United States Department of Agriculture
Forest Service

WILDLIFE

BIOLOGICAL EVALUATION and SPECIALIST REPORT

for the
North Clack Integrated Resource Project
Environmental Assessment

Mount Hood National Forest
Clackamas River Ranger District
Estacada, Oregon

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Cover photo. Climbing for red tree vole survey, unit 80. Climber: Eric Forsman

1.0 SUMMARY

Endangered Species Act Compliance

The effects of the North Clack Integrated Resource project are considered and analyzed for in the Biological Assessment for Routine Land Management Activities with a Potential to Modify Habitat which are Not Likely to Adversely Affect Federally Listed Species within the Willamette Planning Province of Oregon (USDA USDI 2017a). Informal consultation with U.S. Fish & Wildlife Service has been completed for this project. A Letter of Concurrence dated September 26, 2017 (FWS Reference Number 01EOFW00-2017-I-0667) (USDI 2017a) is incorporated by reference.

Northern Spotted Owl

The project area does not contain Critical Habitat for spotted owls. There are no proposed habitat removing or degrading treatments within suitable owl habitat. There are four historic owl home ranges present but none would be substantially affected. Treatments include the removal of approximately 255 acres of current dispersal habitat through regeneration harvest and the maintenance of over 3,500 acres of current dispersal habitat with variable density thinning. Dispersal habitat is not a limiting factor in the project area. There would likely be some short-term impact to prey species including flying squirrels and red tree voles.

Seasonal restrictions are included to minimize disturbance to spotted owls. Even with seasonal restrictions, the proposed action would result in some disturbance that ***may affect,*** but are ***not likely to adversely affect***, nesting spotted owls.

In terms of cumulative effects, the impacts of the proposed action when added to other past, ongoing and foreseeable actions, would be negligible and would not impact northern spotted owl survival, reproduction, feeding, or care of young. The USFWS determined that the cumulative effects of the proposed North Clack Integrated Resource project ***may affect*****,** but are ***not likely to adversely affect the northern spotted owl*** (USDI 2017a).

Sensitive Species

The sensitive species that are likely present in the project area include peregrine falcon, bald eagle, Johnson's Hairstreak, and Western Bumblebee. The proposed actions **may adversely impact individuals, but are not likely to result in a loss of viability in the project area, nor cause a trend toward federal listing.**

Deer and Elk

The proposed action would close a total of 28.5 miles of open roads and reduce open-road densities in both summer and winter range. Summer range open road density would be reduced from 2.7 to 1.4 miles per square mile which is well below the 2.5 miles per square mile in standard FW-208. The LaDee Flat OHV Area is entirely within winter range and affects the

ability to manage for solitude in the project area. In winter range, the combined open road/OHV trail density would be reduced from 2.9 to 2.1 miles per square mile which is above the 2.0 miles per square mile in standard FW-208. And exception is needed for this standard.

The overall effect of the project would be beneficial for deer and elk. Some early-seral habitats and forage would be created. The current population trend for deer and elk on the Forest is decreasing due to the incremental reduction in early-seral habitat across the Forest. The proposed action would increase forage production and improve conditions for deer and elk and ***would not contribute to a negative trend in viability on the Forest for deer and elk.***

Survey and Manage Species

Surveys were conducted where needed. The only species detected was red tree vole, resulting in dropping approximately 94 acres from proposed treatment.

Snags and Down Wood

At the landscape scale, there are fewer snags compared to reference conditions. Large down wood quantities are similar to reference conditions. The action alternatives would have fewer snags and less down wood, compared to no action. However, there would be sufficient quantities in units and across the landscape to provide for the needs of dependent species over time.

2.0 INTRODUCTION

This Biological Evaluation (BE) is a review of management activities proposed for the North Clack Integrated Resource Project Environmental Assessment (EA) of the Mount Hood National Forest (MHNF) to determine whether it may affect federally endangered or threatened species or sensitive species listed by the Pacific Northwest Region (Region 6).

This document is prepared in accordance with standards established in the Forest Service Manual (FSM) 2670. U.S. Forest Service policy requires that all actions be taken to "assure that management activities do not jeopardize the continued existence of sensitive species or result in an adverse modification of their essential habitat" (FSM 2670.3). The sensitive species list for Region 6 was published as a Regional Supplement, effective July 21, 2015. Section 7 of the Endangered Species Act of 1973 (as amended in 1978, 1979, and 1982) directs federal departments/agencies to assure that actions authorized, funded, and/or conducted by them are not likely to jeopardize the continued existence of any threatened or endangered species or result in destruction or adverse modification of their critical habitat. The Act also directs each federal agency to confer or consult with its appropriate Secretary on any action that is likely to jeopardize or affect the continued existence of any species or its habitat.

In addition, this document also serves as the Wildlife Resource Report and discloses the potential environmental effects of proposed project activities on Management Indicator Species (MIS), Survey and Manage species (S&M), and migratory landbirds. Because 'snags and

down wood' are important habitat structure for a wide variety of species, this report describes these habitat features and potential project effects in its own, additional section.

The Mount Hood Land and Resource Management Plan (LRMP) (USDA 1990), as amended by the 1994 Northwest Forest Plan (NWFP) is applicable to this project. The LRMP and NWFP provide direction for management of the wildlife resources contained within the MHNF.

The Clackamas River Ranger District (CRRD) of the MHNF is proposing a number of activities in the North Clack project area. Based on a review of field conditions and available data, there are needs and opportunities 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. An interdisciplinary team of agency resource specialists has developed a proposed action to address the needs and opportunities within the project area. These activities emphasize enhancing forest health and stand growth, improving habitat for northern spotted owl (NSO), enhancing riparian habitat, and providing early-seral habitats. They also include changes to the transportation system to address areas of resource concern and to improve road conditions along specific road segments. More detail on the proposed action, management direction, and project location can be found in the North Clack Integrated Resource Project Information Sheet[1].

3.0 THREATENED AND ENDANGERED SPECIES

The U.S. Fish and Wildlife Service (USFWS) provides a list of Federally Threatened (T), Endangered (E), Proposed (P), Candidate (C) species and Nonessential/Experimental Population (XN). The only federally listed species thought to occur presently or historically within the North Clack Integrated Resource project area is the northern spotted owl (*Strix occidentalis caurina*) (T). Potential effects to the northern spotted owl are discussed below.

Two other listed species can occur on the MHNF; the Oregon spotted frog (*Rana pretiosa*) (T) and the gray wolf (*Canis lupus*) (E). Habitat for the frog is moderate to large wetlands with extensive emergent marsh coverage that warms substantially when Oregon spotted frogs are active at the surface (Cushman and Pearl 2007). There are no known occurrences or suitable habitat for the Oregon spotted frog within the North Clack Integrated Resource project area, nor has any "Critical Habitat" been designated for the frog on the Clackamas River Ranger District.

The gray wolf can be found in a diverse range of environments but tends to be limited to prey availability. On the MHNF, prey species for the wolf are most abundant along the, more open, eastern edge of the Forest. Though the wolf has been documented on the MHNF, there is no evidence that gray wolves den within the Forest boundary. There are no known occurrences for the gray wolf within the North Clack Integrated Resource project area, nor has any "Critical

[1] https://www.fs.usda.gov/nfs/11558/www/nepa/105362_FSPLT3_4630683.pdf

Habitat" been designated for the wolf on the Clackamas River Ranger District.

Therefore, the Oregon spotted frog and the gray wolf are not addressed any further in this document and there will be "**no effect**" to this species.

Endangered Species Act Compliance

The effects of the North Clack Integrated Resource project are considered and analyzed for in the Biological Assessment for Routine Land Management Activities with a Potential to Modify Habitat which are Not Likely to Adversely Affect Federally Listed Species within the Willamette Planning Province of Oregon (USDA USDI 2017a). Informal consultation with U.S. Fish & Wildlife Service has been completed for this project. A Letter of Concurrence dated September 26, 2017 (FWS Reference Number 01EOFW00-2017-I-0667) (USDI 2017a) is incorporated by reference.

3.1 Northern Spotted Owl (*Strix occidentalis caurina*)

Current Conditions

This species is typically associated with old-growth forested habitats throughout the Pacific Northwest. Northern spotted owls have been documented in a variety of forest types; however, this species does show a preference to Douglas-fir forests (USDI 2011). Nest sites and roost sites are typically found in forests that exhibit complex structure and heterogeneity. These habitats are multi-storied with large diameter trees (20 inches diameter and greater) and high canopy cover (greater than 60 percent). Most spotted owls are territorial and dispersal of young depends on availability of suitable habitat and prey species (USDI 2011).

Past management activities, such as timber harvest, have reduced or fragmented northern spotted owl habitat throughout its range. In addition, the barred owl has presented cumulative impacts to this species (Courtney 2004, USDI 2011). The barred owl is an invasive species from the eastern United States and has expanded its range extensively throughout the Pacific Northwest. It is a generalist that can utilize a wide range of habitat types and forest age classes. It also has a wide diet range and can survive on many different prey types (Forsman 2004, USDI 2011). As a result, overall northern spotted owl population densities have decreased, specifically in areas where habitat reduction is concentrated and where barred owls are present (USDI 2011).

Two types of nest sites, Known and Potential, are used when analyzing impacts to northern spotted owls and are defined in the current Biological Assessment for this project (USDA USDI 2017a). Known Owl Sites are sites that were or are occupied by a pair or resident single as defined by protocol (USDA USDI 2017a). Since there are few recent surveys for spotted owls that show the locations of known active nest sites on the Forest, historical spotted owl information is used. Historical nest sites are used because studies show that nests are used for many years and when a site has been found to be unoccupied during surveys, it can be subsequently utilized by a different pair of owls years later. Potential Owl Sites are sites that

were determined based on an area that is able to support resident spotted owls (i.e. a potential breeding pair) in the absence of inventory data (USDA USDI 2017a).

There are four Known Owl Sites located within 1.2 miles of any proposed North Clack project activities. There are no Potential Owl Sites within 1.2 miles of the project area boundary and will not be further discussed in this analysis. No proposed activities would take place within 300 meters (about 984 feet) of any Known Owl Site.

Suitable Habitat

Suitable habitat consists of forested stands used by spotted owls for nesting, roosting and foraging (NRF). Features that support nesting and roosting typically include a moderate to high canopy closure (60-90%); a multi-layered, multi-species canopy with large overstory trees (with diameter of greater than 30 inches); a high incidence of large trees with various deformities (large cavities, broken tops, mistletoe infections, and other evidence of decadence); large snags; large accumulations of fallen trees and other woody debris on the ground; and sufficient open space below the canopy for spotted owls to fly (USDA USDI 2017a). This habitat is described as *nesting and roosting* habitat in the revised spotted owl recovery plan (USDI 2011).

Foraging habitat generally has attributes similar to those of nesting and roosting habitat, but such habitat may not always support successfully nesting pairs (USDI 2011). Trees within foraging habitat may vary in size, and could be of smaller diameter than tress in nesting and roosting habitat depending on site-specific conditions. Together, nesting, roosting or foraging habitat comprise suitable habitat in this document.

For the Willamette Province the northern spotted owl home range is a 1.2 mile radius circle (2,955 acres) centered on the historic nest site or activity center. All four Known Owl Sites within 1.2 miles of North Clack proposed project activities have suitable habitat present.

Suitable Habitat within Home Range: U.S. Fish and Wildlife Service recommends that spotted owl nest territories should have at least 40% suitable habitat in the nest territory (provincial home range) to avoid substantial impact (USDI 2011). Currently, only one of the four known sites within 1.2 miles of proposed North Clack project activities is below the 40% threshold (only slightly at 37%).

Table 1 - Northern Spotted Owl Suitable Habitat within the Home Range Territory

Known Owl Site	Actual Acres of Suitable Habitat within Home Range Territory	Percent of Area in Suitable Habitat within Home Range Territory
5441P94	1,073	37%
5292T90	1,176	41%
5342P89	2,009	69%
5300T90	1,329	46%
4 Total Sites	Average = 1,397	Average = 48%

Suitable Habitat within Core Nest Area: A core nest area has been defined as the area within a home range that receives disproportionately high use (503 acres or 0.5 mile radius circle) centered on the historical nest site. U.S. Fish and Wildlife Service recommends that spotted owl nest territories should have at least 50% suitable habitat in the core nest areas to avoid substantial impact (USDI 2011). None of the four known owl sites within 1.2 miles of proposed North Clack project activities have core nest areas that are currently below the 50% threshold in suitable habitat.

Table 2 - Northern Spotted Owl Suitable Habitat within the Core Nest Area

Known Owl Site	Actual Acres of Suitable Habitat within Core Nest Area	Percent of Area in Suitable Habitat within Core Nest Area
5441P94	289	57%
5292T90	267	53%
5342P89	411	82%
5300T90	279	55%
4 Total Sites	Average = 311	Average = 62%

There are no proposed habitat removing or degrading treatments within suitable habitat in the North Clack Integrated Resource project area. Other project activities are proposed within suitable habitat that would primarily take place along existing roads and disturbed areas and would not alter the suitability of the habitat for owls.

Dispersal Habitat

Dispersal habitat allows spotted owl movement across the landscape between stands of suitable habitat and for juveniles to disperse from natal territories. This habitat generally lacks the optimal characteristics to support nesting and typically lacks multi-storied canopies, large trees or large snags and down wood. Dispersal habitat generally consists of mid-seral stands between 40 and 80 years of age where 50% of the area contain trees with a mean diameter of 11 inches or more and with canopy cover of 40% or greater (aka 50-11-40)(USDI 2011). Most managed or natural forest stands 35-40 years old begin to develop dispersal habitat conditions.

The ability of spotted owls to disperse across landscapes is likely influenced by the overall quality of habitat through which they disperse. Sovern (2015) found the majority of roosts used by dispersing owls in the eastern Washington Cascades were in forested habitats with at least some larger (>19 in diameter) trees and they selected stands with high canopy cover (>70 percent) at the landscape scale. These authors suggested the concept of 'dispersal' habitat as a lower quality type of habitat (e.g., 50-11-40) may be inappropriate. The Willamette Province Level 1 Team considers all spotted owl habitat (nesting, roosting, foraging, and dispersal) to support dispersal of spotted owls across the landscape (USDA USDI 2017a). Higher quality habitat will improve the probability that dispersing owls will survive; however, areas of younger forest with smaller trees (e.g., 50-11-40) can provide support for spotted owl dispersal particularly across more fragmented landscapes.

Although Sovern (2015) observed that dispersing owls selected older forest when available, Forsman (2002) demonstrated that spotted owls could disperse across more fragmented landscapes with lower quality habitat. He used radiotelemetry data to show that spotted owls were able to move from the Coast Range to the Cascades across highly fragmented forests and across areas with little Federal ownership (Forsman 2002).

Currently, dispersal habitat is not limiting across the landscape of the North Clack project area. Within the home ranges of the North Clack known owl sites the average amount of dispersal habitat is 979 acres. Suitable habitat will also function as dispersal habitat. In addition, Riparian Reserves and adjacent Wilderness is expected to provide well-distributed, high quality dispersal habitat for spotted owls.

Areas of Concern (AOC)

The North Willamette LSR Assessment (USDA USDI 1998) identified areas outside the LSRs where there are concerns about spotted owl dispersal due to the lack of primary constituent elements. The AOC were mapped and projects were analyzed to ensure that dispersal habitat is maintained in these locations to facilitate owl dispersal. There were four AOCs identified on the Mt. Hood National Forest.

In 2012, an analysis of the AOCs was completed by Ray Davis, Wildlife Biologist for the Interagency Regional Monitoring Team. Davis found that each of the four areas had over 78 percent coverage of dispersal and suitable habitat, sufficient for Northern spotted owl dispersal across the landscape. Based on this analysis the Mt. Hood National Forest has removed Areas of Concern as a habitat designation for consultation with the USFWS and this habitat is now treated the same as any general habitat on the Forest. None of the previously designated AOCs are located within the North Clack Integrated Resource project area.

Recovery Action 32 Designations

Among the Recovery Actions of the 2011 Revised Recovery Plan for the Northern Spotted Owl, Recovery Action 32 is one of the most important actions in retaining high quality suitable habitat. This Action states:

Because spotted owl recovery requires well distributed, older and more structurally complex multi-layered conifer forests on Federal and non-federal lands across its range, land managers should work with the Service as described below to maintain and restore such habitat while allowing for other threats, such as fire and insects, to be addressed by restoration management actions. These high-quality spotted owl habitat stands are characterized as having large diameter trees, high amounts of canopy cover, and decadence components such as broken-topped live trees, mistletoe, cavities, large snags, and fallen trees.

Maintaining or restoring forests with high-quality habitat will provide additional support for reducing key threats faced by spotted owls. Protecting these forests should provide spotted owls high-quality refugia habitat from the negative competitive interactions with barred owls

that are likely occurring where the two species' home ranges overlap. Maintaining or restoring these forests should allow time to determine both the competitive effects of barred owls on spotted owls and the effectiveness of barred owl removal measures. Forest stands or patches meeting the described conditions are a subset of NRF habitat and actual stand conditions vary across the range. These stands or patches may be relatively small but important in a local area, may not be easily discernable using remote sensing techniques, and likely require project-level analysis and field verification to identify.

Any habitat that is currently identified as high quality suitable or RA-32 was not considered for habitat altering activities in the North Clack Integrated Resource project area. Some of the proposed North Clack activities are designed to restore forested stands to high-quality spotted owl habitat. Treatments include a light variable density thinning on 202 acres to accelerate suitable habitat development and 60 acres of noncommercial treatment to create small openings and snags in order to develop the stand understory. These procedures are in accordance with Recovery Action 32 in the 2011 Revised Recovery Plan for the Northern Spotted Owl.

Barred Owls

The Revised Recovery Plan also identifies competition from the barred owl as an important threat to the spotted owl (USDI 2011). Current science shows that the barred owl is an invasive species from the eastern United States and has expanded its range extensively throughout the Pacific Northwest. Unlike the northern spotted owl, it is a generalist that can utilize a wide range of habitat types and forest age classes. The species has a wide diet range and can survive on many different prey types (Forsman 2004, USDI 2011). As a result, overall northern spotted owl population densities have decreased and barred owls are believed to be out competing spotted owls for habitat and food (USDI 2011). The barred owl resilience to habitat fragmentation and modification increases the likelihood of persistence on the landscape. Hybridization levels may increase if northern spotted owl population levels decrease substantially (Courtney 2004). Vegetation management activities can also benefit barred owls indirectly by providing habitat and prey species that are not necessarily preferred by the northern spotted owl.

Since routine surveys have not been conducted for spotted owls on the Mt. Hood National Forest since approximately 1994, it is unknown as to what extent barred owl presence has affected the population of spotted owls. However, within the Oregon demographic study areas, there has been a steady increase in the number of barred owls as measured by the proportion of spotted owl sites with barred owls detected, with as many as 60 percent of the spotted owl sites having barred owls detected (Forsman 2011). Dugger (2011) modeled extinction and colonization rates for spotted owl pairs in the South Cascade Demographic Study area where barred owls were detected on some home ranges. They found that extinction rates for spotted owls increased with decreasing amounts of old forest in the core area, and that the effect was 2-3 times greater when barred owls were detected. They also found that colonization rates for spotted owls decreased as the distance between patches of old forest

increased (i.e. increased habitat loss and fragmentation) and that barred owl presence similarly decreased the rate of colonization of spotted owl pairs. They concluded that conserving large blocks of contiguous old-forest habitat was important for reducing interference competition between the two owl species.

There is concern that timber harvest and other silvicultural activities may directly or indirectly affect the interaction between barred owls and spotted owls and increase the competitive advantage for barred owls. The three areas of concern frequently mentioned are: a) logging may expand the range of barred owls; b) silvicultural treatments that thin forests, create early-seral habitat, or create edge habitat may favor barred owls over spotted owls; and c) logging that reduces the amount of older forests may increase the competition between the two species by reducing the amount of preferred habitat available. Each concern is addressed individually below with the exception of the last concern as the North Clack project would not reduce the amount of old forest.

a. Does logging expand the range of barred owls?

The Experimental Removal of Barred Owls to Benefit Threatened Northern Spotted Owls Final Environmental Impact (USFWS 2013) specifically considered and rejected an alternative to use forest habitat management to favor spotted owls and hinder barred owls. They reasoned that there are no known forest conditions where spotted owls have a competitive advantage over barred owls. Pearson and Livezey (2003) state that managing forests to benefit spotted owls over barred owls may not be possible because both species use the same type of old-growth habitat. Barred owls successfully colonized Olympic National Park in areas that never had timber harvest (Courtney 2004). Old growth reserves appear to be supporting large populations of barred owls, and in many cases there are more barred owls than spotted owls in the reserves (Pearson 2003). The Revised Recovery Plan (USDI 2011) assumes barred owls now occur at some level in all areas used now or in the past by spotted owls.

b. Do silviculture treatments that thin, create early-seral habitat, or create edge habitat favor barred owls over spotted owls?

A detailed review for the spotted owl recovery plan found much evidence that barred owls prefer old-growth and older forest habitat, not early seral or edge habitat (USDI 2011). In portions of the spotted owl's range, barred owl populations are increasing while spotted owls are declining, to some degree independently of forest management history in the area (Courtney 2004).

Wiens (2012) conducted a detailed study of the interaction between barred and spotted owls in the moist temperate forests of western Oregon by radio tracking 29 spotted owls and 28 barred owls in 36 neighboring territories over a 2-year period. He found that both owl species had similar use of young, mid-seral, and mature forests and that both species avoided areas within 135 meters of forest/non-forest edges. Both species avoided open areas and young forests less than 60 years of age and used mature conifer forests (60-120 years of age) proportional to their availability within the landscape (second order selection). Wiens' study contains the most

detailed information applicable to the project area, comparing the use of younger forest by the two species.

The available information does not provide support for the hypothesis that thinning young and mature forest or the creation of early-seral habitat or forest edge selectively favors barred owls over spotted owls in the action area.

Disturbance

The U.S. Fish and Wildlife Service has concluded that noise can result in a disruption of breeding, feeding, or sheltering behavior of the spotted owl such that it creates the potential for injury to individuals (i.e. incidental take in the form of harassment) (USDI 2011). For a substantial disruption of spotted owl behavior to occur, the disturbance and spotted owl(s) must be in close proximity. The northern spotted owl breeding season generally extends from March 1st to September 30th with March 1st to July 15th considered to be critical from a disturbance perspective (USDA USDI 2017b).

Activities that generate noise above ambient levels have the potential to disturb nesting spotted owls and may result in the incidental take of young and adult birds. The current Biological Assessment and Biological Opinion for disturbance (USDA USDI 2017b, USDI 2017b) for this project identify two types of disturbance levels.

Disturbance distance is the distance from the project boundary which associated activities are likely to cause a northern spotted owl, if present, to be distracted from its normal activity. This disturbance distance extends the entire breeding season (March 1st to September 30th).

Disruption distance is the distance from the project boundary where associated activities are likely to cause a northern spotted owl, if present, to be distracted to an extent as to substantially disrupt its normal behavior and create the likelihood of harm or loss of reproduction. The disruption distance is a subset of the disturbance distance. *The unit wildlife biologist may increase these disturbance distances according to the best available scientific information and site-specific conditions.*

Disturbance activities that can affect northern spotted owl are listed in Table 2 of the current Biological Assessment for disturbance (USDA USDI 2017b, pg. 8) and shows the minimum distances required.

A spotted owl that may be disturbed at a roost site is presumably capable of moving away from a disturbance without a substantial disruption of its behavior. Since spotted owls forage primarily at night, projects that occur during the day are not likely to disrupt its foraging behavior. The concern about noise is with breeding behavior at active nest sites.

In the late breeding period, potential effects from disturbance decline because juvenile spotted owls are increasingly more capable of moving as the nesting season progresses. The critical breeding period is March 1 through July 15. After July 15, most fledgling spotted owls are

capable of sustained flight and can move away from most disturbances (USDI 2011).

Proposed activities for the North Clack Integrated Resource project do not include the use of blasting or pile driving. From Table 2 of the current Biological Assessment for disturbance (USDA USDI 2017b, pg. 8), actions proposed for this project that generate noise above the local ambient levels include helicopter use, log hauling, heavy equipment use, chainsaw use, and prescribed burning. Some tree climbing and some post treatment pile burning is also proposed. Some rock crushing may occur, but the locations would be outside the 0.25 mile disruption distance. The current Biological Assessment for this project determines the disruption distance for noise around known nest sites to be 65 yards for both, heavy equipment and chainsaw use, 0.25 miles for light helicopter use, and for large, type 1 helicopter use, the disruption distance is 0.5 miles (USDA USDI 2017b). However, for historic northern spotted owl activity centers that have not had recent survey occupancy verification, a 300 meter buffer is added to these distances. There are no recent surveys for the owl sites with habitat within the North Clack Integrated Resource project area boundary and the added buffer applies to all project activities.

None of the proposed project activities occur within the 393 yard (65 yards plus 300 meters) disruption distance for chainsaw and heavy equipment use. Only one (5292T90) of the four Known Owl sites within the North Clack project area have proposed project activities within the 0.25 or 0.5 (plus 300 meters) mile disruption distance. Project Design Criteria with the appropriate timing restrictions for these activities are included as part of the North Clack Integrated project proposed action.

Direct and Indirect Effects - Habitat

Northern spotted owls may be affected if habitat is modified within their median home range (1.2 mile radius around the nest tree) or within the core activity center. Habitat modification may occur in three different ways: (1) habitat degradation which affects the quality of suitable or dispersal habitat without altering the functionality of such habitat, (2) habitat downgrading which alters the functionality of suitable habitat so that it no longer supports nesting, roosting, and foraging, and (3) habitat removal which alters suitable or dispersal habitat to such an extent that the habitat no longer supports nesting, roosting, foraging, or dispersal. Effects of the proposed activities that could affect owl habitat are discussed below and proposed activities within spotted owl Core areas and Home Ranges in the North Clack Integrated Resource project area are shown in Table 3 below.

There are 4,532 acres of variable density thinning treatments proposed in the North Clack Integrated Resource project. This includes approximately 2,080 acres within the Matrix land allocation in plantations and fire-originated stands, 934 acres in Riparian Reserve, and 191 acres in LSR. Other treatments include 202 acres of Matrix with an emphasis of improving owl habitat and 88 acres of thinning with a huckleberry enhancement emphasis. Also included, are 1,037 acres of young-stand thinning and brushing. Variable density thinning treatments would differ depending on land allocation, objective, and current condition. Proposed treatments also includes 255 acres of regeneration harvest, 60 acres of noncommercial owl habitat improvement, and 541 acres of fuel break and hazardous fuels reduction. Treatments

proposed for Alternative 2 are similar with the difference being a 117 acre increase in regeneration harvest treatment and a corresponding 117 acre decrease in variable density thinning treatment within the Matrix land allocation.

These acreage figures represent the sum of all of the stands considered for treatment at this time. There would likely be fewer acres treated after accounting for stream protection buffers, skips, and other leave areas. It is estimated that approximately ¾ of these acres would actually be treated. The proposed treatments can have immediate effects on forest diversity, structural diversity, and long-term effects restoring native plant communities as understory species are released and provide a seed source for future recruitment.

Thinning in plantations, fire-originated stands, Riparian Reserve, and LSR – Variable density thinning with skips and gaps is proposed on previously logged and/or burned areas. The stands range in age from 25 to 70 years old in unburned plantations and 60 to 70 or 100 to 120 years old in the burned stands. The proposed stands are currently considered dispersal habitat. Very few, if any, legacy older/larger trees or snags remain within the proposed stands and project design criteria would be in place to protect these elements from harvest. Project design criteria would also be in place to protect existing downed wood and snags. Snags would only be felled if they are a hazard to the logging operation and would be left on site. Most of these stands are currently considered dispersal habitat for the owl.

Variable density thinning is proposed to enhance diversity and to gain greater variability of vertical and horizontal stand structure in these stands. Leave-tree spacing would vary within units and between units depending on the stand objective. Skips and gaps are an important element of the proposed treatments and would be created in a variety of sizes. The sizes and total quantity would vary within and between units depending on the stand objective. Skips may be placed where there are special features such as clumps of minor species, large snags or legacy trees, wet areas, or important wildlife features. Gaps, in general, would be up to two acres in size and may be placed to enhance existing important shrub or grass/forb forage species. Residual post treatment basal area would be between 100 and 160 square feet basal area. Including skips and gaps, the remaining stand level canopy cover would be at least 40% post treatment with some stands in the 60-70% range. Most stands modeled (FVS) out at about 50% canopy cover post treatment. Any impacts to dispersal habitat would not affect the ability of owls to move through these stands. Post treatment, these stands would still be considered dispersal habitat and would then be on a faster trajectory to becoming suitable habitat.

Thinning may have a short-term negative effect on downed wood quantity, but tree response to thinning is expected to result in increased growth, which would speed the ability of the stands to provide the size of snags and down wood needed to meet Forest Plan standards (FW-215, FW-216, FW-219 through FW-223). In addition, there would be some snag and down wood creation as part of the project that would off-set some of the loss of current dead wood and snags. Two to three years post-harvest, surveys would be conducted to assess the levels of the remaining snags and down wood within the harvest units. Units deficient in deadwood needed to meet Forest Plan Standards would be treated to create additional snags and down

wood to bring them to appropriate levels.

Overall, the proposed variable density thinning treatments would be considered Harvest Habitat Maintained and there is an anticipated long-term beneficial effect on northern spotted owl habitat. The number of acres of this proposed treatment within each Core area and Home Range in the North Clack Integrated Resource project area are shown below in Table 3.

Regeneration harvest / Early-seral habitat creation - Regeneration harvest with reserves is proposed on 255 acres in Matrix to create early-seral habitat. The stands are primarily south facing slopes that contain deer and elk palatable brush species that are being shaded out by conifers. The proposal is to use a regeneration harvest across the unit with approximately 15% of the trees retained in skips and as scattered individual trees.

The implementation of this regeneration harvest treatment with the Proposed Action would result in 255 acres of dispersal habitat removed and would be considered Harvest Habitat Removed. This treatment includes 22 acres within the home range of a known northern spotted owl site (Table 3). Alternative 2 proposes to treat 372 acres with regeneration harvest resulting in a removal of dispersal habitat. This includes 59 acres within the home range of a known northern spotted owl site (Table 3). Currently, the home range of this known site is comprised of 41% suitable habitat and the core area has 53% suitable habitat. Suitable habitat can also be utilized as dispersal habitat. Removal of dispersal habitat would be expected to limit spotted owl movement through the treated stand. Thus, the ability of spotted owls to move across portions of the landscape where dispersal habitat has been removed depends entirely on the habitat condition of the surrounding lands. Dispersal or suitable habitat are not limiting the owl in this home range and dispersal habitat is not limiting the owl across the North Clack project area landscape.

No regeneration harvest treatment would occur within northern spotted owl Critical Habitat.

Noncommercial owl habitat improvement – Approximately 60 acres are proposed for a noncommercial treatment to improve northern spotted owl habitat within an owl Core area (Table 3) by increasing structural diversity in the stands. The treatment consists of creating several small gaps within the units, up to ¼ acre in size, which would allow saplings to establish and grow. The trees cut to establish the gaps would be left on site within the stands as down wood. The proposed treatment would rapidly move these stands to be considered suitable habitat. The implementation of this proposed treatment would be considered Terrestrial Habitat Enhancement and there would be an anticipated long-term beneficial effect on northern spotted owl habitat.

Fuel break and hazardous fuels reduction – For the fuel break treatment, the proposal is to reduce fuels along Road 4610 and along property lines totaling about 150 acres. Fuels and slash would be piled and burned. The proposed treatment could potentially remove some dispersal habitat. However, the treatments would be spread out over many miles in a linear fashion along an existing road and property line. This treatment would not be expected to limit the ability of spotted owls to move across the landscape.

Additional hazardous fuels reduction treatments are proposed in the form of under burning of thinned stands on 136 acres and grapple piling and under burning in 255 acres of regeneration harvest units. All proposed burning treatments would be subject to timing restriction design criteria during the northern spotted owl breeding season. The number of acres of this proposed treatment within each Core area and Home Range in the North Clack Integrated Resource project area are shown below in Table 3.

Young stand thinning and brushing – The proposal is to non-commercially thin approximately 985 acres of young plantations. These stands are very dense and are on a very long-term trajectory to develop into suitable, or even dispersal, owl habitat. Implementing this proposed treatment would allow the remaining stands to grow much quicker and greatly shorten the time period to develop into suitable and, especially, dispersal owl habitat.

The proposed young stand thinning would be considered Terrestrial Habitat Enhancement and there is an anticipated beneficial effect on northern spotted owl habitat in the long term. The number of acres of this proposed treatment within each Core area and Home Range in the North Clack Integrated Resource project area are shown below. (Note that the Core Area figures are included in the Home Range figures.)

Table 3 – Acres of Proposed Activities within Spotted Owl Core Areas (C) and Home Ranges (HR)

Known Owl Site	Variable Density Thin Dispersal Habitat – Maintain (acres)	Regeneration Harvest Dispersal Habitat – Remove (acres)	Noncommercial Owl Habitat Improvement *Terrestrial Habitat Enhance* (acres)	Fuel Break / Hazardous Fuels Reduction *Terrestrial Habitat Enhance* (acres)	Prescribed Burning (acres)	Young Stand Thinning / Brushing Terrestrial Habitat Enhance
5441P94	C = 0 HR = 3	C = 0 HR = 0	C = 0 HR = 0	C = 0 HR = 0	C = 0 HR = 0	C = 0 HR = 17
5292T90	C = 77 HR = 426[2]	C = 0 HR = 24[3]	C = 57 HR = 60	C = 0 HR = 6	C = 0 HR = 24	C = 31 HR = 295
5342P89	C = 0 HR = 105	C = 0 HR = 0	C = 0 HR = 0	C = 0 HR = 0	C = 0 HR = 0	C = 0 HR = 0
5300T90	C = 0 HR = 57	C = 0 HR = 0	C = 0 HR = 0	C = 0 HR = 0	C = 0 HR = 0	C = 0 HR = 46

Other Project Activities - The road decommissioning, road maintenance, and aquatic habitat enhancement sites proposed under this project would have very little impact on northern spotted owl habitat because these activities may modify but does not remove the function of any habitat.

[2] Or 367 acres with Alternative 2
[3] Or 59 acres with Alternative 2

Structural diversity - Structural diversity is a combination of several stand characteristics, which would include, but would not be limited to, number of canopy layers, down wood, and snags. With the proposed activities, structural diversity would be improved by initiating a new age class and by creating openings. Thinning would also have an indirect impact by releasing the green retention trees. These retention trees would later become the large diameter snag and downed wood. Thinning may have a short-term negative effect on downed wood quantity, but tree response to thinning is expected to result in increased growth, which would speed the ability of the stands to provide the size of snags and down wood needed to meet the Mt. Hood National Forest Land and Resource Management Plan (Forest Plan) standards (FW-215, FW-216, FW-219 through FW-223). In addition, there would be some snag and down wood creation as part of the project that would offset some of the potential loss of current dead wood and snags. Snags and down wood is discussed in more detail in Section 8 of this document.

Northern Spotted Owl Prey Species

Regeneration Harvest – Some spotted owl primary prey species, such as northern flying squirrels (Holloway 2011) will avoid regeneration harvested habitat areas post-harvest. This is anticipated due to the reduction in habitat features that are important to these species, including canopy cover, mid-story canopy, snags, and down coarse wood in harvested areas. These harvested areas would become much more inhospitable to flying squirrels which are tied to complex mid-story canopies. Red tree vole populations would be impacted as well, due to removal of nest structures, intact canopies, and their food source. Populations of woodrats and brush rabbits may increase after regeneration harvests, as these species regularly occur in early-seral habitats (Maser 1981; Williams 1992; Innes 2007).

Variable Density Thinning – In general, thinning has been promoted as a method for accelerating the development of late-seral habitat and improving the overall health and function of young forests in the Pacific Northwest. Effects of thinning on the primary prey species of spotted owls are discussed below.

Flying Squirrels

Recent studies have shown that traditional thinning, with uniform spacing, can have negative effects on the abundance of northern flying squirrels, which can make up almost 50% of the diet in some cases (Wilson 2013). The majority of these studies indicate that thinning causes a decrease in flying squirrel densities, at least in the near term (11-13 years after harvest) (Manning 2012). These studies suggest that reductions in northern flying squirrels abundance following thinning may be driven by increased susceptibility to predation created by removal of critical aboveground cover. Predation, lack of canopy connectivity, and reduction in suitable nest substrates may all contribute to reduced northern flying squirrels abundance following thinning (Wilson 2013). Thinning treatments proposed under this project promote important mid-story development. They reduce inter-tree competition and therefore accelerate the development of large live trees, which eventually turn into large snags. Thinning young stands, over the long term, may cause an improvement in the habitat of northern flying squirrels.

However, the length of time between thinning and recovery of flying squirrel habitat suitability in young stands is unknown (Wilson 2013).

Wilson (2010) reported most thinning is likely to suppress flying squirrel populations for several decades, but expected the eventual long-term benefits of variable-density thinning for squirrels are likely to be positive. While an emphasis on developing mid-story tree layers is critical if the goal is to accelerate late-seral conditions and promote prey for spotted owls, there can be short-term effects to flying squirrels. Wilson (2010, p. 99) states that "Variable-density thinning had a negative effect on flying squirrel populations during four out of the first five years following treatment, but not significantly so after that period. Likewise, there was an additional significant forest interaction with thinning during 1994 and 1996, but not beyond that point. This supported the conclusion that squirrels recovered from the short-term effects of thinning within 3-4 years post-thinning as reported by Carey (2001)."

Wilson (2010) suggests a few considerations to reduce short-term effects to flying squirrels while trying to create more forest complexity that would benefit them in the long-term. The proposed action incorporates some of those considerations via the aggregate and dispersed retention features, including:

- retention of existing large decadent trees and snags;
- retention of no-treatment areas (e.g., "skips" and no treatment buffers in Riparian Reserves) to provide travel corridors from adjacent late-seral habitats and across the landscape;
- retention of a range of tree size classes throughout the stand;
- improvement of foraging opportunities by promoting the development of understory and shade-tolerant tree species throughout the stand; and
- maintenance of canopy cover within the stands (e.g., lightly and moderately thinned areas) which would provide protective cover from predators, as well as provide a tree density that allows squirrels to adequately glide between trees and move through a stand in order to access foraging areas.

Sollmann (2016) offers the following; "Whereas thinning had negative effects on Northern flying squirrel density on the scale of a thinning treatment unit, our results suggest that these effects were largely absorbed by the heterogeneous landscape, as animals shifted their distribution into un-thinned areas without a decline in overall density. This highlights the need to incorporate the landscape context when evaluating the effects of forest management on wildlife."

Woodrats

Woodrats comprise approximately 20% of the biomass in spotted owls' diets in the Willamette Province area (Forsman 2004). Mixed results have been reported in studies that examined effects of thinning on woodrats. Dusky-footed woodrats occur in a variety of conditions, including both old, structurally complex forests and younger seral stages, and are often associated with streams (Williams 1992; Sakai 1993; Hamm 2009). Research has suggested that

thinning or associated practices (*e.g.*, burning slash piles) could be detrimental to dusky-footed woodrats if it reduces hardwoods, shrubs or downed wood, yet treatments could ultimately benefit woodrats if they result in growth of shrubs or hardwoods (Williams 1992; Innes 2007). There have been no studies addressing bushy-tailed woodrat occurrence in or near the Willamette Province area. In the dry forests of eastern Washington, bushy-tailed woodrats are more abundant in forests with more large snags, dwarf mistletoe brooms, and partly decayed logs. Incidental loss of these habitat features as a result of thinning may cause a decrease in bushy-tailed woodrats; however, this hypothesis has not been tested (Lehmkuhl 2006).

Rabbits and hares

Brush rabbits and snowshoe hares collectively comprise approximately 10% of the diet of spotted owls in the region of the Willamette Province (Forsman 2004). Brush rabbits, as their name implies, occur in thickets and other brushy habitats (Maser 1981). Thinning treatments and regeneration harvests promote brushy habitat, and by extension populations of brush rabbits. Snowshoe hares inhabit mature and immature coniferous forests (Maser 1981). Although no studies on the effects of forest management practices on snowshoe hares have been conducted in western Oregon, research in the panhandle of Idaho indicates that thinning and clearcut treatments cause a short-term (10-15 years) decrease in snowshoe hare populations, but populations of hares are similar or greater than unmanaged mature forests within 15-40 years (Thornton 2012).

Red tree voles

Red tree voles comprise approximately 2% of prey biomass in the diet of spotted owls in the region of the Willamette Province (Forsman 2004). This arboreal species also appears to be negatively impacted by thinning. From Wilson and Forsman (2013): "Small trees in young forests generally have insufficient food resources (conifer needles) in a single tree to support breeding females, so individuals often forage in multiple trees surrounding their nests (Swingle 2009). In closed-canopy forest, they can simply travel across interlocking branches to reach adjacent trees. Thinning breaks these connections and voles must travel down the bole and across the ground to reach other trees. This not only increases their energetic demands, it also puts them at additional exposure to predation. Second, red tree voles build nests of small twigs and conifer needles on platforms created by dwarf mistletoe, epicormic branching, forked boles, and other irregularities in tree-branching patterns. If trees with complex structure are removed during thinning, it may greatly reduce the ability of young tree voles to find suitable nest substrates. Third, young tree voles have limited dispersal ability, and the absence of red tree voles across much of northwest Oregon suggests that they may not be able to disperse across broad areas of intensively managed forest (Maser 1981)."

Wilson (2013) recommend several relevant strategies to reduce known and potential negative effects of thinning on spotted owl prey:

- Accelerate and monitor mid-story development by maintaining the desired balance of understory seedlings and saplings through underplanting, early thinning of saplings, and patchy brush control, where necessary.
- Include very young (<25 year-old) stands in the mix of stands targeted for restoring late-seral forest.
- Retain some young high-density forest on the landscape. Manning (2012) also recommend this action, emphasizing management for connectivity of unthinned, young stands.
- Experimentally evaluate alternative prescriptions to thinning, specifically those that focus solely on maintaining untreated "skips" (i.e., patches of trees left unthinned) and creating gaps (removing patches of trees).

The variable density thinning treatments proposed under this project promote mid-story development. They reduce inter-tree competition and therefore accelerate the development of large live trees, which eventually turn into large snags. All legacy large live trees would be retained. Design criteria would be in place to protect legacy large snags and downed wood. Strategically placed 'skips' would be utilized and buffers along streams and in riparian areas would be in place. Additional non-commercial treatments proposed to improve spotted owl habitat would also be beneficial to spotted owl prey.

Comparison of Effects to Northern Spotted Owl Habitat by Alternative:

No-Action Alternative – Owl Habitat – Direct/Indirect Effects

- This alternative would not modify any suitable, dispersal or unsuitable owl habitat in core nest areas, home ranges, or other land designations related to northern spotted owls. Under the No-Action Alternative, all current conditions of the North Clack Integrated Resource project area would remain the same, in the short term, without any management activities or modifications.
- Many of the unit stands currently providing dispersal habitat would grow into low quality suitable (Nesting, Roosting, Foraging) habitat in the next 50-70 years. At approximately 200 years of age these stands would function in a similar fashion to a thinning treated stand but may have a larger amount of snags and down wood. If untreated the live trees would be smaller and grow slower and would not have a multilayered structure.
- The transition to late-successional habitat may be delayed, but the existing conditions may favor northern spotted owls' preferred prey and habitat in the short term.

Proposed Action Alternative – Owl Habitat - Direct/Indirect Effects

- Proposed project activities within owl core areas and home ranges are displayed in Table 3 above.
- No proposed activities would take place in the nest patch of any owl site.

- None of the proposed units are located in stands that are classified as suitable northern spotted owl habitat. All activities would maintain suitable habitat conditions and no incidental take is anticipated from this Alternative.
- All thinning stands that are currently considered dispersal habitat would still be considered dispersal habitat post treatment as any impacts to the habitat would not affect the ability of owls to disperse through these stands. In addition, their development into suitable habitat would be accelerated.
- There would likely be short-term negative effects on the abundance of some northern spotted owl prey species, particularly northern flying squirrels that can make up almost 50% of the diet. Variable density thinning and other project features are in place that would help minimize these effects.
- 255 acres of dispersal habitat would be removed through regeneration harvest in a landscape where dispersal habitat is not limiting.
- Barred owls are widely established in the Willamette Province area. Therefore, it is not likely that the silvicultural treatments proposed in this proposed action would expand the range of barred owls.

Alternative 2 - Owl Habitat - Direct/Indirect Effects

- Effects from activities proposed under this alternative would be the same as the Proposed Action Alternative with the exception of effects from regeneration harvest treatments.
- 367 acres of dispersal habitat would be removed through regeneration harvest.

Effects Determination - Habitat:

The No-Action Alternative would have ***no effect*** to northern spotted owl or its habitat. Both the Proposed Action and Alternative 2 ***may affect***, but are ***not likely to adversely affect*** territorial or dispersing northern spotted owls and their habitat, due to maintaining, by avoidance, all suitable habitat conditions. There would be a loss of 255 acres of dispersal habitat with the Proposed Action and 367 acres removed with Alternative 2. The loss of dispersal habitat for both action alternatives would occur in a landscape where dispersal habitat is not limiting. Other impacts to dispersal habitat would not affect the ability of owls to disperse through these stands and the stands' development into suitable habitat would be accelerated. Short-term impacts may impact northern spotted owl habitat use, prey species, and indirectly benefit barred owls due to their generalist nature. All proposed units are in current unsuitable habitat and are likely to improve existing habitat conditions in the long term; however, those improvements would not be observed for 20 to 30 years or more. Because there would be no suitable habitat impacted by project activities and because nearly all dispersal habitat would be maintained, it is unlikely that the proposed project activities would impact the health or survival of any northern spotted owls within or adjacent to the North Clack Integrated Resource project area.

Direct and Indirect Effects - Disturbance

The proposed North Clack Integrated Resource project may potentially have disturbance effects from the use of helicopters, chain saws, and heavy equipment. A spotted owl with the potential to be disturbed at a roost site is presumably capable of moving away from a disturbance without a substantial disruption of its behavior. Since spotted owls forage primarily at night, projects that occur during the day are not likely to disrupt its foraging behavior. The primary concern with disruption is with breeding behavior at active nest sites. Since the North Clack Integrated Resource project was planned to avoid spotted owl habitat as much as possible, most project activities would occur outside the threshold zone for disruption of nesting. All project activities that have the potential to occur within the disruption distance of nesting owls are subject to the implementation of a seasonal timing restriction.

Comparison of Effects and Effects Determination of Disturbance to Northern Spotted Owl

No-Action Alternative – Disturbance – Direct/Indirect Effects

This alternative would not disturb any known owl sites in the North Clack Integrated Resource project area because no project activities would occur. This alternative would have ***no effect*** on northern spotted owls due to disturbance.

Action Alternatives – Disturbance - Direct/Indirect Effects

Effects associated with project activities that may result in disturbance to spotted owls are considered short-term and are summarized as follows:

- Any activity proposed in this alternative resulting in disturbance conducted beyond disturbance distances described in the Letter of Concurrence (USDI 2017b) would have ***no effect*** on spotted owls.
- All proposed helicopter activity would take place beyond the established disturbance distance.
- All proposed burning activities within 0.25 miles (plus 300m buffer) of identified known owl sites would receive a seasonal restriction of March 1 to July 15 (critical breeding season), unless those sites are verified unoccupied by protocol surveys.
- Proposed heavy equipment use for road construction and maintenance activities within 393 yards (65 yards plus 300m buffer) of an identified known owl site would receive a seasonal restriction of March 1 to July 15 (critical breeding season).
- Disturbance from proposed actions conducted outside of the breeding period (October 1-February 28) would have ***no effect*** on northern spotted owls.
- During the late breeding season, project activities that are greater than 0.25 miles from a known owl site ***may affect***, but are ***not likely to adversely affect*** these owls.
- There are no known indirect noise disturbance effects that would result from any of the proposed project activities.

- With all required seasonal restrictions employed, all proposed project activities of the North Clack Integrated Resource project area are ***not likely to adversely affect*** northern spotted owl to the extent to disrupt a spotted owl or breeding pair from normal activities. Minimal disturbance is anticipated.

Disturbance impacts from proposed actions would not harm spotted owls or interfere with essential nesting, roosting, or foraging behaviors because the activities would occur beyond the required *disruption* distances. However, since some actions may occur within the *disturbance* distance of known owl sites, such actions ***may affect,*** but are ***not likely to adversely affect***, nesting spotted owls.

Cumulative Effects

Cumulative effects are impacts on the environment that result from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions. The analysis area for northern spotted owl cumulative effects is the area within the known owl home ranges that occur within 1.2 miles of a proposed North Clack Integrated Resource activity. Alterations to owl habitat can be long lasting. The time period for this cumulative effects analysis goes back 200 years due to the length of time it takes for suitable habitat to develop which includes the 1960s, when current active management began. This cumulative effects analysis area includes four known owl home ranges within the project area totaling approximately 11,200 acres.

This analysis relies on current environmental conditions as a proxy for the impacts of past actions. This is because existing conditions reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects. The landscape pattern of vegetation within and surrounding the North Clack Integrated Resource project area has been affected by past timber harvest, wildfires, and insect mortality which all can impact the habitat for spotted owls. Past road construction, decommissioning, and maintenance as well as the designated OHV area have also contributed to the cumulative effect. These activities and events have created a landscape where there is reduced quantity, quality and distribution of suitable habitat and dispersal habitat. Some ecologically important features of landscape pattern are: amount of edge habitat, degree of fragmentation of late-successional forest, and amount of interior forest. As fragmentation of a landscape pattern increases, the amount of interior forest habitat decreases and the amount of edge habitat increases which impacts organisms that prefer large patches of interior habitat, such as the northern spotted owl.

Past forest management in the North Clack Integrated Resource project cumulative effects analysis area has created stands of young trees ranging from roughly 10 to 26 inches in diameter at breast height. These plantations are highly stocked, even-aged stands. The stands have slowed growth and lack the snags and downed wood needed for nesting and foraging owl habitat. In addition, the stands have low tree diversity, are single-canopied, or have trees that are insufficient in size to provide quality snags or down wood. Since 1990, the Forest Service

has commercially treated, or is treating, approximately 5,250 acres within the North Clack project area. Within the project area known owl site home ranges, approximately 830 acres have been thinned and are displayed by home range in Table 4 below. While all previous logging actions are reflected in the current existing condition, the logging actions that happened before 1990 have regrown while the short-term impacts of more recent logging actions are still felt. As additional stands mature, it is reasonable to assume that there may be future vegetation projects or other actions, however, there is currently no proposal for future actions that have sufficient site specificity to conduct an analysis.

Table 4 - Thinning projects within the North Clack Integrated Resource project area known owl site home ranges since 1990

Known Owl Site	Project Name	Year Completed	Acres affected
5441P94	Goat	ongoing	116
5441P94	Rook	2016	11
5441P94	1929	2013	198
5441P94	Cold	2013	13
5441P94	Austin	1996	59
5441P94	Austin	1994	38
5292T90	Upper	2006	59
5292T90	Upper	2005	8
5292T90	Boyer	1993	26
5292T90	Unknown Name	1990	220
5342P89	Sunbeam	2000	20
5300T90	Boya	2012	44
5300T90	Yoda	2000	18

Most of the private lands within the cumulative effects analysis area are managed for commercial timber production. The effects of past timber harvest activities on these lands have substantially altered the landscape, outside of known owl sites, modifying the patterns of vegetation and subsequent disturbance regimes to the degree that contemporary landscapes no longer function as they did historically. This has affected not only the existing forest and disturbance regimes, but the quality, amount, and distribution of spotted owl habitat on the landscape. Nearly all of the private land is not currently suitable spotted owl habitat and has recently had, or would likely receive a regeneration harvest treatment in the future before it can become suitable. Two of the four known owl sites include a small amount of private land within the home range (5292T90 at 4% and 5441P94 at 12%).

The cumulative effect of the North Clack Integrated Resource project when added to these other actions, would be negligible and would not impact northern spotted owl survival, reproduction, feeding, or care of young. The USFWS determined that the cumulative effects of the proposed North Clack Integrated Resource project ***may affect,*** but are ***not likely to adversely affect the northern spotted owl*** (USDI 2017a).

Consistency with Direction and Regulations

The effects to the northern spotted owl for the North Clack Integrated Resource project are considered in a programmatic informal consultation submitted to the U.S. Fish and Wildlife Service on September 7, 2017: Biological Assessment for Routine Land Management Activities with a Potential to Modify Habitat which are Not Likely to Adversely Affect Federally Listed Species within the Willamette Planning Province of Oregon (USDA USDI 2017a). Informal consultation with U.S. Fish & Wildlife Service has been completed for this project. A Letter of Concurrence dated September 26, 2017 (FWS Reference Number 01EOFW00-2017-I-0667) (USDI 2017a).

Table 5 - Mt. Hood National Forest Land and Resource Management Plan and Northwest Forest Plan Standards and Guidelines relating to Northern Spotted Owl that apply to the Action Alternatives.

Standard and Guideline	Text	Rationale
FW-174 p. Four-69	Threatened, endangered, and sensitive plants and animals shall be identified and managed in accordance with the ESA (1973), the Oregon ESA (1987), and FSM 2670.	Habitat for threatened, endangered, and sensitive species has been identified and managed in accordance with the ESA (1973), the Oregon ESA (1987), and FSM 2670.
FW-175 p. Four-69	Habitat for threatened, endangered and sensitive species shall be protected and/or improved.	Habitat for threatened, endangered and sensitive species has been protected and/or improved in accordance with the MHNF Forest Plan Management Direction because recommendations of the recovery plan have been followed and consultation is completed.
FW-176 p. Four-69	Biological Evaluations (FSM 2672.4) shall be prepared for all Forest Service planned, funded, executed, or permitted programs and activities for possible effects on endangered, threatened or sensitive species.	A Biological Evaluation has been prepared.
FW-177 FW-178 p. Four-69	Consultation with the USFWS shall occur on each program activity or project that the Forest Service determines may effect threatened or endangered species. Consultation shall be completed before any decision is made on the proposed project.	A programmatic informal consultation that covers the North Clack Integrated Resource Project was submitted in September of 2017 and a Letter of Concurrence was received from USFWS also in September of 2017.
Northwest Forest Plan LSR	Known spotted owl activity centers. One hundred acres of the best spotted owl habitat would be retained as close	There are no North Clack Integrated Resource harvest activities proposed within any known spotted owl nest site

Standard and Guideline	Text	Rationale
standards (page C10)	to the nest site or owl activity center as possible for all known spotted owl activity centers (as of January 1, 1994) located on federal lands.	or activity center.
Northwest Forest Plan LSR standards (page C12)	There is no harvest allowed in stands over 80 years old.	There are no North Clack Integrated Resource harvest activities proposed in stands over 80 years old within the LSR land designation.

3.2 Northern Spotted Owl Critical Habitat

Critical Habitat (2012)

The final rule on spotted owl critical habitat was published on December 4, 2012 (USDI 2012). Critical Habitat Units (CHU) are intended to provide large blocks of suitable habitat within the landscape that would provide the necessary elements to maintain stable, viable and interconnected populations. The physical and biological features of critical habitat essential to species conservation are identified as Primary Constituent Elements. Primary Constituent Elements (PCEs) are described in the Final CH Rule as the specific elements that comprise the physical or biological characteristics required to sustain the species' life-history processes. Habitat that includes these elements is essential in meeting the home range needs of territorial pairs, and/or the dispersal needs of juvenile and non-territorial spotted owls. Old-growth forest habitat is typically the most suitable habitat to provide such conditions; however, other habitat of lesser quality can provide some elements when that habitat is considered the best available in the absence of suitable habitat.

The PCEs include: 1) specific forest types in early-, mid-, or late-seral stages; and 2) specific habitat that provides for nesting and roosting, 3) specific habitat that provides for foraging, and 4) habitat that supports transience and colonization phases of dispersal. PCEs are described for four ecological zones with the North Clack Integrated Resource project area being in the West Cascades/Coast Range of Oregon and Washington zone.

In addition, four special management considerations or protections were identified for this zone in the Final CH Rule and are listed below. These recommendations should be used to evaluate and to manage for desired future conditions.

1. Conserve older stands that contain the conditions to support NSO occupancy or high-value NSO habitat as described in Recovery Actions 10 and 32.
2. Management emphasis needs to be placed on meeting NSO recovery goals and long-term ecosystem restoration and conservation. When there is a conflict between these goals, actions

that would disturb or remove the essential physical or biological features of NSO CH need to be minimized and reconciled with long-term restoration goals.

3. Continue to manage for large, continuous blocks of late-successional forest.
4. In areas that are not currently late-seral forest or high-value habitat and where more traditional forest management might be conducted (e.g. matrix), these activities should consider applying ecological forestry practices.

There is no Critical Habitat designated within the North Clack Integrated Resource project area. Therefore, both Action Alternatives would have ***no effect*** on northern spotted owl Critical Habitat.

4.0 REGION 6 SENSITIVE SPECIES

Sensitive Species (SS) are those plant and animal species identified by the Regional Forester for which population viability is a concern, as evidenced by:

a. Significant current or predicted downward trends in population numbers or density.

b. Significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution (FSM 2670.5).

Management of sensitive species "must not result in a loss of species viability or create significant trends toward federal listing" (FSM 2670.32).

4.1 Species Considered and Evaluated

The most recent Region 6 SS wildlife list (effective 21 July 2015) was reviewed and 23 species that may occur in or near the Mt. Hood National Forest were identified (Table 6). Although each of these species are known to or could potentially occur in or near the Mt. Hood National Forest, not all of them have potential to occur in the North Clack Integrated Resource project area. A pre-field wildlife review of the project area for all Region 6 SS was completed using Heritage database records, district data, literature reviews, communication with district personnel and the Forest Plan to identify which SS to analyze. Table 6 lists the species and whether the species or their habitat might occur in the project area. Many of the species listed in Table 6 have neither habitat nor documented occurrences within the North Clack Integrated Resource project area. Therefore, the proposed project would have **'no impact'** upon them. No further analysis is provided for these species.

The remaining species have potential habitat at least in portions of the North Clack Integrated Resource project area and require further analysis. These species are analyzed in the following section.

Table 6 - Region 6 Sensitive Species on the Mt. Hood National Forest

R6 Sensitive Species	Known Species Presence Within Project Area?	Habitat Present Within Project Area?	Analysis Included in this document?	Habitat and Rationale for not carrying species forward into this document
American Peregrine Falcon (Falco peregrinus anatum)	YES	YES	YES	Open habitat with cliffs present; optimal cliffs dominate the surrounding landscape and are within 1 mile of some form of water (Pagel 1992). Cliff habitat just outside the project area. Refer to Effects Analysis.
Bald Eagle (*Haliaeetus leucocephalus*)	YES	YES	YES	Usually found near open water (Buehler 2000), which is not found within a ½ mile of the project area. However, migrating and wintering bald eagles may use the project area. Refer to Effects Analysis.
White-headed Woodpecker (*Picoides albolarvatus*)	NO	NO	NO	Strongly associated with open ponderosa pine or dry mixed-conifer forests dominated by ponderosa pine (Mellen-McLean 2013). Will also use recently burned ponderosa pine stands. Habitat not present in the project area.
Lewis's Woodpecker (*Melanerpes lewis*)	NO	NO	NO	Open burned areas with large snags; oak and cottonwood forests, and open, park-like ponderosa pine forests (Tobalski 1997). Habitat not present in the project area.
Bufflehead (Bucephala albeola)	NO	YES	NO	Breeds near ponds and lakes in conifer forest and aspen parkland and nests almost exclusively in holes excavated by Northern Flickers and Pileated Woodpeckers (Marshall 2003). Habitat not present in the vicinity of proposed actions.
Harlequin Duck (Histrionicus histrionicus)	NO	YES	NO	Nests along fast-moving, turbulent rivers and mountain streams on rocky islands or banks and winters along rocky coastlines in the surf (Wiggins 2005). Habitat not present in the vicinity of proposed actions.
California Wolverine (Gulo gulo luteus)	NO	NO	NO	Primarily in tundra, taiga, and subalpine environments where snow cover persists through the spring season. In the western mountains, historical wolverine records generally occurred in or near alpine vegetation (Aubry 2007). Wolverines favored high elevations in nearly all of Copeland (2007) models; 83% of all

R6 Sensitive Species	Known Species Presence Within Project Area?	Habitat Present Within Project Area?	Analysis Included in this document?	Habitat and Rationale for not carrying species forward into this document
				wolverine use points occurred in the 7200 – 8500 feet elevation zone. Habitat not present in the project area.
Sierra Nevada Red Fox (Vulpes vulpes necator)	NO	NO	NO	Occurs in various habitats (e.g., forest openings, meadows, and barren rocky areas) in alpine and subalpine zones and is rarely found below 4,900 feet in elevation (Perrine 2010). Habitat not present in the project area.
Townsend's Big-eared Bat (*Plecotus townsendii*)	NO	YES	NO	Can occur in a wide variety of habitats. Its presence is strongly correlated with the availability of caves or cave-like roosting habitat, such as old mines, bridges, buildings and other man-made structures and rarely in tree cavities (Hayes 2013). Habitat not present in the vicinity of proposed actions.
Fringed Myotis (*Myotis thysanodes*)	NO	YES	NO	Inhabits a variety of plant communities including desert scrub, dry grasslands, shrub-steppe, drier forest, coastal conifer forest, and riparian forest, **but drier woodlands** (e.g., oak, pinyon-juniper, and ponderosa pine**) are often preferred**. Roosts in a variety of structures including caves, mines, tunnels, large snags and buildings (Hayes 2013). Habitat not present in the vicinity of proposed actions.
Western Pond Turtle (Actinemys marmorata)	NO	YES	NO	Occurs in rivers, streams, lakes, ponds, reservoirs, stock ponds, and permanent and ephemeral wetland habitats (Bury 2001). Habitat not present in the vicinity of proposed actions.
Larch Mountain Salamander (Plethodon larselli)	NO	YES	NO	Occurs in a wide array of habitat types including: old-growth forests; younger naturally regenerated forests in gravelly/cobble soils with residual late successional features (snags and large down logs); scree and talus (forested and un-forested); and lava tube entrances where debris has accumulated (Crisafulli 2008). Habitat not present in the

R6 Sensitive Species	Known Species Presence Within Project Area?	Habitat Present Within Project Area?	Analysis Included in this document?	Habitat and Rationale for not carrying species forward into this document
				vicinity of proposed actions.
Cope's Giant Salamander (*Dicamptodon copei*)	NO	YES	NO	Stream-dwelling and reliant on cool, perennial streams with coarse substrates, often occurring in small streams with high gradients in forested uplands. Often found in its larval or paedomorphic adult forms (sexually mature adult with juvenile characteristics); both forms have gills and are restricted to aquatic environments. Also known to transform into terrestrial adults, and have been found in riparian areas close to surface waters (Foster 2014). Stream and riparian habitat protections in place. See Fisheries Specialist Report.
Johnson's Hairstreak (Callophrys johnsoni)	NO	YES	YES	Coniferous forests which contain the mistletoes of the genus *Arceuthobium*, commonly referred to as dwarf mistletoe. Old-growth and late successional second growth forests provide the best habitat for this butterfly (Larsen 1995). Refer to Effects Analysis.
Mardon Skipper (Polites mardon)	NO	NO	NO	Dependent on grasslands and meadows with adequate nectar sources for adults (Kerwin 2011). Little habitat present in the project area and not likely to occur according to Conservation Assessment (Kerwin 2011).
Western Bumblebee (Bombus occidentalis)	NO	YES	YES	Inhabits a wide variety of natural, agricultural, urban, and rural habitats, although species occurrence tends to peak in flower-rich meadows of forests and subalpine zones (Goulson 2003). Refer to Effects Analysis.
Beller's Ground Beetle (Agonum belleri)	NO	NO	NO	Primary habitat for this species is acidic *Sphagnum* bogs in forested regions. It tends to be found in floating mats of *Sphagnum* immediately adjacent to the open water of bogs and lakes (Johnson 1979). Habitat not present in the

R6 Sensitive Species	Known Species Presence Within Project Area?	Habitat Present Within Project Area?	Analysis Included in this document?	Habitat and Rationale for not carrying species forward into this document
				project area.
Puget Oregonian (Cryptomastix devia)	NO	YES	NO	Inhabits moist, mature to old growth forests associated with bigleaf maple growing among conifers (usually Douglas-fir, western hemlock and western redcedar). Often occurring within riparian areas, and possibly confined to the riparian zone (Kogut 2005). Habitat not present in the vicinity of proposed actions.
Columbia Sideband (Monadenia fidelis Columbiana)	NO	YES	NO	Specific habitat for this subspecies has not been described (Stone 2011). However, the parent species, *Monadenia fidelis*, is found in mesic forest habitats or near springs or other water sources in forest situations, generally with rock substrates or large woody debris and logs for refugia (Frest 2000). The subspecies is primarily found in the Lower Columbia River drainage. Habitat not present in the vicinity of proposed actions.
Dalles Sideband (Monadenia fidelis minor)	NO	YES	NO	Associated with talus habitat and seasonally moist rocky areas, especially around seeps and springs (Duncan 2005). Habitat not present in the vicinity of proposed actions.
Crater Lake Tightcoil (Pristiloma arcticum crateris)	NO	YES	NO	Perennially moist areas in mature conifer forests and meadows among surface vegetation, rocks, and woody debris within 10 m. of open water in wetlands, springs, seeps and streams (Duncan 2004). Habitat not present in the vicinity of proposed actions.
Crowned Tightcoil (Pristiloma pilsbryi)	NO	YES	NO	Associated with very moist floodplain forest in riparian and old growth habitat (Frest 2000). Habitat not present in the vicinity of proposed actions.
Shiny Tightcoil (Pristiloma wascoense)	NO	NO	NO	Most known sites for this species are in ponderosa pine and Douglas fir forests at moderate to high elevations (Frest 1995). Burke (2013) describes the habitat as primarily under deciduous trees, particularly quaking aspen/red alder. Habitat not present in the project area.

Analysis Methods

The analysis of potential effects on Sensitive Species was conducted using data gathered in the pre-field review and field reconnaissance on the habitat requirements for each species. The habitat requirements for each species were then used to determine the effects of the alternatives on each Region 6 SS. The habitat impacts and risks to species on the Forest were estimated based on the best available science and data. The overall conclusions were derived from anticipated trends, probable risks, and degree of uncertainty under each alternative.

Alternative analysis is provided on the direct and indirect impacts for each specific SS. Cumulative impacts are also addressed for the individual species. Where appropriate, Forest Plan standards, guidelines, and objectives are discussed. Many of these standards and guidelines are met in the North Clack Integrated Resource project area through the use of specific design criteria.

Species Descriptions, Effects Analysis and Determinations

This section contains the natural history, distribution, and status for Region 6 Sensitive Species that could potentially be impacted by the North Clack Integrated Resource project. This section also presents the expected impacts from taking No Action and implementing the Proposed Action or Alternative 2.

Summary of Determinations

Determinations for each species were made as a result of the information gathered during the pre-field review, field reconnaissance, and effects analysis conducted in this report. The basis for each determination is potential habitat, expected occurrence, distribution, effects from proposed activities, and proposed mitigation used to alleviate the potential effects resulting from Forest-management activities as well as the No-Action Alternative. All species determinations consider all elements of the proposed action, including proposed project design criteria. (Note NI = No Impact, MII – May Impact Individuals.)

Table 7 - Summary of Determinations for R6 Sensitive Species in the North Clack Integrated Resource Project Area.

Species	No-Action Alternative	Action Alternatives
Peregrine Falcon	NI	MII
Bald Eagle	NI	MII
White-headed Woodpecker	NI	NI
Lewis's Woodpecker	NI	NI
Bufflehead	NI	NI
Harlequin Duck	NI	NI
California Wolverine	NI	NI
Sierra Nevada Red Fox	NI	NI
Townsend's Big-eared Bat	NI	NI

Species	No-Action Alternative	Action Alternatives
Fringed Myotis	NI	NI
Western Pond Turtle	NI	NI
Larch Mountain Salamander	NI	NI
Cope's Giant Salamander	NI	NI
Johnson's Hairstreak	NI	MII
Mardon Skipper	NI	NI
Western Bumblebee	NI	MII
Beller's Ground Beetle	NI	NI
Puget Oregonian	NI	NI
Columbia Sideband	NI	NI
Dalles Sideband	NI	NI
Crater Lake Tightcoil	NI	NI
Crowned Tightcoil	NI	NI
Shiny Tightcoil	NI	NI

4.1.1 Peregrine Falcon (*Falco peregrinus anatum*)

The breeding range of the peregrine falcon was significantly diminished from its original range due to the impacts of DDT and other chemical poisons. The species was placed on the List of Endangered and Threatened Wildlife in 1970 and DDT was subsequently banned. The peregrine falcon has made a significant recovery and was officially de-listed as a threatened species by the U.S. Fish and Wildlife Service on August 25, 1999 although the species currently remains on the Forest Service Region 6 Forester's Sensitive Species list.

In Oregon and Washington peregrines occur as resident and migratory populations. They nest on cliffs greater than 75 feet in height and within one mile of some form of water (Pagel 1992). Nesting occurs in xeric areas of eastern Oregon, marine habitats of western Oregon, montane habitats to 6,000 feet elevation, small riparian corridors statewide, and more recently, urban habitats of the lower Willamette and Columbia Rivers. Peregrines are widely distributed in western Oregon and at least 15 pairs are known to occur in the Columbia River Gorge. Two consistently active nesting sites are known to occur within the Clackamas River Watershed on the Mt. Hood National Forest.

The habitat of the peregrine falcon includes many terrestrial biomes in North America. Most often, breeding peregrine falcons utilize habitats containing cliffs and almost always nest near water (White 2002). Peregrine falcons generally utilize open habitats for foraging. Non-breeding peregrine falcons may also occur in open areas without cliffs. Many artificial habitats like towers, bridges and buildings are also utilized by peregrine falcons (White 2002).

Peregrine falcons build their nests in substrates on ledges of cliffs ranging from 8-400 m in height. The male creates a depression in the substrate by scraping it with his feet. Peregrines arrive at nest sites around March or April and egg laying may begin from two weeks to two

months later depending on the latitude (White 2002).

Peregrine falcon prey mainly consists of birds ranging from small passerines to mid-sized waterfowl. They may also feed on bats. Juveniles primarily feed on large flying insects. Peregrines are active throughout the day from dawn to dusk and can even be nocturnal. They are aerial and perching hunters that rarely scavenge (White 2002).

Peregrine falcons often fall victim to illegal shooting. Peregrines still fall victim to poisoning, but no poisons are presently known to have impacts to the species at the population level in North America (White 2002). Adult mortality sources also include electrocution from utility wires and poles. Juveniles collide with several anthropogenic structures and vehicles including windows, cars and trains and succumb to natural predators and mortality resulting territorial aggression (White 2002). Human disturbance near nests can also cause decreased nest success (White 2002).

Peregrine falcon nesting habitat is not found within the North Clack Integrated Resource project area. However, there is a known nest site immediately adjacent to the project area and has been active for several years.

Direct and Indirect Effects: There would be no effects to peregrine falcon habitat from the North Clack Integrated Resource project activities with either action alternative. However, there are potential disturbance effects that could occur during project activities, including nest failure. In general, project activities that may have a disturbance effect are the use of chain saws and heavy equipment within 1.5 miles of the nest site, however, there is significant topography changes between the nest site and many of the proposed North Clack units that would mitigate any disturbance effects. There are four proposed seedling release units where activities could potentially adversely affect the known peregrine site and a seasonal timing restriction would be implemented to mitigate any effect on the peregrines, which is detailed in Table 8 below. All other proposed project activities would occur outside the threshold zone for disruption of nesting. Hunting peregrine falcons are likely to avoid the North Clack Integrated Resource project area during project activities so some potential short-term disturbance may occur.

Table 8 - Seasonal timing restrictions for known Peregrine site based on proposed North Clack Integrated Resource project area activities.

Unit	Activities Restricted	Seasonal Restriction
304, 306, 308, 310	Use of Chainsaws Use of Heavy Equipment	January 15 to August 15

***Cumulative Effects*:** There would be no direct or indirect effects to peregrine falcon habitat by either alternative, therefore there would be no additive cumulative effect from the North Clack Integrated Resource project. The timing restriction would mitigate potential disturbance effects from project activities. Nesting pairs of peregrine falcons would likely continue to be well supported locally and around the Forest where peregrine nesting habitat is available.

Comparison of Effects to Peregrine Falcons by Alternative:

No-Action Alternative: There would be no effects to peregrine falcons with this alternative.

Action Alternatives: There would be no effects to peregrine falcon habitat from project activities. Potential disturbance effects could occur during project activities, however, these would be mitigated by implementing a timing restriction.

Determination for Peregrine Falcon: No-Action Alternative would have no impact. The Proposed Action and Alternative 2 may adversely impact individuals, but are not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing. Individuals may be subjected to short-term disturbance due to management activities. Mortality due to this project is not likely to occur and it is not expected to threaten populations. All alternatives are consistent with Forest Plan direction relevant to sensitive species.

4.1.2 Bald Eagle (Haliaetus leucocephalus)

The best available scientific and commercial data available indicates that populations of the bald eagle have recovered range-wide (Federal Register 2007). As a result of this recovery, the U.S. Fish and Wildlife Service removed the bald eagle from the List of Endangered and Threatened Wildlife effective August 8, 2007 (Federal Register 2007).

The range of the bald eagle includes most of Canada and Alaska, all of the contiguous United States, and northern Mexico. Bald eagles are closely associated with water and rarely nest far from aquatic environments. Bald eagles can be found year round on the Mt. Hood National Forest. Most suitable nesting habitat occurs around the major reservoirs or along major rivers in the Mt. Hood National Forest. Key winter habitat components for the bald eagle on the Mt. Hood National Forest include perch sites, roost sites away from human disturbance, and an adequate food supply. The large conifer landscape throughout the Forest provides suitable roosting habitat.

Nest sites are typically, near a large body of water (rivers, lakes, etc.) that supports an adequate food supply (Buehler 2000). In the Pacific Northwest preferred nesting habitat for bald eagles is predominately an uneven-aged, mature coniferous (ponderosa pine, Douglas-fir) stands or large black cottonwood trees along a riparian corridor (Isaacs and Anthony 2011). Eagles usually nest in mature conifers with gnarled limbs that provide ideal platforms for nests. The nest tree is characteristically one of the largest in the stand and usually provides an unobstructed view of a body of water (Isaacs 2011). In Oregon, the majority of nests are within one mile of the shoreline (Isaacs 2011). The size and shape of a defended breeding territory varies widely (1.6 to 13 square miles) depending upon the terrain, vegetation, food availability, and population density of an area (Isaacs 2011).

During the critical incubation (March) and brooding (late April/early May) phases, human disturbance can result in nest failure with the risk reduced as the nesting cycle progresses towards fledgling at the end of July. Some habituation of eagles to human activity has been

observed, varying according to type and proximity to the bald eagle. Individual birds vary widely in their response to human disturbance (Isaacs 2011).

Wintering eagles tend to perch on dominant trees that provide a good view of the surrounding area and close to a food source such as carrion, fish, etc. (Isaacs 2011). A communal roost generally hosts several eagles each evening at the same site during the winter months. Communal night roosts are generally near a rich food source (high concentrations of waterfowl or fish) and in forested, uneven-aged stands with a remnant old growth component (Buehler 2000). Communal winter roosts tend to be isolated from disturbance and offer more protection from the weather than diurnal roosts (Buehler 2000). Important prey species include fishes, birds, mammals, and carrion (Buehler 2000).

Nesting, wintering, and migrating bald eagles have been documented on the Mt. Hood National Forest and individuals have been observed within the North Clack Integrated Resource project area. Bald eagle habitat is mostly associated with areas of open (ice-free) water where fish are available or waterfowl congregate. The nearest suitable body of water is the North Fork Reservoir approximately one mile from the project area boundary and the nearest known active nesting occurs on Faraday Lake approximately 4.8 miles to the northwest of the project area. There are no known concentrations of wintering eagles (winter roost sites) anywhere within the project area though individuals have been observed. Bald eagles, during migration, are common and can occur sporadically throughout the project area and temporary roost sites during migration are determined more by the availability of carrion than any other factor.

Direct and Indirect Effects: Migrating or wintering bald eagles are likely to avoid the North Clack Integrated Resource project area during project activities, so some short-term displacement effects may occur. No known nesting or roosting sites occur within one mile of the project area; therefore, no impacts to nesting or roosting habitat are anticipated. The primary winter food source, deer carrion, and summer food source, fish and waterfowl, would continue to be available. In the unlikely event any eagle nests or roosts be discovered within the project area, Forest Standards would provide protection and minimize disturbance.

Cumulative Effects: The direct and indirect effects of either action alternative combined with the past, present and reasonably foreseeable future actions would result in no measurable change of habitat available for bald eagles within and adjacent to the project area. Populations of wintering eagles would likely continue to be well supported in and around the Forest and within the North Clack Integrated Resource project area. Habitat for its primary winter food source of deer carrion would continue to be available in the project area and treatment activities proposed for the project area would enhance deer habitat and may further increase deer numbers, adding a beneficial incremental impact for the eagle. Short-term human disturbances due to project activities and roads and trails may contribute to cumulative effects though they would not be substantial.

Comparison of Effects to Bald Eagles by Alternative:

No-Action Alternative: No nests or traditional roosting sites occur within one mile of the

project area, therefore no impacts to breeding or roosting habitat are anticipated under No Action. Potential transient roosting habitat exits in late successional stands and riparian areas within the project area. As forest succession continues, some increase in mature forests may occur. In the absence of stand replacing fire, habitat for this species is expected to increase.

Action Alternatives: No known nesting or roosting sites occur within one mile of the project area, therefore, no impacts to breeding or roosting habitat are anticipated. Migrating or wintering birds are likely to avoid the North Clack Integrated Resource project area during project activities so some short-term disturbance may occur. Potential roosting habitat would continue to exist in late successional stands and riparian areas.

Determination for Bald Eagle: The No-Action Alternative would have no impact. The Proposed Action and Alternative 2 may adversely impact individuals, but are not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing. Individuals may be subjected to short-term disturbance due to management activities. Mortality due to this project is not likely to occur and it is not expected to threaten populations. All alternatives are consistent with Forest Plan direction relevant to sensitive species.

4.1.3 Johnson's Hairstreak (*Callophrys johnsoni*)

Currently the range of this butterfly is not certain (Xerces Society 2015). Evidence of a declining range with populations is very localized and scarce. Many records of this insect tend to be old, those from Washington range from 1891–1995, with many being pre-1980 when old growth forest was more common at lower elevations (Hinchliff 1994, Xerces Society 2015). Johnson's hairstreak populations were recently found near Larch Mountain in eastern Multnomah Co., Oregon in primarily old growth hemlock.

These butterflies occur within coniferous forests which contain the mistletoes of the genus *Arceuthobium*, commonly referred to as dwarf mistletoe. These plants are highly specialized and are known to occur on a number of different conifers (Schmitt 2008). Larsen (1995) states that old-growth and late successional second growth forests provide the best habitat for this butterfly, although younger forests where dwarf mistletoe is present also supports Johnson's hairstreak populations. All sightings in both Washington and Oregon have been in coniferous forests. Perhaps one reason for infrequent sightings of this butterfly could be due to the species spending a majority of its time in the top of the forest canopy (Scott 1986; Pyle 2002).

Larvae can be found feeding on mistletoes of the genus *Arceuthobium* (Opler 1999). Caterpillars can be found on host leaves April-October (Allen 2005). Nectar of flowers in several families from numerous genera including *Actostophylos, Ceanothus, Cornus,* dandelion, *Fragaria, Rorippa* and *Spraguea* is consumed by adult butterflies who obtain additional moisture by visiting mud puddles. Adults fly from mid-May to early September with peaks occurring in May and August (Pyle 2002). Johnson's hairstreak is considered to be the only obligate old-growth butterfly (Pyle 2002). Due to their habitat associations and tendency to reside in the forest canopy, these butterflies are not often encountered.

Threats to Johnson's hairstreak include habitat loss, *Bacillus thuringiensis* var. *kurstaki* (BTK) bacterium effects, and herbicides. The bacterium, BTK is lethal to many butterfly and moth larvae when consumed. According to (Wagner 1995), BTK was applied in large-scale aerial treatments to control spruce budworm during the 1990's in the Washington and Oregon Cascades. It has been speculated that the continued use of this bacterium to control certain species of Lepitopterans could also significantly reduce populations of Johnson's hairstreak due to its ability to kill many other Lepidopteran larvae. Currently this pesticide is the most popular in western forests to control defoliators. The Mt. Hood National Forest has not used BTK since the mid-1980s and has no plans for its use in the future.

There are no known occurrences of Johnson's hairstreak within the North Clack Integrated Resource project area, however, dwarf mistletoe is common in portions of the project area. Recently, a population of Johnson's Hairstreak has been discovered on the Mt. Hood National Forest in mostly old growth hemlock near Larch Mountain, approximately 19 miles north of the project area.

Direct and Indirect Effects:

Preferred conditions for this species exist in old-growth and late-successional second growth forests. Younger forests that contain dwarf mistletoe may also have the potential to support populations of the Johnson's hairstreak. Direct mortality of individuals and habitat loss could potentially occur during project activities.

The proposed regeneration harvest treatments proposed in both action alternatives could remove suitable habitat for this species. In addition, the proposed thinning activities could briefly degrade habitat by reducing the canopy cover in treated areas. Gap placement and early-seral habitat creation would remove potential habitat temporarily until such openings close over time. If dwarf mistletoe is present in a thinning unit, it is likely that some removal of the mistletoe would occur during the proposed treatments. The proposed project may also impact Johnson's hairstreak by temporarily impacting flowering plants during project activities. Reducing this food source would reduce the ability of foraging butterflies to find nectar at these sites which is a required food source. It is expected that these plants would regenerate within a few years and that the butterflies would have other nectar plants available within the project area.

Indirect effects associated with proposed project activities may be beneficial to Johnson's hairstreak as silvicultural prescriptions intend to accelerate the transition from simplified to complex stand structure by thinning and increase forest health in stands that lack such attributes. Tree growth as a result of thinning would increase tree diameter, height, and canopy cover in younger stands that lack such attributes. This could result in improved habitat and microclimate conditions in the long-term; however, short-term actions may affect individuals.

Cumulative Effects:

The direct and indirect effects of the action alternatives combined with the past, present and reasonably foreseeable future actions would result in a reduction of habitat for Johnson's hairstreak within the North Clack Integrated Resource project area. Habitat alterations including those that could destroy, fragment, alter, degrade or reduce dwarf mistletoe populations or the food supply produced by flowers could adversely affect these butterflies.

For the North Clack Integrated Resource project area, the activities that could have cumulative effects to Johnson's hairstreak include: past vegetation treatments, including timber harvests and fuels treatments on federal and adjacent private lands, and BTK aerial treatments to control spruce budworm in the 1980s. Most of these activities have resulted in a temporary reduction of habitat for Johnson's hairstreak. In the case of thinning treatment, it then would have a longer incremental beneficial impact.

Comparison of Effects to Johnson's Hairstreak by Alternative:

No-Action Alternative: Under the No-Action Alternative, Johnson's hairstreak mistletoe habitat and flowering food source would not be impacted and, therefore, there would be no impact to the butterfly.

Action Alternatives: Direct mortality of individuals and habitat loss could potentially occur during project activities. The Proposed Action alternative could remove up to 255 acres of potential habitat through regeneration harvest while Alternative 2 could remove up to 367 acres. Proposed thinning activities would briefly degrade habitat by reducing the canopy cover in treated areas. Gap placement and early-seral habitat creation would remove potential habitat temporarily until such openings close over time. If dwarf mistletoe is present in a thinning unit, it is likely that some removal of the mistletoe would occur during the proposed thinning. However, the surrounding stands outside the units would likely have sufficient dwarf mistletoe to offset loss of habitat in the harvest units. Project activities also have the potential to affect flowering plants.

Determination for Johnson's Hairstreak: The No-Action Alternative would have no impact. The Proposed Action and Alternative 2 may adversely impact individuals, but are not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing. Johnson's hairstreak may be subjected to a reduction in dwarf mistletoe habitat, with Alternative 2 having slightly more potential impact than the Proposed Action. However, the surrounding stands outside the units would likely have sufficient dwarf mistletoe to offset the loss of habitat in the treatment units. All alternatives are consistent with Forest Plan direction relevant to sensitive species.

4.1.4 Western Bumblebee (*Bombus occidentalis*)

The western bumblebee was widespread and common throughout the western United States and western Canada before 1998 (Xerces Society 2012). The former range of U.S. states

included: northern California, Oregon, Washington, Alaska, Idaho, Montana, western Nebraska, western North Dakota, western South Dakota, Wyoming, Utah, Colorado, northern Arizona, and New Mexico. Since 1998, populations of this bumblebee have declined drastically throughout parts of its former range. In Alaska, east of the Cascades and in the Canadian and U.S. Rocky Mountains, viable populations still exist. Populations of the western bumblebee in central California, Oregon, Washington and southern British Columbia have mostly disappeared. It is difficult to accurately assess the magnitude of these declines since most of this bee's historic range has not been sampled systematically. While the western bumblebee was historically known throughout Oregon and Washington, it is now largely confined to high elevation sites and areas east of the Cascade Crest (Cameron 2011, Xerces Society 2012).

According to Goulsen (2003), bumblebee colonies are annual. In the late winter or early spring, the queen emerges from hibernation and then selects a nest site, which is often a pre-existing hole, such as an abandoned rodent hole. She then supplies the nest with pollen as well as nectar, which she stores in a wax pot formed by wax secreted by specialized glands. The queen then starts her new colony by laying between 8 and 16 eggs in her first batch, which she then incubates until hatching. The young feed upon the food mass provided by the queen and subsequent feedings are provided by the queen regurgitating food from her crop. After feeding has been completed, the young pupate in cocoons spun from silk. The queen ceases to forage within a few days of the workers' emergence and then focuses upon increasing the colony's population. Male bumblebees develop from unfertilized eggs and females develop from fertilized eggs. According to Thorp (1983), around the time that the number of workers equal or outnumber the brood to be fed, some unfertilized eggs have been laid, which would develop into males, while fertilized eggs become new queens. Young queens may assist with some household activities before leaving the hive to mate with the male drones. After mating, the queen then digs a hole in which she would hibernate through the winter. The rest of the colony including the old queen, workers and males die out.

Bumble bees inhabit a wide variety of natural, agricultural, urban, and rural habitats, although species richness tends to peak in flower-rich meadows of forests and subalpine zones (Goulson 2003). Like other bumble bees, the western bumblebee has three basic habitat requirements: suitable nesting sites for the colonies, nectar and pollen from floral resources available throughout the duration of the colony period (spring, summer and fall), and suitable overwintering sites for the queens. These are discussed below.

Nest Sites

Reports of western bumblebee nests are primarily in underground cavities such as old squirrel or other animal nests and in open west-southwest slopes bordered by trees, although a few nests have been reported from above-ground locations such as in logs among railroad ties (Hobbs 1968, MacFarlane 1994, Thorp 1983). Availability of nests sites for the western bumblebee may depend on rodent abundance (Evans 2008).

Floral Resources

Bumble bees require plants that bloom and provide adequate nectar and pollen throughout the colony's life cycle, which is from early February to late November for the western bumblebee (although the actual dates likely vary by elevation). The amount of pollen available to foragers directly affects the number of new queens that a bumble bee colony can produce, and since queens are the only type of bumble bees that can form new colonies, pollen availability directly affects the future bumble bee population size (Burns 2004). The western bumblebee is a generalist forager and has been reported to visit a wide variety of flowering plants in Oregon and Washington. Early spring and late fall are often periods with lower floral resources; the presence of flowering plants at these critical times is essential. Bumblebees will visit a range of different plant species and are important generalist pollinators of a wide variety of flowering plants and crops (Goulsen 2003). Although bumblebees do not depend on a single type of flower, some plants rely solely on bumblebees for pollination. In addition, native bees, such as bumblebees are adapted to local conditions (Goulsen 2003).

Overwintering Sites

Very little is known about the hibernacula, or overwintering sites, utilized by the western bumblebee, although Hobbs (1968) reported western bumblebee hibernacula that were two inches deep in a "steep west slope of the mound of earth." The closely related Bombus terrestris reportedly hibernates beneath trees (Hobbs 1968).

The primary threats to the western bumblebee at the sites where it currently exists in Oregon and Washington include: pathogens from commercial bumble bees and other sources, impacts from reduced genetic diversity, and habitat alterations including conifer encroachment (resulting from fire suppression), grazing, and logging. Other threats include pesticide use, fire, agricultural intensification, urban development and climate change (Thorp 2008).

The western bumblebee has been documented on the Mt. Hood National Forest, though not within the North Clack Integrated Resource project area. Focused surveys for the western bumblebee have not occurred within the project area boundary. Flowering plants are widespread throughout the project area and are abundant within the riparian areas.

Direct and Indirect Effects

Direct mortality of individuals could potentially occur during project activities. The action alternatives may also impact western bumblebees by temporarily impacting flowering plants during project activities, including prescribed burning. Reducing this food source would reduce the ability of foraging bumblebees to find nectar at these sites which is a required food source for young bumblebees. It is expected that these plants would regenerate within a few years and that the bumblebees would have other nectar plants available within the project area. Long-term effects would be beneficial because the treatments would enhance flowering plants. The creation of new early-seral habitat through regeneration harvest and gaps created within thinning units would have additional beneficial effects over time as floral resources develop.

Alternative 2 proposes 117 acres of regeneration harvest more than the Proposed Action alternative.

The proposed project may impact current and potential nest sites with heavy equipment during project activities, temporarily reducing the number of nests and potential future nest sites and, therefore, reducing the number of bumblebees that this area could support. Nest sites would increase within a few years after treatment.

Cumulative Effects

The direct and indirect effects of the Action alternatives combined with the past, present and reasonably foreseeable future actions would result in a temporary reduction of floral habitat for western bumblebees within the North Clack Integrated Resource project area with long-term beneficial effects due to the creation of early-seral habitat and gaps within thinning units. Cumulative effects for this species were considered at the watershed scale since genetic diversity and connectivity between colonies is a concern for the bumblebee. Habitat alterations including those that could destroy, fragment, alter, degrade or reduce the food supply produced by flowers as well as destruction of nest sites and hibernation sites for overwintering queens, such as abandoned rodent burrows, adversely affect these bumblebees. Large scale ground disturbing activities alter landscapes and habitat required by bumblebees by removing flowering food sources, disturbing nest sites, and altering the vegetation community. The size of bumblebee populations diminish and inbreeding becomes more common as habitats become fragmented. This in turn decreases the genetic diversity and increases the risk of population decline.

For the North Clack Integrated Resource project area, the activities that could have cumulative effects to bumblebee include: past vegetation treatments, including timber harvests and fuels treatments on federal and adjacent private timber lands. Other activities include past and future road decommissioning and road closures, ongoing road and trail maintenance, legal and illegal OHV use, future hazard tree removal, future noxious weed treatments, and past and future fires. Most of these activities result in a temporary reduction of habitat for western bumblebees and then, many would have an incremental beneficial impact.

While the activities analyzed under cumulative effects may have impacts to individual bumblebees, the main threats to this species are agriculture and urban development, livestock grazing, and broad scale insecticide application (Thorp 2008). These kinds of activities are not included in the North Clack Integrated Resource project area nor are they proposed anywhere on the Clackamas River Ranger District. Because some of the proposed activities increase or improve habitat while others may decrease it, the impacts would likely be relatively small and populations of this species would still persist at the watershed scale.

Comparison of Effects to Western Bumblebee by Alternative

No-Action Alternative: Under the No-Action Alternative, bumblebee nesting, foraging, and over-wintering habitat would not be impacted and, therefore, there would be no impact to the

western bumblebee, including beneficial impacts.

Action Alternatives: Direct mortality of individuals could potentially occur during project activities, including prescribed burning. Project activities also have the potential to impact current and potential future nest sites as well as impacting flowering plants. These impacts are considered temporary in nature and both nest sites and flowering plants would be expected to increase after completion of project activities. The Proposed Action alternative proposes 255 acres of new early-seral habitat would be created with incremental beneficial impacts while Alternative 2 proposes 367 acres. The untreated portions of the project area would continue to provide a food source as well as nesting and hibernating habitat during project activities.

Determination for Western Bumblebee: The No-Action Alternative would have no impact. The Action Alternatives may adversely impact individuals, but are not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing. Western bumblebees may be subjected to a temporary reduction in flowering plants and nesting sites as well as potential direct mortality due to proposed project activities. While the number of bumblebees in the project area may be slightly reduced, this reduction would be temporary as flowering plants and nest sites begin to increase after project activities are complete. All alternatives are consistent with Forest Plan direction relevant to sensitive species.

Consistency with Direction and Regulations for Sensitive Species

Table 9 - Mt. Hood National Forest Land and Resource Management Plan and Northwest Forest Plan Standards and Guidelines relating to R6 Sensitive Species that apply to the Proposed Action alternative.

Standard and Guideline	Text	Rationale
FW-174 p. Four-69	Threatened, endangered, and sensitive plants and animals shall be identified and managed in accordance with the ESA (1973), the Oregon ESA (1987), and FSM 2670.	Habitat for threatened, endangered, and sensitive species has been identified and managed in accordance with the ESA (1973), the Oregon ESA (1987), and FSM 2670.
FW-175 p. Four-69	Habitat for threatened, endangered and sensitive species shall be protected and/or improved.	Habitat for threatened, endangered and sensitive species has been protected and/or improved in accordance with the MHNF Forest Plan Management Direction – Interpretation #7 (USDA 1995).
FW-176 p. Four-69	Biological Evaluations (FSM 2672.4) shall be prepared for all Forest Service planned, funded, executed, or permitted programs and activities for possible effects on endangered, threatened or sensitive species.	A Biological Evaluation has been prepared.

5.0 MANAGEMENT INDICATOR SPECIES

This section describes the link between habitat within the project area and populations of Management Indicator Species (MIS) on the Mt. Hood National Forest.

The Forest Service Manual defines Management Indicator Species as "…plant and animal species, … selected for emphasis in planning, and which are monitored during forest plan implementation in order to assess the effects of management activities on their populations and the populations of other species with similar habitat needs which they may represent" (FSM 2620.5).

The National Forest Management Act (NFMA) requires the Forest Service to manage wildlife habitat to "maintain viable populations of existing native and desired non-native vertebrate species on the Forest". Because it is difficult to monitor all species at the same time, NFMA requires the Forest Service to identify Management Indicator Species (MIS) through the planning process, and to establish objectives to maintain and improve the habitat of indicator species. The primary assumption of this process is that indicator species represent the habitat needs of other species that have similar habitat requirements. Spotted owls, for example, indicate the needs of a variety of species that use old growth forest (FEIS Land and Resource Management Plan Mt. Hood National Forest Page III- 55).

There is no requirement in the Forest Plan to survey for or gather site-specific, project-scale population data regarding the project implementation's effects to the viability of the population of Management Indicator Species. Rather, the Forest Plan directs that habitat be used as a proxy for population monitoring (FEIS Land and Resource Management Plan Mt Hood National Forest Page III- 55).

Although each of these species is known to occur on the Mt. Hood National Forest, not all of them have potential to occur in the North Clack Integrated Resource project area. Table 10 lists each species and whether the species or their habitat occurs in the project area. If an MIS or its habitat is not found in the project area, it was not identified for further analysis.

Table 10 - Mt. Hood National Forest Management Indicator Species

Management Indicator Species	Habitat Description	Habitat Present in Analysis Area?	Species Present in Analysis Area?
Northern Spotted Owl	Old Growth	Yes	Documented
Deer	Early Forest Succession and Mature/Old Growth	Yes	Documented
Elk	Early Forest Succession and Mature/Old Growth	Yes	Documented
Pileated Woodpecker	Mature/Over-Mature	Yes	Documented
American Marten[4]	Mature/Over-Mature	Yes	Likely
Salmonids	Aquatic (see Fisheries Specialist Report)	Yes	Documented
Western Gray Squirrel	Pine-Oak	No	Potentially[5]
Merriam's Turkey	Pine-Oak	No	No

5.1 Northern Spotted Owl as a Management Indicator Species

The northern spotted owl was selected as a Management Indicator Species because it represents old growth habitats. Section 2.1 above describes, in detail, the species and its habitat requirements.

The overall trend for spotted owl populations is declining in the Pacific Northwest. The recovery for the species is covered under the U.S. Fish and Wildlife Service Revised Recovery Plan for the Northern Spotted Owl (*Strix occidentalis causarina*) (USDI 2011). Because the northern spotted owl is listed as a Threatened species, the Forest Service consults on the effects to the species and its habitat with the U.S. Fish and Wildlife Service prior to making decisions on actions by the agency. The US Fish and Wildlife Service has not found any proposed actions on the Forest to place the northern spotted owl in jeopardy. ***The degree of effect to northern spotted owl habitat for the North Clack Integrated Resource project when combined with other projects that affect owl habitat would not contribute to a negative trend in viability on the Forest for the northern spotted owl***.

5.2 Deer (Odocoileus hemionus) and Elk (Cervus canadensis roosevelti)

Deer and elk were selected as Management Indicator Species because they are economically important game animals (USDA 1990).

Deer and elk utilize a wide range of forest types for both foraging and cover. Elk are more sensitive to the effects of forest management and are most often used to represent the general

[4] Known as Pine Marten when Forest Plan was implemented.

[5] Scattered sightings of Western Gray Squirrel occur on the Clackamas River Ranger District. This is atypical habitat for this species. As such they are only used for MIS analysis on the eastside of the Forest.

habitat requirements of both species. Forest Plan Standards and Guidelines have minimum requirements for optimal and thermal cover habitat components. Thermal cover for elk is defined as a stand of coniferous trees at least 40-feet tall with an average crown closure of 70 percent or more. Optimal cover is found mainly in multi-storied mature and old-growth stands. During the 1980s and when the Forest Plan was written, wildlife managers considered cover to be crucial to deer and elk survival and production. More recent research has indicated that cover is not as important as was once thought and that forage quality and abundance is much more critical. Using tightly controlled experimental conditions, Cook (1998) found that thermal cover did not enhance elk survival and production, and was not required by elk where food was not limiting, and could not compensate for inadequate forage conditions. Further research has shown that high summer and fall forage quality is critical to elk reproduction, survival, and population growth and stability (Cook 2013). The increased importance of available forage abundance and quality compared to thermal cover has also been supported by nutritional and physiological studies of black-tailed deer (Parker 1999). With the reduction in timber harvest using regeneration methods on the Mt Hood National Forest in the past two decades, continued tree growth, and suppression of fire, cover habitats now far exceed the desired levels for optimal and thermal cover but openings for forage are becoming scarce, making forage a limiting factor on the Forest.

Both species migrate using summer and winter ranges. Elk and deer migration is due to habitat and forage accessibility in the summer and winter months. Summer range areas occur at higher elevations from spring through early winter and continue until the snow depth drives them out. Winter range areas are typically below 2800ft in elevation on the Westside of the Cascades on the Forest and are areas where elk congregate during the cold season. Deer and elk use natural openings (such as wet meadows) extensively for foraging, breeding, and calving.

Elk herds exhibit a close association with riparian habitat in areas of gentle terrain and low road density. Forage is widely available but is generally of low quality on the westside of the Cascades. The low quality of the forage, especially in winter range, and the lack of wetlands and permanent low-gradient streams within winter range are considered limiting factors for elk and deer on the Forest. The higher quality forage preferred by deer and elk on the Forest is found in early-seral forb and shrub habitat (ODFW 2008). Overall, across the MHNF, this habitat has steadily decreased since 1990 (high of 155,880 acres) to 2016 when last calculated, with 2015 at the lowest level (76,197 acres) as shown in figure 1 below. This trend is consistent with the sharp decline in federal timber harvest, and especially the cessation of clearcut methods in the early 1990's that would have maintained the early-seral forb and shrub forage preferred by deer and elk. The slight increase in 2012 is likely due to large fires that reset some of the high-severity burn areas back to early-seral habitat.

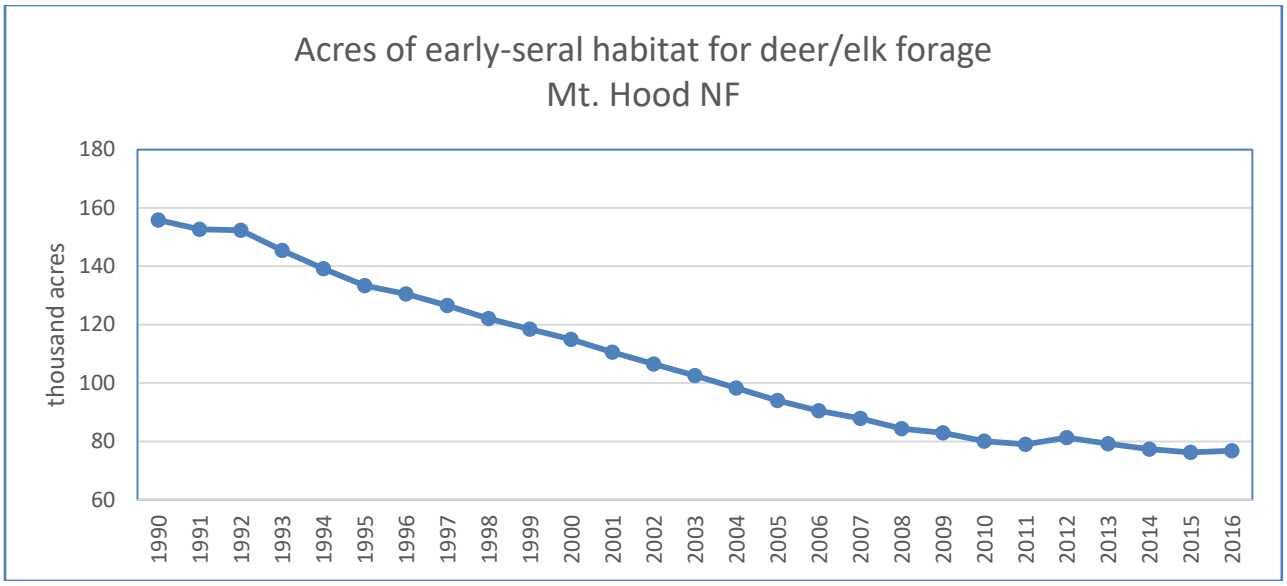


Figure 1 – Acres of early-seral habitat

Roads have long been identified as having impacts on big game populations. Studies at the Starkey Project in northeast Oregon (Wisdom 2005) have disclosed even more information on the effects of roads and open road densities on deer and elk. Rowland (2005) summarized the direct impacts of roads and associated traffic on elk, in addition to outright mortality from vehicular collisions as follows: (1) Elk avoid areas near open roads but varies in response to traffic rates; (2) Elk vulnerability to mortality from hunter harvest, both legal and illegal, increases as open road density increases; and (3) In areas of higher road density, elk exhibit higher levels of stress and increased movement rates. Rowland (2005) also noted that elk use increased proportionally to farther distances between open roads. They also suggested judicious closing of certain road segments (particularly road spurs) while providing sufficient access for management activities, may retain or create blocks of habitat that serve as security areas for elk. In addition, a recent study shows that elk respond to trail-based recreation similarly to their avoidance of roads open to motorized traffic (Wisdom 2018).

Across most of the Mt Hood National Forest, road decommissioning and closure over the past two decades has resulted in a landscape where open road density is seldom a concern for deer and elk.

Current Conditions within the North Clack Integrated Resource Project Area

There is widespread use of the project area by deer and elk but most use is concentrated in small riparian meadows and within the footprint of the 36 Pit Fire, which burned in 2014, as well as connective travel corridors. Black-tailed deer are common and relatively abundant within the project area. Elk are less common. During field surveys, sign of elk and deer use was found throughout the project area and seem to be traveling between riparian meadows within the project area and larger open areas located on the adjacent private timber lands as well as the 36 Pit Fire area. Population numbers for deer and elk are probably most limited by the lack

of quality forage on both, summer and winter range in the project area with the exception being within the 36 Pit Fire area. With the reduction in regeneration timber harvest over the years, the project area has abundant optimal and thermal cover, but openings for forage are becoming scarce. Much of the meadow and early-seral habitat within the project area has been reduced in its forage value over time. Conifers have grown, invasive plant species are spreading, and new grass growth is reduced due to thatch. Within much of the 36 Pit burn area there has been a flush of quality forage that has grown in due to the open canopy and increased nutrient and moisture availability by removal of competing vegetation. Over time, as the canopy closes again, the quality and quantity of the forage would be reduced.

There is an opportunity to increase early-seral habitat and the productivity of forage plant species within the North Clack project area in areas spaced away from both the 36 Pit Fire and private land clearcuts. There are approximately 16,380 acres of designated Deer and Elk Winter Range and 8,450 acres of Summer Range within the project area. Table 11 below displays the proposed North Clack activities within these areas. Nearly all of the 36 Pit Fire burn area is within designated Winter Range.

Table 11 - Proposed North Clack Integrated Resource Project Activities within Deer and Elk Summer (SR) and Winter Range (WR)

Treatment Activity	No Action acres	Proposed Action acres	Alternative 2 acres
Variable Density Thinning (that would enhance forage)	SR = 0 WR = 0	SR = 623 WR = 2,741	SR = 539 WR = 2,708
Regeneration Harvest	SR = 0 WR =0	SR = 89 WR =166	SR = 173 WR =199
Prescribed Under Burn	SR = 0 WR = 0	SR = 177 WR = 215	SR = 261 WR = 248
Meadow Prescribed Burn	SR = 0 WR = 0	SR = 0 WR = 2	SR = 0 WR = 2

Within the Summer Range in the project area, the current open road density is 2.7 miles per square mile, which is slightly more than the 2.5 miles per square mile stated for Standard FW-208. Within the Winter Range in the project area, the open road density is 2.1 miles per square mile, which is also slightly more than the 2.0 miles per square mile stated for Standard FW-208. However, Standard FW-208 includes “roads open to motorized vehicle traffic,” but does not specifically address OHV trails. The LaDee Flat OHV Area is within the project area and is entirely within Winter Range. Since OHV trails result in as much or more noise disturbance than normal open roads, this analysis includes data for both ‘roads only’ and ‘roads and OHV trails combined’. The open road/OHV trail density is 2.9 miles per square mile which is more than the Standard allows. This also does not include the approximately seven miles of unauthorized user-created OHV routes that currently exist in this area. The OHV trails are concentrated in one area of the Winter Range with relatively high density compared to the rest of the Winter Range. The Forest, through its OHV Plan previously made the decision to concentrate OHV trails in this area. It is likely that animals that seek solitude can find it by moving away from the

OHV area.

No-Action Alternative – Direct and Indirect Effects

This alternative would have no direct effects on deer and elk because no new activities would occur. Deer and elk will utilize a wide range of forest types for forage and cover. However, the current condition of young to mid-age, highly stocked, even aged stands is not considered optimal for deer and elk foraging needs. The No-Action Alternative would allow the young plantations to continue to grow thicker and denser allowing very little light to reach the forest floor. The lack of light would suppress the growth of forbs and browse that would be forage for deer and elk. With the absence of active management, forest succession would likely continue, resulting in the continued development of dense stands and ladder fuels which would increase the risk of stand-replacing wildfire. In addition, no roads would be closed or decommissioned, including unauthorized OHV routes. The impact of no action would be to reduce deer and elk production and population within the project area.

Proposed Action Alternative – Direct and Indirect Effects

In general, the overall effect of the North Clack Integrated Resource project would be beneficial for deer and elk. Inside thinning units, some early-seral habitats would be created. Where palatable indicator plants are present, forage areas would be created with gaps. The proposed thinning in units would allow more sunlight to reach the forest floor and would allow more grasses and forbs to grow which would result in increased forage for deer and elk. The method of leaving skips and gaps as part of the thinning prescription would create forage openings and cover opportunities scattered across the thinning units. The project would treat 255 acres with regeneration harvest creating new early-seral habitat. These acres were selected for this treatment because of the south facing aspect and/or the presence of beneficial plant indicator species which greatly increases the chances of increasing the quantity and quality of forage within the project area. The project also includes 391 acres of prescribed underburning of harvested stands and a two acre prescribed burn in a meadow to also increase the quantity and quality of forage in the project area. The increase in forage opportunities is especially important in Summer Range where forage in late summer and fall is critical to deer and elk winter survival (Cook 2013). The increase in forage opportunities is also especially important in Winter Range where forage can be limiting and generally of low quality.

The proposed treatments would temporarily remove thermal cover from the stands. While there would be a loss of some quality thermal cover, thermal cover is not limiting across the landscape. There would also be an increase in quantity and quality of forage within these same stands. The loss of thermal cover and increase in forage in the proposed units would likely alter the distribution and use of habitat by deer and elk within the project area. Within the thinned units, canopy closure is expected to eventually increase over the next 10 to 15 years to the point in which most forage benefits are lost. Most of the lost thermal cover characteristics in the stands should be regained in about 15 years. Forage benefits within the regeneration harvest units would continue to be realized for approximately 20 years.

The North Clack Integrated Project would close a total of 28.5 miles of open road and reduce

open road densities in both Summer and Winter Range. Summer Range open road density would reduce to 1.4 miles per square mile which is well below what the Standard allows. Winter Range open road/OHV trail density would reduce to 2.1 miles per square mile which is slightly above what the Standard allows which is due to the high concentration of OHV trails. While substantial progress is made towards satisfying the Standard FW-208 target, the Proposed Action would not achieve it and an exception to this Standard is needed. Standard FW-210 allows for localized exceptions to Standard FW-208. Table 12 below summarizes current open road densities and Proposed Action road densities.

Table 12 - North Clack Integrated Resource Project Open Road Density Analysis.

Category	Summer Range	Winter Range	Total
Open road miles	30.0	37.8	67.8
OHV Trail Open miles	0	15.4	15.4
Closed miles	5.9	19.4	25.3
Area sq. mi.	11.1	18.2	29.3
Target density (from Standard FW-208)	2.5	2.0	N/A
Current Open Density -combined roads & OHV trails	2.7	2.9	N/A
Current Open Density -Roads only	2.7	2.1	N/A
Proposed Closure miles	13.3	15.2	28.5
Proposed Open Density -combined roads & OHV trails	1.4	2.1	N/A
Proposed Open Density –Roads only	1.4	1.2	N/A

New temporary road construction and old existing temporary roads would be reopened and reconstructed to access several of the units. These roads would not be open to the public and the only disturbance occurring as a result of these roads being opened would be from the proposed activities that would be required to open the road and to accomplish the treatments in the project area. After treatments, the roads that were opened would be closed and open-road density would be back to the current levels or reduced. The temporary increase in open road density during project operations would likely result in some deer and elk displacement.

The North Clack project area contains one of three OHV areas on the Forest, the LaDee OHV Area. The designated OHV areas concentrated legal OHV use and minimized negative OHV effects across the Forest. However, the project area contains numerous unauthorized, user-created trails. Within the project area, there are approximately seven miles of mapped unauthorized routes. The Proposed Action proposes to close and rehabilitate these unauthorized routes which would reduce negative disturbance effects to deer and elk.

Noise during project activities would cause some displacement resulting in a temporary decrease in use of the area. However, project activities would not all be occurring at the same time, but only in a few places at any one time. The potential disturbance is predicted to be small in scale, temporary in nature and would only impact a few individuals. To further mitigate the effect, a project design criteria would require noise generating activities such as harvest and

road construction to be restricted between December 1 and March 31 in the Deer and Elk Winter Range land designation area (Table 13). There would be no increase in the long-term harassment of deer and elk with the Proposed Action; effects would be short-term only.

Table 13 - Design criteria with seasonal timing restrictions for proposed North Clack Integrated Resource project activities within Deer and Elk Winter Range

Design Criteria	Units	Activities Restricted	Seasonal Restriction
J3. Deer and Elk Winter Range	2,4,6,14,16,18,20,22,24,26,28,30,32,36,40, 42-44,46,48,50,54,58,62,64,66,68,72, 85,86,88-90,92,94,96,98,100,102,106, 108,110,112,140,142,144,146,148, 150-156,158,160,162, 164-166,168, 170-172,174,176,178-180,182,84,186, 188,190-194,196,198, 200,206,210, 300,304,306,308,310,312,314,316,318, 320,322,324, 326,328,330,346,350	Harvest operations, road construction, use of motorized equipment, blasting	December 1 to March 31

Alternative 2 – Direct and Indirect Effects

Effects of this alternative would be similar to the effects of the Proposed Action with the exception of the effects of an additional 117 acres of regeneration harvest treatment. In total, this alternative proposes to treat 367 acres with a regeneration harvest that includes underburning. There would be additional beneficial effects to deer and elk with the added regeneration harvest acres due to the additional early-seral creation with an expected increase in forage production. However, unlike the 255 acres of regeneration harvest proposed in the Proposed Action, the added regeneration harvest units were not selected with forage as an objective. Most of the additional acres are not on south facing aspects and it is unknown to what extent beneficial plant indicator species exist. The quantity and quality of forage produced from the additional acres is unknown.

Cumulative Effects

Deer and elk move up and down in elevation and across watersheds depending on the season. Because the effects of this proposed project would primarily effect deer and elk while on their winter range, it was decided to limit the cumulative effects analysis area to the lower part of the Middle Clackamas River watershed (approximately 46,000 acres) that the project area and adjacent private timber lands occur in.

This analysis relies on current environmental conditions as a proxy for the impacts of past actions. This is because existing conditions reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects. The landscape pattern of vegetation within and surrounding the North

Clack Integrated Resource project area has been affected by past management, including timber harvest, OHV use, wildfires, and insect epidemics substantially impacting cover and foraging habitat for deer and elk. Past road construction, decommissioning, maintenance, and conversion to OHV trail have also contributed to the cumulative effect. These activities and events have created a landscape where early-seral and forage habitat is severely lacking, cover habitat has substantially increased, and disturbance from motorized vehicles is high. The North Clack Integrated Resource project would begin to reverse this trend.

Most of the stands proposed for treatment in the project area consist of thermal cover. There are a few patches of old-growth habitat within the project area that would provide optimal cover but these stands are not proposed for treatment. Since 1990, the Forest Service has commercially thinned approximately 5,250 acres within the North Clack Integrated Resource project area. These have short-term negative effects to cover habitats and short-term beneficial effects to forage habitat.

Most of the adjacent private lands are managed for commercial timber production. The effects of past timber harvest activities on these lands have substantially altered the landscape, modifying the patterns of vegetation and subsequent disturbance regimes to the degree that contemporary landscapes no longer function as they did historically. This has affected not only the existing forest and disturbance regimes, but the quality, amount, and distribution of deer and elk cover and forage habitat on the landscape. Based on current aerial photo data, at least 1,650 acres of the adjacent private timber land within a mile of the project area has had a stand regeneration harvest treatment (clear cut) within the last twenty years. The potential future harvest on private lands has been estimated. It is assumed that 50 percent of the private acreage would not provide thermal cover at any given time. In addition, on these private lands, the regeneration harvests are quite large with no cover in close proximity, which limits the usability of the opening. Forage availability and quantity is more of a limiting factor on-Forest, but is more available off-Forest as a result of regeneration harvest on private lands. However, forage quality within recent regeneration harvest treatment areas on private lands may be somewhat reduced due to the practice of spraying herbicides to reduce competition with newly planted conifer seedlings. In addition, there currently is nonnative, invasive tansy growing widespread across the harvested commercial timber land. Tansy can be toxic to deer and elk.

The current population trend for deer and elk on the Forest is decreasing due to the incremental reduction in early-seral habitat across the Forest. The North Clack Integrated Resource project would increase forage production and improve conditions for deer and elk and thus, ***would not contribute to a negative trend in viability on the Forest for deer and elk.***

Consistency with Direction and Regulations for Deer and Elk

Table 14 - Mt. Hood National Forest Land and Resource Management Plan Standards and Guidelines relating to Deer and Elk that are relevant to the Proposed Action alternative.

Standard and Guideline	Text	Rationale
FW-189 p. Four-71	Existing natural meadows/openings shall be maintained.	The North Clack Integrated Resource project includes a treatment to maintain and enhance a natural meadow with a prescribed burn. The project also would restore properly functioning wetlands at Tumala Meadows.
FW-191 p. Four-71	Commercial thinning unit design should consider wildlife habitat objectives, e.g. deferring treatment to provide for cover, diversity and size class diversity.	Inside thinning units, some early-seral habitats would be created. The method of leaving skips and gaps as part of the thinning prescription would create forage openings and cover opportunities scattered across the thinning units.
FW-192, FW-193 p. Four-71	Forage areas created through timber harvest units should be irregularly shaped; no portion of the forage areas should be more than 600 feet from cover.	Forage area placement and shape would be based on where palatable indicator plants are present in order to enhance these areas. This should result in irregularly shaped forage areas. No forage area would be more than 600 feet from available cover.
FW-194, FW-195 p. Four-71	As an effort to maintain stable deer and elk populations, a consistent quantity of foraging areas should be produced through timber harvest. A consistent acreage quantity of early successional plant communities created by timber harvest activities should be encouraged in all decades.	Inside thinning units, some early-seral habitats would be created. The method of leaving skips and gaps as part of the thinning prescription would create forage openings scattered across the thinning units. In addition, 255 acres are proposed to use regeneration harvest to create early-seral habitat and enhance forage with the Proposed Action and 367 acres with Alternative 2. Fifteen percent of the trees would be retained in skips and as scattered individual trees.
FW-197 p. Four-72	A consistent quantity of foraging areas per decade should be created through regeneration harvest at the area analysis level (i.e. typically 3000 to 6000 acre project planning areas).	The North Clack Integrated Resource project includes 255 acres of regeneration harvest treatment with the Proposed Action and 367 acres with Alternative 2.
FW-198, FW-199 p. Four-72	At least 40 percent and 20 percent of all timber harvest units (i.e. regeneration and commercial thinning) should provide nutritional forage enhancement for deer and elk on Inventoried winter range (Map Four-4) and summer range, respectively. Percentages should be calculated at the analysis area level, i.e. approximately 5000 acres.	The North Clack Integrated Resource Proposed Action includes 255 acres of regeneration harvest, 3,364 acres of variable density thinning that would enhance forage, and 392 acres of underburning treatments that would create quality and increased quantity of forage in both, summer and winter range. Location and size of additional forage areas would be determined based on where palatable indicator plants are present in order to enhance these areas. Alternative 2 would include an additional 117 acres of regeneration harvest and underburning treatment.
FW-202, FW-203, FW-205 p. Four-72	Optimal cover and thermal cover habitat components for deer and elk (measured at the area analysis level, i.e. approximately 5000 acres) should be maintained as follows:	The North Clack Integrated Resource project area has abundant optimal and thermal cover habitat across the project area. Cover habitat would also be left in skips within the thinning units.

Standard and Guideline	Text	Rationale
	-On inventoried Westside Cascade deer and elk winter range 20 percent should be optimal cover and 20 percent should be thermal cover. -On Westside Cascade deer and elk summer range 20 percent should be optimal cover and 10 percent should be thermal cover.	
FW-208 p. Four-72	Within the roaded portions of the Forest, by year 2000, roads open to motorized vehicle traffic should be reduced to not exceed 2.0 miles per square mile within inventoried deer and elk winter range and 2.5 miles per square mile within inventoried deer and elk summer range (i.e. outside of inventoried winter range).	The North Clack Integrated Resource project area would decommission or close 28.5 miles of road. The resulting open road densities would be 1.4 miles per square mile in Summer Range and 2.1 miles per square mile in Winter Range. The standard is met in Summer Range but is not in Winter Range due to the concentrated designated OHV area within the project area. Standard FW-210 allows for an exception to meeting this road density standard.
FW-210 p. Four-72	Localized exceptions to FW-208 road densities may occur based on the environmental analysis.	An exception to FW-208 is needed for Winter Range within the project area due to the high concentration of OHV trails designated within the project area.

5.3 Pileated Woodpecker (*Dryocopus pileatus*)

This species was selected as a Management Indicator Species because of its association with mature and over-mature habitat, and their need for large snags and decadent trees (USDA 1990).

Pileated woodpeckers can be found from southern and eastern British Columbia and southwestern Mackenzie across southern Canada to Quebec and Nova Scotia, south in Pacific states to central California, in the Rocky Mountains to Idaho and western Montana, in the central and eastern U.S. to the eastern Dakotas, Gulf Coast, and southern Florida, and west in the eastern U.S. to Iowa, Kansas, Oklahoma, and Texas (NatureServe 2018). In Oregon and Washington its range includes the Olympic Peninsula, Coastal Mountains, Klamath Mountains, Cascade Mountains, Blue Mountains, Northeast Washington, and forested fringes of the Puget Trough, Willamette, Rogue and Umpqua Valleys. Absent from higher and lower elevations due to lack of large trees for nesting, roosting, and foraging (Marshall 2003).

Pileated woodpeckers use mature and older, closed canopy stands for nesting and roosting, but may use younger (40 to 70 years), closed-canopy stands for foraging if large snags are available; large snags and decadent trees are important habitat components for pileated woodpeckers on the west side of Oregon and Washington (Hartwig 2004, Mellen 1992). The Mt. Hood National Forest monitors the amount of pileated woodpecker habitat on the Forest using the metric: acres that contain 10 or more trees per acre that are >20" in diameter. In 2016, this metric registered 596,780 acres across the Forest. Overall, this metric has been steadily increasing since the 1990 Forest Plan was written (543,240 acres in 1990) (figure 2).

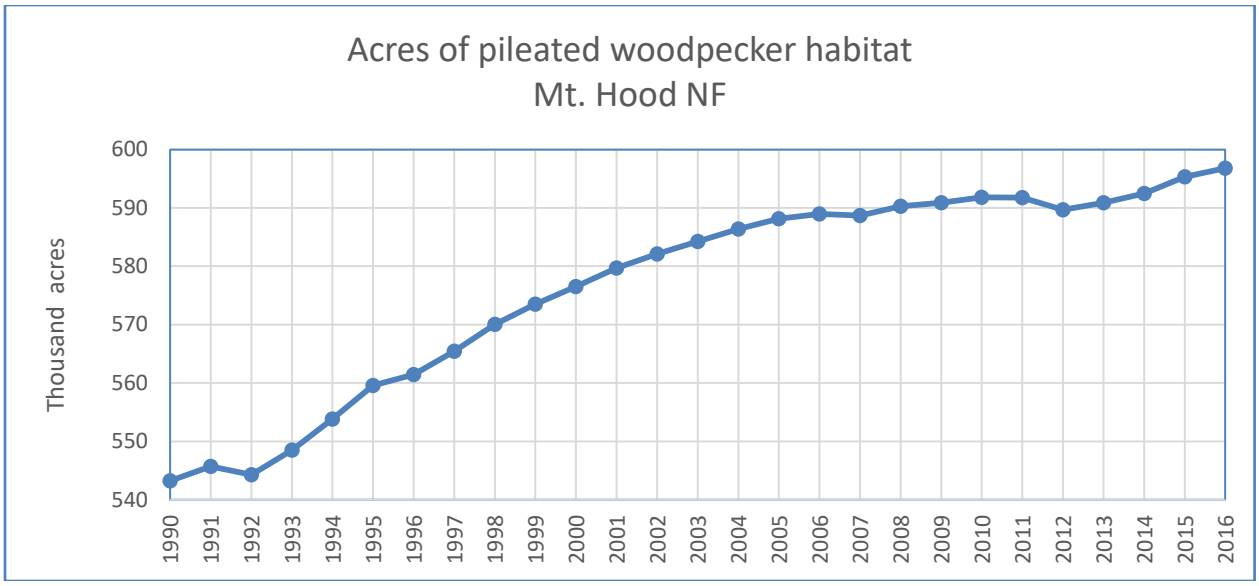


Figure 2 – Acres of Pileated Woodpecker Habitat

The association with late-seral stages comes from the need for large-diameter snags or living trees with decay for nest and roost sites, large-diameter trees and logs for foraging on ants and other arthropods, and a dense canopy to provide cover from predators. Nest cavities average 8 inches in diameter and 22 inches in depth and are excavated at an average height of 50 feet above the ground, therefore nest trees must have a large diameter in order to contain nest cavities. Because ants are the main diet for pileated woodpeckers, large diameter snags and logs with some decay are selected for foraging because carpenter ants inhabit these sites.

The mean home range for pileated woodpeckers is 1,181 acres with approximately a 9-30 percent overlap (about 200 acres) between territories. Therefore, an average home range with overlap for pileated woodpeckers would be approximately 970 acres (Mellen 1992).

Timber harvest has the most substantial effect on habitat for the pileated woodpecker. Removal of large-diameter live and dead trees, of down woody material, and of canopy eliminates nest and roost sites, foraging habitat, and protective cover. Forest fragmentation likely reduces population density and makes birds more vulnerable to predation as they fly between forest fragments. Activites that reduce the number of snags, logs, and cover may reduce the ability of an area to support nesting, roosting, and foraging for this species (Marshall 2003).

There are no B5 land allocations designated for pileated woodpecker in the North Clack Integrated Resource project area therefore there are no relevant standards and guidelines. There are 2,534 acres of the LSR land allocation within the project area, of which 191 acres are proposed for treatment. None of the LSR stands proposed for treatment are over 80 years old. There are over 6,900 acres of Congressionally Reserved Land (Wilderness and Wild and Scenic River) within the project area in which no treatment would occur. There are 202 acres within Matrix proposed for treatment with an objective to improve habitat for northern spotted owl,

which would also benefit pileated woodpecker. Snag standards and guidelines are addressed in Section 8.0 in this document. Analysis indicates that there is enough habitat present in the project area to support populations of late-seral, large home range species including pileated woodpecker.

No-Action Alternative – Direct and Indirect Effects

The No-Action Alternative would have no direct effects on pileated woodpecker because no new activities would occur. In the short-term without treatments, the plantation thin units would not provide nesting habitat and snag levels would remain essentially unchanged. In 20 to 30 years, the stands would start to differentiate to varying degrees and show an increase in the levels of small snags and small down wood. Some of the stands may eventually become suitable habitat. However, with no action, it could take as long as 60 to100 years for these stands to develop into suitable habitat. The older, fire-originated stands would likely develop into suitable habitat sooner due to the legacy tree component within many of the stands.

Action Alternatives – Direct and Indirect Effects

With the Action alternatives, potential for any direct effects on pileated woodpecker would be minimal because treatment units are not proposed within preferred pileated habitat. Pileated woodpeckers depend on large tracts of dense mature and late successional stands with large snags and a closed canopy. Few of the proposed harvest units provide nesting habitat for this species. Most of the stands proposed for treatment are younger managed plantations and range in age from about 50 to 80 years. The main threats to pileated woodpecker include activities that reduce the number of snags, logs, and cover which may reduce the ability of an area to support nesting, roosting, and foraging. The Action alternatives would temporarily reduce cover in the thinning stands by opening the stands, but as these stands respond to thinning treatments, the cover preferred by pileated woodpecker would return in 20 to 30 years. Except for snags that need to be removed for safety reasons, the number of snags and down logs that are currently in these units would not be impacted. The proposed thinning treatments include a thinning prescription that would improve the growth rate of the stands. Larger trees would eventually be provided in the second-growth stands in a shorter period than they would with no thinning. This would increase the rate that suitable nesting and foraging (large snags) habitat would be available for pileated woodpeckers. Some of the older fire-originated stands would become suitable habitat in a shorter time period due to the number of legacy trees within those stands. No legacy trees are proposed for removal. The Action alternatives also includes snag and down wood creation treatments that would help increase snag and down wood habitat until natural mortality has a chance to create more favorable conditions for snag dependent species like woodpeckers. Potential future pileated habitat would be removed with the proposed regeneration Harvest treatments. With the Proposed Action, 255 acres would be removed and 367 acres would be removed with Alternative 2.

Range-wide within Canada and the United States, the pileated woodpecker population has steadily increased from 1966 to 2015, according to the North American Breeding Bird Survey (Sauer 2017). The North Clack Integrated Resource project combined with other thinning

projects in the watershed and across the Forest would have an additive positive cumulative effect for pileated woodpeckers. The current trend for pileated woodpecker is increasing at the forest and range-wide scale and the North Clack Integrated Resource project ***would not contribute to a negative trend in viability on the Forest for pileated woodpecker.***

5.4 American Marten (*Martes americana*)

This species was selected as a Management Indicator Species because of its association with mature and over-mature habitat, and their need for large snags and large amounts of down wood (USDA 1990).

The American marten can be found throughout Canada and Alaska, south through the Rockies, Sierra Nevada, northern Great Lakes Region, and northern New England (NatureServe 2018) though its distribution is often fragmented. In Oregon and Washington, the species can be found in montane forests of the southern Oregon Coast Range, Siskiyou Mountains, Cascade Mountains, Blue Mountains, Olympic Peninsula, and northeast Washington (Marcot 2003).

American marten are typically associated with late-seral coniferous forests with closed canopies, large trees, and abundant snags and down woody (Zielinski 2001). Coarse woody debris is an important component of marten habitat. Large logs and other structures provide protection from predators, access to the subnivean (i.e., beneath the snow) space where most winter prey are captured, and protective thermal conditions, especially during winter (Buskirk 1994). A variety of structures are used for dens, with trees, snags, logs, and rocks accounting for 70 percent of reported den structures (Buskirk 1994). On the Mt. Hood National Forest the species is generally found above 3500' in elevation.

The Mt. Hood National Forest monitors the amount of American marten habitat on the Forest using the metric: acres of Forest at >3500' elevation currently in mature or late-successional stage, with >50% canopy cover. Overall this metric has been increasing since the 1990 Forest Plan was written, but plateaued between 2002 and 2005 (figure 3). From 2006 to 2011, mature/late-successional forests (>3500') acreage declined primarily due to multiple large fires in or adjacent to the Mt. Hood Wilderness and Bull of the Woods Wilderness. After 2011, marten habitat acreage leveled out as almost all fires were at lower elevations, coupled with several years of low fire activity on-forest. From 2014 to 2016, the trend for forest stands that meet this metric stayed relatively constant (252,270 to 252,320 acres). Large fires are a natural part of ecological systems, and all fires that caused this temporary decrease in habitat resulted from lightning strikes. The forest is maintaining habitat for this species, although there will be natural fluctuations in available habitat due to wildfire activity.

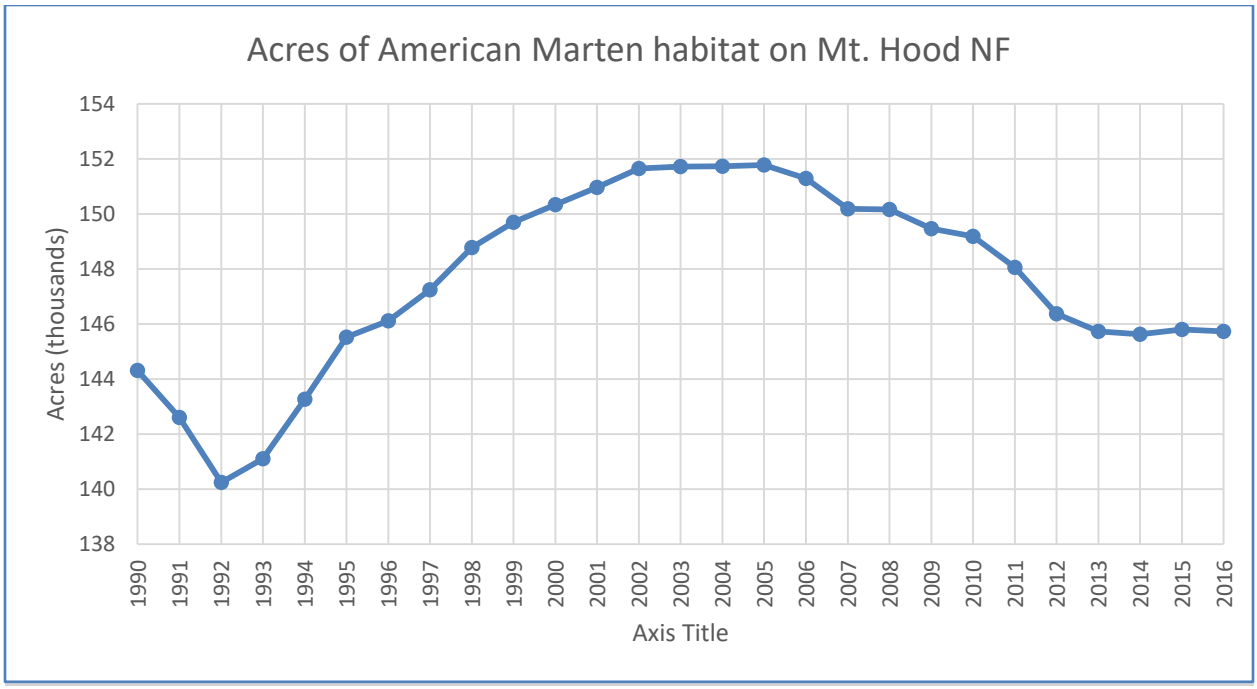


Figure 3 – Acres of American Marten Habitat

Martens prey on vertebrates smaller and larger than themselves, eat carrion, and forage for bird eggs, insects, and fruits (Martin 1994). Their diets in summer include a wide range of food types, while berries are important in the fall. As snow cover increases, martens utilize mostly mammalian prey, the most important of which are ground squirrels, mice, and rabbits. Martens forage by walking along the ground or snow surface, with forays up trees, investigating possible feeding sites by sight and smell.

Activities such as timber harvest and road construction, as well as wildfire, that fragment, dissect, and isolate habitats are the largest threats to marten (Buskirk 1994). Fragmented habitats attract habitat generalist predators like the great-horned owl, coyote, and bobcat that can all prey on marten. In addition, fragmentation eliminates the connectivity and creates isolated individuals and populations that are more susceptible to extirpation.

There are no B5 land allocations for American marten in the North Clack Integrated Resource project area therefore there are no relevant standards and guidelines. There are approximately 144 acres >3500' elevation proposed for treatment within the North Clack planning area, none of which are within mature or late-successional stands. Analysis indicates that there is enough habitat present in the project area to support populations of late-seral, high elevation species including American marten. There is no suitable marten habitat proposed for removal with this project.

No-Action Alternative – Direct and Indirect Effects

The No-Action Alternative would have no direct effects on the marten because no new activities would occur. In the short-term without treatments, the plantation and fire-originated

stands would not provide suitable habitat and snag levels would remain essentially unchanged. In 20 to 30 years, the stands would start to differentiate to varying degrees and show an increase in the levels of small snags and small down wood. Some of the stands may eventually become suitable habitat. However, with no action, it could take as long as 60 to100 years for these stands to develop into suitable habitat. The fire-originated stands would likely develop into suitable habitat sooner due to the legacy tree component within many of the stands.

Action Alternatives – Direct and Indirect Effects

With the Action alternatives, potential for any direct effects on American marten would be minimal because treatment units are not within preferred marten habitat. The marten depends on mature and late successional stands with large coarse woody debris, large snags, and a closed canopy. None of the proposed harvest units are currently suitable habitat for this species. The main threat to American marten is habitat fragmentation. There would be no additional habitat fragmentation with the proposed thinning as the treatment units are not considered marten habitat. The Action alternatives would temporarily reduce cover by opening the stands, but as these stands respond to the thinning treatments, the cover needed by American marten would return in 20 to 30 years. Except for snags that need to be removed for safety reasons, the number of snags and down logs that are currently in these units would not be impacted. The proposed treatments include a thinning prescription that would improve the growth rate of the stands. Larger trees would eventually be provided in the second-growth stands in a faster time frame than they would with no thinning. This would increase the rate that suitable habitat would be available for American marten. The fire-originated stands would likely become suitable habitat in a shorter time period due to the number of legacy trees and down wood within many of the units. No legacy trees are proposed for removal. Potential future marten habitat would be removed with the proposed regeneration harvest treatments. Due to elevation restrictions for this species, only nine acres would be removed with the Proposed Action, and 21 acres would be removed with Alternative 2.

The North Clack Integrated Resource project combined with other thinning projects in the watershed and across the Forest would have an additive positive cumulative effect for American marten. The current trend for American marten is stable and the North Clack Integrated Resource project ***would not contribute to a negative trend in viability on the Forest for American marten.***

6.0 NORTHWEST FOREST PLAN WILDLIFE REQUIREMENTS

In 1994 the Northwest Forest Plan (NWFP) developed a system of reserves, Aquatic Conservation Strategy, and various standards and guidelines for the protection of old growth associated species. Mitigation measures were also included for species that were rare, or thought to be rare due to a lack of information about them. It was unknown whether the major elements of the NWFP would protect these species. These species, collectively known as Survey and Manage species, were included in standards and guidelines under Survey and Manage, Protection Buffers, and Protect Sites from Grazing.

6.1 Survey and Manage Species

Many of the treatment units in the North Clack Integrated Resource project involves plantation thinning in stands less than 80 years of age. The standards and guidelines outlined below in the 2001 Record of Decision for the Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures are not applicable to these stands, as the Pechman exemption applies. The standards and guidelines do apply to the thinning treatments proposed in plantations or fire-originated stands over 80 years of age as well as all units proposed for regeneration harvest.

In January 2001, a Record of Decision for Amendments to the Survey and Manage, Protection Buffer and other Mitigation Measures Standards and Guidelines (2001 amendment) was signed. This decision amended the NWFP Survey and Manage and related standards and guidelines to add clarity, remove duplication, increase or decrease levels of management for specific species based on new information, and established a process for making changes to management for individual species in the future (USDA USDI 2001).

The 2001 amendment put into place a review process that would allow for the adding or dropping of species, based on new information. The 2001 amendment also grouped the species into six categories (A - F) based on level of relative rarity, ability to reasonably and consistently locate occupied sites during surveys prior to habitat disturbing activities, and the level of information known about the species or group of species. A complete description of the categories can be found in the 2001 amendment Standards and Guidelines (S&G) pages 6 through 14.

The North Clack Integrated Resource project applies the Survey and Manage species list published in December 2003 under direction resulting legal action and a district court's remedy order issued on 18 February 2014 (*Conservation Northwest v. Bonnie*, W.WA No. C08-1067-JCC) and thus meets the provisions of the 2001 *Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines*, as modified by the 2014 court order. The following species listed in Table 15 below shows current Survey and Manage species whose known or suspected range includes the Mt. Hood National Forest. Field reconnaissance, consultation with the project silviculturist, and GIS analysis was used to determine habitats that were present in the project area. Pre-disturbance surveys were not required for many of the plantation thinning treatments, as the stands are under 80 years old and the Pechman exemption applies. A total of 1,708 acres proposed for treatment in the North Clack project area are over 80 years old or proposed for regeneration harvest and required pre-disturbance protocol surveys.

Table 15 - Survey and Manage Terrestrial Species within Oregon Western Cascades Geographic Area. December 2003 species list (May 2014 Direction)

Category[6]	Species	Potential Habitat Within the Project Area?	Potential Effects?	Analysis Included in this Document?
A	Larch Mountain salamander (Plethodon larselli)	No; occurs on shady, moss-covered talus slopes and cave entrances at low to mid-elevations in late-seral forests and moist forest where soils are derived from pumice.	No; habitat not present within the project area.	No
A	Great gray owl (Strix nebulosa)	No; associated with conifer and mixed forest, ponderosa pine, and lodgepole, most frequently in old-growth on north-facing slopes; adjacent to large open meadows.	No; There are no proposed activities within old-growth stands adjacent to large open meadows within the project area.	No
C	Red tree vole (Arborimus longicaudis)	Yes; optimal habitat occurs in old-growth conifer forest, but also associated with younger stands containing large, live old-growth trees.	Yes; occurs in the project area, but units where detected were dropped or modified. No legacy old-growth trees in any unit would be removed by treatments.	Yes
A	Columbia oregonian (Cryptomastix hendersoni)	Yes; associated with moist areas under closed-canopy western hemlock forest and moist microclimates in semiarid habitat along the Columbia River.	No; could occur in the project area, but protocol surveys did not detect the species within the treatment units.	No
A	Crater Lake tightcoil (Pristiloma arcticum crateris)	No; occurs in wetlands in moist forest, often in fens or sedge habitats near open water that experience long periods of snow cover.	No; habitat not present within the project area treatment areas and protocol surveys did not detect the species within the treatment units.	No

[6] Survey and manage category definitions:
Category A = Manage all known sites; pre-disturbance surveys practical, strategic surveys
Category B = Manage all known sites; pre-disturbance surveys not practical and not applicable; strategic surveys
Category C = Manage high-priority sites; pre-disturbance surveys practical; strategic surveys
Category F = Known site management and pre-disturbance surveys not applicable; strategic surveys

Category[6]	Species	Potential Habitat Within the Project Area?	Potential Effects?	Analysis Included in this Document?
A	Dalles sideband (Monadenia fidelis minor)	Yes; usually found in moist rock talus near streams, seeps or springs and under moist woody debris or other litter near riparian corridors.	No; habitat not present within the project area treatment areas and protocol surveys did not detect the species within the treatment units.	No
B	Evening fieldslug (Deroceras hesperium)	Yes; typically inhabits low elevation, perennially wet meadows in forested habitats.	No; habitat not present within the project area treatment areas and protocol surveys did not detect the species within the treatment units.	No
B	Panther jumping slug (Hemphillia pantherina)	Yes; found under and inside logs and other forest litter and in talus in moist forest and riparian areas.	No; could occur in the project area, but protocol surveys did not detect the species within the treatment units.	No
A	Puget oregonian (Cryptomastix devia)	Yes; associated with forests where big-leaf maples occur within conifer overstory; often found on or under hardwood logs or leaf litter or rocks.	No; could occur in the project area, but protocol surveys did not detect the species within the treatment units.	No

6.1.1 Survey and Manage Survey Results

Terrestrial Mollusks

Pre-disturbance surveys for Survey and Manage mollusk species were required in 50 units proposed for treatment in the North Clack Integrated Resource project area. Protocol surveys for terrestrial mollusks (Duncan 2003) were conducted equaling approximately 1,744 acres. The surveys took place in the fall of 2017 and spring of 2018 and consisted of two visits to each unit at least three weeks apart and under strict protocol environmental conditions. The surveys did not detect any of the target terrestrial mollusk species described in Table 15 above.

In general, terrestrial mollusk habitat was marginal within the proposed treatment units. Many stands are a bit overstocked and in some sites, only trace amounts of deciduous understory and fern cover, which provide good dead leaf cover to trap moisture for mollusks. Likely reasons for not finding the Survey and Manage target mollusk species are:

- *Monadenia fidelis minor* - the North Clack project area is on the margin of its range, which is mostly in tributaries to the Columbia River in the Gorge. Also, their specific habitat of moist talus near seeps and springs was not abundant in the project area treatment units.

- *Cryptomastix devia* and *C. hendersoni* - the North Clack project area is on the southern margin of their ranges, which extend south from the Columbia River Gorge, primarily in Multnomah and Wasco counties.
- *Pristiloma arcticum crateris* and *Deroceras hesperium* - The specific riparian zones needed by these species were not included within the proposed treatment units.

Red Tree Vole (*Arborimus longicaudus*)

Red tree vole surveys were required by protocol (Huff 2012) in 22 of the proposed treatment units equaling a total of 819 acres. Surveys were not required in the other proposed treatment units primarily due to ages of the stands or elevation constraints of the species. Ground-based transect surveys detected potential red tree vole in four proposed treatment units. Follow up tree climbing surveys found evidence of red tree vole presence within these units.

The red tree vole is a small microtine rodent that is endemic to coniferous forests of western Oregon and northwestern California. Red tree voles are primarily arboreal but will come to the ground to evade predators or to move between trees if there are insufficient branch pathways between trees (Swingle 2009). Needles and twig bark of Douglas-fir is the primary food source for the species. Western hemlock, grand fir, and Sitka spruce have also been known to be consumed by red tree voles.

The red tree vole appears to be negatively impacted by thinning. From Wilson and Forsman (2013):

"Small trees in young forests generally have insufficient food resources (conifer needles) in a single tree to support breeding females, so individuals often forage in multiple trees surrounding their nests (Swingle and Forsman 2009). In closed-canopy forest, they can simply travel across interlocking branches to reach adjacent trees. Thinning breaks these connections and voles must travel down the bole and across the ground to reach other trees. This not only increases their energetic demands, it also puts them at additional exposure to predation. Second, red tree voles build nests of small twigs and conifer needles on platforms created by dwarf mistletoe, epicormic branching, forked boles, and other irregularities in tree-branching patterns. If trees with complex structure are removed during thinning, it may greatly reduce the ability of young tree voles to find suitable nest substrates. Third, young tree voles have limited dispersal ability, and the absence of red tree voles across much of northwest Oregon suggests that they may not be able to disperse across broad areas of intensively managed forest (Maser 1981)."

Wilson and Forsman (2013) recommend several relevant strategies to reduce known and potential negative effects of thinning on spotted owl prey, including red tree vole:

- Accelerate and monitor mid-story development by maintaining the desired balance of understory seedlings and saplings through underplanting, early thinning of saplings, and patchy brush control, where necessary.

- Include very young (<25 year-old) stands in the mix of stands targeted for restoring late-seral forest.
- Retain some young high-density forest on the landscape. Manning (2012) also recommend this action, emphasizing management for connectivity of unthinned, young stands.
- Experimentally evaluate alternative prescriptions to thinning, specifically those that focus solely on maintaining untreated "skips" (i.e., patches of trees left unthinned) and creating gaps (removing patches of trees).

Survey Results and Management: Presence of red tree vole was confirmed in three proposed units within the North Clack project area. Delineation and management of Habitat Areas is recommended to maintain habitat where red tree voles are known or assumed to occur, in accordance with the ROD direction to "manage habitat for the species on sites where they are located (USDA USDI 1994)." These Habitat Areas are designed to protect the physical integrity of the nests from both management activities and natural disturbances such as windthrow, and to provide a short-term approach to maintaining habitat at red tree vole sites until a stand-scale, landscape strategy is devised (USDA USDI 2000). A minimum size of 10 acres for a Habitat Area was used in the management recommendations for red tree vole nests.

Based on survey results, Habitat Areas have been established in the North Clack project area resulting in dropping approximately 94 acres from proposed treatment. This includes dropping one entire unit from proposed treatment and portions of three others.

In addition, many of the management recommendations, recommended above, to reduce potential negative effects to red tree vole due to thinning are incorporated in the proposed North Clack project treatments in both Action Alternatives. The variable density thinning treatments proposed under this project promote mid-story development. They reduce inter-tree competition and therefore accelerate the development of large live trees, which eventually turn into large snags. All legacy large live trees would be retained. Design criteria would be in place to protect legacy large snags and downed wood. Strategically placed 'skips' and 'gaps' would be utilized and buffers along streams and in riparian areas would be in place.

6.2 Additional Species with Northwest Forest Plan Requirements

The 1994 Record of Decision for the Northwest Forest Plan listed this group of species to be managed under the Protection Buffer Standards and Guidelines as applied to Riparian Reserves and Matrix lands. The 2001 Record of Decision for Survey and Manage removed this group of species to a separate standard and guideline that applies to all land allocations.

The white-headed woodpecker, black-backed woodpecker, pigmy nuthatch, flammulated and great gray owls, Canada lynx, and bats are species with standards and guidelines within the Northwest Forest Plan.

- **White-headed woodpecker, pigmy nuthatch, and flammulated owl:** These three species are generally found in mature ponderosa pine habitat on the east side of the Cascades. There is no

ponderosa pine habitat for these species present in the North Clack Integrated Resource project area, therefore the standards and guidelines and management recommendations for these species do not apply.

- **Black-backed woodpecker:** Habitat for this species is found in mixed conifer and lodgepole pine stands in the higher elevations primarily on the eastside of the Cascade Range. There is no habitat for this species present in the North Clack Integrated Resource project area, therefore, the standards and guidelines and management recommendations for this species do not apply.
- **Canada lynx:** This species is federally listed as threatened but is not known or suspected to occur on the Mt. Hood National Forest. No suitable habitat for this species occurs within the North Clack Integrated Resource project area, therefore, the standard and guideline for this species does not apply.
- **Bats:** The Northwest Forest Plan provides additional protection for caves, mines, abandoned wooden bridges and buildings that are being used as roost sites for bats. No caves, mines, abandoned wooden bridges or buildings are known to be present within the North Clack Integrated Resource project area, therefore, these standards and guidelines and management recommendations do not apply.

7.0 MIGRATORY BIRDS

Under the National Forest Management Act (NFMA), the Forest Service is directed to "provide for diversity of plant and animal communities based on the suitability and capability of the specific land area in order to meet overall multiple-use objectives." (P.L. 94-588, Sec 6 (g) (3) (B)). Direction for integrating migratory bird conservation into forest management and planning includes the January 2000 USDA Forest Service Landbird Conservation Strategic Plan; the Partners in Flight (PIF) Landbird Conservation Plans; the 2001 Executive Order (EO)13186; and the 2017 Department of Interior Solicitor's Opinion M-37050. Within the National Forests, migratory bird conservation focuses on providing a diversity of bird habitats at multiple spatial and temporal scales over the long-term. Executive Order 13186 (66 Fed. Reg. 3853, January 17, 2001) "Responsibilities of Federal Agencies to Protect Migratory Birds" directs federal agencies to avoid or minimize the negative impact of their actions on migratory birds, and to take active steps to protect birds and their habitat. Forest Service actions also include promoting migratory bird conservation through enhanced collaboration and cooperation with the Fish and Wildlife Service as well as other federal, state, tribal and local governments. A Memorandum of Understandings (MOU) was developed between the Forest Service and U.S. Fish & Wildlife Service to conserve birds including taking steps to restore and enhance habitat, prevent or abate pollution affecting birds, and incorporate migratory bird conservation into agency planning processes whenever possible. The Forest Service has implemented management guidelines that direct migratory birds to be addressed in the NEPA process when actions have the potential to impact migratory bird species of concern.

Many species of migratory birds are of international concern due to naturally small ranges, loss of habitat, observed population declines, and other factors. The Forest Plan contains a variety of objectives, standards, and guidelines that further the conservation of migratory birds.

Objectives describe desired resource conditions. The most relevant objectives for bird conservation are those relating to vegetation diversity, landscape structural diversity, snags and down woody material, riparian condition, habitat improvements, and disturbance processes. Standards and guidelines are designed to help achieve those objectives and are implemented at the project level.

Bird species of concern applicable to project-level conservation are identified by many sources including the Endangered Species Act; the Region 6 Sensitive Species list; the Forest MIS list, the USFWS' Birds of Conservation Concern (BCC) 2008 publication (USDI 2008), and the Oregon-Washington PIF Plan, "Habitat Conservation for Landbirds in the Coniferous Forests of Western Oregon and Washington Version 2" (Altman and Alexander 2012). All of these sources and their respective species of concern, except the BCC and Oregon-Washington PIF, have been examined elsewhere in this document.

The BCC 2008 publication partitions North America into 37 bird-conservation regions (BCRs). The North Clack Integrated Resource project area is included in BCR 5 – Northern Pacific Forest, U.S. portions only. The Oregon-Washington PIF plan identifies conservation strategies for landbirds in coniferous forests in western Oregon and Washington. The strategies are designed to achieve functioning ecosystems for landbirds by addressing the habitat requirements of "focal species." By managing for a group of species representative of important components of a functioning ecosystem, it is assumed that many other species and elements of biodiversity would be maintained. Table 16 below shows the disposition of migratory landbirds from the USFWS BCR-5 list of Birds of Conservation Concern and the "focal species" list of the Oregon-Washington PIF Plan relative to the North Clack Integrated Resource project.

Table 16 - Landbirds of Conservation Concern BCR 5 and Oregon-Washington PIF Focal Species List and Disposition

Species	List	Disposition
Yellow-billed Loon	BCR 5	No habitat on Forest
Western Grebe	BCR 5	No habitat in Project Area
Bald Eagle	BCR 5	Region 6 Sensitive Species
Northern Goshawk	BCR 5	Mature forest
Peregrine Falcon	BCR 5	Region 6 Sensitive Species
Blue (Sooty) Grouse	OR-WA PIF	Forested landscape mosaic
Solitary Sandpiper	BCR 5	No occurrence on Forest
Band-tailed Pigeon	OR-WA PIF	Species present on Forest. No known habitat in Project Area - Mixed conifer/deciduous forest with nearby mineral sites.
Black Swift	BCR 5, OR-WA PIF	Unknown from the Mt. Hood NF – No habitat in Project Area
Vaux's Swift	OR-WA PIF	Species present on Forest. Old growth

Species	List	Disposition
		forest with large snags – No habitat within project treatment areas
Rufous Hummingbird	BCR 5, OR-WA PIF	Open areas with forested edges and abundant nectar-producing plants
Allen's Hummingbird	BCR 5	Not found on the Mt Hood NF
Pileated Woodpecker	OR-WA PIF	Mt. Hood NF Management Indicator Species
Northern Flicker	OR-WA PIF	Open mixed conifer forest
Pacific-slope Flycatcher	OR-WA PIF	Species present on Forest. Old growth/mature forest with deciduous canopy trees
Olive-sided Flycatcher	BCR 5, OR-WA PIF	Species present on Forest. Mixed conifer forest, disturbed forest
Willow Flycatcher	BCR 5	Species present on Forest. Deciduous thickets (willows) usually near water
Hammond’s Flycatcher	OR-WA PIF	Species present on Forest. Mixed conifer forest
Horned Lark	BCR 5	No habitat on Forest
Brown Creeper	OR-WA PIF	Species present on Forest. Old growth/mature, large trees
Winter Wren	OR-WA PIF	Species present on Forest. Mature coniferous forest
Varied Thrush	OR-WA PIF	Species present on Forest. Old Growth/mature
Black-throated Gray Warbler	OR-WA PIF	Species present on Forest. No habitat in Project Area - Open mixed and oak forest with brushy understory
Hermit Warbler	OR-WA PIF	Species present on Forest. Mature coniferous forest
Orange-crowned Warbler	OR-WA PIF	Species present on Forest. No habitat in Project Area - Young deciduous forest
Wilson’s Warbler	OR-WA PIF	Species present on Forest. Riparian forest with deciduous understory - No habitat within project treatment areas
American Pipit	OR-WA PIF	Species present on Forest. No habitat in Project Area – Alpine grasslands
Oregon Vesper Sparrow	BCR 5	Large, open grass areas. Habitat in Project Area

Species	List	Disposition
Lincoln's Sparrow	BCR 5, OR-WA PIF	Montane wet meadows. Species present on Forest. Habitat in Project Area
Purple Finch	BCR 5	Wide variety of forested habitats

From "Habitat Conservation for Landbirds in the Coniferous Forests of Western Oregon and Washington Version 2" (Altman 2012):

Landbird conservation in the coniferous forests of western Oregon and Washington faces numerous challenges, most either directly or indirectly arising from conflicts with human development or economic issues. The principal conservation issue affecting breeding bird populations is forest management because of the extensive "use" of the forests for a variety of human activities and commodity production. Other issues such as habitat loss to development, diseases, increased levels of predation, and wildfire also impact bird populations to varying degrees, but are generally secondary to the consequences of forest management. For many migratory species, issues occurring outside our geographic scope also are likely affecting their breeding populations, perhaps even more substantially than forest management on the breeding grounds.

Effects of the North Clack Integrated Resource Project to Migratory Landbirds

Mixed conifer and mature forest associated species: Northern Goshawk, Blue Grouse, Rufous Hummingbird, Northern Flicker, Pacific-slope Flycatcher, Olive-sided Flycatcher, Hammond's Flycatcher, Brown Creeper, Winter Wren, Varied Thrush, Hermit Warbler and Purple Finch.

Grassland / Wet Meadow associated species: Oregon Vesper Sparrow, Lincoln's Sparrow, and Willow Flycatcher.

No-Action Alternative – The No-Action Alternative does not involve management activities and therefore, would not alter habitat conditions for migratory landbirds. Existing vegetation conditions would continue to follow current successional pathways, and bird populations would respond accordingly.

No snag habitat, used by some species of migratory landbirds, would be lost due to project activities and no snag habitat would be created within forest stands where it is currently at low densities. Additional snag habitat would occur incrementally through natural mortality in forest stands.

Action Alternatives - Thinning generally does not change habitat conditions so dramatically that bird species can no longer use the stand, but often temporarily increases or decreases bird abundance depending on species. Silvicultural treatments that promote understory shrub development, trees species diversity, deciduous trees, and the growth of larger trees; maintain snags and downed logs; and create gaps in the stand generally improve avian biodiversity. Post-treatment, additional snag habitat would be created within forest stands where it is

currently at low densities. Other proposed treatments, including 255 acres of early-seral habitat creation in the Proposed Action and 367 acres with Alternative 2, would remove habitat for some species and develop and enhance habitat for other species.

The North Clack Integrated Resource project actions provide long-term net benefits by increasing habitat diversity and sustainability. Although some actions may have short-term adverse effects on some individual birds, they are not expected to have a measurable effect on their overall habitat or at the population level. It would be expected to see some shifts in species composition post treatment within the project area, however, any effects would be short-term as more structurally diverse conditions are expected to return as these stands develop over the next 20 to 30 years. Habitat changes proposed by this project should not affect these groups of species such that their ability to persist in the vicinity of the project area or throughout their ranges and populations would not be compromised.

8.0 SNAGS and DOWN WOOD HABITAT

Across the Mt. Hood National Forest snags and downed wood exist at lower levels than the historic range of variability due to large stand replacing fires early in the 20th century, past timber harvest and firewood cutting. Between the years of 1870 to 1920, roughly 300,000 acres or nearly one third of the Mt. Hood National Forest was burned by stand replacement fires. There have also been 350,000 acres harvested since 1900. The combination of large scale stand replacing fires and harvest acres have contributed to the current situation where almost 60% of the forest is in a "mid stage" of stand development with relatively few large snags. However, in recent years large wildfires have burned around the Forest, including the 36 Pit Fire, and in the Bull of the Woods Wilderness creating some concentrations of snags.

Methodology

Analysis of current and future conditions of snag and downed wood habitat is complex. It uses knowledge about the wildlife species that rely on habitat that exists in the area along with modeling snag development into the future under different management actions. This information is combined with field reconnaissance for verification, and relevant "best available science" factors embedded in the models and analysis.

This snag and down wood analysis is based on Standards and Guidelines from the Mt. Hood Land and Resource Management Plan and the Northwest Forest Plan, DecAID Advisor analysis tool, GNN (Gradient Nearest Neighbor) analysis, and Forest Vegetation Simulator (FVS) modeling. Typically, the 5th field watershed, or other areas of at least 20 square miles (12,800 acres), is analyzed for historic and current snag levels as project level analysis is not large enough to provide a meaningful measure to include variability in stand structure and wildlife habitat (Mellen-McLean 2012). These tools and processes are described in detail below.

DecAID Advisor

DecAID is a planning tool intended to advise and guide managers in their analysis to conserve

and manage snags, partially dead trees and down wood for biodiversity (Mellen-McLean 2012). It also can help managers decide on snag and down wood sizes and levels needed to help meet wildlife management objectives. DecAID was developed to collect and synthesize the best available science on wildlife relationships with dead wood. The Guide to the Interpretation and Use of the DecAID Advisor outlines steps for conducting a dead wood analysis and can be found Online[7]. This tool is not a wildlife population simulator nor is it an analysis of wildlife population viability. A critical consideration in the use and interpretation of the DecAID tool is that of scales of space and time. DecAID is designed to be applied at scales of sub-watersheds, watersheds, sub-basins, physiographic provinces, or large administrative units such as Ranger Districts or National Forests. DecAID is not intended to directly predict occurrence of wildlife at the scale of individual forest stands or specific locations. It is intended to be a broader planning aid not a species or stand specific prediction tool.

Modeling biological potential of wildlife species has been used in the past. DecAID was developed to avoid some pitfalls associated with that approach. There is not a direct relationship between the statistical summaries presented in DecAID and past calculations or models of biological potential.

This advisory tool focuses on several key themes prevalent in recent literature:

- Decayed wood elements consist of more than just snags and down wood, such as live trees with dead tops or stem decay.
- Decayed wood provides habitat and resources for a wider array of organisms and their ecological functions than previously thought.
- Wood decay is an ecological process important to far more organisms than just terrestrial vertebrates.

DecAID takes advantage of the spatially-comprehensive dataset of vegetation structure developed for Oregon and Washington by a team from the Pacific Northwest Research Station and Oregon State University using the statistical imputation method Gradient Nearest Neighbor (GNN) (LEMMA 2015). DecAID includes a process ("Distribution Analysis") that allows use of GNN data to evaluate the current frequency distribution of different densities of snags and amounts of cover of down wood within geographic areas such as watersheds selected by users. By using inventory plot data from unharvested areas and information on historic disturbance regimes, the process also allows estimation of reference conditions for both snags and down wood (Mellen-McLean 2012).

GNN - Gradient Nearest Neighbor

GNN uses spectral data from satellite remote sensing as well as physical environmental data to relate inventory plots to the vast majority of forested portions of Oregon and Washington

[7] https://apps.fs.usda.gov/r6_decaid/views/guide_interpreting_decaid.html

lacking field measurements (LEMMA 2015). The use of remote sensing data, which are collected frequently, permits periodic updating of the GNN dataset to capture current conditions. A GNN dataset incorporating remote sensing data from 2012 has recently been released (2015), and incorporated into DecAID and is considered the current condition at the time of this analysis. Major disturbances since 2012 were not captured in this DecAID dataset. However, the DecAID team has developed an algorithm to exploit RAVG (Rapid Assessment of Vegetation Condition after Wildfire) data for wildfires of at least 1000 acres (USDA- Forest Service 2015) in order to estimate effects on density of snags. The predicted proportion of live trees converted to snags immediately after fire varies by fire severity and tree size. The analysis area includes a large fire, 36 Pit, which occurred in 2014. The GNN methodology used for this analysis is the best available science at this time to describe the condition of the snag and downed wood resources by watershed.

FVS - Forest Vegetation Simulator

FVS is an individual-tree, distance-independent, growth and yield model (Dixon 2002). It has been calibrated for specific geographic areas (variants) of the United States. FVS can simulate a wide range of silvicultural treatments for most major forest tree species, forest types, and stand conditions. The Forest Vegetation Simulator (FVS) is a family of forest growth simulation models. It is a system of highly integrated analytical tools that is based upon a body of scientific knowledge developed from decades of natural resources research and experience. FVS answers questions about how forest vegetation would change in response to natural succession, disturbances, and proposed management actions. More information on FVS can be found Online[8].

North Clack Integrated Resource Project Area Current Condition

The proposed North Clack Integrated Resource project area is entirely within the Middle Clackamas River 5th field watershed which encompasses 138,598 acres and includes approximately 10,100 acres of non-Forest Service land.

Two habitat types within the Middle Clackamas River watershed are identified in DecAID, Montane Mixed Conifer Forest and Westside Lowland Conifer-Hardwood Forest. The two habitat types occupy nearly equal fractions of the watershed; however, the North Clack project area is located entirely within the Westside Lowland Conifer-Hardwood Forest with the majority of the acreage composed of Douglas-fir and Western hemlock. The primary and secondary cavity nesting species for the Westside Lowland Conifer-Hardwood Forest are: pileated woodpecker, northern flicker, hairy woodpecker, red-breasted sapsucker, chestnut-backed chickadee and red-breasted nuthatch.

When the project area plantations proposed for treatment were first created, nearly all of the

[8] https://www.fs.fed.us/fvs/

trees were removed along with nearly all of the snags. Under current conditions, these plantations would eventually experience suppression mortality that would likely result in an abundance of small to medium sized snags and down wood. There is some large diameter down wood scattered throughout the proposed thinning units; most of which came from past harvest which left unmerchantable trees on the ground. If current conditions are left unchanged, the availability of new snags and down wood in the near future would be small to medium size.

The current amount of snags and down wood within the fire originated stands proposed for treatment is highly variable. Many of the stands have large amounts of legacy down wood and large diameter snags that are broken off at about twenty feet. A few of the stands have a large number of live and dead legacy trees as well as large amounts of down wood. Most of the stands consist of densely stocked trees that would eventually experience suppression mortality that would likely result in an abundance of small (< 10") to medium (< 20") size snags and down wood.

The project area is within a portion of the watershed that also includes much of the burned area from the 36 Pit Fire, which occurred in September 2014. More than 80% of the area within the fire perimeter on the Forest within the Middle Clackamas River 5th field watershed burned at the lowest severity mapped by RAVG, while less than 10% of the area burned at the highest severity. At the 5th field watershed scale, a relatively small pulse of new, fire created snags would be expected that would not be substantial. However, at the North Clack Integrated project area scale, the snags represent a relatively large pulse of new snags that has occurred and is still occurring and are locally abundant.

DecAID Analysis

Steven Acker, Northwest Oregon Ecology Group, applied the DecAID analytical tool to assess snag densities and down wood cover for the Middle Clackamas River watershed (Acker 2015). Distribution analyses were performed for the Westside Lowland Conifer-Hardwood Forest habitat type, which occupies 59,993 acres in the watershed. A distribution analysis compares the current condition to reference conditions as represented by the vegetation inventory distribution histograms in DecAID. The histograms displayed below illustrate the estimated density of snags for two size classes and for cover for two size classes of down wood within the Westside Lowland Conifer-Hardwood Forest habitat type within the Middle Clackamas River 5th field watershed (Figures 4 thru 7 below). The vertical axis shows the percent of the wildlife habitat type (WHT) in the 5th field watershed. The horizontal axis is the number of snags per acre or the percent cover of down wood. The reference condition from DecAID is on the left of the paired bars. The current condition bar is on the right of the paired bars. The paired bars compare what DecAID indicates is the reference condition with what the GNN satellite data tell us is the current condition on the ground. In general, for both diameter limits, more of the landscape lacks snags under current conditions than under reference conditions.

For snags, the DecAID distribution histograms show there is an over-representation on the current landscape lacking snags compared to reference conditions in the Middle Clackamas

River watershed. Some of the more dense snag conditions are under-represented at present. For snags with a minimum diameter of 10 inches (Figure 4), the portion of the landscape lacking snags is five times reference conditions. The snag density category with the greatest current deficit is 12-24 per acre. For the densest category (>36 per acre), current conditions somewhat exceed reference conditions. For snags with a minimum diameter of 20 inches (Figure 5), the portion of the landscape lacking snags is almost four times reference conditions. The snag density categories with the greatest current deficits are 2-4 and 10-18 per acre. However, most importantly, the analysis shows the lack of large snags across 40% of the Middle Clackamas River Watershed versus only 11% in the reference condition. This reflects past logging practices and would be expected to change over time as the trees in the plantations grow larger. Because of the large size of the watershed, the pulse of large snags from the 36 Pit Fire is largely diluted in the charts. Within the project area and 36 Pit Fire area, large size snags are well represented.

For down wood, the DecAID distribution histograms show that current and reference conditions for cover of down wood are generally similar for both size limits in the Middle Clackamas River watershed (Figures 6 and 7). Past fires, localized root rot outbreaks, and snag management in past harvest units have contributed to the cummulative mortality and may have created a residual of down wood at high densities about what is found in a referrence condition.

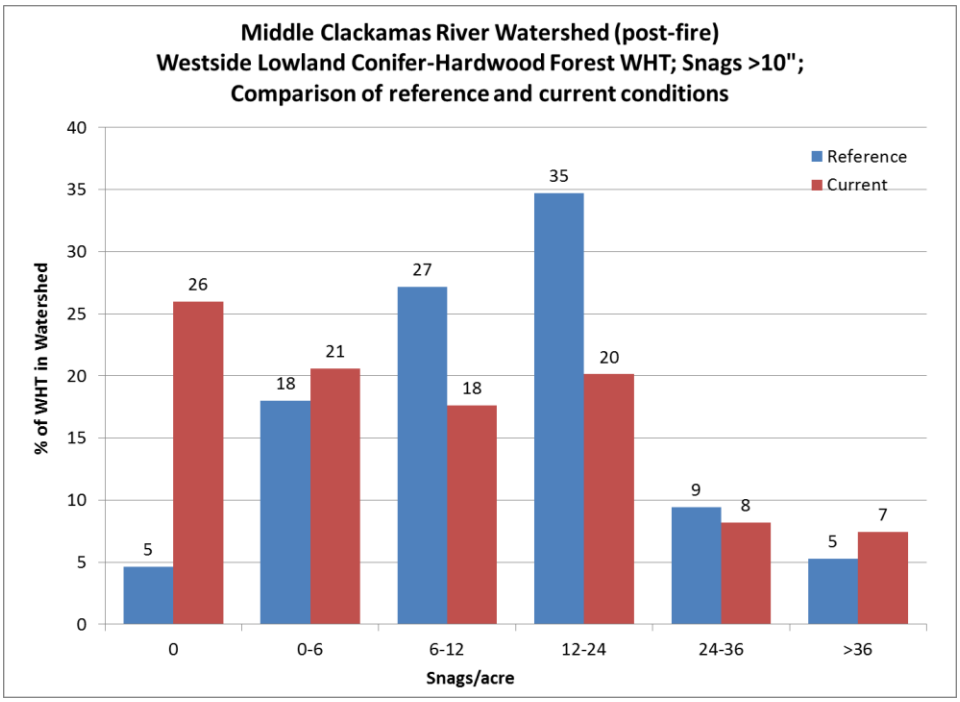


Figure 4 – Middle Clackamas River Watershed Snags Greater than 10 inches

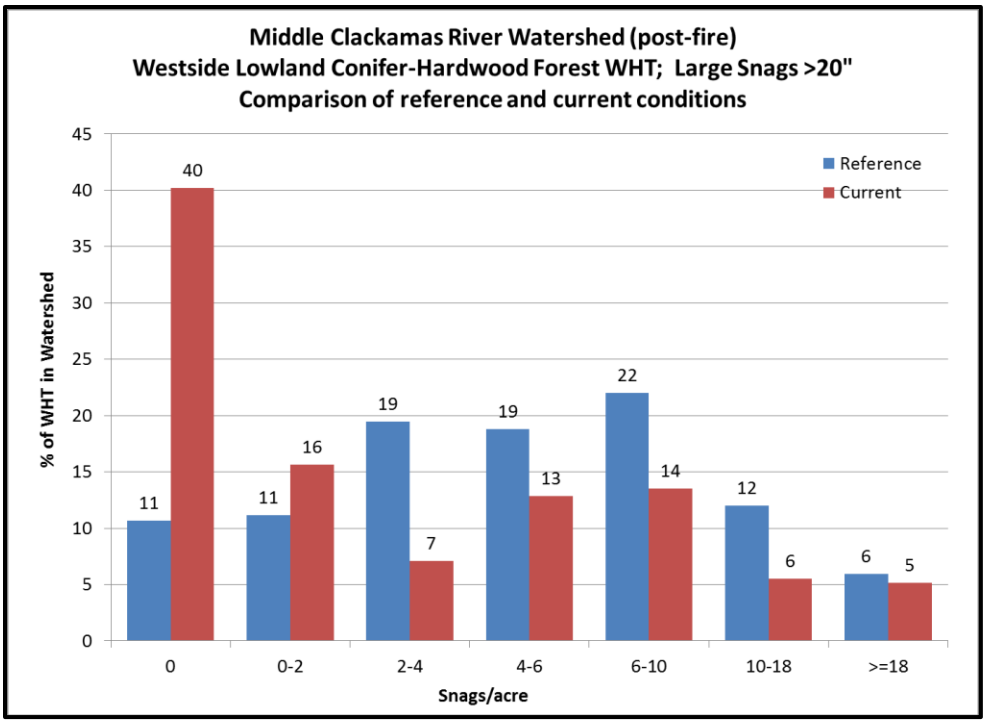


Figure 5 - Middle Clackamas River Watershed Snags Greater than 20 inches

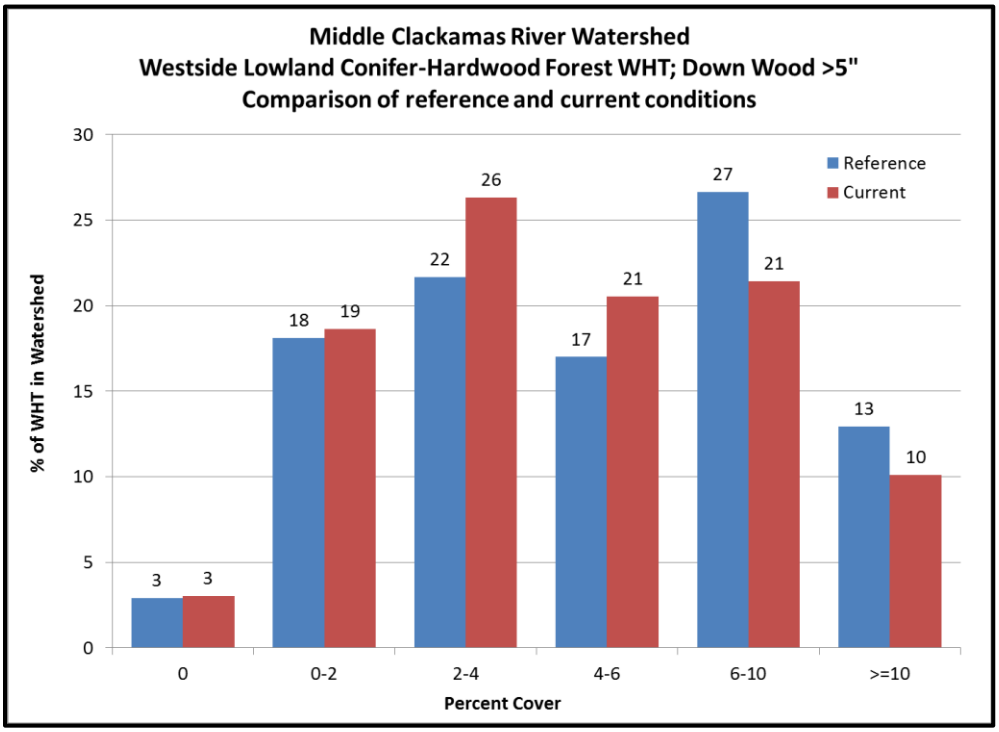


Figure 6 - Middle Clackamas River Watershed Down Wood Greater than 5 inches

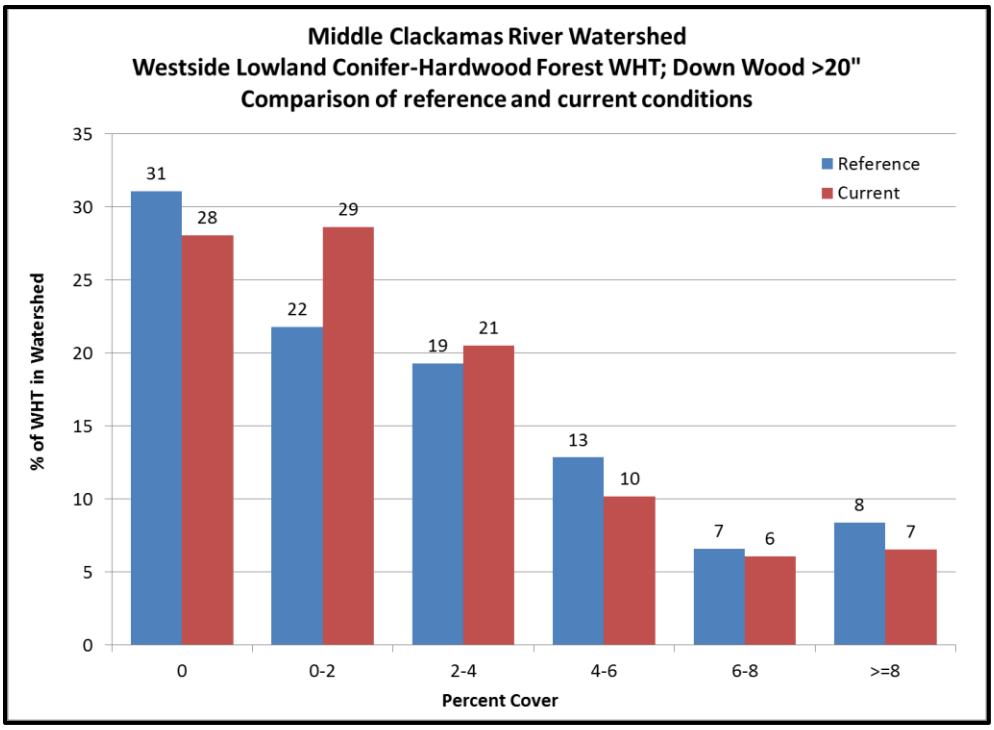
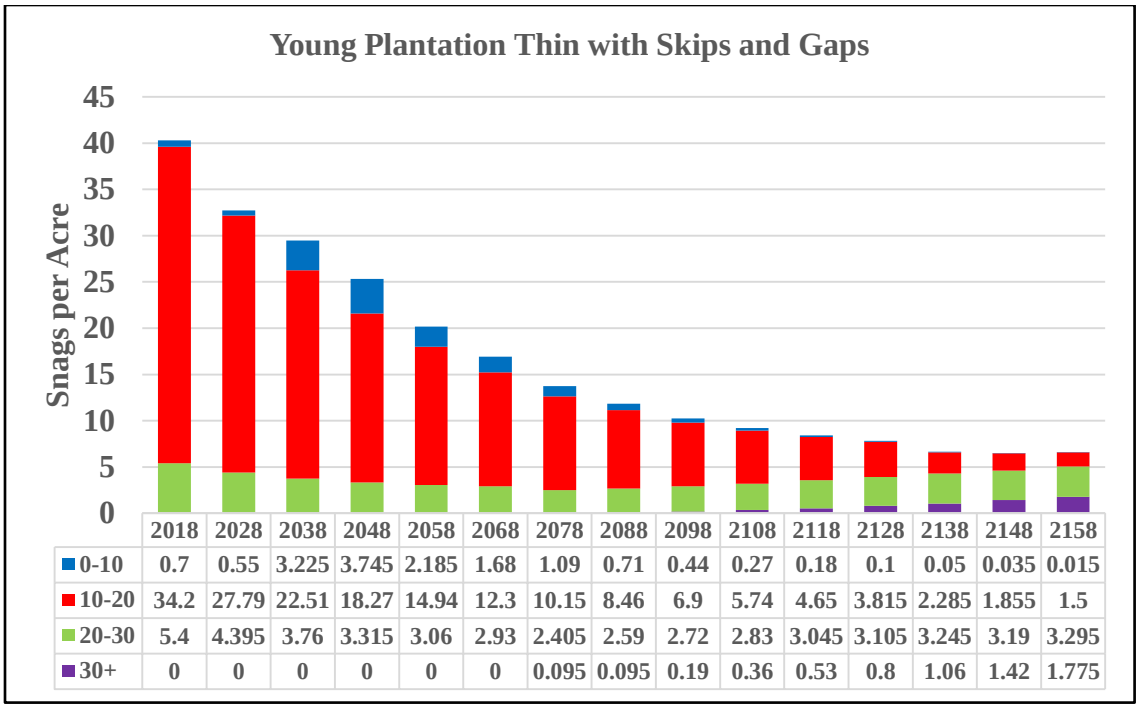


Figure 7 - Middle Clackamas River Watershed Down Wood Greater than 20 inches

FVS - Forest Vegetation Simulator

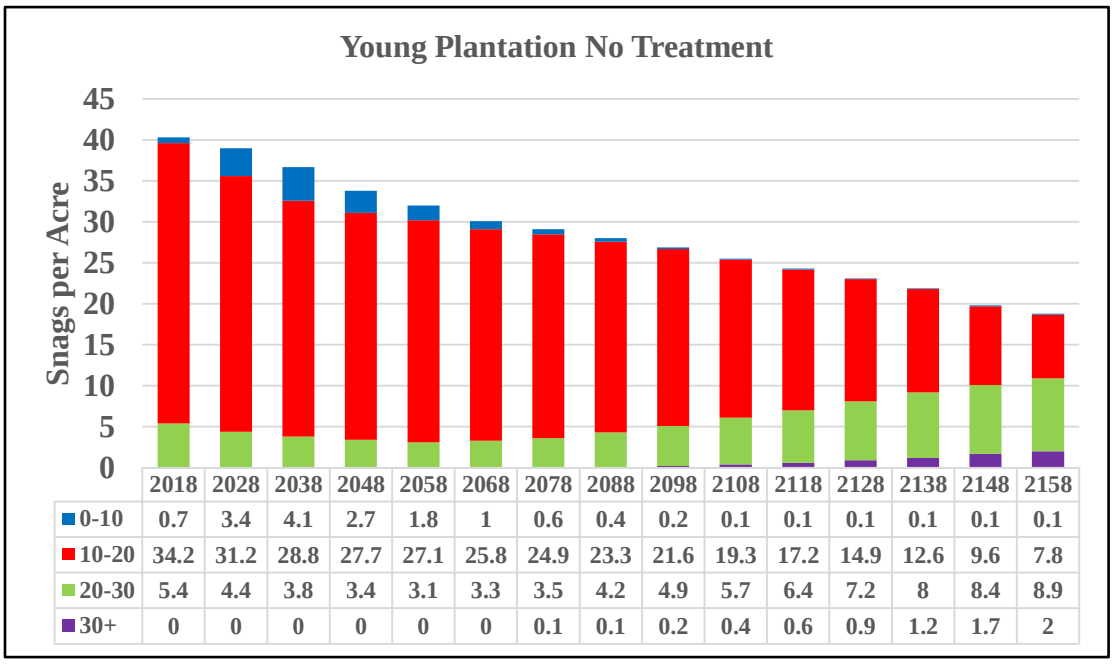
Forest Vegetation modeling can project the development of snags over time. For the North Clack Integrated Resource project the FVS model was run with the most common and representative proposed treatments for the proposed young plantation and older plantation thinning units. In addition, the model was run for a representative proposed treatment to enhance spotted owl habitat. The charts displayed below show the condition of snags from project proposal age projected out for 150 years. As a point of reference, at approximately 180-200 years of age (the age that the stand should be fully functioning as a late successional stand), the stand would benefit spotted owls, cavity nesters, and late succession adapted species. The most important component of this habitat is large soft snags: the minimum size considered a large snag is 20 inches diameter but larger snags provide more habitats for a longer period of time for a wider range of species.

The representative young plantation unit is a 56-year-old stand with a 130BA prescription (130 sq. ft. basal area) that is a weighted average that includes skips and gaps (explained further below) (Figure 8). In addition, the FVS model was run with the No-Action Alternative for the same representative unit (Figure 9). The model begins with the existing snag condition in the proposed stands which is approximately 40 snags per acre, of which nearly all are between 10-20 inch diameter and projects out for 150 years. The model, however, does not take into account the creation of snags following harvest to increase the current snags and to replace snags potentially lost during harvest from incidental loss or loss due to removal of hazard trees.



	2018	2028	2038	2048	2058	2068	2078	2088	2098	2108	2118	2128	2138	2148	2158
0-10	0.7	0.55	3.225	3.745	2.185	1.68	1.09	0.71	0.44	0.27	0.18	0.1	0.05	0.035	0.015
10-20	34.2	27.79	22.51	18.27	14.94	12.3	10.15	8.46	6.9	5.74	4.65	3.815	2.285	1.855	1.5
20-30	5.4	4.395	3.76	3.315	3.06	2.93	2.405	2.59	2.72	2.83	3.045	3.105	3.245	3.19	3.295
30+	0	0	0	0	0	0	0.095	0.095	0.19	0.36	0.53	0.8	1.06	1.42	1.775

Figure 8 North Clack Integrated Resource project proposed young plantation snag recruitment showing total snags in 10 year increments by size class following treatment to a residual basal area of 130 sq.ft.

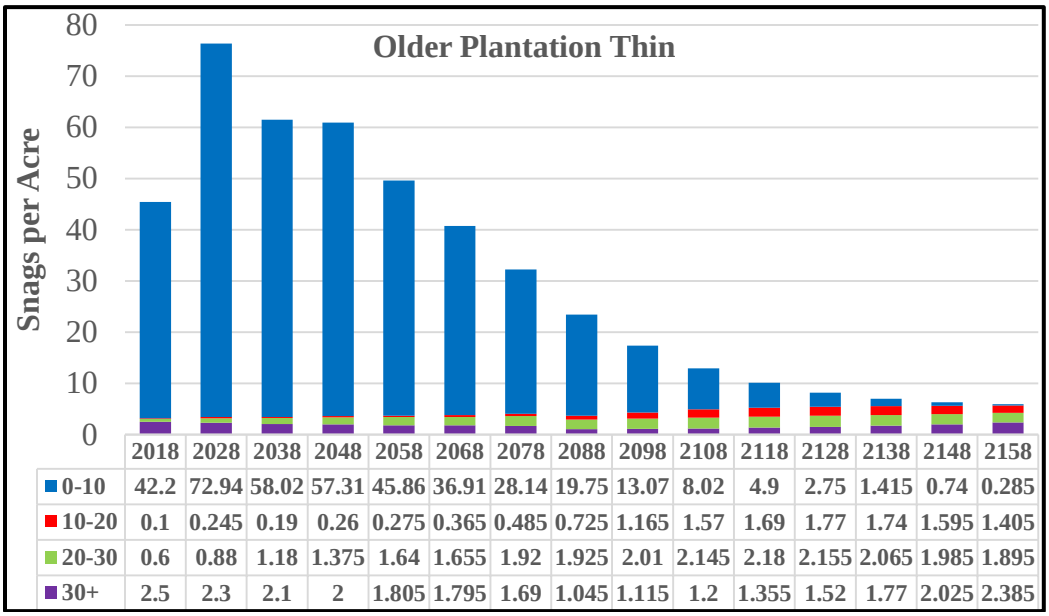


	2018	2028	2038	2048	2058	2068	2078	2088	2098	2108	2118	2128	2138	2148	2158
0-10	0.7	3.4	4.1	2.7	1.8	1	0.6	0.4	0.2	0.1	0.1	0.1	0.1	0.1	0.1
10-20	34.2	31.2	28.8	27.7	27.1	25.8	24.9	23.3	21.6	19.3	17.2	14.9	12.6	9.6	7.8
20-30	5.4	4.4	3.8	3.4	3.1	3.3	3.5	4.2	4.9	5.7	6.4	7.2	8	8.4	8.9
30+	0	0	0	0	0	0	0.1	0.1	0.2	0.4	0.6	0.9	1.2	1.7	2

Figure 9 - North Clack Integrated Resource project No-Action Alternative snag recruitment

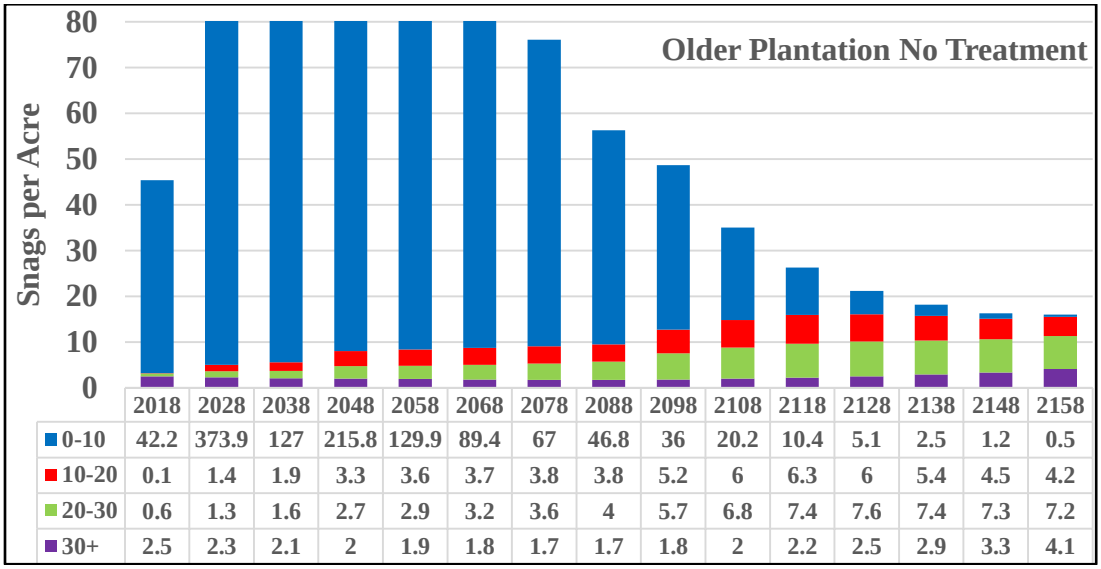
The representative older plantation unit is a 74 year old stand and the proposed treatment would bring the basal area down to 190 square feet of basal area (Figure 10). The model begins with the existing snag condition in the proposed stand which is approximately 45 snags per

acre, of which nearly all are small, between 0-10 inch diameter. In addition, the FVS model was run with the No-Action Alternative for the same representative unit (Figure 11).



	2018	2028	2038	2048	2058	2068	2078	2088	2098	2108	2118	2128	2138	2148	2158
0-10	42.2	72.94	58.02	57.31	45.86	36.91	28.14	19.75	13.07	8.02	4.9	2.75	1.415	0.74	0.285
10-20	0.1	0.245	0.19	0.26	0.275	0.365	0.485	0.725	1.165	1.57	1.69	1.77	1.74	1.595	1.405
20-30	0.6	0.88	1.18	1.375	1.64	1.655	1.92	1.925	2.01	2.145	2.18	2.155	2.065	1.985	1.895
30+	2.5	2.3	2.1	2	1.805	1.795	1.69	1.045	1.115	1.2	1.355	1.52	1.77	2.025	2.385

Figure 10 - **North Clack Integrated Resource project proposed older plantation snag recruitment showing total snags in 10 year increments by size class following treatment to a residual basal area of 190 sq. ft.**

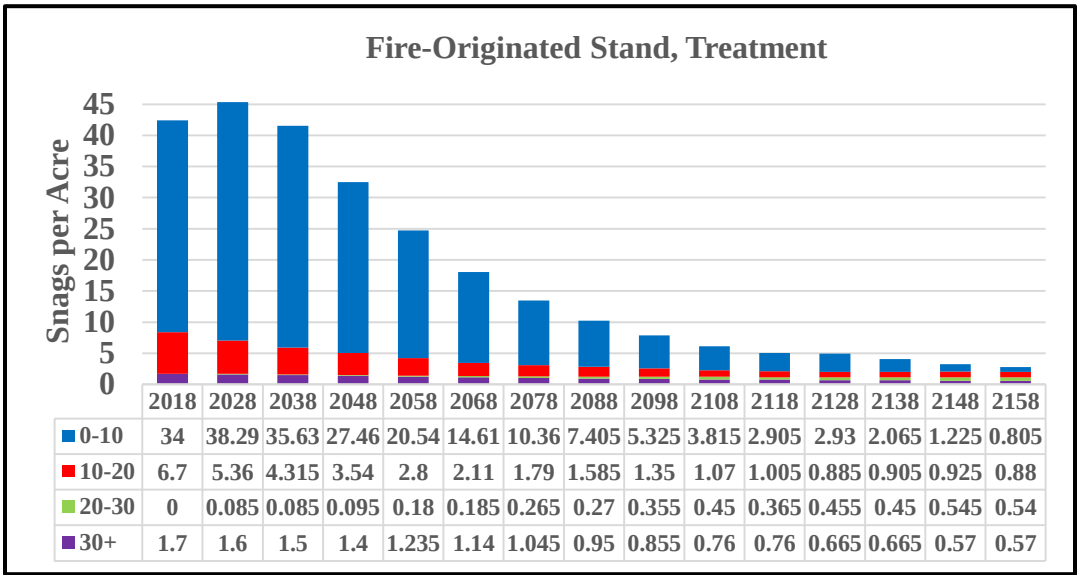


	2018	2028	2038	2048	2058	2068	2078	2088	2098	2108	2118	2128	2138	2148	2158
0-10	42.2	373.9	127	215.8	129.9	89.4	67	46.8	36	20.2	10.4	5.1	2.5	1.2	0.5
10-20	0.1	1.4	1.9	3.3	3.6	3.7	3.8	3.8	5.2	6	6.3	6	5.4	4.5	4.2
20-30	0.6	1.3	1.6	2.7	2.9	3.2	3.6	4	5.7	6.8	7.4	7.6	7.4	7.3	7.2
30+	2.5	2.3	2.1	2	1.9	1.8	1.7	1.7	1.8	2	2.2	2.5	2.9	3.3	4.1

Figure 11 - **North Clack Integrated Resource project No-Action Alternative snag recruitment showing total snags in 10 year increments by size class within proposed older plantation unit**

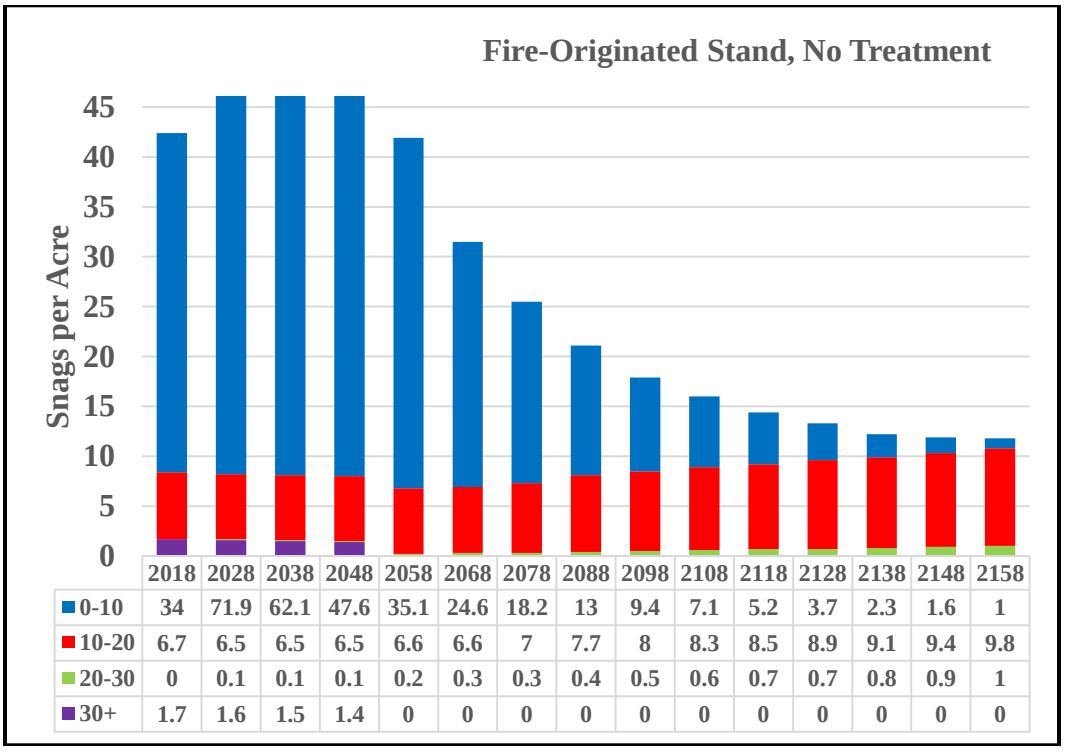
The representative unit for a fire-originated stand is a106 year old stand with a proposed thinning treatment to bring the basal area down to 190 square feet of basal area (Figure 12). The model begins with the existing snag condition in the proposed stand which is approximately 43 snags per acre, of which nearly all are small, between 0-10 inch diameter.

There are approximately 1.7 legacy snags per acre in the over 30 inch category still remaining in the unit. In addition, the FVS model was run with the No-Action Alternative for the same representative unit (Figure 13).



	2018	2028	2038	2048	2058	2068	2078	2088	2098	2108	2118	2128	2138	2148	2158
0-10	34	38.29	35.63	27.46	20.54	14.61	10.36	7.405	5.325	3.815	2.905	2.93	2.065	1.225	0.805
10-20	6.7	5.36	4.315	3.54	2.8	2.11	1.79	1.585	1.35	1.07	1.005	0.885	0.905	0.925	0.88
20-30	0	0.085	0.085	0.095	0.18	0.185	0.265	0.27	0.355	0.45	0.365	0.455	0.45	0.545	0.54
30+	1.7	1.6	1.5	1.4	1.235	1.14	1.045	0.95	0.855	0.76	0.76	0.665	0.665	0.57	0.57

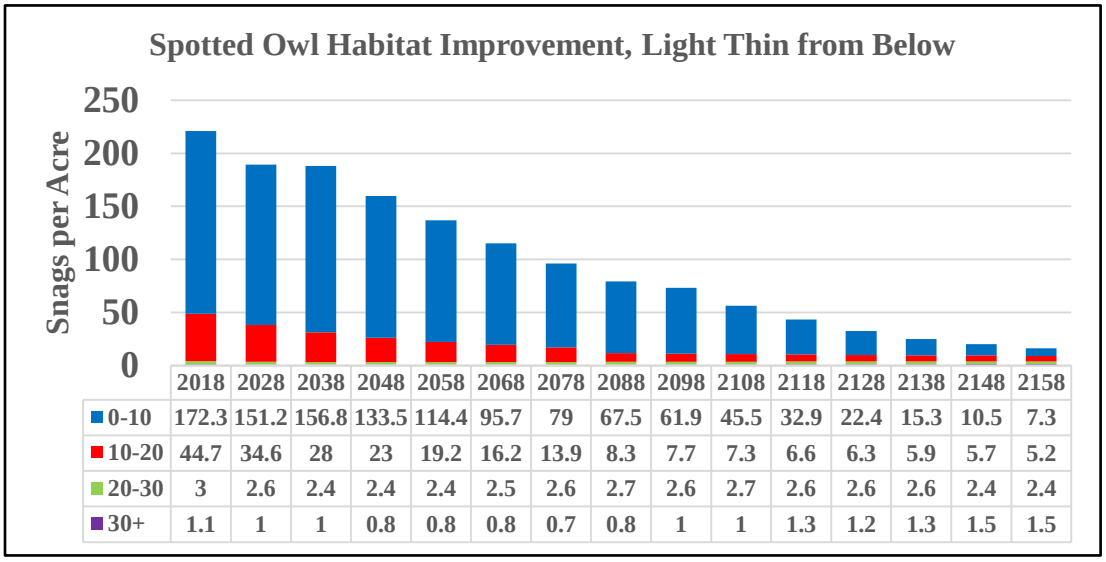
Figure 12 - North Clack Integrated Resource project proposed fire-originated stand snag recruitment showing total snags in 10 year increments by size class following treatment to a residual basal area of 190 sq. ft.



	2018	2028	2038	2048	2058	2068	2078	2088	2098	2108	2118	2128	2138	2148	2158
0-10	34	71.9	62.1	47.6	35.1	24.6	18.2	13	9.4	7.1	5.2	3.7	2.3	1.6	1
10-20	6.7	6.5	6.5	6.5	6.6	6.6	7	7.7	8	8.3	8.5	8.9	9.1	9.4	9.8
20-30	0	0.1	0.1	0.1	0.2	0.3	0.3	0.4	0.5	0.6	0.7	0.7	0.8	0.9	1
30+	1.7	1.6	1.5	1.4	0	0	0	0	0	0	0	0	0	0	0

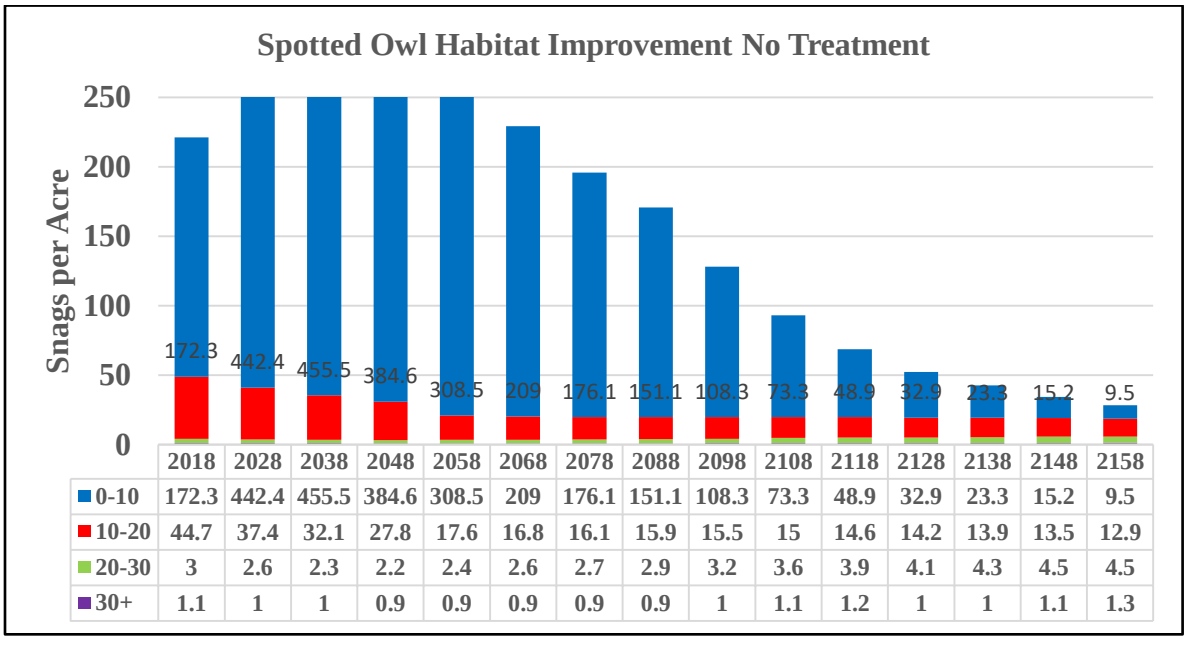
Figure 13 - North Clack Integrated Resource project No-Action Alternative snag recruitment showing total snags in 10 year increments by size class within proposed fire-originated unit.

The representative unit for improving spotted owl habitat is a 111 year old stand and the proposed treatment is a light thin from below with a residual basal area of 250 square feet (Figure 14). The model begins with the existing snag condition in the proposed stand which is approximately 220 snags per acre, of which they are primarily small, between 0-10 inch diameter. The FVS model was also run for the No-Action Alternative for the same unit (Figure 15) and shows about 50 years of dense understory of small trees of which most get shaded out and become small snags.



	2018	2028	2038	2048	2058	2068	2078	2088	2098	2108	2118	2128	2138	2148	2158
0-10	172.3	151.2	156.8	133.5	114.4	95.7	79	67.5	61.9	45.5	32.9	22.4	15.3	10.5	7.3
10-20	44.7	34.6	28	23	19.2	16.2	13.9	8.3	7.7	7.3	6.6	6.3	5.9	5.7	5.2
20-30	3	2.6	2.4	2.4	2.4	2.5	2.6	2.7	2.6	2.7	2.6	2.6	2.6	2.4	2.4
30+	1.1	1	1	0.8	0.8	0.8	0.7	0.8	1	1	1.3	1.2	1.3	1.5	1.5

Figure 14 - North Clack Integrated Resource project proposed spotted owl habitat improvement unit snag recruitment showing total snags in 10 year increments by size class following light thin from below treatment.



	2018	2028	2038	2048	2058	2068	2078	2088	2098	2108	2118	2128	2138	2148	2158
0-10	172.3	442.4	455.5	384.6	308.5	209	176.1	151.1	108.3	73.3	48.9	32.9	23.3	15.2	9.5
10-20	44.7	37.4	32.1	27.8	17.6	16.8	16.1	15.9	15.5	15	14.6	14.2	13.9	13.5	12.9
20-30	3	2.6	2.3	2.2	2.4	2.6	2.7	2.9	3.2	3.6	3.9	4.1	4.3	4.5	4.5
30+	1.1	1	1	0.9	0.9	0.9	0.9	0.9	1	1.1	1.2	1	1	1.1	1.3

Figure 15 - North Clack Integrated Resource project No-Action Alternative snag recruitment showing total snags in 10 year increments by size class within proposed northern spotted owl habitat improvement unit.

Discussion on FVS Snag Recruitment Model

The figures above show stacked bars with the largest size snags at the bottom and progressively smaller snags added as the bar goes up. The total quantity of snags can be visualized by looking at each colored portion of each bar. Each colored portion of the bar represents a different size class of snag. The Action alternatives plantation thinning treatment graphs represent a weighted average that combines the projected snags for skips, gaps, and standard thinning proposed for the majority of the thinning units. The weighted average includes 5% attributed to skips, 10% to gaps, and 85% to the thinning area. Skips are areas not thinned and include riparian protection buffers as well as smaller skips scattered in the harvest units. Snag development in skips would be similar to what is projected for the No-Action Alternative. Leaving skips where suppression processes can occur would produce snags (Lutz 2006). Gaps are small openings scattered in the harvest units. Gaps would naturally regenerate to young trees, and as time goes by they would likely resemble skips with an age younger than the surrounding stand. The model also included an assumed flush of natural regeneration in the gaps and thinned area post treatment.

Based on the FVS snag recruitment model the proposed North Clack Integrated Resource project thinning treatments would result in a lower total number of snags within the harvest units versus the No-Action Alternative. Thinning in young stands does promote the development of larger diameter *green trees* faster over time than in un-thinned stands (Davis 2007, Garman 2003). The reduction of trees during treatment would result in less available trees to naturally die and become snags. In addition, the reduced competition from the thinning reduces density-dependent mortality in the residual trees, allowing them to be healthier and live longer before succumbing to competition, insects, or disease to become a snag. In units proposed to enhance spotted owl habitat, the No-Action Alternative model suggests that by year 2048 you get attributes of old growth-multistructure, whereas in the proposed action the model suggests it shows by 2038, ten years before the No Action.

The North Clack Integrated Resource project also would create snags and down wood within thinning units where they are lacking. The proposed action states:

Except in certain root rot patches where snags are abundant, live trees would be treated within harvest units and protection buffers to provide future snags and down wood. Tree topping is generally the technique used to create longer lasting snags and to create live trees with decay. Girdling is the technique used to create snags quickly but they decay and fall over sooner and become down wood. Some trees are felled to get immediate down wood. After harvest, and after one or two winters elapse, the units would be examined to determine whether trees died or fell down. In areas where the following target levels are not already met, additional trees would be topped, felled or girdled. In LSRs, there should be three trees per acre with broken tops, five trees per acre should be dead and two trees per acre should be on the ground. Thinning outside of LSRs, there should be one tree per acre with a broken top, and two trees per acre should be either dead or down. Within the regeneration harvest units, a similar number of snags would be created, however they would be located along the unit edges. If

trees need to be treated to meet these numbers, they would be treated farther than one tree-height from system roads to minimize safety issues and potential losses from firewood gathering.

The creation of snags as described in the proposed action would help increase snag and down wood habitat until natural mortality has a chance to create more favorable conditions for snag dependent species. The largest available size class of trees would be utilized for snag creation. However, it should be noted that often the largest size class available are small diameter (< 20 inches) trees and would not contribute to the large snag totals over time. In the short term, artificially creating snags would help mimic the snag condition for untreated areas as shown in the No-Action Alternative chart results above. Research has shown that small diameter snags are used by wildlife, primarily for foraging (Mellen-McLean 2012, Hagar 2009). Hagar (2009) found the density of cavity-associated birds to be greater in thinned vs. unthinned stands, though very few birds were found actually nesting in the small snags available. Artificially-created small diameter snags in thinned units would provide foraging habitat from about year five (Hagar 2009). Kilgo and Vukovich (2014) found an increase in woodpecker abundance three years post artificial snag creation versus untreated control plots. However, the tendency is for cavity-nesting birds to use snags of larger size than smaller snags, even with cavities, overall (Zack 2002). The majority of wildlife species utilize larger snags >18" (Mellen-McLean 2012), in which these larger diameters meet multiple life cycle needs.

Comparison of Effects to Snags and Down Wood by Alternative

No-Action Alternative

The No-Action Alternative would not have any management activities and therefore would not alter snag and down wood densities. Existing vegetation conditions would continue to follow natural successional pathways, with snags and down wood responding accordingly as represented in Figures 9, 11, 13, & 15. Snags and large down wood would continue to be created by the various natural mortality agents: insects and diseases, wildfire, windthrow, snowthrow, as well as suppression mortality. In the next 40 to 50 years, these stands would continue to experience increased stand density and become increasingly more susceptible to natural mortality agents and would recruit new snags and down logs, mainly from the smaller intermediate and suppressed trees. The No-Action Alternative would have no direct, indirect, or cumulative effects on snag and down wood in the project area. For comparison purposes, the No-Action Alternative would likely provide more snags overall at maturity than the Action alternatives (Figures 8, 10, 12, & 14).

The Forest would continue to manage the road and trail system for public safety which includes the felling of hazard trees.

Action Alternatives

The North Clack Integrated Resource project would increase the health, growth and diversity of forest stands by altering vegetative structure, density, and composition in mid-aged stands by

variable density thinning with skips and gaps within plantations and fire-originated stands. Thinning such stands can increase the growth, health, and vigor of uncut trees, and can accelerate the development to older, late-successional forest. Snags would also be created for the regeneration harvest treatments, but they would be created from trees around the edges of the units. North Clack Integrated Resource project design criteria to protect or enhance existing snag and down wood habitat is part of both Action alternatives. The snag and down wood design criteria includes the following:

- To enhance diversity, variable-density thinning would include the retention of snags and wildlife trees. The snags within plantations are small planted trees that have died. Few if any legacy snags are present.
- Snags would be retained in all units where safety permits. If snags must be cut for safety reasons they would be left on site.
- To increase the likelihood that snags would be retained, they may be included in skips.
- Certain live trees would also be selected as leave trees that have the "elements of wood decay" as described in the DecAID advisor. This may include trees with features such as dead tops, broken tops and heart rot. They may be retained in skips.
- Old down logs currently on the forest floor would not be removed.
- Additional down woody debris would be generated by thinning. This would include the retention of cull logs, tree tops, broken logs and any snags that would be felled for safety reasons.
- Some units may have standing trees that were girdled or topped in the past. These would be protected where feasible.

The increased health and resistance of the thinned forest stands to future insect infestations and disease would make natural snag development less likely for the next 20 plus years. To help mitigate this, and as stated above, creation of additional snag and down wood habitat would occur in units post-harvest where these elements are lacking.

Some snags would be difficult to retain during harvest activities and road construction because of their inherent instability and danger. It is likely that some snags would need to be cut down during harvest operations due to safety considerations and that some downed logs would be degraded through the process of harvesting. Some aspects of the proposed actions are specifically designed to attempt to maintain snags and down logs by the strategic placement of skips around snag and down wood patches as well as the placement of skid trails and landings. All snags and down wood that need to be cut or moved but would remain on site.

Snags that are left standing after proposed treatments would be more prone to wind damage and snow breakage than they would have been without treatment. There would likely be some loss of these snags within 10 years after harvest which would become down wood. This highlights the importance in planning skips to include areas with the greatest concentration of naturally occurring snags.

Some live trees would be selected as leave trees that are defective or have the elements of decay as described in DecAID advisor. Hollow structures are created in living trees by heart rot

decay organisms over many years. These hollow structures in living trees provide especially valuable habitat for a variety of wildlife, including cavity users. Trees that have heart rot decay present may include features such as, openings in the bole, broken boles with bayonet tops, large dead tops or branches, old wounds on the bole, crooks in the bole signifying previous breakage, and the presence of fruiting bodies. Defective trees with deformities such as forked tops, broken tops, damaged and loose bark or brooms caused by mistletoe or rust can also provide important habitat for a number of species.

Logs existing on the forest floor would be retained. Prior to harvest, sale administrators would approve skid trail and skyline locations in areas that would attempt to avoid disturbing key concentrations of down logs or large individual down logs where possible. The harvest operations would also add small woody debris of the size class of the cut trees at the site. This would include the retention of cull logs, tree tops, broken logs and any snags that would be felled for safety reasons. Snags or green trees that fall down after the harvest operation would contribute to the down wood component of the future stand.

Under the Action alternatives, skips and streamside protection buffers would provide short and mid-term recruitment of snags and down wood similar to the level described for the No-Action Alternative (Figures 9, 11, 13, & 15). Large snags and large down wood would continue to be provided in the late-successional habitat and Wilderness within the watershed until the treatment units begin to provide progressively larger snags and down wood as the stands get older.

Currently tree sizes within the proposed younger plantations average 13.7 inches diameter and average 16.6 inches diameter in the proposed older plantation stands. The average tree size in the fire-originated stands is 15.5 inches diameter. The proposed treatments would reduce the amount of suppression mortality that would occur without treatment. Some of the snags and downed logs that might have formed in the future from the death of the intermediate and suppressed trees would be removed through the timber harvest. As a result, the Action alternatives would delay the attainment of snags less than 20 inches in diameter and down wood through natural process because of the reduction in density of the stands. This effect changes the trajectory for snag development compared to the No-Action Alternative and reduces the number of trees available to become snags. The post treatment creation of snags can help mitigate the reduction of under 20 inch snags in the short term. The proposed thinning treatments also result in larger live trees in the future that could be treated manually to create additional large snags if needed.

Structural diversity would be improved by initiating a new age class and by creating openings (gaps). Structural diversity is a combination of several stand characteristics including the amount of canopy layers, snags, and down wood. The plantations and, most of the, fire-originated stands proposed for thinning under the Action alternatives are currently highly stocked even-aged stands. The stands have slowed growth and in many stands, large snags are lower than reference conditions. Thinning can have both immediate effects on forest diversity and long-term effects restoring native plant communities as understory species are released

and provide a source for future snag and down wood recruitment. Thinning would also have an indirect impact by releasing the green retention trees. These retention trees would later become large diameter snags and down wood. While there may be an overall reduction in the trajectory of snag creation versus the No-Action Alternative, the proposed thinning would provide other ecological benefits by allowing trees to grow larger and faster, increase structural diversity, and to develop other suitable wildlife habitat characteristics (e.g., large limbs, crowns, etc.).

Within the proposed regeneration harvest units of both Action alternatives, 15% of each unit would be retained in clumps and individual trees. In the long term, these retained trees would be considered as future snags and down wood. While the Action alternatives would have fewer snags and less down wood, there would be sufficient quantities in units and across the landscape to provide for the needs of dependent species over time.

Cumulative Effects to Snags and Down Wood

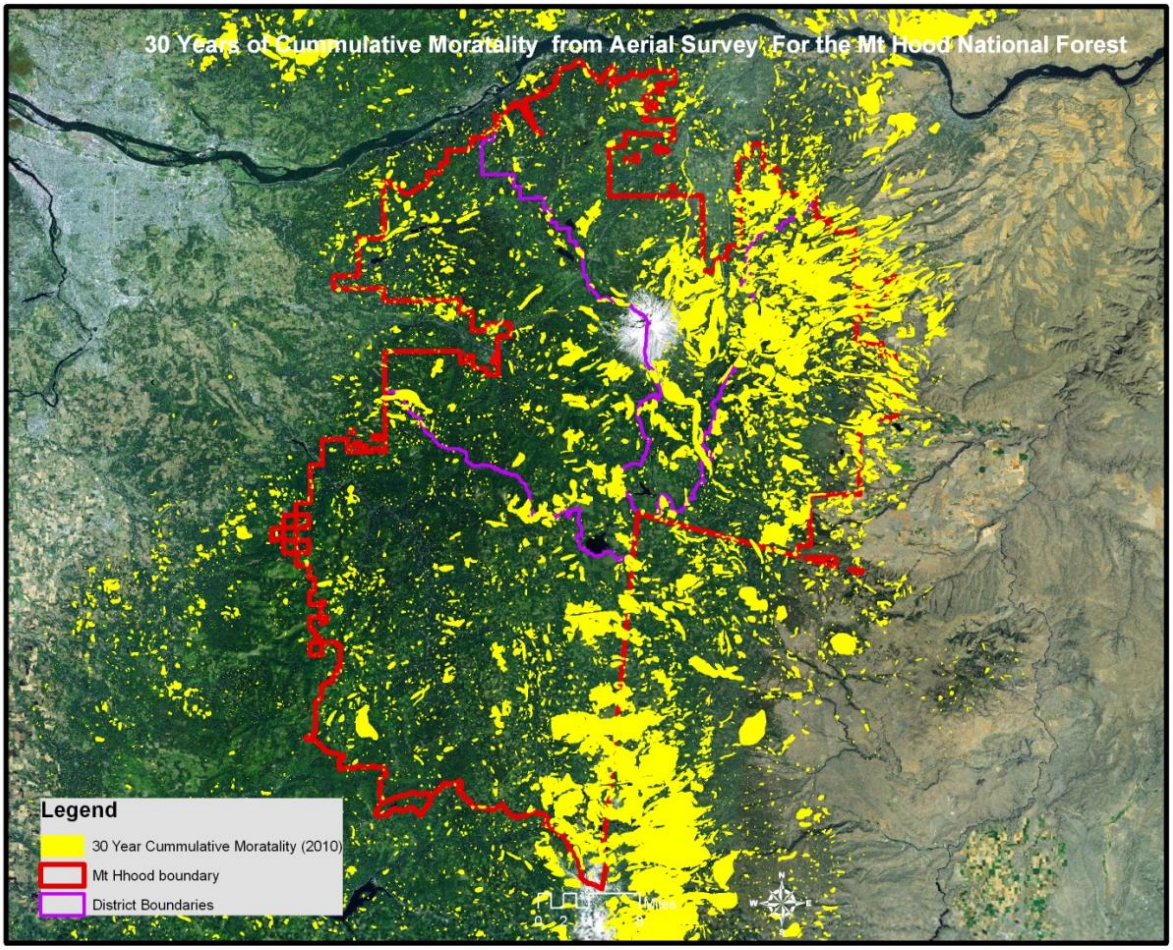
The analysis area for snags and down wood is the Middle Clackamas watershed and this analysis relies on current environmental conditions as a proxy for the impacts of past actions. This is because existing conditions reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects. Across the Mt. Hood National Forest, snags and down wood exist at lower levels than the historic range of variability due to large stand replacing fires early in the 20th century and past timber harvest and firewood cutting which has created the current situation where almost 60% of the forest is in a "mid stage" of stand development with relatively low levels of large snags. The logging actions that occurred 50 or more years ago have still left areas with few large snags or down logs. The fires that occurred approximately 100 years ago created abundant down wood and in some cases, the snags that were created then still remain. There is also private land within the cumulative effects area and are included in the DecAID analysis. These private lands are not typically managed for snags or down logs and the clearcuts there are, essentially, devoid of dead wood. There are no ongoing or foreseeable future actions that would affect snags or down wood to include in this analysis.

Figure 16 below shows 30 years of cumulative mortality for the Mt. Hood National Forest. This map was created in 2010 from a GIS analysis of aerial survey results from the previous 30 years. The cumulative mortality from insect and disease is a cumulative effect. The cumulative mortality from insect and disease regularly creates new snags and down wood. Because snags are created in random patches of varying densities by insects and diseases it is not prudent to try to make a direct comparison of acres. However, the mapped mortality does demonstrate the extant of natural mortality of trees that is creating snag and down wood habitat across the Forest. This natural mortality creates an environment that is sustaining for snag and down wood dependent species.

While both large and small snags are currently limited across the Forest and the Middle Clackamas River 5th field watershed, conditions are improving as stands age. While the snags created from the 36 Pit Fire were included in the DecAID analysis, their effect is diluted

somewhat due to the very large size of the Middle Clackamas River watershed. At a more local scale, the snags created by the fire are in relatively close proximity to the proposed harvest units and benefit snag dependent species locally. Also, some fire stressed trees that survived the fire have been dying a few at a time. DecAID analysis shows that down wood in the large size class is currently at about the same levels as the reference conditions for the Middle Clackamas 5th field watershed (Figure 7).

Past harvest activities across the analysis area has reduced the overall abundance of snags, although there are still abundant small and large snags in the mature forests within the North Clack Integrated Resource project boundary as well as the adjacent Wilderness. Since 1990, the Forest Service has commercially treated, or is treating, approximately 5,250 acres within the North Clack project area. Current science and the changing trend in timber management that has occurred within the past decade, and is projected for the future, should positively influence management of snags and down wood as previously harvested stands redevelop, and more emphasis is placed on retention of key structural components in harvested stands.



30 Year Cummulatiave Mortality for Mt Hood National Forest 2010

Figure 16 – Cumulative Mortality

The slight reduction in snag and down wood that would occur during project activities

combined with the other recent projects would be offset by the influx of snags and down wood from insects and disease that continues to occur. Untreated areas within the project area and adjacent Wilderness would continue to contribute snags and down wood across the landscape. In addition, the creation of snags and down wood within treatment units would supplement the existing dead wood in the project area. The North Clack Integrated Resource project activities are therefore likely to have little cumulative effect on snag and down wood habitat throughout the project area. The overall effect on snags and down wood for the watershed as a result of this project is that snags and down wood would be retained and created and would bring the watershed closer to the range of historic variability and would result in a situation where the needs of snag dependent species are being met across the landscape now and into the future. The impacts and benefits of the activities proposed in the Action alternatives, when added to past, current and foreseeable actions, would not result in substantive cumulative effects.

Consistency with Direction and Regulations for Snags and Down Wood

Table 17 - Mt. Hood National Forest Land and Resource Management Plan and Northwest Forest Plan Standards and Guidelines relating to snag and down wood habitat that apply to the North Clack Resource Project

Standard and Guideline	Text	Rationale
FW-163 FW-164 p. Four-68	A continuous supply of hard snags for community structural diversity shall be maintained in harvested areas. At least 2 to 3 hard snags and 2 to 3 live trees per acre should be retained in harvest units.	All existing snags would be retained in treatment units except for safety concerns. In thinning units, live trees would be retained at an average of at least 130 sq.ft. basal area and 15% green tree retention for live trees in regeneration harvest units. Snags would be created in thinning units that are deficit post treatment. The largest available trees of the cut tree component would be utilized.
FW-166 FW-167 p. Four-68	A continuous supply of down woody material shall be maintained in harvested areas. Within westside-Cascade Forest communities, at least 6 large, hard logs per acre, each at 40 cubic feet in size, should be retained in harvest units.	All existing snags and large down wood would be retained in treatment units except for safety concerns. Snags and down wood would be created in thinning units that are deficit post treatment. The largest available trees of the cut tree component would be utilized.
FW-215 p. Four-74	Where new timber harvest units occur (e.g. regeneration harvest and commercial thinning), wildlife trees (i.e. snags and green reserve trees) should be maintained in sufficient quantity and quality to support over time at least 60 percent of the maximum biological potential of primary cavity nesting species, e.g. woodpeckers.	All existing snags would be retained in treatment units except for safety concerns. Live trees would be retained at an average of at least 130 sq.ft. basal area in thinning units and at least 15% of regeneration harvest units would be retained. Snags would be created in thinning units and around the edges of regeneration harvest units that are deficit in snags post treatment. The largest available trees of the cut tree component would be utilized. In addition, skips and untreated riparian reserves would contribute additional snags and green reserve trees. The 60 percent biological potential for primary cavity nesting species would be met based on USDA (1995) and would increase through time as stands continue to

Standard and Guideline	Text	Rationale
		mature.
FW-216 FW-217 p. Four-74	Measured at the Forest and/or area analysis level (i.e. approximately 5000 acres), at least 40 percent of the maximum biological potential of cavity nesting species shall be maintained through time. If the Forest and/or analysis area is deficient in providing sufficient quantity and/or quality of wildlife trees to support the 40 percent biological potential through time, wildlife tree prescriptions for new timber harvest units and project areas shall compensate for the deficiency.	See rationale for standard FW-215 above. In addition, untreated areas, including LSRs and riparian reserves, adjacent Wilderness, as well as previously treated areas would contribute to meeting at least 40 percent potential of cavity nesting species at the larger landscape level. It is expected that this would continue to increase through time as stands mature. The 36 Pit Fire, also, continues to contribute large snags to the landscape as fire stressed trees die.
FW-218 p. Four-74	Wildlife tree prescriptions shall provide for all primary cavity nesting species indigenous to the treated site.	All existing snags would be retained in treatment units except for safety concerns. Live trees would be retained at an average of at least 130 sq.ft. basal area in thinning units and 15% green tree retention for live trees in regeneration harvest units. Snags would be created in thinning units that are deficit post treatment. The largest available trees of the cut tree component would be utilized. This would provide habitat for all known primary cavity nesting species within the project area.
FW-219 FW-220 p. Four-74	An average total of at least 6 logs per acre in decomposition classes 1, 2 and 3 should be retained in all project activity areas, e.g. clearcut, commercial thin, salvage, or overwood removal. Additional decomposition class 4 and 5 logs may also be retained.	All existing large down wood in all decomposition classes would be retained in all treatment units. Down wood would be created in treatment units that are deficit post treatment. The largest available trees of the cut tree component would be utilized.
FW-221 FW-222 p. Four-74	An average of 2 logs per acre should be maintained in each decomposition class 1, 2 and 3. If logs are not present in a given decomposition class, logs from lesser decomposition classes should be retained to substitute, e.g. classes 1 and 2 can substitute for class 3.	All existing large down wood in all decomposition classes would be retained in all treatment units. Down wood would be created in treatment units that are deficit post treatment. The largest available trees of the cut tree component would be utilized.
FW-223 FW-225 FW-226 p. Four-74	Logs should be at least 20 inches in diameter at the small end and have a volume of at least 40 cubic feet, e.g. a log 20 inches in diameter and 16 feet in length. Smaller size logs may be retained only if the area is incapable of producing larger trees, or the stand is too young to have 20 inch trees. In these cases, logs representing the largest tree diameter class present in the stand should be retained.	All existing large down wood in all decomposition classes would be retained in thinning units. Down wood would be created in thinning units that are deficit post treatment. In some units, few trees 20 inches diameter or larger currently exist. The largest available trees of the cut tree component would be utilized.

Standard and Guideline	Text	Rationale
FW-229 p. Four-74	No area greater than 2 acres in size, and capable of growing sufficient trees, should be without at least 2 logs.	All existing large down wood in all decomposition classes would be retained in treatment units. Post treatment surveys would be conducted and down wood would be created in thinning units that are deficit.
FW-230 FW-231 p. Four-74	Snags and wildlife trees should be well distributed. No 10-acre area capable of supporting forested conditions should be devoid of wildlife trees.	All existing snags would be retained in treatment units except for safety concerns. Post treatment surveys would be conducted and snags would be created in units that are deficit.
FW-234 FW-235 FW-236 p. Four-74 & 75	Wildlife trees retained should be at least 40 feet in height and 22 inches in diameter at breast height. Smaller trees may be retained only if the treated area is incapable of producing larger trees or if the stand is too young to have trees of sufficient size. In these cases, wildlife trees retained should be representative of the largest size class present in the stand.	All existing snags and large down wood would be retained in treatment units except for safety concerns. Snags and down wood would be created in thinning units that are deficit post treatment. In some units, few trees 22 inches diameter or larger currently exist. The largest available trees of the cut tree component would be utilized.
FW-238 FW-239 p. Four-75	Green trees (in various size classes) shall be retained to provide replacements as snag quantities decline. Emphasis should be on retaining defective green trees as long-term wildlife trees.	Live trees would be retained in thinning units at an average of at least 130 sq.ft. basal area and at least 15% of regeneration harvest units would be retained. Project Design Criteria would emphasize retaining green trees with features such as dead tops, broken tops and heart rot.
Northwest Forest Plan Matrix standards page C40	Leave 240 linear feet of logs per acre greater than or equal to 20 inches in diameter.	All existing large down wood would be retained in the thinning and regeneration harvest units. Down wood would be created in units that are deficit post treatment. In some units, few trees 20 inches diameter or larger currently exist. The largest available trees of the cut tree component would be utilized.
Northwest Forest Plan Matrix standards page C40	Coarse woody debris already on the ground should be retained and protected to the greatest extent possible from disturbance during treatment (e.g., slash burning and yarding) which might otherwise destroy the integrity of the substrate.	All existing large down wood would be retained in the treatment units and protected to the greatest extent possible. Areas with high density of large down wood would be highly considered for inclusion in skips.
Northwest Forest Plan Matrix standards page C41	Emphasize green-tree and snag retention in Matrix management. Retain at least 15 percent of the area associated with each cutting unit (stand). Only Matrix lands count toward the 15%. As a general guide, 70 percent should be aggregates of moderate to larger size with the remainder as dispersed structures (individual trees and smaller clumps).	At least 15% of regeneration harvest units would be retained in green tree aggregates and smaller clumps and individual trees. All existing snags would be retained in treatment units except for safety concerns.

Standard and Guideline	Text	Rationale
Northwest Forest Plan Matrix standards page C42	As a minimum, snags are to be retained within the harvest unit at levels sufficient to support species of cavity-nesting birds at 40 percent of the potential population levels.	See rationale for standard FW-215 above.

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