APPENDIX E: WILDLIFE HABITAT QUALITY AND QUANTITY

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INTRODUCTION

Fire has influenced composition, structure, and landscape patterns of animal habitat for millennia, so it is reasonable to assume that animals have coexisted and adapted to periodic perturbations from fire (Smith, 2000a). Wildlife species evolved as fire and other processes shaped their environment. The variation and combination of habitat patterns and textures as a result of historic fires were infinitely complex, and it is because of this complexity that it is difficult to identify predictable responses of wildlife to fire.

Fire plays an important role in creating many different habitat elements. They can be created immediately as a direct result of a fire (*e.g.*, snags) or many years/decades later as an indirect result of fire (*e.g.*, larger, wider-spaced trees resulting from a series of low severity fires). Likewise, wildlife may exploit these elements immediately after their creation or many years later.

HABITAT ELEMENTS

The association of fires with wildlife can be described by a discussion of habitat elements important to wildlife. These elements (such as snags, shrub layers, tree canopy layers, down woody debris, fungi, tree sizes and shapes, edges, and openings) are created by fire and other ecological processes. It is important to recognize that the creation and maintenance of habitat elements within the ecological system is vital to the functionality of the system in space and through time. Therefore, in the long term, many wildlife species benefit from habitat elements created by fires. It is in the short term that some species may experience increased mortality and others may experience changes in competitive status as a result of fire.

Snags

Snags provide a portion of the life support system for many species of wildlife occurring in the project area. Standing dead trees (snags) are important resources for vertebrate species worldwide. Throughout North America, over 85 species of birds use snags for nesting, foraging or drumming (Scott *et al*., 1977; Raphael and White, 1984). In the Douglas fir (*Pseudotsuga menziesii*) and western hemlock (*Tsuga heterophylla*) forests of the Pacific Northwest, over 100 vertebrate species utilize snags for some part of their life cycle (Thomas *et al*., 1979; Neitro *et al*., 1985). Approximately 20% (34 species) of all bird species in the Pacific Northwest depend on snags for nesting and feeding (Carey *et al*., 1991; Lundquist and Mariani, 1991). Furthermore, the abundance of snag-

Snags are important to many bird species in the project area.

dependent birds has been shown to correlate with the density of suitable snags (Zarnowitz and Manuwal 1985; Stribling *et al*., 1990; Carey 1995).

One of the nest structures of the Northern spotted owl (*Strix occidentalis*) is in cavities at the tops of partially dead trees with broken tops. Also, populations of northern flying squirrel (*Glaucomys sabrinus*), the primary prey item of the threatened northern spotted owl (*Strix occidentalis caurina*) reach their highest densities in forests with large snags (Carey, 1995).

Decaying logs

Dead and down woody material, including logs, have long been viewed by foresters as a fire hazard and an important item to "salvage," or remove from the forests. This woody material was also considered a problem because it served as a home for small vertebrate "pests" that impeded reforestation. Decaying logs and other woody material in various stages of decay on the forest floor remaining after a fire event are essential to many species of wildlife in all fire regimes of the project area.

The main function of logs is to provide cover and sites for feeding and reproduction.

The main habitat function of logs is to provide cover and sites for feeding and reproduction. Logs are effective for the greatest variety of small animals when they are well distributed over the ground (Maser *et al*., 1979), such as after a fire.

As a log decomposes, the plant community surrounding it changes, creating gradually changing wildlife habitats. As a log becomes more decayed, it becomes easier for small vertebrates to burrow inside, thus increasing its habitat value. Insect colonizations in the decaying logs are also beneficial to wildlife. One example is the carpenter ant. Carpenter ants colonize the snags and decaying logs in the study area and are the primary food source for the pileated woodpecker. The woodpecker, in turn, is a bird that excavates nest and roost cavities that provide shelter for vertebrates such as the fisher, and cavity nesting birds unable to excavate their own cavity. In the project area these include nuthatches, chickadees, bluebirds, and wood ducks.

The size of the dead material is important for many species (Maser *et al*., 1979). For example, a limb four inches in diameter is large enough to give protective cover to a tiny shrew, but a log ten inches in diameter will afford protection to a deer mouse. As a general rule, the larger the diameter and the greater the length of a log, the more useful it is.

In general, fire is an excellent tool to generate snags and dead material in forests in a pattern, density and distribution essential for many wildlife species.

Meadows and forest openings may be a successional stage in stand development after a fire.

Meadows and Forest Openings

Meadows and forest openings can be a result of the successional stages of stand development after a fire. Meadows and openings are important habitat for wildlife species that are capable of living and reproducing away from the interior of the forest. Some examples in the project area are: acorn woodpecker (depends on oak trees in forest openings for its food source), the great grey owl (usually reproduces near meadows where it can hunt for its major prey items), and the pocket gopher. Meadows are also important foraging and resting areas for black-tailed deer and elk in the project area.

Forest openings also include rock outcrops, which have crevices and caves for bats (over eight species are found in the project area) and other mammals such as the American pika and the wolverine.

Edges created by forest openings are another habitat feature essential to many wildlife species in the project area. These edges or ecotones between two habitat types are sites where certain species find food, cover, nest and den sites. Edge species include certain sparrows, finches and warblers. The northern flying squirrel, one of the main prey items of the northern spotted owl, is associated with ecotones formed by the junction of forest and shrubs.

ASSOCIATION OF TERRESTRIAL WILDLIFE WITH FIRES

Following is a description of the association of wildlife with fires. This information is presented to assist landuse managers in planning fire management opportunities.

Birds

Many birds leave burning areas to avoid injury; some return to take advantage of altered habitat. For example, spotted owls in south-central Washington continued to use areas burned by understory fire but avoided stand-replacement burns, probably because their prey had been reduced (Lyon *et al*., 2000b). A few bird species are attracted to active burns. Several studies show that woodpeckers are particularly attracted to burned areas. Black-backed woodpeckers, which occur in the project area, are almost restricted to standing, dead, burned forests in most parts of their range in the Northern Rocky Mountains. Pileated woodpeckers (also occurring in the project area) foraged extensively on logs in an area of Mississippi that had burned 2 weeks earlier. An abundant food supply of wood-boring beetles appeared to be the primary attraction (Lyon *et al.*, 2000b).

Literature describing the behavioral responses of animals to fire is limited. Also, short-term responses do not provide insights about the sustainability of a species in a given area. Studies of animal populations and communities are more helpful in providing such insights.

Current research on the association of stand replacing fires and bird communities is summarized below. The main results indicate that:

- The changes after a stand replacing fire may be positive for insect and seed-eating species and negative for species that require a dense, closed canopy such as bark and foliage gleaners.

The changes following a stand replacing fire may have both a positive and negative effect on wildlife.

- Many or most of the species present before a stand replacing fire are likely to be replaced by new species.
- Some bird species use habitat that occurs only for a short time after a stand-replacing fire. High turnover occurs in the first five years after stand-replacing fires.
- Greater than five years after a stand-replacing fire, bird communities demonstrated the following changes:
    a. Early seral conditions after the fire fostered high bird diversity;
    b. More bird species bred exclusively in early seral stages after a stand replacing fire than in mature forests; and
    c. Snags were a key habitat feature for avian diversity and abundance.

Research in the literature indicates that bird communities are changed for at least two years by stand replacing fires. A few studies show signs that the community returns to its pre-burn structure three to four years after the burn, but others do not. The changes may be positive for insect and seed-eating species and negative for species that require a dense, closed canopy, such as bark and foliage gleaners (Huff and Smith, 2000). Examples of insect and seed eating species in the analysis area are red crossbills, flycatchers and sparrows. Bark and foliage gleaners include the brown creeper and several species of warblers.

Stand replacing fires in forests are either severe surface fires or crown fires where more than 90 percent of the trees are top-killed or killed. It takes decades to centuries for vegetation to develop structure and composition resembling a pre-burned forest. Many or most of the species present before a stand replacing fire are likely to be replaced by new species (Lyon *et al.*, 2000b).

Some bird species use habitat that occurs only for a short time after stand replacing fire. High turnover occurs in the first five years after the fire. For example, in the western hemlock forests of western Washington (which has a stand replacing fire return interval spanning several centuries) the bird community composition shifted from domination by canopy-dwelling species to species nesting and foraging near the ground (Huff and Smith, 2000). This was found to be true in similar studies in Yellowstone National Park (in a 250 year lodgepole pine-spruce-fir forest) and in Grand Teton National Park, Wyoming, (in a 200 year spruce-fir-lodgepole pine forest).

Many species of woodpeckers show substantial population increases and disperse in areas burned by stand replacing fires. Woodpeckers generally nest in snags or in the forest canopy. Reports indicate that populations of woodpecker using forests with understory fire regimes tend to be unaffected by underburns (Huff and Smith, 2000). Fires that reduce logs, stumps, and snags could have adverse effects on woodpeckers, however, by decreasing insect availability.

Several studies addressed bird communities more than five years after a stand replacing fire. Three long-term studies were conducted in: mixed-conifer forest dominated by Jeffrey Pine and white fir in the Sierra Nevada range; western hemlock forests in western Washington; and lodgepole pine forests in Yellowstone and Grand Teton National Parks of Wyoming (Huff and Smith, 2000). These three studies indicated that:

1) Early seral conditions after the fire fostered high bird diversity;
2) More bird species bred exclusively in early seral stages after a stand-replacing fire than in mature forests; and
3) Snags were a key habitat feature for avian diversity and abundance.

Little is known about the effects of fire on bird populations in mixed severity fire regimes (Lyon *et al*., 2000b).

Bird populations respond to changes in food, cover and nesting habitat caused by fire. The burning season is important because fire during the nesting season may destroy active nests while migratory populations may be affected only indirectly (or not at all) by burns that occur before their arrival in spring or after their departure in fall. Planning for a prescribed fire should therefore take into account whether migrants are present and burning should take place outside the avian nesting season.

Bird populations respond to changes in food, cover and nesting habitat caused by fire.

Most raptor populations are unaffected or respond favorably to burned habitat. Fires often favor raptors by reducing hiding cover and exposing prey populations. When prey species increase in response to postfire increases in forage, raptors are also favored. Beneficial effects of fire on populations of northern goshawk and sharp-shinned hawk have been observed in ponderosa pine forests (Huff and Smith, 2000). Both of these species occur in the project area.

Mammals

The ability of mammals to survive fire depends on their mobility and on the uniformity, severity, size, and duration of the fire. Most small mammals seek refuge underground or in sheltered places within the burn, whereas large mammals must find a safe location in unburned patches or outside the burn. Most small mammals avoid fire by using underground tunnels, pathways under moist forest litter, stump and root holes, and spaces under rock, talus, and large dead wood (Lyon *et al*., 2000b).

Direct fire-caused mortality has been reported for large as well as small mammals, including coyotes, white-tailed deer and elk (Lyon *et al*., 2000b). Mortality is most likely when fire fronts are wide and fast moving.

Since large mammals, such as elk and deer, depend on vegetation for forage, bedding, cover, and thermal protection, they abandon burned areas if fire removes many of the habitat features they need. Therefore, the effects of fire on mammal species are related to the uniformity and pattern of fire on the landscape.

Fire effects on mammals are related to the uniformity and pattern of fire on the landscape.

Many animals are actually attracted to fire, smoke and recently burned areas. Beetles of the subgenus *Melanophila* use infrared sensors to find burning trees, where they mate and lay eggs (Lyon *et al*., 2000b). Most birds and mammals that immigrate in response to fire are attracted by food resources, such as insects.

Spring fires may impact mammal populations more than fires in other seasons because of limited mobility of the young. Species with the most vulnerable young are small mammals, most of which also have high reproductive rates. Postfire habitat should provide food and shelter so that their populations will recover rapidly.

Ungulate species such as deer and elk often benefit from increased food and nutrition on recent burns. Because ungulates are sensitive to alterations in vegetation structure, however, their net response to fire depends on its severity and uniformity.

Reptiles and Amphibians

Little is know about amphibian and reptile emigration and immigration after fire. Fire-caused changes in plant species composition and habitat structure influence reptile and amphibian populations (Lyon *et al*., 2000b). Amphibians in forested areas are closely tied to debris quantities – the litter and woody material that accumulate slowly in the decades and centuries after stand replacing fire. Many herpetofauna populations show little response to understory and mixed severity fire (Lyon *et al*., 2000b).

DISCUSSION OF PAST AND PRESENT CONDITIONS FOR WILDLIFE IN THE ANALYSIS AREA

Past and present conditions are described to assist land managers in planning future fire management opportunities. Generally, it is most useful to discuss past and present conditions for wildlife in the context of geographic areas (zones) rather than across the entire analysis area because most wildlife species are geographically or topographically specific (valley bottom dwellers or subalpine residents).

However, there are some conditions that are common to all zones. These are presented first, with more specific discussions by Fire Zone and Regime following.

Past Condition – Common to all Zones

Catastrophic fires have shaped the vegetation and thereby fauna distribution of the project area.

Mountain building processes that created the Coast and Cascade Ranges played a major role in the formation of the physiographic features of present-day Oregon. These features affected the climate and vegetation, which in turn influenced the evolution and ontogeny of various faunas.

In more modern times, fire events impacted the fauna of large regions of Oregon, including the project area, shaping the vegetation and thus fauna distribution. Most North American fauna communities have developed under pressure from repeated fires of specific severities and frequencies.

Alteration of that pressure during the past 100 to 500 years has changed the abundance and geographic distribution of many kinds of habitat and the animals that depend upon it.

The distribution of fauna populations in Oregon before European settlement was not documented for most species.

Records on mammal species in Oregon during the 1800s are from journals of field naturalists and museum specimens. Meriwether Lewis and William Clark collected mammals in Oregon on their expeditions in the early 1800s. Their descriptions included identification of the black bear (*Ursus americanus*), raccoon (*Procyon lotor*), badger (*Taxidea taxus*), mink (*Mustela vison*), river otter (*Lutra Canadensis*), striped skunk (*Mephitis mephitis*), gray wolf (*Canis lupus*), coyote (*Canis latrans*), gray fox (*Urocyon cinereoargenteus*), bobcat (*Lynx rufus*), Townsend's chipmunk (*Tamias townsendii*), Dourlas squirrel (*Tamiasciurus douglasii),* Black-tailed deer (*Odocoileus* spp.), elk (*Cervus elaphus*) and others (Verts and Carraway 1998). All of these species, with the exception of the wolf, occur in the project area today.

Present Condition – Common to all Zones

There are at least 150 species of birds, 60 species of mammals, 10 species of reptiles and 14 species of amphibians in the project area. These include the following federally listed endangered, threatened or "sensitive[1]" species: Northern spotted owl, Bald eagle, American peregrine falcon, harlequin duck, California wolverine, white-footed vole, Pacific western big-eared bat, Northern red-legged frog, spotted frog and Northwestern pond turtle.

The distribution of special status vertebrates throughout the project area is based on a variety of factors including: elevation, vegetation structure and composition, availability of snags and logs, and availability of water.

The habitat structure and composition required by each of these species is comprised of habitat elements generated by ecological processes including fire. For example, fires generate snags and logs and these provide nest and denning sites for many species of cavity nesting birds and mammals and cover for reptiles, and amphibians. Fires also provide a mosaic of habitat types that will develop into varying seral stages. A mosaic of habitat is important to the lynx for example. This species requires older forests for denning and younger forests for hunting their main prey, the snowshoe hare.

During the past 50 years, fire suppression has created conditions in which only the most severe fires impact the landscape. Small and/or low severity fires are easily extinguished and therefore do not create the more subtle landscape alterations that were often instrumental in creating a mosaic of habitat conditions. This dampening of the fire process, as well as other human-caused landscape alterations, has launched changes in the vegetative and wildlife species composition, abundance and distribution within the INFMS analysis area.

The production forests that dominate much of the project area today, create patches of forest in varying seral stages. However, these clearcut forest stands are very different in structure than the stand following a fire event. Older clearcut stands are homogenous with none to few standing dead trees, while recent managed stands (1990s) are left with some live and standing dead trees based on guidelines specified in the Northwest Forest Plan. Neither of these forest structures comes close to the density of standing live or dead trees left after fire.

Long term, many wildlife species benefit from habitat elements created by fires.

One such example is the Warner Creek Fire, which was a stand-replacing fire event above 3,000 feet elevation in Fire Zone 3 – South Cascades. The density of snags per acre was far greater than the four per acre left in many of the recent clearcuts. This greater amount of snags leaves dispersal corridors essential for less mobile wildlife, unable to travel across corridors with few standing trees or snags, or logs.

Zone 1 – High Cascades

Past Condition

In the higher elevations, this zone is dominated by **Fire Regime 5: High Severity/Low Frequency**. Mountain hemlock and silver fir forests create large coarsely homogenous patches that burned intensely when they burned at all. As a result, large pulses of snags and dead wood were introduced into the system followed by long periods of limited recruitment. This scenario created jackpots of abundant habitat for species such as black-backed and other woodpeckers. In addition, as the understory began to develop after a fire, such prey species as rabbits, deer, mice, and voles were more abundant and available to predators than prior to the fire. In these higher elevations predatory species included: mountain lion, lynx, wolverine, eagles, black bear, and (historically) gray wolf.

In its lower elevations, this zone is characterized by the **Variable Severity/Low Frequency Fire Regime (4)**. Smaller patches of **Variable Severity/High** and **Moderate Frequency Regimes (2, 3)** occur on slopes with more exposed aspects. The moderate and low frequency regimes are found where moister western hemlock and western red cedar forest types occur. These regimes contain forest stands often considered “classic old growth” – large diameter conifers with multi-layered canopies, two to three age classes present, and occasional gaps and anomalies scattered throughout the forest.

Many wildlife species are associated with this habitat (Franklin and Spies, 1991) including some of the most high profile northwestern species such as the northern spotted owls, and red tree vole. The abundant vertical and horizontal layering creates a complex habitat that can support a relatively high number of species.

Fires occurred at 200+ year intervals in these regimes. Occasionally stand replacing fires were part of these events. In this zone there may have been more stand replacement fires in this regime than in other zones. Early seral conditions were generated on those sites. However, more often low intensity smoldering fires crept through older aged stands creating small gaps, clearing out small patches of understory, and creating an occasional snag and downed wood. These habitat elements added important within stand heterogeneity for cavity nesters, accipiters, amphibians, and others.

Present

The fire regime that dominates the mountain hemlock and silver fir forests has not changed much in the present day. Fire suppression efforts are only marginally successful in this regime. While wildlife species composition has changed somewhat, fire suppression has not been the most limiting factor. In comparison to other zones, there has been a limited introduction of exotic species in this zone.

The moderate and low frequency fire regimes that dominate the lower elevations are still within the mean fire return interval window, notwithstanding the past several decades of fire suppression. Stand alteration not related to fire has occurred in much of this regime creating relatively uniform even-aged single species “plantation” stands that bear little resemblance to past early seral stands. Undisturbed stands still contain habitat elements important to endemic wildlife. Species composition is relatively intact but the distribution and abundance of several species are of concern (NWFP, 1994). Fire as a process and a stand modifier at the fine scale has been virtually eliminated and the resulting habitat modifications are no longer occurring within the forest stands.

Zone 2 – Low Cascades

Past

This zone is characterized by the **Variable Severity/Low Frequency Fire Regime (4)**. Smaller patches of the **Variable Severity/Moderate Frequency Regime (3)** occur on slopes with more exposed aspects. The moderate and low frequency regimes occur in the moister western hemlock and western red cedar forest types. The description for these regimes in this zone is similar to Zone 1.

The ridgelines and highest elevations in this zone are in the **High Severity/Low Frequency Regime (5)** also found at the highest elevations of Zone 1. These sites are more isolated than in Zone 1 and, in general, they provide patches of dissimilar habitat between drainages. They may provide travel routes for wide-ranging species (elk, black bears, mountain lion) and may be partial barriers for less mobile animals.

Present

The low frequency fire regime that dominates this zone is still within the mean fire return interval window notwithstanding the past several decades of fire suppression. Stand alteration not related to fire has occurred in much of this regime, creating relatively uniform even-aged single species "plantation" stands that bear little resemblance to past early seral stands. Undisturbed stands still contain habitat elements important to endemic wildlife. Species composition is relatively intact but the distribution and abundance of several species are of concern (NWFP, 1994). Fire as a process and a stand modifier at the fine scale has been virtually eliminated and the resulting habitat modifications are no longer occurring within the forest stands.

For wildlife, the ridge tops are likely functioning similar to the past. Other human-cause factors such as recreation and increased accessibility (disturbance and roads) may have a greater influence on wildlife than fire suppression in these sites.

Zone 3 – South Cascades

Past

This zone has the highest acreage and proportion of the **Variable Severity / High Frequency Fire Regime (2)** within the INFMS analysis area. It is the dominant regime in the zone. The **Variable Severity / Moderate** and **Low Frequency Regimes (3, 4)** are also common. The fire model in this area suggests a fairly high frequency of fire in comparison to the more northern Cascade and Coast Range portions of the analysis area.

Much of the forest in this area was believed to be more open with widely spaced trees and a simple shrub or grassy understory. The common occurrence of pine species also suggests a much different habitat than that found further north. Wildlife species associated with relatively drier habitats or with pine and some hardwoods, such as Oregon white oak, were present. These included several species of woodpeckers, such as the pileated woodpecker, Lewis' woodpecker and the acorn woodpecker. An excellent blend of elk habitat components appeared to be available as a result of the fire legacy in this zone.

Present

While other human caused alterations have occurred in this zone as well, fire suppression is perhaps the most noticeable on the largest amount of acres here. Douglas fir is out competing pine and oak trees in many sites, while there are very few sites that are still dominated by these species. Elk are still an abundant species in this area. However, as the conifer canopy becomes denser, the understory shifts away from more preferred forage such as grass and some shrubs to duff and sparse trees and / or shrubs.

Many woodpecker species are able to exploit Douglas fir trees as well as pines (*e.g.*, pileated woodpecker); however Lewis' woodpecker and the acorn woodpecker depend on more open habitats such as the pine and oak woodlands. In addition, secondary cavity nesters are also affected by these changes. The western bluebird is strongly associated with recently burned forest stands (Hutto, 1995).

Stand alteration not related to fire has also occurred throughout this zone, creating relatively uniform even-aged Douglas fir "plantation" stands that bear little resemblance to past early seral stands.

Zone 4 – Valley/Foothills

Past

This zone is almost entirely comprised of **Fire Regime 1: Low Severity / High Frequency**. Parts of the foothills are in the **Variable Severity / High Frequency Regime (2)**. The valley bottom consisted of wet prairie and prairie habitats with ash woodlands along the rivers and oak and pine woodlands scattered on the landscape. Historic information indicates that the foothills surrounding the valley supported a wide distribution of Oregon white oak communities, Douglas fir / pine communities and Douglas fir / oak communities (see Map 1, GLO Vegetation from 1800s). Oak communities support a variety of wildlife species including a few that are almost completely oak dependent, such as the acorn woodpecker and sharp-tail snake (Applegarth, 1995).

Present

Not surprisingly, human modifications have altered this zone the most. In addition, fire suppression has also had a relatively important role in the vegetative changes within this zone. Many species once believed to be common in the valley / foothills are considered unique or rare today. The Fender's blue butterfly is a valley dweller that is dependent on prairie habitats once abundant in the valley and maintained by fire. Prairie habitats and their associated wildlife are now confined to a few remnants that are heavily infested with non-native plant and animal species. The functionality of these isolated patches is imperiled and many of the valley wildlife species populations are reduced in abundance and distribution (Applegarth, 1995).

Oregon white oak and Ponderosa pine have been selected against in much of the valley foothill area. In addition, the remaining oak or pine woodlands have a structure and understory composition suggesting that fire has not played a role in its creation. Non-native plant and animal species are a serious threat to the native fauna in this zone.

Zone 5 – Coast and Coast Range

Past Condition

This zone is dominated by the **Variable Severity / Low Frequency Fire Regime (4).** Smaller patches of the **Variable Severity / Moderate Frequency Regime (3)** occur on slopes with more exposed aspects. The moderate and low frequency regimes occur in the moister western hemlock and western red cedar forest types. The description of these regimes in this zone is similar to Zone 1.

Many wildlife species are associated with this habitat (Franklin and Spies, 1991) as described in Zones 1 and 2. However the Coast Range also provides habitat to the marbled murrelet.

Fires occurrence and behavior is similar to that described in other zones for these regimes.

Present Condition

The low frequency fire regime that dominates this zone is still within the mean fire return interval window, notwithstanding the past several decades of fire suppression. Stand alteration not related to fire has occurred in much of this regime, creating relatively uniform even-aged single species "plantation" stands that bear little resemblance to past early seral stands. Undisturbed stands still contain habitat elements important to endemic wildlife. Species composition is relatively intact but the distribution and abundance of several species are of concern (NWFP, 1994). Fire as a process and a stand modifier at the fine scale has been virtually eliminated and the resulting habitat modifications are no longer occurring within the forest stands. As a result these elements are becoming less common, even in stands that have not been modified by other influences.

Desired Future Condition

The influence of fire suppression, particularly in the case of low severity fires, is often subtle and occurs over a long period of time. The results can be a reduction in the quality or quantity of some habitat elements (see Table E-1). This effect is confounded by other landscape alterations such as timber harvest, road construction, recreation, and human development, which in some cases may have far more influence on the landscape condition.

As a result, habitat elements beneficial to wildlife become confined to those small and often isolated sites that have remained relatively unaltered by other influences. These areas become the focus of protection efforts, including fire suppression, which further skews the historic fire-influenced stand structure and composition.

Evaluation of these sites as candidates for the reintroduction of low severity fire is reasonable. In addition, opportunities to cultivate habitat elements in forest stands that are affected by timber harvest is another approach to influencing wildlife species composition, distribution, and abundance.

In all cases, special attention should be paid to the condition of the habitat and the changes that have already taken place. When planning the reintroduction of fire, the presence of non-native plant and animal species should be carefully evaluated to determine if a treatment outcome could potentially increase their competitive advantage. Location of treatments should be considered at the spatial and temporal scale to give maximum strategic advantage over time for the wildlife species that are influenced by the target habitats or habitat elements.

Table E-1. High Profile Species, Habitat or Habitat Elements Affected by Fire or Fire suppression.

Zone	Habitats or habitat elements	High profile species
1. High Cascades	• Large patches of snags • Relatively large high elevation meadows	• Lynx • Great gray owl • Primary cavity nesters (black-backed & northern three-toed woodpeckers)
2. Low Cascades	• Occasional large diameter snags • Multi-aged forest understory, shrub layers	• Northern spotted owl • Cloud salamander • Red tree vole
3. South Cascades	• Sugar & Ponderosa pines • Oregon white oak • Hardwood co-dominants • Thick-barked trees	• Northern spotted owl • Primary cavity nesters (pileated, acorn & Lewis' woodpeckers) • Secondary cavity nesters (western bluebird) • Elk
4. Valley/Foothills	• Oregon white oak • Prairie • Ponderosa pine	• Fender's blue butterfly • Sharptailed snake • Acorn, Lewis' & pileated woodpeckers
5. Coast Range	• Occasional large diameter snags • Multi-aged forest understory, shrub layers • Large diameter, widely spaced cedar, hemlock & Douglas fir trees	• Northern spotted owl • Marbled murrelet • Red tree vole • White-footed vole

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