Woodland Fish & Wildlife

Oregon White Oak and Wildlife

Tools for Family Forestland Owners

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Oregon white oak tree. Photo by David Hagen.

The Oregon white oak typically grows 50-90 feet tall with a diameter of 24-40 inches. Oak leaves have 7-9 rounded lobes. Oak species maintain a deep taproot and well-developed laterals for a comprehensive root system.

Oak woodland. Photo by David Hagen.

Introduction

The graceful, spreading Oregon white oak presides over many rich landscapes of the Pacific Northwest, including the Willamette Valley in Oregon, and the Klickitat River in Washington. Here in Oregon and Washington this special oak anchors many rich native habitats.

Oregon white oak (*Quercus garryana*) were once widespread throughout portions of Oregon and Washington. This species provides habitat for over 200 wildlife species, including insects, birds, small mammals, reptiles and amphibians. Even a single oak is important habitat for many species, especially when they are dispersed through various habitats (including agricultural fields and forestland edges). Oak trees have the unique ability to provide wildlife habitat islands in areas where habitat is scarce (Vesely 2006). Due to their ability to survive drought and fire, and their long-lived nature, a mature oak tree can live up to 500 years while supporting a multitude of species. Oak habitat has been classified as a Priority Habitat with the Oregon Conservation Strategy and the Washington Department of Fish and Wildlife, due to its importance to so many wildlife species and the fact that oak habitat faces ongoing significant decline.

Oregon white oaks grow in two main habitat types: oak woodlands and oak savannas (grasslands). Both habitat types were once widespread throughout Oregon and Washington. Prior to European settlement, oak woodlands and savannas covered over a million acres in the Coast Range of Oregon and over 400,000 acres in the Willamette Valley (ODFW 2016). Oak savanna also covered nearly 500,000 acres in southwest Oregon. In Washington, oak woodlands covered tens of thousands of acres in the southern Puget Sound trough. More than 50,000 acres of oak woodland occurred in the Columbia River Gorge. Oak woodlands in western Oregon and Washington were likely maintained by Native American burning but have largely been lost. Development, clearing for agriculture, natural succession to Douglas-fir dominated

Acorn Woodpecker. Photo by Oregon Department of Fish and Wildlife.

forests, and fire exclusion have led to these dramatic losses of oak habitats across its range. In some areas, up to 95% of these important habitat types are gone (ODFW 2016). Currently, as much as 98% of the remaining oak habitat is maintained by private landowners, making their involvement in oak management vital to the survival of the species and this habitat.

The range of the Oregon white oak extends from southern Canada to northern California. While found primarily west of the Cascade Range in Oregon and Washington, scattered populations can be found east of the Cascades (Gucker 2007). Notable populations east of the Cascades include those found in the Klamath River Canyon of southern Oregon and along the Columbia Gorge in northern Oregon and southern Washington (ODFW 2016; Larsen 1998).

Oregon white oak are generally found in the lower elevations (0-3,800 feet) of Oregon and Washington, most typically along the foothills of the Coast and Cascade ranges and within the Willamette Valley of Oregon and the Puget trough of Washington (Vesely 2006; ODFW 2016; Larsen 1998). This species is well suited to droughty sites, such as the exposed edges of forestlands, rocky soils and riparian areas that dry in summer. Oregon white oak has adapted to hot, dry conditions and is highly drought tolerant (Vesely 2006).

Oregon white oak is one of four deciduous oak species native to the west coast, making it a staple in both states' history and a good species for wood production in a niche market. The sale of oak is a common practice to mitigate the cost of managing forestland. Currently, oak is popular for use in flooring, furniture and the market of winemaking; oak barrels are a premiere product of Oregon and Washington (OSU 2018). It is also highly desired as fuel wood.

As climate patterns shift, Oregon and Washington are expected to experience hotter, drier summers and wetter winters – both of which the Oregon white oak can survive (ODFW 2016). As other habitat types may be susceptible to declines due to climate change, Oregon white oak habitat may be able to thrive, making it a potential major component in mitigation of overall habitat loss. Investment in oak habitat restoration could provide both secure wildlife habitat for the future as well as future wood production opportunities. A majority of remaining oak habitats exists on private lands, therefore, active management by small land owners is especially important to preserve, protect and restore these valuable oak habitats.

Oregon White Oak Ecology and Importance for Wildlife

Oak woodlands are characterized by a relatively open canopy (30-70% canopy cover) dominated by Oregon white oak, and often interspersed with conifers such as ponderosa pine and Douglas-fir. Oak trees need lots of sunlight. Oak woodlands are maintained by periodic disturbance (especially low-intensity fire), which removes small oaks and conifers but maintains a moderate understory of shrubs (ODFW 2016). If allowed to grow, conifer can eventually shade out and exclude Oregon white oak; this natural and human-induced succession has occurred through much of the former range of the habitat.

Oak savannas are upland prairies and grasslands that contain highly scattered and widely spaced white oak, generally at a rate of only 1-2 trees per acre. Oregon white oak trees found within savannas are large, umbrella-shaped trees with well-developed limbs and canopies (ODFW 2016, ODFW 2016a). Similar to oak woodlands, oak savannas require periodic disturbance to prevent natural succession. Oak savannas are typically managed more like grasslands. This publication will focus primarily on oak woodlands.

White-breasted nuthatch. Photo by Oregon Department of Fish and Wildlife.

Den in Oregon white oak. Photo by Ken Bevis.

Wildlife Importance

Whether found growing as a single tree in savanna, another habitat type, or within oak woodlands, oaks are extremely valuable to wildlife and can be crucial habitat elements. Wildlife species utilize all parts of an oak tree and the habitat surrounding it, including the canopy, mast (acorns), cavities and deadwood, as well as the understory and leaf litter. For specific benefits of Oak trees to wildlife, see Table 1.

Leaf litter can also provide an important microhabitat to a variety of species by increasing moisture and temperatures on a localized scale; these microhabitats are vital to a variety of amphibian and insect species such as long-toed salamanders and Monarch butterflies.

Oaks have the ability to seal off healthy wood from decaying wood, resulting in the presence of cavities within living trees. Cavity-nesting bird species such as the northern pygmy owl and denning small mammals, such as Western gray squirrels, benefit from this process. Oregon white oaks are long-lived, and mature trees will often become draped with mosses and lichens that create microhabitats and specialized niches for a variety of species that are not found on most conifers (Vesely 2006). Additionally, oaks inhabiting riparian areas provide nutrient and large woody debris inputs to streams, and will stabilize banks, reducing erosion. Fish and aquatic invertebrates benefit through increased water quality and clarity, improved complex habitat structure and the resulting biodiversity. The wildlife benefits of each component of an oak tree are outlined in Table 1.

Over 200 wildlife species across a wide range of taxa utilize Oregon white oak in some way (Vesely and Tucker 2006). Table 2 outlines some of these species and the ways in which Oregon white oak benefit them.

Associated Vegetation and Understory Species

Oregon white oak are often found on the edges, or ecotones, of other habitat types (e.g., in the transition between denser forests and more open spaces, or in or along riparian areas). There are a variety of plant species associated with these habitats (OSU 2018). West of the Cascades, Oregon white oak may be associated with Douglas-fir, mixed conifer-deciduous, Pacific madrone, and purely deciduous forests comprised of Pacific dogwood, bigleaf maple and Oregon ash. East of the Cascades, it may be found with Ponderosa pines or deciduous forests comprised of Pacific madrone, black cottonwood and quaking aspen. Oregon white oak is also found in more open habitats, including savannas, grasslands and chaparral, and shrub-steppe (OSU 2018; Larsen 1998).

Camas understory in oak woodland. Photo by Michael Ahr.

Table 1. Wildlife Benefits of the Specific Parts of an Oak Tree

Main Structural Layer	Wildlife Benefits
Canopy	Large, open crowns and thick, strong branches create great sites for birds to build nests, perch, and hunt. Canopies provide shade during hot summer months. When located in riparian areas, shade can reduce stream temperatures, benefitting aquatic species. Branches provide habitat for a variety of mosses and lichens, which in turn provide microhabitats for many species.
Acorns (mast)	Acorns provide a vital source of high-calorie food for many species. Acorns can be stored for year-round use. During years with plentiful acorn crops, survivability for many species increases.
Cavities and Deadwood	Cavities and deadwood provide places for bird nesting, denning and food storage. Deadwood and bark provide habitat for invertebrates, which larger animals such as woodpeckers utilize as prey. Bark provides nesting areas for small birds, roosting areas for bats and substrate for mosses and lichens. Fungi provide foods sources for small mammals.
Understory and Leaf Litter	Understory vegetation provides cover for both large and small species. Dense leaf litter creates microhabitat conditions that support a variety of arthropods, small mammals, reptiles and amphibians. Understory vegetation and leaf litter provide nutrient inputs to surrounding streams and soils, increasing overall biotic health and therefore biodiversity.

Table 2. Wildlife and Invertebrate Species that Benefit from Oregon White Oak

Species	Benefits
Birds	
Acorn woodpecker (*Melanerpes formicivorus*) American kestrel (*Falco sparverius*) Band-tailed pigeon (*Patagioenas fasciata*) Chipping sparrow (*Spizella passerina*) Lazuli bunting (*Passerina amoena*) Lewis' woodpecker (*Melanerpes lewis*) Nashville warbler (*Oreothlypis ruficapilla*) Northern pygmy owl (*Glaucidium gnoma*) Orange-crowned warbler (*Oreothlypis celata*) Purple finch (*Haemorhous purpureus*) Red-tailed hawk (*Buteo jamaicensis*) Rufous hummingbird (*Selasphorus rufus*) Savanna sparrow (*Passerculus sandwichensis*) Western bluebird (*Sialia mexicana*) Western meadow lark (*Sturnella neglecta*) Western wood-pewee (*Contopus sordidulus*) White–breasted nuthatch (*Sitta carolinensis*) Wood duck (*Aix sponsa*)	Oaks provide locations for nesting and perching, including cavities for cavity-nesting species such as woodpeckers and wood ducks. Acorns, as well as insects found in bark, provide food sources, and limbs provide vantage points from which hawks and other birds of prey can hunt.
Mammals	
Black bear (*Ursus americanus*) Botta's pocket gopher (*Thomomys bottae*) Chipmunk (*Tamias* sp.) Deer (*Odocoileus* sp.) Douglas squirrel (*Tamiasciurus douglasii*) Ground squirrel (*Spermophilus* sp.) Long eared bat (*Myotis evotis*) Raccoon (*Procyon lotor*) Sierra Nevada red fox (*Vulpes necator*) Vagrant shrew (*Sorex vagrans*) Western brush rabbit (*Sylvilagus bachmani*) Western gray squirrel (*Sciurus griseus*)	Oaks provide shade in hot summers and cover from predators. Cavities provide denning and food storage opportunities. Leaf litter and downed wood provide cover and shelter. Acorns provide high-calorie food.
Reptiles	
California mountain kingsnake (*Lamprropeltis zonata*) Gopher snake (*Pituophis catenifer*) Northwestern garter snake (*Thamnophis ordinoides*) Ring necked snake (*Diadophis punctatus*) Rubber boa (*Charina bottae*) Sharptail snake (*Contia tenuis*) Southern alligator lizard (*Elgaria multicarinata*) Western fence lizard (*Sceloporus occidentalis*) Western painted turtle (*Chrysemys picta*) Western pond turtle (*Actinemys marmorata*) Western skink (*Plestiodon skiltonianus*)	Leaf litter, bark, and downed wood provide microhabitats with increased moisture and temperatures and provide cover from predators and habitat for small mammals and insects upon which they may prey.
Amphibians	
Long-toed salamander (*Ambystoma macrodactylum*) Pacific chorus frog (*Pseudacris regilla*) Red-legged frog (*Rana aurora*) Siskiyou mountains salamander (*Plethodon stormi*)	Leaf litter and downed wood provide microhabitats with increased moisture and temperatures and provide cover from predators and habitat for small mammals and insects upon which they may prey.
Invertebrates	
Fender's blue butterfly (*Icaricia icarioides fenderi*) Taylor's checkerspot (*Euphydryas editha taylori*) Mardon skipper (*Polites mardon*) Island marble (*Euchloe ausonides insulanus*) Oregon silverspot (*Speyeria zerene hippolyta*)	Oak habitats are often associated with the host plants (e.g., Kincaid's lupine) that butterfly species rely on for reproduction.

Oak mistletoe (*Phoradendron villosum*) is often found in Oregon white oak trees, and although mistletoe is hemiparasitic, borrowing water and nutrients from the oak trees, they often do little harm to the trees and provide excellent habitat and food for birds and mammals (USGS site, 2018). Vegetation common to the understory of oak habitats include hazel, hawthorn, blue elderberry, common snowberry, serviceberry, wild rose, oceanspray, red-flowering currant, tall Oregon grape, bitterbrush, big sagebrush, and Indian plum. There is great variety in the herbaceous cover often found in oak habitats. Examples include: camas, Kincaid's lupine, wild iris, western columbine, Oregon geranium, western swordfern, western bracken fern, wild strawberry and bedstraw, as well as many grasses (OSU 2018; Larsen 1998). Understory species provide particular value to wildlife by providing cover, nesting and foraging opportunities, and important food and nectar resources. For example, native hazelnut provides valuable food for small mammals and birds while also providing cover from predators. Flowering understory species, such as common snowberry, serviceberry, wild rose and others support beneficial pollinators. Understory species also provide browse and cover for larger animals, such as black bear, elk and deer. Table 3 outlines plant species commonly associated with Oregon white oak.

Threats to Oak Habitats

Threats to Oregon white oak habitats in the Pacific Northwest are numerous and ongoing. The following sections outline the identified threats to oak habitats. Table 4 (see page 6) outlines and summarizes these threats.

Fire suppression

Decades of fire suppression and the general lack of prescribed burns have dramatically shifted the fire regimes in Oregon and Washington. Historically there were more frequent, lower intensity fires than we see today. This has shifted the historic natural disturbance processes that maintain oak habitats,

Table 3. Vegetation Associated with Oregon White Oak Habitats

Common Name	Scientific Name
Trees	
Bigleaf maple	*Acer macrophyllum*
Black cottonwood	*Populus balsmifera ssp. trichocarpa*
California black oak (southern Oregon only)	*Quercus kelloggii*
Douglas-fir	*Pseudotsuga menziesii*
Grand fir	*Abies grandis*
Oregon ash	*Fraxinus latifolia*
Pacific dogwood	*Corunus nuttallii*
Pacific madrone	*Arbutus menziesii*
Ponderosa pine	*Pinus ponderosa*
Quaking aspen	*Populus tremuloides*
Shrubs	
Beaked hazelnut	*Corylus cornuta var. cornuta*
Big sagebrush	*Artemisia tridentata*
Bitterbrush	*Purshia tridentata*
Blackberry	*Rubus spp.*
Black hawthorn	*Crataegus douglasii*
Blue elderberry	*Sambucus cerulea*
California hazelnut	*Corylus cornuta var. californica*
Common snowberry	*Symphoricarpos albus*
Indian-plum	*Oemleria cerasiformis*
Oceanspray	*Holodiscus discolor*
Mock orange	*Philadelphus lewisii*
Poison oak	*Toxicodendron diversilobum*
Red-flowering currant	*Ribes sanguineum*
Serviceberry	*Amelanchier alnifolia*
Tall Oregon-grape	*Mahonia aquifolium*
Wild rose	*Rosa spp.*

has led to the loss of overall oak habitat and creates a significant threat to the remaining oak habitat. Without periodic burns or other disturbance, oak habitat becomes overgrown with conifer, leading to conifer overtopping. Faster-growing conifers shade-out slower-growing oak and compete with oak for resources. This leads to succession of oak habitat to closed-canopy, conifer forests in which oak cannot survive. Additionally, fire suppression has led to excessive organic material on the forest floor (aka "fuel") thus increasing the risk of catastrophic wildfire, which even fire-resistant oak cannot survive.

Land Conversion

Loss of habitat is also attributed to land use changes as oak habitats are converted into vineyards, cropland, or subdivisions. Conversion to urban and suburban, or agricultural land uses have led to total losses of oak habitats in some areas. While some agricultural land uses can be compatible with oak habitat, (e.g. pastures with scattered oaks) many agricultural uses destroy oak habitat by replacing native flora with crop plantings. Vital ground cover species are also removed. Agricultural, urban and residential development continues throughout the range

What about Sudden Oak Death?

Oregon white oak is not susceptible to sudden oak death. Oak trees susceptible in Oregon include California black oak and canyon live oak. Sudden oak death is caused by a water mold pathogen (*Phytophthora ramorum*). This pathogen can also cause Ramorum leaf blight, Ramorum dieback and Phytophthora canker diseases. Sudden oak death causes cankers on the trunk of oak trees, which can lead directly to the death of the tree. Often, trees weakened by cankers are subsequently attacked by bark beetles, which quickly causes mortality. Sudden oak death was first observed in California near San Francisco in 1993 (APHIS 2018). In 2001, it spread to a forest in Curry County, Oregon, and in 2003 it was found in an Oregon nursery infecting nursery stock. It has not yet been observed in Washington outside of nurseries (ODA 2018). Sudden oak death can be spread through nursery stock, wind-blown rain, water from contaminated irrigation sources, other infected plants and contaminated soil or potting mixes. Ramorum leaf blight affects the leaves of many woody species, including Douglas-fir, and although it is rarely fatal to the species, it can facilitate the spread of the diseases associated with *Phytophthora ramorum* (APHIS 2018).

For more information on Sudden Oak Death, visit the USDA Animal and Plant Health Inspection Service (APHIS) ***website:*** https://www.aphis.usda.gov/aphis/resources/pests-diseases/hungry-pests/the-threat/sudden-oak-death/hp-sudden-oak-death

of the Oregon white oak but has caused particularly significant reductions of oak habitat in the Willamette Valley, Puget trough, Coast Range foothills and (more recently) the valleys of southern Oregon.

Conifer Conversion

The conversion of oak habitats to conifer occurs both from deliberate land use changes and as (often unintended) side effects of other activities. Conifer conversion occurs as land managers re-plant areas formerly covered with oak with conifers or ponderosa pine.

Invasive Plant Species

Invasive plant species can pose a risk to oak habitats by out-competing oak and associated understory species for resources. Often, invasive plants are non-native and spread quickly and easily as there are no natural environmental checks to slow their spread. As such, invasive plant species can quickly overrun an area, thus threatening plant diversity and decreasing habitat quality for wildlife species. As Oregon white oak are a slow-growing species, they are especially susceptible to competition by fast-growing and fast-spreading invasive plant species. Invasive plant species often found in oak habitats include Himalayan blackberry, Scotch broom, English hawthorn, bird cherry, English ivy, shiny geranium, false brome, yellow-star thistle and diffuse knapweed (ODFW 2016).

Oak Management Tools

Active oak management techniques include: preventing conifer encroachment and over-shading using induced disturbances, such as thinning (or release), prescribed fire, and mowing or grazing. Habitat health and diversity is encouraged by controlling invasive species, encouraging native understory growth, creating snags, and the planting and/or seeding of oak. The following sections outline these best management practices and tools for maintaining, enhancing and creating quality oak habitat.

Table 4. Summary of Threats to Oregon White Oak Habitat

Threat	Impact
Fire Suppression	Oak rely on frequent, low-intensity fire to remove conifer from their habitats. Without fire or other disturbance to remove conifer, oaks become overtopped and shaded out, and the area will undergo succession to a more closed-canopy conifer-dominated forest.
Land Conversion	Conversion of oak habitats to agriculture or urban and suburban development have contributed to the overall loss of oak habitat.
Conifer Conversion	Areas previously inhabited by oaks have been converted to conifer via a variety of land use and management decisions, including fire suppression, human development, and re-planting oak areas with conifer species. This has contributed to the overall loss of oak habitat in Oregon and Washington.
Invasive Plant Species	Without active management, oak habitats are susceptible to faster growing invasive species that compete for resources and force oak saplings out of their native territories.

Encroachment Prevention

Oak habitats are susceptible to encroachment from conifers and other shade-producing species such as bigleaf maple. Restoring and maintaining oak habitats usually requires periodic disturbance to maintain open spaces for the slow-growing, shade intolerant species. Disturbances that landowners can introduce in a controlled manner include thinning/selective harvest, fire, grazing and mowing.

Thinning/Selective Harvest

The removal of certain overstory trees can help prevent over-shading of existing oaks or future planting and recruitment areas. Conifer and bigleaf maple should be targeted for removal first. The selective removal of some oak trees

Mixed pine and oak woodland. Photo by David Hagen.

in dense oak stands may encourage growth by younger oak trees and may increase stand age diversity. In primarily oak-dominated stands, thinning should occur between December and March to encourage stump sprouting of oak trees. Maintain very old and larger (greater than 20-inch diameter at breast height [DBH]) oak trees, as these individuals provide greater resources for wildlife in the form of cavities, large limbs and more-developed canopies. Existing snags should be maintained, and fallen dead trees, limbs, and leaf litter should be left as it falls to maintain soil moisture and create additional wildlife habitat (Larsen 1998, Vesley 2006, ODFW 2016). Plant understory vegetation following thinning or selective harvest operations, including native grasses, wildflowers and shrubs to encourage healthy habitat conditions and control the spread of invasive species.

Prescribed Fire

Oregon white oak is especially adapted to fire, so the introduction of prescribed fire can greatly benefit existing oak habitats. Prescribed fires should be used with caution and only under the supervision of trained professionals, since they can grow out of control, especially in areas with significant fuel overstocking. Prescribed fires in oak habitats should be low-intensity in nature and occur on a regular basis (generally on 3-5 year intervals, depending on the level of conifer encroachment). In wetter areas, prescribed fires should occur in the fall, whereas drier climates east of the Cascades should perform burns in the late winter or early spring. Seeding with native grasses, herbaceous plants and shrubs following prescribed burns can control the spread of invasive plant species following fire and will enhance overall habitat quality (Larsen 1998, ODFW 2016, Vesely 2006).

Certain tribes of Native Americans historically maintained oak habitats with annual burns. For example, the Kalapuya tribe developed a strong dependence on acorns as they were cut off from access to salmon fishing by larger tribes. This dependence on the Oregon white oak and other regional grasses and shrubs led to the practices of annual burning (Vesley 2006). With European settlement, prescribed burning practices were lost and fire suppression practices were generally employed instead. Decades of fire suppression have contributed to the losses of historic oak habitat across Oregon and Washington, as discussed above.

Grazing and Mowing

Grazing and mowing, when completed in a low-impact manner, can provide the disturbance necessary to maintain healthy oak habitats, especially oak savannas. Grazing or mowing may be an effective alternative to prescribed burning for oak stands in or near homes or residential areas where use of fire is prohibited or too risky. To be effective, grazing should be limited to a small window from early spring to early summer and should end before 25% of the herbaceous vegetation is consumed (Larsen 1998, ODFW 2016). This will prevent over-grazing and destruction of valuable understory species and soil conditions.

Photo by David Hagen.

Oak Sources

Organization	Contact
PlantNative.com	http://www.plantnative.com
Native Seed Network	http://nativeseednetwork.org/find-seed/

Oak woodlands. Photo by Ken Bevis.

Lone Oregon white oak tree. Photo by Michelle Delepine.

Mowing should be completed in late summer after wildflowers have gone to seed and birds have completed nesting activities.

Encouraging Oak Habitat Health

Existing oak habitats may be encouraged in a variety of ways, including controlling the spread of invasive plant species and enhancing or creating habitat features, including snags and understory vegetation. These practices are described in further detail in the following paragraphs.

Controlling Invasive Species

Invasive plant species threaten oak habitats by competing with seedlings, saplings and understory vegetation for light, water and nutrient resources. Control measures may include manual or mechanical (including mowing) removal, as well as the application of appropriate herbicides. Following the removal of invasive species, seeding and planting with native grasses, herbaceous plants and/or shrubs should be completed in order to discourage reoccurrence.

Snag Creation

Snags are extremely valuable to wildlife species, and can provide nesting opportunities, food resources, cover and perching opportunities to a wide variety of species, ranging from invertebrates to mammals. Within oak habitats, snags provide valuable wildlife habitat without over-shading or encroaching open individual oak trees. Snag creation can therefore be a useful tool in opening up oak habitats to encourage oak growth while also providing benefits to wildlife. Snags can be created in a variety of ways, including topping, girdling or removing approximately 75% of the side limbs. Existing snags should be left on the landscape (ODFW 2016, Larsen 1998). If removing conifers that have overtopped oaks, consider creating snags out of the conifers.

Enhancing/Restoring Understory Species

A diverse understory is an important component to a healthy oak habitat, whether it is in the form of native grass and herbaceous species found more often in oak savannas or shrub and understory tree species inhabiting oak woodlands. Understory species can be enhanced or restored by several methods, including direct planting or seeding of native grasses, herbs and shrubs (especially following a disturbance activity) or by protection of existing vegetation. For example, shrub islands and pockets should be maintained during thinning or selective harvest practices. Although understory species may compete with young oaks, exclusion of all understory vegetation is not necessary. A small buffer or circle surrounding your oak seedlings or saplings will prevent competition and shading. Patches of dense shrubs are healthy for oak habitats but should not be present directly underneath oak trees so as not to prevent natural recruitment of seedlings/sprouts (ODFW 2016, Larsen 1998, Vesely 2006). Aim for less than 30% shrub cover in oak woodland habitats (Altman and Stephens 2012).

Planting Oak

Perhaps the most straight-forward way to enhance or create oak habitat is to plant Oregon white oak. There are several things to consider when planting oak, including timing, placement, type (seeding acorns vs. planting seedlings), and the protection and management of seedlings after they are established. It's important to note that an alternate plan through the forest practice rules may apply if planting oak in a stand that was previously Douglas-fir. The following sections provide more detailed information on planting oak.

Deciding to Seed or Plant

Oaks can be grown from seed (acorns) or planted as seedlings purchased from nurseries or other sources. Planting acorns is the most cost-effective, and (arguably) simplest way to grow oak trees. However, acorns are more susceptible to wildlife predation and insect damage than seedlings. When planting acorns, you should always assume that some will be lost to wildlife and that some will fail to propagate. Acorns can be purchased from seed sources, or ripe acorns can be collected from September to November. Acorns should be planted immediately after harvest in fall or can be stored in a refrigerator until the following fall (Vesely 2006). For more information on planting oak, reference Planting Native Oak in the Pacific Northwest by Devine and Harrington 2010 (PNW-GTR-804).

Bare root and container seedlings can be purchased from nurseries, and provide some benefits over seeding acorns, despite the additional cost. While acorns may fail to germinate, seedlings are more likely to survive as they already have grown under optimum nursery conditions for up to one year. Seedlings are also less susceptible to wildlife damage (predation, insect damage) than acorns, increasing survival rates. A good root system is the best indicator of a seedlings' potential growth. The better the root system the more easily a seedling can uptake water leading to increased resource intake and growth. A good root system features a strong taproot and numerous lateral roots; lateral roots take pressure away from the tap-

Black hawthorne understory in oak woodland. Photo by Michael Ahr.

root. Therefore, a seedling with numerous laterals would be expected to grow well. Another indicator of potential growth is size; seedlings with a 1/4-inch stem diameter are best able to compete with existing vegetation. Bare root and container seedlings should also be planted in fall to maximize growth and survival. However, bare root availability is typically low in the fall, so planting often occurs in the winter/spring.

Another method involves growing your own saplings from acorns, using one-gallon nursery pots. Bury acorns at the proper depth and maintain the young plants for 2-4 years until they are at least 10 inches tall . You can use local acorns to ensure the stock is appropriate to your site (Devine and Harrington 2010).

Saplings and small oak trees can also be purchased from nurseries, although at much higher prices. If you plan to only plant a small number of oak trees, purchasing larger trees will increase survival and may provide for a range of age classes across your ownership.

When and Where to Plant

When planting oaks, it is best to wait until after rains saturate and loosen the soil in fall but before the warmth of spring. As with many other tree species, saplings maintain a better chance at survival during their first summer if planted in late fall. This allows the tree to establish roots during the winter and can therefore be prepared to grow during the first spring after planting.

Planting can be conducted in a variety of sites, as oaks are adapted to a range of habitats and site conditions. However, planting sites should be relatively open to allow light to reach the seedlings. Besides being shade-intolerant, stand density is vital to oak health; oaks that grow in overly dense stands produce tight, mangled, or misshapen crowns. Oaks can be planted in a range of soils but prefer droughty, well-drained soils. Oaks can handle soil saturation during the wet season but prefer droughty conditions during the summer months. Oak will benefit from site prep that removes competition from dense grasses and shrubs in the immediate vicinity of the planting site. Typically an acre may support only 20 to 40 fully mature oaks, but the survival of seedlings and acorns is low. It's best to plant at higher densities and thin later, if needed (Vesely 2006).

Oak seedling protection. Photo by Michael Ahr

Oregon white oak seedling. Photo by Michael Ahr

Oak seedling. Photo by Ken Bevis.

Protection of Seedlings/ Management after Planting

Major threats to seedlings include competition from surrounding vegetation, insufficient water, and wildlife browse damage. A combination of site preparation, mulch, weed barriers and herbicides will reduce loss of seedlings to competition and shading from surrounding vegetation. Ideally, mulch or weed barriers should extend two feet around seedlings. Although oaks are drought tolerant, seedlings may benefit from extra water during dry periods. Watering once a month during the first two summers after seedling establishment will increase oak vitality. Focus watering only on the very driest months, and don't oversaturate the area.

Oak seedlings are susceptible to damage and browse from wildlife species. Often, exclosures, seedling shelters or tubes are required to protect the seedlings from wildlife. Protective measures should be used until the branches exceed the height at which they can be foraged on by wildlife. Rodents may also pose a threat to oak seedlings -- when planting make note of any gopher holes on site. Damage from rodents is combatted with the addition of a plastic barrier beneath (20 cm) the soil. Solid plastic tubes that extend to the ground level can protect seedlings against voles. Besides protecting from wildlife damage, tubes and seedling shelters can provide valuable structural support to growing seedlings, and can increase air moisture and temperatures, which may help the seedlings to thrive.

Annual maintenance is often necessary when caring for oak seedlings. Necessary maintenance includes checks to existing sheeting/mulch or annual herbicide applications to ensure that competing vegetation is being kept at bay. Exclosures, seedling shelters or tubes should also be checked annually to ensure they remain intact and pulled up as necessary to protect leaders from browse. During annual maintenance, any wildlife damage can be assessed and adjustments can be made to the immediate surroundings to ensure the health of the seedlings.

Oak Conservation Programs

Oregon white oaks are a key species that improve landscapes and provide ecosystem services, making conservation of oak habitat a high priority in Oregon and Washington. Due to the overall loss of Oregon white oak habitat and the fact that the majority of the remaining havitat is on private land, small landowners are crucial to the persistance of these valuable habitats. Over 95% of existing oak habitat is on private land, therefore involvement of private property owners is vital to the present and future conservation of the Oregon white oak. Special assessments and incentives are available to landowners who manage oak habitats. The Natural Resources Conservation Service (NRCS), Oregon Department of Fish and Wildlife (ODFW), Washington Department of Fish and Wildlife, and the U.S. Fish and Wildlife Service (USFWS), may offer conservation aide and/or tax incentive programs. Your local Soil and Water Conservation District or Watershed Council is a great resource for technical assistance, and possibly financial assistance. Making contact with the Conservation District is a great start as they often can refer you to these other opportunities for assistance depending on your objectives. For more information about the various conservation programs available to landowners, visit the Oregon Conservation Strategy website at: http://oregonconservationstrategy.org/conservation-toolbox/appendix-2-existing-voluntary-conservation-programs/.

Oak Conservation and State Tax Deferrals:

Depending on your site, your operation may be subject to forestland tax deferrals in Oregon. (ORS 321.27-390)

Contact: Oregon Dept. of Revenue

Summary

Oregon white oak habitats are unique and essential for the flora and fauna of Oregon and Washington. However, these habitats have experienced significant decline in recent times. Small woodland owners are critical players in the protection, restoration and perpetuation of these magnificent trees and the habitats they create.

Oregon white oak woodland. Photo by Ken Bevis.

Where to get help

WA Dept. of Fish and Wildlife Management Recommendations for Washington's Priority Habitats, Oregon White Oak Woodlands:
https://wdfw.wa.gov/publications/00030/wdfw00030.pdf

Planting Native Oak in the Pacific Northwest PNW-GTR-804 February 2010:
https://www.fs.fed.us/pnw/pubs/pnw_gtr804.pdf

Oregon Forest Resources Institute:
https://knowyourforest.org/learning-library/creating-a-home-for-wild-animals

Oregon Conservation Strategy Oak Woodlands:
http://oregonconservationstrategy.org/strategy-habitat/oak-woodlands/

A Landowner's Guide for Restoring and Managing Oregon White Oak Habitats:
https://www.blm.gov/or/districts/salem/files/white_oak_guide.pdf

U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Sudden Oak Death:
https://www.aphis.usda.gov/aphis/resources/pests-diseases/hungry-pests/the-threat/sudden-oak-death/hp-sudden-oak-death

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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:

www.woodlandfishandwildlife.com

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Project Partners