United States Department of Agriculture
Forest Service

Stone Creek
Vegetation Management Project

Wildlife
Biological Evaluation and Resource Report

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for:
Clackamas River Ranger District
Mt. Hood National Forest

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SUMMARY

Endangered Species Act Compliance – Section 2.0

The effects of the Stone 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 – Section 2.1

Most of the proposed project activities are within Critical Habitat for spotted owls. There are no proposed habitat removing or degrading treatments within suitable owl habitat. There are eleven historic owl home ranges present but none would be substantially affected. Treatments include the maintenance of approximately 850 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.

Seasonal restrictions are included to minimize disturbance, including smoke, 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 Stone project ***may affect,*** but are ***not likely to adversely affect the northern spotted owl*** (USDI 2017a).

Sensitive Species – Section 3.0

The sensitive species that are potentially present in the project area include bald eagle, Western bumblebee, Suckley cuckoo bumblebee and Cascades axetail slug. 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 – Section 4.2

The proposed action would close approximately 20 miles of open road in the project area and another two miles proposed for passive decommissioning. Summer range open road density would be reduced from 2.9 to 2.3 miles per square mile which would satisfy the Forest Plan Standard FW-208 objective of 2.5 miles per square mile.

The overall effect of the project would be beneficial for deer and elk. Some early-seral habitats

and forage would be created. The population trend for deer and elk on the Forest has been 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 – Section 5.0

No Survey and Manage surveys were required and no effects are expected to these species.

Migratory Birds – Section 6.0

The proposed actions would 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. Habitat changes proposed by this project should not affect this group 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.

Snags and Down Wood – Section 7.0

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

1.0 INTRODUCTION

This Biological Evaluation (BE) is a review of management activities proposed for the Stone Creek Vegetation Management Project Environmental Assessment (EA) of the Mount Hood National Forest (the Forest) 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 November 16, 2021. Section 7 of the Endangered Species Act of 1973 (as amended in 1978, 1979, and 1982) (ESA) 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, endangered, or proposed species or result in destruction or adverse modification of their critical habitat and for sensitive species, to ensure that actions do not contribute to a loss of viability or cause a significant trend toward listing under the ESA. The 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 listed 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 (Forest Plan) (USDA 1990), as amended by the 1994 Northwest Forest Plan (NWFP) (USDA USDI 1994) is applicable to this project. The Forest Plan and NWFP provide direction for management of the wildlife resources contained within the Forest.

The Clackamas River Ranger District of the Mount Hood National Forest is proposing a number of activities in the Stone Creek Vegetation Management (Stone) 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, 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. More detail on the proposed action, management direction, and project location can be found in the Stone Creek Vegetation Management Project Environmental Assessment[1].

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

2.0 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 Stone project area are the northern spotted owl (*Strix occidentalis caurina*) (T) and the gray wolf (*Canis lupus*) (E). Potential effects to these species are discussed below.

One other listed species and one Proposed species can occur on the Forest; the Oregon spotted frog (*Rana pretiosa*) (T), and the North American wolverine (*Gulo gulo luscus*) (PT).

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 2007). There are no known occurrences for the Oregon spotted frog within the Stone project area, nor has any "Critical Habitat" been designated for the frog on the Clackamas River Ranger District.

The wolverine is found primarily in tundra, taiga, and subalpine environments where snow cover persists through the spring season (Aubry 2007). In the western mountains, historical wolverine records generally occurred in or near alpine vegetation. Copeland (2007) found that 83% of all wolverine occurrences were in the 7200 – 8500 feet elevation zone. All documented occurrences on the Forest were above 4,300 feet elevation.

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

Endangered Species Act Compliance

The effects of the Stone 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.

2.1 Northern Spotted Owl (*Strix occidentalis caurina*)

Existing 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, as well as large fires, have reduced or fragmented northern spotted owl habitat throughout its range. In addition, the barred owl (*Strix varia*) 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 species 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 three Known Owl Sites located within Stone project area boundary and another eight Known sites that partially overlap into the project area. This represents all Known Owl Sites within 1.2 miles of any proposed Stone project activities. There are no designated Potential Owl Sites within 1.2 miles of the proposed project activities, however, there are about 4,560 acres of suitable nesting habitat within the Stone project area and while many of those acres are not in patches large enough to support spotted owl nesting, there is potential for unknown nesting owls.

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). There are 4,560 acres of nesting and roosting habitat within the Stone project area.

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. There are 4,627 acres of foraging habitat within the Stone project area. Together, nesting, roosting or foraging habitat comprise suitable habitat in this document and represents about 9,186 acres of the project area.

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 eleven Known Owl Sites within or overlapping of the Stone project area 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, three of the eleven Known Site home ranges within the Stone project area are below the 40% threshold (two only slightly at 38%) (Table 1). One Known Owl site is well below the 40% threshold at 30%. This site primarily occurs on Confederated Tribes of Warm Springs land and only slightly overlaps the Stone project area.

Table 1 - Northern Spotted Owl Suitable Habitat within the Home Range Territories of Known Owl Sites within the Stone Vegetation Management Project Area.

Known Owl Site	Actual Acres of Suitable Habitat within Home Range Territory	Percent of Area in Suitable Habitat within Home Range Territory
Warm Springs	903.87	30.58%
2192P94	1702.26	57.60%
3040T94	1198.14	40.54%
2209P91	1138.75	38.53%
3343T94	1129.55	38.22%
2190P91	1346.35	45.56%
2182P92	1770.79	59.92%
3722T90	1584.45	53.61%
3044P94	1411.53	47.76%
2222P92	1541.10	52.15%
3798P94	1389.23	47.01%
11 Total Sites	Average = 1374.19	Average = 46.5%

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). Currently, only one of the five Known Sites within the Stone project area have a core nest area that is currently below the 50% threshold in suitable habitat and that only slightly at 49.48% (Table 2).

Table 2 - Northern Spotted Owl Suitable Habitat within the Core Nest Area of Known Owl Sites within the Stone Vegetation Management Project Area.

Known Owl Site	Actual Acres of Suitable Habitat within Core Nest Area	Percent of Area in Suitable Habitat within Core Nest Area
2209P91	333.84	66.36%
2190P91	266.28	52.93%
2182P92	300.16	59.67%
2222P92	262.04	52.09%
3798P94	248.89	49.48%
5 Total Sites	Average = 282.24	Average = 56.11%

There are no proposed habitat removing or degrading treatments within suitable habitat in the Stone project area. Roadside fuels treatments are proposed within mapped suitable habitat that would take place along existing roads but would not alter the suitable function 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. The author 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 would improve the probability that dispersing owls would 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 for NSO across the landscape of the Stone project area. Suitable habitat also functions as dispersal habitat. There are currently 4,464 acres of mapped dispersal habitat to go along with the 9,186 acres of suitable NRF habitat well dispersed within the project area. This represents about 53% of the Stone project area.

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.

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 would 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 Stone project area. Some of the proposed Stone project activities are designed to restore forested stands to high-quality spotted owl habitat. Treatments include a light variable-density thinning to accelerate suitable habitat development. 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) and is likely higher now. 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 proposed Stone 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 Statement (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 (2003) states 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 (Courtney 2004) and Mount Rainier National Park (Mangan 2019) in areas that never had timber harvest. 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). Multiple studies have demonstrated that even when high-quality habitat was readily available, the presence of barred owls was negatively correlated with the dynamics of spotted owls (Hamer 2001, Dugger 2011, Wiens 2014, Yackulic 2014, Mangan 2019). 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.

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 Stone project do not include the use of blasting, rock crushing, or helicopter use. 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 chainsaw and heavy equipment use as well as log hauling. The current Biological Assessment for this project determines the disruption distance for noise around known nest

sites to be 65 yards for chainsaw and heavy equipment use and log hauling (USDA USDI 2017b). However, there have been no recent surveys for spotted owl to find or verify nests or activity centers within the project area. For that reason, the Biological Assessment requires a 300-meter buffer to be added to this distance from all historically Known Owl Sites as well as patches of NRF habitat large enough for nesting owls. Five of the proposed project units occurs within the 393-yard (65 yards plus 300-meter buffer) disruption distance for chainsaw and heavy equipment use.

Broadcast and pile burning is also proposed. The current Biological Assessment for disturbance (USDA USDI 2017b) determined that adverse effects would occur if the burning activities occurred within 0.25 miles of nesting spotted owls due to smoke. Since there have been no recent surveys for spotted owl to find or verify nests or activity centers within the project area, a PDC timing restriction would apply to these activities in seven units and adjacent burn units.

Project Design Criteria (PDC) with the appropriate spotted owl timing restrictions for all proposed activities are included as part of the Stone proposed action and are shown below in Table 3.

Table 3 - Northern spotted owl design criteria with seasonal timing restrictions for proposed Stone project activities

Design Criteria	Location	Activities Restricted	Seasonal Restriction
K2. Northern Spotted Owl Timing Restrictions	**Units:** 1319, 1349, 1356, 1366, and 1441	Harvest operations, chainsaws, use of heavy equipment	March 1 to July 15
	Units: 1257, 1316, 1349, 1365, 2000, 1255 (plus burn unit north of 1255), and 1441 (plus burn units east and south of 1441).	Broadcast and pile burning	March 1 to July 15

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 Stone project area are shown in Table 4 below.

There are approximately 850 acres of variable-density commercial thinning treatments proposed in the Stone project. Other treatments include 930 acres of young stand thinning and brushing, 91 acres of sanitation harvest, 1,190 acres of understory broadcast burning, and up to 660 acres of roadside fuels treatment.

These acreage figures represent the sum of all 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.

Variable-density commercial thinning – Variable-density thinning with skips and gaps is proposed on previously logged and/or burned areas. The stands range in age from 32 to 60 years old in unburned plantations. The proposed stands are currently considered NSO dispersal habitat. There are some older/larger legacy trees and shelterwood trees that remain within some of 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.

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 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 and each up to 5% of the unit area. 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 could 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, generally, be between 80 and 100 square feet basal area of trees greater than 5”dbh. Including skips and gaps, the remaining stand level canopy cover would be approximately 37% in the first-year post treatment and would continue to increase. 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 Stone project area are shown below in Table 4.

Broadcast burning – Prescribed fire would be used to reduce the amount of fuels which would reduce the risk of a future stand-replacing fire and would help maintain and improve old growth forest conditions. Large diameter trees would be identified, and during snowpack, their tree wells would be treated with prescribed fire to support low-intensity prescribed fire conditions in the Stone project area. Multiple entries with prescribed fire would occur to slowly re-introduce fire into the landscape. The low intensity broadcast burning proposed in the Stone project area would result in habitat being maintained with the potential of long-term benefits. Short-term negative effects could occur to habitat of spotted owl prey species. However, there may be long-term benefits from a low intensity burn with expected increased plant vigor, forage production, and some tree mortality which could facilitate cavity creation and resultant denning opportunities.

Roadside fuels reduction - Roadside fuels reduction treatments would target removing trees less than or equal to 10-inch diameter at breast height and brushy and woody vegetation by chainsaw and mastication. Cut material would be treated by pile burning. Large diameter trees within the roadside fuels reduction treatment areas would be retained.

The vegetative treatments along existing roads would essentially widen linear features on the landscape. This could potentially inhibit the owl's ability to cross the roads due to the lack of cover and increased risk of predation. However, Forsman et al (2002) notes that that northern spotted owl cross linear features such as large interstates with few issues. The roadside fuels reduction treatments would also be considered Harvest Habitat Maintained as the treatments would not affect the spotted owl's ability to utilize the surrounding habitat. The number of acres of this proposed treatment within each Core area and Home Range in the Stone project area are shown below in Table 4.

Timber stand improvement – The proposal is to non-commercially thin approximately 930 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 the proposed treatments within each Core Area and Home Range in the Stone project area are shown in Table 4 below (Note that the Core Area figures are included in the Home Range figures).

Table 4 – Acres of Proposed Activities within Spotted Owl Core Areas (C) and Home Ranges (HR) in the Stone Project Area

Known Owl Site	Variable-density Thin Dispersal Habitat Maintain (acres)	Roadside Fuels Reduction Habitat Maintain (acres)	Timber Stand Improvement Terrestrial Habitat Enhancement (acres)
2192P94	C = 0 HR = 0	C = 0 HR = 2.4	C = 0 HR = 0
3040T94	C = 0 HR = 29.0	C = 0 HR = 4.8	C = 0 HR = 0
2209P91	C = 0 HR = 207.9	C = 41.5 HR = 203.5	C = 0 HR = 65.8
3343T94	C = 0 HR = 52.8	C = 0 HR = 14.0	C = 0 HR = 0
2190P91	C = 0 HR = 78.2	C = 28.9 HR = 69.4	C = 0 HR = 0
2182P92	C = 0 HR = 173.9	C = 0 HR = 58.6	C = 0 HR = 0
2222P92	C = 0 HR = 0	C = 0 HR = 95.6	C = 0 HR = 0
3798P94	C = 0 HR = 54.9	C = 0 HR = 0	C = 0 HR = 0

Other Project Activities - The road decommissioning, road maintenance, and work in the Monticola seed orchard proposed under this project would have very little impact on northern spotted owl habitat because these activities may modify small amounts of habitat but does not remove the function of any habitat.

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 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 an initial negative effect on snags and 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 are discussed in more detail in Section 8 of this

document.

Northern Spotted Owl Prey Species

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

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 northern spotted owl 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 squirrel abundance following thinning may be driven by increased susceptibility to predation created by removal of critical above ground cover. Predation, lack of canopy connectivity, and reduction in suitable nest substrates may all contribute to reduced northern flying squirrel 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, should 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) 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 (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) recommends 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 the Stone 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.

Broadcast burning – Fire has both short and long-term negative and beneficial effects to small mammals, depending on the species and the severity of fire (Fontaine and Kennedy 2012). Some small mammals may be directly impacted due to smoke or the inability to escape. Other small mammals may not be affected if they are mobile, protected within large downed coarse wood, or able to move underground or up a tree. However, there may be long-term benefits

from a low intensity burn in that the expected increased plant vigor, forage production, and tree mortality resulting from burning could facilitate cavity creation and resultant denning opportunities.

Comparison of Effects to Northern Spotted Owl Habitat by Alternative:

No-Action – 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. With no-action, all current conditions of the Stone 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 lower 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 4 above.
- No proposed activities would take place in the nest patch of any known 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.
- 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.

Effects Determination - Habitat:

With No-Action, there would be ***no effect*** to northern spotted owl or its habitat. The Proposed

Action ***may affect***, but is ***not likely to adversely affect*** territorial or dispersing northern spotted owls and their habitat, due to maintaining, by avoidance, all suitable habitat conditions. 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 Stone project area.

Direct and Indirect Effects - Disturbance

The proposed Stone project may potentially have disturbance effects from the use of chain saws and heavy equipment and the proposed burning activities. 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 Stone project was planned to avoid suitable spotted owl habitat, 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 – Disturbance – Direct/Indirect Effects

With No-Action, there would be no disturbance to any known owl sites in the Stone project area because no project activities would occur. This alternative would have ***no effect*** on northern spotted owls due to disturbance.

Proposed Action – 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 burning activities within 0.25 miles of identified known owl sites or suitable patches of NRF habitat 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 or suitable patches of NRF habitat 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 Stone 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 chosen for northern spotted owl cumulative effects was a 1.2-mile radius buffer around all proposed project units that may change habitat conditions for the spotted owl. 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 spotted owl suitable habitat to develop, which includes the effects of fires, and back to the 1960s, when current active management began. Another important time frame for this analysis is 30 years, which is the approximate time it takes for spotted owl dispersal habitat to develop. Eleven known spotted owl home ranges are within 1.2 miles of a proposed unit.

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 Stone project area has been affected by past timber harvest, wildfires, power line construction, recreation activities, and insect mortality which all can impact the habitat for spotted owls. Past road construction, decommissioning, and maintenance 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 Stone project cumulative effects analysis area has created many stands of young trees ranging from roughly 10 to 20 inches in diameter at breast height. The average quadratic mean diameter (QMD) for all units 11.3 inches. These plantations are mostly 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 1995, the Forest Service has commercially treated, by shelterwood, thinning, and regeneration harvest, approximately 1,795 acres within the home ranges that overlap the Stone project area. While all previous logging actions are reflected in the current existing condition, the logging actions that happened before 1995 have regrown and can be considered dispersal habitat 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.

The Stone project is adjacent to lands of the Confederated Tribes of Warm Springs, where active timber management occurs. The Tribes do survey and manage for northern spotted owl on their land, but data is unavailable. Timber harvest is anticipated to continue.

Other planned or past, present, and reasonably foreseeable actions within the analysis area, that could potentially have an effect on spotted owls or their habitat are; dispersed campsite rehabilitation, recreation site maintenance, completion of construction of Stone Creek Group Campground, road maintenance activities, and ongoing hazard tree removal. It is anticipated that these activities would have minimal effects, if any, on the owl or its habitat.

The cumulative effect of the Stone 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 Stone project ***may affect,*** but are ***not likely to adversely affect the northern spotted owl*** and would not jeopardize the continued existence of the spotted owl. (USDI 2017a).

2.2 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 Critical Habitat (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 Stone 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 are 13,871 acres of Critical Habitat within the Stone project area. All the proposed commercial timber units are within Critical Habitat (1,885 acres) and nearly all of the proposed fuels treatments are within Critical Habitat (618 out of 660 acres).

Effects Determination

Proposed activities have the potential to modify Critical Habitat but will not remove the function of any habitat. Because the proposed activities would not affect PCEs and because Critical Habitat in the project area would continue to support the life history needs of dispersing spotted owls, the Proposed Action ***may affect,*** but is ***not likely to adversely affect***, northern spotted owl Critical Habitat.

2.3 Gray Wolf

Existing Condition

Gray wolves (*Canis lupus*) were reintroduced in the mid-1990s in central Idaho and Yellowstone National Park and then dispersed naturally into Oregon. In 2008 the first wolf pack was

confirmed in Oregon on the Umatilla National Forest by Oregon Department of Fish and Wildlife (ODFW) biologists. In May 2001, the USFWS delisted wolves in Idaho, Montana, parts of Oregon, Washington, and Utah. In December 2015 ODFW removed the gray wolf from its endangered species list because the wolf had met the state's population criteria for delisting. On January 4, 2021, all gray wolves were removed from the federal threatened and endangered list, including the Oregon population west of Hwy 395. Following federal delisting, the gray wolf was moved to the Forest Service R6 Sensitive Species list. Then in February 2022, the gray wolf population west of Hwy 395 was restored to the endangered species list. The USFWS is the lead management agency for wolves west of Hwy 395, including those that may be on the Forest. Since establishment in Oregon was documented in 2008, 40 known packs or groups have established across the state including (ODFW 2025). Most wolves occur in northeastern Oregon, though 12 areas of known wolf activity now occur in the western part of the state (ODFW 2025). There are no known occurrences of gray wolf denning within the Stone project area, though wolves have established at least one pack on adjacent Confederated Tribes of the Warm Springs land. It is reasonable to assume that wolves will, at least occasionally, utilize the Stone project area.

Gray wolves are considered habitat generalists and can be found in a diverse range of environments but primarily use forested habitat with seasonal shifts to more open habitats that reflect seasonal distributions of prey (ODFW 2019).

Environmental Consequences and Effects Determination

The analysis area for gray wolves includes the planning area boundary and a one-mile buffer that would account for any territories that may overlap with proposed project activities. No dens or rendezvous sites have been detected within the Stone project area. Proposed project-related activities would increase human presence during implementation, and this may cause wolves to temporarily avoid the area.

The proposed commercial thinning and fuels treatments, including burning, would increase forage for deer and elk which are the primary prey species of gray wolves. While the proposed activities may cause wolves to temporarily avoid the area during project implementation, should a den or rendezvous site be discovered, project design criteria (PDC K4) would limit disturbance within one mile of project activities during implementation. In addition, the proposed action would indirectly benefit the gray wolf by increasing the availability of prey within in the project area, therefore, the Proposed Action ***may affect,*** but is ***not likely to adversely affect*** the gray wolf.

Consistency with Direction and Regulations for Threatened and Endangered Species

The effects to the northern spotted owl and gray wolf for the Stone 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 was received 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 Proposed Action.

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 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 affect threatened or endangered species. Consultation shall be completed before any decision is made on the proposed project.	A programmatic informal consultation that covers the Stone 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 standards (page C10)	Known spotted owl activity centers. One hundred acres of the best spotted owl habitat would be retained as close 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.	There are no Stone project harvest activities proposed within any known spotted owl nest site or activity center.
Northwest Forest Plan LSR	There is no harvest allowed in stands over 80 years old.	There are no Stone project harvest activities proposed in stands over 80 years old within the LSR land

Standard and Guideline	Text	Rationale
standards (page C12)		designation.

3.0 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).

3.1 Species Considered and Evaluated

The most recent Region 6 SS wildlife list (effective 16 November 2021) was reviewed and 25 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 on or near the Mt. Hood National Forest, not all of them have potential to occur in the Stone 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 Stone 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 Stone 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
Bald Eagle (*Haliaeetus leucocephalus*)	YES	YES	YES	Usually found near open water (Buehler 2000), which is adjacent to the project area. Refer to Effects Analysis below.

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
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 activities.
Harlequin Duck (*Histrionicus histrionicus*)	NO	NO	NO	Nests along fast-moving, turbulent rivers and mountain streams on rocky islands or banks and winters along rocky coastlines in the surf (Rockwell 2018). 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 activities.
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*.

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
				Roosts in a variety of structures including caves, mines, tunnels, large snags and buildings (Hayes 2013). Habitat not present in the vicinity of proposed activities.
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 project area.
Cope's Giant Salamander (*Dicamptodon copei*)	NO	NO	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	NO	NO	Low elevation (100-2500 ft.) 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 et al. 1995). Habitat not present in the project area due to elevation.
Western Bumblebee (*Bombus occidentalis*)	NO	YES	YES	Bumble bees inhabit 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 2010).

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
				Refer to Effects Analysis below.
Suckley Cuckoo Bumblebee (*Bombus suckleyi*)	NO	YES	YES	Bumble bees inhabit 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 2010). Refer to Effects Analysis below.
Zigzag Darner (*Aeshna sitchensis*)	NO	YES	NO	Wet sedge meadows, fens, bogs, and very shallow peaty ponds are the reported habitat for this boreal species (Paulson 2009). Habitat not present in the vicinity of proposed activities.
Subarctic Darner (*Aeshna subarctica*)	NO	YES	NO	Occurs in fens, wet meadows, and bogs with abundant sphagnum and other mosses (Paulson 2009). Habitat not present in the vicinity of proposed activities.
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 project area.
Cascades Axetail Slug (*Carinacauda stormi*)	NO	YES	YES	Montane areas in which Douglas-fir is a dominant overstory species, and western hemlock and vine maple are minor tree species (Leonard 2011). Habitat present in the project area. Refer to Effects Analysis below.
Rocky Mountain Duskysnail (*Colligyrus greggi*)	NO	YES	NO	Generally found in the coldest and most sheltered and shaded habitat near small springs, spring outflows, and spring-fed stream (Frest and Johannes 2004). Habitat not present in the vicinity of proposed activities.
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 activities.

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
Columbia Gorge Oregonian (*Cryptomastix hendersoni*)	NO	YES	NO	Riparian-associated, known from low to middle elevations, generally near seeps and springs, where it occurs in leaf litter along streams, under logs, among brush, and in basalt talus (Frest 1995). Habitat not present in the vicinity of proposed activities.
Dalles Hesperian (*Vespericola depressus*)	NO	YES	NO	Riparian forests, spring and seep borders, near the bottom of a slope, moist valley, ravine, or gorge and appears to be restricted to lowland forests with basalt-derived soils or basalt taluses (Frest 1995). Habitat not present in the vicinity of proposed activities.
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 activities.
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 activities.
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 activities.
Shiny Tightcoil (*Pristiloma wascoense*)	NO	YES	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 vicinity of proposed activities.

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 proposed

project activities 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 the proposed project and taking no action.

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 Stone 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 Stone project. This section also presents the expected impacts from taking No Action and implementing the Proposed Action.

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 proposed activities as well as taking No-Action. 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 Stone Project Area.

Species	No-Action	Proposed Action
Bald Eagle	NI	MII
White-headed Woodpecker	NI	NI
Lewis's Woodpecker	NI	NI
Bufflehead	NI	NI
Harlequin Duck	NI	NI
Sierra Nevada Red Fox	NI	NI
Townsend's Big-eared Bat	NI	NI
Fringed Myotis	NI	NI
Larch Mountain Salamander	NI	NI
Cope's Giant Salamander	NI	NI
Johnson's Hairstreak	NI	NI
Western Bumblebee	NI	MII
Suckley Cuckoo Bumblebee	NI	MII
Zigzag Darner	NI	NI
Subarctic Darner	NI	NI

Species	No-Action	Proposed Action
Beller's Ground Beetle	NI	NI
Cascades Axetail Slug	NI	MII
Rocky Mountain Duskysnail	NI	NI
Puget Oregonian	NI	NI
Columbia Sideband	NI	NI
Dalles Hesperian	NI	NI
Dalles Sideband	NI	NI
Crater Lake Tightcoil	NI	NI
Crowned Tightcoil	NI	NI
Shiny Tightcoil	NI	NI

3.2 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 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, most 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 Stone 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 Timothy Lake immediately adjacent to the project area. There are no known observations of bald eagle nest sites within the project area, however, adult bald eagles have been observed foraging at the adjacent Timothy Lake during the nesting season indicating nearby nesting. There are no known concentrations of wintering eagles (winter roost sites) 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 Stone project area during project activities, so some short-term displacement effects may occur. No known nesting or roosting sites occur within the project area and project PDCs will retain all large legacy trees; 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 Plan Standards would provide protection and minimize disturbance.

Cumulative Effects: The direct and indirect effects of the proposed action 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 Stone 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.

Determination for Bald Eagle: Taking No-Action would have ***no impact***. The Proposed Action ***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. Both alternatives are consistent with Forest Plan direction relevant to sensitive species.

3.3 Western Bumblebee (*Bombus occidentalis*)

The western bumblebee was once widespread and common throughout the western United States and western Canada before 1998 (Xerces Society 2025, Lamke et al. 2020). 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, Lamke et al. 2020).

According to Goulsen (2010), 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.

Bumblebees 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 2010). 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 et al. 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 2010). 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 2010).

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 (Lamke et al. 2020).

The western bumblebee has been documented on the Mt. Hood National Forest, in areas adjacent the Stone 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.

Effects and Determination (discussed together with Suckley Cuckoo Bumblebee below)

3.4 Suckley Cuckoo Bumblebee (*Bombus suckleyi*)

The Suckley cuckoo bumblebee historically occurred throughout much of the western United States, though largely confined to mountainous regions. It is also present east through the Canadian Great Plains. This species is known from northern California, Oregon, Washington, Idaho, Colorado, Montana, North Dakota, South Dakota, British Columbia, Alaska, the Yukon and Northwest Territories, Alberta, Saskatchewan, and Manitoba (Williams et al. 2014). A recent analysis by Hatfield et al. (2014) indicates that this species has undergone significant declines throughout much of its range. While this species has historically been sparsely distributed throughout much of Oregon and Washington, there has only been one observation of this species on the Mt. Hood National Forest since 2015 (Forest Service unpublished data).

Most species of bumble bees are primitively eusocial insects that live in colonies made up of one queen, female workers, and, near the end of the season, reproductive members of the colony (new queens and males). New colonies are initiated by solitary queens, generally in the early spring. This process includes locating a suitable nest site; collecting pollen and nectar from flowers; building a wax structure to store nectar; forming a mass of pollen to lay eggs on; and building a wax structure to enclose the eggs and pollen (Goulson 2010).

Bombus suckleyi, and other species in the subgenus *Psithyrus*, are unique in that they are dependent on another *Bombus* spp. to serve as a host. Because they have no corbicula, they have an obligate dependency on social bumble bees (Goulson 2010) to collect pollen on which to rear their young. As such, *B. suckleyi* are a cuckoo species that are nest parasites of other species of bumble bees and are not primitively eusocial themselves – there is no division of labor within the species; all members of the species have equal status and are reproductive.

Cuckoo bumble bees typically emerge from their hibernacula later in the spring than other bumble bee species. This ensures that adequate hosts will have an established nest before the female emerges. Once the female does emerge, she forages for herself and begins searching for occupied nests. Once she finds a suitable host (some cuckoo bumble bees have a narrow range of possible host species) she enters the nest, kills or subdues the queen of that colony, and forcibly (using pheromones and/or physical attacks) "enslaves" the workers of that colony. Then she lays her own eggs and forces the workers of the native colony to feed her and her developing young. Since all the resulting cuckoo bee offspring are reproductive (not workers), they leave the colony to mate, and the mated females seek out a place to overwinter, then repeat the cycle the following spring/early summer (Goulson 2010).

Cuckoo bumble bees often attack a broad range of host species, but some species specialize in attacking the members of just one species or subgenus. *Bombus suckleyi* has been recorded in nests of bumble bees in six different subgenera, but the most common associations were with the subgenera *Pyrobombus* and *Bombus*, and the only nests in which *B. suckleyi* adults were produced were those of the western bumblebee (*Bombus occidentalis*) (Thorp 1983). As such, *B. suckleyi* has been documented breeding as a parasite of colonies of B*. occidentalis*, and has been recorded as present in the colonies of *B. terricola*, *B. rufocinctus*, *B. fervidus*, *B. nevadensis*, and *B. appositus* (Williams et al. 2014).

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 2010). *Bombus suckleyi* has three basic habitat requirements: suitable occupied nesting sites for its host (e.g. *Bombus occidentalis*), 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

Bombus suckleyi has been detected in the nests of several species of bumble bees, but it has only ever been observed reproducing in nests of *B. occidentalis* (Thorp 1983). See description above for western bumblebee, section 3.3.

Floral Resources

Bumble bees require plants that bloom and provide adequate nectar and pollen throughout the colony's life cycle, which is from mid-April to October for *B. suckleyi* (although the actual dates likely vary by elevation). For *B. suckleyi* to survive, there must also be early season resources for its host, *B. occidentalis*. There are records of *B. occidentalis* from early February to late November. The amount of pollen available in the landscape directly affects the number of new queens that a bumble bee colony can produce, and since queens are the reproductive members of the colony, pollen availability is directly related to future bumble bee population size (Burns 2004). Early spring and late fall are often periods with lower floral resources; the presence of flowering plants at these critical times is essential.

Overwintering Sites

Very little is known about the hibernacula, or overwintering sites, utilized by *B. suckleyi,* although generally bumble bee females are known to overwinter in soft, disturbed soil (Goulson 2010), or under leaf litter or other debris (Williams et al. 2014).

Since *B. suckleyi* is so closely tied to the success of its host, any threats that would potentially harm *B. occidentalis* also have the potential to imperil *B. suckleyi*. The primary threats to the *B. occidentalis* 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 (Hatfield et al. 2017).

Bombus suckleyi has been documented on the Mt. Hood National Forest, though not recently and not within the Stone project area. Focused surveys for *B. suckleyi* 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 for Western and Suckley Cuckoo Bumblebees:

Direct mortality of individuals could potentially occur during project activities. The proposed action may also impact both bumblebees by temporarily impacting flowering plants during project activities. 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.

The proposed action 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 proposed action combined with the past, present and reasonably foreseeable future actions would result in a temporary reduction of floral habitat for bumblebees within the Stone project area with long-term beneficial effects due to the creation of some early-seral habitat with gaps in thinning units. Cumulative effects for both species were considered at the watershed scale since genetic diversity and connectivity between colonies is a concern for bumblebees. 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 diminishes, 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 Stone project area, the activities that could have cumulative effects to bumblebees include past vegetation treatments, including timber harvests and fuels treatments on federal and adjacent tribal 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 both 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 these species are agriculture and urban development, livestock grazing, and broad-scale insecticide application (Hatfield et al. 2017). These kinds of activities are not included in the Stone 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 these species would still persist at the watershed scale.

Determination for Western and Suckley Cuckoo Bumblebees: Taking No-Action would have ***no impact*** to either species. The Proposed Action ***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 and Suckley Cuckoo 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. Both alternatives are consistent with Forest Plan direction relevant to sensitive species.

3.5 Cascades Axetail Slug (*Carinacauda stormi*)

The Cascades axetail slug was only recently described (2011) and was subsequently added to R6 Regional Forester's Sensitive Species List. The species was previously considered as part of the salamander slug (*Gliabates oregonius*). Cascades axetail slug is known only from Oregon where it occurs in Clackamas, Marion, Linn and Lane counties on the western slopes of the Cascade Range and occurs at elevations ranging from around 610 to 1190 m (2000 to 3900 ft.) in the Willamette and Mt. Hood National Forests (Leonard 2011). It also has been detected on BLM lands.

Cascades axetail tends to inhabit Douglas fir-western hemlock stands with a vine maple understory. Areas where down wood retains pockets of moisture and where vine maple leaves form a layer to hold moisture is preferred habitat (Young 2010). This species was found almost exclusively in semi-saturated to fully saturated Douglas fir-western hemlock needle litter, between the recent year's needle-duff layer and the compacted needle-duff layers of previous years (approximately 2.5 to 5 cm below the needle-duff layer surface) and where the ground cover was almost exclusively free of a moderate shrub vegetation layer or moss (Young 2010). In addition, small topographic depressions where water collects or saturation occurs as the rainy season develops appear to be important microhabitat features (Leonard 2011). This species was found exclusively with vine maple present at the micro-site. Most specimens have been located in a very moist Douglas-fir needle litter/duff layer approximately 2.5 to 5 cm below the surface, between the current year's needle layer and the compacted layer of previous years, with a vine maple leaf layer on the top (Young 2010, Leonard 2011). Forest age class does not seem to be a factor in detecting this species; detections have occurred in forests 25 years to over 150 years in age (Leonard 2011). This species was rarely detected in forest stands where either incense-cedar or Western red cedar was a dominant tree species. Shrub, fern, and moss layers were lacking in the areas where detections occurred. Although it has been found at the margins of small streams, this species is not associated with seeps or wetlands, but rather in areas where water can collect or areas that will become saturated as the rainy season develops (Leonard 2011).

Vine maple is not common across the Stone project area, but some suitable habitat does exist

for Cascades axetail. Focused surveys for the slug have not occurred within the project area boundary.

Direct and Indirect Effects: Direct mortality of unknown individuals and habitat loss could potentially occur during project activities. The proposed actions thinning activities could degrade habitat. Thinning, gap placement and early-seral habitat creation may cause desiccation of the soil and remove potential habitat, at least temporarily, until such openings close over time. Tree-felling and ground-based logging systems can disturb the substrate resulting substrate compaction. The areas underlying skid trails nearest to landings are most likely to incur damage because they receive the most trips with equipment.

Several project PDCs would be in place to protect soil conditions during and following project activities to help protect site productivity, maintain water movement through the soil, reduce erosion risks and associated sedimentation, and protect organic matter.

Activities in the young managed plantations would not pose significant threats to the Cascades axetail slug. The existing stand structure is typically uniform, even aged, and lacks many of the suitable habitat features required for this species. Given the extent of past activity and the relative lack of vine maple present, the proposed treatment sites would not currently be expected to support populations of this species. Treatments would improve habitat for the Cascades axetail slug in the long-term by creating larger diameter trees (future down wood) and improving the overall health of the stand and opening up the stands to increased shrub (vine maple) growth. In addition, all legacy trees would be retained as well as all snags except where they are a hazard. All large down wood would be retained, and the use of strategically placed skips would protect patches of snags or large amounts of down wood.

Cumulative Effects: The direct and indirect effects of the proposed action combined with the past, present and reasonably foreseeable future actions would result in a temporary reduction of habitat for Cascades axetail slug within the Stone project area. Most of the stands proposed for treatment are highly stocked, even-aged stands. These stands have very little growth and lack the snags and downed wood needed for Cascades axetail slug. In addition, the stands have low tree diversity, are single-canopied, or have trees that are insufficient in size to provide quality snags or downed wood. The landscape pattern of vegetation within and surrounding the Stone project area has been affected by past timber harvest, wildfires, power line construction, and insect mortality which all can impact the habitat for Cascades axetail slug. Past road construction, decommissioning, and maintenance have also contributed to the cumulative effect. As additional plantation stands mature, it is reasonable to assume that additional vegetation projects will be planned and implemented in the future.

Determination for Cascades axetail slug: Taking no action will have ***no impact***. The Proposed Action ***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***. Cascades axetail slug could be crushed during project activities and may be subjected to a temporary reduction habitat, however, the surrounding stands outside the units would have sufficient habitat to offset any temporary loss of habitat within the plantations. Both alternatives are consistent with Forest Plan direction

relevant to sensitive species.

Consistency with Direction and Regulations for Sensitive Species

Table 8 - 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 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.

4.0 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 Stone project area. Table 9 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 9 - 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[2]	Mature/Over-Mature	Yes	Documented
Salmonids	Aquatic (see Fisheries Specialist Report)	Yes	Documented
Western Gray Squirrel	Pine-Oak	No	No
Merriam's Turkey	Pine-Oak	No	No

2 Known as Pine Marten when Forest Plan was implemented.

4.1 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 (USDA 1990). 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 Stone 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***.

4.2 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 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 three 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 2800 feet 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 Forest, this

habitat has steadily decreased since 1990 (high of 155,880 acres) to 2017 (86,514 acres) when last calculated, 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. However, since the last calculation, several large fires have occurred that reset much of the higher burn severity areas back to early-seral habitat. This includes the 2020 Riverside Fire that burned over 85,000 acres. In total, approximately 10% of the entire Forest burned in 2020.

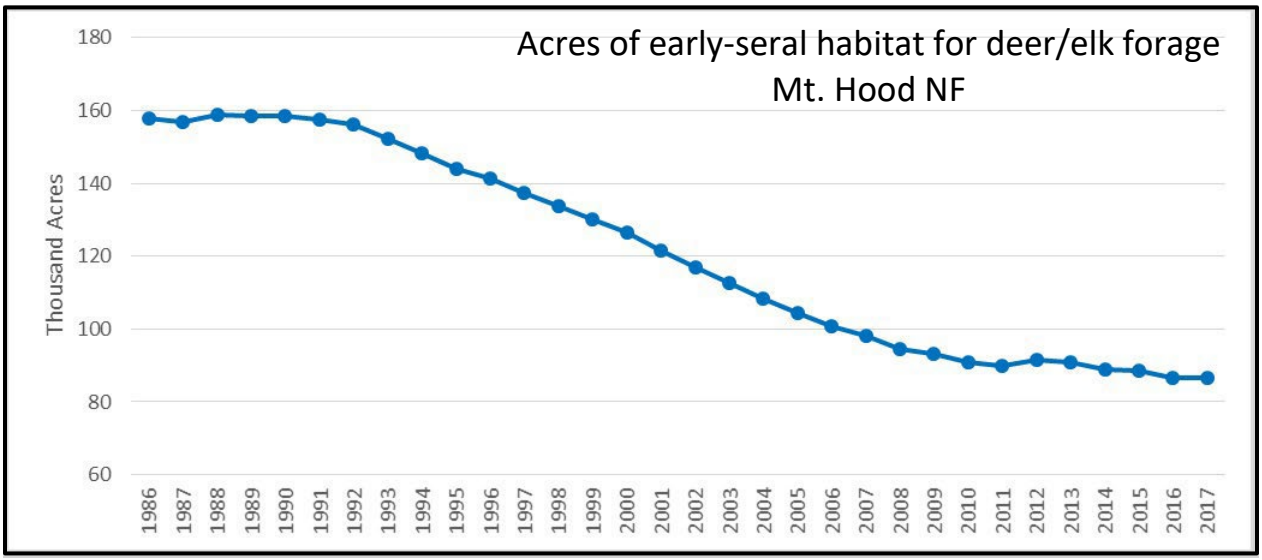


Figure 1 – Acres of early-seral habitat

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 Stone Project Area

There is widespread use of the project area by deer and elk though not in large numbers primarily due to the heavy recreation use in the area. Most elk use occurs in the summer season primarily utilizing meadow and riparian areas. The adjacent meadow system on Confederated Tribes of the Warm Springs land is a known elk calving area. Wintering elk migrate to lower elevation areas of the Forest out of the Stone project area as well as tribal land. Use of the area by deer is more widespread throughout the project area but most use is concentrated in riparian areas and small meadows as well as connective travel corridors. Deer will also migrate to lower elevations, primarily riparian valley bottoms, during winter months.

Population numbers for deer and elk are probably most limited by the lack of quality forage in early fall in the project 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. There is an opportunity to increase early-seral habitat and the productivity of forage plant species within the Stone project area.

There is a small amount of designated B11 Deer and Elk Summer Range, 257 acres, within the project area but no project activities are proposed in it. Nearly the entire project area is over 2,800 feet in elevation which the basic threshold for deer and elk winter range. No project activities are proposed in any area under 2,800 feet elevation.

Forest Plan Standard FW-208 states that within the roaded portions of summer range on the Forest, roads open to motorized vehicle traffic should be reduced to not exceed 2.5 miles per square mile within deer and elk summer range, which are areas over 2,800 feet elevation. The current open road density within the Stone project area is 2.9 miles of road per square mile, which is higher than the standard. There is an opportunity and a proposal to reduce the open road density within the project area. Implementation of the proposed Stone project road closures would result in an open road density of 2.3 miles of road per square mile which is below the threshold and deer and elk in the project area will easily be able to seek and find solitude in these roadless areas, which is the objective of Forest Plan Standard FW-208.

No-Action – Direct and Indirect Effects

Taking no-action 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. Taking no-action would allow the younger 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. Prescribed burn activities would also not occur which would also increase the risk of stand-replacing wildfire. The impact of no action would be to reduce deer and elk production and population within the project area. In addition, the existing high levels

of open-road density would remain with no action.

Proposed Action – Direct and Indirect Effects

In general, the overall effect of the Stone 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 proposed prescribed fire activities will increase quantity and quality of forage at least in the short term. 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 proposed treatments would temporarily remove some 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 15 to 20 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 gap areas and regeneration harvest unit would continue to be realized for approximately 20 years.

The Stone project would close approximately 20 miles of open road in the project area and another two-mile proposed for passive decommissioning. This would reduce open road densities in summer range to a level that would satisfy Forest Plan Standard FW-208.

Noise and disturbance 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.

Cumulative Effects

Deer and elk move up and down in elevation and across watersheds, often great distances, depending on the season. The effects of this proposed project could affect deer and elk while on their summer range. Because some of the animals, some of the elk in particular, are known to seasonally migrate long distances, it was decided to limit the cumulative effects analysis area to the proposed project area and adjacent tribal lands.

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 Stone project area has been affected by past management, including timber harvest, recreation use, wildfires, and insect epidemics substantially impacting cover and foraging habitat for deer and elk. Past road construction, decommissioning, and maintenance 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 recreation can be high. The Stone project would begin to reverse some of these trends.

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 provide optimal cover, but these stands are not proposed for treatment. Since 1995, the Forest Service has commercially treated, by shelterwood and regeneration harvests within the Stone project area. These have short-term negative effects to cover habitats and short-term beneficial effects to forage habitat. While all previous logging actions are reflected in the current existing condition, the logging actions that happened before 1995 have regrown while the short-term effects 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.

There is active timber management that occurs on adjacent Confederated Tribes of the Warm Springs land. It is reasonable to expect this activity will continue both short and long-term. Beneficial effects to deer and elk would be expected. There are many recreation opportunities in the project area which also likely cause short-term, local disturbance effects to deer and elk. A new group campground is nearing completed construction by PGE. Additional disturbance effects would be expected once the campground opens.

The current population trend for deer and elk on the Forest had been decreasing due to the incremental reduction in early-seral habitat across the Forest. However, the 2020 fires have provided a large amount of new early-seral habitat, and it would be expected to see a deer and elk population spike as a result. The Stone project would provide a small 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 3 - 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.	No Stone project activities would take place in any meadows.

Standard and Guideline	Text	Rationale
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, at least partly, 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.
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).	No regeneration harvest is proposed in the Stone project. Powerline corridor, several nearby large meadows, extensive riparian areas, and adjacent tribal land provide a consistent quantity of forage in the area.
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 Stone Proposed Action includes xxxx acres of variable-density thinning that would create quality and increased quantity of forage in summer range. There is no winter range in the project area. The locations and sizes of forage areas within harvest units would be determined based on where palatable indicator plants are present in order to enhance these areas.
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: -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.	The Stone 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
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 Stone project projects would decommission or close approximately 22 miles of road. The resulting open road densities would be 2.3 miles per square mile in summer range. The standard would be met. There is almost no winter range in the Stone project area.

4.3 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 2025). 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. Overall, this metric has steadily increased since the 1990 Forest Plan was written until 2016, when last calculated (figure 2). This does not include a likely dip in habitat as a result of several large fires since last calculation. New data analysis tools are currently being developed.

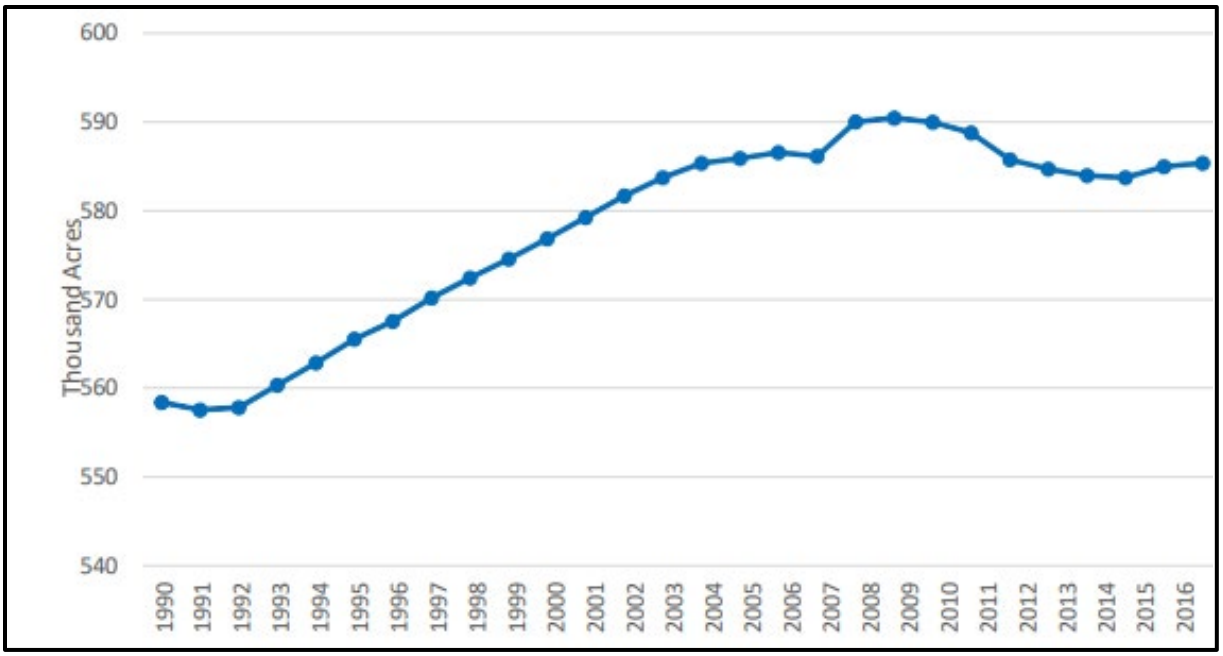


Figure 2 – Acres of Pileated Woodpecker habitat over time

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 and high severity fire has the most substantial effect on habitat for the pileated woodpecker. Loss 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 treatments proposed in the LSR land allocation within the project area. Variable-density thinning treatments would have long-term benefits to pileated woodpecker habitat. Snag standards and guidelines are addressed in Section 7.0 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 (there are 9,186 acres of northern spotted owl habitat within the Stone project area).

No-Action – Direct and Indirect Effects

Taking No-Action would have no direct effects on pileated woodpeckers 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 to 100 years for these stands to develop into suitable habitat. Stands with previous shelterwood treatments would likely develop into suitable habitat sooner due to the large tree component within these stands.

Proposed Action – Direct and Indirect Effects

With the Stone proposed action, 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 mature and late successional stands with large snags and a closed canopy. None of the proposed harvest units provide nesting habitat for this species. The stands proposed for treatment are younger managed plantations. 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 proposed action 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 post treatment. 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 previous shelterwood stands would become suitable habitat in a shorter period due to the number of remaining large trees within those stands. No shelterwood retention or legacy trees are proposed for removal. The proposed action may also include 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.

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 Stone project combined with other thinning projects across the Forest would have an additive, incremental positive cumulative effect for pileated woodpeckers. The current trend for pileated woodpecker is increasing at the forest and range-wide scale and the Stone project ***would not contribute to a negative trend in viability on the Forest for pileated woodpecker.***

4.4 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 2025) 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 martens 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 habitat has been increasing since the development of the Forest Plan in 1990, but as shown in Figure 3, these acres plateaued between 2002 and 2005. From 2006 to 2011, mature/late-successional forests (>3500') acreage fluctuated 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 relatively low fire activity on-forest. From 2014 to 2016 when last calculated, the trend for forest stands that meet this metric stayed relatively constant. From 2016, there is likely to be a dip in habitat as a result of several additional large fires, though many of them have been at lower elevations. New data analysis tools are currently being developed. Large fires are a natural part of ecological systems. The forest is maintaining habitat for this species, although there would be natural fluctuations in available habitat due to wildfire activity.

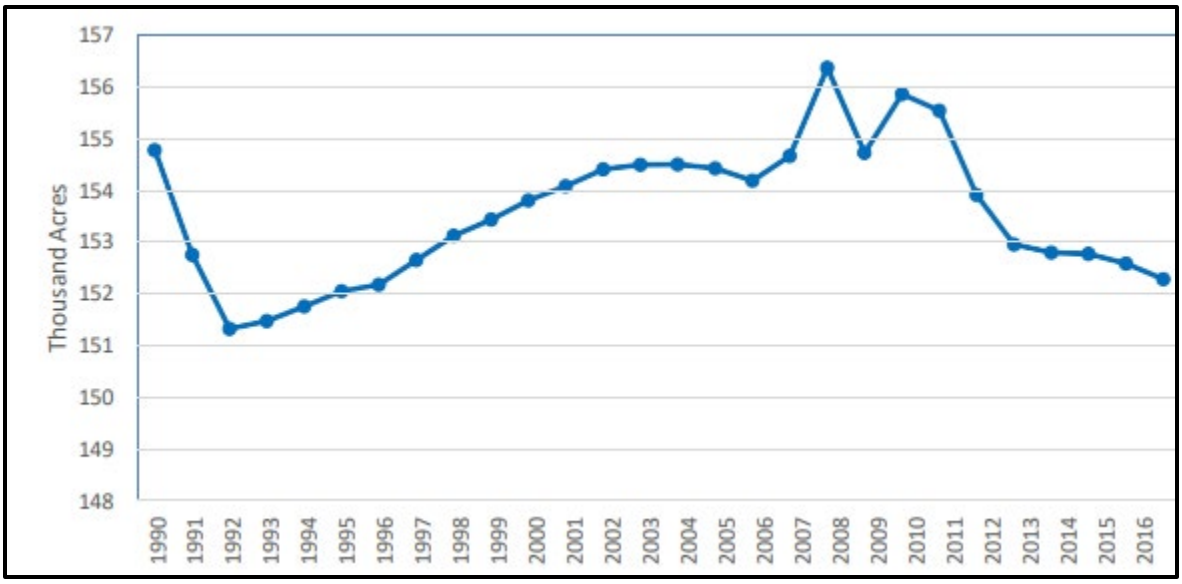


Figure 3 – Acres of American Marten habitat over time

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 and will utilize the subnivean layer in times of heavy snow.

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.

Much of the Stone project area is at or near 3,500 feet in elevation. There are no treatments proposed in the LSR land allocation within the project area. Variable-density thinning treatments would have long-term benefits to American marten habitat. Snag standards and guidelines are addressed in Section 7.0 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 American marten (there are 9,186 acres of northern spotted owl habitat within the Stone project area).

No-Action – Direct and Indirect Effects

Taking No-Action would have no direct effects on the marten because no new activities would occur. In the short term, without treatments, the plantation thin units would not provide denning habitat, and snag 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 to 100 years for these stands to develop into suitable habitat. Stands with previous shelterwood treatments would likely develop into suitable habitat sooner due to the large tree component within these stands.

Proposed Action – Direct and Indirect Effects

With the Stone proposed action, 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 generally above 3,500 foot elevation. None of the proposed harvest units are currently considered suitable habitat for this species. The stands proposed for treatment are younger managed plantations. 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 proposed action 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 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 habitat would be available for American marten. Some of the previous shelterwood stands would become suitable habitat in a shorter period due to the number of remaining large trees within those stands. No shelterwood retention or legacy trees are proposed for removal. The proposed action may also include 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 American marten.

The Stone project combined with other thinning projects across the Forest would have an additive, incremental positive cumulative effect for American marten. The current trend for the species is stable and the Stone project ***would not contribute to a negative trend in viability on the Forest for American marten.***

5.0 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 (USDA USDI 2001).

Current direction for implementation of the January 2001 *Record of Decision and Standards and*

Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines (USFS et al. 2001) is based on the district court's remedy order issued on February 18, 2014 (*Conservation Northwest v. Bonnie*, W.WA No. C08-1067-JCC). This remedy order followed after the 9th Circuit Court of Appeals rejected the 2011 Consent Decree executed in resolution of the district court action (*Conservation Northwest, et al v. Harris Sherman, et al and D.R. Johnson Company*, 715 F.3d. 1181, C.A. 9 (Wash), April 25, 2013).

The current direction also includes four categories of projects exempt from the Survey and Manage standards and guidelines as stipulated by Judge Pechman (October 11, 2006, "Pechman exemptions") and are as follows:

a) Thinning projects in stands younger than 80 years old;
b) Replacing culverts on roads that are in use and part of the road system, and removing culverts if the road is temporary or to be decommissioned;
c) Riparian and stream improvement projects where the riparian work is riparian planting, obtaining material for placing in-stream, and road or trail decommissioning; and where the stream improvement work is the placement of large wood, channel and floodplain reconstruction, or removal of channel diversions; and
d) The portions of projects involving hazardous fuel treatments where prescribed fire is applied. Any portions of a hazardous fuel treatment project involving commercial logging will remain subject to the survey and manage requirements except for thinning of stands younger than 80 years old under subparagraph (a) of this paragraph.

All of the proposed commercial thinning treatments in the Stone project area involves plantation thinning in stands less than 80 years of age and are exempted from the Survey and Manage standards and guidelines. An exemption also applies to the standards and guidelines for the prescribed broadcast burning. Habitat surveys were completed for the roadside fuels treatment and assessments were made to determine if habitat for Survey and Manage species was present. Fuels treatment unit boundaries were adjusted to avoid suitable habitat. Therefore, all proposed Stone project activities are exempted from Survey and Manage standards and guidelines and pre-disturbance surveys for Survey and Manage species were not required.

5.1 Survey and Manage Species

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 Stone project applies the Survey and Manage species list published in December 2003 (except for the red tree vole which remains as Category C across its range) 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 11 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 any of the proposed Stone project activities

Table 11 - Survey and Manage Terrestrial Species within Oregon Western Cascades Geographic Area. December 2003 species list (May 2014 Direction)

Category[3]	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.	No; Habitat occurs in the project area but not within treatment units. No legacy old-growth trees in any unit would be removed by treatments.	No

[3] 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[3]	Species	Potential Habitat Within the Project Area?	Potential Effects?	Analysis Included in this Document?
A	Columbia oregonian (Cryptomastix hendersoni)	No; habitat generally excluded from treatment units; associated with moist areas under closed-canopy western hemlock forest and moist microclimates in semiarid habitat along the Columbia River.	No; habitat not present within the project area treatment areas.	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.	No
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.	No
B	Evening fieldslug (Deroceras hesperium)	No; typically inhabits low elevation, perennially wet meadows in forested habitats.	No; habitat not present within the project area treatment areas.	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; habitat not present within the project area treatment areas.	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; habitat not present within the project area treatment areas.	No

5.2 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 Stone 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 Stone 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 Stone 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 are known to be present within the Stone project area, however there are several abandoned buildings. All buildings are outside of any treatment units and the buildings will not be disturbed; therefore, these standards and guidelines and management recommendations do not apply.

6.0 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) 2021 publication (USDI 2021), and the Oregon-Washington Partners in Flight (PIF) Plan, "Habitat Conservation for Landbirds in the Coniferous Forests of Western Oregon and Washington Version 2" (Altman 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 2021 publication partitions North America into 37 bird-conservation regions (BCRs). The Stone 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 12 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 Stone project.

Table 12 - Landbirds of Conservation Concern BCR 5 and Oregon-Washington PIF Focal Species List and Disposition

Species	List	Disposition
Western Grebe	BCR 5	Open water. No habitat in Project Area
Clark's Grebe	BCR 5	Open water No habitat in Project Area
Flammulated Owl	BCR 5	Species present on Forest. Mixed conifer forest
Western Screech-Owl	BCR 5	Species present on Forest. Mixed conifer and riparian forest
Blue (Sooty) Grouse	OR-WA PIF	Forested landscape mosaic, east side of the Forest, potential in project area
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

Species	List	Disposition
Vaux's Swift	BCR 5, OR-WA PIF	Species present on Forest. Old growth 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	Species present on Forest. Open mixed conifer forest
Chestnut-backed Chickadee	BCR 5	Species present on Forest. Coniferous forest
White-breasted Nuthatch	BCR 5	Low elevation deciduous forest. Not in project area
Evening Grosbeak	BCR 5	Species present on Forest. Coniferous forest
Cassin's Finch	BCR 5	Species present on Forest. Coniferous 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
Hammond's Flycatcher	OR-WA PIF	Species present on Forest. Mixed conifer 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	BCR 5, 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

Species	List	Disposition
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. No habitat in Project Area
Lincoln's Sparrow	OR-WA PIF	Montane wet meadows. Species present on Forest. No habitat in Project Area

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 Stone Project to Migratory Landbirds

Mixed conifer and mature/old forest associated species: Flammulated Owl, Western Screech-Owl, Blue Grouse, Rufous Hummingbird, Northern Flicker, Pacific-slope Flycatcher, Olive-sided Flycatcher, Hammond's Flycatcher, Chestnut-backed Chickadee, Evening Grosbeak, Cassin's Finch, Brown Creeper, Winter Wren, Varied Thrush, and Hermit Warbler.

No-Action – Taking No-Action 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.

Proposed Action - 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, tree 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 could be created within forest stands where it is currently at low densities. Other proposed treatments, including prescribed burning and roadside fuels treatments, would have little effect on most species. Prescribed burning would occur outside of the nesting season and the roadside fuels treatments would occur along roads in already disturbed areas.

The proposed Stone 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 locally 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 this group 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.

7.0 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 over 350,000 acres harvested since 1900. Prior to 2020, the combination of large-scale stand replacing fires and harvest acres contributed to a situation where almost 60% of the forest was in a “mid stage” of stand development with relatively few large snags. However, since 2020, several large wildfires have burned around the Forest, most notably the Riverside Fire creating some large 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, Forest Vegetation Simulator (FVS) modeling, and annual estimates of forested acres damaged by insect and disease carried out by the Pacific Northwest Region Aerial Detection Survey (ADS) program. 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 2017). 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 2017). 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[4]. The most recent version of DecAID Advisor is version 3.06. Major changes from version 2.2 include using the potential natural vegetation (PNV) map product developed by R6 area ecologists (Simpson et al. 2020) as the basis for wildlife habitat type (WHT) assignments, using LANDFIRE biophysical settings (BpS) to obtain pre-European settlement succession stages (LANDFIRE 2013), and adopting the most current Gradient Nearest Neighbor (GNN) map which was developed using a different methodology to previous versions (Landscape Ecology, Modeling, Mapping & Analysis Group (LEMMA) 2023).

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.

[4] https://apps.fs.usda.gov/decaid/views/what_is_decaid.html

- 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 2023). 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 2017). The DecAID Advisor 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.

Forest Vegetation Simulator - FVS

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 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[5].

Stone Project Area Current Condition

The proposed Stone project falls within the Oak Grove Fork Clackamas River 5th field watershed. The watershed encompasses approximately 79,209 acres, of which 66,889 acres are on the Mt. Hood National Forest and 12,320 acres are on Confederated Tribes of the Warm Springs Land. Within the watershed, the project area falls within the Montane Mixed Conifer Forest habitat type.

When the project area plantations that are proposed for treatment were first created, all of the trees were removed or in the case of shelterwood treatments, a few retention trees were left. In both cases, nearly all the snags were also removed. Under current conditions, these stands would eventually experience suppression mortality that would likely result in an abundance of small (< 10") to medium (< 20") 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

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

unchanged, the availability of new snags and down wood in the near future would be small to medium size, though a few scattered shelterwood retention trees will also become snags or down wood.

DecAID Analysis

The Northwest Oregon Ecology Group applied the DecAID analytical tool to assess snag densities and down wood cover for the Oak Grove Fork Clackamas River 5th field watershed. A distribution analyses was performed in the watershed for the Montane Mixed Conifer Forest habitat type. 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 of down wood within the Montane Mixed Conifer Forest habitat type within the 5th field watershed.

Results

In the histograms, 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, current conditions are similar to reference conditions. However, for both diameter limits, more of the landscape lacks snags under current conditions than under reference conditions. For snags with a minimum diameter of 10 inches (Figure 4), in general, current conditions are similar to reference conditions. A notable exception to that is the area estimated to contain >36 snags/acre which is almost double in the reference condition vs. current condition. For snags with a minimum diameter of 20 inches (Figure 5), most notably, the portion of the landscape with >6 large snags per acre in the reference condition is more than twice the area estimated for the current condition (39% vs. 18%). This reflects past logging practices and would be expected to change over time as the trees in the plantations grow larger.

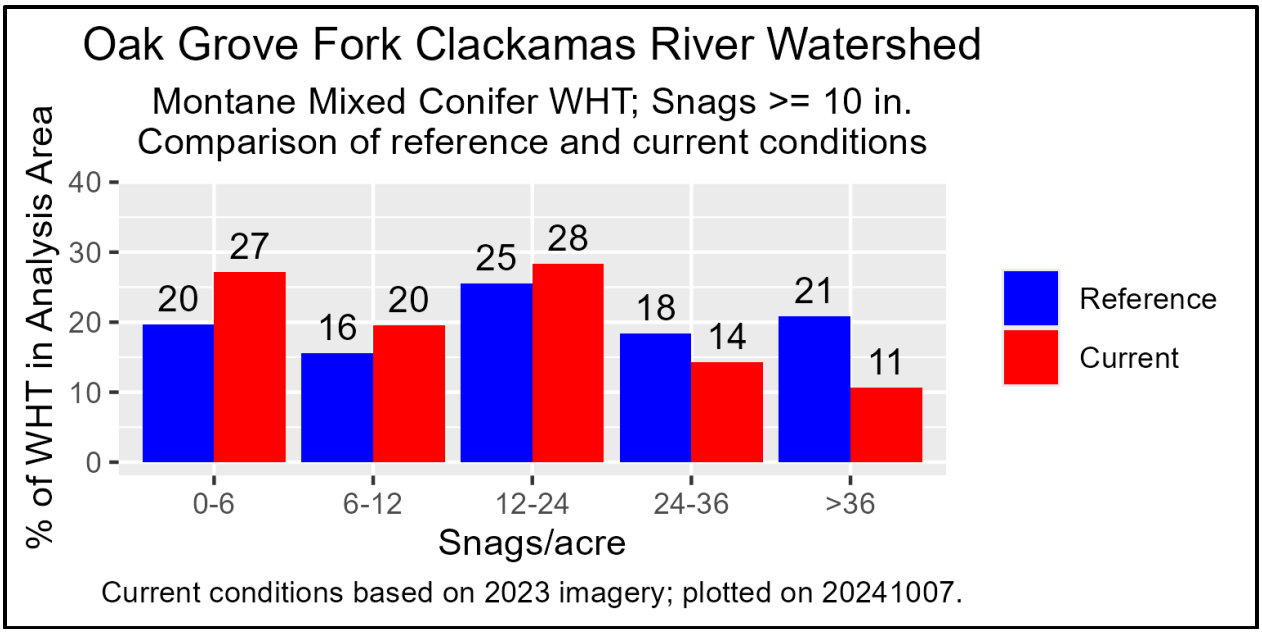


Figure 4 – Oak Grove Fork Clackamas River Watershed Snags Greater than 10 inches

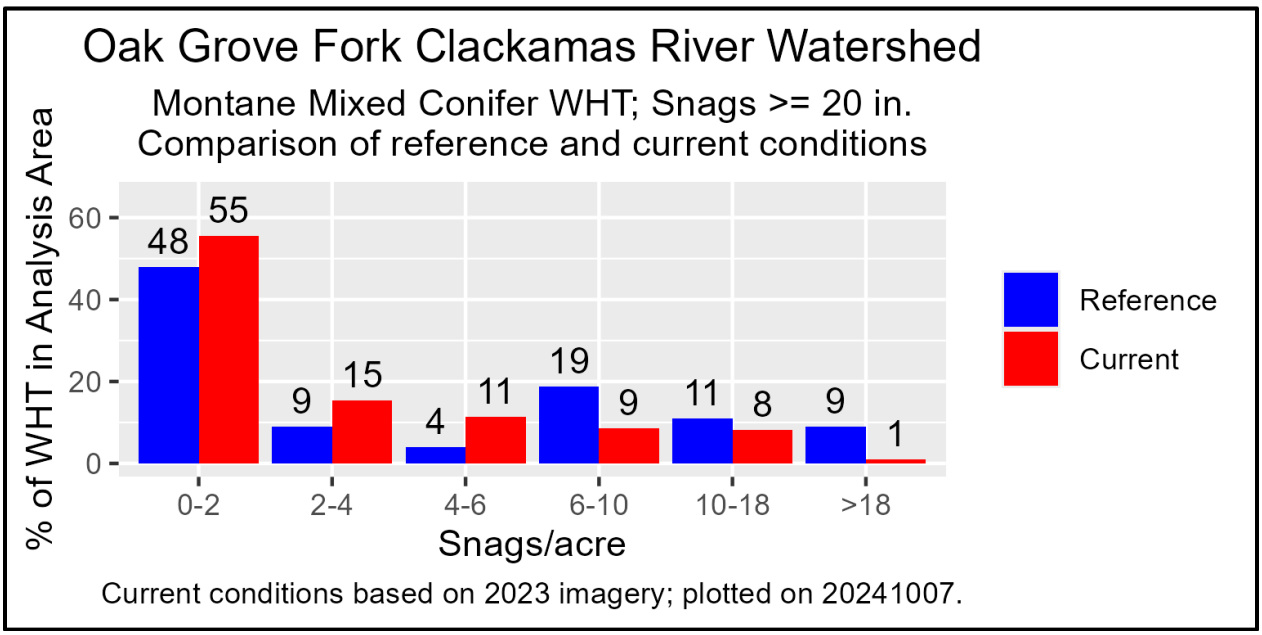


Figure 5 - Oak Grove Fork Clackamas River Watershed Snags Greater than 20 inches

For down wood, the DecAID distribution histograms show that the portion of the landscape under current conditions between 2-10% cover of down wood with a minimum diameter of 5 inches (Figure 6) is significantly higher than the reference conditions (86% vs. 62%) likely due to the current overstocking of the stands and the resulting competition mortality. However, the portion of the landscape with >10% cove is significantly greater in the reference condition. Interestingly, it is also significantly larger in the reference condition in the 0-2% cover portion of the landscape. For down wood with a minimum diameter of 20 inches (Figure 7), the landscape

is remarkedly similar under both conditions. It shows the landscape with low levels of large down wood. Past fires may have consumed large down wood.

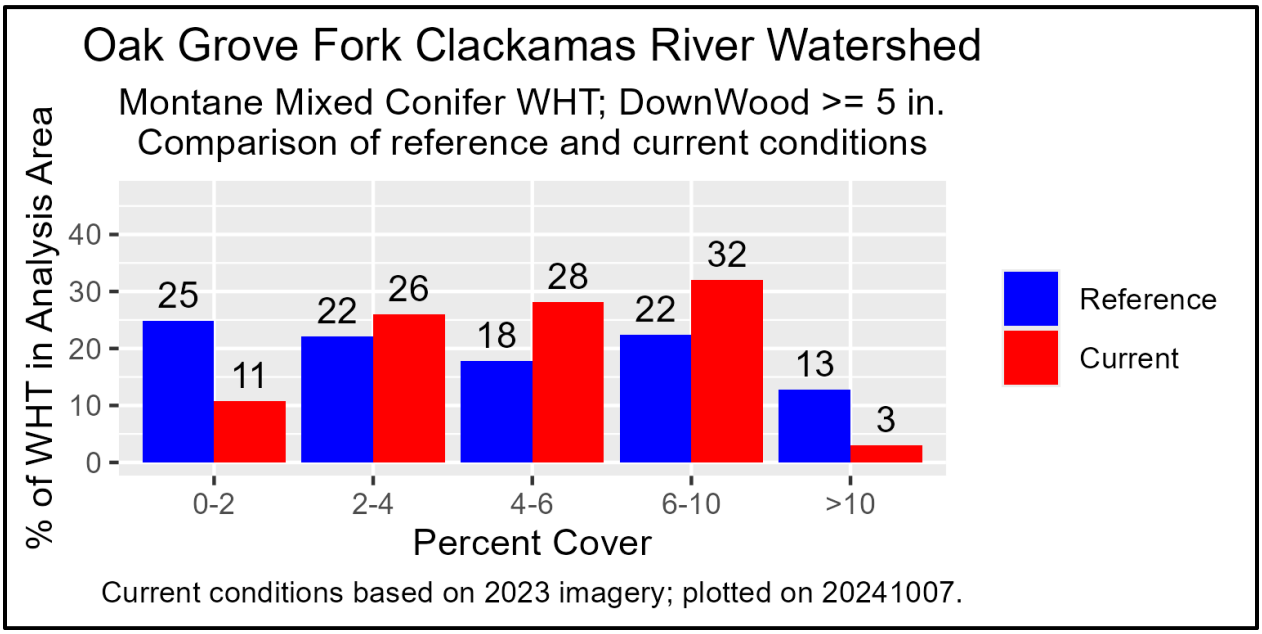


Figure 6 - Oak Grove Fork Clackamas River Watershed Down Wood Greater than 5 inches

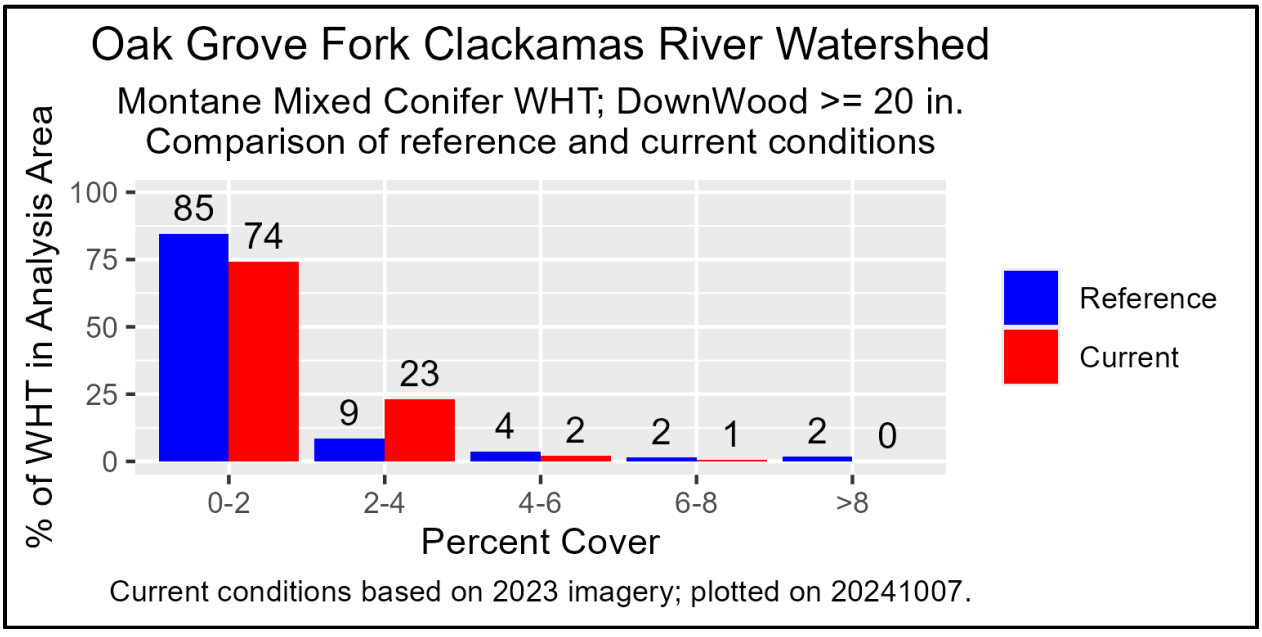


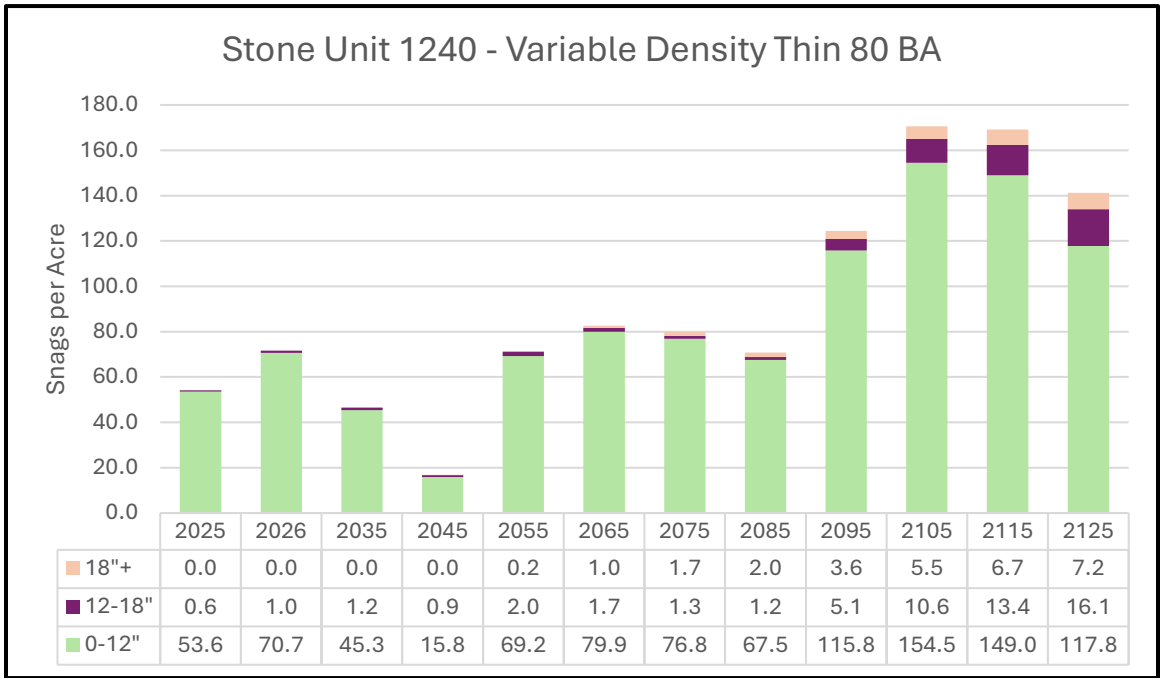
Figure 7 - Oak Grove Fork Clackamas River Watershed Down Wood Greater than 20 inches

FVS - Forest Vegetation Simulator

Forest Vegetation modeling can project the development of snags over time. For the Stone

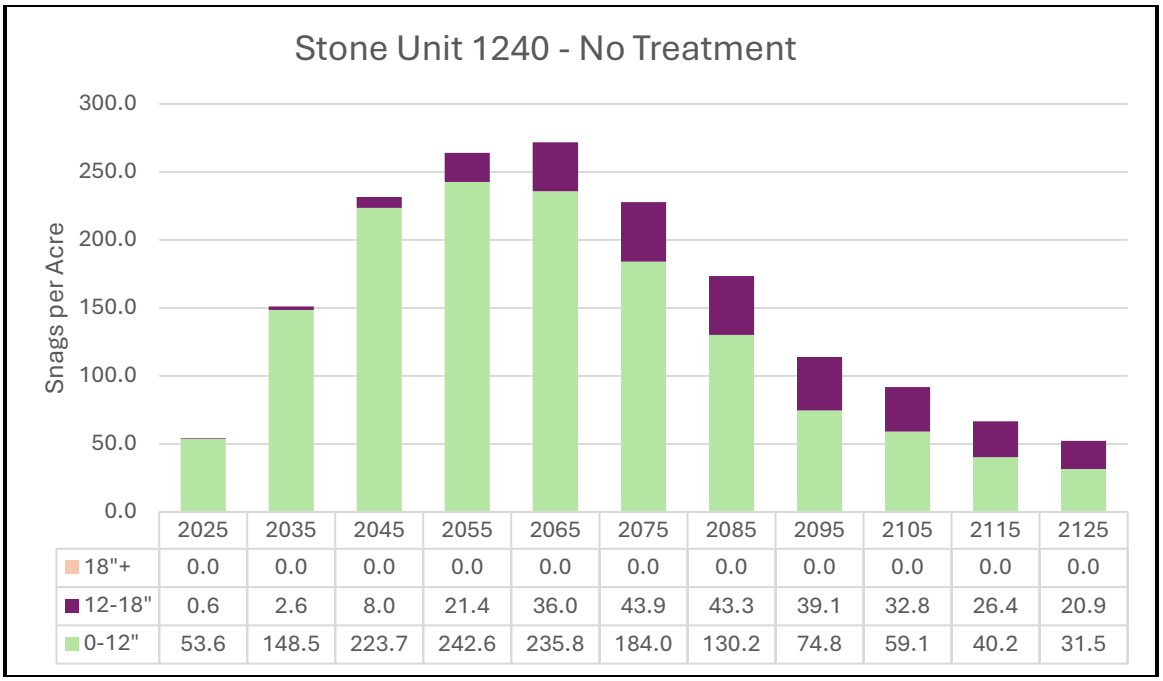
project the FVS model was run with the most representative proposed treatment for the Stone units. The charts displayed below predict the condition of snags from project proposal age projected out for 100 years as well as if no treatment were to occur. As a point of reference, at approximately 180-200 years of age (the age that the stand should be fully functioning as old growth 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 18-20 inches diameter, but larger snags provide more habitats for a longer period of time for a wider range of species.

The representative plantation unit for the Stone project is a 46-year-old stand with a variable-density thinning prescription to a target of 80-100 BA (sq. ft. basal area) of trees greater than 5“dbh, (currently at 189 BA) (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 stand, which is approximately 54 snags per acre, all of which are under 18-inch diameter and projects out for 100 years. The model, however, does not account for skips and gaps which can be up to 10% of the unit (up to 5% each). It also does not consider the potential creation of snags following harvest to increase the current snags and to replace snags potentially lost during harvest from incidental loss due to removal of hazard trees.



	2025	2026	2035	2045	2055	2065	2075	2085	2095	2105	2115	2125
18"+	0.0	0.0	0.0	0.0	0.2	1.0	1.7	2.0	3.6	5.5	6.7	7.2
12-18"	0.6	1.0	1.2	0.9	2.0	1.7	1.3	1.2	5.1	10.6	13.4	16.1
0-12"	53.6	70.7	45.3	15.8	69.2	79.9	76.8	67.5	115.8	154.5	149.0	117.8

Figure 8 - Stone project proposed Unit 1240 snag recruitment showing total snags out 100 years by size class following treatment to a residual basal area of approximately 90 sq.ft.



	2025	2035	2045	2055	2065	2075	2085	2095	2105	2115	2125
18"+	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12-18"	0.6	2.6	8.0	21.4	36.0	43.9	43.3	39.1	32.8	26.4	20.9
0-12"	53.6	148.5	223.7	242.6	235.8	184.0	130.2	74.8	59.1	40.2	31.5

Figure 9 - Stone project proposed Unit 1240 snag recruitment showing total snags out 100 years by size class with no treatment

Discussion on FVS Snag Recruitment Model

The figures above show stacked bars with the largest size snags at the top and progressively smaller snags added as the bar goes down. 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 proposed Stone unit variable-density thinning treatment graph represents the standard thinning proposed for most of the thinning units. The graph also only is representative of approximately 90% of the unit as it does not account for skips and gaps, only the area where variable density thinning is applied. Skips are areas not thinned and may include riparian protection buffers as well as smaller skips scattered in up to 5% of the harvest units. Snag development in skips would be similar to what is projected for no treatment. Leaving skips where suppression processes can occur would produce snags (Lutz 2006). Gaps are small openings scattered in up to 5% of a harvest unit. 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.

Based on the FVS snag recruitment model the proposed Stone project thinning treatments would result in a higher total number of snags within the harvest units 100 years out versus doing no treatment. Initially, and for the first 70 years post treatment, the overall number of snags is significantly higher in the untreated stands then shifts to higher numbers in the treated stand. 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. Most importantly, the large

snags begin showing up in the treated stand about 40 years post treatment and continue increasing as time goes on. Large snags do not show up in the untreated stands in the 100 years the model was run. 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 Stone project also could potentially create snags and down wood within thinning units where they are lacking. Stone Project Design Criteria K1 states:

> Except in certain root rot patches where snags are abundant, live trees may be treated within harvest units and protection buffers to provide future snags and down wood. Several techniques may be used. Tree topping is a technique used to create longer lasting snags and to create live trees with decay. Girdling near the base of the tree is the technique used to create snags quickly, but they decay, fall over sooner, and become down wood. Top girdling, girdling the tree approximately 2/3 up the tree, is an effective way to create long lasting snags. The use of fire to effectively girdle a tree is a new technique that can be used. Some trees are felled to get immediate down wood. After the harvest treatment, and after one or two winters elapse, the units would be examined to determine whether remaining trees died or fell down. In areas where the following target levels are not already met, additional trees may be topped, felled, girdled, or burned. In thinning units, there should be one tree per acre with a broken top, and two trees per acre should be either dead or down. If trees need to be treated to meet these numbers, they would be treated farther than one tree-height from system roads or trails 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 (<18 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 2017, Hagar 2009). Hagar (2009) found the density of cavity-associated birds to be greater in thinned vs. un-thinned 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 (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 2017), in which these larger diameters meet multiple life cycle needs.

Comparison of Effects to Snags and Down Wood by Alternative

No-Action

Taking No-Action 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 Figure 13. 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 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.

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

Proposed Action

The Stone 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 young plantations. Thinning such stands can increase the growth, health, and vigor of uncut trees, and can accelerate the development to older, late-successional forest. Stone project design criteria to protect or enhance existing snag and down wood habitat is part of the proposed action. 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. Many of 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, treetops, 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 slow for the next 60 plus years. To help mitigate this, and as stated above, potential creation of additional snag and down wood habitat could occur in units post-harvest where these elements are lacking.

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, treetops, 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 proposed action, 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 13). Large snags and large down wood would continue to be provided in the late-successional habitat and riparian areas 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 plantations average 11.3 inches quadratic mean 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 proposed action 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 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 proposed for thinning under the

proposed action are currently highly stocked even-aged stands and some with shelterwood retention trees. The stands have slowed growth, and 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 a short-term reduction in the trajectory of snag creation versus taking No-Action, 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.). The proposed action would have fewer snags and less down wood than taking no action in the short-term, however, there is a long-term benefit with the faster development of large snags. There would be enough snags and down wood within units and, combined with untreated areas across the landscape, there would be sufficient quantities of snags and down wood 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 Oak Grove Fork Clackamas River 5th field watershed, however, many snag dependent wildlife species will follow disturbances where large pockets of snag are created, so much of this discussion will include the whole Forest. 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. There are still abundant small and large snags in the mature forest within the Stone project boundary. There have been no recent large fires within the planning area that would have contributed a quick pulse of snags. There are no ongoing or foreseeable future actions that would affect snags or down wood to include in this analysis.

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 cumulative mortality does demonstrate the extant of natural mortality of trees that is creating snag and down wood habitat across the Forest. Table 13 below shows the most recent, 2024, insect and disease mortality across the Forest as detected by the Region 6 Annual Forest Insect and Disease Aerial Detection Survey (USDA 2025). Results show that 51,190 acres were showing insect and disease effects across the Forest. This natural mortality creates an environment that is sustaining for snag and down wood dependent species.

Table 13.

2024 Forest Insect & Disease Activity - Mt. Hood National Forest Summary of Aerial Survey Results (Acres[1])							
	Mortality Agent						
Ranger District	Ponderosa Pine Mortality Attributed to Bark Beetles	Douglas-fir beetle	Fir Engraver	Young Conifer Mortality	Silver Fir Beetle	Balsam Woolly Adelgid	Mortality Total
Barlow Ranger District	29,440	6,430	1,960	< 5	80	30	**37,940**
Clackamas River Ranger District	30	4,680	3,170	70	0	30	**7,980**
Hood River Ranger District	< 5	2,440	900	< 5	0	270	**3,610**
Zigzag Ranger District	< 5	1,580	20	40	0	20	**1,660**
Mt. Hood National Forest Total	**29,470**	**15,130**	**6,050**	**110**	**80**	**350**	**51,190**

[1] Values rounded to the nearest 10, sum of individual values may differ from totals due to rounding.

Since 1995, the Forest Service has commercially treated, by shelterwood and regeneration harvests within the Stone project area. Current science and the changing trend in timber management that has occurred within the past two decades, 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.

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 would continue to contribute snags and down wood across the landscape. In addition, the creation of snags and down wood within treatment units could supplement the existing dead wood in the project area. The Stone project activities are therefore likely to have little cumulative effect on snag and down wood habitat throughout the analysis area. The overall effect on snags and down wood for the Oak Grove Fork Clackamas River 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 Proposed Action, when added to past, current and foreseeable actions, would not result in substantive cumulative effects and while the Proposed Action would have fewer snags and less down wood in the short-term than

taking no action, there would be sufficient quantities across the landscape to provide for the needs of dependent species over time.

Consistency with Direction and Regulations for Snags and Down Wood

Table 14 - 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 Stone 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 80-100 sq.ft. basal area. All legacy and shelterwood retention trees would be retained. Snags could 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 could 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. In thinning units, live trees would be retained at 80-100 sq.ft. basal area. All legacy and shelterwood retention trees would be retained. Snags could be created in thinning units that are deficit 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) guidelines and would increase through time as stands continue to 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 riparian reserves and skips, 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.

Standard and Guideline	Text	Rationale
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. In thinning units, live trees would be retained at 80-100 sq.ft. basal area. All legacy and shelterwood retention trees would be retained. Snags could be created in thinning units that are deficit 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. 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 could 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 could 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.
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 could 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 could be conducted, and snags would be created in units that are deficit.
FW-234	Wildlife trees retained should be at least 40 feet in height and 22 inches in diameter at breast height. Smaller trees	All existing snags and large down wood would be retained in treatment units except for safety concerns. Snags and down wood could be created in thinning

Standard and Guideline	Text	Rationale
FW-235 FW-236 p. Four-74 & 75	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.	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.	In thinning units, live trees would be retained at an average of 80-100 sq.ft. basal area. 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 could 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 units would be retained in green tree aggregates and smaller clumps and individual trees, including skips. All existing snags would be retained in treatment units except for safety concerns.
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 and FW-216 above.

8.0 LITERATURE CITED

Altman, B. and J.D. Alexander. 2012. Habitat conservation for landbirds in coniferous forests of western Oregon and Washington. Version 2.0. Oregon-Washington Partners in Flight (www.orwapif.org) and American Bird Conservancy and Klamath Bird Observatory.

Aubry, K. B., K. S. Mckelvey, J. P. Copeland. 2007. Distribution and Broadscale Habitat Relations of the Wolverine in the Contiguous United States. Journal of Wildlife Management. Article: pp. 2147–2158

Buehler, D. A. 2000. Bald Eagle (*Haliaeetus leucocephalus*). In The Birds of North America, No. 506 (A. Poole and F. Gill, eds.). Birds of North America, Inc., Philadelphia, Pennsylvania, USA. https://birdsoftheworld.org/bow/species/baleag/2.0/introduction

Burke, T.E. 2013. Land Snails and Slugs of the Pacific Northwest. Oregon State University Press. Corvallis, OR. 344 Pp.

Burns, I. 2004. Social development and conflict in the North American bumblebee *Bombus impatiens* Cresson. U of MN. Ph.D. Thesis.

Buskirk, S.W. and R.A. Powell. 1994. Habitat Ecology of Fishers and American Martens. In: Martens, Sables, and Fishers: Biology and Conservation. (Buskirk, S.W., A.S. Harestad, M.G. Raphael, comps., eds.) Cornell University Press. Ithaca, NY. Pp. 283-296.

Buskirk, S.W. and L.F. Ruggiero. 1994. American Marten. In: The Scientific Basis for Conserving Forest Carnivores in the Western United States. (L.F. Ruggiero, K.B. Aubrey, S.W. Buskirk, eds.) United States Department of Agriculture, Forest Service, Rocky Mountain Range and Experiment Station. Gen. Tech. Report RM-254.

Cameron, S. A., J. D. Lozier, J. P. Strange, J. B. Koch, N. Cordes, L. F. Solter, and T. L. Griswold. 2011. Patterns of widespread decline in North American bumble bees. Proceedings of the National Academy of Sciences 108:662–667.

Carey, A. B. 2001. Experimental manipulation of spatial heterogeneity in Douglas-fir forests: effects on squirrels. Forest Ecology and Management 152:13-30.

Cook, R. C, J. G. Cook, D. J. Vales, B. K. Johnson, S. M. Mccorquodale, L. A. Shipley, R. A. Riggs, L. L. Irwin, S. L. Murphie, B. L. Murphie, K. A. Schoenecker, F. Geyer, P. B. Hall, R. D. Spencer, D. A. Immell, D. H. Jackson, B. L. Tiller, P. J. Miller, and L. Schmitz. 2013. Regional and seasonal patterns of nutritional condition and reproduction in elk. Wildlife Monographs 184:1–44. Sub Cook 2016?

Cook, J. G., L. L. Irwin, L. D. Bryant, R. A. Riggs, and J. W. Thomas. 1998. Relations of forest cover and condition of elk: a test of the thermal cover hypothesis in summer and winter. Wildlife Monographs 141.

Copeland J. P., Peak J., Groves C., Melquist W., McKelvey K. S., McDaniel G. W., Long C. D., Harris C. E. 2007. Seasonal habitat associations of the wolverine in central Idaho. Journal of Wildlife Management. 71: 2201–2212

Courtney, S.P., J.A. Blakesley, R.E. Bigley, M.L. Cody, J.P. Dumbacher, R.C. Fleischer, A.B. Franklin, J.F. Franklin, R.J. Gutierrez, J.M. Marzluff, L. Sztukowski. 2004. Scientific Evaluation of the Status of the Northern Spotted Owl (SEI Report). Sustainable Ecosystems Institute, Portland OR. September 2004.

Crisafulli, C. M., D. Clayton, and D. Olson. 2008. Conservation Assessment for the Larch Mountain Salamander. USDA Forest Service Region 6 and USDI Bureau of Land Management. 36p.

Cushman, K. A. and C. A. Pearl. 2007. A Conservation Assessment for the Oregon Spotted Frog. USDA Forest Service Region 6 and USDI Bureau of Land Management. 46p.

Davis, L. R., K. J. Puettmann and G. F. Tucker. 2007. Overstory response to alternative thinning treatments in young Douglas-fir forests of western Oregon. Northwest Science. 81(1):1-14.

Dixon, G.E. 2002. Essential FVS: A User's Guide to the Forest Vegetation Simulator. Internal Rep. Fort Collins, CO: U.S. Forest Service. Forest Management Service Center. 204 p. (Revised: January 2007).

Dugger, K.M., R.G. Anthony and L.S. Andrews. 2011. Transient dynamics of invasive competition: barred owls, spotted owls, habitat composition and the demons of competition present. Ecological Applications.

Duncan, N. 2004. Conservation Assessment for *Pristiloma arcticum crateris*, Crater Lake Tightcoil. USDA Forest Service Region 6 and USDI Bureau of Land Management. 18p.

Duncan, N. 2005. Conservation Assessment for Conservation Assessment for *Monadenia fidelis minor*, Dalles Sideband. USDA Forest Service Region 6 and USDI Bureau of Land Management. 14p.

Evans, E., R. W. Thorp, S. Jepsen, and S. H. Black. 2008. Status review of three formerly common species of bumble bee in the Subgenus Bombus. Available at: https://www.xerces.org/sites/default/files/2019-10/xerces_2008_bombus_status_review.pdf.

Federal Register Notice. July 9, 2007. Volume 72, Number 130. Endangered and Threatened Wildlife and Plants; Removing the Bald Eagle in the Lower 48 States From the List of Endangered and Threatened Wildlife. Department of the Interior, Fish and Wildlife Service.

Fontaine JB and Kennedy PL. 2012. Meta-analysis of avian and small-mammal response to fire severity and fire surrogate treatments in U.S. fire-prone forests. Ecol Appl. 2012 Jul;22(5):1547-61. doi: 10.1890/12-0009.1. PMID: 22908713; PMCID: PMC7163597.

Foster, A. D. and D. H. Olson. 2014. Conservation Assessment for the Cope's Giant Salamander. USDA Forest Service Region 6 and USDI Bureau of Land Management. 57p. https://www.fs.usda.gov/pnw/pubs/journals/pnw_2014_foster001.pdf

Forsman, E.D., R.G. Anthony, J.A. Reid, P.J. Loschl, S.G. Sovern, M. Taylor, B.L. Biswell, A. Ellingson, E.C. Meslow, G.S. Miller, K.A. Swindle, J.A. Thrailkill, F.F. Wagner, and D. E. Seaman. 2002. Natal and breeding dispersal of northern spotted owls. Wildlife Monographs 149:1-35.

Forsman, E.D., R.G. Anthony, E.C. Meslow and C.J. Zabel. 2004. Diets and Foraging Behavior of Northern Spotted Owls in Oregon. Journal of Raptor Research 38: 214-230.

Forsman, E.D., R.G. Anthony, K.M. Dugger, E.M. Glenn, A.B. Franklin, G.C. White, C.J.Schwarz, K.P. Burnham, D.R. Anderson, J.D. Nichols, J.E. Hines, J.B. Lint, R.J. Davis, S.H. Ackers, L.S. Andrews, B.L. Biswell, P.C. Carlson, L.V. Diller, S.A. Gremel, D.R. Herter, J.M. Higley, R.B. Horn, J.A. Reid, J. Rockweit, J. Schaberl, T.J. Snetsinger and S.G. Sovern. 2011. Population demography of northern spotted owls: 1985–2008. Studies in Avian Biology. Cooper Ornithological Society.

Frest, T. J. and E. J. Johannes. 1995. Interior Columbia Basin mollusk species of special concern. Final report to the Interior Columbia Basin Ecosystem Management Project, Walla Walla, WA. Contract #43-0E00-4-9112. 274 pp. plus appendices.

Frest, T.J. and E. J. Johannes. 2000. Baseline Mollusk Survey of Southwest Oregon (Rogue and Umpqua Basins). Deixis Consultants, Seattle, Washington. Oregon Natural Heritage Program, Portland Oregon.

Frest, T.J. and E.J. Johannes. 2004. Grazing effects on springsnails, Cascade-Siskiyou National Monument, Oregon. Prepared for World Wildlife Fund, Cascade-Siskiyou Ecoregion Office.

Garman, S.L., J.H. Cissel, and J.H. Mayo. 2003. Accelerating Development of Late-Successional Conditions in Young Managed Douglas-Fir Stands: A Simulation Study. General Technical Report PNW-GTR-557.

Goulson, D. 2010. Bumblebees: Behavior, Ecology, and Conservation. Oxford University Press. 317p.

Hagar, J. 2009. Young Stand Thinning and Diversity Study: Response of Songbird Community One Decade Post-Treatment. Open-File Report 2009-1253, U.S.

Hamer, T., D. Hays, C. M. Senger, and E. D. Forsman. 2001. Diets of Northern Barred Owls and Northern Spotted Owls in an area of sympatry. Journal of Raptor Research 35:221–227.

Hamm, Keith A., and Lowell V. Diller. 2009. Forest Management Effects on Abundance of Woodrats in Northern California. *Northwestern Naturalist* 90, no. 2: 97-106.

Hartwig, C.L., D.S. Eastman, and A.S. Harestad. 2004. Characteristics of pileated woodpecker (*Dryocopus pileatus*) cavity trees and their patches on southeastern Vancouver Island, British

Columbia, Canada. Forest Ecology and Management 187:225-234.

Hatfield RG, Colla SR, Jepsen S, Richardson LL, Thorp RW, Foltz-Jordan S. 2014. IUCN Assessments for North American Bombus spp. for the North American IUCN Bumble Bee Specialist Group. The Xerces Society for Invertebrate Conservation, Portland, OR.

Hatfield, R., S. Jepsen and S.F. Jordan, Xerces Society for Invertebrate Conservation. 2017. Interagency Special Status/Sensitive Species Program (ISSSSP) Species Fact Sheet: *Bombus suckleyi.* USDA Forest Service Region 6 and USDI Bureau of Land Management Oregon State Office.

Hayes, G. and G. J. Wiles. 2013. Washington bat conservation plan. Washington Department of Fish and Wildlife, Olympia, Washington. 138+viii pp.

Hobbs, G. A. 1968. Ecology of species of *Bombus* Latr. (Hymenoptera: Apidae) in southern Alberta. VI. Subgenus Bombus, Canadian Entomologist 100: 156-164.

Innes, R.J., D.H. VanVuren, D.A. Kelt, M.L. Johnson, J.A. Wilson and P.A. Stine. 2007. Habitat associations of dusky-footed woodrats (Neotoma fuscipes) in mixed-conifer forest of the Northern Sierra Nevada. Journal of Mammalogy 88:1523-1531.

Isaacs, F. B., and R. G. Anthony. 2011. Bald eagles (*Haliaeetus leucocephalus*) nesting in Oregon and along the lower Columbia River, 1978-2007. Final Report, 18 March 2011. Oregon Cooperative Fish and Wildlife Research Unit, Department of Fisheries and Wildlife, Oregon State University, Corvallis, Oregon, USA.

Johnson, P.J. 1979. Report on a survey for Beller's ground beetle on the North Fork Snoqualmie River, King Co. WA. Report to the US Army Corps of Engineers. 19 pp.

Kilgo, J. C. and M. A. Vukovich. 2014. Can snag creation benefit a primary cavity nester: Response to an experimental pulse in snag abundance. Biological Conservation 171 (2014) 21–28.

Kogut, T. and N. Duncan. 2005. Conservation Assessment for *Cryptomastix devia*, Puget Oregonian. USDA Forest Service Region 6 and USDI Bureau of Land Management. 24p. http://www.fs.fed.us/r6/sfpnw/issssp/planning-documents/assessments.shtml

LANDFIRE: LANDFIRE Biophysical Settings layer. (2013, June - last update). U.S. Department of Interior, Geological Survey, and U.S. Department of Agriculture. [Online]. Available: https://landfire.gov/version_download.php

Lamke, K., R. Hatfield, and S. Jepsen. 2020. Interagency Special Status/Sensitive Species Program (ISSSSP) Species Fact Sheet: *Bombus occidentalis*. USDA Forest Service Region 6 and USDI Bureau of Land Management Oregon State Office. 26 pp.

Larsen, E.M., E. Rodrick and R. Milner. 1995. Management Recommendations for Washington's

Priority Species, Volume I. 42-46 pp.

Lehmkuhl, J. F., K. D. Kistler and J. S. Begley. 2006. Bushy –tailed woodrat abundance in dry forests of eastern Washington. Journal of Mammalogy 87:371-379.

LEMMA. 2023. LEMMA--Landscape Ecology, Modeling, Mapping, and Analysis. http://lemma.forestry.oregonstate.edu/

Leonard, W.P., L. Chichester, C.H. Richart, and T.A. Young. 2011. *Securicauda hermani* and *Carinacauda stormi*, two new genera and species of slug from the Pacific Northwest of the United States (Gastropoda: Stylommatophora: Arionidae), with notes on *Gliabates oregonius* Webb 1959. Zootaxa 2746:53-56.

Lutz, J. A., and C. B. Halpern. 2006. Tree mortality during early forest development: a long-term study of rates, causes, and consequences. Ecological Monographs 76(2):257-275.

Macfarlane R. P., K. D. Patten, L. A. Royce, B. K. W. Wyatt, and D. F. Mayer. 1994. Management potential of sixteen North American bumble bee species. Melanderia 50:1-12.

Mangan, A. O., Tara Chestnut, Jody C Vogeler, Ian K Breckheimer, Wendy M King, Keith E Bagnall, Katie M Dugger. 2019. Barred Owls reduce occupancy and breeding propensity of Northern Spotted Owl in a Washington old-growth forest. *The Condor*, Volume 121, Issue 3, 1 August 2019.

Manning, T., J. C. Hagar, and B. C. McComb. 2012. Thinning of young Douglas-fir forests decreases density of northern flying squirrels in the Oregon Cascades. *Forest Ecology and Management* 264:115–124.

Marcot, Bruce G., Barbara C. Wales, and Rick Demmer. 2003. Range maps of terrestrial species in the Interior Columbia River Basin and northern portions of the Klamath and Great Basins. PNW-GTR-583, USDA Forest Service, Pacific Northwest Research Station, and USDI Bureau of Land Management, Portland, OR. 304 p. http://www.fs.fed.us/pnw/publications/gtr583/

Marshall, D.B., M.G. Hunter, and A.L. Contreras, Eds. 2003. Birds of Oregon: A General Reference. Oregon State University Press, Corvallis, OR. 768 Pp.

Martin, S.K. 1994. Feeding ecology of American martens and fishers. In: Buskirk, S.W.; Harestat, A.S.; Raphael, M.B., comps., eds. Martens, sables, and fishers: biology and conservation. Ithaca, NY: Cornell University Press: 297-315.

Maser, C., Mate, B.C., Franklin, J.F., Dyrness, C.T. 1981. Natural history of Oregon Coast mammals. General Technical Report PNW-133. Portland, OR. US Forest Service, Pacific Northwest Forest and Range Experiment Station. https://www.srs.fs.usda.gov/pubs/gtr/gtr_pnw133.pdf

Mellen, T. K., E. C. Meslow, and R. W. Mannan. 1992. Summertime home range and habitat use

of pileated woodpeckers in western Oregon. Journal of Wildlife Management 56:96-103.

Mellen-McLean, K., B. Wales, and B. Bresson. 2013. A Conservation Assessment for the White-headed Woodpecker (*Picoides albolarvatus*). USDA Forest Service, Region 6 and USDI Bureau of Land Management, Oregon and Washington. 41 p.

Mellen-McLean, Kim, Bruce G. Marcot, Janet L. Ohmann, Karen Waddell, Elizabeth A. Willhite, Steven A. Acker, Susan A. Livingston, Bruce B. Hostetler, Barbara S. Webb, and Barbara A. Garcia. 2017. DecAID, the decayed wood advisor for managing snags, partially dead trees, and down wood for biodiversity in forests of Washington and Oregon. Version 3.0. USDA Forest Service, Pacific Northwest Region and Pacific Northwest Research Station; USDI Fish and Wildlife Service, Oregon State Office; Portland, Oregon. https://apps.fs.usda.gov/decaid/views/index.html

NatureServe. 2025. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer.

ODFW. 2008. Oregon black-tailed deer management plan. 61pp.

ODFW. 2019. Oregon Wolf Conservation and Management Plan

ODFW. 2025. Oregon Wolf Conservation and Management 2024 Annual Report. Oregon Department of Fish and Wildlife, 4034 Fairview Industrial Drive SE. Salem, OR, 97302

Parker, K. L., M. P. Gillingham, T. A. Hanley, and C. T. Robbins. 1999. Energy and protein balance of free-ranging black-tailed deer in a natural forest environment. Wildlife Monographs 143.

Paulson, D. 2009. Dragonflies and damselflies of the west. Princeton University Press. 536 pp.

Pearson, R. R., and K. B. Livezey. 2003. Distribution, numbers, and site characteristics of spotted owls and barred owls in the Cascade Mountains of Washington. Journal of Raptor Research 37: 265-276.

Perrine, J. D., L. A. Campbell, and G. A. Green. 2010. Sierra Nevada red fox (Vulpes vulpes necator): a conservation assessment. USDA Forest Service, R5-FR-010.

Rockwell, S.M. 2018. Conservation Assessment for Harlequin Duck (*Histrionicus histrionicus*. USDA Forest Service Region 6 and USDI Bureau of Land Management, Oregon and Washington. 76 pp.

Rowland, M.M., M.J. Wisdom, B.K. Johnson, and M.A. Penninger. 2005. Effects of roads on elk: Implications for management in forested ecosystems. Pages 42-52 In Wisdom, M.J., technical editor, The Starkey Project: a synthesis of long-term studies of elk and mule deer. Reprinted from the 2004 Transactions of the North American Wildlife and Natural Resources Conference, Alliance Communications Group, Lawrence, Kansas, USA.

Sakai, H. F. and B. R. Noon. 1993. Dusky-footed woodrat abundance in different-aged forests in northwestern California. Journal of Wildlife Management 57(2):373-382.

Sauer, J. R., D. K. Niven, J. E. Hines, D. J. Ziolkowski, Jr, K. L. Pardieck, J. E. Fallon, and W. A. Link. 2017. The North American Breeding Bird Survey, Results and Analysis 1966 - 2015. Version 2.07.2017 USGS Patuxent Wildlife Research Center, Laurel, MD. https://www.usgs.gov/centers/eesc/science/north-american-breeding-bird-survey

Simpson M, J. Kertis, S. Acker, P. Hochhalter, A. Nathanson, and T. DeMeo. 2020. Potential Natural Vegetation Classification and Mapping for Washington, Oregon, and California Using Gradient Nearest Neighbor Imputations. https://www.fs.usda.gov/main/ecoshare/tools/potential-natural-vegetation

Sollmann, R., A. M. White, G.L. Tarbill, P.N. Manley, E.E. Knapp. 2016. Landscape heterogeneity compensates for fuel reduction treatment effects on Northern flying squirrel populations. Forest Ecology and Management 373 (2016) 100–107.

Sovern, S.G., E.D. Forsman, K.M.Dugger, and M.Taylor. 2015. Roosting habitat use and selection by northern spotted owls during natal dispersal. Journal of Wildlife Management. 79(2):254 262.

Swingle, J.K. and E.D. Forsman. 2009. Home range areas and activity patterns of red tree voles (*Arborimus longicaudus*). Northwest Sciend 83: 273-286.

Tobalske, B. W. 1997. Lewis' Woodpecker (*Melanerpes lewis*). In The Birds of North America, No. 284 (A. Poole and F. Gills, eds.). The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologists' Union, Washington, D.C.

Thorp, R. W., D. S Horning and L. L. Dunning. 1983. Bumble bees and cuckoo bumble bees of California (Hymenoptera: Apidae). Bulletin of the California Insect Survey 23: viii.

Thornton, D.H., A.J. Wirsing, J.D. Roth, and D.L. Murray. 2012. Complex effects of site preparation and harvest on snowshoe hare abundance across a patchy forest landscape. Forest Ecology and Management 280:132-139.

USDA-Forest Service, Pacific Northwest Region. 1990. Record of Decision, Land and Resource Management Plan. Mt Hood National Forest.

USDA-Forest Service, Pacific Northwest Region. 1995. Cavity-Nesting Bird Habitat Guide: Western Cascades. Mt. Hood National Forest and Gifford Pinchot National Forest.

USDA-Forest Service. 2025. Region 6 Annual Forest Insect and Disease Aerial Detection Survey (2024). https://www.fs.usda.gov/detail/r6/forest-grasslandhealth/insects-diseases/?cid=stelprdb5286951

USDA Forest Service and USDI Bureau of Land Management. 1994. Record of decision on

management of habitat for late-successional and old-growth forest related species within the range of the northern spotted owl (Northwest Forest Plan). USDA Forest Service, USDI Bureau of Land Management. Portland, OR.

USDA Forest Service and USDI Bureau of Land Management. 1998. North Willamette LSR Assessment, Mt Hood National Forest Cascades Resource Area, Salem BLM.

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

USDA-Forest Service and USDI Bureau of Land Management. 2017a. 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-Forest Service and USDI Bureau of Land Management. 2017b. Biological Assessment for Routine Land Management Activities within the Willamette Planning Province of Oregon with a Potential to Disturb the Northern Spotted Owl (*Strix occidentalis caurina*).

USDI Fish and Wildlife Service. 2021. Birds of Conservation Concern 2021. United States Department of Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Arlington, Virginia. Online version available at https://www.fws.gov/media/birds-conservation-concern-2021

USDI Fish and Wildlife Service (USFWS). 2011. Revised Recovery Plan for the Northern Spotted Owl (*Strix occidentalis caurina*). U.S. Fish and Wildlife Service, Portland, Oregon. xvi + 258 pp.

USDI Fish and Wildlife Service. 2012. Designation of Revised Critical Habitat for the Northern Spotted Owl (*Strix occidentalis caurina*) - Final Rule. Fed. Reg. Vol. 77. 233: 71876-72068. December 2012.

USDI Fish and Wildlife Service. 2017a. Letter of Concurrence Regarding the Effects of 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 (FWS Reference Number 01EOFW00-2017-I-0667).

USDI Fish and Wildlife Service. 2017b. Letter of Concurrence Regarding the Effects of Routine Land Management Activities within the Willamette Planning Province of Oregon with a Potential to Disturb the Northern Spotted Owl (*Strix occidentalis caurina*) (FWS Reference Number 01EOFW00-2017-I-0261).

USFWS (U.S. Fish and Wildlife Service). 2013. Experimental removal of barred owls to benefit threatened northern spotted owls. Final Environmental Impact Statement, Oregon Fish and Wildlife Office, Portland, OR, July 2013.

Wiens, J. D. 2012. Competitive Interactions and Resource Partitioning Between Northern

Spotted Owls and Barred Owls in Western Oregon. PhD Dissertation, Oregon State University, Corvallis, OR.

Wiens, D. J., R. G. Anthony, and E. D. Forsman (2014). Competitive interactions and resource partitioning between Northern Spotted Owls and Barred Owls in Western Oregon. Wildlife Monographs, no. 185.

Williams, D.F., J. Verner, H.F. Sakai and J.R. Waters. 1992. General biology of major prey species of the California spotted owl. Pages 207–221 in J. Verner, K.S. McKelvey, B.R. Noon, R.J. Gutiérrez, G.I. Gold, Jr., and T.W. Beck (technical coordinators), The California spotted owl: a technical assessment of its current status. General Technical Report PSW-GTR-133, Pacific Southwest Research Station, U.S. Department of Agriculture, Forest Service, Albany, California.

Williams, P. H., R. W. Thorp, L. L. Richardson, and S. Colla. 2014. Guide to the Bumble Bees of North America. Princeton University Press.

Wilson, Todd M. 2010. Limiting factors for northern flying squirrels (Glaucomys sabrinus) in the Pacific Northwest: a spatio-temporal analysis. In: Interdisciplinary Studies. Union Institute & University, Cincinnati, p. 219

Wilson, Todd M. and Eric D. Forsman. 2013. Thinning effects on spotted owl prey and other forest-dwelling small mammals. In: Anderson, Paul D.; Ronnenberg, Kathryn L., eds. Density management for the 21st century: westside story. Gen.Tech. Rep. PNW-GTR-880. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station: 79–90.

Wisdom, M. J., technical editor. 2005. The Starkey Project: a synthesis of long-term studies of elk and mule deer. Alliance Communications Group, Lawrence, Kansas, USA.

Wisdom, M. J., H. K. Preisler, L. M. Naylor, R. G. Anthony, B. K. Johnson, and M. K. Rowland. 2018. Elk responses to trail-based recreation on public forests. Forest Ecology and Management. 411, pp. 223-233.

Xerces Society. 2025. Western Bumble Bee. https://www.xerces.org/endangered-species/species-profiles/at-risk-bumble-bees/western-bumble-bee. Accessed April 2025.

Yackulic, C. B., J. Reid, J. D. Nichols, J. E. Hines, R. Davis, and E. D. Forsman (2014). The roles of competition and habitat in the dynamics of populations and species distributions. Ecology 95:265–279.

Young, T., J. Doerr, R. Price and R. Davis. 2010. FY2010 ISSSP report on two salamander slug (*Gliabates oregonius)* survey projects. Unpublished Report, Interagency Special Status Species Program (USDI Bureau of Land Management and USDA Forest Service), Portland, OR.

Zack, S., George, L., Laundenslayer, W.F., Jr., 2002. Are there snags in the system? Comparing cavity use among nesting birds in ‘‘Snag-rich’’ and ‘‘Snag-poor’’ Eastside pine forests. USDA Forest Service General Technical Report PSW-GTR-181, pp. 279–191.

Zielinski, W. J., K. M. Slauson, C. R. Carroll, C. J. Kent, and D. G. Kudma. 2001. Status of American martens in coastal forests of the Pacific states. Journal of Mammalogy 82:478-4