Wildlife Habitat

This section addresses potential impacts to habitat across the OESF for a range of wildlife species. Potential impacts to the northern spotted owl and marbled murrelet are discussed separately, in their respective sections.

Under the 2006 *Policy for Sustainable Forests*, wildlife habitat is defined as the combination of resources (food, water, cover) and environment (climate, soils, vegetation structure) that attracts and supports a species, population, and/or assembly of species (scientifically referred to as communities or guilds).

Why Is Wildlife Habitat Important?

Wildlife habitat, regardless of its location—Uplands, Riparian areas, or Wetlands—performs a variety of important functions for both terrestrial and aquatic species, including providing areas essential for feeding, roosting, breeding, nesting, and refuge.

The distribution and composition of wildlife on the Olympic Peninsula is influenced by its geographic isolation from the rest of western Washington and the presence of a high mountain range that divides the Peninsula and acts as a barrier to species movement. In addition, some isolated coastal and mountainous areas remained ice-free throughout periods of continental and alpine glaciations, acting as refugia for plant and animal species, and a source for recolonization after glaciers receded (Pielou 1991).

Species occurring elsewhere in western Washington, but missing from the Olympic Peninsula include pika, ptarmigan, golden mantle ground squirrels, lynx, wolverine, grizzly bears, bighorn sheep and before their introductions, red foxes and mountain goats. Wolves were extirpated from the Olympic Peninsula by the 1930s (Scheffer 1995). Fishers were reintroduced to the Olympic Peninsula in 2008 because their population failed to recover following the 1934 trapping ban (Lewis and Hayes 2004).

ENDEMIC SPECIES

The geographic isolation and characteristics of the Olympic Peninsula have led to the evolution of endemic species and subspecies, shown in Table 3-62. Endemic species are those species that are native and exclusive to a particular area. Of the animals listed in Table 3-62, only the Olympic ermine and Olympic torrent salamander are found on DNR-managed lands in the OESF.

Table 3-62. Wildlife Species and Subspecies Endemic to the Olympic Peninsula

Olympic Peninsula Endemic Species	
Common Name	**Scientific Name**
Olympic marmot	*Marmota olympus*
Olympic yellow-pine chipmunk	*Tamias amoenus caurinus*
Olympic snow mole	*Scapanus townsedii olympicus*
Olympic Masama pocket gopher	*Thomomys mazama melanops*
Olympic ermine	*Mustela erminea olympica*
Olympic torrent salamander	*Rhyacotriton olympicus*

Table 3-63. Wildlife Species Known or Suspected to Occur on DNR-Managed Lands in the OESF

Species and Status[a]	Habitat: Foraging	Habitat: Breeding and/or Resting	Habitat: General Upland	Status in the OESF[b]
Red-Legged Frog (FCo)	Ecosystem Initiation and Structurally Complex stand development stages	Requires riparian for breeding.	Moist habitats, including shrubby areas with large woody debris.	Widespread, common
Western Toad (FCo, SC)	All	Requires riparian for breeding.	Large woody debris.	Locally common
Northern Goshawk (FCo, SC)	Edges and open forest, Structurally Complex.	Structurally Complex	Mature and late-successional forests.	Local, rare
Bald Eagle (SS, FCo)	Large trees and snags near water.	All stages, but requires large trees for nesting and protected stands for roosting.	Large trees for nesting, dense and mature forest stands for winter roosts.	Widespread, common
Great Blue Heron (SM)	May forage in Ecosystem Initiation stands.	Biomass Accumulation, Structurally Complex, (generally near large water bodies)	Mature forest stands (nesting).	Widespread in appropriate habitat, uncommon
Olive-Sided Flycatcher (FCo)	Ecosystem Initiation	Structurally Complex	Large trees adjacent to open areas.	Widespread, uncommon
Osprey (SM)	Water (non-forest)	Structurally Complex	Large trees for nesting, perching, roosting near large bodies of water.	Distribution and abundance declining with increase in bald eagles
Turkey Vulture (SM)	May forage in Ecosystem Initiation stands.	Structurally Complex	Mature tree stands for roosting.	Increasing as a breeding season resident
Vaux's Swift (FCo, SS)	Aerial foraging over all stages.	Structurally Complex	Large snags for nesting.	Widespread, common near nesting habitat (including residential chimneys)
Willow Flycatcher (FCo)	Ecosystem Initiation	Ecosystem Initiation	Shrubby habitats.	Widespread, common in appropriate habitat
Long-Eared Myotis (FCo, SM)	Ecosystem Initiation	Structurally Complex	Large snags and trees for roosting.	Distribution and abundance of individual *Myotis* species unknown
Long-Legged Myotis (FCo, SM)	Ecosystem Initiation	Structurally Complex	Large trees and snags for roosting.	Unknown
Yuma Myotis (FCo)	Ecosystem Initiation	Structurally Complex	Large trees and snags for roosting.	Unknown

[a] Source: Brown1985; Johnson and O'Neil 2001

[b]FCo = Federal Species of Concern, SC = State Candidate, SE = State Endangered, SS = State Sensitive, ST = State Threatened, SM = State Monitor

[q]ualitative assessment of distribution and abundance based on local knowledge (Horton pers. comm. 2010)

What Is the Criterion for Assessing Wildlife Habitat?

The criterion for assessing wildlife habitat is the conservation of biological diversity including ecosystem, species, and genetic diversity. The Washington State Biodiversity Council defines biodiversity as "the full range of life in all its forms." This includes the habitats in which life occurs, the ways that species and habitats interact with each other, and the ecological processes necessary for those interactions. DNR conservation efforts focus on the preservation of biological diversity as a guiding principle for sustainable forest management (DNR 2006b). DNR's 1997 *Habitat Conservation Plan* (HCP) is a long-term management plan to maintain and improve habitat for threatened and endangered as well as unlisted native species (DNR 1997a, 2006b).

What Are the Indicators for Assessing Wildlife Habitat?

The amount and distribution of forest in the different stand development stages (refer to *Forest Conditions*, Text Box 3-3), and the extent of connectivity and/or fragmentation within those stands are used to assess the wildlife communities (guilds) dependent on those habitats.

WILDLIFE GUILDS

Guilds are assemblages of species that have similar habitat requirements for foraging, breeding (nesting, denning, shelter). Since there may be considerable ecological overlap between guilds, individual species can belong to several. The guilds used in this analysis (Table 3-64) were developed to describe species that will benefit from various forest conditions (stand development stages), based largely on Brown (1985) and Johnson and O'Neil (2001). The guilds and species listed are merely examples of how different assemblages of wildlife may respond over time to forest structures and conditions created by DNR to enhance wildlife habitat on forested state trust lands. Species composition may respond to changes in forest conditions under the different alternatives.

Table 3-64. Wildlife Guilds and Species Benefiting from Various Forest Conditions and Structures

Forest Structures and Conditions	Benefiting Guild	Representative Species
Retained live trees (patches and individual trees)	Feed and/or breed in large trees (generally greater than 24 inches diameter)	Chestnut-backed chickadee, brown creeper, northern flying squirrel, red crossbill, pileated woodpecker
	Arboreal seed eaters	Pine siskin, Douglas squirrel, Townsend's chipmunk
	Arboreal needle/bud eating	Blue grouse, Douglas squirrel
	Arboreal omnivores	Raccoon, forest deer mouse
	Bark probers/gleaners	Hairy woodpecker, red breasted nuthatch, brown creeper
	Foliage gleaning insectivores	Warbling vireo, golden-crowned kinglet, yellow-rumped warbler, western tanager
	Perching/hawking (especially during Ecosystem Initiation)	Red-tailed hawk, great horned owl olive-sided flycatcher, cedar waxwing
Retained and created snags	Primary cavity nesters	Pileated woodpecker, hairy woodpecker
	Secondary cavity nesters	Chestnut-backed chickadee, saw-whet owl
	Arboreal insectivores (nesting)	Tree swallow, violet green swallow, Vaux's swift

Forest Structures and Conditions	Benefiting Guild	Representative Species
	Large snag dependent	Pileated woodpecker, northern saw-whet owl, western screech owl, spotted owl, black bear, fisher, bats
Retained coarse woody debris, ground cover, organic soil layers	Herbivorous and fungivorous forest floor small mammals (truffles and fungi, seeds, berries, insects)	Trowbridge’s shrew, shrew-mole, red backed vole
	Small mammal predators	Bobcat, long-tailed weasel, spotted owl, spotted skunk
	Ground insectivores	western toad, Northwest salamander, Pacific tree frog, shrews, moles, black bear
	Large downed wood dependant	Ensatina, northwest salamander, black bear, fisher
Created small forest openings, diversity of tree sizes, vertical and horizontal diversity	Understory birds	Dark-eyed junco, fox sparrow, Swainson’s thrush, orange-crowned warbler, ruby-crowned kinglet, Wilson’s warbler, winter wren
	Herbivorous mammals	Columbia black-tailed deer, Roosevelt elk, snowshoe hare, mountain beaver, creeping vole
	Aerial salliers	Western tanager, olive-sided flycatcher
	Foliage gleaning insectivores	Golden-crowned kinglet, warbling vireo, black-throated gray warbler
	Understory-gleaning insectivores	Winter wren, song sparrow
	Edge species	Deer, elk , western screech owl, great horned owl, bats
	Large mammal predators	Cougar, black bear
Complex forest structure: Structurally Complex stand development stage	Late successional specialists	Northern goshawk, northern spotted owl, marbled murrelet, northern flying squirrel

STAND DEVELOPMENT STAGES

The amount of specific stand development stages indicates the potential for specific wildlife habitat conditions within the OESF (Table 3-65). In general, the early (Ecosystem Initiation) and late stages (Biomass Accumulation and Structurally Complex) of forest development support greater diversity and abundance of wildlife compared to the Competitive Exclusion stages (Olsen and others 2001). Stand age is not used as an indicator, as the 1997 HCP found it to be an insufficient measure of stand structure and ecological function (DNR 1997a, 2004).

Table 3-65. Stand Development Stages and Associated Vertebrate Species

Stand Development Stages	Species
Ecosystem Initiation	Northwestern salamander, Northwestern garter snake, blue grouse, Steller's jay, Wilson's warbler, orange-crowned warbler, rufous-sided (spotted) towhee, white-crowned sparrow, dark-eyed junco, snowshoe hare, mountain beaver, deer mouse, creeping vole, Pacific jumping mouse, Roosevelt elk, Columbian black-tailed deer, black bear
Competitive Exclusion	Northwestern salamander, red-legged frog, Steller's jay, willow flycatcher, Pacific-slope flycatcher, golden-crowned kinglet, Wilson's warbler, black-throated gray warbler, Hutton's vireo, Trowbridge's shrew, snowshoe hare, mountain beaver, , Douglas' squirrel
Biomass Accumulation	Red-legged frog, blue grouse, northern goshawk, Steller's jay, Pacific-slope flycatcher, golden-crowned kinglet, chestnut-backed chickadee, western tanager, Trowbridge's shrew, Townsend's chipmunk, Douglas' squirrel, red-backed vole
Structurally Complex	Red-legged frog, Marbled murrelet, blue grouse, northern pygmy-owl, northern spotted owl, pileated woodpecker, Pacific-slope flycatcher, golden-crowned kinglet, northern goshawk, northern pygmy-owl, Vaux's swift, winter wren, varied thrush, Trowbridge's shrew, long-legged myotis, Keen's myotis, silver-haired bat, big brown bat, snowshoe hare, Townsend's chipmunk, Douglas' squirrel, northern flying squirrel, red-backed vole, Roosevelt elk, black bear

FOREST FRAGMENTATION

Forest fragmentation occurs when large, continuous forests are divided into smaller blocks by timber harvesting, roads, agricultural clearing, urbanization, or other human development. Fragmentation reduces the total area of mature forest habitat, decreases average patch size and amount of interior forest habitat, increases the amount of edge and can isolate habitat patches. In managed forested landscapes, location and timing of harvest patterns create a mosaic of forest conditions. The extent (acres) of the Ecosystem Initiation stand development stage is used here as a surrogate for forest fragmentation.

Forest fragmentation can lead to habitat fragmentation for many species. Not all wildlife species respond to fragmentation in the same way. Many species show little fragmentation effects (Carey 2007), while others benefit from the diversity and juxtaposition of habitat conditions found in some fragmented landscapes (Kremsater and Bunnell 1999; Fahrig 2003), some tolerate fragmented habitat, while others cannot (Table 3-66).

Table 3-66. Wildlife Species Closely Associated with High-Contrast Forest and Shrub Edges

Meets All Habitat Requirements	Ensatina, ruffed grouse, band-tailed pigeon, great horned owl, rufous hummingbird, winter wren, Swainson's thrush, hermit thrush, American robin, varied thrush, orange-crowed warbler, yellow-rumped warbler, western tananger, black-headed grosbeak, rufous-sided towhee, dark-eyed junco, brown-headed cowbird, purple finch, pine siskin, American goldfinch, vagrant shrew, mountain beaver, deer mouse, red-tailed hawk, common raven, Steller's jay
Meets Foraging Habitat Requirements Only	Blue grouse, Cooper's hawk, northern pygmy-owl, northern saw-whet owl, western screech-owl, ruby-crowned kinglet, Vaux's swift, big brown bat, silver-haired bat, hoary bat, California myotis, Keen's myotis, little brown myotis, American marten, short-tailed weasel, mountain lion, black-tailed deer, bobcat

How Does Wildlife Habitat Relate to the Stand Development Stages?

The current distribution of stand development stages, used to assess wildlife habitat needs across the OESF, is provided in Chart 3-16 (*Forest Conditions*). For a listing of guilds associated with forest structures and conditions, refer to Table 3-64; and for the species associated with these stand development stages, refer to Table 3-65.

ECOSYSTEM INITIATION

Forest stand development begins with open, newly established forest stands of rapidly growing young trees and shrubs. Wildlife diversity increases in the Ecosystem Initiation stage until stands reach more structurally diverse conditions (Brown 1985; Olson and others in Johnson and O'Neil 2001).

Many species use the Ecosystem Initiation stage more for foraging than breeding. Brown (1985) identified 70 species in western Washington and Oregon that used this stage (grass/forb stage in Brown 1985) as the primary foraging habitat, compared to 26 species that used this stage as primary breeding habitat (refer to Table 3-65). Forest stands in this stage of development create edge habitat[1] that can increase wildlife use (Hunter 1990; Patton 1992; Johnson and O'Neil 2001). Adjacent stands in the Competitive Exclusion and Structurally Complex stand development stages provide cover and perching habitat adjacent to possible high-quality foraging habitat within the Ecosystem Initiation stage. Such high-contrast edges are known to be used by red-tailed hawks, accipiters (sharp-shinned and Cooper's hawks), and several species of owls (Johnsgard 1988, 1990; Table 3-66). Edges also provide escape and hiding cover for species that forage within the relatively open Ecosystem Initiation stands, such as deer and elk (Kirchhoff and others 1983; Yahner 1988).

COMPETITIVE EXCLUSION

No wildlife species in western Washington are found exclusively in the Competitive Exclusion stand development stage (Carey and Johnson 1995) because of its low structural diversity and low or absent shrub cover (Johnson and O'Neil 2001). However, some species use these stands as cover for hiding, escape, breeding, and protection from weather. For example, ruffed grouse nest within this habitat type and use it to escape from predators (Dessecker and McAuley 2001). Therefore, the presence of stands in the Competitive Exclusion stage contributes to overall wildlife species abundance, distribution, and biodiversity (refer to Table 3-65).

BIOMASS ACCUMULATION

Biomass Accumulation forest stands contain relatively large diameter trees (at least 15 trees more than 30 inches in diameter per acre) spaced sufficiently to allow rapid growth. This stage is often created through commercial thinning of Competitive Exclusion stands with high canopy closure and lacking a well-developed understory. Johnson and O'Neil (2001) listed 11 wildlife species closely associated with this development stage, although many require the presence of remnant snags for breeding. These species include long-legged myotis, Vaux's swift, and the pileated woodpecker. Because of historic forest practices methods, many of the existing stands in the Biomass Accumulation stage in the OESF lack large snags. Trees in the Biomass Accumulation stage are sufficiently mature to produce large cone crops, food for seed-eating wildlife such as the red crossbill,

[1] Variable retention harvesting creates temporary edges between stands of different ages. Edges are considered "abrupt" or "hard" when the age difference is great between stands, or gradual or "soft" when the age difference is less (DeGraaf 1992, Payne and Bryant 1994). Edges created by variable retention harvests are initially abrupt, and as stands regenerate they become "soft," and then nonexistent as contrast between the two stands diminishes. (Manolis and others 2002)

Douglas' squirrel, and Townsend's chipmunk (Adkisson 1996; Chapman and Feldhammer 1982). Larger crowns and crown growth in this stage likely support use by needle-eating wildlife, including the blue grouse (Cade and Hoffman 1990).

STRUCTURALLY COMPLEX

Numerous studies have shown that many species require Structurally Complex forest stands for some or all of their life history requirements (Zobrist and Hinckley 2005). Key elements of Structurally Complex forests include large live trees, dead trees (snags), coarse woody debris of various sizes and conditions (DNR 2004), multiple vertical canopy layers (for example hemlock, vine maple), within-stand structural diversity (patches of larger trees and small openings), and a diverse understory of tree and shrub species of varying sizes and shapes.

More species require the Structurally Complex stage for breeding than any of the other stand development stages. Brown (1985) listed 70 species in western Washington and Oregon that primarily use Structurally Complex forest stands for breeding. Based on habitat associations presented in Johnson and O'Neil (2001) and distribution maps prepared by Cassidy and others (1997), 30 of those species breed within the OESF and are closely associated with the Structurally Complex stand development stage, shown in Table 3-65.

How Does DNR's Management Affect Wildlife Habitat?

One of DNR's long-term management goals is to provide a variety of stand development stages to support a broader diversity of wildlife species at a large scale (DNR 1997a, 2004, 2006b).

TIMBER HARVESTING

DNR manages state trust lands for specific wildlife habitats and forest conditions through the combination of silviculture and management strategies, as described in Appendix F of the *Final EIS for Policy for Sustainable Forests* (DNR 2006a) and the 1997 *Habitat Conservation Plan*. Silvicultural techniques include variable retention harvests and variable density thinning treatments, developed by DNR staff from the forestry literature (Holmberg and others 2007; Franklin and others 2002; Carey and others 1995). For a description of these harvest types refer to *Forest Conditions*.

Timber harvesting activities change forest stand conditions and may alter the wildlife species composition associated with them (refer to Table 3-67). Timber harvesting also can fragment forested wildlife habitat by increasing edge, and the related edge effects are shown to affect ground nesting birds (Manolis and other 2002).

Table 3-67. Effects of Timber Harvesting on Wildlife

Harvest Type	Duration	Detrimental Impacts	Beneficial Impacts
Variable Retention Harvest	Short-term	Eliminates habitat for many species using the forested stand being harvested. Significance depends on stand conditions prior to harvest. Noise from harvest activities may cause wildlife (including deer, elk, and bear) to leave the immediate area. Physical disturbance from yarding can reduce shrub layers and habitat for ground-associated species. Possible direct mortality (unintentionally cutting down a nest tree). Potential removal of snags for worker safety reduces habitat for cavity nesting birds.	Immediately opens stand and promotes shrub growth, supporting foraging habitat for many species under Ecosystem Initiation. Produces habitat for species that are rare or absent in other stand development stages. Leave trees provide perches for olive-sided flycatchers, red-tailed hawks, and great horned owls. Wildlife trees provide habitat for cavity-nesting birds such as woodpeckers. High-contrast edge supports species such as western screech owl and accipiter hawks. Created and retained snags and coarse woody debris support cavity-nesting birds, small mammals, and amphibians.
	Long-term	Reduces or eliminates wildlife species that require mature over stories such as hermit warblers, northern flying squirrels	Legacy trees and leave patches will eventually support species that require large trees and snags such as brown creeper, pileated woodpecker, and many species of bats.
Variable Density Thinning	Short-term	Noise and activity may cause wildlife to leave the area. Physical disturbance can reduce shrubs and associated habitat for birds. Potential removal of snags for worker safety reduces habitat for cavity-nesting birds. Possible direct wildlife mortality caused by unintentionally cutting down a nest tree.	Opens stand to provide space for forest birds such as sharp-shinned and Cooper's hawks. Variable density thinning can create openings used by many types of wildlife that forage within Ecosystem Initiation stands. Dead and down wood created and retained within legacy patches provides hiding or nesting cover for amphibians, small mammals, and insects.
	Long-term	Tree removal reduces habitat for species that require denser stands such as blue grouse.	Encourages development of large trees that are necessary components of structurally diverse stands, eventually supporting breeding habitat for woodpeckers, bats, and other species. Increases structure and remnant cohorts for long-term increase in wildlife diversity and abundance. Trends move toward structurally complex conditions and associated wildlife communities.

ROADS

Roads can result in increased habitat fragmentation of interior forests and a greater amount of edge habitat (Miller and others 1996; Reed and others 1996). Whenever forest roads are built, changes in habitat are likely, which can lead to changes in wildlife populations (Lyon 1983). Andrews (1990) hypothesized that effects of traffic noise on wildlife include increase in stress hormones, altered behaviors, interference with communication during breeding activities, hearing loss, and sensitivity to different frequencies (Reijnen 1995; Reijnen and others 1995; Wasser 1997). Roads also provide access for people to enter the forest. Proposed roads may need to be relocated to avoid wildlife habitats, such as balds, caves, and talus slopes, but DNR's existing management framework already addresses this. Restricting timing of road building may be needed, especially during the breeding season of sensitive species.

Comparison of Management Alternatives for Wildlife Habitat

STAND DEVELOPMENT STAGES

Chart 3-75 shows a general increase in Structurally Complex forests across the entire OESF under both alternatives. The differences between the alternatives are minor with respect to the amount of Structurally Complex forests, which, at the end of the tenth decade, account for about 20 percent of trust lands in the OESF. The No Action Alternative projects a 61 percent increase (from approximately 30,000 acres to 50,000 acres) and the Landscape Alternative a 48 percent increase (from 30,000 to approximately 46,000 acres). Tables 3-16 and 3-17 (*Forest Conditions*) report the projected acres in the specific forest conditions at the end of the planning horizon (2110), by alternative, for each of the landscapes. This generally follows the trend presented in Chart 3-75.

Under both alternatives, Ecosystem Initiation forests are variable over the entire 100-year model simulation, generally increasing from current conditions, and higher under the Landscape Alternative— which results in more foraging habitat (Chart 3-76). Both management alternatives show a decrease in Competitive Exclusion over the long-term (Table 3-16 and 3-17, *Forest Conditions*). Biomass Accumulation increases in the long-term under the No Action Alternative, notably in the Coppermine, Goodman, Kalaloch, and Sekiu landscapes (Table 3-16). Under the Landscape Alternative, long-term trends are mixed. Biomass Accumulation increases moderately in some landscapes, and decreases notably in the Dickodochtedar, Reade Hill, and Sol Duc landscapes (Table 3-17). Structurally Complex forests increase under both alternatives, notably in the Clallam, Dickodochtedar, Goodman, Reade Hill, and Sol Duc landscapes (Table 3-16 and Table 3-17). However, under the Landscape Alternative, a six percent decline (379 acres) is predicted in the Willy Huel landscape. Additional detail is provided in Appendix D.

The different wildlife species associated with specific stand development stages are shown in Table 3-65. Under the Ecosystem Initiation stand development stage, the Landscape Alternative has higher levels of forging habitat than the No Action. However, the alternatives have similar trends (Chart 3-76). For Competitive Exclusion stages both alternatives decrease in the short-term and remain relatively unchanged over the 100-year modeling simulation. No wildlife species (Table 3-65) in western Washington are found exclusively in the Competitive Exclusion stage (Carey and others 1995) because of its low structural diversity and low or absent shrub cover (Johnson and O'Neil 2001). Over time, forest stands in the Biomass Accumulation stage continually increase under

Chart 3-75. Structurally Complex Forest Development over Time

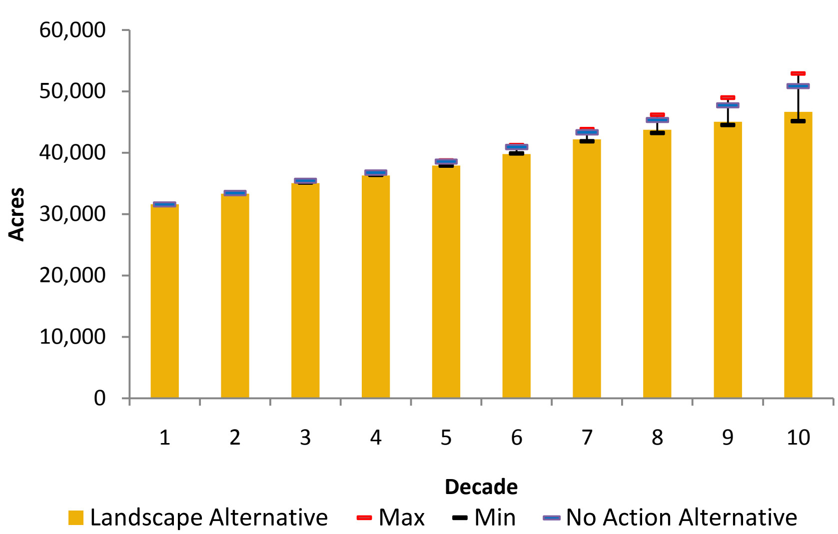
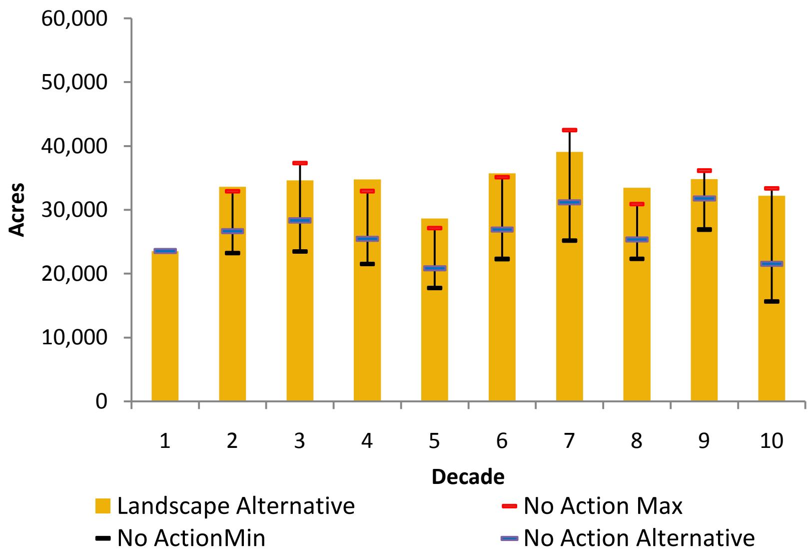


Chart 3-76. Ecosystem Initiation Stand Development over Time



the No Action Alternative, while the Landscape Alternative increases over the first five decades and then decreases back to similar levels found in the first decade. Trees in the Biomass Accumulation stage are sufficiently mature to produce large cone crops, which is a food source for seed-eating wildlife such as the red crossbill, Douglas' squirrel, and Townsend's chipmunk (Adkisson 1996; Chapman and Feldhammer 1982). Larger crowns and crown growth in this stage likely support use by needle-eating wildlife, including the blue grouse (Cade and Hoffman 1990). Forest stands in the Structurally Complex stages of stand development steadily increase under both alternatives with the No Action containing more acres of this forest type. More species require the Structurally Complex stage for breeding than any of the other stand development stages. Brown (1985) listed 70 species in western Washington and Oregon that primarily use Structurally Complex forests for breeding.

FOREST FRAGMENTATION

The extent (acres) of the Ecosystem Initiation stage is a surrogate for the indicator of forest fragmentation. For the Entire OESF the Landscape Alternative has a larger amount of acres in Ecosystem Initiation Stage than the No Action Alternative in every time period evaluated (Chart 3-76). At the end of the tenth decade the landscape Alternative has approximately 30 percent more acres than the weighted mean of the No Action Alternative. The maximum for the No Action Alternative however is similar and in some cases higher than the Landscape Alternative, suggesting that similar forest fragmentation levels may occur under either alternative. Within individual landscapes, the amount in Ecosystem Initiation fluctuates by decade in response to variable retention harvest activities (Appendix D).

Forest fragmentation can lead to habitat fragmentation for many species. Not all wildlife species respond to fragmentation in the same way. Many species show little fragmentation effects (Carey 2007), while others benefit from the diversity and juxtaposition of habitat conditions found is some fragmented landscapes (Kremsater and Bunnell 1999; Fahrig 2003) some tolerate fragmented habitat, while others cannot (Table 3-66).

Direct, Indirect, and Cumulative Effects to Wildlife Habitat

Wildlife species and associated guilds respond in a similar fashion to shifts in forest stand development stages over time. Wildlife species and guilds associated with a particular forest stand development stage can be found in Table 3-65 and needed structural elements are found in Tables 3-64 and 3-66.

Timber harvest activities change forest stand conditions and may alter the wildlife species found there. The projected average harvest levels by decade for the two harvest types (variable retention harvest and variable density thinning) are shown in Charts 3-2 and 3-3 (*Forest Conditions*). Table 3-67 provides a list of the detrimental and beneficial effects to wildlife. Annual timber harvests within the OESF are projected to impact approximately two percent of DNR-managed lands under both management alternatives. Collectively, the frequency (Chart 3-8) and type of harvest (Table 3-11) both could result in short-term wildlife impacts across the landscape, including disturbance and habitat loss to wildlife species.

Potential effects from the general increase in Ecosystem Initiation stage over time (Chart 3-76) are an increase in foraging habitat for many species, including deer, elk, shrub-associated birds, and small mammals. Deer and elk populations have been declining in the Northwest coast region since the 1990s because of a decline in foraging habitat (Spencer 2002). Increases in Ecosystem Initiation acres on forested state trust lands could increase habitat for these species. A beneficial trend over the long term is the decrease in the Competitive Exclusion stage which has no wildlife species specifically associated with it (refer to Appendix D) and the increased area and value of wildlife habitat in the Structurally Complex stand development stages (Chart 3-75).

As mentioned, the Ecosystem Initiation stage can be used as a coarse measure of forest fragmentation; an inference can be made that as the percent of Ecosystem Initiation stage increases, forest patches would be further apart with more edge. Forest roads also can increase habitat fragmentation to core forest areas and produce a greater amount of edge habitat (Miller and others 1996; Reed and others 1996).

However, impacts are expected to be insignificant because of the mitigation methods provided in the 2001 *Final EIS on Alternatives for Forest Practices Rules* (p. 3-175 to 3-186 and Appendix F), which DNR is incorporating by reference.

Over the long term, there is a general increase in stand complexity under both alternatives, as stands transition from Competitive Exclusion to more complex stages, with a related increase in high quality habitat for a broad suite of wildlife species such as northern goshawk, northern flying squirrel, Vaux's swift, Townsend's warbler, several species of bats, the northern spotted owl, and the marbled murrelet. The benefits of increased Structurally Complex forests on forested state trust lands complements similar efforts taking place on adjacent federal lands.

The impacts that DNR management activities have on wildlife habitat are not expected to be significant or beyond those analyzed in the 1997 *Habitat Conservation Plan*. No probable, significant, adverse, environmental impacts to wildlife are anticipated under either alternative as analyzed.

Existing Wildlife Habitat Mitigation

The OESF Forest Land Plan is a 'non-project' SEPA action. At this level, DNR cannot say with certainty that future site-specific actions will result in significant, adverse, environmental impacts that will not be mitigated. All future site-specific actions resulting from this plan, such as proposed timber sales and road construction, will receive additional environmental review under SEPA.