Diseases and Willamette Valley ponderosas

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Even though numerous diseases of ponderosa pine are in the Willamette Valley, very few have caused significant damage.

In managed forests, trees typically live for 40 to more than 100 years. During this time, environmental conditions and pathogen populations can change drastically.

Many native diseases break out when environmental factors affect both the host trees and the pathogens and favor infection and disease development. Diseases absent for decades can appear suddenly and cause damage over an entire landscape. For example, during the late 1940s, Elytroderma disease (a needle disease of pines) increased dramatically in eastern Oregon, killing trees and resulting in the salvage of millions of dead and dying trees. A few years later, active disease could be found only occasionally.

Figure 31.—Environmental conditions and pathogen populations might change drastically before this seedling reaches full maturity.

Currently, ponderosa pine is widely scattered in the Willamette Valley and usually grows in small groves or as a component of mixed-species stands. Few even-age plantations exist. But this is changing, and with change comes risk—risk that currently benign or minor diseases will be catapulted to significance as our management practices interact with environmental factors.

Recent observations of Douglas-fir provide a cautionary tale. For most of the twentieth century, coastal Douglas-fir was considered a relatively disease-free species except for root diseases. It was planted practically everywhere—in dense, even-age plantations on coastal sites and on harsh sites in the Willamette Valley. For decades, the trees did well even with occasional setbacks from environmental extremes such as drought and unusually low temperatures.

Beginning in the late 1980s, however, a significant and widespread problem in coastal Douglas-fir plantations became apparent. Swiss needle cast, thought for years to be a benign native needle disease of Douglas-fir, now severely damages hundreds of thousands of acres of coastal Douglas-fir.

The plausible explanation for the outbreak is a combination of factors that include the establishment of dense, even-age plantations in an environment conducive to the disease, the use of off-site seed sources, and possibly environmental factors that have not been found to date. Before plantations became widespread in the Coast Range, Swiss needle cast was such a minor disease in Oregon that pathologists debated whether the causal fungus was even pathogenic.

The Swiss needle cast situation and other experience in plantation forestry suggest caution as ponderosa pine planting increases in the Willamette Valley. Mixed-species stands will provide some buffer against unforeseen diseases and environmental stresses. Deploying only genetically suitable seedlings should minimize damage and may prevent buildup of certain pathogens. Carefully monitoring incidence and severity of disease will fill gaps in our knowledge and improve management decisions.

The descriptions that follow draw heavily on observations of ponderosa pines growing in places other than the Willamette Valley. Diseases that are likely to cause damage are included even though they may not have been observed in the Willamette

Valley. No doubt we have overlooked a few diseases that have not yet become obvious or whose potential we have underestimated. For more information about these diseases, including pesticide recommendations, see the current edition of the "Pacific Northwest Disease Management Handbook" (see page 39).

Needle diseases

Red band needle blight
(Dothistroma needle blight)

Caused by the fungus *Mycosphaerella pini* (synonyms *Scirrhia pini, Dothistroma septospora,* and *Dothistroma pini)*

Red band needle blight affects many species of pine throughout the world. Damage tends to be most severe in areas with cool, moist weather. Off-site plantings of native or exotic pines often are damaged severely by this disease.

The term "red band" refers to one of the disease symptoms, which is a red-brown band on needles at the point of infection. The disease causes needles to turn brown and eventually drop from the tree. Foliage loss results in growth loss and occasionally can kill young trees. In the Pacific Northwest, damage to ponderosa pine has been spotty and apparently relates to local climatic conditions and suitability of the particular seed source to the site.

Hosts Many pine species are susceptible. In the Pacific Northwest, the most susceptible are ponderosa, shore, Scots, Austrian, and knobcone x Monterey (KMX) hybrid pines.

Damage potential for Willamette Valley ponderosa pine Low. Damage potential is moderate if off-site pines are planted, particularly in areas with unusually cool, moist conditions.

Symptoms The initial symptom of yellow or tan spots on needles eventually develops into red or brown bands encircling the needle (Figure 32). The part of the needle beyond the band dies and turns tan while the needle base remains green. Eventually the whole needle dies and falls from the tree. Small black fruiting structures break through the surface of the dead needle and may be visible any time of year.

Symptoms often are most abundant in the lower crowns of trees. As infected needles are shed, the tree crown becomes sparse and transparent. Loss of older needles may give branches a peculiar tufted appearance, referred to as "lion's tailing," in which only a tuft of the most recently produced needles remains at the branch end.

Disease management Severe episodes of red band needle blight have not been reported on Willamette Valley ponderosa pine. However, as the number of pines planted increases, disease potential may increase.

Use preventive cultural methods, such as the following, to reduce disease risk.

- Use local seed sources.
- Maintain good air circulation around young trees by controlling competing vegetation.
- Prune lower branches as tree size permits (do not remove more than 50 percent of the live crown).
- Avoid planting in areas with persistent cool, moist conditions or with a history of damage from the disease.

Chemical control usually is not warranted in forest plantings.

Figure 32.—Symptoms of red band needle blight include yellow to tan spots that eventually become red bands encircling the needle.

Lophodermella needle cast (Bynum's blight)

Caused by the fungus *Lophodermella morbida*

Lophodermella needle cast is a potentially serious disease of ponderosa pine west of the Cascades in Oregon and Washington. The disease causes needles to turn brown rapidly and eventually to fall from the tree. The main effect on trees is growth loss, but young trees can die after several years of severe defoliation.

Figure 33.—Ponderosa pine infected with Lophodermella needle cast.

The first reports of this disease were from the Willamette Valley near Corvallis in a ponderosa pine plantation. Other reports were from the west slopes of the Cascades. Many pine plantings with severe damage were from eastern Oregon seed sources, but the disease has been observed in trees with probable Willamette Valley sources. Areas with moist conditions in June or July, particularly those prone to persistent fog, are highly conducive to the disease. There is much genetic variation in ponderosa pines' susceptibility to *L. morbida.*

Figure 34.—Fruiting bodies of the fungus Lophodermella morbida.

Hosts Ponderosa pine; also knobcone pine in northern California

Damage potential for Willamette Valley ponderosa pine Low. Damage potential is moderate to high on the western slope of the Cascades in areas with persistent fog, usually between 2,000 and 4,000 feet elevation.

Symptoms Current-year needles begin to turn brown by late summer or early fall, within a few weeks of infection, although they remain on the tree. After spore release in spring, dead needles fall off (Figure 33). Severely damaged trees may have few green needles intact in spring before the new foliage emerges. Pale brown fruiting bodies are faintly visible on needles in fall; they darken to almost black and are highly visible in spring of the following year. The fruiting bodies have a football shape and align neatly in the center of the needle (Figure 34).

Disease management Cultural—Plant only trees from Willamette Valley seed sources. On western slopes of the Cascades, plant only below 2,000 feet elevation. Avoid areas known to have persistent fog in June and July or that have a history of Lophodermella needle cast.

Chemical—Fungicides such as chlorothalonil effectively control Lophodermella needle cast but are not recommended for forest trees.

Lophodermium needle cast

Caused by the fungi *Lophodermium seditiosum* and *L. pinastri*

Of the two pathogens, only *L. seditiosum* is aggressive and capable of colonizing and killing 1-year-old needles. *L. pinastri* is weakly pathogenic or saprophytic (living on dead organic matter), colonizing only older age classes of needles; it rarely, if ever, causes damage.

Serious damage to Willamette Valley ponderosa pine from any species of *Lophodermium* has not been observed, even though the pathogens are present.

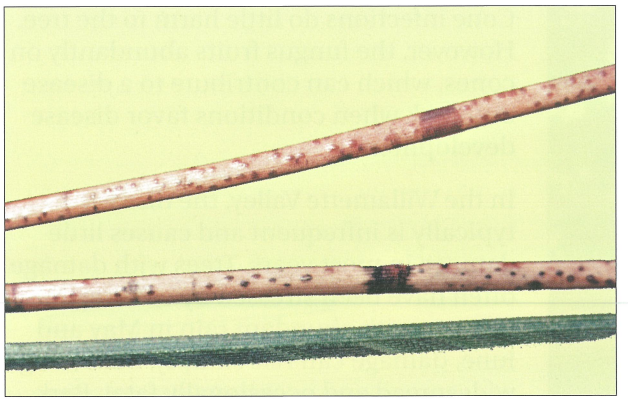


Figure 35.—Fruiting bodies of the needle cast fungi Lophodermium.

Hosts Ponderosa pine and other two- and three-needle pines.

Damage potential for Willamette Valley ponderosa pine Low

Symptoms Missing older needles and straw-color needles with black to light brown fruiting structures. *Lophodermium* species produce dull to shiny black oval fruiting structures at or near the needle surface, which commonly are visible in dead needles on or under trees (Figure 35). In Valley ponderosa pine, usually only the oldest needle age classes (3 years or older) have symptoms of fruiting structures. Taxonomy of *Lophodermium* species is complicated, and in most cases only specialists can determine the species accurately.

Disease management Cultural—Specific control measures for Lophodermium needle cast usually are not warranted in forest situations. During thinning or other partial harvesting, selecting the trees that look healthiest may have some benefit.

Chemical—Not necessary in forest situations. In ornamentals, fungicides such as chlorothanil applied from August to October can protect needles from infection by *L. seditiosum.*

Branch and stem diseases

Sphaeropsis shoot blight (Diplodia shoot blight, Diplodia canker, pine tip blight)

Caused by the fungus *Sphaeropsis sapinea* (synonym *Diplodia pinea)*

Sphaeropsis shoot blight is a disease of ponderosa pine characterized by dead branch tips. The disease is common on Valley ponderosa pine in years with abundant spring and early summer rain. In most years, the disease seems practically nonexistent. The most recent outbreak in the Valley was 1996–97.

Sphaeropsis blight rarely kills trees, but parts of the crown may be deformed when disease is severe. Infected trees may be attacked and killed by the red turpentine beetle or other bark beetles. Most observations of this disease to date in the Valley have been on mature trees. Stressed trees seem particularly susceptible.

Figure 36 (above).—Ponderosa pine affected by Sphaeropsis shoot blight.

Figure 37 (left).—Pitch binds needles, killed by Sphaeropsis shoot blight, to the branch shoot.

Figure 38.—Galls, caused by western gall rust fungi, on ponderosa pine.

Hosts Ponderosa and other pines

Damage potential for Willamette Valley ponderosa pine Moderate

Symptoms The obvious symptom of Sphaeropsis blight is the red-brown needles of dead shoots in the tree crown. These usually are most visible in late summer or fall. When disease is light, scattered shoots show symptoms; when severe, the entire crown or a part of it may appear as if scorched by fire (Figure 36). Repeated infection results in dead branches and, occasionally, top-kill.

Close examination of blighted shoots shows abundant pitch at the base of needles and on the shoot. Dead needles typically are bound to the shoot by abundant pitch (Figure 37). Bark and wood at the base of these shoots is impregnated with resin.

Fruiting structures of the fungus are inconspicuous on infected shoots, but spores are easily identified by specialists. The fungus also infects cones and produces fruiting structures on them.

Biology and disease development *Sphaerospsis* spores infect needles, shoots, second-year cones, and occasionally stems. Most infection occurs on needles and shoots in spring when moisture is abundant and tissues are succulent. The fungus grows through needles and into stem tissues, causing the shoot and buds to die back.

Cone infections do little harm to the tree. However, the fungus fruits abundantly on cones, which can contribute to a disease outbreak when conditions favor disease development.

In the Willamette Valley, the disease typically is infrequent and causes little damage in most years. Trees with damage often have been stressed by other agents. In years with abundant rain in May and June, damage can rise sharply, becoming widespread and occasionally fatal. Bark beetle attacks often hasten mortality. Even if most of the tree's crown dies back, it can recover within a year if weather does not favor the outbreak's continuing.

Disease management Cultural—Pruning infected branches on ornamental trees may improve appearance but probably will not affect disease levels because of abundant fungal spore production on cones. Prevent tree stress by avoiding site and soil disturbance and tree damage. Promote vigorous growth through vegetation management and stocking control in forest situations.

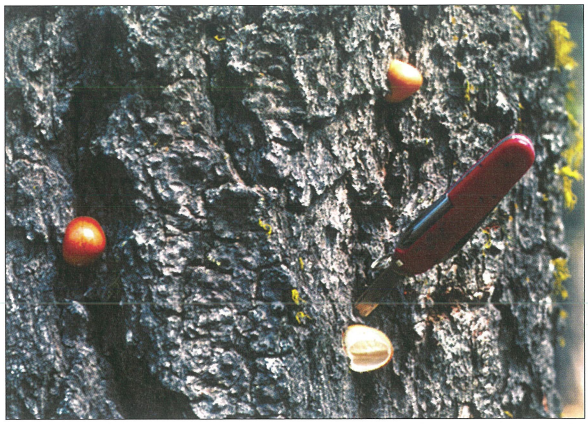
Chemical—Not necessary in forests. Several chemicals are available to protect new shoots from infection in ornamental trees.

Western gall rust (Pine gall rust)

Peridermium harknessii (Synonym *Endocronartium harknessii*)

Western gall rust is a widespread disease of hard pines caused by a fungus that induces the tree to form round, woody swellings (galls) on stems and branches. Galls on the main stem seriously degrade lumber value and may be a break point if stressed by wind, snow, or ice. Some people consider branch galls unsightly in ornamental plantings, and they may harm tree growth. Infections on the main stem of a seedling or sapling can kill the tree.

Figure 39.—A ruptured gall releases spores of western gall rust fungus.



Figures 40a, 40b, and 40c.—Conks indicate tree decay, caused by various fungi.

In the Willamette Valley, Western gall rust has not caused much damage in young plantations, possibly because we have so few of them. Observations in mature trees have revealed very heavy branch infection in the upper crowns of many trees but few infections on the main stems. In some areas, the disease has severely damaged KMX pine.

Hosts Ponderosa pine and other hard pines

Damage potential for Willamette Valley ponderosa pine Moderate. The disease is quite common in the Valley and likely will increase in young trees as plantings increase.

Symptoms The most common symptom is round, woody galls on branches and main stems (Figure 38). These are the tree's response to infection. The bark-covered galls range in diameter from about 0.5 inch to 4 or 5 inches on branches and up to 12 inches on main stems.

Most of the year, the galls are bark covered or at least bark color. From May to early June, masses of spores develop in blisters on the gall's surface; when the blister's thin cover ruptures, the brilliant yellow-orange spores become visible (Figure 39).

Disease management Cultural—Individual pines vary in their genetic susceptibility to western gall rust. Select apparently resistant individuals for crop trees or seed trees. During thinning, remove trees with galls on the main stem or within a few inches of the main stem. It is not necessary to remove all trees with branch galls, only branches with galls that would be encompassed by trunk growth by the time the tree is harvested. Pruning galls on ornamental trees reduces spore production and improves the tree's appearance.

Chemical—Not recommended.

Decays

(Heart rot, decay following wounding)

Caused by many fungi including *Phellinus pini, Heterobasidion annosum, Fomitopsis pinicola,* and *Phaeolus schweinitzii*

Wood decay fungi enter a tree through wounds, broken branches, or small branch stubs. These fungi rarely kill trees, and they reduce tree growth only when decay is very extensive. Decay reduces the value of wood products and weakens tree structure, increasing the likelihood of breakage during storms. On the other hand, because decayed wood provides habitat for many animals for nesting, foraging, or other activities, some decayed trees are desirable.

Because ponderosa pine is resinous, it is less prone to decay than many other conifers. Most decay of living trees is associated with broken tops and branches or with fire or machinery injury to the main stem.

Decay is most damaging to mature and overmature trees, usually more than about 125 years old.

Three categories of decay affect Willamette Valley ponderosa pine: heart rot, butt rot, and sap rot.

Heart rot typically begins in living trees and results in decay of the central heartwood cylinder. The most common heart rots of ponderosa pine are red ring rot, caused by the fungus *Phellinus pini*, and brown trunk rot, caused by the fungus *Fomitopsis officinalis* (quinine conk).

Figure 41.—Animal holes are a sign of tree decay.

Two wound-invading fungi, *Heterobasidion annosum* (which causes a white rot) and *Fomitopsis pinicola* (the red-belt fungus, which causes a brown crumbly rot) often cause decay after a main stem wound.

Phaeolus schweintizii is the most common butt rot of ponderosa pine. It causes a brown cubical rot of the base of the trunk and in roots. *P. schweinitzii* and *H. annosum* also are considered root diseases.

Sap rot is a decay of the sapwood, which generally proceeds rapidly after the tree is dead. The pouch fungus, *Cryptoporus volvatus,* causes a gray-brown sap rot and is a common and visible sap rotter of recently killed ponderosa pine.

The most common stem decays of ponderosa pine are in Table 4.

Hosts All trees are subject to decay.

Damage potential for Willamette Valley ponderosa pine Moderate

Symptoms Conks are the spore-producing structures of many wood-decay fungi. Conks often are visible on the main stem of the tree or at the bases of branches (Figures 40a–c, page 27). Conks generally indicate a substantial amount of decay. In general, more and larger conks indicate greater amounts of decay.

Wounds or animal holes also indicate decay (Figure 41).

The amount of decay increases with wound size and age, and basal wounds tend to have more associated decay than wounds on the upper stem.

Various other indicators such as old breaks from snow weight, swollen knots, swollen butts, and stem cracks may indicate internal decay.

Disease management Management can influence the amount of decay and defect in a stand or tree. Increasing the frequency and size of wounds will result in more decay; preventing wounds will reduce the amount of decay.

Decay also can be deliberately introduced into a tree by drilling holes and inserting wood dowels infested with decay fungi. You might want to do that if you're trying to attract cavity-nesting wildlife to your ponderosa pine stand.

Table 4. Common stem decays of ponderosa pine

Decay	Synonyms for fungus or decay	Causal fungus
Gray-brown saprot	Pouch fungus	*Cryptoporus (Polyporus) volvatus*
Brown trunk rot	Quinine conk, chalky fungus, red-brown heart rot	*Fomitopsis officinalis*
Red ring rot	White speck, pini conk, conk rot, white pocket rot	*Phellinus (Fomes) pini*
Red-brown butt rot	Schweinitzii rot, brown-cubical rot, velvet top fungus	*Phaeolus (Polyporus) schweinitzii*
White spongy rot	Annosum root rot, Fomes root rot, white stringy rot	*Heterobasidion (Fomes)*
Brown cubical rot	Sulfur fungus, chicken of the woods, red-brown heart rot	*Laetiporus sulfureus*
Brown crumbly rot	Red-belt fungus, brown-cubical rot, pinicola conk	*Fomitopsis pinicola*

Figure 42.—A tree infected with Armillaria *typically exudes resin at its base.*

Most managers want to limit the amount of decay in a stand and can do so by following these guidelines.

- Manage on rotations of 125 years or less.
- Maintain tree vitality by thinning.
- Thin stands when young so decay columns that develop from injuries stay small.
- Select crop trees with the least amount of defect and with the best form and vitality.
- When pruning, cut only to the branch collar; do not cut flush with the trunk or leave stubs.

Minimize wounding during stand management by taking these steps.

- Avoid logging when bark is loose (that is, spring and early summer).
- Match equipment size with topography, tree size, and soil characteristics.
- Designate skid trails before logging.
- Match log length with crop-tree spacing.
- Cut low stumps in skid trails.
- Use directional felling.
- Remove limbs on felled trees before skidding or yarding them.
- Remove slash from base of crop trees if the site is to be burned.
- Explain to the loggers the effect of tree wounding and gain their cooperation in preventing it.

Root diseases

Armillaria root disease (Shoestring root rot)

Caused by the fungus *Armillaria ostoyae* (synonyms *A. mellea, A. obscura,* honey mushroom)

Several species of *Armillaria* cause root diseases in Pacific Northwest trees. Of these, *Armillaria ostoyae* is the species most aggressive on conifers in Oregon.

Armillaria root disease occurs throughout the Willamette Valley, where it affects conifers and hardwoods. It is a major disease of Oregon white oak and also damages Douglas-fir plantations less than about 30 years old. In some locations, most Douglas-fir planted on cleared or partially cut Oregon white oak woodlands have died. *Armillaria* can damage ponderosa pine planted in similar situations.

Hosts Many conifer and hardwood species

Damage potential for Willamette Valley ponderosa pine Moderate. Many Willamette Valley ponderosa pine plantations have been established in agricultural fields, pastures, or brushfields, in which risk of Armillaria root disease is low because of a lack of inoculum. As plantations increase in oak woodlands and sites previously stocked with conifers, damage potential likely will increase. The susceptibility of Willamette Valley ponderosa pine to *Armillaria* in other trees in the Willamette Valley is unknown, but in most other locations in Oregon,

Figure 43 (below).—Mycelial fans.

Figure 44 (bottom).—Rhizomorphs in infected wood.

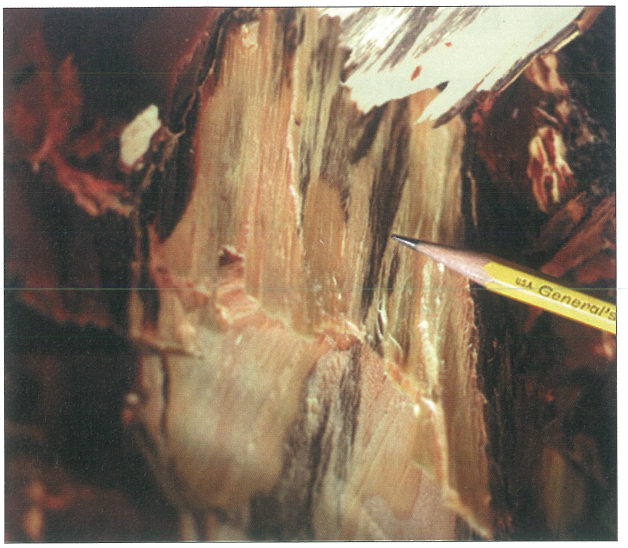


Figure 45.—Black stain root disease.

ponderosa pine is relatively tolerant of the disease.

Symptoms Infected young trees yellow and die rather suddenly, usually during summer when trees experience the most severe moisture stress. Mature trees may decline over several years, showing typical aboveground root disease symptoms such as chlorosis, sparse crown, reduced rate of height growth, and a distress cone crop.

A tree infected with *Armillaria* typically exudes resin at its base (Figure 42, page 29) in response to the fungi growing under its bark. Removing the bark near the margin of resin flow reveals dense white rubbery mats of fungal mycelium called mycelial fans. These are in the inner bark and at the interface between the bark and wood. Bark must be chopped into or otherwise removed to see the mycelial fans (Figure 43, page 29).

Rhizomorphs are dark brown to black shoestringlike fungal structures that may be in or on infected or decayed wood (Figure 44, page 29). The honey-color mushrooms may appear at the bases of infected trees (live or dead) in autumn. They are especially abundant on infected Oregon white oaks.

Disease management Cultural—Keep trees vigorous by managing competing vegetation and by controlling stocking. Some disease tolerance often develops as trees age. If disease develops in a stand, do not repeatedly salvage dead and dying trees; that could make the disease worse. Removing "bridge" trees at the periphery of a disease patch might curtail spread into the adjacent trees. Mechanically removing stumps and roots could reduce inoculum, but removal must be very thorough and so is likely to be cost prohibitive in the vast majority of situations.

Chemical—Not recommended.

Black stain root disease

Caused by the fungus *Leptographium wageneri* (synonyms *Verticicladiella wageneri* and *Ophiostoma wageneri)*

Black stain root disease first came into prominence in Oregon as a disease of Douglas-fir that severely damaged young plantations in southwest Oregon. Since then, another strain of the fungus has been identified that attacks pines. This strain currently attacks ponderosa pine in eastern Oregon and in northern California. It has not been reported on pine in the Willamette Valley.

Black stain is a vascular wilt disease very similar to Dutch elm disease. It kills trees by plugging the water-conducting tracheids of the sapwood. Unlike other root diseases of ponderosa pine, it can spread both by vegetative growth of mycelium across root contacts and by several insects that carry the spores on their bodies over long distances.

Hosts Two strains of the fungus are in Oregon; one infects pines, and the other infects Douglas-fir.

Damage potential for Willamette Valley ponderosa pine Low

Symptoms Aboveground symptoms are typical of other root diseases. Infected young trees yellow and die suddenly, usually during summer, when trees experience the most severe moisture stress. Mature trees may decline over several years, showing symptoms such as chlorosis, a sparse crown, reduced rate of height growth, and a distress cone crop. Infected trees often are attacked by bark beetles before aboveground symptoms are evident. Decline and death usually is in groups of trees, reflecting the contagious nature of the disease.

Resin flow sometimes appears at the base of an infected tree. The disease is diagnosed by chopping through the bark and into the wood at the tree base or a large lateral root. Streaks of dark brown to black stain in the outer few rings of wood are diagnostic (Figure 45). The "stain" is in fact the dark microscopic strands (hyphae) of the fungus.

Biology and disease development The disease spreads in patches when fungal mycelium grows across root contacts from an infected tree to a healthy tree. Once inside the root, the fungus grows toward the root collar and eventually colonizes other roots. As the fungus colonizes the water-conducting tubes in the root and root collar, water transport is disrupted, and the tree declines and dies. The fungus does not decay the wood and can remain alive only 1 or 2 years after the tree dies.

The disease spreads long distances when bark beetles and weevils contact fungal spores while feeding or reproducing in roots. Infested insects fly to other trees to feed or reproduce, putting spores in contact with wood of the uninfected tree. Disease patches often originate in areas of site disturbance or tree stress such as roadsides and wet areas. Trees in these areas appear to attract the insects that transmit the disease.

Disease management Cultural—Prevent the disease by limiting stand disturbances. In particular, avoid soil compaction and tree damage, both of which might attract insects that transmit the disease. If disease develops in a stand, favor other tree species whenever possible.

Annosum root disease (Annosus root disease)

Caused by the fungus *Heterobasidion annosum* (synonym *Fomes annosus)*

Annosum root disease is an important root disease of true firs and pines in Oregon. Two forms or strains of the causal fungus are in Oregon: the S-group and the P-group. The S-group infects true fir, hemlock, and spruce; the P-group infect pines.

Annosum root diseases can kill ponderosa pine of all ages, and it does so in parts of eastern Oregon. To date, annosum root disease has not been reported as causing damage in Willamette Valley ponderosa pine.

Hosts Ponderosa pine plus many other conifers

Damage potential for Willamette Valley ponderosa pine Low

Symptoms Aboveground symptoms of annosum root disease are similar to those of other root diseases: chlorotic foliage, sparse crowns, and reduced rate of height growth. Infected pines often die standing, either as the direct result of the pathogen or because of bark beetles which are attracted to trees infected with root disease. Declining and dead trees typically are in small groups (Figure 46).

The disease can be difficult to diagnose in pines. In declining or recently killed trees, root wood often is resin soaked. Small conks may be visible in the duff near the tree base or on root surfaces near the root collar. A tree disease specialist usually is required to confirm annosum root disease in ponderosa pine.

Biology and disease development Annosum root disease spreads through two mechanisms:

- Vegetative growth of mycelium from an infected root to a healthy root at the point of contact

Figure 46.—Dead and dying ponderosa pine, casualties of annosum root disease.

- Wind-blown spores, which colonize wounds or cut stump surfaces. Freshly cut stumps are susceptible to infection for about 1 month after cutting. Spores landing on stumps germinate and grow into the stump, through the root system, and into the roots of adjacent healthy trees.

Annosum root disease is most severe in stands that have been repeatedly thinned or partially cut and so have many stumps and mechanical wounds. Bark beetles frequently attack and kill trees infected with *H. annosum.*

Disease management Cultural—Logging practices that minimize tree damage can reduce the risk of disease. Losses also can be reduced by keeping rotations to less than 125 years and, when thinning, by removing trees with wound-associated decay.

Chemical—If disease is not already in the stand, prevent stump infections by treating cut stump surfaces with a commercial powdered formulation of borax called Sporax, immediately after cutting. Sporax treatments might also be appropriate in landscapes or parks.

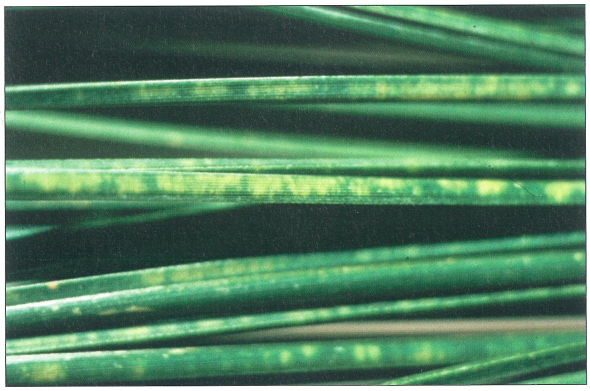


Figure 47.—Chlorotic mottle on pine needles, a symptom of ozone injury.

Environmental stresses

Ozone injury

Ozone is the most likely pollutant to damage ponderosa pine in Oregon. Ozone forms in the atmosphere when nitrogen dioxide and hydrocarbons (mostly from auto emissions and fossil fuel industries) react with sunlight. Typically, ozone concentrations are highest on mountain slopes, downwind of major metropolitan areas, and during warm, sunny weather.

Hosts Ponderosa pine is the most susceptible Oregon conifer.

Damage potential for Willamette Valley ponderosa pine Low. Ozone levels generally are low in the Willamette Valley.

Symptoms The classic signature of ozone injury to ponderosa pine is chlorotic mottle on needles (Figure 47). However, needle discoloration can be for other reasons as well; diagnosis by a specialist is best. Pines with significant ozone injury lose needles in older age classes and exhibit abnormally short, yellow, mottled needles. Affected needles function poorly and eventually fall from the tree. Loss of foliage and impaired needle function both contribute to reduced growth. Affected trees are more susceptible to attack by bark beetles and to annosum root disease.

Disease management Don't pollute. Encourage clean power production, less use of motor vehicles, cleaner auto emissions, and mass transportation.

Autumn browning

Ponderosa pine typically sheds older needles in autumn. Needles turn yellow then red-brown. The sudden browning of needles throughout the crown can be alarming, but it does not indicate disease. Usually the entire needle bundle drops. Autumn browning is most dramatic during droughts.

Animal damage and Willamette Valley ponderosas

R. Fletcher and H. Dew

Like most conifers, ponderosa pine has its share of animal pests. Most animal damage is during the reforestation stage, when seedlings are vulnerable.

Rodent damage

Good vegetation management *before* planting trees is the best way to prevent mice and vole damage. When these destructive creatures are allowed the cover of vegetation, they will girdle young seedlings by chewing the bark and cambium (Figure 48).

Hoeing, mulching, or spraying around the seedlings after planting can prevent damage. Using Vexar tubes also helps if the tube is tight to the ground (Figure 49).

Figure 48.—Vole damage to young pine seedling.

Figure 49.—Vexar tubing can reduce damage from many types of animals. However, it is not failsafe and must be maintained periodically.

For more information on rodent damage, refer to OSU Extension publications EC 1255, "Controlling Pocket Gopher Damage to Conifer Seedlings," and EC 1256, "Controlling Vole Damage to Conifer Seedlings" (see page 39).

Porcupine damage

Porcupine damage is becoming more prevalent in the Willamette Valley because of a building population over the last few years (Figure 50, page 34). Prevention is difficult because of these creatures' stealth. It's usually too late for a few trees by the time you discover the damage, but you must find the culprit immediately to prevent more damage.

Figure 50.—Porcupine damage to ponderosa pine seedling.

Currently, no repellents have proved effective on porcupines in the Willamette Valley. Poison baits are available but should be used very carefully to avoid poisoning nontarget species. Hunting and trapping seem to be the best methods of control.

Big game damage

Deer and elk in the fall rub their antlers on trees to remove velvet, and for some unknown reason pines are prime targets. Rubbing can severely damage or even kill young trees with thin bark.

In addition, deer and elk sometimes will browse ponderosas (Figure 51), although they seem less interested in pines than in other conifer species that you might plant.

A variety of tree protection devices can shield young trees from browse damage. Repellents also have been used successfully in some cases. Keeping deer and elk from rubbing on trees can be much trickier. Hunting is one good solution to this problem.

For more information on this topic, refer to OSU Extension publication EC 1201, "Understanding and Controlling Deer Damage in Young Plantations."

Livestock damage

If at all possible, avoid letting livestock graze uncontrolled in a ponderosa pine plantation. Livestock trample and do great damage to small seedlings. They also compact the soil, which is not good for tree growth.

If livestock numbers and grazing period are carefully regulated, however, as in an agroforest, pines can be very compatible with livestock.

Beaver damage

Ponderosa pine is being planted as a streamside tree in watershed plantings. While an excellent choice for this purpose, it also is susceptible to damage by river beavers. Prevention is difficult but not impossible. Individual fencing with small-mesh wire may be the best way to protect both young seedlings and older trees.

Figure 51.—Deer-browsed pine seedling.

Harvesting and marketing Willamette Valley ponderosa pine

S. Bowers

Some special considerations apply to harvesting and marketing Valley ponderosa pine if you want to maximize the value of your timber harvest and avoid some of the pitfalls.

Considerations include:

- Felling and bucking techniques
- Elapsed time from stump to mill
- Purchase order specifications
- Mill selection

Harvesting tips

This is a good time to restate a few very important basic rules for felling, bucking, and merchandising logs.

Do not cut any tree until you have investigated the market and secured a buyer. Once a tree is on the ground, there is no turning back! The marketing process has begun and must be seen through to completion.

Once a tree has been bucked, you may have eliminated some markets, and your negotiating position with any remaining buyers has been compromised. Ponderosa pine markets in the area currently are very limited, so it's even more imperative for Valley growers to secure markets before cutting.

It's also important to understand that future markets for trees planted today are uncertain. Who knows what the world will be like in 40 to 50 years?

One hedge against this uncertainty is to plant enough trees of a certain species so that an economically viable volume will be ready for future harvests. Over the past decade, Willamette Valley ponderosa pine growers have planted about 600,000 trees per year. The number is increasing yearly; soon, the annual planting in the Valley will be about 1 million trees per year. This number of trees certainly is capable of sustaining future local milling facilities.

Figure 52.—Successful harvesting begins with the felling and bucking process.

Successful harvesting begins with the felling and bucking process.

If you're making a partial cut of the stand, once the tree is on the ground consider cutting off the limbs right there rather than at the landing. Ponderosa pine limbs are very tough and tend to stick out from the bole of the tree, potentially damaging leave trees during yarding.

Regardless of tree species, always cut limbs flush with the bole of the tree because aesthetics count when marketing your logs.

Marketing pine logs

When marketing logs of any species, buyers will say they want a freshly cut, green log. Ponderosa pine trees should be felled, bucked, skidded, and delivered to the mill

Figure 53.—Ponderosa pine should be felled, bucked, skidded, and delivered to the mill as quickly as possible to avoid blue stain problems.

in the shortest time possible because of problems that can arise from a blue stain fungus carried by ambrosia beetles.

These insects quickly invade a cut tree and deposit the stain organism along exposed portions of the tree (severed limbs and ends of the log). The result is a bluish stain in the log. The consequence to the woodland owner (depending on the log grade) is a log valued much less than if the stain were not present.

Blue stain spreads faster in the warmer, drier months—the typical time of year for private woodland timber harvests—than in the cooler, wetter months.

Log grades

Log grades that purchasers use are related to the amount of certain qualities of wood products (lumber, veneer, pulp) that can be recovered from a given log. Consideration of grade recovery from logs is seldom an issue when merchandising Douglas-fir and whitewoods. However, due to the growth characteristics of second-growth ponderosa pine, lumber recovery becomes an extremely important factor in determining log grade(s) in ponderosa pine with scaling diameters of 12 inches or larger.

Lower grade pine logs have no trouble meeting recovery requirements. The lowest quality boards, along with veneer cores and backs, are produced from this smaller diameter material.

Sellers of 5- to 11-inch logs, however, are facing stiff competition from pine growers in the southeast United States along with lower quality whitewoods from the Pacific Northwest. Ample supply from these sources most likely will keep lower quality and small-diameter pine at relatively low prices for the foreseeable future. Look for values to be approximately 50 to 60 percent of those for material 12 inches and larger and for #4 Sawmill ponderosa pine logs.

With relatively low values for smaller diameter pine, there may be an economic incentive for longer rotations, which produce a larger percentage of logs with scaling diameters of at least 12 inches in diameter, one of the requirements for a #4 sawmill log.

It also might be necessary to ship the logs to high-value pine markets east of the Cascades or in southwest Oregon. Substantial increases in the supply of ponderosa pine logs from the Valley in the future may induce local manufacturers to use smaller diameter logs, thus lowering trucking costs and increasing profit margin. However, at this time, sellers of Valley pine logs under 12 inches in scaling diameter do not realize profits comparable to those from other conifer species in the Valley.

It is an exceptional case when a Douglas-fir or whitewood log satisfies the size requirement (12 inches minimum scaling diameter for both #2 fir logs and #4 pine logs) and exterior characteristics of a #2 Sawmill, and yet is not assigned that grade due to the scaler's determination that the log will not satisfy recovery requirements.

Ponderosa pine is just the opposite. A large percentage of Valley pine logs 12 inches and larger in scaling diameter will be downgraded to a #5 Sawmill for failure to yield 50 percent or more of the net scale in the form of #2 Common boards.

Managing the loose knot problem

Dead limbs are the culprit. In ponderosa pine, the consequence of dead limbs is encased knots (loose knots) within the bole of the tree. Loose knots are not allowed in #2 Common pine lumber.

Because of the loose knot issue, you may elect to manage for shorter rotations or to prune your pine stand early on to produce a maximum amount of clear wood.

If your objective is to grow ponderosa pine to scaling diameters of 12 inches or more in order to capitalize on grade break, you must carefully consider spacing options that will allow good growth long enough to enable trees to reach that diameter. Denser plantings result in fewer limbs, and those are shed earlier in the cycle. This option addresses the loose knot issue and satisfies the recovery requirements of a #4 Sawmill.

Pruning is another option to consider, but it's economically beneficial only if logs from those trees meet the requirements of the #4 Sawmill grade. Both options require longer rotations, and you need to weigh costs and benefits.

Ponderosa pine logs 12 inches or more in diameter and with #4 Sawmill grade or better characteristics generally have better market opportunities than smaller logs. Larger diameter pine logs have the potential to produce high-value lumber used by door and window manufacturers. Over the last few years, 12-inch-plus pine logs are comparable in value to Douglas-fir and on many occasions are worth more than their #2 Sawmill grade Douglas-fir counterparts.

The chip market

For woodland owners in the Willamette Valley who have only recently begun working with ponderosa pine, harvesting options are several years away. Thinnings until that time will yield only wood for chips.

Because of the lack of supply, chip buyers in the Valley currently purchase pine as processed chips rather than as logs. Pine chips are lower quality than fir or white-wood chips, necessitating stricter quality control. Valley pine chip logs are so scarce that mills do not want to sacrifice the area at their plants or money for equipment and processing when processed pine chips are readily available east of the Cascades. Pine chip logs may become marketable in the future. At least one chip buyer in the Valley has stated he would indeed purchase chip logs in the future, if supply was sufficient.

Westside vs. eastside scaling rules

Valley sellers who ship logs east of the Cascades must become familiar with eastside scaling rules. For the seller, the two most important differences in eastside versus westside rules are:

- The maximum length of a single segment log (20 feet eastside vs. 40 feet westside)
- Diameter measurements (fractional inches rounded to the nearest inch eastside vs. fractional inches rounded down westside)

Consider these differences in measuring log volume to develop some sort of conversion factor that will enable you to compare values per MBF of eastside and westside buyers.

Figure 54.—Lumber recovery is extremely important in determining log grade(s) in ponderosa pine with scaling diameters of 12 inches or larger.

Purchase orders

When selling to mills, what can you expect to see in a purchase order for Valley ponderosa pine?

The trend in pine logs is similar to that for fir logs: higher quality and larger logs are being sawn, and the lower quality and smaller diameter logs are being peeled.

Historically, sellers of pine have marketed their logs in 16- and 32-foot lengths. This generally continues to hold true for logs greater than 12 inches in diameter, but peeler lengths (17, 26, and 34 feet) often are required for logs with less than a 12-inch diameter. Before you buck your logs, make sure that you understand the log specifications in your purchase order. Improper lengths may well result in penalties, resulting in less money to you the seller.

Westside buyers mirror eastside buyers in one respect: purchase orders for pine tend to be based on diameter breaks rather than on official log grade specifications for minimum diameters.

The reason is that most ponderosa pine milled in Oregon comes from second-growth stands, from which relatively small amounts of shop grade or clear lumber are recovered. There is a correlation between larger percentages of better quality lumber coming from larger diameter logs, but that correlation is not necessarily indicative of diameter breaks within log grades.

Price breaks for buyers in the Roseburg area are currently for logs 5 to 9 inches, 10 to 11 inches, 12 to 15 inches, and 16 inches and larger. Note that official log grade rule breaks are at 5-, 6-, and 12-inch log diameters. Approximate values for these diameter breaks are approximately 50, 75, and 85 percent, respectively, of values for logs 16 inches and larger.

Only time will tell whether Valley ponderosa pine will be manufactured locally. Regardless of log size or value, pioneers of Willamette Valley ponderosa pine regeneration anxiously await opening of new log markets in the Valley. This will happen only after an adequate fiber supply warrants local mills' investing appropriate amounts of capital for labor and equipment. It's the classic economic theory of supply and demand, which in this case predicts that if the supply is there, demand will follow. Until then, viable markets do exist for Willamette Valley ponderosa pine east of the Cascades and in the Roseburg area and points farther south.

For more information on harvesting and marketing timber, refer to OSU Extension publications EC 1127, "Measuring Timber Products Harvested from Your Woodlands"; EC 1384, "Selling Timber and Logs: Seven Steps to Success"; EC 1487, "How to Manage Your Own Timber Sale: Guidelines for Success"; and EC 1190, "Stand Volume and Growth: Getting the Numbers" (see page 39).

For further information

OSU Extension publications

Many OSU publications are available on the Web at http://eesc.oregonstate.edu/ Click on "Publications and Videos"; then, type in the publication series number (for example, EC 1255) in the search box.

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EC 1127, Measuring Timber Products Harvested from Your Woodlands. 20 pages.

EC 1188, Site Preparation: An Introduction for Woodland Owners. 12 pages.

EC 1190, Stand Volume and Growth: Getting the Numbers. 28 pages.

EC 1196, Selecting and Buying Quality Seedlings. 12 pages.

EC 1201, Understanding and Controlling Deer Damage in Young Plantations. 8 pages.

EC 1255, Controlling Pocket Gopher Damage to Conifer Seedlings. 8 pages.

EC 1256, Controlling Vole Damage to Conifer Seedlings. 6 pages.

EC 1384, Selling Timber and Logs: Seven Steps to Success. 36 pages.

EC 1388, Site Preparation: An Introduction for Woodland Owners. x pages.

EC 1457, Pruning to Enhance Tree and Stand Value. 12 pages.

EC 1487, How to Manage Your Own Timber Sale: Guidelines for Success. 32 pages.

EC 1498, Successful Reforestation: An Overview. 8 pages.

EC 1504, The Care and Planting of Tree Seedlings on Your Woodland. 8 pages.

PNW 33, Plant Your Trees Right. 12 pages.

Pacific Northwest Insect Management Handbook (revised annually). 490 pages (2003 ed.).

Pacific Northwest Plant Disease Management Handbook (revised annually). 550 pages (2003 ed.).

Pacific Northwest Weed Management Handbook (revised annually). 430 pages (2003 ed.).

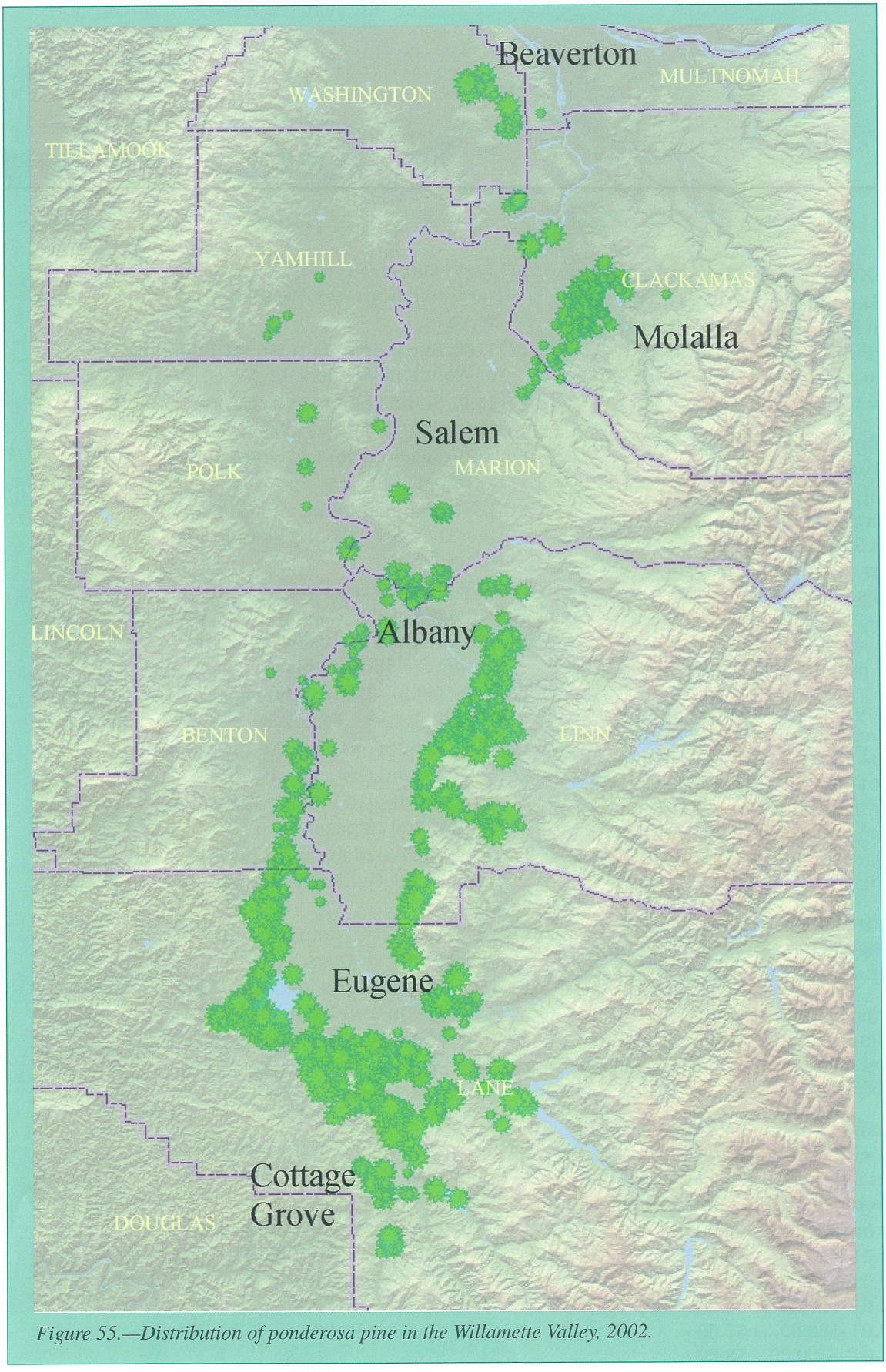

Figure 55.—Distribution of ponderosa pine in the Willamette Valley, 2002.

A ponderosa pine plantation thrives despite periodic flooding on a site near Albany, OR.

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