United States Department of Agriculture
Forest Service

Wildlife Specialist Report

Forest Plans Amendment

Forest Management Direction for Large Diameter Trees in Eastern Oregon

Draft Environmental Assessment

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Wildlife

Affected Environment

The planning area includes two broad ecoregions (based on the Level III ecoregions), the Blue Mountains Ecoregion of northeastern Oregon and southeastern Washington and the Eastern Cascades Ecoregion that occurs along north-south along the eastern portion of the Cascades mountains (Stine et al. 2014). The national forests associated with the Blue Mountains Ecoregion include the Umatilla, Malheur, and Wallowa-Whitman (Table 1), and the national forests associated with the Eastern Cascades are the Deschutes, Ochoco, and Fremont-Winema (Table 1). These broad ecoregions have unique climate, topography, and disturbance regimes that interact to form a template upon which habitats are formed for a broad diversity of plant and animal species across the planning area. There are four federally listed or proposed wildlife species that are Documented (D) or Suspected (S) to occur in the planning area, one species is Endangered (Gray wolf, *Canis lupus*), two species are Threatened (Oregon spotted frog, *Rana pretiosa*; Canada lynx, *Lynx Canadensis*), and one species is Proposed for listing (wolverine, *Gulo gulo*). In addition, there are 85 species that are on the Region 6 Sensitive Species list, including 25 bird species, eleven mammals, three amphibians, one reptile, and 45 invertebrates (USFS 2019).

There are a broad array of animal species across that planning area that are associated with Late and Old Structure (LOS)(Wisdom et al. 2000, Wales et al. 2011, Stine et al. 2014). The number of wildlife LOS associates includes federally listed mammal species and 14 Region 6 Sensitive Species. Of the R6 Sensitive Species that are associated with LOS, seven are bird species, two mammals, one amphibian, and four invertebrates.

Dead trees, or live trees with some decaying wood, and down wood provide important habitat for a wide-variety of wildlife species and is a key component of LOS habitat (Rose et al. 2001, Mellen-McLean et al. 2013). Data from 2004-2017 (using Gradient Nearest Neighbor Trend and Accounting Explorer) were used to assess the trends in snag habitat across the planning area and for some wildlife habitat types. For years 2004-2017, the general trend was that the abundance of snags greater than or equal to 20" has generally stayed the same with the Ochoco having the lowest abundance followed by the Deschutes. The remaining four forests have remained relatively static. There is lower abundance of snags greater than or equal to 20" in the Lodgepole pine habitat type, followed by the Montane Mixed Conifer and Ponderosa Pine/Douglas Fir wildlife habitat types. The wildlife habitat type with the highest abundance of snags greater than or equal to 20" is the Eastside Mixed Conifer/East Cascades Blue Mountains. There was not enough reliable data to include the Southwest Oregon Mixed Conifer Hardwood habitat type.

Blue Mountains Ecoregion

The Federally listed wildlife species that are Documented (D) or Suspected (S) to occur on the Forests in the Blue Mountains Ecoregion include the gray wolf (D-

Malheur), wolverine (D-Wallowa-Whitman, S-Umatilla, Malheur), and Canada lynx (S-Umatilla, Wallowa-Whitman). One of these species (Canada lynx) is associated with LOS. There are 41 R6 Sensitive wildlife species that are documented or suspected to occur on the Umatilla, of which eleven species are associated with LOS. There are 25 R6 Sensitive wildlife species on the Malheur National Forest, of which eight are associated with LOS. On the Wallowa-Whitman National Forest, there are 35 R6 Sensitive wildlife species, and nine are associated with LOS.

The current condition of wildlife habitats in the Blue Mountains shows that viability outcomes for a wide-range of species have declined from historical conditions due a variety of habitat changes and risk factors (e.g., roads, past timber harvest, etc.)(Wisdom et al. 2000, Wales et al. 2011, Stine et al. 2014, Gaines 2017). The species for which current viability outcomes have declined the least include those associated with multi-layered, closed canopy late and old structure (e.g., northern goshawk). This pattern is consistent across all three of the National Forests (Umatilla, Malheur, and Wallowa-Whitman) in the Blue Mountains Ecoregion. The species whose current viability outcomes have declined the most from historical viability outcomes include those associated with open-canopy, single-strata late and old structure (e.g., white-headed woodpecker). Again, this pattern is consistent across the three National Forests that occur in the Blue Mountains Ecoregion.

East Cascades Ecoregion

The Federally listed or proposed wildlife species Documented (D) or Suspected (S) to occur on the Forests in the East Cascades Ecoregion include the gray wolf (S-Deschutes, D-Fremont-Winema), wolverine (S-Deschutes, Ochoco, Fremont-Winema), and Oregon spotted frog (D-Deschutes, Fremont-Winema). There are 29 R6 Sensitive wildlife species that are documented or suspected to occur on the Deschutes National Forest, of which eleven species are associated with LOS. There are 21 R6 Sensitive wildlife species on the Ochoco National Forest, of which 6 are associated with LOS. On the Fremont-Winema National Forest, there are 39 R6 Sensitive wildlife species, and nine are associated with LOS.

The condition of wildlife habitats in the East Cascades Ecoregion shows that the viability outcomes for a wide-range of species have declined from historical conditions due to a variety of habitat changes and risk factors (Wisdom et al. 2000, Stine et al. 2014, Haugo et al. 2015). The species for which current viability outcomes have declined the least include those associated with multi-layered, closed canopy late and old structure (e.g., northern goshawk)(Wisdom et al. 2000, Stine et al. 2014, Haugo et al. 2015). Some watersheds, particularly in the southern portion of the East Cascades Ecoregion (e.g., Fremont-Winema National Forest) showed increases in the availability of habitats for these species (Wisdom et al. 2000).

The species whose current viability outcomes have declined the most from historical viability outcomes include those associated with open-canopy, single-

strata late and old structure (e.g., white-headed woodpecker)(Wisdom et al. 2000, Stine et al. 2014). Strong declines in viability outcomes are most pronounced in the northern and central portions of the Eastern Cascades Ecoregion, while habitat conditions are closer to historical conditions in the southern portion of the ecoregion (Wisdom et al. 2000).

Table 1. A summary of the suspected or documented TEP, R6 Sensitive, and MIS wildlife species (invertebrates and vertebrates) in the planning area and the number of species associated with late and old forest structure.

Species Status	National Forests in the Blue Mountains Ecoregion			National Forests in the East Cascades Ecoregion		
	Umatilla	Malheur	Wallowa-Whitman	Deschutes	Ochoco	Fremont-Winema
Wildlife						
No. Federally Listed Species	2	3	2	4	1	4
No. Federally Listed Species-LOS Associate	1	1	1	0	0	0
No. R6 Sensitive/MIS	41	25	35	29	21	39
No. R6 Sensitive/MIS-LOS Associate	11	8	9	11	6	9

Deer and Elk

Mule deer and Rocky Mountain elk are management indicator species used by the national forests in eastern Oregon. Deer and elk have considerable cultural, economic, and ecological values (ODFW 2003a,b).

Mule deer are widespread in eastern Oregon, and the population objective is about 350,000 (ODFW 2003a). The national forests in the planning area provide important summer range, which generally consists of adequate forage, cover, and security from disturbance. Fire exclusion has allowed forests to become denser, reducing the abundance and diversity of understory plants that provide mule deer forage. The application of thinning and prescribed fire can dramatically increase understory plant diversity and productivity, and restore forage availability for mule deer (Hull et al. 2020).

The Rocky Mountain elk population objective in eastern Oregon is about 72,000 elk, with major populations occurring in the Blue Mountains and in south-central Oregon (ODFW 2003b). The national forests in eastern Oregon provide much of the summer range that elk use. Summer elk forage consists of lush forbs, grasses and shrubs high in nutrients and easily digestible. Generally, higher elevation wet meadows, springs, and riparian areas in close proximity to forest cover offers these

condition for the longest period into summer. Elk achieve peak body condition in the late summer and fall and their winter survival and productivity depend on their ability to develop fat reserves from the forage they consume during the summer. The application of thinning and prescribed fire to restore forest structure and composition can alter elk forage and cover, and fire suppression has resulted in an increase in closed-canopy forests throughout much of eastern Oregon forests (Haugo et al. 2015). Removal of tree canopy (to <40%) in dry forests using thinning and prescribed fire treatments can increase the availability of forage for elk by 2-3 times compared to closed-canopy forest conditions (Lehmkuhl et al. 2013).

Wildlife and Climate Change

Climate projections suggest year-round warming and declines in summer precipitation throughout the western US. This will have profound effects on the wildfire regimes of the Pacific Northwest with fire seasons lengthening and burned area increasing. Modeling suggests that burned area will increase by three to four times, individual fire sizes will increase, and fire severity will increase where forests are dense and layered with abundant woody fuels. The effects of a changed fire regime will interact with other stressors creating even more change in the forested ecosystems.

The anticipated climatic changes to eastern Oregon environments are likely to result in a variety of effects to wildlife populations and their habitats (Stine et al. 2014, Halofsky and Peterson 2016). A striking conclusion reached from several climate change studies is the degree of change that has already occurred to wildlife habitat and populations (Root et al. 2003, Lawler and Mathias 2007). There are a range of responses of wildlife to changing climatic conditions that have occurred, are occurring, or are anticipated to occur including: changes in species distributions, changes in the timing of breeding and other life history activities, changes in pathogens and invasive species distributions, changes in survival and extinction risks, and changes in the interactions among species (Stine et al. 2014). An important climate change impact that influences wildlife habitats is the documented increase in the amount and severity of wildfires (Westerling et al. 2006, Westerling 2016) and the anticipated 2-4 fold increase in fires expected in the inland west by the 2040s (Littell et al. 2009). Climate adaptations that increase the resiliency of forested wildlife habitats to increased wildfire and other disturbances are important to sustaining viable wildlife populations (Halofsky and Peterson 2016).

Federally Listed Species

The federally listed species that are "Documented" to occur in the planning area include the gray wolf, wolverine, and Columbia spotted frog.

Gray Wolf and Wolverine

The gray wolf and wolverine are habitat generalists, meaning they are not closely associated with any one type of vegetation or habitat. They are wide ranging species and are adaptable in their prey selection. However, the primary prey of gray wolves (deer and elk) will be addressed. The scope of this amendment has limited potential to affect gray wolves and wolverines for the following reasons:

1) This amendment does not change the following elements of the interim eastside screens or any other plan component in the respective existing forest plans covering the six forests proposed for this amendment:

- #2 Exempted activities are still required to conduct NEPA and ESA consultation at the project level
- #5 a-c. Interim Ecosystem standard which addresses habitat connectivity.
- #3 Even for the five other types of sales that are not subject to #5 interim ecosystem standard, forests must apply the interim riparian (Pacfish/Infish as amended 2005) and #6 wildlife standards Scenario A #6d 1-4 or Scenario B #6e 1-4.

2) Because of #5 above, the Pacfish/Infish standard, and the LOS analysis requirement in #6 all three action alternatives identify the ability to move forests closer to LOS which will be beneficial as climate stressors continue.

3) None of the alternatives affect wilderness.

4) The amendment alternatives all propose to move multiple vegetation types into LOS for both single story and multi-story stands. This may have an impact on a given species of prey by changing distribution where newly created habitat becomes available but given the adaptability of wolves and wolverine, it will not have measurable impacts across their range.

5) All the action alternatives state that Forests will be required to conduct a snag and down wood analysis at the project level for activities that may impact those habitat elements using best available science to maintain or increase habitat for a diverse array of species.

Columbia Spotted Frog
The Columbia spotted frog occurs on two of the six forests where the proposed amendment will apply. For the following reasons, it will not be further evaluated in the analysis:

1) It is an aquatic and riparian species whose habitats are largely defined and protected through the guidance of the Pacfish/Infish as amended (USFS 2005).

2) Project level analyses will be required on the Forests where this species occurs (Deschutes, Fremont-Winema) to address any site-specific effects that projects may have on this species.

Canada Lynx
Canada lynx is also a federally listed species but is only “Suspected” to occur in the Blue Mountains ecoregion of the planning area. Lynx are closely associated with mid

and upper elevation subalpine fir forests (Aubry et al. 2000, ILBT 2013). The Blue Mountains are identified as a Peripheral Area by the US Fish and Wildlife Service (USFWS 2005) and in the lynx conservation strategy (ILBT 2013). There is no designated Critical Habitat for Canada lynx in the planning area (USFWS 2014). The only management direction that applies to Canada lynx concerns vegetation management (ILBT 2013):

Conservation measures for vegetation management in Periphery Areas: Provide a mosaic of forest structure that includes early-successional coniferous and mixed-coniferous-deciduous stands, along with a component of mature multi-story coniferous stands. Flexibility in the amounts and arrangement of various successional stages is acceptable, provided that a mosaic can be sustained. Vegetation treatments should be designed in consideration of historical landscape patterns and disturbance processes. Design timber harvest, planting, and thinning to include some representation of young densely-stocked regenerating stands in the mosaic for snowshoe hare production areas.

Therefore, for the following reasons, Canada lynx will not be further addressed in this analysis: (1) the uncertainty of lynx occurrence in the planning area, (2) the lack of any designated critical habitat in the planning area, (3) the only lynx conservation measure is consistent with the Eastside Screen (USFS 1995) emphasis on managing LOS habitats within the historic range of variation, and (4) project specific analyses would still be required to address any site-specific effects that projects may have on federally listed species.

Environmental Effects and Indicators

Assumptions

- The Pacfish/Infish amendment (USFS 2005) provides adequate regulatory mechanisms to provide for the viability of riparian and wetland associated species.
- Existing forest plan direction provides cover:forage requirements and timing restrictions to assure that restoration treatments address deer and elk habitat and potential for disturbance.
- Replacing outdated science used to determine snag numbers (e.g., population potential for primary cavity excavators) with a standard to use the best available science to maintain or increase snag habitat will result in improved conditions for snag-dependent wildlife species, and provide an important habitat component for LOS associated species.
- Project-specific NEPA and ESA Consultation will be required and can address more site-specific wildlife issues.
- See assumptions for vegetation effects analyses by alternative.
- Net LOS (open or closed) will increase under management objectives (not including disturbance) as managed non-LOS stands develop over time.

Desired Conditions

- The abundance and connectivity of habitat for LOS associated species is within the historical range of variability, providing conditions that maintain or restore a high viability outcome (A or B, Appendix B).
- The abundance and spatial arrangement of old trees, large trees , and large snags are within the historical range of variability, providing conditions that maintain or restore a high viability outcome (A or B, Appendix B).
- Forested wildlife habitats are sustainable and resilient.

Methods of Analysis

The list of 89 wildlife species addressed in this analysis was derived from the federally listed species (Threatened, Endangered, Proposed) and the Region 6 Sensitive Species list (USFS 2019)(Appendix A). There are four federally listed or proposed wildlife species that are known or suspected to occur in the planning area, one species is Endangered (Gray wolf, *Canis lupus*), two species are Threatened (Oregon spotted frog, *Rana pretiosa*; Canada lynx, *Lynx Canadensis*), and one species is Proposed for listing (wolverine, *Gulo gulo*). In addition, there are 85 species that are on the Region 6 Sensitive Species list, including 25 bird species, 11 mammals, three amphibians, one reptile, and 45 invertebrates (USFS 2019).

Information on the habitat relationships for each of these species was used to assign them to the habitat-types described in Johnson and O'Neil (2001). Species were then placed in habitat groups based on those assigned to similar habitat-types. Because LOS habitat is of special concern and is the focus of this Forest Plan amendment, species associated with late and old forest structures (large trees, large snags, downed wood) were identified and grouped. The habitat-types identified for each species-group were cross-walked to existing habitat or vegetation information (Wales et al. 2011, Gaines 2017; Haugo et al. 2015, 2019) in order to establish a baseline of conditions and to estimate trends in the availability of habitats for those species associated with late and old forest structures. An important distinction in habitat-types was made for those species associated with old forest with an open canopy (late-open) versus those associated with old forest with a multi-layer closed canopy (late-closed), as these structure types are a focus of the 1995 Eastside Screens (USFS 1995).

The term "viability outcome" is used to describe the amount and spatial arrangement of habitat and the risk-factors that influence the viability of wildlife species in a habitat-group. Viability outcomes are described in detail in Appendix B and in Gaines et al. (2017). This terminology was used in previous viability assessments (Wisdom et al. 2001, Wales et al. 2011, Gaines 2017) that helped establish a baseline of conditions for wildlife species across the planning since the 1995 Eastside Screen amendment occurred (USFS 1995). Viability outcomes are used to compare how each alternative contributes to the viability of wildlife associated with the LOS habitat-group.

Indicators and Wildlife Information Common to All Alternatives

Federally Listed Species – Gray Wolf and Wolverine
Deer and elk are the primary prey species of gray wolves (Endangered-East Cascades Forests, R6 Sensitive Species-Blue Mountains Forests) and an important prey component for wolverine (Proposed Threatened-Documented on Wallowa-Whitman National Forest, suspected on the other five Forests). Previous consultations have established protection guidelines for gray wolf den and rendezvous sites on the national forests for which gray wolves are federally listed. All alternatives may affect, but would not likely adversely affect gray wolves, and may impact, but would not lead to federal listing of the wolverine. The effects of the alternatives on deer and elk are presented below.

Late and Old Structure Associated Wildlife Species
Forest activities that directly influence the viability of LOS associated species and that are relevant to this amendment include the loss of LOS habitat from fire (Healy et al. 2008, Davis et al. 2011, 2015), vegetation treatments (e.g. timber harvest, thinning, prescribed fire) that affect forest structure (e.g., canopy closure, snags, down wood) (Healy et al. 2008, Wisdom and Bate 2008, Davis et al. 2011), and protection of riparian areas which are an important element of LOS habitat for some species (e.g., bald eagles). Riparian habitats are managed under PACFISH/INFISH (USFS 2005) (see above).

Habitat Sustainability and Resiliency
Since the mid-1980s, the size and intensity of large wildfires in the western United States has increased markedly (Westerling et al. 2006, Westerling et al. 2016, Halofsky and Peterson 2017, Halofsky et al. 2019), due, in part, to a reduction in fuel moisture driven by increased temperature and lower snowpack. The increase in fire risk and severity has also been driven, in part, by an increase in fuel loads because of fire suppression practices used over the last century (McKenzie et al. 2004). Predicted increases in spring and summer temperatures would exacerbate the frequency and intensity of disturbances such as fire (McKenzie et al. 2004, Wotton and Flannigan 1993) and defoliation caused by forest insects (Littell et al. 2009). In the Interior Columbia Basin, which includes this planning area, Littell et al. (2009) predict that the area burned is likely to double or even triple by 2050. Climate-driven changes in fire regimes would likely be the dominant driver of changes to forests and LOS habitats in the western United States over the next century.

Table 2. Key Indicators Used to Assess Potential Effects to Wildlife Habitats and Species

Wildlife Habitat Issue	Wildlife Habitat Group	Key Indicators
Late and old forest habitat	LOS associated species • Late-closed habitat • Late-open habitat	The amount and trends in Late-closed habitat The amount and trends in Late-open habitat
Large trees, old trees, and	LOS associated species	Trends in the availability

Wildlife Habitat Issue	Wildlife Habitat Group	Key Indicators
large Snags		of large trees and large snags
Conifer encroachment into meadows and wetlands	Meadow and wetland associated species	Ability to manage conifer encroachment into special habitats
Availability and quality of forage for deer and elk	Management Indicator Species	Treatment that reduces canopy closure to <40%
Resilience of forested wildlife habitats	LOS associated species and other species associated with forested habitats	Ability to restore disturbance regimes and sustain wildlife habitat

Current Management Alternative

Direct and Indirect Effects

Late and Old Structure Associated Wildlife Species

The continued implementation of this alternative would result in a steady increase in the amount of late-closed habitat as a result of forest succession, and a low rate of increasee in the amount of late-open habitat (Table 3). This alternative would provide for the viability of wildlife species associated with late-closed habitats (e.g., northern goshawk-MIS, and fisher-R6 Sensitive Species Fremont-Winema National Forest). However, the viability of species associated with late-open habitats would continue to remain low and their viability outcomes (e.g., white-headed woodpecker-R6 Sensitive Species) are already well below historical conditions (Wisdom et al. 2001, Wales et al. 2011, Mellen-McLean et al. 2013, Gaines 2017).

Table 3. Current Amount and Trends for Late and Old Structure (LOS) Habitat under Current Management Alternative

Potential Vegetation Group	Late and Old Structure Habitat	Current Acres (in 1,000s)^	Trend 1995 to Present	Predicted Trend Present to +25 Years
Dry	Late-Open	399.16	Slight Increase	Low rate of Increase
	Late-Closed	926.12	Considerable Increase	Steady Increase*
Moist	Late-Open	273.90	No Change	Low rate of increase
	Late-Closed	1,739.01	Increase	Steady Increase*
Cold	Late-Open	54.29	Increase	Steady Decrease
	Late-Closed	139.12	No Change	Steady Increase*

*Increasing risk of habitat loss from large-scale high severity wildfire.

This alternative includes plan components for key elements of old forest habitat. This alternative includes a standard limiting the harvest of large live trees ≥21 inches dbh. This alternative does not provide for the retention of trees with old tree characteristics that are <21 inches dbh, and they are expected to decline over time due to a combination of stressors: competition, fire, insects, diseases and drought. The trend in the amount of trees ≥21 inches dbh varies by species. Since 1995, the tree species associated with dry forest (sugar pine, ponderosa pine, Douglas-fir) increased in abundance across the planning area, as did those associated with mixed conifer forests (white fir/grand fir). Tree species typically associated with late-open forest conditions would have increased more except they experienced high mortality from insects, disease and fire.

This alternative also includes management direction for large snags and green tree replacements, but desired snag levels are based on outdated scientific information (e.g., population potential for primary cavity excavators) that limits the contribution to the viability of species associated with snag habitats (Bull and Holthausen 1993) and does not provide specific guidelines on characteristics that optimize snag recruitment through green tree retention.

Meadow and Wetland Habitats
The tree diameter limit associate with this alternative has limited the ability to remove conifers encroaching on meadows and wetlands, thus reducing the contribution to the viability of species associated with these habitats.

Deer and Elk
Current management direction has limited the amount of forest treatments used to reduce canopy closure in closed-canopy forest habitats that have increased as a result of fire suppression and past management practices (Haugo et al. 2015, DeMeo et al. 2018). As a result, the amount of forage available for deer and elk has been reduced. This alternative would continue to limit the application of restoration treatments that can be applied to increase the quality and quantity of forage for deer and elk (Endress et al. 2012, Lehmkuhl et al. 2013, Hull et al. 2020). Deer and elk are the primary prey species of gray wolves and an important prey component for wolverine.

Habitat Sustainability and Resiliency
This alternative would result in an increased risk of habitat loss due to uncharacteristically severe wildfires at the stand and potentially the landscape levels (Littell et al. 2009, Prichard et al. 2010, Haugo et al. 2019, Prichard et al. 2020) because this alternative limits the ability to apply active management to restore forest resiliency and enhance the sustainability of LOS habitats and other forested habitats.

Current Management Alternative Wildlife Summary

Implementation of this alternative would make a relatively low contribution to the viability of wildlife species associated with late-open habitats, whose viability outcomes (Viability Outcomes D and E, Appendix B) are well below their historical viability outcomes (Wisdom et al. 2000, Wales et al. 2011, Gaines et al. 2017). This alternative limits the ability to restore meadow and wetland habitats, and limits the ability to apply restoration treatments that reduce tree canopy closure and enhance elk and deer forage. This alternative would maintain the viability of species associated with late-closed habitats (Viability Outcomes A and B), though these habitats would be at relatively high risk of loss to uncharacteristically severe wildfires.

Old Tree and Large Tree Guideline Alternative (with Adaptive Management)

Key Assumption for this Alternative
Monitoring is carried out in a way that allows changes in the availability of large and old trees to be detected in a timely fashion so that adaptive management occurs before the viability outcome of any MIS or R6 Sensitive Species is reduced.
Direct and Indirect Effects

Late and Old Structure Associated Wildlife Species
The implementation of this alternative would result in an increase in the amount of late-closed habitat as a result of forest succession, though at a slower rate than the Current Management Alternative. This alternative would result in a low-moderate increase in the amount of late-open habitat as treatments are implemented that restore open structure and emphasize disturbance-resistant tree species (Table 4). This alternative would provide for the viability of wildlife species associated with late-closed habitats (e.g., northern goshawk-MIS, fisher-Proposed-Fremont-Winema National Forest), and contribute to the viability of species associated with late-open habitats (e.g., white-headed woodpecker-R6 Sensitive Species), whose viability outcomes are already well below historical conditions (Wisdom et al. 2001, Wales et al. 2011, Mellen-McLean et al. 2013, Gaines 2017).

Table 4. Current Amount and Trends for Late and Old Structure (LOS) Habitat under the Old and Large Tree Guideline Alternative

Potential Vegetation Group	Late and Old Structure Habitat	Current Acres (in 1,000s)	Trend 1995 to Present	Predicted Trend Present to +25 Years
Dry	Late-Open	399.16	Slight Increase	Low-moderate Increase
	Late-Closed	926.12	Considerable Increase	Increase*
Moist	Late-Open	273.90	No Change	Steady Increase
	Late-Closed	1,739.01	Increase	Increase*
Cold	Late-Open	54.29	Increase	Low-moderate

Potential Vegetation Group	Late and Old Structure Habitat	Current Acres (in 1,000s)	Trend 1995 to Present	Predicted Trend Present to +25 Years
				Increase
	Late-Closed	139.12	No Change	Low-moderate increase*

*Declining risk of habitat loss from large-scale high severity wildfire

This alternative includes plan components for key elements of old forest habitat. This alternative includes a guideline limiting the harvest of old trees regardless of tree size or species (Van Pelt 2008). Old trees are a key habitat component for LOS associated species. This alternative includes plan guidance to retain large trees to meet future LOS structural objectives and green trees for future large snags. This alternative would facilitate the management of large and old trees so that the impact of stressors such as competition, fire, insects, diseases and drought, would be reduced. This alternative would result in a continued increase in the abundance of large trees while moving species composition towards more resilient and sustainable conditions.

This alternative also includes management direction to retain large (>20 inches dbh) snags and to manage green tree replacements based on recent science (Mellen-McLean et al. 2012). This alternative requires that a snag habitat assessment be completed to maintain or increase habitat for snag dependent species and provides an important structural component of habitat for LOS associated species.

Meadow and Wetland Habitats
Implementation of this alternative would increase the ability to remove conifers that have encroached on meadows and herbaceous wetlands, thus contributing to the viability of species associated with these habitats.

Deer and Elk
The implementation of this alternative would increase the amount of forest restoration treatments used to reduce canopy closure in the closed-canopy forest habitats that have increased as a result of fire suppression and past management practices (Haugo et al. 2015). As a result, the amount of forage available for deer and elk would be increased as understory plant diversity and composition is restored (Endress et al. 2012, Lehmkuhl et al. 2013, Hull et al. 2020).

Habitat Sustainability and Resiliency
This alternative would result in a declining risk of habitat loss due to uncharacteristically severe wildfires at both the stand and potentially landscape scales (Littell et al. 2009, Haugo et al 2019). This is because alternative allows for active management to restore forest resiliency and enhance the sustainability of LOS habitats and other forested habitats (see Halofsky et al. 2019 climate change adaptation). Restoration treatments that include thinning and prescribed fire have

been shown to reduce fire severity, increase large tree survival and, depending on the spatial location, can alter fire behavior at the landscape scale (Prichard et al. 2010, 2020).

Old and Large Tree Guideline Alternative Wildlife Summary
Implementation of this alternative would make a moderate contribution to the viability of wildlife species associated with late-open habitats, whose viability outcomes (Viability Outcomes D and E, Appendix B) are well below their historical viability outcomes (Wisdom et al. 2000, Wales et al. 2011, Gaines et al. 2017). This alternative facilitates the application of treatments to restore meadow and wetland habitats, and restoration treatments that reduce forest canopy closure and enhance elk and deer forage. This alternative would maintain the viability of species associated with late-closed habitats (Viability Outcome A or B), and reduce the risk of loss to uncharacteristically severe wildfires. This alternative would enhance the resiliency of forested habitats and the sustainability of LOS habitats.

Old Tree Standard Alternative

Direct and Indirect Effects
Late and Old Structure Associated Wildlife Species
The implementation of this alternative would result in an increase in the amount of late-closed habitat as a result of forest succession, though at a slower rate than the Current Management Alternative (Table 5). This alternative would result in a low-moderate increase in the amount of late-open habitat as treatments are implemented that restore open structure and emphasize disturbance-resistant tree species. This alternative would provide for the viability of wildlife species associated with late-closed habitats (e.g., northern goshawk-MIS, fisher-Proposed-Fremont-Winema National Forest), and contribute to the viability of species associated with late-open habitats (e.g., white-headed woodpecker-R6 Sensitive Species), whose viability outcomes are already well below historical conditions (Wisdom et al. 2001, Wales et al. 2011, Mellen-McLean et al. 2013, Gaines 2017).

Table 5. Current Amount Trends for Late and Old Structure (LOS) Habitat Under Old Tree Standard Alternative

Potential Vegetation Group	Late and Old Structure Habitat	Current Acres (in 1,000s)	Trend 1995 to Present	Predicted Trend Present to +25 Years
Dry	Late-Open	399.16	Slight Increase	Low-moderate Increase
	Late-Closed	926.12	Considerable Increase	Increase*
Moist	Late-Open	273.90	No Change	Slight Increase
	Late-Closed	1,739.01	Increase	Increase*
Cold	Late-Open	54.29	Increase	Slight Increase
	Late-Closed	139.12	No Change	Increase*

*Declining risk of habitat loss from large-scale high severity wildfire

This alternative includes plan components for key elements of old forest habitat. This alternative includes a standard limiting the harvest of old trees regardless of tree size or species (Van Pelt 2008). Old trees are a key habitat component for LOS associated species. This alternative includes plan guidance to retain large trees to meet future LOS structural objectives and green trees for future large snags. This alternative would facilitate the management of large and old trees so that the impact of stressors such as competition, fire, insects, diseases and drought, would be reduced. This alternative would result in a continued increase in the abundance of large trees while moving species composition towards more resilient and sustainable conditions. This alternative will develop old forest conditions with multiple cohorts of tree ages and size classes that will foster structural diversity as would be expected in fire prone ecosystems.

This alternative also includes management direction to retain large (>20 inches dbh) snags and to manage green tree replacements based on recent science (Mellen-McLean et al. 2012). This alternative requires that a snag habitat assessment be completed to maintain or increase habitat for snag dependent species, and provides an important structural component of habitat for LOS associated species.

Meadow and Wetland Habitats
Implementation of this alternative would increase the ability to remove conifers that have encroached on meadows and wetlands, thus contributing to the viability of species associated with these habitats.

Deer and Elk
The implementation of this alternative would increase the amount of forest restoration treatments used to reduce canopy closure in the closed-canopy forest habitats that have increased as a result of fire suppression and past management practices (Haugo et al. 2015). As a result, the amount of forage available for deer and elk would be increased as understory plant diversity and composition is restored (Endress et al. 2012, Lehmkuhl et al. 2013, Hull et al. 2020).

Habitat Sustainability and Resiliency
This alternative would result in a declining risk of habitat loss due to uncharacteristically severe wildfires at the stand and potentially the landscape scales. (Littell et al. 2009, Haugo et al. 2019). This is because this alternative allows for active management to restore forest resiliency and enhance the sustainability of LOS habitats and other forested habitats (see Halofsky et al. 2019 climate change adaptation). Restoration treatments that include thinning and prescribed fire have been shown to reduce fire severity, increase large tree survival and, depending on the spatial location, can alter fire behavior at the landscape scale (Prichard et al. 2010, 2020).

Old Tree Standard Alternative Wildlife Summary

Implementation of this alternative would make a moderate contribution to the viability of wildlife species associated with late-open habitats, whose viability outcomes (Viability Outcomes D and E, Appendix B) are well below their historical viability outcomes (Wisdom et al. 2000, Wales et al. 2011, Gaines et al. 2017). This alternative would facilitate the application of treatments to restore meadow and wetland habitats, and restoration treatments that reduce forest canopy closure and enhance elk and deer forage. This alternative would maintain the viability of species associated with late-closed habitats (Viability Outcomes A and B, Appendix A), and reduce the risk of loss to uncharacteristically severe wildfires. This alternative would enhance the resiliency of forested habitats and the sustainability of LOS habitats.

Adaptive Management Alternative

Key Assumption for this Alternative
Monitoring is carried out in a way that allows changes in the availability of large and old trees to be detected in a timely fashion so that adaptive management occurs before the viability outcome of any MIS or R6 Sensitive Species is reduced.
Direct and Indirect Effects

Late and Old Structure Associated Wildlife Species
The implementation of this alternative would result in an increase in the amount of late-closed habitat as a result of forest succession, though at a slower rate than the Current Management Alternative. This alternative would result in a low-moderate increase in the amount of late-open habitat as treatments are implemented that restore open structure and emphasize early-seral tree species (Table 6). This alternative would provide for the viability of wildlife species associated with late-closed habitats (e.g., northern goshawk-MIS, fisher-Proposed-Fremont-Winema National Forest), and contribute to the viability of species associated with late-open habitats (e.g., white-headed woodpecker-R6 Sensitive Species), whose viability outcomes are already well below historical conditions (Wisdom et al. 2001, Wales et al. 2011, Mellen-McLean et al. 2013, Gaines 2017).

Table 6. Current amount, and past and future trends on late and old structure (LOS) habitat as a result of the implementation of Alternative D (adaptive management).

Potential Vegetation Group	Late and Old Structure Habitat	Current Acres (in 1,000s)	Trend 1995 to Present	Predicted Trend Present to +25 Years
Dry	Late-Open	399.16	Slight Increase	Low-moderate Increase
	Late-Closed	926.12	Considerable Increase	Increase*
Moist	Late-Open	273.90	No Change	Low-moderate Increase
	Late-Closed	1,739.01	Increase	Increase*

Potential Vegetation Group	Late and Old Structure Habitat	Current Acres (in 1,000s)	Trend 1995 to Present	Predicted Trend Present to +25 Years
Cold	Late-Open	54.29	Increase	Increase
	Late-Closed	139.12	No Change	Increase*

*Declining risk of habitat loss from large-scale high severity wildfire

This alternative does not include standards or guidelines for key elements of old forest habitat but relies on meeting desired condition and monitoring and adaptive management to determine if large and old trees are being retained to move toward LOS habitat objectives. This alternative is likely to increase the abundance of large trees and slightly reduce the abundance of old trees This alternative includes desired conditions to retain large trees to meet future LOS structural objectives and green trees for future large snags.

This alternative also includes management direction to retain large (>20 inches dbh) snags and to manage green tree replacements based on recent science (Mellen-McLean et al. 2012). This alternative requires that a snag habitat assessment be completed to maintain or increase habitat for snag dependent species, and provides an important structural component of habitat for LOS associated species.

Meadow and Wetland Habitats
This implementation of this alternative would increase the ability to remove conifers that have encroached on meadows and herbaceous wetlands, thus contributing to the viability of species associated with these habitats.

Deer and Elk
The implementation of this alternative would increase the amount of forest restoration treatments used to reduce canopy closure in the closed-canopy forest habitats that have increased as a result of fire suppression and past management practices (Haugo et al. 2015). As a result, the amount of forage available for deer and elk would be increased as understory plant diversity and composition is restored (Endress et al. 2012, Lehmkuhl et al. 2013, Hull et al. 2020).

Habitat Sustainability and Resiliency
This alternative would result in a declining risk of habitat loss due to uncharacteristically severe wildfires at the stand and potentially the landscape scales (Littell et al. 2009, Haugo et al 2019). This is because this alternative allows for active management to restore forest resiliency and enhance the sustainability of LOS habitats and other forested habitats (see Halofsky et al. 2019 climate change adaptation). Restoration treatments that include thinning and prescribed fire have been shown to reduce fire severity, increase large tree survival and, depending on the spatial location, can alter fire behavior at the landscape scale (Prichard et al. 2010, 2020).

Adaptive Management Alternative Summary
Implementation of this alternative would make a moderate contribution to the viability of wildlife species associated with late-open habitats, whose viability outcomes (Viability Outcomes D and E, Appendix B) are well below their historical viability outcomes (Wisdom et al. 2000, Wales et al. 2011, Gaines et al. 2017). However, a key assumption of this alternative is that monitoring is carried out in a manner that allows changes in the availability of LOS habitat, and large and old trees to be detected in a timely fashion so that adaptive management occurs before the viability outcome of any MIS or R6 Sensitive Species is reduced.
This alternative facilitates the application of treatments to restore meadow and wetland habitats, and restoration treatments that reduce forest canopy closure and enhance elk and deer forage.

This alternative would maintain the viability of species associated with late-closed habitats (Viability Outcomes A and B), and reduce the risk of loss to uncharacteristically severe wildfires. This alternative would enhance the resiliency of forested habitats and the sustainability of LOS habitats.

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Appendix A: Wildlife Species List and Habitat Associations

Appendix B: Description of the Viability Outcomes

The viability outcomes are based on (Wales et al. 2011, Gaines 2017, Gaines et al. 2017) and were calculated for current and historical conditions to assess changes in habitat conditions. The term "suitable environment" refers to a combination of source habitat and risk factors that influence the probability of occupancy and demographic performance of a surrogate species. The five viability outcomes that were used:

1. **Outcome A**—Suitable environments are broadly distributed across the historical range of the species throughout the assessment area. Habitat abundance is high relative to historical conditions. The combination of distribution and abundance of environmental conditions provides opportunity for continuous or nearly continuous intraspecific interactions for the surrogate species.
2. **Outcome B**—Suitable environments are broadly distributed across the historical range of the species. Suitable environments are of moderate to high abundance relative to historical conditions, but there may be gaps where suitable environments are absent or present in low abundance. However, any disjunctive areas of suitable environments are typically large enough and close enough to permit dispersal among subpopulations and to allow the species to potentially interact as a metapopulation. Species with this outcome are likely well distributed throughout most of the assessment area.
3. **Outcome C**—Suitable environments moderately distributed across the historical range of the species. Suitable environments exist at moderate abundance relative to historical conditions. Gaps where suitable environments are either absent or present in low abundance are large enough such that some subpopulations may be isolated, limiting opportunity for intraspecific interactions especially for species with limited dispersal ability. For species for which this is not the historical condition, reduction in the species' range in the assessment area may have resulted. Surrogate species with this outcome are likely well distributed in only a portion of the assessment area.
4. **Outcome D**—Suitable environments are low to moderately distributed across the historical range of the species. Suitable environments exist at low abundance relative to their historical conditions. While some of the subpopulations associated with these environments may be self-sustaining, there is limited opportunity for population interactions among many of the suitable environmental patches for species with limited dispersal ability. For species for which this is not the historical condition, reduction in species' range in the assessment area may have resulted. These species may not be well distributed across the assessment area.
5. **Outcome E**—Suitable environments are highly isolated and exist at very low abundance relative to historical conditions. Suitable environments are not well distributed across the historical range of the species. For species with limited dispersal ability there may be little or no possibility of population interactions among suitable environmental patches, resulting in potential for extirpations within many of the patches, and little likelihood of recolonization of such patches. There has likely been a reduction in the species' range from historical

conditions, except for some rare, local endemics that may have persisted in this condition since the historical period. Surrogate species with this outcome are not well distributed throughout much of the assessment area.