



## 2005 Forest Insect and Disease Conditions Report

### Native Insects

#### 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.

An increase in mortality was observed in 2005. Mapped acres increased from 59,252 (1.39 TPA (trees per acre)) in 2004 to 76,968 acres (1.72 TPA) in 2005.

Within the Colville Reporting Area in NE Washington, Douglas-fir mortality was mapped on 20,812 acres at approximately 2.28 TPA. Other Reporting Areas with significant mortality include: Wenatchee (15,037 acres/ 1.42 TPA), Gifford-Pinchot (6,253 acres/ 1.21 TPA), Yakama Indian Reservation (5,907 acres/ 2.21 TPA), and Okanogan (5,265 acres/ 2.36 TPA).

In Oregon, the most significant mortality was mapped on the Wallow-Whitman National Forest (3,558 acres with 0.88 TPA).

---

#### 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 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.

Acres with mortality decreased (672,387 acres in 2004 to 540,630 acres in 2005), but TPA (trees per acre) killed by fir engraver increased this year (1.4 TPA in 2004 to 1.72 TPA in 2005).

The following Reporting areas are listed in order of highest levels of mortality: Colville 100,387 acres, 2.56 TPA; Wenatchee 85,904 acres, 2.45TPA; Yakama Indian Reservation 38,001 acres,

2.38 TPA; Malheur 30,546 acres, 0.44 TPA; Umatilla 30,098 acres, 0.34 TPA; and Okanogan 21,111 acres, 2.30 TPA.

---

## **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 of attacked host trees and contribute to tree mortality. Some infestations have resulted in extensive mortality over large areas. Dense stand conditions continue to predispose areas to mountain pine beetle infestations.

In 2005, 757,969 acres were affected, with an average of 8.01 trees per acre (TPA) killed, compared to 543,631 acres affected with an average of 6.44 TPA in 2004. Overall increases in mortality were reported in all pine host types.

### **Lodgepole Pine**

Tree mortality in lodgepole pine increased in both acres and intensity. Total reported affected acres increased from 380,306 acres, 8.22 TPA in 2004 to 606,023 acres, 9.31 TPA in 2005.

Areas mapped with the significant levels of mortality include Forest Service administered lands on the following National Forests: Okanogan 121,572 acres, Deschutes 80,369, Fremont 52,932, and Wenatchee 48,926 acres. Additionally, 41,970 acres (18.56 TPA) were reported on the Yakama Indian Reservation, and 28,072 acres (9.06 TPA) on the Colville Indian Reservation. Within the North Cascades National Park 13,031 acres (14.3 TPA) were reported.

### **Ponderosa Pine**

Fewer acres were mapped in the ponderosa type in 2005 (98,620 acres), but the intensity was slightly higher (1.58 TPA) than in 2004 (101,938 acres/ .85 TPA).

Most heavily affected areas include lands administered by the Forest Service on the Fremont (16,293 acres with 0.94 TPA), the Deschutes (9,425 acres with 1.33 TPA), and the Wenatchee (10,536 acres with 2.98 TPA). Additionally, the Glenwood Reporting Area with 10,889 acres at 1.45 TPA, and the Yakama Indian Reservation with 10,501 acres averaging 1.26 TPA.

### **Sugar Pine**

Activity in sugar pine was reported on 796 acres 2005, a decrease from acres reported in 2004 (4106 acres), but at similar intensities. Due to the ecological importance of this rapidly disappearing species, observers attempt to record individual tree mortality to better assist land managers. Most of the recorded sugar pine mortality was mapped within the Siskiyou Reporting Area.

### **Western White Pine**

Activity in western white pine increased, from 7,245 acres (0.88 TPA) in 2004 to 11,117 acres (0.87 TPA) in 2005. Highest levels of mortality were reported on Forest Service administered lands of the Idaho Panhandle National Forest within the State of Washington with 3,743 acres

mapped with an average of 3.59 TPA. Other significant areas of mapped mortality include: Fremont Reporting Area (2,476 acres/ 1.19 TPA), the Yakama Indian Reservation (1,446 acres/ 1.54 TPA), the Wenatchee Reporting Area (774 acres/ .85TPA), and the Mt Hood Reporting Area (748 acres/ .50 TPA).

Aerial detection of western white pine mortality is difficult because it is often found as a minor component in mixed conifer stands and has a color signature very similar to that of Douglas-fir.

### **Whitebark Pine**

Acres affected in the whitebark pine type increased from 41,036 acres, 4.63 TPA in 2004 to 41,413 acres, 5.98 TPA in 2005. Highest levels of mortality were reported on Forest Service administered lands on the Okanogan National Forest and on the Wenatchee National Forest. Most of the mortality occurred on federally owned lands, and within the Pasayten and Chelan Sawtooth Wilderness areas.

---

### **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.

Acres with mortality decreased from 27,601 acres (2.25 TPA (trees per acre)) in 2004 to 17,812 acres (2.63 TPA) in 2005. Mortality was scattered throughout the Region with the following Reporting Areas listed in order of the highest levels of tree mortality: Glenwood 5,522 acres (3.70 TPA), Colville Indian Reservation 3,727 acres (2.26 TPA), Wenatchee 2,362 acres (2.21 TPA), Yakama Indian Reservation 2,216 acres (2.67 TPA), and Colville 1,687 acres (1.03 TPA).

---

### **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 2005 was in Engelmann spruce. Reported acres increased from 23,444 acres, 9.24 TPA (trees per acre) in 2004 to 39,802 acres, 18.20 TPA. The majority of mortality occurred on Forest Service lands within the Okanogan Reporting Area. On the Okanogan Reporting Area, 38,235 acres were mapped with spruce mortality averaging 18.72 TPA. The Colville Reporting Area reported 536 acres with 4.47 TPA. Other Reporting Areas with reported mortality include: Wenatchee 299 acres (3.23 TPA); North Cascades National Park 272 acres (11.38 TPA); and Wallowa-Whitman 198 acres (0.57 TPA).

## 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 affected 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 from 195,775 acres, 1.06 TPA (trees per acre) in 2004 to 70,137 acres, 1.10 TPA in 2005. Activity in large ponderosa pine was reported on 29,717 acres at 1.13 TPA and activity in pole-sized trees was reported on 40,996 acres at 1.09 TPA.

Highest levels of mortality occurred within the following Reporting Areas: Colville 12,147 acres (1.02 TPA); Ochoco 9,828 acres (1.34 TPA); Spokane Indian Reservation 7,567 acres (1.74 TPA); Colville Indian Reservation 7,000 acres (1.53 TPA); Yakama Indian Reservation 6,699 acres (0.64 TPA); and Malheur 6,527 acres (0.92 TPA).

---

## 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.

There were no areas of visible defoliation caused by tussock moth recorded in 2005.

---

## Pandora Moth, *Coloradia pandora*

**Hosts:** Ponderosa pine, Jeffrey pine, lodgepole pine

Pandora moths occur in central and southern Oregon in the Pacific Northwest Region, preferring pumice soils. Periods of heavy defoliation during outbreaks can weaken trees, making them more susceptible to bark beetle attacks. Due to the 2-year life cycle (feeding in alternate years), and the fact that terminal buds are not eaten, trees often have an opportunity to recover. Native Americans traditionally lit ground fires to roast the pupae, which provide crunchy, nutritious protein, now primarily harvested by fat local chipmunks.

Special surveys are conducted in even years (2002, 2004, 2006) to coincide with the insect's life cycle, so there are no survey results for 2005.

---

## Phantom Hemlock Looper, *Nepytia phantasmaria*

**Hosts:** Douglas-fir and western hemlock

The primary hosts of the phantom hemlock looper are western hemlock, although western red cedar, Sitka spruce, true firs, and pines have also been recorded as hosts.

Larvae feed first on the new foliage, then on the old. Outbreaks of phantom hemlock looper are often not observed because they tend to be local and sporadic. Populations of phantom hemlock looper have been found to be abundant in identified outbreaks of western hemlock looper and western blackheaded budworm.

Approximately 5,700 acres of defoliation were mapped in 2002. No areas of phantom hemlock looper defoliation have been mapped since 2002.

---

## Western Blackheaded Budworm, *Acleris gloverana*

**Hosts:** western hemlock (preferred), Sitka spruce, white spruce, true firs, Douglas-fir, and mountain hemlock

Larvae feed within buds and on current year's foliage and can cause top-kill, growth loss, and, sometimes, death of the host. Defoliation becomes apparent in June and July as partially eaten needles dry and turn red, giving crowns of host trees a red or brown appearance. Weather plays an important role in regulating budworm populations. Relatively warm, dry days in June through August following a warm September in the previous year can result in a rapid increase in blackheaded budworm. Natural controls have resulted in significant decreases of blackheaded budworm populations. Some wasps parasitize budworm eggs, larvae, and pupae. A virus, fungi, and larval starvation also have contributed to budworm declines. Songbirds are also effective natural enemies.

There were no reported areas of black-headed budworm defoliation in 2005.

---

## Western Hemlock Looper, *Lambdina fiscellaria lugubrosa*

**Hosts:** western hemlock and associated conifers.

The primary hosts of the western hemlock looper are western hemlock; however, during outbreaks other associated conifer species are also defoliated, including western red cedar, true firs, Douglas-fir, spruces, western white pine and larch.

The larvae are wasteful feeders, chewing off needles at their bases and thus causing the stand to appear yellowish-red and brown in color. In heavy infestations, trees may be stripped in a single season. Defoliation starts in the upper crown, but as feeding progresses more and more of the crown is affected, increasing the risk of mortality. Late in summer, larvae are very mobile, crawling over tree trunks and shrubs, and by dropping by silken threads from the trees to the ground.

Western hemlock looper has caused more mortality of western hemlock than has any other

defoliator. Outbreaks generally last for 2 to 3 years on any one site, and mortality seems to be greatest in old growth, although 80 to 100-year old stands can be heavily defoliated. Outbreak collapse is usually brought about by the combined effects of pathogens, parasites, predators, and sometimes, adverse weather conditions or larval starvation.

Acres defoliated in Washington State decreased from 2,189 acres in 2004 to 1,207 acres in 2005. Defoliated areas are located in the Mt Baker-Snoqualmie and North Cascades reporting areas.

---

## 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 types east of the Cascade Mountains crest. 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 lethal infections by root pathogens or 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 visible defoliation increased from approximately 199,684 acres in 2004 to 352,210 acres in 2005. The most notable increase in budworm defoliation occurred within the Wenatchee Reporting Area for the fourth straight year, where acres of visible defoliation increased from 157,489 acres in 2004 to 259,725 acres in 2005. Of the acres in the Wenatchee reporting area 6,431 acres were on state lands and 15,944 are private lands. Other Reporting areas showing an increase in acres defoliated by western spruce budworm include: Okanogan (20,088 acres in 2004 to 64,133 acres in 2005); North Cascades National Park (3,594 acres in 2004 to 10,320 acres in 2005); and NE Washington (4,143 acres in 2004 and 5,308 acres in 2005).

The most notable decrease occurred within the Malheur Reporting Area, where 5,343 acres were reported in 2004 compared to 254 acres reported in 2005. Trap intensity and ground observations suggest that observable defoliation should have been more extensive. Although not verified, observers felt that survey timing may have been such that discolored trees were not aerially visible at the time of survey.

---

## Insects: Non-Native

### Balsam Woolly Adelgid, *Adelges piceae*

**Hosts:** True firs



The balsam woolly adelgid is an introduced insect that has had significant impact on grand fir, silver fir and subalpine 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 nodes. 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.

Acres affected by balsam woolly adelgid (BWA) increased from 83,325 in 2004 to 108,128 in 2005. BWA was mapped throughout the Region in high elevation stands dominated by subalpine fir.

In Oregon, 36,037 acres were mapped within the Wallowa-Whitman Reporting Area, 22,875 acres on the Umatilla, and 2,593 acres on the Mount Hood Reporting Area. In Washington, 8,358 acres were mapped within the Gifford-Pinchot Reporting Area, 10,069 acres on the Olympic National Park and 3,712 within the Wenatchee Reporting Area.

---

## Larch Casebearer, *Coleophora laricella*

**Hosts:** Western larch

After years of negligible occurrence, larch casebearer-caused defoliation of western larch slowly increased in the late 1990's to 15,836 acres reported in 1999. Ideal timing for a larch casebearer survey in the Pacific Northwest is in June; however, most of the surveys in larch type occur in late July through early September.

Approximately 2,532 acres were mapped in 2005, a decrease from 7,877 acres mapped in 2004. Reporting areas with the greatest number of acres affected included: Wallowa-Whitman 1,511 acres and the Mt. Hood 802 acres.

Introduced parasites released in the Pacific Northwest in the early 1960s 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 refoliate is one of the reasons we do not expect to see tree mortality as a result of this insect.

---

## Diseases: Native

**Annosus Root Disease**, caused by *Heterobasidion annosum*

**Hosts:** True firs, pines, and hemlocks

Annosus root disease causes damage primarily in partially harvested white and grand fir stands in southern and eastern Oregon and eastern Washington. Damage from root and stem decay also occurs in subalpine fir, red fir, noble fir, pacific silver fir, and mountain hemlock, especially in partially harvested stands and in wounded trees. Mortality is high where annosus root disease

and fir engravers occur together. Despite high infection levels in true fir stumps cut 20-25 years ago, mortality of surrounding conifer regeneration is low in northeastern Oregon, but infection levels are high especially in sapling grand fir, subalpine fir, Engelmann spruce, and Douglas-fir. Annosus root disease in low-elevation western hemlock occurs primarily as a butt rot in wounded trees. Efforts are underway to artificially inoculate unwanted western juniper with *H. annosum* to create mortality centers in eastern Oregon.

---

### **Armillaria Root Disease**, caused by *Armillaria ostoyae*

**Hosts:** conifers

Armillaria root disease causes serious mortality losses east of the Cascade Range in mixed-conifer stands. It is the most commonly encountered root disease in Oregon and Washington. True firs sustain the most losses; however, in localized areas Douglas-fir and ponderosa pine mortality can be significant. Several large Armillaria clones exist throughout the region. Thinning of young conifers has been shown to significantly increase tree growth rates and reduce mortality caused by Armillaria root disease in the Cascade Range of Oregon and Washington. Permanent plots on the Winema National Forest were examined in 2005. Ten years after commercial thinning, shelterwood harvesting, and group selection cuts, crop-tree mortality caused by Armillaria root disease is, at least, not exacerbated by harvesting, and at most, reduced by the silvicultural methods tested. 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 reducing disease spread and tree mortality. Infected trees are often attacked by bark beetles.

---

### **Black Stain Root Disease**, caused by *Ophiostoma wageneri*

**Hosts:** Douglas-fir and 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 thinning, 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; it is widespread on the southeastern portion of the Malheur National Forest. Some smaller localized infestations are known in other portions of the Blue Mountains. Black stain root disease is seen infrequently in eastern Washington. Pacific Northwest Research Station scientists are investigating relationships with natural and prescribed fire, vector insects, and management strategies.

---



## **Cytospora canker of true firs, dwarf mistletoe, sawfly (unknown species), and fir engraver beetle complex, *Cytospora abietis*, *Arceuthobium* spp., *Neodiprion* sp. and *Scolytus ventralis***

**Hosts:** True firs

The various agents of this complex are widely distributed throughout Oregon and Washington wherever true firs occur. Activity levels of each agent typically fluctuate more-or-less independently among locations and over time. *Cytospora abietis* is a weak, canker-inducing fungus that attacks stressed trees. It commonly infects branches bearing dwarf mistletoe infections (described below), causing branch death. Conifer-feeding sawfly larvae feed on old foliage, temporarily weakening trees and slowing their growth. Outbreaks are usually sporadic and subside quickly. Fir engraver beetle (described above) activity is strongly associated with tree stress.

Aerially detected damage decreased from 5,551 acres in 2004 to 2,916 acres in 2005. Most of the aerially detected damage occurred within the Willamette and the Siskiyou Reporting Areas.

Aerial observers sometimes mistake the color signature of *Cytospora* with that of balsam woolly adelgid. Incidence was associated with mature noble fir and silver fir stands located near ridge tops, and is probably related to drought stress.

---

## **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 reducing 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. New management policies including green tree retention requirements and restrictions on silvicultural treatment of certain sensitive areas and large diameter trees will reduce sanitation opportunities, and allow mistletoe intensification in the future. New information about wildlife use of dwarf mistletoe is leading to retention of infected trees in some locations.

---

## **Laminated Root Rot**, caused by *Phellinus weirii*

**Hosts:** Conifers

Laminated root rot is the most serious forest tree disease west of the Cascade Mountain crest 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 Cascade crest, laminated root rot affects mixed-conifer stands north of the Crooked River in central and northeastern Oregon, and throughout eastern Washington.

Besides the highly susceptible hosts listed above, the other true firs, spruce, larch, and hemlock are intermediately susceptible; lodgepole, sugar, and western white pine are tolerant; cedars, redwood, and ponderosa pine are resistant, and all hardwoods are immune. 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 trees. Hardwood trees and shrubs often increase their site capacity. Infected conifers are often attacked by bark beetles.

---

### **Swiss Needle Cast**, caused by *Phaeocryptopus gaeumannii*

**Hosts:** Douglas-fir

Swiss needle cast, a fungal-caused foliage disease of coastal Douglas-fir, has caused significant volume growth loss estimated at 25% throughout coastal Oregon and parts of Washington. A combination of warmer winters, increasing acreages of Douglas-fir, and the presence of two distinctive lineages of the fungus may be the cause of the severe disease symptoms over the past 15 years. A special survey was conducted in the spring 2005 for Swiss needle cast in the Coast Range and along the Cascade foothills in Oregon. The survey determined that there was 207,090 acres affected by Swiss needle cast in Oregon. The disease is also severe in localized areas in coastal Washington, with 1,377 acres reported in the general overview survey. Thinning of young trees has been recently shown to result in improved volume growth of severely affected trees. Research on Swiss needle cast continues at Oregon State University and the PNW Research Station concerning growth impact, infection biology, nutrient imbalances, fungicide testing, and fertilizer and vegetation control.

---

### **Larch Needle Cast** and **Larch Needle Blight**, caused by *Meria laricis* and *Hypodermella laricis*

**Hosts:** Western larch

Larch needle blight and larch needle cast, are reported as a complex because of their similar signatures as viewed from the air, increased from 2,117 acres in 2004 to 4,011 acres in 2005. Concentrations of infections were quite localized and mainly involved dense thickets of seedlings and saplings. These foliage diseases were most severe in stands of western larch growing in moist grand fir and moist subalpine fir plant associations as well as in riparian areas.

---

### **Lodgepole Pine Needle Cast**, caused by *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. Trees are affected with heavy discolorations of the lower crowns of lodgepole pine. Areas mapped as affected by lodgepole pine needle cast in 2005 totaled 3,312 an increase from the 1,385 acres mapped in 2004.

---

## Diseases: Non-Native

**Port-Orford-cedar Root Disease**, caused by *Phytophthora lateralis*

**Hosts:** Port-Orford-cedar

Port-Orford-cedar root disease continues to cause mortality of Port-Orford-cedar on sites with conditions favorable for spread and establishment of the causal pathogen. The annual aerial survey reported evidence of the disease on 9,336 acres (1.16 TPA) in 2005, down from 9,910 acres (0.54 TPA) in 2004. The vast majority of the reported mortality was mapped on private lands within the Coos-Douglas (5,393 acres) and Siskiyou (3,213 acres) Reporting Areas.

Hosts growing in riparian areas, swamps, drainage ditches, and low-lying areas downhill from roads suffer by far the greatest impacts. Trees on about 9 percent of the area within the limited range of Port-Orford-cedar are affected. Management activities such as road gating during the wet season, washing vehicles before they enter uninfested areas and roadside sanitation treatments help slow the spread of the pathogen.

A major cooperative effort between the Forest Service, Bureau of Land Management, and Oregon State University to develop Port-Orford-cedar that is resistant to *P. lateralis* now has results. In fall 2002, the first operational collections of resistant seed from the Dorena containerized seed orchard occurred. Sowing will occur in winter 2002 / 2003 and seedlings will be available for outplanting in the spring of 2004. Approximately 26,000 resistant seedlings will be planted in 2004, many of them in the 500,000 acre area burned in the 2002 Biscuit fire.

---

**White Pine Blister Rust**, caused by *Cronartium ribicola*

**Hosts:** Western white pine, sugar pine, and 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 Willowa Mountains and in sugar pine in southwest Oregon where about 45 percent of stands with host components are affected.

An attempt was made to identify areas symptomatic of blister rust through aerial survey beginning in 1994. Blister rust is known to occur extensively throughout the range of susceptible

host type. Observers mapped approximately 2,211 acres in 2005, down from 3,488 acres in 2004. 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. In Washington areas were mapped within the Wenatchee Reporting Area, in NE Washington, and in the Okanogan Reporting Area. In Oregon, the most heavily mapped area was on the Siskiyou National Forest.

---

## Diseases: Unknown Origin

### Sudden Oak Death, caused by *Phytophthora ramorum*

*Phytophthora ramorum*, the causal agent of Sudden Oak Death (SOD), was first discovered in Oregon by aerial survey in July 2001. Since fall of 2001, state and federal agencies have been attempting to eradicate *P. ramorum* from infested sites by cutting and burning all infected host plants and adjacent apparently uninfected plants, and treating stumps to prevent sprouting. At the end of 2005, the area under federal and state quarantine remained at 11 mi<sup>2</sup> near Brookings, Curry County, Oregon. The number of new infected trees discovered each year since the pathogen was first discovered in Oregon, decreased, until 2005. In 2005, the number of newly infected plants increased. In addition, three streams outside the quarantine area were found positive for *P. ramorum*. The infested sites occur on federal, private industrial and private non-industrial forestlands.

2005: In Oregon and Washington, nursery surveys, surveys of the forest environs adjacent to nurseries, and general forest areas were surveyed using the national survey protocol. Oregon had four confirmed *P. ramorum* positive nurseries, and six positive landscape plantings. In all cases eradication activities were carried out using the appropriate protocol for the site.

---

## Abiotic Damage

### Bear Damage, *Ursus americanus*

**Hosts:** Douglas-fir, western hemlock, and Port-Orford-cedar

Loss of crop trees and reduction in value due to feeding by bears is a widespread problem in the Pacific Northwest. Bark peeling by black bear can kill trees, and result in stain, decay, breakage, and loss of value in trees that are not killed outright. Bears are attracted to thinned plantations and feed on trees from April to July. Bears tear off large patches of bark and feed on the cambium, and can damage many trees per day. Loss in merchantable volume in Douglas-fir trees that have suffered past bear damage can run 7 to 10 percent.

Acres with trees killed by bear as interpreted by aerial observers increased from 178,709 acres (1.66 TPA (trees per acre)) in 2004 to 271,976 acres (2.52 TPA) in 2005. The vast majority of recorded damage was mapped in Western Oregon and Western Washington. The aerial survey only detects trees that have been recently killed by bear feeding. A ground survey on Quinalt lands found that at least 3.5 times as many Douglas-fir trees are damaged as killed.

Noteworthy Reporting areas include: Southwestern Washington, 36,170 acres, 2.24 TPA; Gifford-Pinchot, 62,698 acres, 2.53 TPA; Mount Baker-Snoqualmie, 50,662 acres, 3.12 TPA; Olympic, 59,984 acres, 3.00 TPA; Northwestern Oregon, 19211 acres, 0.80TPA; and Quinault IR 12,300 acres, 3.31 TPA.

---

## Nursery Insects and Diseases

### Black Vine Weevil, *Otiorhynchus sulcatus*

**Hosts:** Containerized hardwoods, shrubs and conifers

Monitoring was conducted weekly from April through August. Root weevil activity was observed in mid-June. Two treatments of chlorpyrifos were made. Damage was minimal.

---

### Cranberry Girdler, *Chrysoteuchia topiaria*

**Host:** Conifers

Monitoring for the girdler was done with the standard pheromone trap system. Inspection of seedlings in the seedbeds did not reveal any damage on the plants at the end of the growing season. No chemical treatments were used.

---

### Fungus Gnats, Family *Sciaridae*

**Hosts:** containerized conifers and aspen

The fungus gnat population built up in conifers growing in Q-plugs, and in aspen rootstock in a greenhouse at one nursery. Inspection revealed a small amount feeding damage on young roots. Three applications of Gnatrol (*Bacillus thuringensis*) prevented further damage. At another nursery, fungus gnats built up in a small group of maples in a greenhouse. Removal of empty containers, algae and weeds, and placement of yellow sticky tape reduced the population to acceptable levels.

---

### Lygus, *Tropidostepes* spp.

**Hosts:** conifers

Monitoring for the lygus was done with the yellow sticky trap system. Insect levels were low for most of the season and then increased rapidly toward the end of July. Seven treatments with Asana were made after high insect levels were noted. Inspection of seedlings in the seedbeds did not reveal any damage on the plants at the end of the growing season.

---

## **Corky Root Syndrome, *Cylindrocarpon destructans* and *Fusarium* spp.**

**Hosts:** Western white pine and sugar pine

Mortality attributed to root disease caused by *C. destructans* and *Fusarium* spp. was observed in bareroot western white and sugar pines during the growing season. However, the number of seedlings culled during grading because of corky roots continues to decline. A batch of sugar pines from an infected seedlot that were transplanted into one-gallon containers suffered severe mortality after they were fertilized. To protect the remaining seedlings, growing conditions were monitored to minimize stress and symptomatic seedlings were removed and destroyed.

---

## **Fusarium Root Rot, *Fusarium proliferatum***

**Hosts:** sugar pine

*F. proliferatum* caused scattered mortality in small plugs in styroblock containers in one greenhouse. Symptomatic seedlings were removed to prevent buildup of inoculum and the grower minimized stress on the seedlings as much as possible to discourage disease development.

---

## **Gray Mold, *Botrytis cinerea***

**Hosts:** Port-Orford-cedar, incense cedar, western red cedar, and Douglas-fir

One nursery experienced a minor amount of gray mold. The disease was controlled by spacing seedlings to increase air flow, knocking water off foliage after watering in the fall, continuous checks for and removal of infected foliage, and spot treatments with Zeritol. At another nursery an outbreak of gray mold was resolved by reducing moisture and opening the green house to increase air movement.

---

## **Leaf Spots, *Marssonina populi***

**Hosts:** black cottonwood

Young containerized black cottonwood cuttings were damaged by leaf spots during a long period of unusually wet weather in late spring. Diseased leaves were removed and the seedlings were monitored until the weather improved. No chemical treatment was needed.

---

## **Phytophthora Root Rot, *Phytophthora* spp.**

**Hosts:** conifers

The nursery continued to irrigate bareroot crops with untreated water. The water was sampled periodically for *Phytophthora* species during the growing season. No *Phytophthora* species were found in water in the nursery system. No evidence of Phytophthora root disease was observed. Monitoring of water and crops will be continued.

---



## Unidentified Powdery Mildew

**Hosts:** bigleaf maple

Foliage of large containerized bigleaf maple were damaged by an outbreak of an unidentified powdery mildew in late spring. The first emerging leaves were most severely affected. The foliage was treated with Safers Garden Fungicide to prevent the fungus from spreading as new leaves emerged.

---

## Unidentified Shoot Blight

**Hosts:** black cottonwood

Large containerized black cottonwood were damaged by shoot blight during a long period of unusually wet weather in late spring. Severely affected plants, fallen leaves and debris were removed and destroyed. The remaining plants were placed in clean racks at wider spacing.

---

## Jackrabbits, *Lepus spp.*

**Hosts:** conifers and hardwoods

Jackrabbits are starting to annoy the grower at one nursery. They caused a noticeable amount of damage by biting the tops off seedlings to create runs. Control may be needed in the future.

---

## Canada Geese, *Branta canadensis.*

**Hosts:** grasses

Canada geese are also bothering the grower at the same nursery. They wiped out a large portion of *Danthonia spp.* and the crop had to be replaced. Control may be needed in the future.

---

# Seed Orchard Insects and Diseases

## Cone Beetle, *Conophthorus spp.*

**Hosts:** ponderosa pine and western white pine

Cone beetles destroyed a pickable ponderosa pine cone crop at one orchard. Population levels of the beetle have been increasing. The orchard will consider bagging the cones next year to prevent damage.

---

### **Cone Worm, *Dioryctria* spp.**

**Hosts:** western white pine and sugar pine

Damage was evident in older western white pine used for controlled crosses for resistance breeding at one orchard. Year old conelets were treated to prevent infestation. At another orchard sugar pine cones were damaged by mining. Developing cones were recovered with cloth bags during the second growing season and unharvested cones were removed.

---

### **Douglas-fir Cone Gall Midge, *Contarinia oregonensis***

**Hosts:** Douglas-fir

Minor *Contarinia* damage of the 2005 cone crop was noted during longitudinal cut-face counts in early August at one orchard. The cone crop was extremely small and scattered, and was not operationally collected. An aerial application of esfenvalerate was applied to 58 orchard acres in early spring 2005 for the primary purpose of reducing Douglas-fir gall midge damage. Duff vacuuming was conducted on three acres in fall 2005 as a means of removing overwintering habitat, thereby reducing damage to the 2006 cone crop. At another orchard damage was observed but no treatments were made.

---

### **Douglas-fir Cone Moth, *Barbara colfaxiana***

**Hosts:** Douglas-fir

Cone moths were in found in one of the Douglas-fir seed orchards. Since the cone crop was not large enough to harvest there was no insect damage to the crop. However the insects were observed in the few cones that were present and sanitized.

---

### **Douglas-fir Seed Chalcid, *Megastigmus spermotrophus*.**

**Hosts:** Douglas-fir

*Megastigmus* was noted during longitudinal cut-face counts in early August at one of the orchards. Damage was considered minimal. No chemical control measures were used to limit damage in 2005.

---

### **False Chinch Bug, *Nysius* spp.**

**Hosts:** Port-Orford-cedar

Damage contributed to a reduction in the percentage of filled seed in controlled crosses of containerized stock. The orchard experimented with control treatments and is assessing the results.

---

## **Fir Cone Worm, *Dioryctria abietivorella***

**Hosts:** Douglas-fir

In two seed orchards cone worms were evident in mature Douglas-fir that were girdled for stimulation of a seed crop; however damage was considered to be minor. Higher than normal insect damage was noted in mature cones during longitudinal cut-face counts in August (the cone crop was extremely small and scattered. The cone worms appeared to be concentrated on what few cones were available). No chemical control measures were used to limit damage in 2005.

---

## **Western Conifer Seed Bug, *Leptoglossus occidentalis***

**Hosts:** Douglas-fir

Seed bugs were observed in one of the Douglas-fir seed orchards. Since the cone crop was not large enough to harvest there was no insect damage to the crop. However there were insects in the few cones that were present and sanitized. *Leptoglossus* were also observed in small numbers in sugar pine cones at an orchard during installation of the cotton cone bags. When the seeds were extracted it turned out that about 25 percent of the potential yield had been lost. Populations of the insect have also increased in a western white pine orchard and treatment may be needed next year.

---

## **Unidentified Adelgids and Scales**

**Hosts:** Port-Orford-cedar

Unidentified species of adelgids and scales infested containerized Port-Orford-cedar seedlings in a greenhouse at one of the seed orchards. They were treated with horticultural oil. The orchard also took steps to reduce density and improve air circulation.

---

## **Unidentified Cone Midges**

**Hosts:** Port-Orford-cedar

Damage contributed to a reduction in the percentage of filled seed in controlled crosses of containerized stock. The orchard experimented with control treatments and is assessing the results.

---

## **Cypress Canker, *Seiridium cardinale***

**Hosts:** Port-Orford-cedar

Cypress canker continues to affect a small number of trees in a containerized orchard. Diseased trees are removed and destroyed.

---

### **Phytophthora Root Rot, *Phytophthora cinnamomi*, *P. cryptogea*, and *P. spp.***

**Hosts:** sugar pine, western white pine, and Port-Orford-cedar

In one orchard *Phytophthora cinnamomi* caused mortality in three year old containerized whitebark pine seedlings used for testing resistance to white pine blister rust. The affected seedlings and soil were removed and destroyed, and the containers were sanitized. A new water treatment system and improvements in preventive measures, early detection and sanitation will be used to reduce damage from this disease in the future. At another orchard, root disease caused by *P. cryptogea* resulted in the death of about 275 sugar pine trees. An unidentified *Phytophthora* species was suspected as the cause of death of 40 young sugar pines at a third orchard. The orchards are taking steps to improve measures to reduce additional losses and prevent further spread of infection. An unidentified *Phytophthora* species was associated with mortality in a containerized Port-Orford-cedar orchard. Sanitation and management practices designed to prevent spread of inoculum from infected to healthy trees will be used to prevent further losses.

---

### **Black Bear, *Ursus americanus***

**Hosts:** western white pine

Ten percent of the trees at one orchard have been damaged by bears over the last five years. Fencing is planned but has not yet been funded.

---

## Summary Table

Insect or Disease	State	Ownership	Acres Infested	Volume Killed (m3)	# Trees Killed
<b>Douglas-fir Beetle</b>	OR	federal	5,300	795,100	4,300
		state	900	328,500	800
		private	2,200	594,500	2,000
	WA	federal	40,700	9,119,000	76,000
		state	11,600	2,915,600	22,600
		private	16,400	3,904,100	26,500
<b>Fir Engraver</b>	OR	federal	107,800	3,467,600	54,000
		state	18,600	650,500	9,000
		private	46,100	1,707,400	24,900
	WA	federal	169,000	21,561,900	380,900
		state	74,400	9,478,400	172,700
		private	124,400	15,940,400	289,000
<b>Mountain Pine Beetle</b>	OR	federal	223,700	17,633,100	1,195,600
		state	22,600	1,801,800	111,400
		private	19,100	577,200	38,900
	WA	federal	278,800	41,119,700	2,976,400
		state	116,700	17,617,400	1,291,800
		private	97,100	6,168,200	454,500

<b>Insect or Disease</b>	<b>State</b>	<b>Ownership</b>	<b>Acres Infested</b>	<b>Volume Killed (m3)</b>	<b># Trees Killed</b>
<b>Western Spruce Budworm</b>	OR	federal	300	0	0
		state	0	0	0
		private	0	0	0
	WA	federal	312,300	0	0
		state	16,500	0	0
		private	23,200	0	0
<b>Western Pine Beetle</b>	OR	federal	17,400	1,794,400	18,500
		state	3,100	157,400	2,200
		private	5,700	474,400	5,700
	WA	federal	8,000	586,600	9,500
		state	17,500	1,340,300	19,200
		private	19,000	1,590,700	23,100
<b>Douglas-fir Tussock Moth</b>	OR	federal	0	0	0
		state	0	0	0
		private	0	0	0
	WA	federal	0	0	0
		state	0	0	0
		private	0	0	0