Management Options for Declining Red Alder Forests

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Managing Declining Red Alder Forests

A Guide for Family Forest Owners and Restoration Workers

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Red alder (*Alnus rubra*) is one of the most common hardwood trees in the low elevation forests of western Washington. Though red alder forests are frequently found in **riparian areas**, the species also grows upland either in pure stands or in mixture with other tree species. Red alder forests have high biodiversity value, as the dense shrub layer commonly associated with these forests provides forage for many species of wildlife. Red alder has an important ecological role, as the decomposition of its leaf litter and downed wood enriches forest soils and streams. Red alder wood also has commercial timber value with many end product uses.

Mature red alder forests are found throughout the western Washington lowlands as a result of past land use history. As red alder is a naturally short-lived species, many of these mature alder forests are in stages of decline and senescence, and many landowners are unsure how to manage these forests for long-term forest cover and other benefits. This publication is intended to help forest landowners and managers evaluate their options for red alder, based on their desired objectives, current forest conditions, and management style.

How red alder forests establish and develop

Red alder is a **pioneer species**, meaning that it is one of the first trees to colonize a site following a **disturbance**. Red alder seedlings thrive best when they germinate on bare, mineral soil, which accounts for its rapid emergence following logging and its presence on other disturbed sites such as landslides, roadcuts or areas subject to periodic flooding. However, red alder will not regenerate in the organic material found on the surface of undisturbed forest soils; nor will it grow in the shade. This means that in a mature alder forest, new alder seedlings do not usually replace the aging trees in the absence of a natural or human disturbance.

In comparison to many of our region's long-lived conifers, red alder has a relatively short lifespan. Although fast growing as a young tree, by 60 to 80 years the **crown** (branches and foliage) begins to break apart. By this time, when crown dieback exceeds new growth, red alder is considered to be in decline. Red alder rarely lives beyond age 100.

During most of the 20th century, the volume of red alder in Pacific Northwest forests increased until reaching an all-time high in the early 1990s (Ahrens 2006). Many of these red alder forests are a legacy of past management practices that resulted in alder regeneration. Through the 1940s, conifer forests were

Figure 1. Declining red alder forests are characterized by trees with broken limbs or tops, lots of sunlight, and a dense shrub component. (Photo: Kevin Zobrist)

logged intensively. At that time, the stringent reforestation requirements of the state's Forest Practices laws that are now in place had not yet been developed. Many forest managers did not replant following logging, and natural regeneration of conifers was often unsuccessful. Red alder became established on these sites, resulting in the 50- to 80-year-old red alder-dominated forests found today. Similarly, red alder forests also became established on former agricultural lands that were abandoned in the World War II era. The number of acres of red alder in western Washington has declined since 1980, indicating the gradual die-off and/or harvest of these mature stands (Ahrens 2006).

Where will natural forest succession lead?

The fate of a declining red alder forest is determined largely by the composition of its **understory**, or the trees and shrubs found in the lower layers of the forest. Sometimes, shade-tolerant conifers, such as western redcedar, western hemlock, or Sitka spruce, are found scattered in and below the alder **canopy**. If so, then these trees may eventually become the dominant trees in the **stand** as the alder dies. However, **stocking** of these species may be low and uneven, and it may be many years before a new closed canopy emerges (Harrington 2006).

Although red alder trees produce abundant seed, it is rare that a new red alder forest replaces a declining one. Typically, red alder seedlings have a difficult time getting established on the organic soils under the shade of the shrub layer. A disturbance to the stand resulting in exposed mineral soils (i.e. logging or burning) may lead to a newly regenerated red alder stand.

In many cases, the understory of a mature alder forest is made up largely of shrubs without a significant conifer component (Hibbs and Bower 2001). Salmonberry is one of the most common shrubs associated with alder forests, though vine maple, Himalayan and trailing blackberry, red elderberry, and others are also found. Salmonberry spreads via underground stems called **rhizomes**. Once established on a site, the rhizomes can occupy much of the space in the upper soil layer, making it extremely difficult for trees or other shrubs to establish (Tappeiner et al. 1991). Once the alder in the **overstory** (upper canopy layer) dies out, what often results is a salmonberry thicket that may persist for

Figure 2. A dense thicket of salmonberry is often found under mature red alder trees, creating difficult conditions for young conifer trees to establish. (Photo: Kevin Zobrist)

many years until the next disturbance. For many forest owners, this resulting brush patch does not meet their management objectives. In such cases, active management is needed to establish an adequately stocked conifer forest or a new alder forest on the site.

Determining Your Management Approach

There are a variety of management approaches for addressing an alder stand in decline. Options include a combination of harvesting the alder at varying intensities, underplanting with shade-tolerant species, controlling unwanted vegetation with herbicides, or doing nothing. Your decision will depend upon your management objectives and management style, as well as the condition of your stand, scale of your operation, market conditions, and other factors.

The first step in determining a management approach is to **evaluate your objectives** for the site. Do you want to establish a new cohort of conifers? If so, you should be more aggressive in your approach to reducing the alder overstory and shrub competition. Do you want a stand with high biological and structural diversity? If so, then you might be content to simply **release** understory conifers (if present) from shrub competition. Based on what you would like your stand to look like in ten, twenty, or fifty years, you can take steps now to shape your stand's future.

Next, you will need to **assess the current condition** of your forest. An on-the-ground assessment is needed, which may be a simple walk-through inspection from a road or trail, or may be a more thorough, systematic inventory. Once you have evaluated the current condition of your stand, you have better information with which to assess management options which are discussed in "Management intervention options."

Assessing your stand

Your assessment should include information on overall site characteristics, overstory condition and understory composition as described below. The Stand Assessment Checklist will help you get organized and gather the right information. An aerial photo may also be useful to help you get oriented and map out stand boundaries and other site features.

Overall site characteristics. What is the size of the area under consideration? Some management tactics, such as hand-scalping planting sites, may be appropriate for a half-acre site but not feasible on a larger scale. Conversely, commercial harvesting generally requires a larger site to be economical. Is there a steep slope, and if so, which direction (**aspect**) is it facing? Steep slopes present challenges for using heavy equipment safely and may make the operation more expensive. The aspect will affect your choice of species for reforestation; south- and west-facing slopes are hotter and drier and more suitable for Douglas-fir, whereas north- and east-facing slopes are best planted to cedar, hemlock, or spruce. Also note soil conditions such as permeability. Red alder and cedar tolerate a wet site, but Douglas-fir does not.

Overstory condition. In what stage of maturity is the red alder? Are many trees beginning to die, or do they still appear to be vigorously growing? Is there evidence of damage from wind, ice, or other agents causing the canopy to break up? Approximately what percentage of the canopy is closed?

Stand Assessment Checklist

I. Overall site characteristics

- ❑ What is the size of area?
- ❑ How steep is the slope (steep, flat, moderate, etc.)?
- ❑ What is the aspect (direction the slope faces)?
- ❑ What is the soil like (wet, dry, etc.)?

II. Overstory conditions

- ❑ What is the condition of the alder (still vigorous, beginning to die, broken tops, etc.)?
- ❑ Are there other species present in the overstory (conifer or broadleaved)? If yes:
  - ❑ What species are present?
  - ❑ What percentage of the overstory do these species make up?
  - ❑ What is their height relative to the alder (taller, shorter, same height)?
  - ❑ How are they distributed (clumped or evenly distributed)?
  - ❑ What is their condition (healthy, diseased, dying, etc.)?
- ❑ What is the approximate overall percentage of canopy closure (e.g., fully closed = 100%)?

III. Understory composition

- ❑ What types of shrubs are present (tall, short, woody, etc.)?
- ❑ Estimate the percentage cover of each type of shrub on the ground.
- ❑ Are any conifer seedlings/saplings present in the understory? If yes:
  - ❑ What species are present?
  - ❑ How many are there (a lot, a few, very few, etc.)?
  - ❑ Approximately how tall are they?
  - ❑ What is their height relative to the shrubs (taller, shorter, same height)?
  - ❑ How are they distributed (clumped or evenly distributed)?
  - ❑ What is their condition (healthy, suppressed, dying, etc.)?

Many red alder stands have an overstory component of conifers and other, longer-lived hardwoods, such as bigleaf maple and black cottonwood. Document the number of these trees found per acre, along with their species and height relative to the alder. Also, record whether they are distributed evenly throughout the site, or whether they are clumped, diseased, or dying (see sidebar discussion on root disease). You will also want to think about what will happen to them once the alder is harvested or dies naturally. If the alder is harvested, the residual conifers may blow down soon afterward. You will need to decide whether to harvest these trees as well, or to leave them behind as a source of woody debris for wildlife habitat and soil enrichment.

Understory composition. On a systematic basis, you should assess the type of shrub cover and presence of conifer regeneration on your site. This can be done by setting up **inventory** plots or by walking **transects** through the site and recording what you find. Areas dominated by short, deciduous plants will require less maintenance after planting, while areas dominated by salmonberry, elderberry, vine maple, or other tall shrubs will require more intensive site preparation and maintenance. Document the number of conifers per acre found, along with their species, height, and height relative to competing shrubs. Also, record whether the conifers are distributed evenly throughout the site, or whether they are clumped, diseased, or dying.

Trees found in the understory will respond differently to release, depending on their species and condition. Shade-tolerant species such as western redcedar, western hemlock, true firs, Sitka spruce, and bigleaf maple tend to respond well. Individual Douglas-fir trees need to be assessed on an individual basis. Trees with fuller crowns, lower **height-to-diameter ratios**, and steady **leader** growth are more likely to respond with vigorous growth. On the other hand, Douglas-fir trees that have poor leader growth, drooping branches, and a high height-to-diameter ratio are often too suppressed to capitalize on the increased sunlight after release. Such trees should not be relied upon to form a major component of your future stand.

Figure 3. These two understory saplings will respond differently to release. The tree above is not vigorous enough to withstand an extreme change in light and temperature and most likely will never become a dominant tree if released. Note the sparse foliage and progressively shorter internodes (space between branch whorls). The tree on the right is more likely to respond to release with vigorous growth. (Photo: Andy Perleberg, above; Amy Grotta, right.)

Riparian zones and red alder

Whereas red alder stands in upland areas often are the result of past human disturbance, red alder stands naturally occur in riparian areas where periodic flooding creates the soil conditions needed for alder germination. Harvesting in riparian areas is subject to limits set by the Washington Forest Practices Rules to protect water quality and fish habitat. While the harvesting restrictions vary by the size of the stream and other factors, you should expect to retain unharvested buffer zones in most cases. Consult the Washington Department of Natural Resources (DNR) for more information: *http://www.dnr.wa.gov/BusinessPermits/ForestPractices/Pages/Home.aspx.*

If you plan to convert a riparian alder stand to conifers, you may be able to gain some flexibility in your buffer requirements by developing an Alternate Plan. This is a harvest plan that provides equal or greater stream protection while deviating from the normal buffer width or harvest limitations set by the Forest Practices Rules. Conversion of riparian hardwood forests to conifers is a common component in Alternate Plan proposals. For more details, contact the Washington DNR Small Forest Landowner Office: *http://www.dnr.wa.gov/BusinessPermits/Topics/SmallForestLandownerOffice/Pages/fp_sflo_altplans.aspx.*

Management options

Once you have evaluated your objectives and assessed the current condition of your stand, you have better information with which to consider your management options. Several such options are discussed below.

Overstory removal (Harvesting)

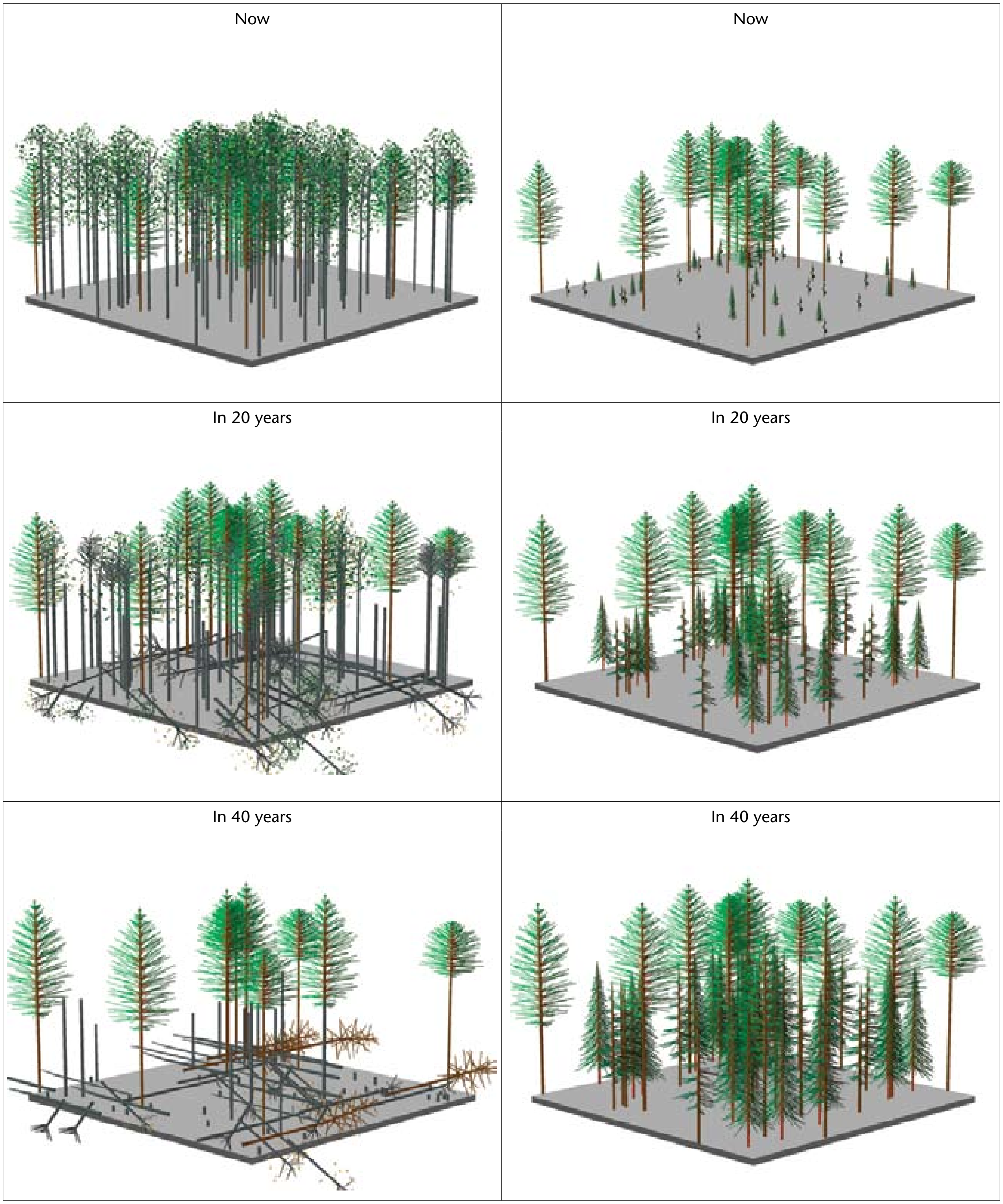
Depending on the size and condition of the alder, it may be feasible and prudent to consider harvesting and selling it. Red alder has emerged as one of the more highly priced species in our region; however, red alder log prices are highly variable depending on log size and condition, as well as market fluctuations. Large, straight logs with very little decay command premium prices and may be worthwhile to remove. Small diameter logs or those with red stain, heart rot, or poor form may only be suitable for pulp or firewood and, depending on current markets, it may not be cost-effective to remove them from the site. Logging the alder overstory has the potential to offset some of the costs of reforestation and maintenance. In small stands where there is not enough timber value to offset the cost of hauling to a mill, firewood production may be a good option. A consulting forester can help you to assess the volume of marketable alder you have on your site and its approximate value. Your local Extension Forester can provide information on how to hire a consulting forester.

Removing the alder overstory allows more light to penetrate to the forest floor and thus permits a wider array of species to choose from for reforestation. Depending on your objectives and the condition of the mature alder, you may wish to do a **clearcut** harvest, or remove portions of the canopy in patches, leaving the unmerchantable trees behind to provide important wildlife habitat components as they die and decay. If it appears that alder mortality is imminent, you may wish to harvest more aggressively to capture the economic value of the trees before decay sets in.

Unlike recommendations for conifer stands, thinning mature red alder stands is not recommended as a means of improving the growth of residual trees. Red alder trees only respond to thinning with increased diameter growth until approximately age 20 (Bluhm and Hibbs 2006). Red alder also has thin bark and retained trees will be particularly susceptible to logging damage if thinning is attempted. Therefore, if you wish to retain some of the alder as standing trees, they should be left in patches rather than dispersed evenly throughout the site.

The harvesting process will also facilitate preparation of the site for planting, by breaking or uprooting shrubs and creating access. In addition, the movement of logging equipment across the site will expose the mineral soil in some areas. Pay special attention to unwanted competing vegetation that may regenerate in these areas, especially invasive species such as Himalayan blackberry, reed canary grass, and knotweed, and control them as needed. Also, remember that more alder will probably

Figure 4. Comparison of two treatments for a mature red alder stand with a minor conifer component. On the left, the stand is left alone. The red alder dies out gradually, leaving an unevenly stocked conifer stand. On the right, the alder is harvested and western red cedar are underplanted below the residual conifers.



Is root disease an issue for you?

Western Washington conifers are susceptible to a number of root diseases, the most common of which is laminated root rot (*Phellinus weirii*). Endemic to the area, this pathogen remains on a site for many years after the host conifers have succumbed. If you wish to re-establish conifers on a red alder site, you should first try to assess whether root disease will pose a future problem. Some upland red alder stands may exist precisely because root disease killed prior conifers, and red alder became the dominant species because a seed source was available. Hardwoods such as red alder are immune to *Phellinus weirii* and certain other root diseases that frequently impact native conifers.

Several signs may indicate the presence of root disease. On standing Douglas-fir trees that may be surrounding or interspersed in your red alder stand, check to see whether the foliage is thinned or sparse-looking, and whether the top growth is slowed (distance between branch whorls is progressively shorter), resulting in a compressed, rounded look at the top of the tree. Both of these are symptoms of root disease. The presence of standing dead trees is another indicator. If you have fallen conifers in the area, check to see whether they fell over with a large root plate, or whether the exposed roots are decayed and broken off. The latter is another root disease indicator.

A professional forester can help you to verify the presence of root disease. If it is suspected on the site, you should consider replanting the site to a species which is resistant or immune to root rot. These species include hardwoods such as red alder and bigleaf maple, or conifers such as western redcedar and western white pine.

See the "Further Reading" section for references with more information regarding laminated root rot.

germinate on the exposed soils if the site is not captured by invasive species. For more information on site preparation, consult the Further Reading section at the end of this publication.

Removal of the alder overstory allows you to select from a wider range of species for replanting. In larger openings, or in smaller gaps with a south/west exposure, Douglas-fir is a suitable choice if laminated root rot is not present. Douglas-fir will perform best with more sunlight, so shrub control is important. On wet sites, or on the shady edges of patch cuts, western hemlock, western redcedar, and Sitka spruce are good choices because of their shade and moisture tolerance. A consulting forester or your local Extension Forester can provide further assistance with species selection.

Felling the alder trees and leaving them in the forest is an option to consider if your site is sensitive to ground disturbance, the trees have low market value, or selling timber is undesirable or infeasible. This approach provides the benefit of increased sunlight for your planted seedlings as well as reducing the risk of damage to them from future falling trees or limbs. The major drawback to this option is that site preparation and access to planting

Figure 5. A western red cedar sapling overgrown by Himalayan blackberry. Controlling blackberry and other invasive weeds before underplanting with conifers is essential for success. (Photo: Kevin Zobrist)

Harvesting mature red alder: Key recommendations

- For optimum market value, do not wait for red alder trees to exhibit signs of decay.
- Do not harvest prior to selling the logs, as alder logs can develop stain or decay rapidly once they are cut and on the ground.
- If you do not wish to remove all of the alder from your stand, plan the harvest so that you remove trees in patches. Do not thin your stand evenly.
- Leave behind trees that do not have market value for future wildlife trees, snags, or woody debris.

spots is made much more difficult by the stems remaining on the ground. In any scenario, leaving at least some of the unmerchantable trees on the ground is a good practice. It costs less than removing them from the site, and they provide important ecological functions such as habitat for small mammals, substrate for fungal and lichen communities, and organic material for the soil.

Conifer underplanting

Conifer **underplanting** is appropriate for a site with sparse or clumped conifer regeneration; in which the alder has little to no market value; where the site is too sensitive for disturbance (e.g. on a steep slope or in a riparian zone); where management plans prohibit tree removal; or in any other case where removal of the overstory canopy is undesirable.

Because there will be no ground disturbance from harvesting activity, understory shrubs should be controlled prior to underplanting. Shrubs compete with tree seedlings both above ground for light and below ground for water and nutrients. Shrubs must be controlled within a four-foot radius around each planting spot. In areas of tall, vigorous shrubs such as elderberry, salmonberry, or blackberry, controlling a wider radius may be necessary to allow sufficient light to reach the underplanted seedlings. You should also be more aggressive in your approach to removing invasive species such as Himalayan blackberry. Thorough, effective blackberry control before planting will save many future headaches (Figure 5).

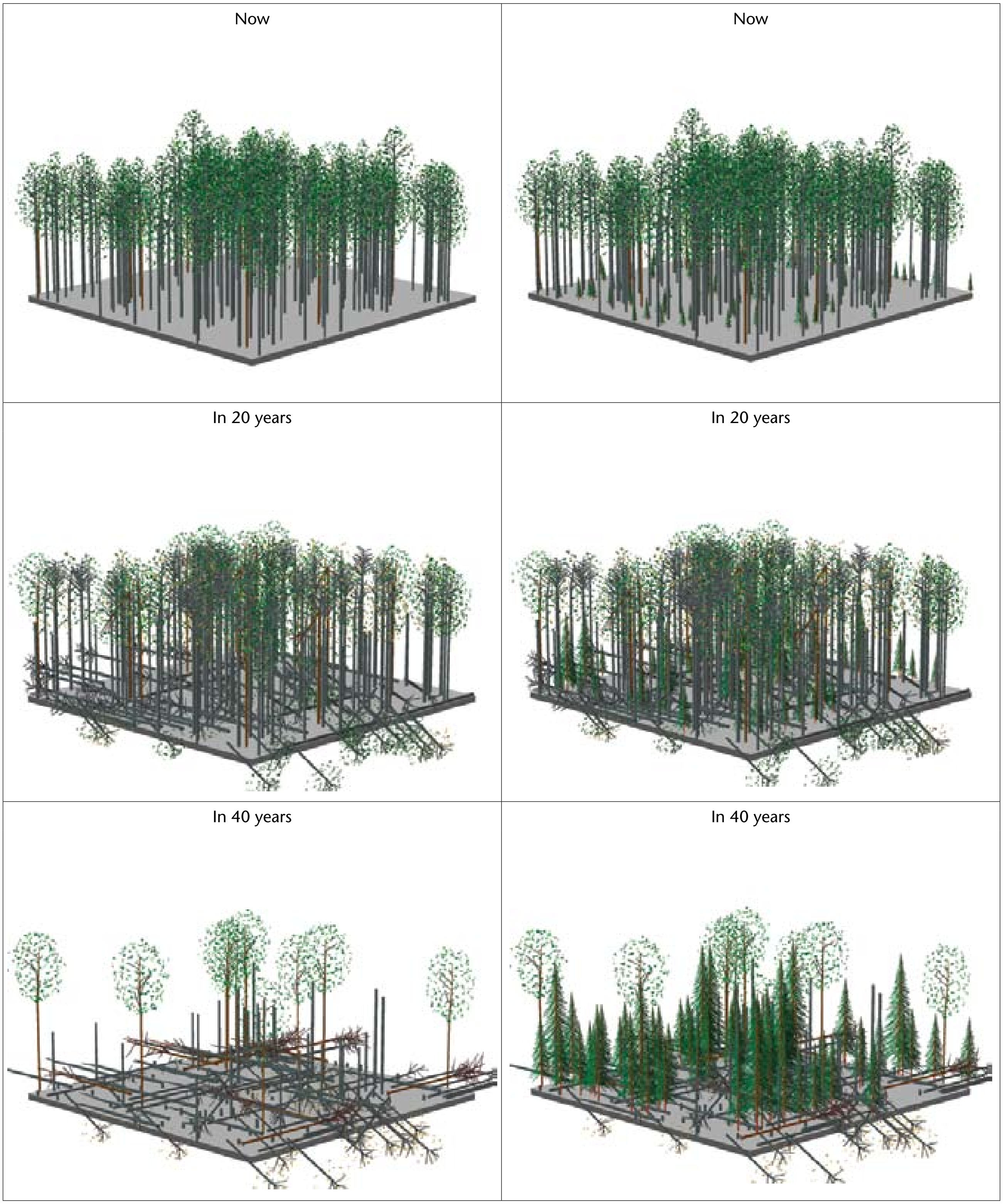
One option for shrub control is to **spot spray** with herbicides prior to planting. Herbicides have the advantages of being less labor-intensive and causing less soil disturbance than other vegetation control methods. All herbicides should be used in accordance with their labels, and they should not be used near water, in areas of high sensitivity to wildlife, or without proper protective equipment. Many herbicides used on broadleaf shrubs are damaging to conifers, so when using these products it is very important to do so *before* new seedlings are planted. Consult the Pacific Northwest Weed Management Handbook (see Further Reading section) for the latest information about specific herbicides registered for forest use and guidelines for using them.

Shrubs can also be controlled mechanically, though this approach is more time-consuming and potentially less effective. Use a brush cutter or loppers to cut the vegetation and access the planting site. For best results, **hand-scalp** the planting site, removing all cut stems, surface roots, and organic matter in a four-foot radius. Since the shrubs are almost certain to resprout vigorously, it is imperative to revisit the planting sites to cut back the regrowth at least once per growing season.

Choose seedlings that are shade tolerant for underplanting. Good choices include western redcedar, western hemlock, and to a lesser degree grand fir and Sitka spruce. Western redcedar tolerates a wide range of sites and is well suited to wet areas, as is Sitka spruce. Western hemlock tolerates the shadiest conditions, while grand fir is more resistant to drought than either cedar or hemlock. Western redcedar is susceptible to deer and elk browsing; if these animals are known to frequent the area, consider protecting your cedar seedlings with one of several commercially available repellents or seedling protection tubes.

Seedlings come in a variety of sizes; select the largest planting stock possible to minimize the amount of time needed for the seedlings to grow above the shrub layer. This will reduce the amount of repeated brush control needed to maintain seedling growth. If possible, choose planting spots where non-aggressive understory

Figure 6. Two potential scenarios for a declining red alder stand. In the left hand column, the stand is left alone and the alder gradually dies. On the right, western red cedar seedlings are underplanted, allowing a new forest to develop.



plants (i.e. ferns or other short, non-woody plants) dominate, to give your seedlings the best chance to emerge quickly from the shrub layer.

The overstory alder will continue to die gradually over time. You should expect some seedling loss from falling trees or limbs, as well as other natural causes of seedling mortality (Figure 6).

Doing nothing

Some landowners prefer to take a hands-off approach, to "let nature take its course." For publicly-owned open spaces, this may also be what is mandated for management of the site. However, it is important to stress that forests are dynamic and that leaving the stand alone does not mean that the makeup of the stand will remain the same over time. In choosing a passive approach, one must recognize the possibility that once the red alder canopy dies, it may be many years before any new trees become established on the site to take their place. Any shrub layer (including invasive species) currently existing beneath the alder canopy will likely become more vigorous with increasing sunlight as the canopy breaks apart, and in the absence of ground disturbance new seedlings will not naturally establish.

In some cases, leaving the stand alone to let nature take its course may be a desired approach, such as under one or more of the following conditions:

- many conifers (at least 25 dominant/co-dominant or 50 to 100 understory per acre) are dispersed throughout the site;
- few or no invasive species are present;
- access to the site is difficult; or
- a shrub-dominated area is preferred (for example, if the site is surrounded by conifer forest and some landscape diversity is desired).

Even if you plan to do nothing else to your stand, invasive plants such as Himalayan blackberry and English ivy should be monitored and controlled wherever feasible. For suggestions on how to do this, see the Weed Management heading in the Further Reading section.

Conclusion

Many options exist for treating declining red alder forests, and no single approach is best for every situation. The first step in managing your red alder forest is to assess your stand condition in the context of your management goals. Planning ahead, understanding how understory plants respond to changing overstory conditions, and monitoring and maintaining new plantings are all critical factors to the success of your project.

References

Ahrens, G.R. 2006. Overview of supply, availability, and regulatory factors affecting red alder in the Pacific Northwest. In *Red alder—a state of knowledge*. Eds. R.L. Deal and C.A. Harrington. Portland, OR: U.S. Dept. of Agriculture, Pacific Northwest Research Station General Technical Report PNW-GTR-669: p. 125–132.

Bluhm, A.A. and D.E. Hibbs. 2006. Red alder: its management and potential. In *Red alder—a state of knowledge*. Eds. R.L. Deal and C.A. Harrington. Portland, OR: U.S. Dept. of Agriculture, Pacific Northwest Research Station General Technical Report PNW-GTR-669: p. 73–86.

Harrington, C.A. 2006. Biology and ecology of red alder. In *Red alder—a state of knowledge,* eds. R.L. Deal and C.A. Harrington. Portland, OR: U.S. Dept. of Agriculture, Pacific Northwest Research Station General Technical Report PNW-GTR-669: p. 21–43.

Hibbs, D.E. and A.L Bower. 2001. Riparian forests in the Oregon Coast Range. *Forest Ecology and Management* 154:201–213.

Tappeiner, J. et al. 1991. Salmonberry clonal and population structure: the basis for a persistent cover. *Ecology* 72(2): 609–618.

Further Reading

Washington State University Extension produces a number of publications for forest landowners, many of which are available as free downloads. View the catalog at: *http://pubs.wsu.edu*. The WSU Extension Forest and Wildlife website contains numerous other resources at *http://ext.wsu.edu/forestry*. Below are selected publications with more detailed information, organized by topic.

Assessing Your Site

Green, D. et al. Mapping and Managing Poorly Stocked Douglas-fir Stands. Oregon State University Extension Publication EC 1133. *http://extension.oregonstate.edu/catalog/pdf/ec/ec1133.pdf*.

Marketing Timber

Schlosser et al. *Managing Your Timber Sale*. Washington State University Extension publication EB1818. *http://cru.cahe.wsu.edu/CEPublications/eb1818/eb1818.pdf*.

Consulting Foresters' Directory for Washington and Neighboring States. Directory maintained by Washington State University Extension. *http://ext.nrs.wsu.edu/publications/forestry/consultingdirectory.htm*

Red Alder Ecology and Management

Bondi, M., and W. Emmingham. *Converting Western Oregon Red Alder Stands to Productive Conifer Forests*. Oregon State University Extension publication EC 1186. *http://extension.oregonstate.edu/catalog/pdf/ec/ec1186.pdf*.

Root Disease

Schies and Thurrock. 1995. *Laminated Root Rot in Western North America*. Portland, OR: U.S. Dept. of Agriculture, Pacific Northwest Research Station General Technical Report PNW-GTR-349. In cooperation with: Natural Resources Canada, Canadian Forest Service, Pacific Forestry Centre. *http://www.fs.fed.us/pnw/publications/pnw_gtr349/*.

Site Preparation and Reforestation

Atkinson and Fitzgerald. *Successful Reforestation: An Overview*. Oregon State University Extension publication EC 1498. *http://extension.oregonstate.edu/catalog/pdf/ec/ec1498.pdf*.

Weed Management

Pacific Northwest Weed Management Handbook, updated annually. Published by Oregon State University. *http://ag.ippc.orst.edu/pnw/weeds*.

Forest Steward Field Guide. Green Seattle Partnership. *http://www.greenseattle.org/forest-steward-resources*.

Glossary[†]

Aspect. The compass direction which a slope faces.

Canopy. The uppermost layer of the forest, formed collectively by tree crowns.

Clearcut. A harvest and regeneration technique removing all the trees (regardless of size) from a site in one operation. Clearcutting is often used to regenerate species which are intolerant of shade.

Crown. The branches and foliage of a tree.

Disturbance. A natural or human-caused event that alters the structure and composition of an ecosystem.

Hand-scalping. A site preparation technique in which all vegetation and surface roots are cleared from an area using a mattock or similar tool.

Height-to-diameter ratio. The ratio of the total height (in feet) of a tree to its diameter (in inches). Diameter is measured at 4.5 feet off the ground for saplings and just above the ground level for smaller trees. A tree with a lower height-to-diameter ratio tends to be more vigorous.

Inventory. The process of determining the composition of a forest stand. An inventory can be done through an informal reconnaissance or through a more rigorous method using sample plots and/or transects. Typical features surveyed include tree species composition, density, tree size, age, and understory composition.

Leader. The growing top (terminal shoot) of a tree.

Overstory. The portion of trees in a stand that form the upper canopy layer.

Pioneer species. Shade-intolerant species that are the first to colonize a freshly disturbed area.

Release. A stand improvement technique in which desirable species are favored by cutting back vegetation competing with them for light, water, and space.

Rhizome. A horizontal plant stem, often belowground, that sends out new roots and shoots, enabling the plant to spread vegetatively.

Riparian area. The area along the banks of a river, stream, or lake.

Snag. A standing, dead tree.

Spot spray. A weed management technique in which herbicides are applied only to the target vegetation, as opposed to a broadcast spray in which the chemical is applied to an entire area (target and non-target vegetation).

Stand. An area of forest that is relatively homogenous and can be managed as a single unit.

Stocking. A description of the number of trees, basal area, or volume per acre compared with a desirable level for best growth and management. Often used as a relative term such as partially stocked, normally stocked, or overstocked.

Transect. A sampling technique in which a straight line is navigated through an area, often using a compass bearing, and measurements are taken along the line.

Underplanting. The practice of planting trees beneath an existing canopy of taller trees.

Understory. The portion of trees or other vegetation below the forest canopy layer.

[†] Some of these definitions are excerpted from Hanley et al. Terminology for Forest Landowners. Washington State University Extension Bulletin EB1353. *http://cru.cahe.wsu.edu/CEPublications/eb1353/eb1353.pdf*.

Stand Assessment Worksheet

I. Overall site characteristics

- Stand area (dimensions, square acreage) ______
- Slope (steep, flat, moderate, etc.) ______
- Slope aspect (compass direction the slope faces) ______
- Soil (wet, dry, sandy, rocky, etc.) ______

II. Overstory conditions

- Condition of the alder (still vigorous, beginning to die, broken tops, etc.) ______
- Other species present in the overstory (conifer or broad-leaved) ______
- Percentage of the overstory filled by other species ______
- Height of other species, relative to the alder (taller, shorter, same height) ______
- Distribution/spacing (clumped or evenly distributed; how far apart in general) ______
- Condition of other species (healthy, diseased, dying, etc.) ______
- Percentage of canopy closure (for example, fully closed = 100%) ______

III. Understory composition

Shrubs

- Types present (tall, short, woody, etc.) ______
- Percentage cover of each type ______

Conifers

- Seedlings/saplings present (species and quantity) ______
- Height ______
- Height relative to the shrubs (taller, shorter, same height) ______
- Distribution (clumped or evenly distributed) ______
- Condition (healthy, suppressed, dying, etc.) ______

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