

**USDA Forest Service
Pacific Northwest Region**

1999 Forest Insect and Disease Conditions Report

Indigenous Insects

Mountain Pine Beetle, *Dendroctonus ponderosae*

Hosts: Jeffrey pine, lodgepole pine, ponderosa pine, sugar pine, western white pine, whitebark pine.

Mountain pine beetles occur throughout the range of the pine type in the Pacific Northwest. Both adults and larvae feed in the phloem layer of the inner bark, producing one generation per year. Fungi introduced by the beetles clog the conductive tissues and mortality may result. Some infestations have resulted in extensive mortality over large areas.

Three straight years of decreases in the number of acres affected by mountain pine beetle have ended. Activity was reported on 111,148 acres with on average of 3.63 trees/acre in 1999 compared with 95,963 acres with an average of 3.31 trees/acre in 1998. Increased activity was detected in all host types with the exception of ponderosa pine. Areas most heavily affected by mountain pine beetle in lodgepole pine include federal lands within the Deschutes and Okanogan reporting areas. Federal lands within the Fremont reporting area showed the most dramatic decrease in acres affected by mountain pine beetle in lodgepole pine. In contrast to last year, most heavily affected areas in the ponderosa pine type shifted from private lands to Forest Service lands within the Malheur, Umatilla, and Okanogan Reporting areas. The most significant decrease in acres affected in the ponderosa pine host type occurred on private lands in central Oregon and Northeast Washington. In the whitebark pine host type, the most heavily affected areas were in the Pasayten, Goat Rocks and Alpine Lakes wilderness areas. Approximately 3,400 acres in the western white pine host type were mapped on federal lands within the Kaniksu reporting area.

Dense stand conditions continue to predispose areas to mountain pine beetle infestations.

Douglas-fir Beetle, *Dendroctonus pseudotsugae*

Hosts: Douglas-fir

Douglas-fir beetles occur throughout the range of Douglas-fir and are considered the most important bark beetles which cause mortality in Douglas-fir. Normally they breed in felled, injured, or diseased trees. The females bore into the bark and tunnel upward through the phloem. Tree mortality occurs when phloem continuity is disrupted by beetle larval galleries or by fungi introduced by the beetles. Mortality is widely scattered when

at low levels. At times, these insects reach epidemic levels and kill apparently healthy trees over extensive areas.

Douglas-fir beetle activity, as expected, was detected on more acres, at somewhat greater intensities. Activity was reported on 151,120 acres with an average of 1.4 tree/acre in 1999 as compared to 33,600 acres averaging 1.1 tree/acre in 1998. . Increased levels of activity were detected on virtually all Reporting areas within the Region. Northeastern Washington, the Blue Mountains of Oregon and westside Forests in the Oregon Cascades were most heavily affected. Predisposing tree stresses caused by repeated years of defoliation by western spruce budworm, drought, and overstocking may result in relatively high levels of Douglas-fir beetle activity in the next few years. Increased activity in northeastern Oregon and in other parts of the Region is associated with either recent fires or with windstorm breakage or blowdown that has occurred the past couple of years. Another year of increased Douglas-fir beetle caused mortality is expected for the summer of 2000 and likely into the year 2001. Heavy blowdown associated with winter 2000 storms will probably exacerbate the problem.

Fir Engraver, *Scolytus ventralis*

Hosts: True firs

Fir engravers infest true firs in western forests. These beetles attack pole-sized and mature trees, causing significant mortality during and following periods of drought. Trees infected with annosus root disease are especially subject to attack. Trees defoliated by Douglas-fir tussock moth, western spruce budworm or Modoc budworm also are likely to be attacked. These beetles commonly breed in logging slash and windthrown trees.

A three fold increase in fir engraver activity was mapped in 1999, which followed three straight years of decline. Approximately 34,800 acres in 1999 (2.45 tree/acre) were mapped compared to 11,400 acres in 1998 (0.74 tree/acre). Increased levels of activity were reported on Forest Service lands within the Fremont and Wallowa-Whitman Reporting areas and on the Yakama Indian Reservation. Following four years of approximately normal precipitation, mortality levels remain highest in areas which have experienced drought, defoliation, or are infected with root disease. Many of the most heavily infested areas are pine sites which, due to selective logging and fire exclusion, now have a large component of true fir.

Pine Engraver Beetles, *IPS* spp.

Hosts: Ponderosa pine

Pine engraver beetles affect all species of pine but are most notable for their effect on ponderosa pine. Populations commonly build up in weakened trees, improperly treated logging and thinning slash, and windthrow. High populations in warm, dry years may kill large numbers of apparently healthy saplings and pole-sized trees as well as tops of mature trees.

Pine engraver activity increased over 1998 levels. The majority of activity was detected on Colville and Spokane Indian Reservation and private lands in northeastern Washington.

Western Pine Beetle, *Dendroctonus brevicomis*

Hosts: Ponderosa pine

Western pine beetles periodically kill large numbers of ponderosa pine in the Pacific Northwest. Normally, these beetles breed in large, old trees; in windfalls; in trees infected by root disease; or in trees weakened by drought, overstocking, or fires. Under epidemic conditions, they will attack and kill trees of all ages having bark sufficiently thick to protect the insect during development. Two generations per year of this beetle are typical in the Pacific Northwest.

Acres affected by western pine beetle activity decreased in both large and pole-sized ponderosa pines throughout much of the Region, although intensity increased over fewer mapped acres in the pole-sized stands. Over 5,700 large trees were killed in 1999 compared to about 13,300 in 1998. Mortality in smaller, pole-sized trees increased from 7,800 trees in 1998 to 12,000 trees killed in 1999. Areas most heavily affected included Forest Service lands on the Malheur, Wallowa-Whitman and Wenatchee National Forests. Other areas with notable levels of mortality include private lands within the Northeast Washington Reporting area and Indian Reservation lands within the Colville and Yakima Reporting Areas.

Spruce Beetle, *Dendroctonus rufipennis*

Hosts: Engelmann spruce

Spruce beetles infest all species of spruce and are the most significant mortality agent of mature spruce trees. Populations build up in windthrown trees. Stand susceptibility can relate to a variety of factors including geographic location, tree diameter, basal area, and percentage of spruce in the canopy.

All reported mortality in Oregon and Washington in 1999 was in Engelmann spruce. Reported trees killed decreased from approximately 2,900 trees in 1998 to fewer than 1,800 in 1999. The majority of mortality occurred on Forest Service lands within the Okanogan and Wallowa-Whitman reporting areas. In other areas, spruce beetle activity was lightly scattered in the host type. Low levels of spruce beetle activity are due, in part, to the gradual removal of preferred host trees by previous infestations.

Ponderosa Pine Needle Miner, *Coleotechnites moreonella*

Hosts: Ponderosa pine

In 1999 about 2,800 acres were reported to be infested. This is down from the approximately 24,700 acres of needle miner in ponderosa pine reported in central and eastern Oregon in 1998, which was the first aerially detected outbreak of ponderosa pine needle miner since 1992. A species determination was not made, but the causal insect is believed to be *Coleotechnites moreonella*. The crown symptoms of yellowing caused by larval mining seemed to be more pronounced along the edges of meadows and the surrounding lowland forests. Parasitoids are expected to increase in number and eventually bring the needle miner population back in check. The majority of the area affected was once again mapped on the Ochoco National Forest, although a new area was mapped on private lands within the Northeast Washington Reporting Area.

Douglas-fir Tussock Moth, *Orgyia pseudotsugata*

Hosts: Douglas-fir, true firs

The primary hosts of the Douglas-fir tussock moth are Douglas-fir, grand fir, subalpine fir and white fir. Early instar larvae feed on the current year's foliage as the shoots elongate and later instars feed on all foliage. Normally this insect occurs at very low population levels; however it experiences cyclic population increases every 7 - 13 years, and populations can have significant impacts on resources when these eruptive outbreaks occur.

The Douglas-fir tussock moth early warning system was established to monitor DFTM population trends throughout its range. There are over 350 plots in the system scattered throughout eastern Washington and Oregon. Since 1995, traps have indicated a trend for increasing populations; in 1998, the number of moths trapped per plot, for all plots, averaged over 10 moths. This was the highest average number of moths trapped for the Region since the trapping program began in 1979. In 1999, average number of moths trapped decreased slightly, although the numbers of plots with traps catching moths remained approximately the same. This decrease in trap catches could be expected as natural populations increase. Early larval sampling in the spring, and later a more intensive cocoon and egg mass sampling in the fall was done over much of the potentially infested area. These samples confirmed that in some areas, Douglas-fir tussock moth populations are either at sub outbreak or outbreak levels. Specific areas of concern are on the Pine Ranger District of the Wallowa-Whitman NF and the northern part of the Umatilla NF. Other Forests with plots indicating sub outbreak or outbreak populations on some of the sample plots include the Malheur, Ochoco, Okanogan, and Wenatchee NF's.

During the 1999 aerial detection survey, approximately 21,000 acres of visible defoliation was mapped on the Wallowa-Whitman NF for the first time in this potential outbreak. The majority was in the moderate defoliation category.

It is anticipated that Douglas-fir tussock moth populations will continue to increase. In 1999, the Forest Service initiated preparation of a site-specific Environmental Impact

Statement over 9 National Forests for potential suppression activities over the next several years.

Western Spruce Budworm, *Choristoneura occidentalis*

Hosts: Douglas-fir, true firs, Engelmann spruce, western larch

Western spruce budworm is a common defoliator of conifers in the Pacific Northwest. Budworm outbreaks commonly occur in the true fir/Douglas-fir forest type. Larvae prefer new foliage but also feed on older foliage when new foliage is in short supply. On western larch, larvae not only feed on the needles but also sever new shoots. Repeatedly defoliated trees experience substantial radial growth reduction and, if defoliation is great enough, are predisposed to attack by various bark beetles. Increasingly effective fire prevention and suppression during this century have eliminated many major fires and nearly all surface fires. As a consequence, host trees have increased, resulting in an abundant and expanding source of the budworm's favorite food: shade-tolerant, late-successional species such as true fir.

Areas of aerially visible defoliation decreased from approximately 486,000 acres in 1998 to 189,700 acres in 1999. Ground surveys conducted by field crews during the summer of 1998 indicated that the extent and severity of budworm that year was actually less than indicated by aerial surveys. Over 76 percent of the area reported with visible defoliation caused by western spruce budworm in 1999 occurred on Yakama Indian Reservation lands. Over 13,000 acres of defoliation was detected on the Gifford-Pinchot National Forest. Approximately 28,500 acres of adjoining state and private lands were also affected.

Approximately 37,000 acres were treated with *Bacillus thuringiensis* (Bt) on the Yakima Indian Reservation, an additional 5,000 acres has been identified for a suppression project in 2000. Approximately 400 acres is planned for treatment on the Gifford-Pinchot National Forest to protect northern spotted owl nesting sites.

Non-indigenous Insects

Balsam Woolly Adelgid, *Adelges piceae*

Hosts: True firs

The balsam woolly adelgid (BWA) is an introduced insect that has had significant impact on grand fir, silver fir and sub alpine fir in Washington and Oregon. It can kill trees slowly by infesting the twigs or branches, or quickly, by infesting the bole. It also causes gouting of branch tips. During the 1950's and 1960's it caused extensive mortality primarily along the Cascade Range. Since that initial mortality, BWA damage has been chronic and subtle and is not often visible from the air.

Balsam woolly adelgid activity was observed on 6,900 acres in 1999, an increase of approximately 4,400 acres from 1998 reported levels. The majority of activity occurred in Oregon on the Umatilla and Wallowa-Whitman NF's.

In 1998, a Forest Health Monitoring ground survey was initiated to confirm its occurrence and distribution in the host type throughout WA and OR; and determine effects on host species and changes in local ecosystems. To date the ground survey has focused primarily on the coasts of Oregon and Washington, the Olympic National Park and the Cascade Range in OR. The permanent plots indicate that environment plays a significant role in the fluctuations of BWA populations; this is true, for instance, at higher elevations. Once the BWA has infested an area, it does not disappear; however, on higher elevation areas such as the Olympic NP, there may be occasional population increase, followed by a decline to less damaging levels. The BWA survey will continue along the Puget trough and Cascades in Washington and in Northeastern Oregon, in 2000.

Gypsy Moth, *Lymantria dispar*

Hosts: Oaks, apple, sweetgum, other hardwoods

While no defoliation has been observed in either State, pheromone traps continue to catch moths. These catches represent either new introductions or populations not completely eradicated by previous treatments. In Washington, two eradication projects totaling 27 acres were conducted using ground applications of *Bacillus thuringiensis* (Bt). The gypsy moth survey in 1999 resulted in trap catches of 42 individuals. Of those, 41 were identified as the European strain. One moth from the Ballard area of Seattle was identified as Asian gypsy moth. Eradication projects are planned for 2000 at three sites with an estimated 726 acres.

In Oregon, one eradication project was conducted using two ground applications of Bt on 19 acres. Thirteen moths were trapped in 1999 in Oregon, and all have been identified as the European strain. One site in Ashland, encompassing an estimated 10 acres is proposed for eradication in 2000 using two ground applications of Bt followed by mass trapping. New introductions are expected to continue as long as moth populations in the eastern United States persist and people move from the generally infested area to the Pacific Northwest.

Larch Casebearer, *Coleophora laricella*

Hosts: Western larch

After years of negligible damage, larch casebearer-caused defoliation of western larch has slowly increased in the late 1990's to 15,836 acres in 1999. The vast majority of the observed damage was mapped within the Mt. Hood and Wallowa-Whitman Reporting Areas.

Introduced parasites released in the Pacific Northwest in the early 1960's and established years ago, along with needle diseases on larch, helped maintain low levels of casebearer for many years. As casebearer populations declined, so did the introduced parasites. Parasites are expected to respond to the increasing casebearer population, although there may be several more years of defoliation before they increase to effective levels. Refoliation of larch in late summer typically masks most of the defoliation; and because of this these trees are not as evident to observers late in the season. The ability of larch to re-foliate is one of the reasons we do not expect to see much, if any, tree mortality. Accurate assessment of the casebearer situation would require extensive aerial surveys in early June (rather than later in the summer when region-wide survey is done).

Indigenous Diseases

Annosus Root Disease, *Heterobasidion annosum*

Hosts: True firs, ponderosa pine, western hemlock

Annosus root disease causes losses in many partially-cut white and grand fir stands in southern and eastern Oregon and eastern Washington. Damage is often especially severe in sub alpine fir, and is associated with smaller stumps than other true fir species. Mortality is high where annosus root disease and fir engravers operate as a complex. The Region Six Current Vegetation Survey requires examination of cut stumps. This has led to increased reporting and awareness of annosus root disease on many national forests. In eastern portions of the Region, where many stands were cut 10-20 years ago, trees surrounding cut stumps are dying. Disease severity is expected to increase with time. Annosus root disease was observed with increasing frequency in stands which are predominantly ponderosa pine on drier sites in eastern Washington and Oregon, and in true fir species in mixed conifer and true fir stands throughout southwest Oregon.

Reports of the disease in mountain hemlock and Pacific silver fir in high-elevation stands in the Cascade Range are also increasing. Annosus root disease in low-elevation western hemlock stands primarily causes butt rot. Impacts are considered low unless stands are managed at rotations greater than 120 years.

Armillaria Root Disease, *Armillaria ostoyae*

Hosts: Conifers

The most serious losses from this disease have occurred east of the Cascade Range in mixed conifer stands. Mortality continues in both disturbed and undisturbed stands. True firs and Douglas-fir sustain the most losses. However, in localized areas, ponderosa pine mortality is significant. In the Blue Mountains of Oregon, there is a several thousand-acre armillaria-infected area. In mid- to high-elevation stands in the Cascades of southwestern Oregon, armillaria root disease causes mortality of several conifer species. Mortality on lower slopes west of the Cascades and in the Coast Range

is usually confined to younger, stressed trees. Assessing species resistance on a site-by-site basis and discriminating for the more resistant species during stand management activities are considered the most effective means of controlling spread and mortality. Studies are currently being made on the genetic characteristics of especially large concentrations of *Armillaria* on the northeastern portion of the Malheur National Forest.

Black Stain Root Disease, *Ophiostoma wagneri*

Hosts: Douglas-fir, ponderosa pine

In southwestern Oregon, black stain root disease is the most commonly encountered disease in Douglas-fir plantations. High-risk areas are those where disturbances, such as road building or soil compaction, have occurred or where road maintenance equipment injured roadside Douglas-firs. Infected larger individuals are found scattered in previously entered forest stands. Black stain root disease continues to be observed on ponderosa pine east of the Cascades. Best management practices, especially related to prescribed fire and reducing vectoring insect effectiveness, are currently being investigated.

Laminated Root Rot, *Phellinus weirii*

Hosts: Conifers

Laminated root rot is the most serious forest tree disease west of the Cascade Mountains in Washington and Oregon. Overall, an estimated eight percent of the area with susceptible host species is affected in this portion of the Region. Locally, 15 to 20 percent of an area may be affected. East of the Cascades, laminated root rot affects mixed conifer stands north of the Crooked River in central and northeastern Oregon and throughout eastern Washington. Effects of the disease include significant changes in species composition, size, and structure. Regeneration of susceptible species in root disease centers may not grow beyond sapling and pole size. Hardwood trees and shrubs, which are immune to the fungus, often increase their site occupancy.

Dwarf Mistletoes, *Arceuthobium* spp.

Hosts: Conifers

Dwarf mistletoes are present on approximately 9.5 million acres of forested lands in the Pacific Northwest Region. Their status changes little from year to year. However, long-term impacts, including reduced growth, mortality, deformity, and top-kill, are significant, particularly in unmanaged stands. Most conifer species are affected to some degree. Douglas-fir dwarf mistletoe is abundant east of the Cascades and in southwestern Oregon. Western larch dwarf mistletoe causes significant effects in northeastern Oregon and eastern Washington. The intensity of dwarf mistletoes in eastern Oregon and Washington and in southwest Oregon is closely related to fire ecology. Lack of frequent, periodic fire in the last century has allowed infection levels to increase on many

sites, especially those where mistletoe was not culturally controlled. Directed policy of retaining all trees larger than 21", regardless of disease incidence and spread potential, will reduce the effectiveness of sanitation treatments.

Swiss Needle Cast, *Phaeocryptopus gaumannii*

Hosts: Douglas-fir

Swiss needle cast, a fungus disease of Douglas-fir foliage, is endemic in Douglas-fir west of the Cascade Mountain crest. Over the last 15 years, distinctive yellowing, needle loss, and growth reduction have been observed in coastal Douglas-fir plantations. A combination of favorable climate, plantation age, and genetics may be the cause of severe disease symptoms seen in recent years. In 1999, 295,000 acres of discolored Douglas-fir along the Oregon coast were mapped by a spring, special aerial survey. Surveys were also conducted during the spring of 1996, 1997 and 1998. An overall increase in affected acreage and intensification of the affected areas has been detected. Estimates of affected acreage for all years, however, are conservative since mapped acres represent only those areas with obvious symptoms; ground surveys indicated that Swiss needle was present in all Douglas-fir stands throughout the survey area. The 1997 survey showed more discoloration in mature trees than was seen in previous surveys.

Washington Department of Natural Resources conducted their first aerial survey for Swiss needle cast in the spring of 1998 and mapped in 44,000 acres. Over 200,000 acres were mapped during the 1999 survey. A survey is scheduled for the spring of 2000 in Oregon and Washington.

Larch Needle Cast and **Larch Needle Blight**, *Meria laricis* and *Hypodermella laricis*

Hosts: Western larch

Larch needle cast and needle blight were less widespread in Washington in 1999 than 1998, although 75% of the observed areas were in the state of Washington. Concentrations of infections were quite localized and mainly involved dense thickets of seedlings and saplings. In Oregon all of the reported needle cast was mapped in the Eagle Cap Wilderness of the Wallowa-Whitman National forest. These foliage diseases were most severe in stands of western larch growing in moist grand fir and moist sub alpine fir plant associations as well as in riparian areas. Less than 2,000 acres of larch needle cast were detected by aerial survey in 1999, down from 65,000 acres reported in 1998.

Lodgepole Pine Needle Cast, *Lophodermella concolor*

Hosts: Lodgepole pine

Appearance of this needle disease on lodgepole pine is sporadic and strongly influenced by weather conditions. Infected trees will shed foliage prematurely, and vigor and growth may be reduced with successive years of infection. Heavy discoloration of the lower crowns of lodgepole pine, typical of lodgepole pine needle cast, was detected on the Colville, Fremont and Winema National Forests. The causal agent was not verified, but the symptom was fairly widespread, covering over 17,200 acres in 1999, down from over 55,000 acres reported in 1998.

Douglas-fir Needle Cast, *Rhabdocline pseudotsugae*

Hosts: Douglas-fir

There was above normal occurrence of Douglas-fir needle cast in Douglas-fir in northeast Washington, especially the Republic area.

Non-indigenous Diseases

Port-Orford-Cedar Root Disease, *Phytophthora lateralis*

Hosts: Port-Orford-cedar

Port-Orford-cedar root disease causes mortality of Port-Orford-cedar in southwestern Oregon. Where it has been introduced, the disease causes extensive mortality on sites favorable for infection and spread of its waterborne spores, especially along creeks, in low-lying areas, and below roads where water is channeled.

The annual aerial survey reported evidence of the disease on over 4,300 acres (1.48 trees/acre) in 1999. Within these areas, mortality was distributed in scattered pockets or individual trees. On National Forest System lands, slightly less than 10 percent of all Port-Orford-cedar is infected.

White Pine Blister Rust, *Cronartium ribicola*

Hosts: Western white pine, sugar pine, whitebark pine

Cronartium ribicola was introduced to the west coast in 1910. Its impacts include top-kill, branch flagging, and tree mortality. While much of the mortality associated with this disease occurred earlier in the century, its impacts are still great in wild populations of five-needled pines throughout their range. Locally, this disease, in combination with mountain pine beetle, still kills many host trees. Of particular concern are the effects of

blister rust in whitebark pine at high elevations in the Cascades and in the Blue and Wallowa Mountains and in sugar pine in southwest Oregon where survey and impact data are not available.

An attempt was made to aerially identify areas symptomatic of blister rust beginning in 1994. Although blister rust is known to occur extensively throughout the range of susceptible host type, observers mapped only 3,139 acres in 1999. Blister rust symptoms are difficult to distinguish from the more easily observed effects of mountain pine beetle. With the exception of blister rust in whitebark pine (which grows at higher elevations and in more open conditions), blister rust is very difficult to detect from the air. The bulk of the reported 3,139 acres mapped in 1999 fell within the Yakama Indian Reservation, the Wenatchee National Forest and on state and Forest Service lands within the Okanogan Reporting Area. An on-going study of whitebark pine stands in eastern Washington has found that 81 percent of the trees are alive, most mortality is more than 10 years old, and in trees greater than nine inches DBH. Thirty-four percent of the mortality is attributed to blister rust. The Colville National Forest is pruning western white pine plantations to reduce the incidence of lethal blister rust infections. Ground surveys indicate that blister rust is common in whitebark pine communities in the Seven Devils (Idaho), Elkhorn, and Wallowa Mountains, but scarce in the Strawberry Mountains, and all of northeastern Oregon.

A recent survey of whitebark pine along the Pacific Crest National Scenic Trail on the Umpqua National Forest estimated that 50 percent of the whitebark pine were infected by white pine blister rust. Ninety percent of the infected trees had potentially lethal cankers. Topkill caused by blister rust was common.

Nursery Diseases

Cranberry Girdler, *Chrysoteuchia topiaria*

Hosts: Conifers

Cranberry girdler caused minor losses in some lots of Douglas-fir, however, there were significant amounts of damage in some lots of true fir (10-20%). Adult moths were detected at low levels in pheromone traps. Late in the growing season girdler damage was noted at the ground line in Douglas-fir but not in the true fir. Douglas-fir was treated with one application of chlorpyrifos.

Damping-off, *Fusarium* spp., *Pythium* spp.

Hosts: Conifers

The nursery experienced less than 5 percent mortality to damping-off. Fumigation, early sowing, deep watering, and delayed fertilization helped control damping-off.

Fusarium Rot and Hypocotyl Rot, *Fusarium* spp.

Hosts: Conifers

The nursery experienced less than 5 percent mortality due to root and shoot Fusarium infections during the 1-0 year. Cooling by irrigation helped to limit losses.

Storage Molds

Hosts: Conifers

There were no significant storage mold incidences noted during the past season. Freezer storage is recommended for most of our clients.

Phytophthora Root Rot, *Phytophthora* spp.

Hosts: Douglas-fir

At the nursery, Phytophthora damage was not notable this growing season. At the tree improvement center, there were no new Phytophthora infections this year.

Animal Damage - Rabbit

Hosts: Conifers

There was no appreciable rabbit damage at the nursery this season.

Botrytis Gray Mold, *Botrytis cinerea*

Hosts: Conifers

Botrytis gray mold caused losses of 2-3% in rooted cuttings and seedlings of Port-Orford cedar in a greenhouse at the tree improvement center.

1999 Forest Insect and Disease Conditions Report

Summary Table

| Insect or Disease | State | Ownership | Acres Infested | Volume Killed (m3) | # Trees Killed |
|---------------------------------|-------|-----------|----------------|--------------------|----------------|
| mountain pine beetle | OR | federal | 32,000 | 805,800 | 53,700 |
| | | state | 7,100 | 522,600 | 31,900 |
| | | private | 7,100 | 104,800 | 8,200 |
| | WA | federal | 57,300 | 4,187,700 | 288,000 |
| | | state | 3,500 | 79,000 | 5,700 |
| | | private | 4,100 | 237,400 | 15,500 |
| western spruce budworm | OR | federal | 0 | 0 | 0 |
| | | state | 0 | 0 | 0 |
| | | private | 0 | 0 | 0 |
| | WA | federal | 15,300 | 0 | 0 |
| | | state | 145,900 | 0 | 0 |
| | | private | 28,500 | 0 | 0 |
| Douglas-fir tussock moth | OR | federal | 21,000 | 0 | 0 |
| | | state | 0 | 0 | 0 |
| | | private | 100 | 0 | 0 |
| | WA | federal | 0 | 0 | 0 |
| | | state | 0 | 0 | 0 |
| | | private | 100 | 0 | 0 |
| Douglas-fir beetle | OR | federal | 46,700 | 12,787,700 | 47,100 |
| | | state | 3,200 | 978,800 | 3,000 |
| | | private | 6,600 | 1,625,400 | 5,800 |
| | WA | federal | 23,000 | 5,627,000 | 49,300 |
| | | state | 10,300 | 1,884,100 | 17,700 |
| | | private | 17,100 | 3,606,700 | 28,200 |

| Insect or Disease | State | Ownership | Acres Infested | Volume Killed (m3) | # Trees Killed |
|----------------------------|--------------|------------------|-----------------------|---------------------------|-----------------------|
| | | | | | |
| fir engraver | OR | federal | 23,700 | 5,884,300 | 76,000 |
| | | state | 300 | 14,000 | 200 |
| | | private | 1,800 | 49,600 | 800 |
| | WA | federal | 4,300 | 302,100 | 5,700 |
| | | state | 3,500 | 67,800 | 1,300 |
| | | private | 1,300 | 79,900 | 1,400 |
| | | | | | |
| western pine beetle | OR | federal | 1,900 | 141,600 | 1,000 |
| | | state | 100 | 8,700 | 100 |
| | | private | 600 | 41,500 | 300 |
| | WA | federal | 1,200 | 101,400 | 1,600 |
| | | state | 2,900 | 207,600 | 3,300 |
| | | private | 5,000 | 657,500 | 11,500 |
| | | | | | |
| root diseases | OR | federal | 372,000 | 31,324,000 | |
| | | state | 13,000 | 9,218,000 | |
| | | private | 894,000 | 44,808,000 | |
| | WA | federal | 819,000 | 58,222,000 | |
| | | state | 156,000 | 10,466,000 | |
| | | private | 752,000 | 32,921,000 | |
| | | | | | |
| dwarf mistletoes | OR | federal | 1,137,000 | 10,124,000 | |
| | | state | 43,000 | 2,979,000 | |
| | | private | 2,760,000 | 14,482,000 | |
| | WA | federal | 2,703,300 | 21,831,000 | |
| | | state | 505,000 | 3,924,000 | |
| | | private | 2,470,000 | 12,344,000 | |