



# Woodland Fish & Wildlife

## Westside Douglas-Fir Forests and Wildlife Management Tools for Family Forest Owners

Authors: **Jennifer Weikel**, Oregon Department of Forestry, **Ken Bevis**, Washington Department of Natural Resources, **Andrew B. Perleberg**, Washington State University, **Donald P. Hanley**, retired, and **James Bottorff**, retired  
 Edited by: **Fran Cafferata Coe**, Cafferata Consulting

### Introduction

Westside Douglas-fir forests are one of the most productive forest types in the world and are common in Oregon and Washington. Douglas-fir is one of the world's most economically important timber trees due to its quick growth and the versatility and usefulness of the wood it produces. These forests also provide habitat for a wide range of wildlife species. Along with Sitka spruce and western hemlock, older Douglas-fir have unique properties that make them important to species who may not otherwise be present, such as marbled murrelets, American martens, red tree voles, and clouded salamanders.

Westside Douglas-fir forests are generally defined as Douglas-fir dominated forests west of the Cascade Mountains crest and below the elevation of approximately 3,500 feet above sea level. In Oregon and Washington, these forests occupy the majority of the western parts of each state, including the Oregon and Washington Coast Ranges and the lower reaches of the western Cascades. The extent of westside Douglas-fir forests in Washington and Oregon also coincide with the majority of family forest owners in the Pacific Northwest. This provides a unique opportunity for those landowners to positively impact a wide array of wildlife species while growing healthy, productive forests.

Throughout the extent of its range in Washington and Oregon, Douglas-fir often occur in pure, even-aged stands. It may also be associated with western hemlock, western redcedar, grand fir, western white pine, red alder, bigleaf

maple, Pacific madrone, and Oregon white oak. In riparian zones, black cottonwood, Oregon ash, and numerous willow species can be found. Understory species often include vine maple, thimbleberry, beaked hazelnut, salmonberry, vanilla leaf, boxwood, elderberry, huckleberry, rhododendron, serviceberry, ocean spray, Pacific dogwood, and salal, among many others. These understory plants provide rich, and often overlooked wildlife habitats.

Due to the widespread nature of westside Douglas-fir forests in Oregon and Washington, many wildlife species depend upon these forests to be healthy, diverse and

widespread, and composed of varying degrees of stand development and tree and shrub species diversity. The following pages outline what wildlife utilize westside Douglas-fir forests, and will provide specific management practices that will help improve wildlife habitat while still growing productive westside Douglas-fir forests.

### Forest Succession and Diversity

There are over 100 wildlife species associated with westside Douglas-fir forests, including amphibians, reptiles, birds and mammals. These wildlife species utilize this habitat over a broad range of successional stages, from early successional stages such as recent clearcuts to late-successional forests, such as old-growth stands. Forest succession refers to the way a forest changes over time after a disturbance. Disturbances may be natural (e.g., windthrow, fire, disease) or human-caused (e.g., harvest, prescribed fire). As the forest reseeds and grows from seedlings to saplings to mature trees, the wildlife who utilize the forest change as well. Figure 1 shows the successional stages of westside Douglas-fir forests.

Many animals are "successional" species. They survive only in those stages of succession to which they are adapted. Many successional stages are relatively short-lived, and the presence of wildlife associated with them is equally short-lived. Forest succession develops distinct plant and wildlife communities. Common communities over time can be generalized into these categories: Young Forest (grass forb, shrub, and sapling), Middle



*Westside Douglas-fir forests are one of the most productive forest types in the world and are common in Oregon and Washington.*  
 Photo by Ken Bevis.

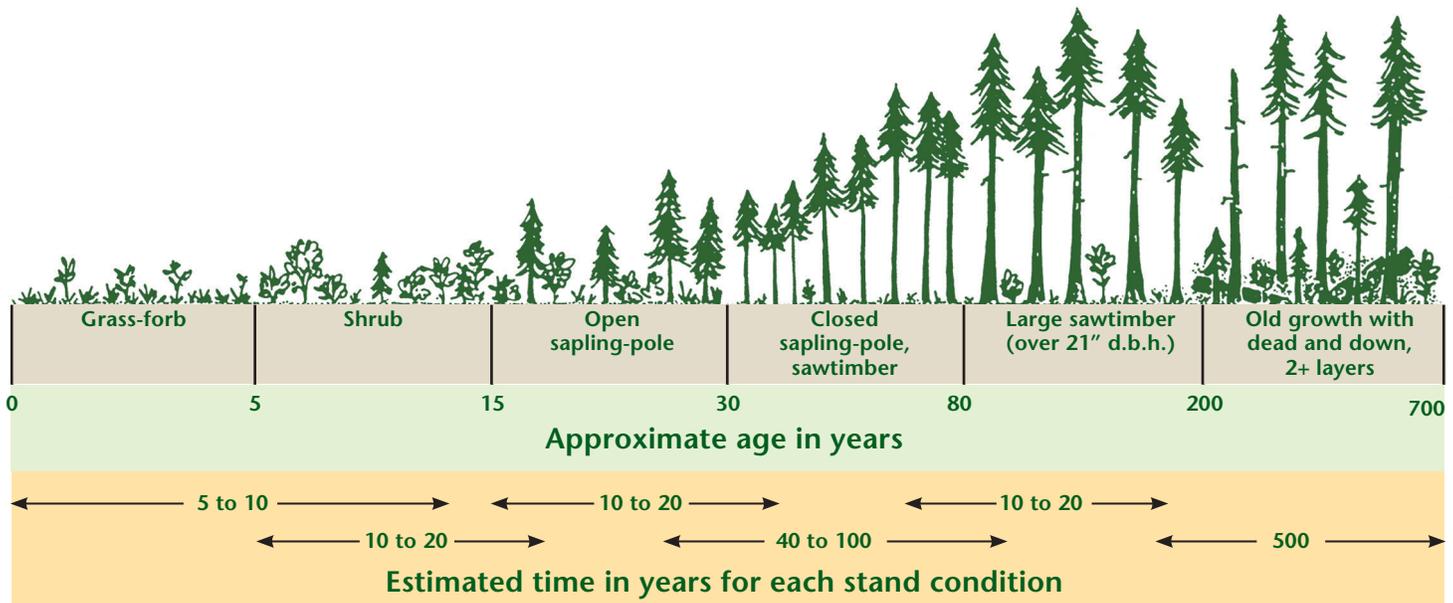


Figure 1. Successional stages in Douglas-fir forests after even-aged harvesting. From Brown (1985).

Aged (pole, small sawtimber), and Mature (old growth). For the purposes of this publication, we will refer to these general categories.

Each successional stage results in different habitat for wildlife species. The composition of wildlife species changes as stands grow through successional stages. For example, older forests host Townsend’s warblers, who avoid open, early successional stages. In contrast, orange-crowned warblers avoid old forests, but thrive in young, brushy forests.

An Oregon study showed that migratory songbird populations are linked to the presence of abundant shrubs in young forest stands. ([http://oregonforests.org/sites/default/files/publications/pdf/OFRI\\_WIMF\\_Songbirds\\_web.pdf](http://oregonforests.org/sites/default/files/publications/pdf/OFRI_WIMF_Songbirds_web.pdf)).

Some wildlife species such as amphibians, which are often linked to mature forest structure (such as rotten logs) are sensitive to forest disturbance and are slow to colonize disturbed sites. Amphibians, such as salamanders thrive in older stands where abundant down wood provides dry season habitats. Mature stands and riparian forests can provide these habitats over time.

### Age Structure

Douglas-fir forests are often even-aged. Even-aged stands result from stand replacement disturbances such as wild-fire and logging. Although Douglas-fir can survive for long periods in the shade, growth is most rapid when the trees in a stand receive direct sunlight. As for wildlife habitat, an even-aged stand can be low in habitat diversity. Habitat diversity can be increased if even-aged stands are in small blocks mixed with other stand types, and if structure is provided with defective and dead trees (snags) and scattered live trees (green or “recruitment” trees) in the post-disturbance stand. The opposite of even-aged structure is a structure that has three or more age classes. This multi-aged forest is called an uneven-aged structure. Uneven-aged stands maintain themselves through frequent, small-scale disturbances such as windthrow, which create small gaps that allow for development of a new cohort of trees. Uneven-aged stands often include subdominant trees that are generally shade tolerant, since reproduction must occur under the canopy of older trees.

Shade intolerant species cannot compete under these conditions. Douglas-fir trees seldom occur as multiple ages within individual stands because Douglas-fir are mostly shade intolerant. Tree age and thus habitat diversity usually occurs from stand-to-stand as aggregates of even-aged patches across the landscape.

### Vertical Development and Habitat Diversity

Vertical development of Douglas-fir and shrub species is affected by shade tolerance, tree stocking, site quality, and disturbance factors. As a stand grows over time, natural competition, primarily for sunlight and soil nutrients, influences the height growth of trees and shrubs. This difference in height growth creates the towering canopy habitats of tree branches and boles. Overstory tree growth also results in overtopping of many plants, and the ultimate death of those species that cannot “keep up.” This natural mortality, called suppression mortality, can occur rapidly in Douglas-fir stands. Suppression mortality, along with natural disturbance (e.g., windthrow), results in openings in the forest canopy which allows light to the

understory. If enough light is present, shrubs and seedlings can establish and grow, eventually creating multiple layers of vegetation in the stand. Many wildlife species use these canopy gaps and multiple layers by responding to the diversity of plant species and growth forms (Figure 2). Generally speaking, the more vertical diversity you have in a stand, the greater number of wildlife species can find habitat there. Wildlife habitat diversity can be promoted through the creation of multiple canopy layers.

### Horizontal Development and Habitat Diversity

Horizontal diversity in a stand can be at the scale of multiple forest stands across the landscape or in smaller patches within a stand. Since Douglas-fir stands are often even-aged it is important to have many age classes scattered across the landscape to achieve a diversity of habitat types. Horizontal diversity is created naturally through disturbances such as wind, forest diseases, and even fire at larger landscape scales. Managed landscapes have a variety of stand types, often in large blocks. Recent research has shown that horizontal diversity is important to wildlife. Retention of

unlogged patches, even those as small as 1/10 of an acre, within a logged stand can serve as refuge for some wildlife. In contrast, the creation of openings within forested stands can provide key habitats and attract some wildlife species to a stand that is otherwise unsuitable.

### Species Composition

Stands that naturally regenerate after a stand replacement disturbance usually contain many tree species (Table 1). This is generally beneficial for wildlife as it promotes habitat diversity in the stand. Multiple tree species influence vertical and horizontal diversity in a stand. Shrubs are also very important for wildlife. The concepts of species diversity and shade tolerance apply to the major shrub and browse species found in Douglas-fir forests, as well. As tree canopies close, shrubs decrease in abundance. Often the abundance of shrubs is critical to many wildlife populations providing crucial food and cover for numerous species. For example, many shrub species favored by ungulates (deer and elk) for browse are intolerant of shade and require some degree of openings to thrive.

If you wish to maintain a variety of wildlife on your property, it is desirable to develop diverse stand conditions in terms of succession, age, species, vertical and horizontal diversity. Plant diversity leads to wildlife diversity because diversity provides many different habitat opportunities for wildlife. Common species that inhabit westside Douglas-fir forests are listed in Appendix A.

### Wildlife of Westside Douglas-fir Forests

Wildlife utilize habitats for different reasons. A specific habitat condition may provide the elements a species may require, such as the woodpecker's need for snags. Wildlife may be drawn to habitats based on other physical factors, such as proximity to water, proximity to food, or microclimate. Some species may only utilize forests of specific successional stages or with various levels of openness due to their life history traits, dietary needs, or for safety from predators. For example, beavers require low gradient streams with adequate flow and desirable forage plants. Flying squirrels need cavities for day roosts. Song sparrows prefer brushy edges along openings.



Figure 2. An example of the birds that utilize the vertical diversity in a mature Douglas-fir forest. From Brown (1985)

**Table 1.** Common tree species of the coastal Douglas-fir forest type, and a few of their important characteristics.

Characteristic	Douglas-fir	Noble Fir	Grand Fir	Western Hemlock	Lodgepole Pine	Western Red Cedar	Red Alder	Oregon White Oak	Pacific Yew
Shade tolerance	INT	IT	T	VT	IT	T	IT	IT	VT
Competitiveness	INT	INT	INT	T	IT	T	IT	INT	T
Wet site suitability	IT	INT	INT	T	IT	T	T	IT	T
Dry site suitability	INT	IT	IT	IT	T	IT	IT	T	IT
Ease to establish seedlings	HIGH	MED	MED	MED	HIGH	MED	MED	LOW	LOW
Provides browse	YES	NO	NO	NO	NO	YES	NO	YES	?
Response to thinning	HIGH	HIGH	?	MED	MED	MED	?	?	?
Provides thermal cover	HIGH	HIGH	HIGH	HIGH	LOW	HIGH	MED	LOW	HIGH
Provides hiding cover	HIGH	HIGH	HIGH	HIGH	LOW	HIGH	MED	MED	LOW
Easily damaged by wildlife	MED	MED	MED	HIGH	MED	MED	HIGH	HIGH	MED

IT= Intolerant; INT=Intermediate; T=Tolerant; VT=Very Tolerant; ? = not known

Overall species diversity (# of different species occurring) is actually the highest in early successional stages where the shrubs and young trees intermingle, providing openings and rich, diverse habitats. This diversity however, goes down significantly in the closed canopy pole stages where the shrub layer is largely gone due to shading, and the overstory trees are not well developed enough to provide cones or dead trees for cavities and down logs. In many cases, these young stands have lost most of their dead wood habitat as well, due to the effects of past management involving site preparation and slash disposal. Species diversity becomes high again in the mature large sawtimber (old growth) forest after enough time has passed for openings to develop (often from windthrow), canopies spread out, trees become large and abundant snags and down logs occur.

As with other habitats, species that utilize westside Douglas-fir forests depend upon many factors, including landscape setting, successional stages and individual habitat components. The following paragraphs will generalize the successional stages that occur in westside Douglas-fir and give examples of species that are closely associated with those stages.

### Young Forests (grass forb, shrub, and sapling)

Young open forest stands in westside Douglas-fir forests generally occur following a disturbance such as wind, fire or a timber harvest that has removed most, or all, of the larger trees. This condition typically lasts about 15 years. This early stage of the regenerative process is characterized by tree seedlings or saplings, along with a variety of herbs and shrubs. Wildlife species that prefer this stand type tend to be those that like open canopies, bare ground, or dense shrub cover. Some of the more common species found in this successional stage include:

- Western bluebird
- Willow flycatcher
- Ruffed grouse
- Spotted towhee
- Orange-crowned warbler
- Black-tailed deer
- Roosevelt elk
- Mountain beaver
- Striped skunk
- Deer mouse

Important habitat characteristics in young westside Douglas-fir forests include legacy materials such as, tall stumps, and down wood, and large-diameter residual trees; lush herbaceous vegetation, shrub cover, and hardwood trees such as Red alder.

### Middle-aged Forests (pole, small sawtimber)

Middle-aged westside Douglas-fir forests occur after young stands have grown to a point where natural crowding or thinning results in the elimination of smaller and less dominant trees and little understory due to high canopy cover not allowing light through the canopy. Later, as more and more trees die, the forest canopy may open up enough to allow the reestablishment of ground vegetation and the beginning of an understory. Some of the more common species found in this successional stage include:

- Chestnut-backed chickadee
- Townsend's warbler
- Cooper's hawk
- Steller's jay
- Band-tailed pigeon
- Douglas squirrel
- Ensatina salamander



*Photo of a middle-aged forest. These stands tend to be uniform so any structural diversity will improve habitat for wildlife. Photo by Ken Bevis.*

Because this stage tends to be uniform, any structural diversity in the stand will improve habitat for wildlife. Important habitat characteristics in middle-aged Douglas fir forests include small openings in the forest stand, patches of hardwoods (including alder), and diverse understory vegetation, particularly fruit-bearing hardwood shrubs. Snags and down logs are important too, particularly if they are larger (>12" diameter), but small snags have a role too.

### **Mature Forests (large saw-timber, old-growth)**

Mature westside Douglas-fir forests have larger trees and a more varied and complex canopy with multiple vertical layers of vegetation, a diversity of tree species, and a highly developed understory. There are larger amounts of down wood and snags. Some of the common species found in this forest type include:

- Northern goshawk
- Pileated woodpecker
- Barred owl
- American marten
- Long-legged myotis (bat)
- Northern flying squirrel
- Clouded salamander

Important habitat characteristics in mature westside Douglas-fir forests include dense and layered canopy cover, large diameter trees, multiple tree species and vertical layers, gaps or openings in the forest canopy, a high incidence of large diameter snags and down wood, hardwood patches, and understories including hardwoods and fruit-bearing shrubs. Mature forests generally develop after 80-100 years and eventually can become old growth where the same general characteristics occur, but are much more developed.

### **Other Habitats**

#### **Red Alder**

Red alder can occur as a sub-component of Douglas-fir forests and are common along streams. Alder can also occur as a pure stand type in upland areas. In moist areas they will grow across the landscape and are an important tree species for wildlife habitat. Some of the common species that use alder forests include:

- Wood duck
- Sharp-shinned hawk
- Band-tailed pigeon



*Mature forests have large diameter trees, multiple tree species and provide habitat for many species of wildlife. Photo by Ken Bevis.*



*Riparian habitats are those found along streams. They are essential for many wildlife species. Photo by Ken Bevis.*

- Western screech owl
- Warbling vireo
- River otter
- Black-tailed deer
- American beaver
- Pacific giant salamander
- Common garter snake

Important habitat characteristics in patches of red alder within westside Douglas-fir forests include diverse understory vegetation such as salmonberry, elderberry and evergreen or trailing blackberry. Snags and down wood are also important for species that use this forest type.

#### **Riparian Areas**

Westside riparian habitats are those found along streams and are varied in composition. They may consist of Douglas-fir, alder, spruce, cedar and many other species. Riparian areas are essential for many wildlife species as they provide movement corridors and feeding and breeding areas. Some of the common wildlife species closely associated with riparian areas include:

- Great blue heron
- Cedar waxwing
- Mink
- American beaver
- Big brown bat
- Western toad
- Pacific tree frog

Important habitat characteristics in westside riparian areas include snags, down wood, and understory vegetation. Close proximity to water is important for many species, as the interface between the riparian corridor and the surrounding forests provides food, cover and space for wildlife to raise their young.

### Wetlands and Ponds

Wetland and pond habitats are special habitats often found within managed forests. They may be forested or may be open water features. These areas are essential for many species of wildlife and are used by many others. Some species found in wetlands and ponds include:

- Great blue heron
- Common yellowthroat
- Wood duck
- American beaver
- Pacific tree frog
- Red-legged frog
- Rough skinned newt
- Western pond turtle

### Management Practices

The best management practices for forest landowners wishing to improve wildlife habitat involve providing the specific structures and microhabitats required by wildlife, while also improving or maintaining tree production. The following sections suggest management practices that may benefit species associated with westside Douglas-fir forests across all successional stages.

**Timing:** In all successional stages, wildlife can benefit from timing harvest activities outside of peak activity or breeding times. In general, breeding times for migratory birds range from March 1 to August 31. Avoiding disturbance to known wildlife sites (such as raptor nests) through the use of nest site buffers during the breeding season can greatly reduce the impacts of harvest activities to these species. However it's important to remember that different wildlife species are active at different times. Timing for one species may not be the same for another. For example wintering elk may require a limitation on harvest activity in the deep winter months of January and February.

**Arrangement:** Different stages of succession in a patchwork across the landscape may best provide for the greatest number of wildlife species. Patches should be small, between ¼ and 5 acres in size to optimize the opportunities for a variety of species.

### Pathogens: Good or Bad?

It is important to note that in some areas Douglas-fir forests are affected by pathogens such as several varieties of root rot or Swiss Needle Cast (a disease that impacts the crown of the Douglas-fir). In these areas it is especially important to have a mix of tree species that are not affected by these agents. However, these pathogens often create snags or weak trees which are great for wildlife.

### Young Forests (grass forb, shrub, and sapling)

The earliest successional stages habitats in Westside Douglas fir forests can provide rich habitat for many familiar wildlife species. In fact, some wildlife are specific to early successional stages. For example, ruffed grouse will utilize shrub habitats year around, feeding almost exclusively on vegetation and use what's available at various times of the year. Migratory songbirds, such as spotted towhees will nest and forage in and around bushy shrubs.

**Shrubs:** To fulfill the habitat needs of many species throughout the year, a variety of shrub habitats should be maintained. Shrubs provide wildlife food, cover, and shelter. You can meet the shrub cover needs of wildlife by leaving existing brushy areas unplanted or by thinning the tree canopy to stimulate shrub growth. Replanted or allowed to regenerate naturally, these openings will create pockets of early successional stage habitat that will attract many species of wildlife. Some seedling species, as well as desired shrubs often require direct sunlight for adequate growth. Native shrubs can also be planted to create habitat. Plant-



Management strategies can be used within any age forest stand to help maintain or create habitat for many species including the pileated woodpecker shown here. Photo by Bruce Thompson.



*Retaining and creating snags is one of the best ways to improve wildlife habitat and can be done in all successional stages. Photo by Matt Hane.*

ing stock for native shrubs can be found at specialized nurseries. Landowners should study what beneficial shrub habitats occur naturally on their property, and in similar nearby conditions to decide species to plant.

**Grass/forb habitat:** If your property already contains some open land, you can maintain a healthy mixture of grasses and forbs by seeding, periodic burning, grazing, or mowing to keep this area in this vegetative stage. This habitat can be created by making openings in existing stands using small clearcut patches (1/4 to 5 acres) and seeding the disturbed area with a wildlife forage seed mix. (Note that some openings may not be compatible with reforestation laws). Forage mixes can be applied such as roadside edges and landings, creating linear meadows. Prescribed burning can be used to maintain grass stands but is strictly regulated and should be carried out only with caution under the direction of a qualified natural resource professional. Wildflowers are often abundant in this vegetative community, providing a colorful bonus and habitat for pollinators!

## Middle-aged Forests (pole, small sawtimber)

When the forest is well established with tree stocking, it grows into a condition of canopy competition as the trees begin to gain diameter and height. This also reduces the availability of food producing shrubs due to shading of the forest floor, and stands generally haven't had enough time to develop dead wood habitats (snags and down logs). These stands actually have the lowest habitat quality and wildlife species diversity in the successional sequence (Fig 1 and 2).

In active management, pole and sawtimber stands can be harvested using clearcut or thinning methods. Each of these methods provides light to the forest floor, allowing forbs and shrubs to regenerate. Retain broken-topped trees or snags, which will soon become wildlife havens. Dead and decaying trees will be used by insects, woodpeckers, songbirds, squirrels, and other small mammals. Patch thinning is highly recommended in older stands to provide more light to the forest floor and to create horizontal diversity in the stand. Leave cull logs (coarse woody debris) to provide down woody habitat and small openings. (Forest protection laws recognize the importance of this habitat and require leaving minimal numbers of leave trees or snags and down log during harvest). To maximize the benefits from snags and down log, a general rule of thumb is that bigger is better and more is better than fewer. Snags should be at least 12 inches in diameter, but larger diameters are best as they will provide more living space for a greater number of wildlife species. Logs should be at least 20 feet long and at least 12 to 15 inches in diameter. Cull logs may be left on-site to serve this purpose. If possible, down logs should be scattered throughout the harvest unit where it can be used for food, shelter, and cover by a variety of birds, mammals, and amphibians (especially salamanders). Leaving large diameter live trees and snags as well as

down logs goes a long way toward providing the habitat characteristics present in older forests that are used by many species of wildlife.

An early, or pre-commercial, thinning of trees in sapling-pole stands will maintain a healthy, vigorous condition. Given ample room to grow, Douglas-fir, western hemlock, and western redcedar will develop deep, thick crowns. Take care to leave standing dead and defective live trees as well as known den or nest trees. Unfortunately, wildlife diversity in these monetarily valuable timber stands is often low, unless these specific wildlife measures are introduced. Include a plan for leaving legacy trees, live tree patches, snags and down logs in thinning and harvest planning so that they are present in young forests and can be maintained through the forest succession stages. By maintaining elements of the older forest (i.e. snags, down logs and legacy trees), many species will occur in young stands that otherwise would not be there.

For more information on leave tree and down wood requirements review the forest practice rules for Oregon: <http://www.oregon.gov/ODE/Pages/index.aspx>

Washington: <http://www.dnr.wa.gov/programs-and-services/forest-practices>

## Mature Forests (large sawtimber, old-growth)

Older Douglas-fir forests support substantial populations of wildlife, including shrews, owls, flying squirrels, and marten. Specific habitat requirements for wildlife species found in these forests are often tied to the presence of older forest structures such as large trees, snags and down logs. If you have mature forest habitat on your ground consider the benefit it has towards wildlife and if it makes sense with your management goals – consider maintaining it as a wildlife area. Even

small patches of mature forest in a managed landscape can provide significant habitat diversity for many species and allow them to utilize mixed landscapes. Patches need to be large enough to resist windthrow and provide some habitat conditions derived from being in the interior of deep forest stands; these conditions generally emerge in stands from a minimum of 1-10 acres.

Uneven aged management is sometimes practiced in locations where landowners wish to maintain mature forests, yet periodically harvest a selected portion of the trees. Methods such as single tree selection or small group harvest logging are good ways to remove some of the value from the stand while still maintaining the overall mature forest conditions. These stands will provide long term habitat for mature forest dependent wildlife species if adequate large diameter trees of mixed species and snags, down logs, and defective trees are provided. Succession will generally move towards more shade tolerant species under this type of management.

### Red Alder

Red alder sometimes readily seeds in, establishing dense pure stands of this



Wildlife depend upon westside Douglas-fir forests. Providing vegetative diversity in all forest ages provides habitat for wildlife. Photo by Ken Bevis.



Red alder stands can have high commercial value and they also have high value for wildlife. Photo by Ken Bevis.

fast growing broadleaf tree. Wildlife habitat value can be high due to the dappled sunlight and lack of winter leaves that allow a rich shrub layer to occur. Mature alder trees provide seeds for small birds and older trees can be excellent cavity substrate.

Alder stands on good sites have high commercial timber value. Natural stands of red alder generally establish at variable densities, but can be very dense when young. Plantations of red alder are usually planted at high tree densities so that seedlings grow straight and minimize branching. In both plantations and young natural red alder stands, thinning may be used both for stand management purposes and to promote development of an understory of shrub species. Creation of gaps will help to improve wildlife habitat by allowing additional sunlight to the forest floor. When managing red alder, retain existing snags, down logs, and legacy trees as these add habitat diversity to the stand. Leaving a few patches of alders to grow and develop dead tops and decayed stems is a good strategy for habitat diversity in these stands.

### Riparian Areas, Wetlands and Ponds

Riparian areas, wetlands and ponds often have a high species diversity and are critical for wildlife. Maintaining healthy riparian areas, wetlands and ponds in westside Douglas-fir forests is important for many species. Common management strategies include maintaining a buffer from harvest activities, leaving large diameter green trees, snags and down logs, planting native fruit-bearing shrubs and trees, and planting a diverse mix of hardwoods and conifer trees. Note that buffers for riparian areas, wetland and ponds are required by Washington and/or Oregon State Law in many cases. For more rule information see **Oregon**: <http://www.oregon.gov/ODF/Pages/index.aspx>

**Washington**: <http://www.dnr.wa.gov/programs-and-services/forest-practices>

### Summary

Wildlife species depend upon westside Douglas-fir forests in different ways at every successional stage. Providing vegetative diversity and structure within

all stages in westside Douglas-fir forests will go a long way towards providing essential habitat for these wildlife species. Management actions that will help wildlife species in westside Douglas-fir forests at all successional stages are summarized below.

- Use forest management tools to create, develop, or enhance habitats for wildlife. Examples are thinning, patch cuts, leaving clumps or stands untouched, and specifically creating habitat types such as snags, down logs, or shrub patches.
- Retain dead or defective standing trees for perching, nesting, and insect-feeding wildlife.
- Retain some hardwoods, such as big leaf maple, cottonwood and red alder.
- Retain woody debris and logging slash for wildlife cover on at least 10 % of harvested area.
- Leave cull logs un-yarded.
- Maintain some slash piles for wildlife habitat.
- Create snags 8-25 feet tall using feller-buncher harvesters.
- Minimize activity during breeding season (especially April-July) for wildlife species you are trying to encourage on your land.
- Keep roads out of riparian areas.
- Include legumes in seeding mixes. Consider using native (weed free) seed mixes along forest edges, roads, cut slopes, landings and in new plantations.
- Maintain vegetative cover along roads, in riparian areas, and especially in areas generally deficient in cover.
- Leave patches of unlogged forest dispersed in clearcut units. Make patches at least ¼ acre.
- Provide a diverse arrangement of various stand types across the land at all times. Avoid large scale monoculture.
- Use herbicides strategically for stand establishment and allow selected shrub species to occur in young plantations.



*Diversity in all forest ages provides habitat for a variety of birds such as owls and thrushes. Photos by William Meyer (owl) and Greg Thompson (thrush).*

## Literature Citations

- Johnson, David and T. O'Neil. 2001. *Wildlife-Habitat Relationships in Oregon and Washington*. Oregon State University Press. Corvallis, Oregon. 736 pages.
- Brown, E.R., ed. 1985. *Management of Wildlife and Fish Habitats in Forests of Western Oregon and Washington*. USDA-FS, PNW Region, R6 F&WL-192-1985. Portland, OR.

## Additional Resources

- Washington Department of Natural Resources.** <http://www.dnr.wa.gov/>
- Oregon Department of Forestry:** <http://www.oregon.gov/ODF/Pages/index.aspx>
- WSU Extension – Forest and Wildlife Extension:** <http://forestry.wsu.edu/>
- OSU Forestry Extension Program:** <http://extensionweb.forestry.oregonstate.edu/>
- USDA Natural Resources Conservation Service.** <http://www.nrcs.usda.gov/wps/portal/nrcs/site/national/home/>
- Oregon Department of Fish and Wildlife:** <http://www.dfw.state.or.us/>
- Washington State Department of Fish and Wildlife:** <http://wdfw.wa.gov/>
- USDA Forest Service – Cooperative Programs:** <http://www.fs.fed.us/cooperativeforestry/>
- Oregon Forest Resources Institute:** [www.oregonforests.org](http://www.oregonforests.org)
- Woodland Fish and Wildlife Publications:** <http://WoodlandFishAndWildlife.com/>
- Know your Forest:** <http://www.knowyourforest.org/>

## Appendix A

Examples of Wildlife Species Associated with Coastal Douglas-Fir Forests by successional/ stand type\*.

Species	Young Forest			Middle-aged Forest		Mature Forest	Other stand types	
	Grass-forb	Shrub	Sapling	Pole	Sawtimber	Old Growth	Red Alder	Riparian Habitat
<b>Amphibians</b>								
Pacific giant salamander <sup>1</sup>	F	F	F	F	F	F	F	<b>X</b>
clouded salamander <sup>2</sup>				X	<b>X</b>	<b>X</b>		
ensatina <sup>2</sup>	X	X	X	X	X	X	X	
Pacific chorus frog <sup>1</sup>	X	X	X	X	X	X	X	X
<b>Reptiles</b>								
northern alligator lizard	<b>X</b>	<b>X</b>	X	X	X	X	X	
western fence lizard	<b>X</b>	<b>X</b>	X				X	
common garter snake	X	X	X	X	X	X	X	<b>X</b>
rubber boa	X	X	X	X	X	X	X	<b>X</b>
<b>Birds</b>								
Cooper's hawk				<b>X</b>	<b>X</b>	<b>X</b>	X	X
ruffed grouse				X	X	X	X	<b>X</b>
sooty/ blue grouse				X	X	X		
band-tailed pigeon <sup>3</sup>	F	F	F	X	X	X	X	F
Western screech owl <sup>2</sup>			X	X	X	X	<b>X</b>	<b>X</b>
northern saw-whet owl <sup>2</sup>				X	X	X	X	X
northern pygmy owl <sup>2</sup>				X	X	<b>X</b>	X	X
Barred owl				X	X	<b>X</b>	X	X
rufous hummingbird <sup>3</sup>	<b>X</b>	<b>X</b>	<b>X</b>	X	X	X	X	X
hairy woodpecker <sup>2</sup>			F	X	X	X	X	X
pileated woodpecker <sup>2</sup>			F	F	<b>X</b>	<b>X</b>	F	X
northern flicker <sup>2</sup>	X	X	X	X	X	X	X	X
Pacific slope flycatcher				<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>
Willow flycatcher <sup>3</sup>		<b>X</b>	<b>X</b>					X
Steller's jay		F	F	X	<b>X</b>	<b>X</b>	F	X
chestnut-backed chickadee <sup>2</sup>		X	X	X	<b>X</b>	<b>X</b>	X	X
red-breasted nuthatch <sup>2</sup>			F	X	<b>X</b>	<b>X</b>		
brown creeper <sup>2</sup>				X	<b>X</b>	<b>X</b>		X
Pacific/ winter wren			X	X	X	X	X	X
American robin	F	F	X	X	X	X	X	X
Wilson's warbler <sup>3</sup>		X	X	X	X	X	X	X
MacGillvray's warbler <sup>3</sup>	<b>X</b>	<b>X</b>	X					
hermit warbler				X	X	X		
dark-eyed junco	<b>X</b>	<b>X</b>	<b>X</b>	X	X	X	X	X
white crowned sparrow	<b>X</b>	<b>X</b>	<b>X</b>				X	
American goldfinch	F	X	X				X	<b>X</b>

## Appendix A (continued)

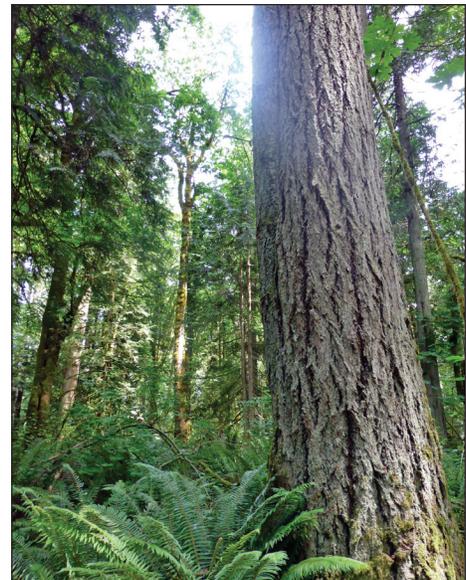
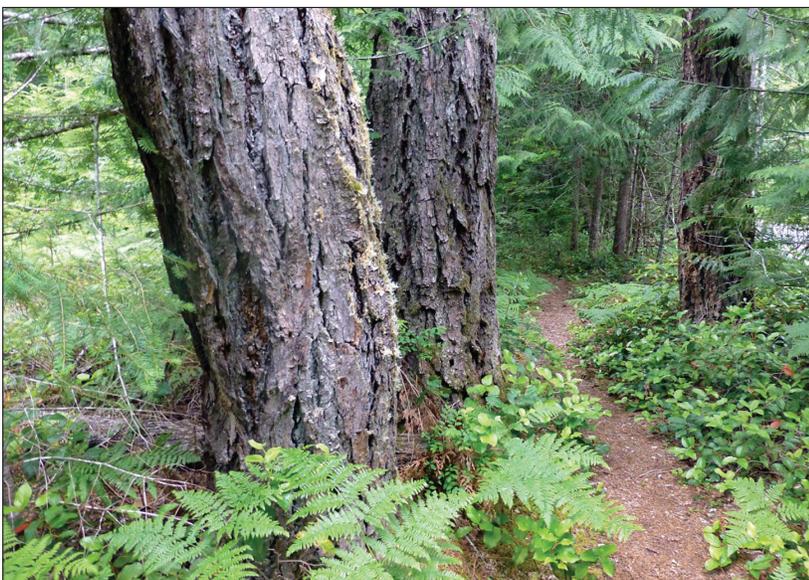
Species	Young Forest			Middle-aged Forest		Mature Forest	Other stand types		
	Grass-forb	Shrub	Sapling	Pole	Sawtimber	Old Growth	Red Alder	Riparian Habitat	
<b>Mammals</b>									
shrews & moles <sup>3</sup>	X	X	X	X	X	X	X	X	
big brown bat <sup>3</sup>	F	F	F		<b>X</b>	<b>X</b>	F	<b>X</b>	
silver-haired bat <sup>3</sup>	F	F	F		X	X	X	X	
black bear	F	F	X	X	X	<b>X</b>	X	X	
striped skunk	<b>X</b>	<b>X</b>	X	X	X	X	X	X	
elk	<b>F</b>	<b>F</b>	X	X	X	X	X	X	
black tailed deer	<b>X</b>	<b>X</b>	<b>X</b>	X	X	X	X	X	
mountain beaver	X	<b>X</b>	X	X	X	X	X	<b>X</b>	
northern flying squirrel <sup>3</sup>				X	<b>X</b>	<b>X</b>		X	
Douglas' squirrel			X	X	X	X		X	
bush-tailed woodrat				X	X	X	?	X	
deer mouse	<b>X</b>	<b>X</b>	X	X	X	X	X	X	
porcupine	F	F	X	X	X	X	X	X	

\*F = feed only in this habitat type; X = both feed and reproduce in this habitat type; Bold color font indicates the species is closely associated with this successional stage or habitat type. Adapted from Johnson and O'Neil (2001)

<sup>1</sup> Species requires streams or ponds.

<sup>2</sup> Species requires snags or down logs.

<sup>3</sup> Species requires or is closely associated with shrubs or hardwood trees within this successional stage.



*Mature Douglas-fir forests. Photos by Ken Bevis.*

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### About the Woodland Fish and Wildlife Group

The Woodland Fish and Wildlife Group is a consortium of public agencies, universities, and private organizations which collaborates to produce educational publications about fish and wildlife species, and habitat management, for use by family forest owners in the Pacific Northwest.

Currently available publications can be viewed and downloaded, free of charge, at the organization's website:

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### Comments or other communications may be directed to:

Woodland Fish and Wildlife Group  
 c/o Executive Director  
**Western Forestry and Conservation Association**  
 4033 SW Canyon Road  
 Portland, OR 97221  
 (503) 226- 4562  
[richard@westernforestry.org](mailto:richard@westernforestry.org)

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## Project Partners

