General Technical Report
PNW-GTR-666
February 2006

USDA United States Department of Agriculture

Forest Service

Pacific Northwest Research Station

A Practical Guide to Oak Release

Constance A. Harrington and Warren D. Devine

Authors

Constance A. Harrington and **Warren D. Devine** are research foresters, Forestry Sciences Laboratory, 3625 93rd Avenue SW, Olympia, WA 98512-9193.

Cover photograph by Constance Harrington.

Abstract

Harrington, Constance A.; Devine, Warren D. 2006. A practical guide to oak release. Gen. Tech. Rep. PNW-GTR-666. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 24 p.

Oregon white oak savannas and woodlands represent a biological and cultural legacy in the Pacific Northwest. Many Oregon white oak stands are deteriorating owing to invasion and eventual overtopping by Douglas-fir or other conifers. Releasing the shade-intolerant oak trees from overtopping conifers can often restore these oak stands. When planning a release operation, there are many factors to consider such as timing and intensity of release, which trees to select for release, and management of the understory. A carefully executed oak release can minimize damage to oak trees, and followup treatments may reduce the spread of invasive plants. This guide answers the most commonly asked questions related to oak release.

Keywords: Oregon white oak, Garry oak, *Quercus garryana*, release, restoration, competition, savanna.

Why manage for oak?

OUR OAK SAVANNAS and woodlands (and the associated prairies) represent a biological and cultural legacy. Most areas with oak trees were previously maintained in an open condition by frequent burning by Native Americans. Many plant and animal communities associated with oaks and prairies are unique, and most of the species in these communities are not found in conifer-dominated forests. More than 90 percent of the areas that had oak or were in prairies at the time of European settlement have been converted to agriculture, urban development, or conifer forests. If we allow the oak legacies we have to disappear, we will lose their associated species and communities. The primary reasons given for wanting to manage for oak are maintaining oak-related wildlife habitat, preserving ecological diversity, and desiring to have open areas in the landscape. Oaks also can be managed for timber production or specialty products.

Warren Devine

Few oak stands still contain native plant communities. The blue flowers in this photo are camas; its bulbs were an important food source for Native Americans.

To which oak species are you referring?

THIS GUIDE IS BASED on our experience with Oregon white oak, also known as Garry oak. This species is native in California, Oregon, Washington, and British Columbia.

What does "oak release" mean?

In forestry terminology, release means to release a tree from competition, i.e., to reduce the competition for light, water, and nutrients associated with the presence of other trees. Here, oak release is a phrase used primarily to describe removing overtopping conifers from the vicinity of oak trees.

Constance Harrington

These oak trees once grew on an open savanna, but now they are surrounded by taller, faster growing Douglas-fir trees. Because the oak trees in this photo still have many living branches, they are good candidates for release.

Why do oak trees need to be released?

OREGON WHITE OAK is not shade tolerant, meaning its leaves do not photosynthesize at their maximum in the shade, and the shaded branches will die. If most of the crown becomes shaded, the tree may persist for several decades but will eventually die. In addition, the plant and animal communities associated with Oregon white oak need open areas or sunny conditions.

How do I know if an oak tree or oak stand needs to be released?

OAK TREES WITH CROWNS that are partially or totally overtopped by the crowns of conifers will benefit from release. One of the best indications of whether an oak tree is being suppressed by conifers is the shape and condition of the oak's crown. Tree crowns are influenced by the amount of crowding and shading they have experienced throughout their lives. Oak trees that initially developed with very little competition (i.e., open-grown) have wide-spreading crowns sometimes described as "mushroom shaped." If one of these trees becomes overtopped, portions of the crown will die back slowly, and eventually the entire tree will die. Trees that initially grew in more crowded conditions will have narrower crowns, sometimes described as "columnar" or "vase-shaped," with fewer large-diameter limbs. When these narrower crowned trees become overtopped, they may develop very irregular crown shapes, as the shading and dieback usually occur on one side first.

When assessing the condition of oaks, it is often helpful to compare the crowns of overtopped oak trees to those of oak trees growing well away from any conifers. Compare the number of dead limbs on the overtopped oaks to the oaks growing apart from conifers. Also, compare the density of the crowns. If an oak is suffering from overtopping, its crown will be more sparse.

Can I use stand exam or forest inventory data to select stands for oak release?

STAND EXAM DATA often include detailed information on the tree species present and their size, as well as notes on site features or stand conditions of interest. If data from stand exams indicate that both Oregon white oak and conifers are present, those stands may be good candidates for release activities. If a stand is going to be inventoried or examined, it may be possible to request that notes be made on areas where release would be appropriate. *A Landowner's Guide for Restoring and Managing Oregon White Oak Habitats* (see page 23) explains how a landowner can gather information on trees for use in developing a management plan.

Most forest inventory systems are designed to collect infomation on large areas to make summaries of timber volumes. They often only record information on trees of merchantable size and species, and thus, could provide only limited information on the location of stands that would be candidates for oak release. Sampling intensity is low in forest inventory systems, and so they can easily miss less common features that would be of interest.

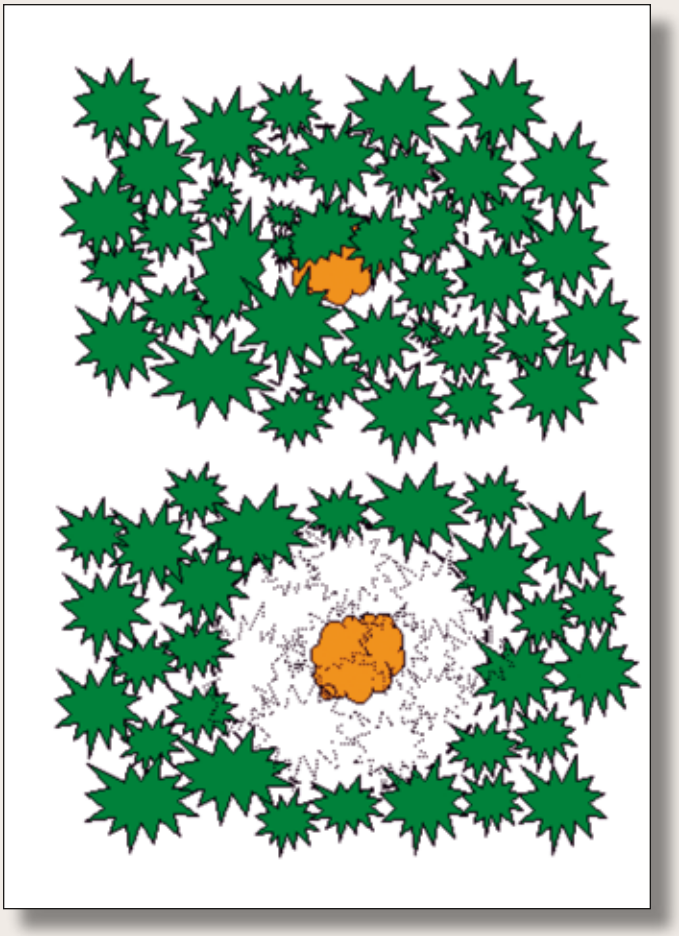
Should I release individual trees or do a stand-level release?

THIS DEPENDS ON your management objectives. If you want to restore an oak woodland or oak savanna, then you should remove all (or most) of the conifers. You cannot manage for plant communities associated with prairies, oak savannas, and oak woodlands if you retain a conifer overstory. Keeping scattered conifers may, however, benefit wildlife species such as the western gray squirrel. On the other hand, if you are managing a predominantly coniferous forest for timber production and want to retain individual oak trees as legacies for the future, then removing conifers from the vicinity of individual oak trees might be appropriate. To make

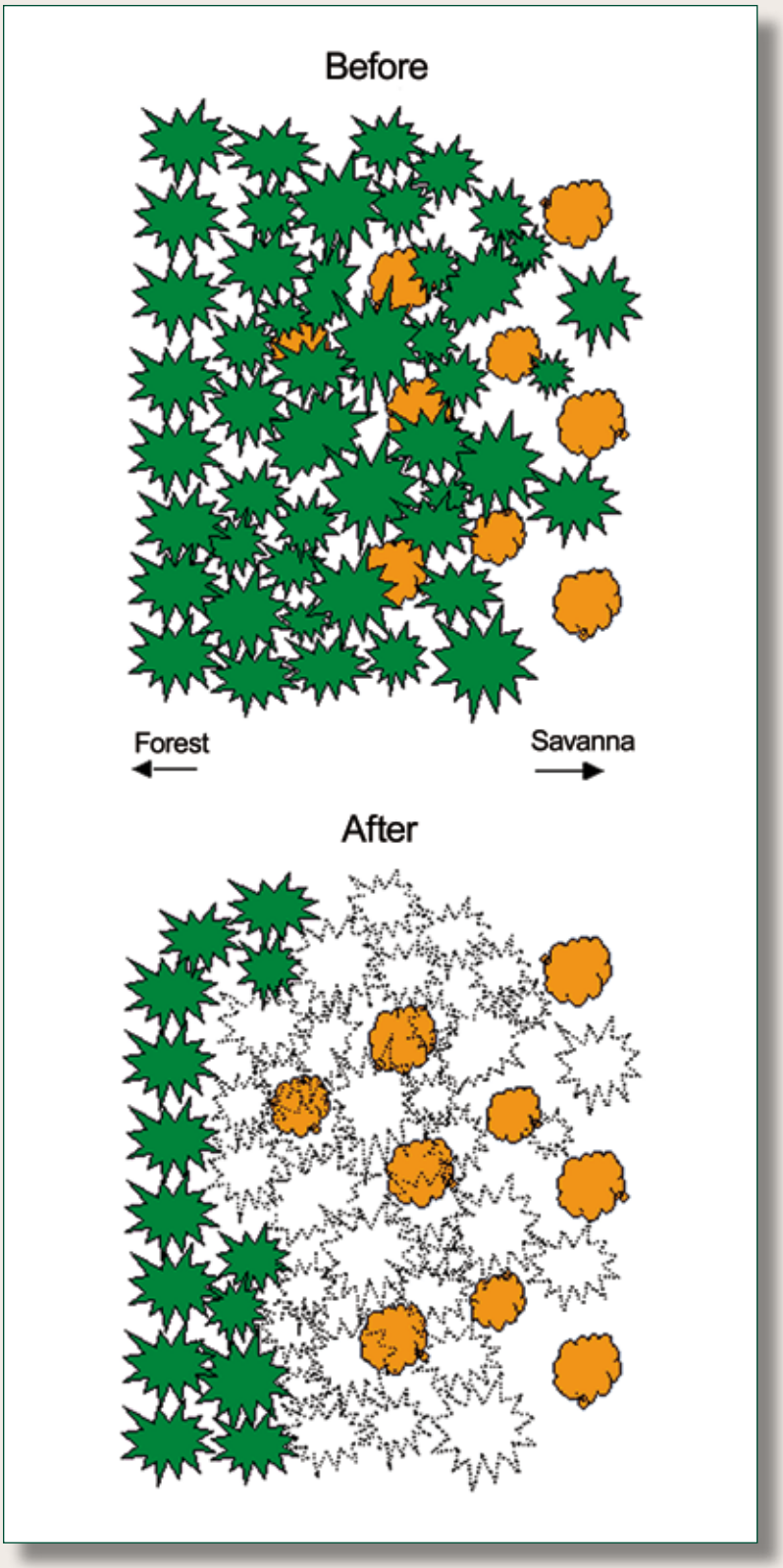
an effective individual-tree release, enough conifers must be removed to expose the whole oak crown to sunlight. Depending on the size of the trees, the slope, and the aspect, this usually means removing conifers within at least 30 to 40 feet (9 to 12 meters) of oaks (but often to a greater distance). An individual-tree release is not a permanent solution though, as the surrounding conifers will continue to grow at a faster rate than the oak and will eventually begin to shade it again requiring future release treatments.

Another option for release activities is to start with a core area that is in good condition and expand out from there. For example, many oak savannas and prairie areas had a fringe of oak trees around the outer edge, and these fringe trees have been overtopped. Expanding the boundary of the current oak woodland or savanna by removing conifers might result in areas that are easier to manage and have greater ecological value because the habitat would be more continuous.

If you do not have as many good trees to release as you want, consider releasing all of the trees that you do have. Although oak trees in poor health sometimes die back above ground, they may sprout from the base of the stem and regrow from the same root system. These sprouts will likely grow much faster than newly planted trees and thus will more quickly grow out of reach of animals that browse on young oaks.



The top half of this diagram shows an overhead view of an individual oak (rounded orange crown) that is overtopped; the lower half shows an oak that has been released by removing all conifers (pointed green crowns) within a specified radius.



In the top diagram, a conifer forest is encroaching, from left to right, upon an oak savanna. The lower diagram shows the result of releasing these oaks and thereby expanding the savanna.

Stand selection—Should I save the best first or save the best for last?

A COMMON OPINION in ecological restoration discussions is that one should concentrate activities on the sites in the best condition first, and when those sites are in good shape, move on to sites in poorer conditions. The idea is that you can intervene in preventing a problem from developing in the better sites or bring them to the desired condition more quickly or less expensively, so they are the ones to target first. Does this concept apply to releasing oaks from overtopping conifers? Yes and no. If you have decided to concentrate your efforts on restoring an oak savanna or woodland on only one or a few sites and you have many to choose from, then certainly it would make sense to select the sites where the oak is currently in the best condition in terms of crown size and vigor. These sites will probably also have more of the plant species associated with oak savannas and prairies still present. If, however, you hope to treat all or many of the areas, but can only do a few at a time, there can be good reasons to treat at least some of the sites where the oak is in poor condition first. The oaks in poor condition will continue to decline in vigor and may die without treatment, so promptly releasing those trees is a "limited-time opportunity." Even trees with a large amount of crown dieback and fairly low vigor can be rejuvenated by release. In addition, you can gain experience in treating some of the sites in poorer condition that can help in dealing with the more valuable sites where the oaks are in good condition.

Constance Harrington

Oak trees near a large opening may still have very full crowns. Releasing these trees will allow the crowns to develop in a way similar to those of open-grown trees.

Should I gradually release the oaks or do it all at once?

SOME PEOPLE HAVE ADVOCATED doing a gradual release to avoid "shocking" the released trees. There is no evidence, however, that a gradual release is necessary. As far as the tree's vigor is concerned, the sooner it is completely released, the better. On the other hand, if you are managing the conifers in the stand for timber production, a gradual release will retain more of the stand in timber production for a longer period and allow flexibility in future timber management. Multiple harvest operations, however, could result in a stand with too few trees to interest a logger or in greater time and cost associated with setting up multiple timber sales.

The understory will likely require different levels of management depending on whether you release all at once or do a gradual release. Releasing all at once may accelerate growth of invasive species, but it may also facilitate understory management techniques such as burning and mowing.

Joseph Kraft

This large Douglas-fir has been marked for removal because it is overtopping several oak trees. The large lower branches on the Douglas-fir indicate it developed in a low-density stand.

Constance Harrington

Removing overtopping conifers along a section of road will create visual diversity for travelers. Because the road provides the opening on one side, fewer conifers need to be removed to release roadside oaks.

How long will it take an overtopped tree to respond?

OAK TREES TYPICALLY BEGIN TO BENEFIT soon after release, and, depending on the condition they were in prior to release, you may be able to see some responses to release as early as the second year. For example, released trees often respond by increasing their acorn crops and building larger crowns. One way they do this is by sprouting epicormic branches (discussed below). However, a severely overtopped tree will take many years to expand its crown, and a tree with a very narrow crown will probably never achieve a wide-spreading, mushroom-shaped crown. Oaks can be long-lived, however, and the crowns should be able to expand for many years if future growing conditions are favorable.

What are epicormic branches and are they good or bad?

EPICORMIC BRANCHES SPROUT from suppressed buds (under the bark) on the trunk and limbs of trees. They may occur as a result of injury, such as crown dieback or logging damage. However, they also sprout in response to a sudden increase in sunlight, like that which results from release. In the past, many foresters considered epicormic branches to be undesirable as they could reduce the timber value of the tree. Because most oak trees that would be released are being managed for nontimber objectives, this concern is not relevant. Epicormic branches are important to released trees because this is the method the tree uses to rebuild its crown. Leaves on epicormic branches improve the tree's capacity for photosynthesis; plus, epicormic branches can eventually bear acorns. Although they may look small and ineffective at first, some epicormic branches persist and develop into large-diameter, long-lived limbs.

Warren Devine

Epicormic branches often form on the stem and limbs of released oaks.

Constance Harrington

Although these oaks have been released, decades of suppression have already caused severe crown dieback and mortality.

Should I concentrate on removing conifers on all sides of the oak or is just removing them on the south side good enough?

IF YOU DECIDE TO remove only a few trees because of other resource objectives, then the conifers on the south and southwest sides of the oak are blocking the most direct sunlight and should be targeted for removal. However, if trees on the other sides of the oak are not also removed, the oak crown will develop in a very lopsided way. Additionally, the overtopped oaks also are competing with surrounding trees for water and nutrients, so only removing the overtopping conifers on one side will not provide the whole benefit that removing conifers on all sides would.

What time of year is best for releasing oaks?

RELEASING SUPPRESSED OAK TREES in summer can potentially damage their leaves because oak trees, like other deciduous trees, form leaves that are adapted to the amount of sunlight they receive. A shaded oak tree typically has thinner leaves, and sudden exposure of these leaves to direct sunlight may damage or kill the leaves. Leaf damage can be avoided by releasing trees during the dormant season when leaves have turned brown or fallen. During the dormant season, soils can be wet and thus may be susceptible to rutting or compaction from logging equipment. You may want to restrict or monitor heavy equipment on the site during the wettest times but still schedule the release in the fall, winter, or spring prior to leaf-out.

Joseph Kraft

Oaks that have an opening on only one side usually form an unbalanced crown and often lean toward the sunlight.

Do I only need to worry about the larger conifers, or should I treat smaller ones also?

Constance Harrington

These oak trees have been released, but the next generation of conifers will soon overtop them again.

REMOVING (cutting or girdling) the large overtopping conifers is the first priority as these trees are having the greatest negative impact on the oaks. However, conifers that are not currently overtopping oaks probably will do so in the future and it may be much easier to cut them when they are still small.

Which sites should not be released?

YOU SHOULD BE CAUTIOUS in removing conifers from a site with major amounts of invasive species in the understory. Plan ahead how you will deal with the aggressive growth of scotsbroom, Himalayan blackberry, English ivy, false brome, and other species that are likely to greatly increase their growth under more sunlight. Treating some of these undesirable species **prior** to release is often advantageous because control activities may be more effective on plants in an understory. Specific treatments will depend on the site and the species that you are working to control. But even if the understory requires extensive work following the release operation, the oaks in the overstory will already be benefiting from the release.

Joseph Kraft

Large scars or visible fungi are signs of internal decay. These trees are important as wildlife habitat, but they may not be structurally sound.

Which trees should not be released?

IF YOU HAVE MORE oak trees than you need for your final objectives, then you should concentrate on trees with large spreading crowns and no sign of major decay in the stem (evidenced by large scars or mushroom fruiting bodies). Priority for release should then be placed on the largest trees because they would take the longest to replace. If you have noticed that certain trees are good acorn producers, you may want to favor these trees for their ability to produce wildlife food and for regeneration.

Do I need to obtain any permits before I start?

FOREST PRACTICES REGULATIONS in individual states (or in British Columbia) will specifiy certain practices that need to be followed. Most regulations were written with the assumption that managing for conifers was most desirable and there are still features in some of these regulations that make management for hardwoods more difficult. There is an appreciation by many involved in overseeing these regulations that changes or exemptions are sometimes needed to ensure that desirable activities are not discouraged. Contact your state or provincial forest practices forester to see which regulations you need to be concerned with.

How much will it cost to release oaks?

OFTEN, REMOVAL OF CONIFERS does not result in a cost to the landowner, as the trees can be sold. However, if you only want a few trees removed, it may be difficult to get a contractor to bid on them. In addition, some of the conifers growing among oaks may have developed when the stand was more open and therefore have many large-diameter branches, and thus, a lower timber value. Low-value trees can be girdled to create snags for wildlife or cut for firewood. Information from a forestry consultant or an extension service specialist can help you determine if there would be costs to you. Cost-share programs, through agencies such as the USDA Natural Resources Conservation Service, may be available.

Constance Harrington

Will the oaks be damaged during logging?

IT IS IMPORTANT THAT before taking bids from logging contractors on the release, the contractors understand that the main objective is to preserve the oak trees. If possible, you should choose a logging contractor who has experience thinning stands and therefore knows how to minimize damage to the trees you are keeping. Prior to the operation, meet with the contractors and anyone else involved to discuss the specifics of the release. In some situations, even the most skilled loggers will not be able to save all of the oak trees when they are removing many large conifers from the immediate vicinity. Sometimes a good compromise is to girdle a conifer if it is not easily accessible to loggers or if felling it would cause certain damage to oaks. You should be prepared to accept that some oak trees will be damaged during the logging operation. Unless damaged or dead oak trees present a safety issue for humans, they should be left standing as they are important as wildlife habitat. For example, where a limb is broken off during logging, a nesting cavity may form.

Hugh Snook

Some conifers cannot be removed without seriously damaging oak trees. It may be best to girdle the conifer in such situations.

If I cut the conifers, would it be better to just leave them on the ground to provide coarse woody debris than to remove them?

THE PLANT AND ANIMAL COMMUNITIES associated with oaks and prairies are not associated with conifer woody debris so, no, there is not an ecological reason to leave the conifer wood on the site. Also, if you want to use prescribed burning to maintain the understory after releasing oaks, it would be better not to leave the woody debris on the site as it could make the fires much hotter than desired.

Large amounts of logging slash may be created during the release operation. You should plan ahead of time how this slash is to be managed. Possible options include chipping slash or burning the slash in piles, although you may be able to remove larger pieces of wood for firewood before piling. Always check with local authorities on burning restrictions and regulations.

Warren Devine

Constance Harrington

Logging slash is inevitable; it may be piled and then burned when wildfire risk is low.

Once I release my oaks, will I need to do any followup treatments?

THE NEED FOR FUTURE TREATMENTS will depend on your management objectives and the current stand conditions. Most areas with overtopping conifers will have smaller conifers present and a seed source to regenerate future conifers. Followup treatments are often desirable to prevent these conifers from competing with the oaks. If you choose to release individual oak trees rather than the entire stand, future release treatments will be necessary as the conifers fill in the gaps created to release the oaks.

Followup treatments will typically be necessary if you want the understory to be relatively free of invasive species. Treatments to control invasives may include removing them by hand, mowing, herbicide application, or prescribed fire. Fire is the most natural method because it is a part of these oak ecosystems; however, it requires significant planning, proper permissions, and experienced personnel. Once invasive species are under control, you may want to purchase native plants and seed to reestablish particular species.

Publications with more information:

Devine, W.D.; Harrington, C.A. 2004. Garry oak woodland restoration in the Puget Sound Region: releasing oaks from overtopping conifers and establishing oak seedlings. In: Proceedings of the 16th international conference of the Society for Ecological Restoration. Victoria, BC, Canada. http://www.fs.fed.us/pnw/olympia/silv/publications/no_497_2004_devinew_garryoakwoodland.pdf. (15 November 2005).

Harrington, C.A.; Kallas, M.A., comps. 2002. A bibliography for *Quercus garryana* and other geographically associated and botanically related oaks. Gen. Tech. Rep. PNW-GTR-554. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 115 p. http://www.fs.fed.us/pnw/pubs/gtr554.pdf. (15 November 2005). Search bibliography at: http://www.ncrs.fs.fed.us/RIS/RISWEB.isa. (15 November 2005).

Vesely, D.; Tucker, G. 2004. A landowner's guide for restoring and managing Oregon white oak habitats. Salem, OR: U.S. Department of the Interior, Bureau of Land Management. 65 p. Available at many Bureau of Land Management, state extension service, and Natural Resources Conservation Service offices. Request a copy by emailing your name and address to: or080mb@or.blm.gov.

Other resources:

Garry Oak Ecosystems Recovery Team. 301-1205 Broad Street, Victoria, BC V8W 2A4. http://www.goert.ca/.

Oregon Oak Communities Working Group. http://www.oregonoaks.org/. Email: oregonoaks@comcast.net.

Scientific names

Common name	Scientific name
Plants:	
Douglas-fir	*Pseudotsuga menziesii* (Mirb.) Franco
English ivy	*Hedera helix* L.
Himalayan blackberry	*Rubus armeniacus* Focke
Oregon white oak (also called Garry oak)	*Quercus garryana* Dougl. ex Hook.
scotsbroom	*Cytisus scoparius* (L.) Link
slender false brome	*Brachypodium sylvaticum* (Huds.) Beauv.
Mammals:	
Western gray squirrel	*Sciurus griseus*

Acknowledgments

We thank the Forestry Program, U.S. Army, Fort Lewis, for financial support.

Christel Kern

Several oak trees have been released by cutting conifers in a portion of this stand.

Pacific Northwest Research Station

Web site	http://www.fs.fed.us/pnw/
Telephone	(503) 808-2592
Publication requests	(503) 808-2138
FAX	(503) 808-2130
E-mail	pnw_pnwpubs@fs.fed.us
Mailing address	Publications Distribution Pacific Northwest Research Station P.O. Box 3890 Portland, OR 97208-3890

U.S. Department of Agriculture
Pacific Northwest Research Station
333 SW First Avenue
P.O. Box 3890
Portland, OR 97208-3890