systematically.

Although neither a sensitive nor a strategic species on the Region 6 Regional Forester and OR/WA State Director Special Status Species List, Methuselah's beard (*Usnea longissima*) is a Survey and Manage Category F species: management (protection) of sites is <u>not</u> required. But I recommend that sites be protected for the following reasons: (a) this rare lichen is a declining species of North American old-growth forests (Bennett 1995); (b) it is sporadic in distribution on the Clackamas River Ranger District and throughout the Northwest Forest Plan area (northwestern Washington to northwestern California) (NRIS TESP database); (c) it has been extirpated from all of its range in Europe and Scandinavia due to habitat loss and air pollution, except for parts of Norway and Italy where it is "red-listed" as an endangered species (Kalas *et al*. 2006, Storaunet *et al*. 2008); (d) it is listed on the "Red List of California Lichens" (The California Lichen Society); and (e) it is valued and used medicinally for its reputed anti-bacterial, anti-viral, and anti-cancer properties.Use "skips" to protect sites. The Forest Service's NRIS TESP database documents a number of Methuselah's beard (*Usnea longissima*) sites in the proposed project area, and additional sites were found during field surveys in 2017 and 2018. See Tables 5 & 6 and Figures 5, 6 & 7 for locations. Populations of Methuselah's beard occur predominantly in riparian reserves, hanging from trees growing along or nearby rivers and tributaries, but populations can also occur in upland forest. It is highly likely that more populations of Methuselah's beard would be found/detected within riparian reserves if rivers and streams in the proposed project area were surveyed in a systematic fashion.

Allotropa virgata (candystick, sugarstick), a mycoheterotrophic plant, was found in proposed units 194 and 198, and the NRIS TESP database lists *A. virgata* in unit 138. Additionally, the public found and reported 27 sightings of *A. virgata* (see Table 6). (This species is relatively easy to identify.) *A. virgata* is a former Survey and Manage species but it currently has no federal status. The sightings reported by the public suggest that *A. virgata* may be relatively common in the North Clack project area. **Protection of *A. virgata* sites is not required**. Given the paucity of known sites for this species on the west side of the Mt. Hood National Forest, before the occurrences found in North Clack, post-disturbance monitoring of a sample of *A. virgata* sites in the proposed project area would be a good step, from a conservation management standpoint, by providing valuable information on how this species fares following commercial thinning. New sites found in the future elsewhere on the west side of the Mt. Hood National Forest should be mapped in NRIS TESP so that we can obtain a better idea of just how common or uncommon this species may be on the Mt. Hood National Forest.

The uncommon orchid called phantom orchid or snow orchid (*Cephalanthera austiniae*; formerly known as *Eburophyton austiniae*) was found in unit 198. Phantom orchid has no federal conservation status in Region 6. **Protection of phantom orchid sites is not required.** Given the paucity of observations recorded for this species on the west side of the Mt. Hood National Forest, new sites found in the future elsewhere on the Mt. Hood National Forest should be mapped in NRIS TESP so that we can obtain a better idea of how common or uncommon this species may be on the Mt. Hood National Forest. Although neither a sensitive or strategic species on the Region 6 Regional Forester and OR/WA State Director Special Status Species List (July 2015) nor a Survey and Manage species, phantom orchid may be worthy of conservation/protection. I have only come across it a few times on the west side of the Mt. Hood National Forest. The phantom orchid is a "species at risk" in British Columbia (Environment and Climate Change Canada, 2018). Canada's recovery strategy[5] for this species sets out to arrest or reverse the decline of phantom orchid, including identifying critical habitat for it.

Commercial thinning may impact *individuals* or the *habitat* of some fungi that are on the Region 6 Regional Forester and OR/WA State Director Special Status Species List. Field surveys did not detect any sensitive fungi on this list because botanical surveys were conducted outside the peak spring and fall fruiting seasons for fungi in the Pacific Northwest region (April-May and October-November, respectively). Botanical surveys also would not have detected hypogeous/sequestrate fungi (= truffles and false truffles), which produce belowground fruiting bodies. Pre-disturbance surveys for hypgeous/sequestrate fungi would be highly labor-intensive and time-consuming, involving probing and digging in the soil. Furthermore, the large areal extent of the proposed project area and limited amount of time available to conduct and complete surveys for hypogeous fungi make field surveys for them impractical.

Forest Service policy on the subject of pre-disturbance surveys for sensitive fungi on the Region 6 Regional Forester and OR/WA State Director Special Status Species List is that they are

[5] https://www.registrelep-sararegistry.gc.ca/virtual_sara/files/plans/rs_phantom_orchid_e_proposed.pdf

impractical because of the difficulty of finding mushrooms (particularly the truffles and false truffles produced by hypogeous fungi), the difficulty of identifying many fungi in the field (e.g., identification in many cases requires examination of spores and hyphae for clamp connections using a compound microscope), the variability in fruiting-body production from year to year (fungi do not produce fruiting bodies every year and fruiting body production can vary considerably from year to year), the ephemerality of fruiting bodies (most are short-lived), and other factors. Consequently, sensitive fungi are assumed to be present in proposed project areas if suitable habitat for them is present. This biological evaluation recognizes that some sensitive fungi on the Region 6 Regional Forester and OR/WA State Director Special Status Species List may be present in the proposed project area and acknowledges the potential impact of ground- and habitat-disturbing activities associated with commercial thinning on individuals, populations, or their habitat.

Tumala Meadow Botanical Area (Special Interest Area/Research Natural Area)

Tumala Meadow or Meadows (formerly called Squaw Meadow) is a large meadow complex located at the eastern edge of the North Clack project area (T4S, R6E, Sec. 13 & 14). To the northwest, Tumala Mountain (formerly called Squaw Mountain), at 4,500 feet elevation, rises above Tumala Lakes (formerly called Squaw Lakes) and Tumala Meadow. Water drains from the high-elevation meadow complex (3,600 to 3,800 feet) to the southwest into Tumala Creek (formerly called Squaw Creek), which flows into the Roaring River.

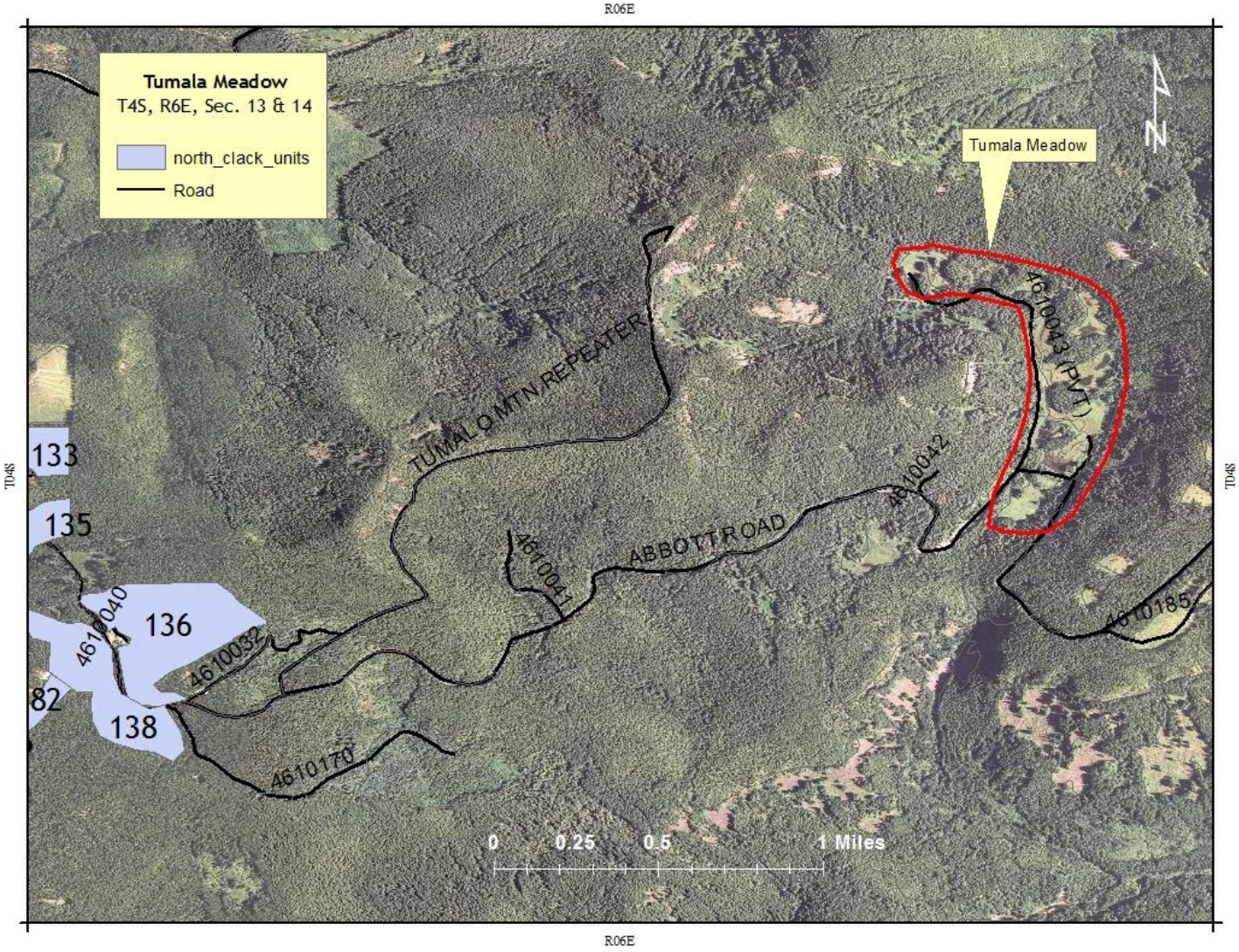
It is not clear if Tumala Meadow is or was an "official" botanical area or research natural area. Only sparse documentation and information about Tumala Meadow can be found at the Estacada Ranger Station. At some time in the late 1980s or early 1990s, the area was proposed as a research natural area. The former district botanist recalls Tumala Meadow as a private parcel that was transferred over to The Nature Conservancy in a land exchange (G. Masters, pers. comm., 2018). What year that happened is not clear. After some period of time (a year or two), The Nature Conservancy transferred the parcel over to the Mt. Hood National Forest with the understanding that the meadow complex be managed as a protected wetland in perpetuity.

Visiting the meadow complex in August 1988, The Nature Conservancy (TNC) recorded that the meadows and lakes in the basin below Tumala Mountain are surrounded by Pacific silver fir/western hemlock forest with Sitka alder (*Alnus sinuata*) in avalanche chutes (TNC records provided by S. Vrilakas, Oregon Biodiversity Information Center). Plant communities in the meadows are dominated by Sitka sedge (*Carex aquatilis* var. *dives*; syn. *C. sitchensis*) with blister sedge (*Carex vesicaria*), beaked sedge (*Carex rostrata*), lakeshore sedge (*C. lenticularis*), king's scepter gentian (*Gentiana sceptrum*), and arrowleaf ragwort (*Senceio triangularis*). Another synonym for Sitka sedge is water sedge. Common on the west side of the Mt. Hood National Forest, Sitka sedge is an indicator species for wet meadows. The meadows, the report continues, are ringed with Geyer willow (*Salix geyeriana*), Lemmon willow (*Salix lemmonii*), and perhaps other willow species. Yellow pond lily (*Nuphar polysepalum*), along with minor amounts of pondweed (*Potamogeton* sp.), is the dominant emergent vegetation in the ponds/lakes in the basin.

Cold water corydalis (*Corydalis aquae-gelidae*), a sensitive species in Region 6 (Pacific Northwest) as well as a Survey and Manage species, may inhabit headwaters and downstream reaches in the basin. There is a historical record from 1955 of cold water corydalis observed in Tumala Creek (southwest of the meadow complex). There are no records for cold water corydalis in Tumala Meadow in the Forest Service's NRIS TESP database, but known sites are documented nearby: (a) just north of the meadow complex and Tumala Mountain in the headwaters of Eagle Creek and (b) west of the meadow complex in the North Fork of the Clackamas River and its tributaries (NRIS TESP and ORBIC databases). Two rare/uncommon species, fir clubmoss (*Huperzia selago*; formerly *Lycopodium selago*) and Willamette false rue anemone (*Enemion hallii*; formerly *Isopyrum hallii*), occur in the area. Neither species was on the Region 6 sensitive species list (at least going back as far as 2004) nor has either been on the Survey and Manage list (2001 to present) or on Table C-3 of the Northwest Forest Plan, 1994; (pages C-60 to C-61). They may have been on the Region 6 sensitive species list before 2004 (in the 1990s or 1980s). The former district botanist recalls moonwort (*Botrychium*) species observed in ephemeral waters at the north end of the meadow complex and an occurrence possibility in the meadow itself. The *Botrychium* species—it is not clear if one or more species were observed and what *Botrychium* species was/were observed--were on the "original" TES plant species lists that were part of the Rare Plant Program in Region 6 pioneered by former Forest Service botanists Jean Siddall, Rick Brown, Lois Kemp (former forest botanist for the Mt. Hood National Forest in the late 1980s and early 1990s), and others. The former district botanist recalls a sphagnum bog/fen present at the north end of the meadow complex.

Timber harvest has occurred in the past in the vicinity of Tumala Meadow, but no timber harvest is proposed in the vicinity of the meadow complex with the North Clack project. The district wildlife biologist has been involved in recent discussions about the possibility of re-introducing beavers in or near the meadow complex. Recent sightings of a beaver or beavers in the area have been reported. It is not clear what the effect of beaver activity in the area (primarily upstream impoundment of water) might have on cold water corydalis populations, if any are present, downstream in Tumala Creek. It is conceivable that impounded water behind beaver dams may have time to warm enough on sunny days, before making its way downstream, to create unfavorable habitat conditions for cold water corydalis in Tumala Creek. Cold water corydalis requires cold water (43 to 57 degrees F.). Surveys for cold water corydalis in headwaters draining into the Tumala Meadow complex and in Tumala Creek have not been conducted to verify whether the species is present or absent and, if populations are present, what steps may need to be taken to protect the species.

Figure 8 - Tumala Meadow (eastern edge of North Clack project area)



CONCLUSIONS AND RECOMMENDATIONS

Recommended Project Design Criteria

Protect all known cold water corydalis (*Corydalis aquae-gelidae*) sites within the proposed project area. Cold water corydalis is both a sensitive species on the Region 6 Regional Forester and OR/WA State Director Special Status Species List and a Survey and Manage Category A species (manage all known sites). The North Fork of the Clackamas and its tributaries are home to a number of documented sites for cold water corydalis, and it is highly likely that there are more cold water corydalis sites other than those documented in the NRIS TESP and ORBIC databases that have not yet been detected/found in headwater seeps and springs, streams, and stretches of river in the proposed project area. Stream and river corridors were not surveyed because of (1) a lack of resources (only one botanist conducting field surveys) and (2) riparian reserves, especially those along unit edges, are typically excluded from logging disturbance. New cold water corydalis populations can establish downstream via seed transported by water flowing from upstream populations, making the probability of there being more populations downstream from documented upstream populations highly likely. Avoid disturbance in headwater seeps and springs, streams, and the North Fork of the Clackamas River within the proposed project area. The documented sites for this species indicate that there are certainly more sites in the North Fork of the Clackamas and its tributaries.

Protect all Methuselah's beard (*Usnea longissima*) sites within the proposed project area. Methuselah's beard is a Catergory F Survey and Manage species: i.e., management (protection) of sites is <u>not</u> required. But I recommend that sites be protected for the following reasons: (a) this rare lichen is a declining species of North American old-growth forests (Bennett 1995); (b) it is sporadic in distribution on the Clackamas River Ranger District and throughout the Northwest Forest Plan area (northwestern Washington to northwestern California) (NRIS TESP database); (c) it has been extirpated from all of its range in Europe and Scandinavia due to habitat loss and air pollution, except for parts of Norway and Italy where it is "red-listed" as an endangered species (Kalas *et al*. 2006, Storaunet *et al*. 2008); (d) it is listed on the "Red List of California Lichens" (The California Lichen Society); and (e) it is valued and used medicinally for its reputed anti-bacterial, anti-viral, and anti-cancer properties. Use "skips" to protect sites. Avoid/minimize disturbance in riparian reserves where more *U. longissima* individuals/populations are very likely present. The lichen is vulnerable to changes in tree density and canopy closure (Sillett & Goslin 1999, Dettki & Esseen 1998). Methuselah's beard tends to be associated, for the most part, with riparian reserves, but can also occur in upland forest. Without a doubt, there are more Methuselah's beard sites that have not yet been found or documented in riparian areas and upland forest in the North Clack project area.

Retain **<u>some</u>** hardwood pockets in the proposed project area during thinning operations using "skips." Neitlich & McCune (1997) found that creation of canopy gaps and retention of hardwood trees and shrubs contribute to lichen diversity in young, thinned stands. Hardwoods, in particular, are focal points ("hotspots") for lichen diversity in conifer-dominated forests

(Neitlich & McCune 1997). The biomass of epiphytic lichens (those growing on trees and shrubs) accumulates slowly in forest canopies (Sillett *et al.* 2000).

All Taxa

The proposed actions for the North Clack Integrated Resource project **may impact** *individuals* or the *habitat* of some special-status (i.e., sensitive) vascular plants, bryophytes, lichens, and fungi on the Region 6 Regional Forester and OR/WA State Director Special Status Species List, but is ***not*** likely to contribute to a trend towards Federal listing of any species or loss of viability to any species overall (i.e., throughout its geographical range).

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Appendix A. PLANT LIST - Botanical Species in North Clack

Species	Common Name	Native Species	Vegetative Regeneration (Asexual Reproduction)
Abies amabilis	Pacific silver fir	Yes	No
Abies procera	noble fir	Yes	No
Acer circinatum	vine maple	Yes	No
Acer macrophyllum	bigleaf maple	Yes	No
Alnus rubra	red alder	Yes	No
Alnus sinuata	Sitka alder	Yes	No
Pinus contorta	lodgepole pine	Yes	No
Pinus monticola	western white pine	Yes	No
Populus balsamifera ssp. *trichocarpa*	black cottonwood	Yes	root suckering, coppice sprouts, or cladoptosis (physiological abscission of twigs with leaves still attached)
Prunus emarginata	bitter cherry	Yes	No
Pseudotsuga menziesii	Douglas-fir	Yes	No
Salix scouleriana	Scouler's willow	Yes	sprouts from belowground root crown
Thuja plicata	western red cedar	Yes	No
Tsuga heterophylla	western hemlock	Yes	No
Amelanchier alnifolia	serviceberry	Yes	sprouts from the root crown and/or rhizomes, or by layering
Arctostaphylos nevadensis	pinemat manzanita	Yes	roots adventitiously from stems that contact the soil
Arctostaphylos uva-ursi	kinnikinnick	Yes	from adventitious feeding roots produced along stems or stolons
Ceanothus velutinus	snowbrush ceanothus	Yes	sprouting and layering
Chimaphila menziesii	little prince's-pine	Yes	rhizomatous
Chimaphila umbellata	pipsissewa, common prince's-spine	Yes	rhizomatous
Chrysolepis chrysophylla	chinquapin	Yes	root crowns, burls, or roots
Corylus cornuta	hazelnut, filbert	Yes	No
Cytisus scoparius	Scotch broom	**No**	root crown, roots, rhizome
Gaultheria ovatifolia	Oregon wintergreen	Yes	probably like *G. shallon* (i.e., from roots, rhizomes, underground stems, and stem base)
Gaultheria shallon	salal	Yes	roots, rhizomes, underground stems, stem base
Holodiscus discolor	oceanspray	Yes	sprouts from the root crown
Lonicera ciliosa	orange honeysuckle, twining vine	Yes	No
Mahonia nervosa (syn. *Berberis nervosa*)	dwarf Oregon Grape	Yes	rhizome, root stock
Menziesia ferruginea var. *ferruginea*	false huckleberry	Yes	possibly from layering
Oplopanax horridum	devil's club	Yes	possibly by rhizomes or layering
Paxistima myrsinites	Oregon boxwood	Yes	following fire, buds on taproot or from root crown
Rhamnus purshiana	Cascara buckthorn	Yes	layering, coppice sprouts
Rhododendron macrophyllum	Pacific rhododendron	Yes	stem bases, root crown
Ribes lacustre	swamp gooseberry	Yes	layering (stems along ground develop adventitious roots); probably also sprouts from rhizomes

Species	Common Name	Native Species	Vegetative Regeneration (Asexual Reproduction)
Rosa gymnocarpa	baldhip rose	Yes	root crown or rhizome
Rosa pisocarpa	clustered wild rose, cluster rose, swamp rose	Yes	unknown but probably similar to other rose species
Rosa woodsii	Wood's rose	Yes	root crown, root suckering, and layering
Rubus armeniacus	Himalayan blackberry	**No**	root crown, roots, rhizomes
Rubus lasiococcus	dwarf bramble	Yes	stolons (non-rhizomatous)
Rubus nivalis	snow bramble	Yes	stolons (trailing stems)
Rubus parviflorus	thimbleberry	Yes	rhizomatous
Rubus spectabilis	salmonberry	Yes	sprouts from the root crown, stem base or root stock, and rhizomes
Rubus ursinus	trailing blackberry	Yes	sprouts from root or stem suckers, or from rooting stem tips
Sambucus racemosa	red elderberry	Yes	sprouts from the root crown or rhizomes; also from layering
Symphoricarpos albus	common snowberry	Yes	rhizomatous
Symphoricarpos mollis	creeping snowberry	Yes	rhizomatous
Vaccinium alaskaense	Alaska huckleberry	Yes	basal sprouts, roots, or rhizomes
Vaccinum ovalifolium	oval-leaf huckleberry	Yes	basal sprouts, roots, or rhizomes
Vaccinium membranaceum	big huckleberry, thinleaf h.	Yes	rhizomatous
Vaccinium parvifolium	red huckleberry	Yes	root crown
Achillea millefolium	wild yarrow	Yes	rhizomatous
Achyls triphylla	vanilla-leaf	Yes	rhizomatous
Actaea rubra	baneberry	Yes	No
Adenocaulon bicolor	pathfinder	Yes	sprouts from fibrous-rooted crown
Adiantum pedatum	maidenhair fern	Yes	rhizomatous
Anaphalis margaritacea	pearly everlasting	Yes	rhizomatous
Anemone deltoidea	three-leaf anemone, western white a.	Yes	rhizomatous
Anemone lyallii	Lyall's anemone	Yes	rhizomatous
Anemone oregana	Oregon windflower	Yes	sprouts from caudex, rhizome, or tuber
Aruncus sylvester	goatsbeard	Yes	rhizomatous
Arnica latifolia	mountain arnica	Yes	caudex, rhizome
Asarum caudatum	wild ginger	Yes	sprouts from rootstock
Athyrium filix-femina	lady fern	Yes	rhizomatous
Blechnum spicant	deer fern	Yes	rhizomatous
Brachythecium sylvaticum	false brome	No	root fragments
Caltha leptosepala ssp. *howellii* (syn. *Caltha biflora*)	marsh marigold	Yes	unknown
Campanula scouleri	Scouler's harebell, pale bellflower	Yes	rhizomatous
Castilleja suksdorfii	Suksdorf's paintbrush	Yes	probably sprouts from the root crown
Chamerion angustifolium (formerly *Epilobium angustifolium*)	fireweed	Yes	sprouts from rhizomes
Circaea alpina	enchanter's nightshade	Yes	rhizomatous
Claytonia sibirica (syn. *Montia sibirica*)	Siberian miner's lettuce, Siberian springbeauty	Yes	rhizomatous
Clintonia uniflora	queenscup beadlily, Queen's	Yes	bulb or rhizome
	cup		
Coptis laciniata	goldenthread	Yes	rhizomatous

Species	Common Name	Native Species	Vegetative Regeneration (Asexual Reproduction)
Corallorhiza mertensiana	Pacific coralroot	Yes	No
Cornus unalaschkensis (syn. *C. canadensis*)	bunchberry	Yes	rhizomatous
Dianthus armeria	Deptford pink	**No**	No
Dicentra formosa	bleeding heart	Yes	rhizomatous
Digitalis purpurea	foxglove, purple foxglove	**No**	No
Equisetum telmateia	giant horsetail	Yes	rhizomatous
Fragaria vesca	woodland strawberry	Yes	stolons
Fragaria virginiana	Virginia strawberry, blueleaf strawberry	Yes	stolons
Galium aparine	common bedstraw, common cleavers	Yes	No
Galium oreganum	Oregon bedstraw	Yes	rhizomatous (creeping rhizomes)
Galium triflorum	sweet-scented bedstraw	Yes	rhizomatous (creeping rhizomes)
Geranium lucidum	shining geranium, shiny leaf geranium	**No**	from root and stem fragments
Geranium robertianum	herb Robert	**No**	from root and stem fragments
Geum macrophyllum	geum	Yes	rhizomatous
Goodyera oblongifolia	rattlesnake plantain	Yes	rhizomatous
Hieracium albiflorum	white-flowered hawkweed	Yes	short rhizome
Heracleum maximum (syn. *H. lanatum)*	cow-parsnip	Yes	taproot or cluster of fibrous roots
Hypericum perforatum	common St. John's-wort, Klamath weed	**No**	rhizomatous
Hypochaeris radicata	hairy cat's-ear	**No**	from root fragments and rhizomes
Iris tenuis	Clackamas iris	Yes	rhizomes (sometimes bulbs)
Lathyrus nevadensis	sweetpea	Yes	rhizomatous
Leucanthemum vulgare	oxeye daisy	**No**	rhizomatous
Linnaea borealis	twinflower	Yes	Stolons
Lotus corniculatus	bird's-foot trefoil	**No**	No
Lupinus latifolius	broadleaf lupine	Yes	root sprouts, root fragments, and from the caudex
Luzula parviflora	small-flowered woodrush	Yes	rhizomatous
Lysichiton americanus	skunk cabbage	Yes	rhizomatous
Maianthemum dilatatum (syn. *Smilacina dilatata*)	false lily-of-the-valley	Yes	spreading rhizomes
Maianthemum stellatum (syn. *Smilacina stellata*)	starry false lily-of-the-valley, star-flowered solomon's-seal	Yes	spreading rhizomes
Moehringia macrophylla (syn. *Arenaria macrophylla*)	bigleaf sandwort	Yes	rhizomatous
Monotropa uniflora	Indian pipe	Yes	No
Mycelis muralis (syn. *Lactuca muralis*)	wall lettuce	**No**	No
Nemophila parviflora	small-flowered nemophila	Yes	No
Nothochelone nemorosa	woodland beardtongue	Yes	sprouting from woody caudex (base)
Orthilia secunda (syn. *Pyrola secunda*)	sidebells pyrola, one-sided wintergreen, one-sided p.	Yes	rhizomatous
Osmorhiza berteroi (syn. *O. chilensis*)	sweet cicely	Yes	No
Oxalis oregana	Oregon wood-sorrel	Yes	rhizomatous

Species	Common Name	Native Species	Vegetative Regeneration (Asexual Reproduction)
Pedicularis racemosa	sickletop lousewort	Yes	woody base
Petasites frigidus	coltsfoot	Yes	from creeping rhizome
Platanthera dilatata (formerly *Habenaria dilatata*)	white bog-orchid	Yes	No
Polypodium glycrrhiza	licorice fern	Yes	creeping rhizomes
Polystichum munitum	sword fern	Yes	rhizomatous
Prosartes (= *Disporum*) *hookeri*	Hooker fairy-bell	Yes	rhizomatous
Prosartes (= *Disporum*) *smithii*	Smith's fairy bells	Yes	rhizomatous
Prunella vulgaris	common self-heal	Yes	rhizomatous
Pteridium aquilinum	bracken fern	Yes	rhizomatous
Pterospora andromedea	pinedrops	Yes	unknown
Pyrola asarifolia	wintergreen, pyrola	Yes	rhizomatous
Pyrola picta	white-veined pyrola	Yes	rhizomatous
Rubus lasiococcus	dwarf bramble, three-leaf b.	Yes	stolons
Rubus ursinus	trailing blackberry, dewberry	Yes	rhizomatous
Senecio jacobaea	tansy ragwort	**No**	from fibrous roots of the root crown
Stachys cooleyae	Cooley's hedge-nettle	Yes	rhizomatous
Thalictrum occidentale	meadowrue	Yes	rhizomatous
Thermopsis montana	golden pea	Yes	rhizomatous
Tiarella trifoliata var. *unifoliata*	coolwort, foamflower	Yes	rhizomatous
Tolmiea menziesii	piggyback plant	Yes	rhizomatous
Trientalis latifolia	broadleaf starflower	Yes	rhizomatous
Trifolium repens	white clover	**No**	stolons
Trillium ovatum	trillium, wake robin	Yes	rhizomatous
Valeriana sitchensis	Sitka valeriana	Yes	rhizomatous
Vancouveria hexandra	inside-out flower	Yes	rhizomatous
Viola adunca	early blue violet	Yes	rhizomatous
Viola glabella	stream violet, pioneer v.	Yes	rhizomatous
Viola sempervirens	evergreen violet	Yes	rhizomatous
Xerophyllum tenax	beargrass	Yes	from offshoots of the rhizome
Arceuthobium tsugense	hemlock dwarf mistletoe	Yes	No
Dicranum fuscescens	dusky broom moss	Yes	from moss fragments
Dicranum scoparium	fork moss	Yes	from moss fragments
Eurhynchium oreganum	feather moss	Yes	from moss fragments
Eurhynchium praelongum	feather moss	Yes	from moss fragments
Hylocomnium splendens	stair-step moss	Yes	from moss fragments
Hypnum circinale	hypnum moss	Yes	from moss fragments
Hypnum subimponens	hypnum moss	Yes	from moss fragments
Isothecium stoloniferum	diaper moss	Yes	from moss fragments
Leucolepsis acanthoneuron	palm-tree moss	Yes	from moss fragments
Neckera douglasii	Douglas's neckeri	Yes	from moss fragments
Plagiothecium undulatum	mouse-tail moss	Yes	from moss fragments
Polystichum commune	haircap moss	Yes	from moss fragments
Polytrichum juniperinum	haircap moss	Yes	from moss fragments
Racomitrium canescens	racomitrium moss	Yes	from moss fragments
Rhytidiadelphus loreus	lanky moss	Yes	from moss fragments
Rhytidiadelpus triquetrus	electrified cat's-tail moss	Yes	from moss fragments
Rhytidiopsis robusta	pipe-cleaner moss	Yes	from moss fragments
Trachybryum megaptilum (syn. *Homalothecium megaptilum*)	trachybryum moss	Yes	from moss fragments
Alectoria sarmentosa	old-man's beard	Yes	from thallus fragments*

Species	Common Name	Native Species	Vegetative Regeneration (Asexual Reproduction)
Bryoria glabra	shiny horsehair lichen	Yes	from thallus fragments
Bryoria pseudofuscescens	horsehair lichen	Yes	from thallus fragments
Cetraria chlorophylla	powdered wrinkle lichen	Yes	from thallus fragments
Cetraria orbata	variable wrinkle lichen	Yes	from thallus fragments
Cladonia spp.	cladonia	Yes	from thallus fragments
Evernia prunastri	oakmoss lichen	Yes	from thallus fragments
Hypogymnia apinnata	beaded tube lichen	Yes	from thallus fragments
Hypogymnia enteromorpha	gut lichen	Yes	from thallus fragments
Hypogymnia inactiva	mottled tube lichen	Yes	from thallus fragments
Hypogymnia metaphysodes	deflated tube lichen	Yes	from thallus fragments
Hypogymnia occidentalis	lattice tube lichen	Yes	from thallus fragments
Hypogymnia physodes	hooded tube lichen	Yes	from thallus fragments
Hypogymnia tubulosa	powder-headed tube lichen	Yes	from thallus fragments
Letharia vulpina	wolf lichen	Yes	from thallus fragments
Lobaria oregana	lettuce lichen, Oregon lungwort	Yes	from thallus fragments
Lobaria pulmonaria	lungwort, lung lichen	Yes	from thallus fragments
Nephroma resupinatum	pimpled kidney lichen	Yes	from thallus fragments
Nodobryoria oregana	nodobryoria lichen	Yes	from thallus fragments
Parmelia hygrophila	western shield lichen	Yes	from thallus fragments
Parmelia sulcata	hammered shield lichen	Yes	from thallus fragments
Parmeliopsis ambigua	green starburst lichen	Yes	from thallus fragments
Parmeliopsis hyperopta	gray starburst lichen	Yes	from thallus fragments
Peltigera aphthosa	green dog lichen, common freckle pelt	Yes	from thallus fragments
Peltigera brittanica	British felt lichen	Yes	from thallus fragments
Peltigera canina	dog lichen	Yes	from thallus fragments
Peltigera collina	tree pelt	Yes	from thallus fragments
Peltigera membranacea	membranous dog lichen	Yes	from thallus fragments
Physcia adscendens	hooded rosette lichen	Yes	from thallus fragments
Platismatia glauca	varied rag lichen	Yes	from thallus fragments
Platismatia herrei	tattered rag lichen	Yes	from thallus fragments
Platismatia stenophylla	rag lichen	Yes	from thallus fragments
Pseudocyphellaria anomala	netted specklebelly	Yes	from thallus fragments
Ramalina dilacerata	punctured ramalina	Yes	from thallus fragments
Ramalina farinacea	dotted ramalina	Yes	from thallus fragments
Sphaerophorus globosus	coral lichen	Yes	from thallus fragments
Usnea filipendula	fishbone beard lichen	Yes	from thallus fragments
Usnea scabrata	horny beard lichen	Yes	from thallus fragments
Amanita gemmata	gemmed amanita	Yes	belowground hyphae in soil
Discina perlata	pig's ears	Yes	belowground hyphae in soil
Fomitopsis pinicola	redbelt fungus	Yes	hyphae in decayed wood
Guepiniopsis alpina	poor-man's gumdrops	Yes	hyphae in decayed wood
Gryomitra esculenta	false morel, brain mushroom	Yes	belowground hyphae in soil
Lichenomphalia umbellifera	none	Yes	hyphae in decayed wood
Nolanea verna	none	Yes	belowground hyphae in soil
Phaeolus schweinitzii	dyer's polypore	Yes	belowground hyphae in soil

Footnotes:

Red font indicates invasive nonnative plant species.

Vegetative regeneration = vegetative reproduction = asexual reproduction (i.e., regeneration/reproduction other than by seed or spores)

*thallus = the lichen body

Information on vegetative regeneration for vascular plants was obtained from *Flora of the Pacific Northwest* by C.L. Hitchcock and A. Cronquist (1973), the Fire Effects Information System (FEIS) website (http://www.feis-crs.org/beta/), and the Burke Museum of Natural History and Culture website (http://www.burkemuseum.org/herbarium)

SURVEY AND MANAGE

BACKGROUND

In addition to effects on (a) federally listed TEP (threatened, endangered, or proposed) species, (b) species on the Region 6 Regional Forester and OR/WA State Director Special Status Species List (so-called "sensitive" species), and (c) strategic species, all Forest Service projects, programs, and activities are reviewed for possible effects on Survey and Manage (S&M) species. The agency's current direction is to use the December 2003 Survey and Manage list (Instruction Memorandum No. OR-2014-037, June 2014). The December 2003 list incorporates species changes and removals made as a result of the 2001, 2002, and 2003 Annual Species Reviews (ASRs). Within the December 2003 list, there are 12 species with ASR changes/removals in all or a portion of their ranges.

DIRECTION REGARDING NORTH CLACK

Some of the forest stands in the North Clack project area are exempt from the need for pre-disturbance surveys for S&M species because they are less than 80 years old (Pechman exemptions, 2006). Surveys are required for S&M vascular plants, bryophytes, and lichens in stands over 80 years old. Equivalent-effort" (= pre-disturbance) surveys for S&M fungi are required for ground- or habitat-disturing activities in old-growth forest (i.e., stands greater than 180 years old) (Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines Northwest Forest Plan, 2001).

S&M species are considered to be closely associated with late-successional/old-growth (LSOG) forest. In many cases, however, that is not the only habitat in which they can be found. Some S&M species can occur and have been found in young (early seral) and mature (mid-seral) stands. Younger stands, particularly those with biological legacies, can be inhabited by S&M species. Biological legacies in the fire-originated stands in North Clack create structural complexity (multiple substrates and ecological niches) that promote biological (animal and plant) diversity, create potential habitat for certain S&M species, and increase the potential likelihood of some S&M species being present.

SURVEY RESULTS AND RECOMMENDATIONS

A number of cold water corydalis (*Corydalis aquae-gelidae*) and Methuselah's beard (*Usnea longissima*) populations are documented in the North Fork of the Clackamas and its tributaries in the North Clack project area (NRIS TESP database). Cold water corydalis is both a Survey and Manage Category A species (manage all know sites) and a sensitive plant on the Region 6 Regional Forester and OR/WA State Director Special Status Species List. **Protection of this species is required.**

Methuselah's beard is a Survey and Manage Category F species and a number of populations are documented in riparian reserves in the proposed project area. **Protection of this species is not required, but is recommended given its global and regional rarity.**

Candystick/sugarstick (*Allotropa virgata*) is a former Survey and Manage species and three are documented (NRIS TESP and ORBIC) and 27 were reported by the public in the project area. See Tables 5 & 6 and Figures 5, 6 & 7 in the botanical biological evaluation for locations. **No protection of this species is required.**

CONCLUSIONS

For a more detailed discussion of cold water corydalis, Methuselah's beard, and candystick/sugarstick, refer to the botanical biological evaluation (BE) for the North Clack project area.

References

EMS TRANSMISSION – 06/19/2014, Instruction Memorandum No. OR-2014-037, Additional Direction Regarding the Survey and Manage Mitigation Measure as a Result of Court Ruling in Conservation Northwest et al. v. Bonnie et al., Case No. 08-1067-JCC (W.D. Wash.), United States Department of the Interior, Bureau of Land Management, Oregon State Office, Portland, OR, June 13, 2014.

Montgomery, A., J. Lippert, D. Lebo, and T. Fennell. 2017. Conservation Assessment and Management Recommendations for Cold Water Corydalis. USDA-Forest Service and Bureau of Land Management.

NRIS TESP database. Natural Resource Information System – Threatened, Endangered, and Sensitive Plants. USDA Forest Service.

Northwest Ecosystem Alliance v. Rey, No. 04-844-MJP. Survey and Manage Mitigation Measure (Pechman Exemptions). Oct. 10, 2006.

USDA Forest Service & USDI Bureau of Land Management. 2001. Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines (January 2001). Portland, OR.

Van Norman, K. and R. Huff. 2012. Survey & Manage Category B Fungi Equivalent-Effort Survey Protocol. Version 1.0. USDA Forest Service Region 6, Oregon and Washington; USDI Bureau of Land Management, Oregon, Washington, and California; and USDA Forest Service Region 5, California.

Table 9 lists the Survey and Manage Species. They are in Table 1-1 of the Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines (2001). Species categories are described on page 7 of the Standards and Guidelines section of that document. The list has been modified several times; the list below represents the December 2003 version. Where a species has more than one name indicated, the first is the currently accepted name, and the second one (in parentheses) is a name used in other documents including the Northwest Forest Plan (Table C-3). (Species highlighted in blue font are documented on the Mt. Hood National Forest. A brief habitat description has been added for some highlighted species.)

Table 9 – Survey and Manage Species and their Category

TAXA GROUP	Species	Category
FUNGUS	*Acanthophysium farlowii* (*Aleurodiscus farlowii*)	B
FUNGUS	*Albatrellus avellaneus*	B
FUNGUS	*Albatrellus caeruleoporus*	B
FUNGUS	*Albatrellus ellisii*	B
FUNGUS	*Albatrellus flettii,* In Washington and Oregon	B
FUNGUS	*Alpova alexsmithii*	B
FUNGUS	*Alpova olivaceotinctus*	B
FUNGUS	*Arcangeliella camphorata* (*Arcangeliella* sp. nov. #Trappe 12382; *Arcangeliella* sp. nov. #Trappe 12359)	B
FUNGUS	*Arcangeliella crassa*	B
FUNGUS	*Arcangeliella lactarioides*	B
FUNGUS	*Asterophora lycoperdoides*	B
FUNGUS	*Asterophora parasitica*	B
FUNGUS	*Baeospora myriadophylla*	B
FUNGUS	*Balsamia nigrens* (*Balsamia nigra*)	B
FUNGUS	*Boletus haematinus*	B
FUNGUS	*Boletus pulcherrimus*	B
FUNGUS	*Bondarzewia mesenterica* (*Bondarzewia montana*), In Washington and California	B
FUNGUS	*Bridgeoporus nobilissimus* (*Oxyporus nobilissimus*) (on noble and Pacific silver fir stumps, snags, and occasionally live trees; found on Zigzag and Clackamas River Ranger Districts)	A
FUNGUS	*Cantharellus subalbidus,* In Washington and California	D
FUNGUS	*Catathelasma ventricosa*	B
FUNGUS	*Chalciporus piperatus* (*Boletus piperatus*)	D
FUNGUS	*Chamonixia caespitosa* (*Chamonixia pacifica* sp. nov. #Trappe #12768)	B
FUNGUS	*Choiromyces alveolatus*	B
FUNGUS	*Choiromyces venosus*	B

TAXA GROUP	Species	Category
FUNGUS	*Chroogomphus loculatus*	B
FUNGUS	*Chrysomphalina grossula*	B
FUNGUS	*Clavariadelphus ligula*	B
FUNGUS	*Clavariadelphus occidentalis* (*Clavariadelphus pistillaris*)	B
FUNGUS	*Clavariadelphus sachalinensis*	B
FUNGUS	*Clavariadelphus subfastigiatus*	B
FUNGUS	*Clavariadelphus truncatus* (syn. *Clavariadelphus borealis*)	D
FUNGUS	*Clavulina castanopes* var. *lignicola* (*Clavulina ornatipes*)	B
FUNGUS	*Clitocybe senilis*	B
FUNGUS	*Clitocybe subditopoda*	B
FUNGUS	*Collybia bakerensis*	F
FUNGUS	*Collybia racemosa*	B
FUNGUS	*Cordyceps ophioglossoides*	B
FUNGUS	*Cortinarius barlowensis* (syn. *Cortinarius azureus*)	B
FUNGUS	*Cortinarius boulderensis*	B
FUNGUS	*Cortinarius cyanites*	B
FUNGUS	*Cortinarius depauperatus* (*Cortinarius spilomeus*)	B
FUNGUS	*Cortinarius magnivelatus*	B
FUNGUS	*Cortinarius olympianus*	B
FUNGUS	*Cortinarius speciosissimus* (*Cortinarius rainierensis*)	B
FUNGUS	*Cortinarius tabularis*	B
FUNGUS	*Cortinarius umidicola* (*Cortinarius canabarba*)	B
FUNGUS	*Cortinarius valgus*	B
FUNGUS	*Cortinarius variipes*	B
FUNGUS	*Cortinarius verrucisporus*	B
FUNGUS	*Cortinarius wiebeae*	B
FUNGUS	*Cudonia monticola*	B
FUNGUS	*Cyphellostereum leave*	B
FUNGUS	*Dermocybe humboldtensis*	B
FUNGUS	*Destuntzia fusca*	B
FUNGUS	*Destuntzia rubra*	B
FUNGUS	*Dichostereum boreale* (*Dichostereum granulosum*)	B
FUNGUS	*Elaphomyces anthracinus*	B
FUNGUS	*Elaphomyces subviscidus*	B

TAXA GROUP	Species	Category
FUNGUS	*Endogone acrogena*	B
FUNGUS	*Endogone oregonensis*	B
FUNGUS	*Entoloma nitidum* (*Rhodocybe nitida*)	B
FUNGUS	*Fayodia bisphaerigera* (*Fayodia gracilipes*)	B
FUNGUS	*Fevansia aurantiaca* (*Alpova* sp. nov. # Trappe 1966) (*Alpova aurantiaca*)	B
FUNGUS	*Galerina cerina*	B
FUNGUS	*Galerina heterocystis*	E
FUNGUS	*Galerina sphagnicola*	E
FUNGUS	*Galerina vittaeformis*	B
FUNGUS	*Gastroboletus imbellus*	B
FUNGUS	*Gastroboletus ruber*	B
FUNGUS	*Gastroboletus subalpinus*	B
FUNGUS	*Gastroboletus turbinatus*	B
FUNGUS	*Gastroboletus vividus* (*Gastroboletus* sp. nov. #Trappe 2897; *Gastroboletus* sp. nov. #Trappe 7515)	B
FUNGUS	*Gastrosuillus amaranthii* (*Gastrosuillus* sp. nov. #Trappe 9608)	E
FUNGUS	*Gastrosuillus umbrinus* (*Gastroboletus* sp. nov. #Trappe 7516)	B
FUNGUS	*Gautieria magnicellaris*	B
FUNGUS	*Gautieria otthii*	B
FUNGUS	*Gelatinodiscus flavidus*	B
FUNGUS	*Glomus radiatum*	B
FUNGUS	*Gomphus bonarii*	B
FUNGUS	*Gomphus clavatus*	F
FUNGUS	*Gomphus floccosus,* In California	F
FUNGUS	*Gomphus kauffmanii*	E
FUNGUS	*Gymnomyces abietis* (*Gymnomyces* sp. nov. #Trappe 1690, 1706, 1710; *Gymnomyces* sp. nov. #Trappe 4703, 5576; *Gymnomyces* sp. nov. #Trappe 5052; *Gymnomyces* sp. nov. #Trappe 7545; *Martellia* sp. nov. #Trappe 1700; *Martellia* sp. nov. #Trappe 311; *Martellia* sp. nov. #Trappe 5903)	B
FUNGUS	*Gymnomyces nondistincta* (*Martellia* sp. nov. #Trappe 649)	B
FUNGUS	*Gymnopilus punctifolius*, In California	B
FUNGUS	*Gyromitra californica*	B
FUNGUS	*Hebeloma olympianum* (*Hebeloma olympiana*)	B
FUNGUS	*Helvella crassitunicata*	B
FUNGUS	*Helvella elastic*	B

TAXA GROUP	Species	Category
FUNGUS	*Hydnotrya inordinata* (*Hydnotrya* sp. nov. #Trappe 787, 792)	B
FUNGUS	*Hydnotrya subnix* (*Hydnotrya subnix* sp. nov. #Trappe 1861)	B
FUNGUS	*Hydropus marginellus* (*Mycena marginella*)	B
FUNGUS	*Hygrophorus caeruleus*	B
FUNGUS	*Hygrophorus karstenii*	B
FUNGUS	*Hygrophorus vernalis*	B
FUNGUS	*Hypomyces luteovirens*	B
FUNGUS	*Leucogaster citrinus*	B
FUNGUS	*Leucogaster microsporus*	B
FUNGUS	*Macowanites chlorinosmus*	B
FUNGUS	*Macowanites lymanensis*	B
FUNGUS	*Macowanites mollis*	B
FUNGUS	*Marasmius applanatipes*	B
FUNGUS	*Martellia fragrans*	B
FUNGUS	*Martellia idahoensis*	B
FUNGUS	*Mycena hudsoniana*	B
FUNGUS	*Mycena overholtsii*	D
FUNGUS	*Mycena quinaultensis*	B
FUNGUS	*Mycena tenax*	B
FUNGUS	*Mythicomyces corneipes*	B
FUNGUS	*Neolentinus adhaerens*	B
FUNGUS	*Neolentinus kauffmanii*	B
FUNGUS	*Neournula pouchettii*	B
FUNGUS	*Nivatogastrium nubigenum,* In entire range except OR Eastern Cascades and CA Cascades Physiographic Provinces	B
FUNGUS	*Octavianina cyanescens* (*Octavianina* sp. nov. #Trappe 7502)	B
FUNGUS	*Octavianina macrospora*	B
FUNGUS	*Octavianina papyracea*	B
FUNGUS	*Otidea leporine*	D
FUNGUS	*Otidea smithii*	B
FUNGUS	*Phaeocollybia attenuata*	D
FUNGUS	*Phaeocollybia californica*	B
FUNGUS	*Phaeocollybia dissiliens*	B
FUNGUS	*Phaeocollybia fallax*	D
FUNGUS	*Phaeocollybia gregaria*	B

TAXA GROUP	Species	Category
FUNGUS	*Phaeocollybia kauffmanii*	D
FUNGUS	*Phaeocollybia olivacea,* In Oregon	F
FUNGUS	*Phaeocollybia olivacea,* In Washington and California	E
FUNGUS	*Phaeocollybia oregonensis* (syn. *Phaeocollybia carmanahensis*)	B
FUNGUS	*Phaeocollybia piceae*	B
FUNGUS	*Phaeocollybia pseudofestiva*	B
FUNGUS	*Phaeocollybia scatesiae*	B
FUNGUS	*Phaeocollybia sipei*	B
FUNGUS	*Phaeocollybia spadicea*	B
FUNGUS	*Phellodon atratus* (*Phellodon atratum*)	B
FUNGUS	*Pholiota albivelata*	B
FUNGUS	*Podostroma alutaceum*	B
FUNGUS	*Polyozellus multiplex*	B
FUNGUS	*Pseudaleuria quinaultiana*	B
FUNGUS	*Ramaria abietina*	B
FUNGUS	*Ramaria amyloidea*	B
FUNGUS	*Ramaria araiospora*	B
FUNGUS	*Ramaria aurantiisiccescens*	B
FUNGUS	*Ramaria botryis* var. *aurantiiramosa*	B
FUNGUS	*Ramaria celerivirescens*	B
FUNGUS	*Ramaria claviramulata*	B
FUNGUS	*Ramaria concolor f. marrii*	B
FUNGUS	*Ramaria concolor f. tsugina*	B
FUNGUS	*Ramaria conjunctipes* var. *sparsiramosa* (*Ramaria fasciculata* var. *sparsiramosa*)	B
FUNGUS	*Ramaria coulterae*	B
FUNGUS	*Ramaria cyaneigranosa*	B
FUNGUS	*Ramaria gelatiniaurantia*	B
FUNGUS	*Ramaria gracilis*	B
FUNGUS	*Ramaria hilaris* var. *olympiana*	B
FUNGUS	*Ramaria largentii*	B
FUNGUS	*Ramaria lorithamnus*	B
FUNGUS	*Ramaria maculatipes*	B
FUNGUS	*Ramaria rainierensis*	B
FUNGUS	*Ramaria rubella* var. *blanda*	B

TAXA GROUP	Species	Category
FUNGUS	*Ramaria rubribrunnescens*	B
FUNGUS	*Ramaria rubrievanescens*	B
FUNGUS	*Ramaria rubripermanens,* In Oregon	D
FUNGUS	*Ramaria rubripermanens,* In Washington and California	B
FUNGUS	*Ramaria spinulosa* var. *diminutiva* (*Ramaria spinulosa*)	B
FUNGUS	*Ramaria stuntzii*	B
FUNGUS	*Ramaria suecica*	B
FUNGUS	*Ramaria thiersii*	B
FUNGUS	*Ramaria verlotensis*	B
FUNGUS	*Rhizopogon abietis*	B
FUNGUS	*Rhizopogon atroviolaceus*	B
FUNGUS	*Rhizopogon brunneiniger*	B
FUNGUS	*Rhizopogon chamaleontinus* (*Rhizopogon* sp. nov. #Trappe 9432)	B
FUNGUS	*Rhizopogon ellipsosporus* (*Alpova* sp. nov. # Trappe 9730)	B
FUNGUS	*Rhizopogon evadens* var. *subalpinus*	B
FUNGUS	*Rhizopogon exiguous*	B
FUNGUS	*Rhizopogon flavofibrillosus*	B
FUNGUS	*Rhizopogon inquinatus*	B
FUNGUS	*Rhizopogon truncates*	D
FUNGUS	*Rhodocybe speciose*	B
FUNGUS	*Rickenella swartzii* (*Rickenella setipes*)	B
FUNGUS	*Russula mustelina*	B
FUNGUS	*Sarcodon fuscoindicus*	B
FUNGUS	*Sedecula pulvinata*	B
FUNGUS	*Sowerbyella rhenana* (*Aleuria rhenana*)	B
FUNGUS	*Sparassis crispa*	D
FUNGUS	*Spathularia flavida*	B
FUNGUS	*Stagnicola perplexa*	B
FUNGUS	*Thaxterogaster pavelekii* (*Thaxterogaster* sp. nov. #Trappe 4867, 6242, 7427, 7962, 8520)	B
FUNGUS	*Tremiscus helvelloides* (syn. *Phlogiotis helvelloides*)	D
FUNGUS	*Tricholoma venenatum*	B
FUNGUS	*Tricholomopsis fulvescens*	B
FUNGUS	*Tuber asa* (*Tuber* sp. nov. #Trappe 2302)	B
FUNGUS	*Tuber pacificum* (*Tuber* sp. nov. #Trappe 12493)	B

TAXA GROUP	Species	Category
FUNGUS	*Tylopilus porphyrosporus* (*Tylopilus pseudoscaber*)	D
LICHEN	*Bryoria pseudocapillaris* (strictly oceanic/coastal; not occurring on Mt. Hood NF)	A
LICHEN	*Bryoria spiralifera* (strictly oceanic/coastal; not occurring on Mt. Hood NF)	A
LICHEN	*Bryoria subcana (*syn. *Alectoria subcana)* (pale white thallus; primarily coastal but with documented sites on Gifford Pinchot and Willamette NFs; could occur on Mt. Hood NF)	B
LICHEN	*Buellia oidalea*	E
LICHEN	*Calicium abietinum* (pin lichen on snags and trees with furrowed bark) Strategic Surveys Completed	B
LICHEN	*Calicium adspersum* (pin lichen on snags and trees with furrowed bark)	E
LICHEN	*Cetrelia cetrarioides*	E
LICHEN	*Chaenotheca chrysocephala* (pin lichen on snags and trees with furrowed bark) Strategic Surveys Completed	B
LICHEN	*Chaenotheca ferruginea* (pin lichen on snags and trees with furrowed bark) Strategic Surveys Completed	B
LICHEN	*Chaenotheca subroscida* (pin lichen on snags and trees with furrowed bark)	E
LICHEN	*Chaenothecopsis pusilla* (syn. *Chaenotheca subpusilla, Calicium asikkalense, Calicium floerkei,Calicium pusillum, Calicium subpusillum*) (pin lichen on snags and trees with furrowed bark)	E
LICHEN	*Collema nigrescens,* In WA and OR, except in OR Klamath Physiographic Province	F
LICHEN	*Dendriscocaulon intricatulum,* In CA (on tree branches)	E
LICHEN	*Dendriscocaulon intricatulum,* Rest of Oregon outside of Coos, Curry, Douglas, Josephine, & Jackson Counties; WA	A
LICHEN	*Dermatocarpon luridum* (in coldwater streams)	E
LICHEN	*Heterodermia sitchensis*	E
LICHEN	*Hypogymnia duplicata* (on tree boles and branches; old-growth forest associate)	C
LICHEN	*Hypogymnia vittata*	E
LICHEN	*Hypotrachyna revoluta*	E
LICHEN	*Leptogium burnetiae var. hirsutum (Leptogium hirsutum)* (on moss-covered hardwoods such as vine maple, alder, cottonwood)	E
LICHEN	*Leptogium cyanescens* (on moss-covered hardwoods such as vine maple, alder, cottonwood)	A
LICHEN	*Leptogium rivale*	E
LICHEN	*Leptogium teretiusculum*	E
LICHEN	*Lobaria linita* var. *tenuoir*, In WA WL, WA WC south of Snoqualmie Pass, WA EC; OR (on tree boles and branches)	A
LICHEN	*Lobaria oregana,* In California	A
LICHEN	*Microcalicium arenarium* (pin lichen on snags and trees with furrowed bark) Strategic Surveys Completed	B
LICHEN	*Nephroma bellum,* In OR; Klamath, Willamette Valley, Eastern Cascades; WA; Western Cascades (outside GPNF), Eastern Cascades, Olympic Peninsula Physiographic Provinces (on trees, shrubs, and mossy rocks)	E

TAXA GROUP	Species	Category
LICHEN	*Nephroma isidiosum*	E
LICHEN	*Nephroma occultum* **(**found at Old Maid Flats on Zigzag Ranger District)	C
LICHEN	*Niebla cephalota* (oceanic/coastal species; not occurring on Mt. Hood NF)	A
LICHEN	*Pannaria rubiginosa* **(**found on Clackamas River and Hood River Districts by Mark Boyll)	E
LICHEN	*Peltigera pacifica* (found in summer home tracts on Mt. Hood NF along Hwy 26)	E
LICHEN	*Platismatia lacunosa,* all except OR CR (rare with only few sites on Mt. Hood NF)	E
LICHEN	*Pseudocyphellaria perpetua (Pseudocyphellaria* sp. 1) (oceanic/coastal species not occurring on Mt. Hood NF)	A
LICHEN	*Pseudocyphellaria rainierensis* (old-growth forest associate found at Old Maid Flats, in Bull Run watershed, along Collawash River, near Bagby Hot Springs, and known from a few other locations on the Mt. Hood NF)	A
LICHEN	*Stenocybe clavata* (small pin-like lichen found in Still Creek Campground by Hwy 26)	E
LICHEN	*Teloschistes flavicans*	A
LICHEN	*Tholurna dissimilis,* south of Columbia River (high-elevation alpine-arctic lichen found along Timberline trail on Mt. Hood)	B
LICHEN	*Usnea hesperina*	E
LICHEN	*Usnea longissima*, In California and in Curry, Josephine, and Jackson Counties, Oregon	A
LICHEN	*Usnea longissima*, In Oregon, except in Curry, Josephine, and Jackson Counties, and in Washington (Although assigned as a category F species, *U. longissima* remains an uncommon lichen found scattered across the Zigzag and Clackamas River Ranger Districts and in the Bull Run watershed.)	F
BRYOPHYTE	*Brotherella roellii*	E
BRYOPHYTE	*Buxbaumia viridis,* In California	E
BRYOPHYTE	*Diplophyllum plicatum* Strategic Surveys Completed	B
BRYOPHYTE	*Herbertus aduncus*	E
BRYOPHYTE	*Iwatsukiella leucotricha* (only 1 known site: Saddle Mt. in OR Coast Range) Strategic Surveys Completed	B
BRYOPHYTE	*Kurzia makinoana* Strategic Surveys Completed	B
BRYOPHYTE	*Marsupella emarginata v. aquatica* (on rocks in streams) Strategic Surveys Completed	B
BRYOPHYTE	*Orthodontium gracile* (only known in coastal redwood forests) Strategic Surveys Completed	B
BRYOPHYTE	*Ptilidium californicum*, In California	A
BRYOPHYTE	*Racomitrium aquaticum* (a misnomer since it's actually found in upland forest habitat)	E
BRYOPHYTE	*Rhizomnium nudum,* In OR (shallow depressions on forest floor; found in Bull Run watershed and on Barlow Ranger District) Strategic Surveys Completed	B
BRYOPHYTE	*Schistostega pennata* (soil on underside of rootwads; several known sites just east of Government Camp)	A
BRYOPHYTE	*Tetraphis geniculata* (bent seta; on cut logs; 2 known sites on Salmon River Trail south of Welches)	A
BRYOPHYTE	*Tritomaria exsectiformis* (possibly on Barlow District along seeps, springs, and low-gradient streams)	B

TAXA GROUP	Species	Category
BRYOPHYTE	*Tritomaria quinquedentata* (possibly on Barlow District along seeps, springs, and low-gradient streams) Strategic Surveys Completed	B
VASCULAR PLANT	*Arceuthobium tsugense mertensianae*, In Washington only	F
VASCULAR PLANT	*Bensoniella oregano*, In California only	A
VASCULAR PLANT	*Botrychium minganense*, In Oregon and California (in forest wetlands on east side of Mt. Hood NF)	A
VASCULAR PLANT	*Botrychium montanum* (in forest wetlands on east side of Mt. Hood NF)	A
VASCULAR PLANT	*Coptis asplenifolia*	A
VASCULAR PLANT	*Coptis trifolia* (along edge of meadow within grazing allotment on east side of Mt. Hood NF)	A
VASCULAR PLANT	*Corydalis aquae-gelidae* (along coldwater streams; known sites along Oak Grove Fork of the Clackamas River, Stone Creek, Peavine Creek, and upper Clackamas River)	A
VASCULAR PLANT	*Cypripedium fasciculatum,* WA outside Eastern Cascades; OR; CA (on east side of Mt. Hood NF)	C
VASCULAR PLANT	*Cypripedium montanum*, Entire range except Washington Eastern Cascades Physiographic Province (on west side of Mt. Hood NF)	C
VASCULAR PLANT	*Eucephalus vialis* (syn. *Aster vialis*)	A
VASCULAR PLANT	*Galium kamtschaticum*, Olympic Peninsula, WA Eastern Cascades, OR & WA Western Cascades Physiographic Provinces, south of Snoqualmie Pass (appears to be restricted to NW Washington)	A
VASCULAR PLANT	*Platanthera orbiculata* var. *orbiculata* (syn. *Habenaria orbiculata*) (appears to be restricted to NW Washington; possibly in Bull Run watershed where climate is colder as in NW Washington)	C

Invasive Plant Risk Assessment and Recommendations to Minimize the Introduction and Spread of Invasive Nonnative Plants

Invasive Plants

Invasive plants are any species not native to Pacific Northwest ecosystems that can spread across the landscape, alter native plant communities, and negatively affect ecosystems (their composition, structure, function, and health). They include, but are not limited to, species on the Oregon Department of Agriculture's (ODA) noxious weed list. Noxious weeds are a subset of invasive plants that have been identified by ODA as harmful to Oregon's forests and grasslands, agriculture, and economy. Invasive plants may disrupt natural ecosystems by displacing native species and reducing natural diversity through the replacement of native communities with invasive monotypic weed stands. They reduce productivity of forest ecosystems by outcompeting and displacing desirable native species and monopolizing valuable resources (Oregon Weed Control Program 2002). Refer to Table 10 (a list ODA noxious weeds) and Table 11 (Supplemental List of Invasive Plants for the Clackamas River and Zigzag Ranger Districts) below.

In addition to the above-mentioned lists, it should be noted that new invasive plant species are continually being introduced with the potential of spreading far and wide. New invaders may not always be included on the present lists.

Table 10- Oregon Department of Agriculture Noxious Weed List

Rating	Common Name	Scientific Name
B	velvetleaf	*Abutilon theophrasti*
B	bidy-bidy	*Acaena novae-zelandiae*
B	Russian knapweed	*Acroptilon repens*
B	jointed goatgrass	*Aegiops cylindrica*
A	ovate goatgrass	*Aegilops ovata*
A	barbed goatgrass	*Aegilops triuncialis*
B	quackgrass	*Agropyron repens*
A	camelthorn	*Alhagi pseudalhagi*
B	Ragweed	*Ambrosia artemisiifolia*
A	skeletonleaf bursage	*Ambrosia tomentosa*
B	common bugloss	*Anchusa officinalis*
B	false brome	*Brachypodium sylvaticum*
B	lens podded white top	*Cardaria chalapensis*
B	white top (hoary cress)	*Cardaria draba*
B	hairy white top	*Cardaria pubescens*
B	musk thistle	*Carduus nutans*
A	plumeless thistle	*Carduus alanthoides*
B	Italian thistle	*Carduus phycnocephalus*
B	slender flowered thistle	*Carduus tenuiflorus*
A	smooth distaff thistle	*Carthamus baeticus*

Rating	Common Name	Scientific Name
A,T	wooly distaff thistle	*Carthamus lanatus*
A,T	purple starthistle	*Centaurea calcitrapa*
B	diffuse knapweed	*Centaurea diffusa*
A,T	Iberian starthistle	*Centaurea iberica*
B,T	spotted knapweed	*Centaurea stoebe (C. maculosa)*
B	short fringed knapweed	*Centaurea nigrescens*
B	meadow knapweed	*Centaurea pratensis*
B,T	yellow starthistle	*Centaurea solstitialis*
A,T	squarrose knapweed	*Centaurea virgata*
B,T	rush skeletonweed	*Chondrilla juncea*
A	western water hemlock	*Cicuta douglasii*
B	Canada thistle	*Circium arvense*
B	bull thistle	*Circium vulgare*
B	traveler's joy	*Clematis vitalba*
B	poison hemlock	*Conium maculatum*
B	field bindweed	*Convolvulus arvensis*
B	common crupina	*Crupina vulgaris*
B	houndstongue	*Cynoglossum officinale*
B	yellow nutsedge	*Cyperus esulentus*
A	purple nutsedge	*Cyperus rotundus*
B	French broom	*Cytisus monspessulanas*
B	Scotch broom	*Cytisus scoparius*
B	Portugese broom	*Cytisus striatus*
B	cutleaf teasel	*Dipsacus laciniatus*
B	South American waterweed (elodea)	*Elodea (=Egeria) densa*
B	giant horsetail	*Equisetum telmateia*
B,T	leafy spurge	*Euphorbia esula*
B	Japanese knotweed	*Fallopia japonica*
B	Himalayan knotweed	*Fallopia polystachyum*
B	giant knotweed	*Fallopia sachalinensis*
B	shiny leaf geranium, shining geranium	*Geranium lucidum*
B	herb Robert	*Geranium robertianum*
B	halogeton	*Halogeton glomeratus*
B	English ivy	*Hedera helix*
A	Texas blueweed	*Helianthus ciliaris*
B	spikeweed	*Hemizonia pungens*
A,T	giant hogweed	*Heracleum mantegazzianum*
A	orange hawkweed	*Hieracium aurantiacum*
A,T	yellow hawkweed	*Hieracium floribundum*
A	mouse ear hawkweed	*Hieracium pilosella*
A	king devil hawkweed	*Hieracium piloselloides*
A	meadow hawkweed	*Hieracium pratense*
A	Hydrilla	*Hydrilla verticillata*
B	St. John's-wort (Klamath weed)	*Hypericum perforatum*
B	policeman's helmet	*Impatiens glandulifera*
B	yellow flag iris	*Iris pseudacorus*
B	dyers woad	*Isatis tinctoria*
B	kochia	*Kochia scoparia*

Rating	Common Name	Scientific Name
B	perennial pepperweed	*Lepidium latifolium*
B	dalmatian toadflax	*Linaria dalmatica*
B	yellow toadflax	*Linaria vulgaris*
B,T	purple loosestrife	*Lythrum salicaria*
B	Eurasian watermilfoil	*Myriophyllum spicatum*
A	matgrass	*Nardus stricta*
B	Scotch thistle	*Onopordum acanthium*
B	small broomrape	*Orobanche minor*
B	wild proso millet	*Panicum miliaceum*
A	African rue	*Peganum harmala*
B	sulfur cinquefoil	*Potentilla recta*
A,T	kudzu	*Pueraria lobata*
B	creeping yellow cress	*Rorippa sylvestris*
B	Armenian (Himalayan) blackberry	*Rubus armeniacus*
B	Mediterranean sage	*Salvia aethiopis*
B,T	tansy ragwort	*Senecio jacobaea*
B	milk thistle	*Silyburn marianum*
A	silverleaf nightshade	*Solanum elaegnifolium*
B	buffaloburr	*Solanum rostratum*
B	Johnsongrass	*Sorghum halepense*
A	smooth cordgrass	*Spartina alterniflora*
A	spartina	*Spartina anglica*
A	spartina	*Spartina densiflora*
B	spartina	*Spartina patens*
B	spanish broom	*Spartium junceum*
B	Austrian peaweed	*Sphaerophysa salsula*
B	dodder	*Suscuta spp.*
B	medusahead rye	*Taeniatherum canput-medusae*
B	tamarix	*Tamarix ramossissima*
B	puncturevine	*Tribulus terrestris*
A	coltsfoot	*Tussilago farara*
B,T	gorse	*Ulex europaeus*
B	spiny cocklebur	*Xanthium spinosum*
A	Syrian bean caper	*Zygophyllum fabago*

Noxious Weed Control Rating System

Noxious weeds are designated as “A,” “B,” and/or “T” species according to the ODA Noxious Weed Rating System:

“A” designated weed is a weed of known economic importance that occurs in the state in small enough infestations to make eradication /containment possible; or is not known to occur, but its presence in neighboring states make future occurrence in Oregon seem imminent. Recommended action: Infestations are subject to intensive control when and where found.

"B" designated weed is a weed of economic importance that is regionally abundant but may have limited distribution in some counties. Where implementation of a fully integrated statewide management plan is infeasible, biological control shall be the main control approach.

"T" designated weed is a priority noxious weed designated by the State Weed Board as a target weed species for which ODA will implement a statewide management plan.

Table 11 - Invasive Plants Documented or Suspected on the West Side of the Mt. Hood National Forest

Scientific Name	Common Name
Acer platanoides	Norway maple
Ailanthus altissima	tree-of-heaven
Ammophila arenaria	European beachgrass
Brachypodium sylvaticum	false brome
Buddleia alternifolia	fountain butterfly bush
Buddleia davidii	butterfly bush
Cotoneaster spp.	cotoneaster
Cortaderia jubata	pampas grass
Cortaderia selloana	pampas grass
Crataegus monogyna	English hawthorn
Daphne laureola	spurge laurel
Digitalis purpurea	foxglove
Eichhornia crassipes	water hyacinth
Genista monspessulana	French broom
Geranium lucidum	shiny leaf geranium
Geranium robertianum	herb Robert
Ilex aquifolium	English holly
Impatiens glandulifera	policeman's-helmet
Iris pseudacorus	yellow flag iris
Juniperus virginiana	eastern redcedar
Lathyrus latifolius	perennial peavine
Ligustrum spp.	privet
Lotus corniculatus	bird's-foot trefoil
Melissa officinalis	lemon balm
Myosotis scorpioides	common forget-me-not
Nymphaea polysepela	water lily
Pennisetum spp.	fountain grass
Phalaris aquatica	reed canarygrass
Phalaris arundinacea	reed canarygrass
Prunus laurocerasus	English laurel
Prunus lusitanica	Portugal laurel
Prunus avium	sweet cherry
Prunus cerasifera	thundercloud cherry
Pyracantha spp.	firethorn
Ranunculus repens	creeping buttercup
Robinia pseudoacacia	black locust
Rosa eglanteria	sweet-briar

Scientific Name	Common Name
Rosa multiflora	multiflowered rose
Sorbus aucuparia	European mountain ash
Vinca major	bigleaf periwinkle, vinca
Vinca minor	common periwinkle, vinca

Supporting Direction

Development of invasive plant (weed) prevention practices is supported by U.S. Forest Service policy and strategy. Forest Service policy is to prevent the introduction and establishment of invasive nonnative plants—including noxious weeds (a subset of invasive plants identified by ODA as particularly harmful to Oregon's agriculture, forests, and economy). This policy directs the Forest Service to (1) determine the factors that favor establishment and spread of invasive plants, (2) analyze invasive plant risks in resource management projects, and (3) design management practices to reduce these risks. Forest Service strategy identifies the development of invasive plant prevention practices and early detection-rapid response as priorities before, during, and following habitat- or ground-disturbing activities. In April 2005 Region 6 completed a Final Environmental Impact Statement (FEIS) for *Preventing and Managing Invasive Plants*. In March 2008, the Mt. Hood National Forest and Columbia River Gorge National Scenic Area completed a FEIS for *Site-Specific Invasive Plant Treatments* that authorizes the use of ten herbicides and implements an early detection/rapid response program. *Executive Order 13112 on Invasive Species* (February 1999) requires federal agencies to use relevant programs and authorities to prevent the introduction of invasive species and to *not* authorize or carry out actions that are likely to cause the introduction or spread of invasive species unless the agency has determined--and made public--documentation that shows that the benefits of such actions clearly outweigh the potential harm. All feasible and prudent measures to minimize risk of harm will need to be taken in conjunction with the actions. An additional authority for coordinated efforts to prevent and control the spread of invasive plants in Region 6 is the 1988 *Final EIS for Managing Competing and Unwanted Vegetation.*

As part of the NEPA process, the Forest Service must analyze and discuss the need for measures to prevent the establishment or spread of invasive plants based upon a survey of any project areas proposed for habitat or ground disturbance. Projects may include construction of proposed temporary roads or new specified roads, reconstruction of existing roads, and likely transportation routes to establish the presence or absence of invasive plants and to identify equipment cleaning and other potential requirements. Invasive plant risks must be analyzed in the planning stage to identify the likelihood of weeds spreading into the project area and to determine the consequences of weed establishment in the project area. A finding of risk is the basis for identifying the appropriate weed-prevention practices from the *Guide*, which are likely to be effective in a particular project situation.

The excerpts from the Forest Service *Guide to Noxious Weed Prevention Practices, USDA July 2001 (GUIDE)* below provide a comprehensive directory of invasive plant prevention practices for use in planning and wildland resource management activities and operations. The *Guide* supports implementation of Executive Order 13112. Federal agencies are expected to follow

the direction in this order. In addition, Best Management Practices, or other credible methods, may be used in establishing equipment-cleaning needs and requirements.

Risk Ranking

The **Factors** and **Vectors** considered in determining the risk level for the introduction or spread of invasive plants are as follows:

Factors

A. Known noxious weeds [invasive plants] in close proximity to project area that may foreseeably invade project
B. Project operation within noxious weed [invasive plant] populations
C. Any of vectors 1-8 in project area

Vectors

1. Heavy equipment (implied ground disturbance including compaction or loss of soil "A" horizon)
2. Importing soil,/cinders,/gravel,/straw, or hay mulch
3. ORVs (off-road vehicles) or ATVs (all-terrain vehicles)
4. Grazing
5. Pack animals (short-term disturbance)
6. Plant restoration
7. Recreationists (hikers, mountain bikers, etc.)
8. Forest Service or other project vehicles

High-, moderate-, or low-risk rankings are possible. For the high ranking, the project must contain a combination of factors A+C or B+C (above). The moderate ranking applies to the presence of any vectors (1 through 5 above) identified within the project area. The low ranking applies to the presence of any vectors (6 through 8) in the project area or if invasive plants are known to be present within or adjacent to the project area (even without such identified vectors).

Table 12 - Invasive Plant Risk Ranking Results – North Clack Project

Project	Factors	Vectors	Risk Ranking
North Clack	A, B, & C	1, 2, & 3	High

Table 13 - Invasive Plant Species with Potential of Being Introduced and Spread

Species Name	Common Name
Alliaria petiolata	garlic mustard
Brachypodium sylvaticum	false brome
Centaurea stoebe (*=C. maculosa*)	spotted knapweed
Centaurea diffusa	diffuse knapweed

Species Name	Common Name
Cirsium arvense	Canada thistle
Cirsium vulgare	bull thistle
Cytisus scoparius	Scotch broom
Digitalis purpurea	foxglove
Geranium lucidum	shiny leaf geranium
Geranium robertianum	herb Robert
Hedera helix	English ivy
Hieracium aurantiacum	orange hawkweed
Hieracium lachenalii	common hawkweed
Hieracium pratense	meadow hawkweed
Hieracium sabaudum	European hawkweed
Hypericum perforatum	St. John's-wort
Hypochaeris radicata	hairy cat's-ear
Leucanthemum vulgare	oxeye daisy
Mycelis muralis	wall lettuce
Rubus armeniacus	Himalayan blackberry
Senecio jacobea	tansy ragwort

Red font indicates those species present in the North Clack project area.

DISCUSSION

Populations of the invasive plant species listed in red font above are located in the proposed project area and listed as noxious weeds on the Oregon Department of Agriculture's "A" or "B" List. The most serious of these invasive species is false brome (*Brachypodium sylvaticum*) and herb Robert (*Geranium robertianum*). See respective species discussions below.

Some of these species (e.g., Canada thistle, bull thistle, Himalayan blackberry, oxeye daisy, Scotch broom, St. John's-wort, tansy ragwort) are widely established regionally; thus, management objectives are to control infestations on a case-by-case basis. There are, for example, scattered populations of St. John's-wort, tansy ragwort, Canada thistle, and Scotch broom along 4610-019 road. In all likelihood, these common and widespread species are scattered throughout the North Clack project area. Garlic mustard, false brome, European hawkweed, orange hawkweed, meadow hawkweed, spotted knapweed, and diffuse knapweed, however, are not at all widely established; so early detection followed by rapid response (i.e., implementation of control measures) is recommended to check the spread of these species. These plants can be considered "ecosystem-altering" species because of their ability to quickly overrun native plant communities and to alter natural habitats and negatively affect ecosystem functions.

Bull thistle is a biennial weed with a short, fleshy taproot. It is not uncommon in areas with previous soil disturbance, including roadsides, forest plantations, and manipulated forage openings. Present control efforts are limited to handpulling associated with specific site objectives or project areas.

Threats: This plant is a threat to agricultural lands and to native forest biodiversity.

Mode of Establishment: Spreads by wind, animals, and vehicles.

Canada thistle is a perennial weed distributed on the west side of the crest of the Cascade Range in areas where previous soil disturbance has occurred (e.g., roadsides, timber harvest areas, forest plantations, forest openings, and meadows). It can also colonize areas with little or no disturbance such as dry or wet meadows. Canada thistle is difficult to eradicate because of its deep rhizomes (belowground roots); new plants can sprout from rhizomes even if all all of the aboveground plants have been removed.

Threats: This plant is a threat to agricultural lands and to native forest biodiversity.

Mode of Establishment: Spreads locally via rhizomes (underground stems) or by seed or vegetative propagules (stem and root fragments) transported by the wind, animals, or vehicles.

English ivy is a perennial vine common in disturbed areas on the west side of the Cascade Range.

Threats: This vine can overrun the forest floor and climb into the forest canopy, toppling trees.

Mode of Establishment: Primarily spreads vegetatively (via root and stem fragments) but also spreads via seed.

False brome was found along the 4610 road near LaDee Flats at the following locations. Clackamas Soil and Water Conservation District treated the false brome populations this past summer (2018). Annual retreatments will be needed.

Table 14 – Locations of false brome

Site	Lat	Long	Easting	Northing
1	45.2211509	-122.219473	561280	5007814
2	45.2220544505	-122.219808758	561253	5007914
3	45.2215871502	-122.220060252	561234	5007862

Note: UTM Coordinates are in NAD83.

False brome is a highly invasive “ecosystem-altering” grass, capable of invading and overrunning roadsides, trailsides, openings, and forest interiors (even forests with closed canopies). This non-native grass is a species of particular concern in the Willamette Valley where it has invaded thousands of acres on the Willamette National Forest and Eugene BLM District. Populations of false brome have now spread along roads and trails in the Columbia River Gorge. The Nature

Conservancy and East Multnomah County Soil and Water Conservation District are treating populations in the Columbia River Gorge with herbicide on an annual basis. Several populations have been found on the Clackamas River Ranger District (along USFS road 70 in the Collawash area, near Three Lynx, and now on the 4610 road) and one on the Zigzag Ranger District (Lolo Pass road). Ten years ago, there was only one known population on the Mt. Hood National Forest (the USFS road 70 location).

Threats: This plant is a serious threat to forests and meadows on the west side of the Cascade Range and can spread rapidly (like wildfire).

Mode of Establishment: Spreads via seed or vegetatively from stem and root fragments.

Garlic mustard is another highly invasive "ecosystem-altering" plant species, capable of invading and overrunning roadsides, trailsides, openings, and interior forest. This non-native herb has invaded thousands of acres of forest in the northeastern and midwestern United States (e.g., New England, Wisconsin, Minnesota). It is now present along trails in the Columbia River Gorge and in Forest Park near downtown Portland. Populations in the Columbia River Gorge were probably spread from what is thought to be the source population in the nearby town of Corbett by elk, deer, and recreationists (Disc/Frisbee golf players). Garlic mustard has been found and treated in Brightwood and Welches, both just west of the Zigzag Ranger District. A few years ago, a hiker reported seeing garlic mustard along the Clackamas River trail, but no plants were observed when following up on this report. Garlic mustard exudes a chemical into the soil that disrupts beneficial mycorrhizal associations between native plants--including many of our conifer species--and fungi. Infestations of garlic mustard can overrun forest understories and suppress tree regeneration.

Threats: This plant is a serious threat to forests and meadows on the west side of the

Cascade Range and can spread rapidly (like wildfire). This plant is very difficult to eradicate or control.

Mode of Establishment: Spreads by seed or vegetatively from stem and root fragments.

Hairy cat's-ear is an invasive plant species with a broad ecological amplitude, occurring from the Pacific Coast to timberline. This species is common and widespread in disturbed areas on the Mt. Hood National Forest (e.g., roadsides, trailsides, clearcuts, landings, decommissioned roads).

Threats: This species is usually present wherever ground has been disturbed. It spreads quickly and displaces native plants.

Mode of Establishment: Reproduces and spreads from seed (dispersed by wind, animals, people, or vehicles) or vegetatively from root fragments and rhizomes.

Herb Robert can be found on spur road 4610-011 (or 4610-012) between proposed units 10 and 164 in the North Clack project area. Populations are scattered here and there along the entire length of the road.

Table 15 – Locations of herb Robert

Site	Lat	Long	Easting	Northing
1	45.225412	-122.217673995	561417	5008289
2	45.225499	-122.2172779207	561448	5008299

Note: UTM Coordinates are in NAD83.

It is highly likely that herb Robert is growing along other spur roads in the proposed project area. The species was more than likely introduced during the last timber harvest entry (entries) in the area. Herb Robert is on the increase on the west side of the Mt. Hood National Forest. It often occurs with shining geranium (*Geranium lucidum*). Both invasive plants are turning up more and more along the sides of highways and roads, including Highway 224, along the perimeters of parking lots, in campgrounds (e.g., Lazy Bend, Indian Henry), and other disturbed areas. Once established, both species are difficult to get rid of.

Threats: Easily spread by vehicles, people, and animals.

Mode of Establishment: Reproduces and spreads vegetatively (from root and stem fragments) or from seed.

Himalayan blackberry is common and widespread in disturbed areas (e.g., along roadsides, in riparian zones, old landings) across much of western Oregon and at lower elevations on the west side of the Mt. Hood National Forest. Himalayan blackberry is common along Highway 224 on the Clackamas River Ranger District. ODOT treats the highway every year with herbicide to control a number of invasive plants (e.g., Himalayan blackberry, herb Robert, shiny leaf geranium) and encroaching native vegetation, which ODOT claims damages the pavement along the edges of the highway and interferes with the visibility of drivers. Their annual treatments control invasive plants but also foster the reinvasion of treated areas with nonnative plants like herb Robert and shiny leaf geranium that are adept at invading or reinvading areas because they are prolific seed producers.

Himalayan blackberry is less common in the upper Clackamas River basin along the 46 road, but can be found in here and there, especially in disturbed areas.

Threats: Capable of being spread by birds and mammals that eat the berries and then widely disperse the seed

Modes of Establishment: Himalayan blackberry produces good seed crops every year and is capable of extensive and vigorous vegetative regeneration. Biennial stems develop from perennial rootstocks or creeping stems. New stems are capable of sprouting vigorously from root or stem suckers and from rooting stem tips. Plants spread extensively by trailing stems that root at the nodes.

Meadow and orange hawkweed have already invaded over 1,000 acres in the Bonneville powerline corridor along Lolo Pass Road (just west of Mt. Hood). Populations of orange hawkweed can also be found along the Pacific Crest Trail at Lolo Pass and there is one population occupying about 3-4 acres in a meadow complex just off of the Burnt Lake Trail in the Mt. Hood Wilderness Area (about 5 miles WNW of Timberline Lodge). Populations are very difficult to eradicate. Control requires annual treatment with herbicide (clopyralid). The Oregon Department of Agriculture (ODA) has been treating meadow and orange hawkweed along Lolo Pass for over 15 years now. ODA has been treating the orange hawkweed population in the wilderness area for three years now. European hawkweed was recently found (summer 2018) in the South Fork of the Clackamas River drainage and treated by Clackamas Soil and Water Conservation District. No sightings of any invasive hawkweed species have been reported in the North Clack project area—so far.

Threats: These two species can be considered "ecosystem-altering" invasive plants because of their ability to overrun (displace) native species in montane meadows and openings.

Mode of Establishment: Reproduce and spread from seed (dispersed by wind, animals, people, or vehicles) or vegetatively from stolons, root fragments, and rhizomes.

Oxeye daisy establishes in open areas that have been disturbed (e.g., roadsides, landings, previously logged upland forest and riparian areas). Oxeye daisy can easily be spread with ground disturbance from commercial thinning operations into surrounding stands, impeding tree regeneration. Oxeye daisy does not produce allelopathic compounds, but it does crowd out other plant species (Jacobs 2008). Plants can reproduce from seed or regenerative vegetatively from rhizomes. Small populations can be controlled manually, but hand-pulling does not remove the rhizomes. To control large infestations/populations, the application of herbicide is the only practical option. Herbicides used to control large oxeye daisy infestations/populations include metsulfuron methyl, picloram (Tordon), and clopyralid (Transline) (Jacobs 2008; G. Miller, pers. comm., 2015). See Appendix Q in the Site-Specific Invasive Plant FEIS for the Mt. Hood National Forest and Columbia River Gorge National Scenic Area for information about these authorized herbicides and their application.

Threats: Oxeye daisy is a prolific seed producer and spreads rapidly from seed or by the spread of belowground rhizomes. Once established, it is difficult to get rid of.

Mode of Establishment: Reproduces aggressively from seed or rhizomes (underground stems)

Scotch broom establishes in open areas with little tree cover and along roadways at low and moderate elevations, mostly west of the Cascade Range crest. Management priorities on the Forest are two-fold: (a) east of the crest, control populations to keep them from expanding, with the long-term goal of eradication; (b) west of the crest, where the species is well-established, active management is considered on a site-by-site basis where there are overriding resource concerns. Bio-control insects are established west of the crest and are relied on to depress Scotch broom infestations where resource concerns are not critical.

Threats: Where broom establishes, it can form a monoculture, outcompeting and displacing native trees, shrubs, forbs, and grasses; delaying forest development; and altering ecologic functioning. The hard, long-lived seed can persist in the soil for up to 75 years.

Mode of Establishment: Scotch broom establishes from seed that may be transported by vehicles carrying soil or plant parts.

Shining geranium (shiny leaf geranium) is on the increase on the west side of the Mt. Hood National Forest. It often occurs with herb Robert (*Geranium robertianum*). Both invasive plant species are turning up more and more along the sides of highways and roads, including Highway 224, along the perimeters of parking lots, in campgrounds (e.g., Lazy Bend, Indian Henry), and other disturbed areas. It is highly probable that shining geranium is present, along with herb Robert, on other spur roads, like the 4610-011 and 4610-012 roads, in the North Clack project area. Once established, both shining geranium and herb Robert are difficult to get rid of.

Threats: Easily spread by vehicles, people, and animals.

Mode of Establishment: Reproduces and spreads vegetatively (from root and stem fragments) or from seed.

Spotted and diffuse knapweed populations are located along Highway 26 and Highway 35. The tap-rooted plants displace native vegetation and can form dense populations. Population distributions are spotty on the west side of the Cascade Range crest (e.g., scattered along Highway 26 and on the Clackamas River Ranger District), but on the east side they can form dense populations that exclude native shrubs, forbs, and grasses. A number of areas and Forest Service roads on the nearby Hood River Ranger District are infested with spotted, diffuse, and meadow knapweed.

Threats: Displaces native vegetation.

Mode of Establishment: Spreads by seed. Dispersal distances for the seed are short: seeds generally fall within a 3-12 dm radius of the parent plant. Movement over greater distances requires transport by rodents, livestock, vehicles, or hay or commercial seed.

St. John's-wort is distributed across the Forest along road shoulders, in rock storage areas, in quarries, and in other areas of soil disturbance. Similar to Scotch broom, active management to control or eradicate an infestation occurs when there are overriding resource concerns. Bio-control insects are well established and are the primary means of control on the Forest.

Threats: While infestations don't result in a great deal of economic harm in forestry settings, St. John's-wort displaces native vegetation and can alter ecological functions.

Mode of Establishment: St. John's-wort establishes from seed that may be transported by vehicles carrying soil or plant parts.

Tansy ragwort's distribution on the Forest is similar to that of Scotch broom. West of the Cascade Range crest, control efforts on the Forest are mostly limited to biological control (e.g., introduced insects). East of the crest, bio-control insects have not established, due to the colder winters. Management priority in this area is to control and eradicate infestations by manual, mechanical, or chemical treatment methods.

Threats: Tansy ragwort is poisonous to livestock, particularly horses. The plant contains poisonous alkaloids. At sites where it becomes dominant, it can displace native vegetation and alter ecologic functioning.

Mode of Establishment: The light seed is dispersed by wind and can be transported in soil on vehicles.

DIRECT AND INDIRECT EFFECTS of the NO-ACTION ALTERNATIVE

With no action, there is far less risk of introducing and spreading invasive non-native plants in the North Clack project area. With no action, there would be no log trucks, dump trucks, or off-road logging vehicles (e.g., skidders, bulldozers, front-end loaders) and, therefore, no ground or habitat disturbed by commercial thinning.

The rehabilitation of damaged by OHV areas and the closure and decommissioning of roads would not occur. The forfeiture of these beneficial elements in the action alternatives package would be offset by a greatly reduced risk of invasive plants being introduced and spread in the planning area due to no ground and habitat disturbance from logging occurring.

DIRECT AND INDIRECT EFFECTS - ACTION ALTERNATIVES

Timber harvest activities can increase the risk of introducing and spreading invasive non-native plants in disturbed areas, particularly along system roads, in skid roads, in landings, and in gaps created by thinning. Non-native plants reduce biological diversity (native plants, wildlife, beneficial insects, fungi) and alter ecosystem functions (e.g., nutrient cycling, mycorrhizal associations, hydrologic regimes). Some non-native plants are "ecosystem-altering" species capable of overrunning and radically altering understory plant communities (e.g., false brome, garlic mustard), meadows (e.g., invasive hawkweeds), and roadsides (e.g., Scotch broom, St. John's-wort, tansy ragwort, herb Robert, shiny leaf geranium, invasive knapweeds). Garlic mustard can prevent the establishment of tree seedlings in forest understories by disrupting mycorrhizal associations between trees and mycorrhizal fungi--thereby, blocking forest regeneration in the understory.

The invasive plants highlighted in red font on page 75, particularly false brome and herb Robert, have the highest likelihood of being spread in the proposed project area because they are already present and are highly invasive; however, other invasive plant species (e.g., invasive knapweeds, invasive hawkweeds, garlic mustard) can also be introduced and spread in the proposed project area because they are either present nearby the project area or nearby the Mt. Hood National Forest. Spotted and diffuse knapweed are scattered in locations in the

Collawash area, Memaloose area, and along Highway 26. Orange hawkweed can be found along Lolo Pass road, and common hawkweed has become more and more common in the Bull Run watershed. Garlic mustard is in the Columbia River Gorge, around the town of Corbett (on the north side of the Bull Run watershed), Brightwood and Welches, and on the nearby Willamette National Forest. Project design features (e.g., cleaning of logging equipment before entry onto the Mt. Hood National Forest) would reduce, but not eliminate, the risk of introducing and spreading invasive plants.

Other openings (created from past logging entries), roadsides, and decommissioned roads in the North Clack project area have been colonized by bull thistle, Canada thistle, hairy cat's-ear, Himalayan blackberry, oxeye daisy, Scotch broom, St. John's-wort, and/or tansy ragwort. All of these invasive plant species are common and widespread on the west side of the Mt. Hood National Forest, not just in the North Clack project area. They are difficult to eradicate because of their widespread distribution and their ability to establish and spread rapidly from seed (sexually) or from rhizomes, stolons, or root fragments (asexually/vegetatively). To control (reduce) their spread, it is desirable to treat landings, decommissioned roads, and other openings infested with invasive plants that are planned to be used during project activities, but the scale and scope of such control efforts must be considered as well and may determine action or no action.

Rehabilitation of areas damaged by OHV use in the area could aid in the prevention and control of invasive plants if rehabilitation consists of the closing-off and/or decommissioning of OHV trails and revegetation/restoration of such trails and other ground disturbed by OHVs.

Road closures and road decommissioning (active or passive) associated with the proposed action would be a plus, reducing opportunities for introducing and spreading invasive plants.

BEST MANAGEMENT PRACTICES

With the exception of the "ecosystem-altering" invasive species listed above, the other invasive plant species are common along roadsides and trailsides, in old landings, in clearcuts, and in other areas with a history of ground disturbance in the North Clack project area. Vehicles and heavy equipment are major vectors for the spread of invasive plants along roads and from roads into forest, forest openings, and meadows.

Table 16 - Practices to Reduce the Risk of Introducing and Spreading Invasive Plants

Management Objectives	Management Practice
Reduce the risk of spreading invasive plant populations already in the project area.	1. Clean log trucks and off-road logging vehicles (e.g., skidders, front-end loaders, bulldozers, feller-bunchers) using pressurized water before they enter national forest lands. A weed-cleaning station located near the project area is not required but would be an effective way to reduce the risk of introducing and spreading weeds. Invasive plant management practices can be stipulated in the contract specifications to ensure they are mandatory and not discretionary (e.g., WO-CT6.36). 2. Staging equipment in designated areas that are pre-determined to be weed-free can prevent the introduction and spread of invasive plants from an infested area (e.g., an old landing or skid road) to an uninfested area. It may be difficult, however, to adhere to this practice if it makes sense from a logging standpoint to use old landings and skid roads for the current timber sale in order to avoid disturbing previously undisturbed ground for the new landing or skid road. In some cases, not using an infested landing or skid road is warranted if the infestation involves serious ecosystem-altering invaders (e.g., Japanese knotweed, garlic mustard, false brome, invasive hawkweeds, or invasive knapweeds) as was the case with a helicopter landing in unit 312 in the Tuba timber sale, originally part of the 2007 plantation thinning project, being infested with spotted knapweed. 3. As much as possible, limit soil disturbance consistent with the project's objectives in order to avoid creating more "growing-space" opportunities for invasive plants to colonize. 4. Consider treating invasive plant infestations of concern. 5. Educate purchasers and operators about invasive plants by including invasive plant management provisions in the contract.

Management Objectives	Management Practice
Reduce the risk of introducing and then spreading invasive plants not currently in the proposed project area into the project area.	1. Inspect off-road logging vehicles prior to start of work to ensure it is free of all soil, seeds, vegetative matter, and other debris that could hold or contain invasive plant seed or propagules (WO-CT6.36). Clean log trucks and off-road logging vehicles (e.g., skidders, front-end loaders, bulldozers) with pressurized water before they enter national forest land. 2. Ensure that rock and other materials imported to the project area originate from a rock source as weed-free as possible. All commerical rock sources and quarries tend to have invasive plants. Practically speaking, it becomes a matter of selecting a rock source or quarry that has fewer invasive plants or less serious invasive plants (e.g., no Japanese knotweed, invasive knapweeds, yellow-flag iris). 3. Use erosion-control materials (e.g., seed, vegetable straw, wood straw) that are certified free of weed seed and propagules. In place of straw, consider using "wood strand" (also known as wood fiber or wood straw), a weed-free straw analog made from wood fiber.

Recommended Project Design Criteria

1. Avoid or remove sources of weed seed and propagules to prevent the introduction of new infestations and the spread of existing weeds.

Clean all off-road logging vehicles (e.g., skidders, front-end loaders, bulldozers, feller-bunchers) with pressurized water before entering national forest lands. Remove mud, dirt, and plant parts; clean wheels, tires, undercarriage, and radiator of vehicles and any other equipment parts that may harbor weed seed or propagules before moving it into a project area. This practice does not apply to log trucks or service vehicles traveling frequently in and out of the project area that will remain on the paved road or highway. Insert contract language (e.g., WO-CT6.36) in timber sale contracts to enforce compliance with invasive plant prevention standards and guidelines. This practice may the single most effective way to prevent the introduction and spread of invasive plants.

2. Prevent the introduction and spread of weeds caused by moving infested sand, gravel, borrow, and fill material in Forest Service, contractor, and cooperator operations.

Inspect material sources on site, and ensure that they are reasonably weed-free before use and transport. Treat weed-infested sources for eradication, and strip and stockpile contaminated material before any use of pit material.

Inspect and document the area, where material from treated weed-infested sources is used, annually for at least three years after project completion to ensure that any weeds transported to the site are promptly detected and controlled.

Maintain stockpiled, un-infested material in a weed-free condition.

3. Treat invasive plant infestations of concern with an herbicide authorized in the Site-Specific Invasive Plant FEIS for the Mt. Hood National Forest and Columbia River Gorge National Scenic Area before project activities commence to prevent/reduce any spread during project activities.

A one-time application of herbicide is rarely sufficient. Follow-up treatment would be needed. Typically, invasive plant populations must be treated for successive years to control invasive plants at a site since the seeds of most invasive plant species are long-lived in the soil (seedbank) and many plants can regenerate vegetatively from rhizomes (belowground horizontal stems), stolons/ runners (aboveground horizontal stems), root stocks, and some even from root or stem fragments.

4. In areas with relatively closed canopies that would not be opened up for timber harvest, retain shade as much as possible to suppress the establishment and growth of invasive plants.

Retain native vegetation in and around project activity to the maximum extent possible while pursuing project objectives.

5. Avoid creating soil conditions that promote weed germination and establishment.

Minimize soil disturbance (the "disturbance footprint") as much as possible.

6. Where project disturbance creates bare ground, re-establish vegetation to prevent conditions for the colonization of invasive plants.

Revegetate disturbed soil (except travelways on surfaced projects) in a manner that optimizes plant establishment for that specific site.

Revegetation may include (a) topsoil replacement, (b) transplanting, (c) planting, (d) seeding, (e) fertilization, (f) liming, and (g) weed-free mulching as necessary. Use *locally adapted* native plant materials (i.e., seed or nursery-grown stock originating from the Mt. Hood National Forest). Use certified wood strand (wood fiber) mulch or certified weed-free straw. Where practical, stockpile weed-free topsoil and replace it on disturbed areas.

Consult with the westside zone botanist on plant propagation and restoration materials and techniques to restore native vegetation in disturbed sites.

7. Educate purchasers and operators about invasive plants by including invasive plant management provisions in the contract.

Insert contract language (e.g., WO-CT6.36) in timber sale contracts to enforce compliance with invasive plant prevention standards and guidelines. This practice may be the single most effective way to prevent the introduction and spread of invasive plants.

Supply the contractor/operator who will implement the project with the flyer, *Simple Things You Can Do to Help Stop the Spread ofWeeds.*

REVEGETATION/RESTORATION

Native plant species should be used to prevent soil erosion, revegetate disturbed ground or habitat, restore or enhance wildlife habitat, and meet any other management objectives that benefit the land and natural resources. Appropriate plant and seed transfer guidelines should be observed. The first choice in revegetation/restoration of disturbed habitats or ground should always be the use of *locally adapted* (i.e., genetically and ecologically appropriate) native plant materials collected on the Mt. Hood National Forest. Undesirable or invasive nonative plants should never be used.

The terms “locally adapted” and “genetically appropriate” are more or less synonymous. Both refer to the collection of native plant materials (seed, cuttings, divisions) as locally as possible for genetic and ecological reasons. In the case of North Clack, native plant materials collected from the west side of the Mt. Hood National Forest would be appropriate. Inappropriate would be the use of non-local native plant materials originating from, for example, the Willamette Valley, Puget Trough, Oregon Coast Range, eastern or southern Oregon, Washington state, Canada, California, the Intermountain West (Rocky Mountains), the southeastern United States, et cetera. Collecting plant materials as locally as possible ensures that non-local/exotic genes (genotypes, alleles) that may be harmful are not introduced into local gene pools/local populations. Locally adapted plants will be ecologically adapated to their environment (i.e., more fit) unlike non-local plants and have a greater likelihood of surviving and thriving in the wild. It is Forest Service policy to use locally adapted native plant materials whenever possible.

There may be occasions when locally adapted native plant materials are not available at all or not available in enough quantities to meet the revegetation/restoration needs of a project. If native plant materials are unavailable, some nonnative species may be used-- but not without first consulting with the westside zone botanist. Some nonnative examples are annual ryegrass and Madsen sterile wheat. These two species have been used in the past and are thought to *not* persist in their introduced environment (i.e., to occupy a disturbed site for a few years until local native plants colonize, establish, and reoccupy the site); however, it has been reported that annual ryegrass can be persistent. Native plants from local commercial nurseries may also be used if locally collected native plants are not available. The use of nonnative and non-local plants, however, should be phased out as cost, availability, and technical knowledge barriers are overcome. Any proposal to use nonnative or non-local plants should, first, be reviewed by the westside zone botanist.

Locally adapted native plant materials that are available on the Mt. Hood National Forest include the grasses blue wildrye (*Elymus glaucus*), California brome (*Bromus carinatus*), and slender hairgrass (*Deschampsia elongata*), and the forb broadleaf lupine (*Lupinus latifolius*). The Forest is currently propagating other native species such as big huckleberry (*Vaccinium membranaceum*), oceanspray (*Holodiscus bicolor*), boxwood (*Paxistima myrsinites*), Pacific rhododendron (*Rhododendron macrophyllum*), twinflower (*Linnaea borealis*), pearly everlasting (*Anaphalis margaritacea*), Cascade aster (*Eucephalus ledophyllus*), and some sedges (*Carex* spp.). It takes one year to propagate sedge and forb seedlings and two-to-three (usually three) years to propagate shrub seedlings. Plants are grown out at Dorena Genetic Resource Center (Cottage Grove, OR), a U.S. Forest Service nursery. Non-native, non-invasive, non-persistent plant species, such as annual ryegrass (*Lolium perenne* ssp*. multiflorum*) or Madsen sterile wheat, may be used if not enough locally adapted native plant materials are available or as an interim measure designed to aid in the reestablishment of native plants. There are reports that annual ryegrass is more persistent than thought and should not be used at all. In general, native plants are preferred and nonnative plants, even if non-persistent, are discouraged for re-vegetating sites. Orchard grass (*Dactylis glomerata*) has been used in the past as a forage species for elk and deer (particularly on the Clackamas River Ranger District), but use of this non-native grass is highly discouraged in Region 6 because it is not native and persists at sites. **Invasive non-native plant species should never be used for re-vegetation.**

Seed must be certified by the states of Oregon or Washington or grown under government-supervised contracts to assure it is weed-free. In some cases, non-certified seed may be used if it is judged to be weed-free, but not without first consulting with the westside zone botanist.

If **straw** is used as a **mulch**, it should originate from fields in the state of Oregon or Washington that grow state-certified seed or be grown under government-supervised contracts to assure noxious weed-free status, or originate in annual ryegrass fields in the Willamette Valley. In certain cases, straw or hay from non-certified grass seed fields may be used if is determined to be free of noxious weeds listed by the state of Oregon.

If **wood straw/wood strand** is used as a **mulch**, it too should be certified weed-free and applied at a rate that does not prevent sown seed from germinating or nearby native plants from recolonizing the area. Wood strand has been applied too heavily in some areas (e.g., ski runs constructed for the Timberline Express project on Mt. Hood on the Zigzag Ranger District), impeding revegetation. A layer of 1-2 inches applied over the sown seed seems to work best. Wood straw/wood strand should not be confused with wood chips. Wood chips have a much higher C:N ratio, resulting in soil nitrogen being immobilized by soil microbes for a lengthy period of time, making it unavailable to plants. Wood straw/wood strand, by contrast, decomposes more quickly with soil nitrogen immobilized for less time.

Invasive nonnative species: All off-road equipment is required to be free of soil, seeds, vegetative matter, or other debris that could contain or hold weed seeds or plant reproductive propagules (e.g., rhizomes, stolons, root fragments), from which plants can reproduce, before coming onto national forest lands. Include provisions in timber sale contracts and service

contracts to minimize the introduction and spread of invasive plants. These provisions contain specific requirements for the cleaning of off-road equipment. Ensure that these provisions are included in the contract for the project.

References

Jacobs, J. 2008. Ecology and management of oxeye daisy (*Leucanthemum vulgare* Lam.). USDA-NRCS. Invasive Species Technical Note No. MT-19. http://www.nrcs.usda.gov/Internet/FSE_PLANTMATERIALS/publications/mtpmstn782 0.pdf

Miller, G. 2015. Weed specialist with Oregon Department of Agriculture. Personal communication.

Appendix B. Habitat and Identification Period for Botanical Species on the Region 6 Regional Forester and OR/WA State Director Special Status Species List (July 2015) Documented or Suspected on the Mt. Hood National Forest. (Note: Pre-disturbance surveys are not required for strategic species, which are displayed in blue shading.)

Type	Species	Common Name	General Habitat	Identification Period	Potential Habitat in Project Area?
Vascular Plant	*Agoseris elata*	tall agoseris	moist-dry meadow/prairie (lodgepole pine, Englemann spruce, grand fir)	June-Aug	No
Vascular Plant	*Astragalus tyghensis*	Tygh Valley milkvetch	shrub-steppe grassland	May-Aug	No
Vascular Plant	*Boechera atrorubens* (=*Arabis sparsiflora* var. *atrorubens*)	sicklepod rockcress	dry meadow, shrub-steppe (oak/pine or transition oak-steppe habitat), mostly of sagebrush & ponderosa pine country; also rocky areas (Columbia River Gorge)	April-June	No
Vascular Plant	*Botrychium lunaria*	common moonwort	meadows and open, mesic habitats at middle elevations in the mountains	May-Sept	**Possibly**
Vascular Plant	*Botrychium montanum*	mountain grape fern	forested wetlands	June-Sept	**Yes**
Vascular Plant	*Calamagrostis breweri*	Brewer's reedgrass	subalpine, moist to dry meadows	June- Sept	No
Vascular Plant	*Carex capitata*	capitate sedge	wet or seasonally wet meadows; often alpine but also at lower elevations	May-Sept	**Possibly**
Vascular Plant	*Carex comosa*	bristly sedge, longhair sedge	marshes, lakeshores, and wet meadows; sea level to 2,500 ft. elevation	May-Sept	No
Vascular Plant	*Carex diandra*	lesser panicled sedge	bogs, fens, lakeshores, springs, seeps	May-Sept	**Yes**
Vascular Plant	*Carex lasiocarpa* var. *americana*	slender sedge	perennially wet areas at low to mid elevations (lakeshores, wetlands)	May-Sept	**Yes**
Vascular Plant	*Carex nardina*	spikenard sedge, spike sedge	alpine rocky outcroppings, slopes, and ridges	June-Aug	No
Vascular Plant	*Carex retrorsa*	retrorse sedge	floodplain forests, edges between lakes & forests, swamps, streamsides, wet thickets & wet meadows	May-Sept	**Yes**

Type	Species	Common Name	General Habitat	Identification Period	Potential Habitat in Project Area?
Vascular Plant	*Carex vernacula*	native sedge	alpine & subalpine wet meadows, rocky slopes that receive snowmelt; edges of headwater streams; lakeshores	May-Sept	**Possibly**
Vascular Plant	*Castilleja thompsonii*	Thompson's paintbrush	rock outcrops east of the Cascade Range crest	July-Aug	No
Vascular Plant	*Coptis trifolia*	3-leaflet goldthread	edge of forested fens	June-July	**Yes**
Vascular Plant	*Corydalis aquae-gelidae*	coldwater corydalis	forested seeps, streamsides, riverbanks	June-Sept	**Yes**
Vascular Plant	*Delphinium nuttallii*	Nuttall's larkspur	rocky outcrops, rocky meadows	May-June	**Possibly**
Vascular Plant	*Douglasii laevigata* (OR-STR)	smooth-leaved douglasii	talus slopes, rocky ridges, & ledges at alpine to (occasionally) low elevations	June-Oct	No
Vascular Plant	*Elatine brachysperma*	short-seeded waterwort	wetlands, riparian areas	April-Sept	**Yes**
Vascular Plant	*Erigeron howellii*	Howell's daisy	moist-dry cliffs, talus, rocky slopes	June-Sept	**Yes**
Vascular Plant	*Eucephalus gormanii*	Gorman's aster	dry cliffs, talus, rock slopes above 3,500 ft.	June-Sept	**Yes**
Vascular Plant	*Fritillaria camschatcensis*	Indian rice	moist-dry meadow	June-Aug	**Possibly**
Vascular Plant	*Howellia aquatilis* var. *howellia* (FEDERALLY THREATENED SPECIES)	howellia	low-elevation lakes and ponds	June- Sept	**Yes**
Vascular Plant	*Lewisia columbiana* var. *columbiana*	Columbia lewisia	dry cliffs, talus, rocky slopes	June-Sept	**Yes**
Vascular Plant	*Lomatium watsonii*	Watson's desert parsley	open hillsides with sagebrush	May-Sept	No
Vascular Plant	~~*Luzula arcuata ssp. unalaschcensis*~~ (Not on 2015 ISSSSP list)	~~Alaska curved woodrush~~	~~rocky or gravelly soil, generally on glacial moraines or above timberline~~	~~June-Sept~~	~~No~~
Vascular Plant	*Lycopodiella inundata*	bog club-moss	wet meadows and bogs	July-Sept	No
Vascular Plant	*Lycopodium complanatum*	gound cedar	open conifer forest	Apr-Nov	**Possibly**
Vascular Plant	*Ophioglossum pusillum*	adder's tongue	wet-moist meadow	June-Sept	**Yes**

Type	Species	Common Name	General Habitat	Identification Period	Potential Habitat in Project Area?
Vascular Plant	*Phlox hendersonii*	Henderson's phlox	sub-alpine, dry, rocky, scree	July-Sept	No
Vascular Plant	*Pinus albicaulis*	whitebark pine	timberline, subalpine	Year-round	No
Vascular Plant	*Potentilla villosa*	villous cinquefoil	sub-alpine, dry, rocky, scree	July-Sept	No
Vascular Plant	*Ranunculus triternatus* (=*R. reconditus*)	Dallas Mt. buttercup, obscure buttercup	sagebrush slopes	June-Sept	No
Vascular Plant	*Romanzoffia thompsonii*	mistmaiden	vernally wet cliffs	April-June	No
Vascular Plant	*Rorippa columbiae*	Columbia cress	moist, generally sandy soil (riversides, streamsides, lakeshores, wet meadows, ditches)	April-Oct	**Yes**
Vascular Plant	*Rotala ramosior*	lowland toothcup	damp areas in fine silt/sand (swamps, lake & pond margins, riversides)	June-Aug	**Yes**
Vascular Plant	*Scheuchzeria palustris* ssp. *americana*	scheuchzeria	wet meadow, bog, fen	June-Sept	**Yes**
Vascular Plant	*Sisyrinchium sarmentosum*	pale blue-eyed grass	moist-dry meadow	June-Aug	**Yes**
Vascular Plant	*Streptopus streptopoides*	kruhsea, small twistedstalk	dense, damp, montane coniferous forest	June-Aug	**Yes**
Vascular Plant	*Suksdorfia violacea*	violet suksdorfia	moist cliffs, talus, rocky slopes	May-July	No
Vascular Plant	*Sullivantia oregana*	Oregon sullivantia, Oregon coolwort	moist cliffs, especially near waterfalls (low elevations)	May-Aug	No
Vascular Plant	*Taushia stricklandii*	Strickland's taushia	wet-dry meadows and moist slopes, bogs, alpine meadows	June-Sept	**Yes**
Vascular Plant	*Utricularia minor*	lesser bladderwort	affixed rather than free-floating in standing or slowly moving water (wetlands, bogs, lake margins)	June-Aug	**Yes**
Vascular Plant	*Utricularia ochroleuca*	northern bladderwort	standing or slowly moving water (wetlands, bogs, lake margins)	June-Aug	**Yes**

Type	Species	Common Name	General Habitat	Identification Period	Potential Habitat in Project Area?
Vascular Plant	*Wolffia borealis*	dotted water-meal	pond, lake, gently flowing water	May-Sept	**Yes**
Vascular Plant	*Wolffia columbiana*	water-meal	pond, lake, gently flowing water	May-Sept	**Yes**
Bryophyte	*Anastrophyllum minutum*	tiny notchwort (liverwort)	bogs and peaty soil; coast and high mountains; reported from Hood River County on Mt. Hood (D.Wagner)	Year-round	No
Bryophyte	*Andreaea nivalis* (OR-STR)	granite moss, lantern moss	wet rocks in streams, snow flushes, seeping outcrops; moderate to high elevations	Year-round	**Yes**
Bryophyte	*Andreaea schofieldiana*	broad-leaved lantern moss, Schofield's black moss	forming mats on dry and exposed to moist, shaded igneous rocks; montane to subalpine	Year-round	**Yes**
Bryophyte	*Anomobryum julaceum* (OR-STR)	filiform anomobryum moss	earth cliff crevices, cliff crevices, tussock tundra with seeps and late snowmelt areas, granitic outcrops	Year-round	No
Bryophyte	*Anthelia julacea*	alpine silverwort (liverwort)	on peaty soil, often with sparse shrub cover. Only recorded site by D. Wagner is at McNeil Point on Mt. Hood. Reported from Clackamas and Wallowa counties by ORNHIC	Year-round	No
Bryophyte	*Barbilophozia barbata* (OR-STR)	bearded pawwort (liverwort)	on rotting logs, peat, or other well-decayed organic matter; in Oregon known only from Saddle Mountain in Coast Range (D.Wagner)	Year-round	Yes
Bryophyte	*Barbilophozia lycopodioides*	giant fourpoint, maple liverwort	damp ledges of rock outcrops and cliffs at higher elevations (3,400-7,500 ft. elevation)	Year-round	No
Bryophyte	*Blepharostoma arachnoideum*	spidery threadwort (liverwort)	on rotting wood at higher elevations	Year-round	No
Bryophyte	*Brachydontium olympicum*	Olympic brachydontium moss	boulders or soil in rock crevices (boulder fields, moraines, ledges of cliffs) at subalpine to alpine elevations	Year-round	No
Bryophyte	*Bruchia bolanderi* (OR-STR)	Bolander's pygmy moss, Bolander's candle moss	on disturbed, moist organic soil along roadside ditches and fallow fields; also in montane meadows and along streambanks (3,500 to 5,000 ft.	Year-round	No

Type	Species	Common Name	General Habitat	Identification Period	Potential Habitat in Project Area?
			elevation)		
Bryophyte	*Bryum calobryoides*	beautiful bryum (moss)	rocks and soil in shaded to exposed boulder fields, montane to alpine meadows, cliffs, & outcrops (3,000-7,000 ft.)	Year-round	No
Bryophyte	*Calypogeia sphagnicola*	bog pouchwort (liverwort)	nutrient-poor fens containing sphagnum moss	Year-round	No
Bryophyte	*Cephaloziella spinigera*	spiny threadwort (liverwort)	on peat and over peat- forming mosses; in coastal and montane fens	Year-round	No
Bryophyte	~~*Chiloscyphus gemmiparus* (OR-STR)~~ (Not on 2015 ISSSSP list)	~~alpine waterwort~~	~~rocks in beds of cold montane streams~~	~~Year-round~~	~~Yes~~
Bryophyte	~~*Codriophorus ryszardii* (OR-STR)~~ (Not on 2015 ISSSSP list)	~~Ryszard's racomitrium moss~~	~~forming mats on shaded, moist rocks and cliffs along shady streams or in forests, often in the splash zone, but never aquatic~~	~~Year-round~~	~~Yes~~
Bryophyte	*Conostomum tetragonum*	ribbed mountain moss, helmet moss	soil in rock crevices in boulder fields, glacial moraines, and ledges of cliffs (subalpine to alpine elevations)	Year-round	No
Bryophyte	*Cynodontium jenneri* (OR-STR)	Jenner's dog-tooth moss	on shaded cliff shelves, peaty slopes, shaded rocks, outcrop crevices and shelves, humus of cliff terrace slopes; coastal to subalpine	Year-round	Yes
Bryophyte	*Encalypta brevicollis*	extinguisher moss	soil in open montane and alpine habitats (Mt. Rainier and Siskiyou Mts.)	Year-round	**Yes**
Bryophyte	*Encalypta brevipes*	candle snuffer moss, stubby extinguisher moss	soil on ledges and in crevices on cliffs	Year-round	**Possibly**
Bryophyte	*Entosthodon fascicularis*	banded cord-moss	on exposed soil in seeps or along intermittent streams in grassland, oak savanna, grassy balds, and rock outcrops	Year-round	No

Type	Species	Common Name	General Habitat	Identification Period	Potential Habitat in Project Area?
Bryophyte	*Gymnomitrion concinnatum*	braided frostwort, pointy whiteworm	soil on cliffs and rock outcrops (subalpine parkland areas with mountain hemlock and subalpine fir)	Year-round	No
Bryophyte	*Haplomitrium hookeri*	Hooker's flapwort (liverwort)	among other bryophytes, usually tightly packed on peaty soil	Year-round	**Yes**
Bryophyte	*Harpanthus flotovianus*	great mountain flapwort (liverwort)	on peat at high elevations in the mountains	Year-round	No
Bryophyte	*Helodium blandowii*	Blandow's feather moss	montane fens (edges of fens too & streamlets of fens)	Year-round	No
Bryophyte	*Herbertus aduncus* ssp. *aduncus*	common scissorleaf, red prongwort (liverwort)	exposed, dry, montane, windswept sites in moist, protected microsites on rock outcrops, in crevices, and on ledges, wedged among stones or roots	Year-round	**Yes**
Bryophyte	*Herbertus dicranus* (OR-STR)	Pacific scissorleaf, Pacific prongwort (liverwort)	on rock cliffs.; in Oregon known only from Saddle Mountain in Coast Range (D. Wagner)	Year-round	No
Bryophyte	*Lophozia gillmanii*	Gillman's pawwort (liverwort)	known from only three locales: Elkhorn Ridge (Baker County) & Haiku Meadow and Vinegar Hill (Grant County)	Year-round	No
Bryophyte	*Lophozia laxa*	bog pilewort (liverwort)	on hummocks of *Sphagnum* in fens and bogs (sea level to 5,000 ft.)	Year-round	No
Bryophyte	*Marsupella condensata*	compact rustwort (liverwort)	on compact, peaty soil in subalpine-alpine areas; only known on Mt. Hood in Oregon (D. Wagner)	Summer	No
Bryophyte	*Marsupella emarginata* var. *aquatica*	stream ladderwort, robust rustwort (liverwort)	strictly aquatic, growing on rocks in the bottom of swift streams; in Oregon known only from the outlet stream of Waldo Lake (D. Wagner)	Year-round	No
Bryophyte	*Marsupella sparsifolia*	sharp ladderwort, rounded rustwort (liverwort)	on soil or rock in subalpine to alpine areas; only one verified record in Oregon (on Mt. Hood) (D. Wagner)	Year-round	No

Type	Species	Common Name	General Habitat	Identification Period	Potential Habitat in Project Area?
Bryophyte	*Nardia japonica*	Pacific spikewort, Japanese flapwort (liverwort)	on soil at high elevations (alpine zone) in the mountains	Year-round	No
Bryophyte	*Plagiobryum zieri* (OR-STR)	Zierian hump-moss	on wet or damp shaded crevices in rock cliffs, on humus over rock cliffs; (microhabitats for the three Oregon collections are shaded cliff shelf, damp crevice of shaded cliff, and damp shaded cliff)	Year-round	Yes
Bryophyte	*Plagiopus oederiana* (STR)	Oeder's apple-moss	on shaded, humid, calcareous cliffs and rocks in crevices and vertical faces; from sea level to subalpine elevations	Year-round	Yes
Bryophyte	*Pohlia cardotii* (STR)	Cardot's pohlia moss	on wet soil or along snowmelt streamlets in subalpine and alpine habitats (>6,000 ft. elevation)	Year-round	No
Bryophyte	~~*Pohlia sphagnicola* (OR-STR)~~ (Not on 2015 ISSSSP list)	~~pohlia moss, sparse hummock moss, nodding bog moss~~	~~among *Sphagnum* moss atop hummocks in coastal and montane bogs and fens~~	~~Year-round~~	~~No~~
Bryophyte	*Pohlia tundra* (OR-STR)	tundra thread-moss, tundra pohlia moss	on wet acid soil or along snowmelt streamlets in subalpine and alpine habitats (>6,000 ft. elevation)	Year-round	No
Bryophyte	*Polytrichastum sexangulare* var. *sexangulare* (OR-STR)	northern haircap moss	on damp gravelly soil and rocks next to snowmelt streams and areas with late summer snowmelt in subalpine to alpine areas (>4,200 ft. elevation)	Year-round	No
Bryophyte	*Polytrichastrum sexangulare* var. *vulcanicum*	dwarf rock haircap	on igneous rocks in exposed or sheltered spots in subalpine or alpine habitats at or above timberline	Year-round	No
Bryophyte	*Polytrichum sphaerothecium*	dwarf rock haircap	on igneous rocks in subalpine parkland to alpine krummholz (with mountain heath)	Year-round	No
Bryophyte	*Polytrichum strictum* (= *P. juniperinum* var. *affine*)	slender haircap moss, narrow-leaved haircap moss	on organic soils, particularly on top of *Sphagnum* hummocks, in montane and coastal bogs and fens	Year-round	No

Type	Species	Common Name	General Habitat	Identification Period	Potential Habitat in Project Area?
Bryophyte	*Porella vernicosa* ssp. *fauriei* (OR-STR)	Pacific scalemoss (liverwort)	presumably on rock; known only from Columbia River Gorge	Year-round	No
Bryophyte	*Preissia quadrata*	blister ribbon, narrow mushroom-headed liverwort	on soil (found along the Sandy River)	Year-round	No
Bryophyte	*Racomitrium ryszardii* (OR-STR)	Ryszard's racomitrium moss	on shaded moist rocks and cliffs along shady streams or in forests, often in the splash zone, but never aquatic; 1,000 to 6,000 ft. elevation	Year-round	Yes
Bryophyte	*Radula brunnea* (OR-STR)	brown flatwort (liverwort)	in thick mats on peaty ledges and cliffs near summit ridges; known only from Saddle Mountain in Coast Range (D. Wagner)	Year-round	No
Bryophyte	*Rhytidium rugosum* (STR)	crumpled leaf moss, pipecleaner moss	exposed rocks or soil on sloping sides and tops of bluffs and cliffs at middle to higher elevations	Year-round	Yes
Bryophyte	*Rivulariella gemmipara*	liverwort	on rocks in moderately fast-moving streams; favors sites in open areas, exposed to sun; most sites above 1,700m	Year-round	Yes
Bryophyte	*Scapania gymnostomophila* (OR-STR)	puckered spadewort, narrow-lobed earwort (liverwort)	on rock; in Oregon known only from Columbia River Gorge cliffs	Year-round	No
Bryophyte	*Scapana obscura*	scorched spadewort, dark earwort (liverwort)	on stones in small, coldwater streams	Year-round	**Yes**
Bryophyte	*Schistidium cinclidodonteum*	schistidium moss	on wet or dry rocks, or on soil in crevices of rock and boulders, often along intermittent streams (5,000-11,000 ft. elevation)	Year-round	No
Bryophyte	*Schofieldia monticola*	alpine masterwort (liverwort)	on peaty soil, often mixed with other liverworts, sometimes among heather stems; in Oregon known only from Three Sisters Wilderness and in the Waldo Lake basin	Year-round	**Possibly**

Type	Species	Common Name	General Habitat	Identification Period	Potential Habitat in Project Area?
Bryophyte	*Scouleria marginata* (OR-STR)	margined streamside moss	bedrock material or boulders along rivers & streams	Year-round	No
Bryophyte	~~*Splachnum ampullaceum*~~ ~~(~~Not on 2015 ISSSSP list)	~~purple-vased stink moss, small capsule dung moss~~	~~old dung of herbivores or on soil enriched by dung in peatlands or wetlands~~	~~Year-round~~	~~No~~
Bryophyte	*Tetraphis geniculata*	fourtooth bent-knee moss	large decaying logs in old-growth forest	Year-round	**Yes**
Bryophyte	*Thamnobryum neckeroides* (STR)	Necker's thamnobryum (moss)	on rocks and trees, often in shaded, damp locations in TSHE- PSME forest with bigleaf maple; also humid cliff bases and boulder faces, esp. near watercourses	Year-round	Yes
Bryophyte	*Trematodon asanoi* (= *T. boasii*)	Asano's trematodon moss	soil along the edges of trails, streams, & ponds in subalpine areas	Year-round	No
Bryophyte	~~*Tritomaria exsectiformis*~~ (Not on 2015 ISSSSP list)	~~little brownwort~~	~~seeps, springs, low- gradient streams on east side of Cascade Range~~	~~Year-round~~	~~No~~
Bryophyte	*Tritomaria quinquedentata* (OR-STR)	giant brownwort, arch notchwort (liverwort)	on wet humus over wet boulders, shaded cliffs, soil over exposed rock surfaces, decaying branches at the fringes of spray zones, and among heather on slopes; known only from Oregon on Saddle Mountain in Coast Range (D. Wagner)	Year-round	No
Lichen	~~*Chaenotheca subroscida* (STR)~~ (Not on 2015 ISSSSP list)	~~lemondrop whiskers, needle lichen (pin lichen)~~	~~boles of live trees and snags in moist forest (restricted to the bark of old trees)~~	~~Year-round~~	~~Yes~~
Lichen	*Collema curtisporum* (OR-STR)	jelly lichen	on hardwood trees in riparian zones (northern Idaho, eastern Oregon, Umpqua Valley, Klamath Mountains)	Year-round	No
Lichen	~~*Hypogymnia duplicata* (OR-STR)~~ (Not on 2015 ISSSSP list)	~~ticker-tape lichen~~	~~conifer boles where > 90" inches of precipitation~~	~~Year-round~~	~~Yes~~

Type	Species	Common Name	General Habitat	Identification Period	Potential Habitat in Project Area?
Lichen	*Hypotrachyna riparia*	riparian loop lichen	on deciduous shrubs and trees in riparian forests below about 2,000 ft. in elevation in the foothills of the western Cascade Range. Forest types are *Fraxinus latifolia* associations but also may occur with mixed riparian forests containing western hemlock, Douglas-fir, and grand fir.	Year-round	**Yes**
Lichen	~~*Lecanora pringlei* (STR)~~ (Not on 2015 ISSSSP list)	~~Pringle's rim lichen~~	~~siliceous, usually igneous, rocks, often andesite; in crevices or sheltered faces of large exposed outcrops; sometimes on the underside of rocks or overhangs; seldom below 5,500 ft. elevation. With whitebark pine, mountain hemlock, and Douglas-fir forests and in alpine tundra.~~	~~Year-round~~	~~No~~
Lichen	*Leptogium burnetiae* (OR-STR)	jellyskin lichen	bark of deciduous trees, decaying logs and moss on rock	Year-round	**Yes**
Lichen	*Leptogium cyanescens*	blue jellyskin lichen	moss and bark of deciduous trees	Year-round	**Yes**
Lichen	~~*Leptogium teretiusculum* (OR-STR)~~ (Not on 2015 ISSSSP list)	~~shrubby vinyl~~	~~shaded and humid bark of hardwood trees in riparian areas~~	~~Year-round~~	~~Yes~~
Lichen	*Lobaria linita*	cabbage lungwort	lower bole of conifers, often mossy boulders	Year-round	**Yes**
Lichen	*Pannaria rubiginella*	petalled mouse	on bark and wood in cool moist habitats along the Pacific Coast; inland occurrences may be an undescribed *Pannaria* sp.	Year-round	**Possibly**
Lichen	*Pilophorus nigricaulis*	matchstick lichen	rock on cool, north- facing slopes	Year-round	**Yes**
Lichen	*Ramalina pollinaria*	chalky ramalina	bark in moist, low- elevation habitats	Year-round	**Possibly**
Lichen	*Schaereria dolodes* (STR)	tricky lecidea	on bark of conifers and decaying wood in mature, dry, open forests (Douglas-fir, true fir, western larch, western red cedar, & incense cedar)	Year-round	Yes

Type	Species	Common Name	General Habitat	Identification Period	Potential Habitat in Project Area?
Lichen	*Stereocaulon spathuliferum*	chalk foam, snow lichen	crustose lichen on basalt blocks of talus slopes (3,000-5,000 ft. elevation)	Year-round	No
Lichen	*Texosporium sancti-jacobi*	woven spore lichen	with biotic crusts in arid and semi-arid habitats on east side of Cascade Range	Year-round	No
Lichen	*Tholurna dissimilis*	urn lichen	branches of krummholz at moderate to high elevation	Year-round	No
Lichen	*Usnea lambii* (OR-STR)	Zebra beard, banded beard	on acidic rocks and boulders in open subalpine to alpine habitats. Forest types are mountain hemlock, subalpine fir, and whitebark pine associations.	Year-round	No
Lichen	~~*Usnea rubicunda* (OR-STR)~~ (Not on 2015 ISSSSP list)	~~old man's beard, red beard lichen~~	~~bark of trees and shrubs along the coast. Forest types are Sitka spruce, shore pine, and Douglas-fir associations.~~	~~Year-round~~	~~No~~
Fungus	*Albatrellus avellaneus*		terrestrial polypore endemic to the coastal lowlands of OR and WA (< 1,000 ft. elevation); occurs principally with Sitka spruce; mycorrhizal	Oct-Jan	No
Fungus	*Albatrellus caeruleoporus* (OR-STR)		terrestrial polypore mycorrhizal with *Tsuga* spp.	Sept-Nov	Yes
Fungus	*Albatrellus dispansus* (OR-STR)		terrestrial polypore mycorrhizal with species in Pinaceae	Aug-Dec	Yes
Fungus	*Albatrellus skamanius* (OR-STR)		rare polypore with only four collections reported from Washington state	Aug-Dec	Yes
Fungus	~~*Arcangeliella crassa* (OR-STR)~~ (Not on 2015 ISSSSP list)		~~sequestrate fungus associated with various Pinaceae spp. in mixed forests from 2,000-2,200 meters in elevation~~	~~June-Oct~~	~~No~~
Fungus	*Balsamia platyspora* (OR-STR)		sequestrate fungus; mycorrhizal?	summer-autumn	Yes
Fungus	*Boletus regius* (OR-STR)	butter bolete	under conifers	spring and fall	Yes
Fungus	*Brauniellula albipes* (OR-STR)		hypogeous, gastroid agaric; on the ground in rich forest duff	autumn	Yes
Fungus	*Bridgeoporus nobilissimus*	noble polypore	large true fir stumps, snags, & live trees (perhaps with western hemlock too)	Year-round	**Yes**

Type	Species	Common Name	General Habitat	Identification Period	Potential Habitat in Project Area?
Fungus	*Choiromyces alveolatus* (OR-STR)		sequestrate fungus associated with various Pinaceae spp. above 1,300 meters elevation	May-Nov	Yes
Fungus	*Choiromyces venosus*		sequestrate fungus; associated with western and mountain hemlock	Oct	**Yes**
Fungus	~~*Chroogompus loculatus* (OR-STR)~~ (Not on 2015 ISSSSP list)		~~sequestrate fungus (hypogeous to partly emergent); associated with various Pinaceae spp., esp. with mountain hemlock~~	~~Oct~~	~~**Yes**~~
Fungus	*Chrysomphalina grossula* (OR-STR)		on water-soaked coniferous wood, bark chips, and debris in mixed forests	autumn	Yes
Fungus	*Clavariadelphus subfastigatus* (OR-STR)		on soil or duff under mixed conifers	Oct-Jan	Yes
Fungus	*Clavulinopsis fusiformis* (OR-STR)		clustered growth pattern under conifers or hardwoods	summer-fall	Yes
Fungus	*Clitocybe subditopoda* (OR-STR)		forms fairy rings on needle beds of spruce spp. and pine spp. in coastal to mid-elevation conifer forests	Oct-Dec	No
Fungus	*Cortinarius barlowensis*		on soil in montane coniferous forest to 4,000 ft. elevation	autumn	**Yes**
Fungus	*Cortinarius cyanites* (OR-STR)		on soil in conifer forests	Aug-Sept	Yes
Fungus	*Cortinarius wiebeae* (OR-STR)		hypogeous; associated with the roots of Douglas-fir and ponderosa pine above 1,200 meters in elevation	June	Possibly
Fungus	*Cudoniella clavus* (OR-STR)		on rotting stems of grasses and herbs in boggy montane meadows	spring shortly after snowmelt	No
Fungus	*Cystangium idahoensis*		epigeous under conifers	autumn	**Yes**
Fungus	*Dendrocollybia racemosa* (OR-STR)		on rotting or mummified remnants of agarics or sometimes in nutrient-rich leaf mulch in forests	autumn	Yes
Fungus	*Elaphomyces anthracinus* (OR-STR)		sequestrate fungus associated with the roots of ponderosa pine in Oregon	May & Aug	No

Type	Species	Common Name	General Habitat	Identification Period	Potential Habitat in Project Area?
Fungus	*Fevansia aurantiaca* (OR-STR)		sequestrate fungus associated with various Pinaceae spp. (subalpine fir & Douglas-fir)	Aug	Yes
Fungus	*Galerina fuscobrunnea* (OR-STR)		on humus under alder; known from Wapinitia Summit (Wasco Co.)	autumn	No
Fungus	*Gastroboletus imbellus* (OR-STR)		sequestrate fungus; with grand fir, subalpine fir, mountain hemlock (1,650 meters elevation)	Oct	Probably not
Fungus	*Glomus radiatum* (OR-STR)		sequestrate fungus; known from coastal NW California and the Willamette & Wenatchee National Forests	June, Oct, & Nov	No
Fungus	*Gomphus kauffmanii* (OR-STR)	Kauffman's scaly chanterelle	epigeous in deep humus under pine and true fir	autumn	Yes
Fungus	*Helvella crassitunicata*		on soil, esp. along trails, in montane regions with *Abies* spp.	Aug-Oct	**Yes**
Fungus	*Hydnotrya inordinate* (OR-STR)		sequestrate fungus; associated with Pacific silver fir, lodgepole pine, Douglas-fir, and western hemlock, 1,200-2,000 meters in elevation	March, April, & July	Yes
Fungus	*Hydropus marginellus* (OR-STR)		on wood of conifers (*Abies*, *Pinus*) in forests	spring & autumn	Yes
Fungus	~~*Hygrophorus caeruleus*~~ (Not on 2015 ISSSSP list)		~~in soil with roots of Pinaceae spp. near melting snowbanks~~	~~May-July (possibly autumn too)~~	~~Yes~~
Fungus	*Leptonia subeuchroa* (OR-STR)		one known site growing on mossy log in western red cedar, western hemlock, & *Acer* forests	autumn	Yes
Fungus	*Leptonia violaceonigra* (OR-STR)		no habitat information available	presumably autumn	Yes
Fungus	*Lyophyllum chamaeleon* (OR-STR)		little habitat information available; under pine	presumably autumn	Yes
Fungus	*Lyophyllum lubricum* (OR-STR)		little habitat information available; on soil under conifers	presumably autumn	Yes

Type	Species	Common Name	General Habitat	Identification Period	Potential Habitat in Project Area?
Fungus	*Macowanites mollis*		sequestrate fungus; under conifers	autumn	**Yes**
Fungus	*Mycena hudsoniana* (OR-STR)		on woody debris or duff near snowbanks above 700 meters elevation	April-July	Yes
Fungus	*Mycena quinaultensis* (OR-STR)		on senescent conifer needles or decayed wood in conifer forests	May-Dec	Yes
Fungus	*Mycena tenax* (OR-STR)		in duff under true firs, Douglas-fir, spruce, & *Sequoia*	spring & autumn	Yes
Fungus	*Mythicomyces corneipes*		epigeous along margins of bogs or on wet soil under conifers	autumn	**Yes**
Fungus	*Octaviania cyanescens* (OR-STR)		sequestrate fungus; found with mountain hemlock at 1,900 meters elevation	Sept	Yes
Fungus	*Octaviania macrospora* (OR-STR)		sequestrate fungus; with roots of western hemlock	Aug	Yes
Fungus	*Otidea smithii* (OR-STR)	cup fungus	under cottonwood, Douglas-fir, and western hemlock	Aug-Dec	Yes
Fungus	*Phaeocollybia californica*		epigeous with Pacific silver fir, Douglas-fir, and western hemlock	March, May, Oct-Nov	**Yes**
Fungus	*Phaeocollybia lilacifolia* (OR-STR)		epigeous; occurs as solitary or scattered individuals in old-growth conifer forests	presumably autumn	Yes
Fungus	*Phaeocollybia oregonensis*		epigeous with Douglas- fir, Pacific silver fir, w. hemlock	Oct-Nov	**Yes**
Fungus	*Phaeocollybia pseudofestiva* (OR-STR)		epigeous under mixed conifers and hardwoods	Oct-Dec	Yes
Fungus	*Podostroma alutaceum* (OR-STR)	club fungus	club mushroom growing on litter, dead wood, & possibly the roots of trees in conifer forests	autumn	Yes
Fungus	*Pseudaleuria quinaultiana* (OR-STR)	cup fungus	cup fungus on disturbed microsites (trail sides, recent windthrow mounds) in low-elevation old- growth forests	March-May	No
Fungus	*Pseudorhizina* (=*Gyromitra*) *californica*	false morel, brain mushroom	on or adjacent to well- rotted stumps or logs of coniferous trees or on soil rich in brown rotted wood	June	**Yes**

Type	Species	Common Name	General Habitat	Identification Period	Potential Habitat in Project Area?
Fungus	*Ramaria abietina* (OR-STR)	coral mushroom	coral fungus found on conifer debris	May & Sept-Nov	Yes
Fungus	*Ramaria coulterae* (OR-STR)	coral mushroom	on conifer debris	spring to early summer	Yes
Fungus	*Ramaria gelatiniaurantia* (OR-STR)	coral mushroom	coral fungus with true firs, Douglas-fir, western hemlock	Oct	Yes
Fungus	*Ramaria maculatipes* (OR-STR)	coral mushroom	fruits in humus or soil and matures above the surface of the ground (true firs, Douglas-fir, hemlock)	Nov	Yes
Fungus	*Ramaria rubribrunnescens* (OR-STR)	coral mushroom	fruits in humus or soil and matures above the ground; associated with Pinaceae	Oct-Nov	Yes
Fungus	~~*Ramaria spinulosa* var. *diminutive*~~ (Not on 2015 ISSSSP list)	~~coral mushroom~~	~~epigeous with Pinaceae~~	~~Oct-Nov~~	~~Yes~~
Fungus	*Rhizopogon abietis* (OR-STR)		sequestrate fungus; associated with true firs, hemlock, spruce, and pines	July-Dec	Yes
Fungus	*Rhizopogon alexsmithii* (formerly *Alpova alexsmithii*)		sequestrate fungus, mycorrhizal with Pinaceae, esp. western and mountain hemlock	Aug-Dec	Yes
Fungus	*Rhizopogon atroviolaceus* (OR-STR)		sequestrate fungus; associated with true firs, hemlock, spruce, pines, & Douglas-fir	May-Dec	Yes
Fungus	*Rhizopogon bacillisporus* (OR-STR)		sequestrate fungus; mycorrhizal with Pinaceae	presumably autumn	Yes
Fungus	*Rhizopogon brunneifibrillosus*		sequestrate fungus	presumably autumn	**Yes**
Fungus	*Rhizopogon brunneiniger* (OR-STR)		sequestrate fungus; associated with roots of assorted Pinaceae from sea level to 2,350 meters elevation	Sept-Oct	Yes
Fungus	*Rhizopogon clavitisporus* (OR-STR)		sequestrate fungus; probably mycorrhizal with Pinaceae spp.	presumably autumn	Yes
Fungus	*Rhizopogon ellipsosporus*		sequestrate fungus under Douglas-fir, tanoak, and mountain hemlock	Oct-Nov	**Yes**

Type	Species	Common Name	General Habitat	Identification Period	Potential Habitat in Project Area?
Fungus	*Rhizopogon exiguus*		sequestrate fungus; under Douglas-fir & western hemlock (under 4,000 ft. elevation)	spring & autumn	**Yes**
Fungus	*Rhizopogon inquinatus*		sequestrate fungus; under Douglas-fir & western hemlock (500-1,400 meters elevation)	Sept-Oct	**Yes**
Fungus	*Rhizopogon oswaldii* (OR-STR)		sequestrate fungus; probably mycorrhizal with Pinaceae spp.	presumably autumn	Yes
Fungus	*Rhizopogon quercicola* (OR-STR)		sequestrate fungus; probably mycorrhizal with Pinaceae spp.	presumably autumn	Yes
Fungus	*Rhizopogon rogersii* (OR-STR)		sequestrate fungus; probably mycorrhizal with Pinaceae spp.	presumably autumn	Yes
Fungus	*Rhizopogon subpurpurascens* (OR-STR)		sequestrate fungus; probably mycorrhizal with lodgepole pine, mountain hemlock, and subalpine fir	presumably autumn	No
Fungus	*Rickenella swartzii* (OR-STR)		among mosses under hardwoods	late summer & autumn	Yes
Fungus	*Sarcodon fuscoindicus* (OR-STR)		on soil, litter, and humus in forests (western hemlock and Pacific silver fir) under 3,000 ft. elevation	autumn- winter	Yes
Fungus	*Stagnicola perplexa*		on rotten wood, sometimes buried deeply enough to appear “rooting” in wet or recently dried-up depressions in conifer forest	autumn	**Yes**
Fungus	*Tricholomopsis fulvescens* (OR-STR)		found solitary on decayed conifer wood above 3,000 ft. elevation	Sept-Oct	Yes