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Managing Insects and Diseases of Oregon Conifers

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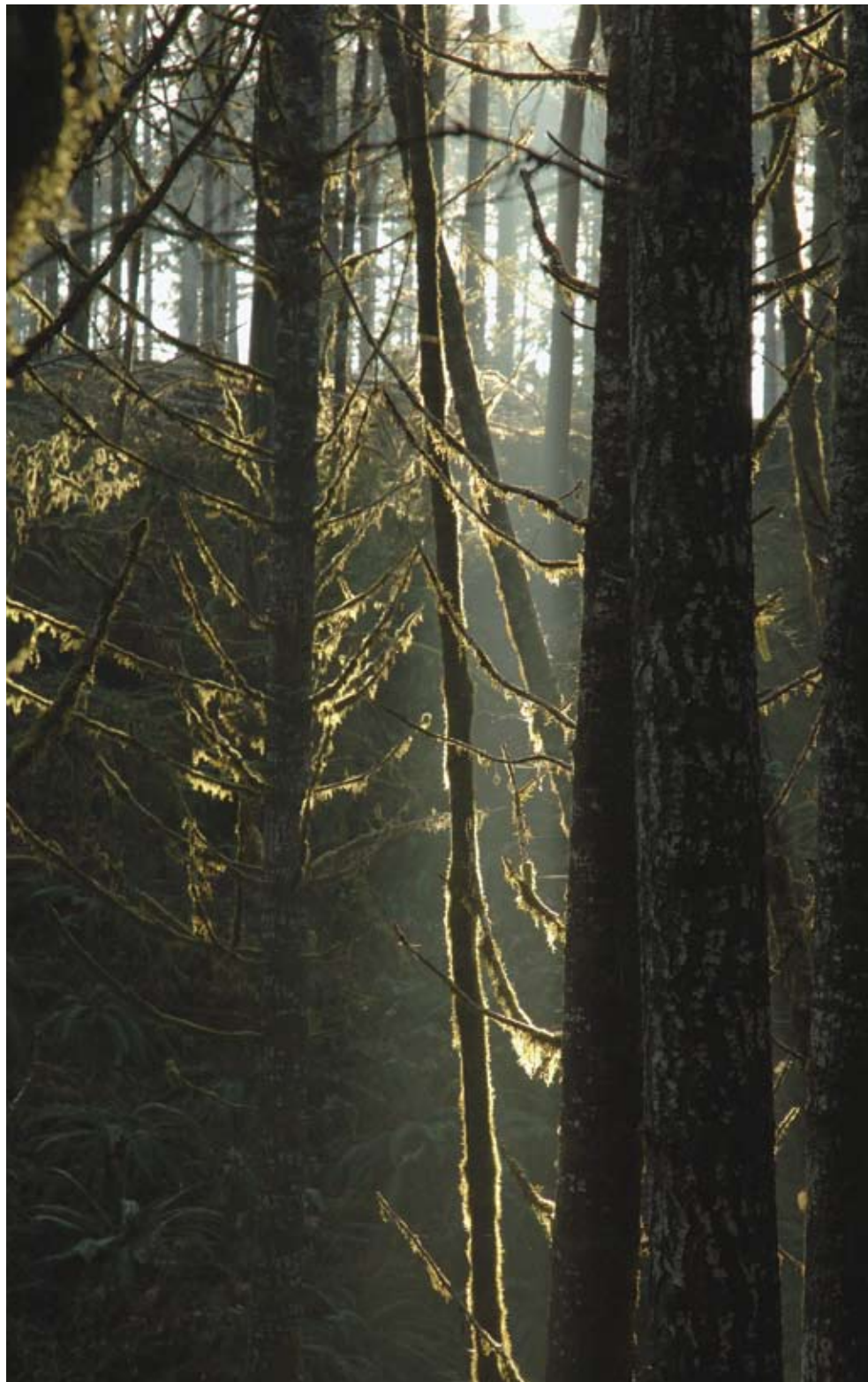
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Introduction

This management guide is designed to help field foresters, loggers, and landowners deal with the major insect pests and diseases of conifers in Oregon forests. We do not attempt to cover every insect and disease, only the most common and economically important. Our focus is on silvicultural techniques; we discuss chemical and biological controls only when relevant or commonly used. We also note that all insects and fungi are not bad—in fact, many of them benefit forests in innumerable ways.

To determine appropriate management action in a certain disease or pest situation:

1. Survey the property and map the general distribution of the problem.
2. Evaluate species composition, stand density, and structure.
3. Describe your overall forest management plan, including your desired economic and wildlife benefits.
4. Develop a proactive management plan that integrates the spatial distribution of the problem and your long-term goals for the site.

Here is an example of how to use this field guide:

You are considering a 40-year-old Douglas-fir stand for commercial thinning. You discover laminated root rot has created canopy gaps. Dead and dying trees surround the gaps, and logs and windthrown trees are in the gaps.

Go to Chapter 6, on root diseases. Table 6-2 (page 44) notes that coastal Douglas-fir is highly susceptible to the disease. Table 6-3 (page 48) lists management strategies, which include excavating stumps or thinning to decrease root contacts. (Planting to favor resistant species is an especially important alternative, but that won't help right now because new planting won't occur until after final harvest.)

Survey the site and determine the extent of the problem. As noted on pages 48–49, if your stand has only one or two root-disease centers, you might be safe in ignoring the problem.

If less than 5 percent of the site is affected, it may be more economical to leave the problem alone.

The companion guide

Management guidance in this book complements *Field Guide to the Common Diseases and Insect Pests of Oregon and Washington Conifers* (Goheen, E.M., and E.A. Willhite, 2006, USDA Forest Service), which is an identification guide.¹

Throughout this publication, we refer to specific pages in Goheen & Willhite for help in identifying a pest and gauging its importance. These references appear as, for example, “(G&W 14–16).” Also see the identification key on pages 1–12 of the *Field Guide*.

¹Ordering information is on page 91.

Since you are considering commercial thinning, you'll want to learn more about:

- Advantages and disadvantages of commercially thinning a root-rot center (page 45)
- Sanitation–salvage cutting (page 45)
- Clearcutting and regeneration (page 46)
- Uneven-age management (page 47)
- Prescribed burning (page 47)
- Stump excavation (page 47)
- Chemical controls (page 48)

Management considerations above are from a strictly economic perspective. If, however, wildlife management is a goal for the site, root-disease centers can play interesting roles in improving habitat. For example, the forest gaps that root disease creates in 20- to 40-year-old westside conifer forests usually improve forage on the forest floor, because more light penetrates the canopy. Also, dead and dying trees provide habitat for cavity-nesting birds and mammals as well as food for insect-eating woodpeckers, nuthatches, and chickadees. Down woody debris can improve habitat for small mammals and amphibians, while pileated woodpeckers will forage on carpenter ants that inhabit down wood. Therefore, base the management of forest insects and diseases on the landowner's objectives, which may differ.

Other resources¹

For an overall silviculture, ecology, and management perspective on the unique eastside forests of Oregon, see *Ecology and Management of Eastern Oregon Forests*. This manual has much information on specific stand management guides by forest type.

For management of insects, weeds, and diseases, including registered chemical controls, see the current editions of the *PNW Insect Management Handbook*, the *PNW Plant Disease Management Handbook*, and the *PNW Weed Management Handbook*. Each volume is revised and reissued annually.

A diagnostic clinic for plant diseases and insect identification operates from the OSU campus, in Corvallis. Forms for submitting samples, fee information, and other details are online at http://www.science.oregonstate.edu/bpp/Plant_Clinic/index.htm

Nursery and seedling pests and Christmas tree problems are not addressed specifically in this guide, but many insects and diseases described in these chapters do affect Christmas trees as well. OSU Extension foresters in county offices can help, also. For an excellent guide to Christmas tree health, see *Christmas Tree Diseases, Insects, and Disorders in the Pacific Northwest: Identification and Management*.

Hazard and danger tree problems are not addressed in this guide, though attacks by many pests discussed in this guide do result in hazard trees (see Chapter 11 for references).

Forest protection against abiotic threats (weather, drought, nutrition, etc.) and vertebrate pests (deer, elk, gophers, bear, etc.) are not discussed in this book. Nor do we discuss invasive insects and diseases currently threatening Oregon but not yet established, such as the gypsy moth. For more information on these topics, see Chapter 11.

¹For details and ordering information, see Chapter 11.

Aphids, Adelgids, and Scale Insects¹

Sucking defoliators—including aphids, adelgids, and scale insects—insert their strawlike mouth parts into foliage and stem tissue and draw out plant juices. Defoliation results when affected needles deteriorate and fall off. Symptoms can appear as stippled foliage (dead spots), needle necrosis, needle distortion such as twisting or stunting, and a thinning crown (Table 4-1, page 33).

Management strategies

Balsam woolly adelgid

Balsam woolly adelgid (BWA) originated in Europe and first appeared in Oregon in the 1920s. It attacks true fir species, principally grand fir, subalpine fir, and Pacific silver fir. Although widespread tree mortality subsided after outbreaks in the 1950s and '60s, this insect currently is in resurgence and is causing significant mortality of subalpine fir at high elevations. It has greatly reduced grand fir at low elevations in the Willamette Valley and, in some high-elevation areas, has eliminated subalpine fir and damaged other true fir. Susceptibility of Pacific silver fir to BWA appears to increase at elevations below 3,000 feet in the Coast Range and Cascades; stands most heavily damaged are on the wettest sites at lower elevations. However, damage is variable throughout the range of Pacific silver fir, which makes forest managers reluctant to plant it.

All BWA individuals in North America are females capable of reproducing without males. Thus, once established, BWA tends to persist indefinitely on a site. BWA has no known native predators or parasites. Significant numbers of predators from Europe, Asia, and Australia have been introduced as biological control agents. A recent review found six beetle and fly species had become established; however, none appeared to be having an impact on BWA populations. Cold winters are thought to reduce BWA survival, but populations often recover quickly and continue to cause damage.

Management steps on forest sites (Figure 4-1) include:

- Harvest the infested and at-risk true fir, and plant nonhost trees adapted to the site.
- Thin out damaged true fir in infested mixed-species stands.
- On infested sites, collect true fir cones from trees without symptoms.

Management steps with ornamental trees:

- Replace the infested tree with a nonhost tree.
- Do not apply nitrogen fertilizer (e.g., urea) to infested trees; it may enhance adelgid survival and reproduction.

¹ Goheen & Willhite, 140–141 and 272–285.

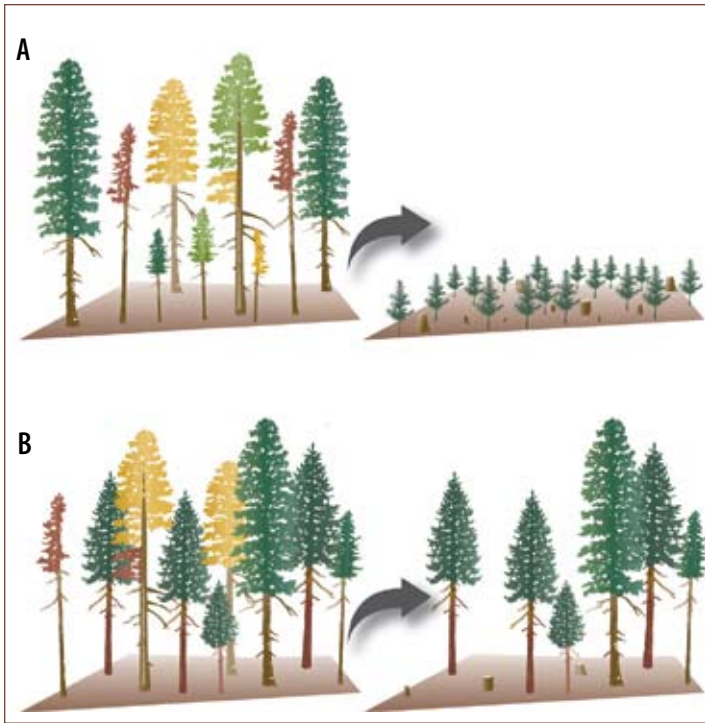


Figure 4-1. Balsam woolly adelgid management:

A) In infested stands dominated by true fir, harvest damaged and high-risk species and convert to nonhost species such as larch, pine, and Douglas-fir;

B) In mixed-species stands, remove damaged and high-risk hosts.

Illustration: Gretchen Bracher.

- If using an insecticide (carbaryl or esfenvalerate), good coverage is essential, and the application must be carefully timed to coincide with the BWA crawler stage, when the insect is most vulnerable. Usually this stage is at or near budbreak in early spring, but timing varies with annual weather patterns. A generally better approach for sap-feeding insects is to use a systemic (imidacloprid) that can be applied to soil or injected into the stem.

Spruce aphid

Sitka spruce trees with sparse crowns, caused by losing older needles, are likely victims of the spruce aphid. Much of the Sitka spruce decline along the Oregon coast is due in large part to spruce aphid. The insect can affect native and ornamental spruce and lives in both western and eastern Oregon, although in eastern Oregon populations develop later in the spring. Large trees tend to be severely defoliated.

Weather and other natural factors normally control aphid populations before they cause significant damage. Mild winters tend to favor population expansions. Prolonged cool temperatures or early spring frosts can help to lower populations.

Fertilizing spruce with nitrogen is not recommended because increased nitrogen in foliage may favor higher aphid populations. Other nutrients may help or be neutral. No insecticides are registered for forest trees. Lower populations on smaller, high-value trees around homes or in parks can be treated with contact pesticides including insecticidal oils and soaps, permethrin, and esfenvalerate. Early-season timing (before needle drop) and thorough coverage are essential for success. Better choices for larger trees are trunk or soil applications of systemic insecticides such as acephate or imidacloprid.

Black pineleaf scale and pine needle scale

The black pineleaf scale (BPS) has caused visible damage and some mortality in pine forests in local areas of eastern Oregon, especially near commercial agriculture areas or where mosquitoes are sprayed, as well as in low-elevation, poor growing areas, and along dusty roads. Both species can be a problem along dusty roads or in landscape plantings.

Natural factors help regulate BPS populations. Several species of parasitic wasps and predatory beetles can control the insect. Weather also plays a role; in particular, prolonged cold and rapid temperature drops during spring development can reduce BPS survival.

In stands exposed to insecticide spray drift, large BPS populations can build up because the spray impacts the insects' natural predators and parasites, including behavioral changes. Because scales are protected by their shells, they are not affected by heavy dust on foliage along roads—but their predators and parasites *are* affected.

To protect natural predators:

- Apply insecticides to crops when temperature, relative humidity, and wind direction and velocity are within the prescription window. This allows the insecticide to settle on the target plants instead of drifting off site.
- Avoid using mosquito fogging in areas or near homesites with mature pines.
- Control dust along roads, construction sites, and urban and industrial areas to increase predator and parasite populations.

Moisture stress affects trees' susceptibility and resiliency to infestations. Stands on the fringe of rangeland (i.e., marginally productive forest sites), upland sites, south slopes, or sites that are overstocked or experiencing extended drought are at higher risk. Pole-size and larger trees are at greater risk of attack and defoliation.

Silvicultural practices that can help tree resistance include thinning and, in home landscapes, watering. Watering improves tree crowns and so increases the tree's tolerance to scale infestation.

Use pesticides safely!

- Wear protective clothing and safety devices as recommended on the label. Bathe or shower after each use.
- Read the pesticide label—even if you've used the pesticide before. Registrations may change or be withdrawn at any time. Follow closely the instructions on the label (and any other directions you have).
- Be cautious when you apply pesticides. Know your legal responsibility as a pesticide applicator. You may be liable for injury or damage resulting from pesticide use.

Thinning reduces competition for moisture and thus fosters tree vigor. Choosing leave trees with live-crown ratios of at least 30 percent is essential to keeping vigor high in your stand. Thinning also can help control the insects' spread. Wind can carry BPS crawlers; thinning dense stands improves the chance that windblown crawlers will fall to the ground and starve or become prey.

The severity of an infestation indicates whether management intervention is needed. To assess severity, count the number of live scale insects per inch of needle on current-year growth. The sampling process outlined on page 34 may be more intensive than some forest-land owners will want to do themselves; however, understanding the process will be helpful even if the work is contracted.

Table 4-1. Important sucking defoliators in Oregon: Hosts, key identifiers, distribution, and severity.

Pest	Major hosts	Key identifiers	Distribution and severity
Balsam woolly adelgid (introduced) <i>Adelges piceae</i>	True firs, especially grand fir, Pacific silver fir, and sub-alpine fir	<ul style="list-style-type: none"> • White “woolly” tufts on tree branches and boles • Swollen (gouty) branch nodes and terminal buds • Misshaped crowns • Thin, reddish brown, or blackish green crowns 	Throughout Oregon. Particularly susceptible are grand fir in western Oregon lowland valleys and Pacific silver fir and sub-alpine fir at the lower extremes of their ranges.
Spruce aphid (introduced) <i>Elatobium abietinum</i>	Sitka spruce and ornamental spruces	<ul style="list-style-type: none"> • Chlorotic (yellowing) or sparse foliage • Healthy green branch tips • Small green aphids on underside of older needles 	Coastal Oregon on Sitka spruce; throughout Oregon on ornamentals. Outbreaks on Sitka spruce are sporadic and short lived.
Black pineleaf scale <i>Nuculaspis californica</i>	Ponderosa pine, sugar pine, Jeffrey pine, and lodgepole pine	<ul style="list-style-type: none"> • Small, black scale insects on needles • Thin tree crowns • Foliage mostly at branch tips • Discolored and stunted needles 	Throughout Oregon, but most damage is east of the Cascade crest. In local areas, damage can be significant; infestation predisposes trees to bark beetle attack.
Pine needle scale <i>Chionaspis pinifoliae</i>	Ponderosa pine and lodgepole pine	<ul style="list-style-type: none"> • White scale insects on needles 	Throughout host range. Weakened trees susceptible to bark beetle attack and slower growth.

To assess an individual tree, take four branch samples from the lower to middle crown (one branch from each side of the tree), then randomly sample at least 25 needles of current-year growth per branch (100 needles per tree). For stands, use a systematic tree-selection approach that covers the area, selecting a total of at least 10 dominant or co-dominant trees. Count the number of scale insects per inch of needle. If the average insect count is less than half a scale per inch, damage is not likely. Densities of up to four scales per inch of needle could reduce growth, but detailed studies are lacking. Densities greater than four scales per inch of needle have been shown to reduce needle length and retention. If this continues over several consecutive years, it can lead to reduced twig or leader lengths and a decline in radial growth. At densities above 20 insects per inch (over several years), needle loss can be severe and, along with additional declines in terminal and radial growth, can make trees more susceptible to being killed by bark beetles or other agents, such as drought.

Foliar sprays of contact insecticides (permethrin or bifenthrin) generally are not recommended; they are difficult to time correctly (must be when crawlers are moving onto new needles) and may also harm natural enemies. Systemic insecticides (acephate or imidacloprid) injected into the trunk or soil in early spring can also be used to reduce populations on high-value trees. However, scale populations may continue to rise unless the underlying causes are resolved, such as poor site conditions, spray drift, and dust.



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