1998 Forest Insect and Disease Conditions Report

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 subalpine 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 new Region Six vegetation inventory (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 that 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, indicating one or more especially virulent strains of the fungus. 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 wageneri*

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. All 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 central 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 1998, 173,000 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 and 1997. 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. A survey is scheduled for the spring of 1999 in Oregon and Washington.

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

Hosts: Western larch

Larch needle cast and needle blight were less widespread in Washington in 1998 than 1997. Concentrations of infections were quite localized and mainly involved dense thickets of seedlings and saplings. In Oregon reporting areas, the needle cast and needle blight were more widespread in 1998 than 1997. 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. Over 65,000 acres of larch needle cast were detected by aerial survey in 1998, down from over 393,000 acres reported in 1997.

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, were detected on the Deschutes, Fremont and Winema National Forests. The causal agent was not verified, but the symptom was fairly widespread, covering over 55,000 acres in 1998.

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.

Evidence of the disease was reported over a total of 21,000 acres in 1994. 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. Over 1,400 dead Port-Orford cedar on about 1,600 acres were mapped by the 1998 regular aerial survey.

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 2924 acres in 1997. 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 664 acres mapped in 1998 fell within the Yakama Indian Reservation and the Wenatchee National Forest. 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. Some Forests are pruning 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 was 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 10 to 15 percent loss in some lots of Douglas-fir and true fir. No adult moths were detected in pheromone traps. The growing season was one of unusual weather patterns, and the trapping period for adult moths may have missed the time period when they were active.

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

Hosts: Conifers

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

Fusarium Root and Hypocotyl Rot, *Fusarium* spp.

Hosts: Conifers

The nurseries 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

One + one Douglas-fir transplants from lots lifted during warm weather in January had 4 percent mortality due to storage molds. Seedlings were lifted when plant moisture stress was high and then were refrigerated for an extended period of time.

Phytopthora Root Rot, *Phytophthora* spp.

Hosts: Douglas-fir

At the nursery, one + one Douglas-fir transplanted into wet spots were culled due to Phytophthora root rot, resulting in 5 to 10 percent losses in Douglas-fir transplants.
At the tree improvement center, Phytophthora root rot in the rust runs resulted in partial loss of some replicates.

Animal Damage, rabbit

Hosts: Conifers

One lot of 2+0 Douglas-fir suffered 20 percent mortality due to rabbit gnawing of cambium.

Declines/Complexes, *Pacific Madrone Decline*

Hosts: Pacific Madrone

High levels of pacific madrone leaf spotting and dieback caused by a variety of fungi were reported in southwest Oregon. The greatest impacts appeared on madrones growing in wetter areas of the Region, particularly in river valleys and creek bottoms.

Although Pacific madrone decline was not detected and mapped from the air in Oregon, approximately 5,000 acres were detected and mapped in Washington. Areas affected include the Olympic peninsula, the Puget Sound area and coastlines in northwestern Washington.

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.

Acres affected by mountain pine beetle decreased for the third year from 157,089 acres with an average of 2.16 trees/acre in 1997 to 95,963 acres with an average of 3.31 trees/acre in 1998. Decreased 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, Fremont, and Okanogan reporting areas. Most heavily affected areas in the ponderosa pine type occurred on private lands within the Ochoco, Umatilla, Central Oregon, and Northeast Washington Reporting areas. 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 that 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. Mortality occurs when phloem continuity is disrupted by beetle larval galleries or by fungi introduced by the beetles. The resulting 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 33,600 acres averaging 1.1 tree/acre in 1998 as compared to 8,600 acres with an average of 1.0 tree/acre in 1997. Increased levels of activity were detected on Forest Service lands in North-central and Northeastern Washington as well as the Blue Mountains of Oregon. 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 1999 and likely into the year 2000.

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.

Fir engraver activity within the Region decreased for the third straight year from less than 26,000 acres in 1997 (0.82 tree/acre) to 11,400 acres in 1998 (0.74 tree/acre). Increased levels of activity were reported within the Deschutes and Ochoco reporting areas. Following three years of approximately normal precipitation, mortality levels remain highest in areas that have experienced drought, defoliation, or are infected with root disease. Many of the most heavily infested areas are pine sites that, 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 decreased slightly over 1997 levels. The majority of activity was detected on federal and private lands in northeastern Oregon and northeastern Washington. Field checks in northeastern Oregon suggest that some pine engraver beetle activity is coded as mountain pine beetle during the annual region-wide aerial survey.

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.

Western pine beetle activity increased in both large and pole-sized ponderosa pines throughout much of the Region. Over 2,900 large trees were killed in 1997 compared to about 13,300 in 1998. Mortality in smaller, pole-sized trees increased from 4,300 trees in 1997 to 7,800 trees killed in 1998. The most notable increase in large and pole-sized tree mortality occurred in northeastern Washington.

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 1998 was in Engelmann spruce. Reported trees killed decreased from approximately 6,500 trees in 1997 to fewer than 2,900 in 1998. Over 92 percent of all trees reported killed were on Federal lands. Sixty-eight percent of the reported acreage affected occurred within Wenatchee 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* (Heinrich)

Hosts: Ponderosa pine

Approximately 24,700 acres of needle miner in ponderosa pine was reported in central and eastern Oregon in 1998. This was the first aerially detected outbreak of ponderosa pine needle miner since 1992. In the Ochoco National Forest 17,700 acres were reported. 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. Observable defoliation will probably continue into 1999.

Pandora Moth, *Coloradia pandora*

Hosts: Lodgepole pine, ponderosa pine

Pandora moths infrequently defoliate pines. The insect has a 2-year life cycle: The larval stage causes defoliation in even-numbered years, and adult moths appear in odd-numbered years. The current pandora moth infestation in central Oregon began in 1986 and grew with each successive generation until 1994, when pines on 369,100 acres experienced some level of defoliation. A naturally occurring virus was noted throughout the infested area in 1994. Only 12,300 acres were defoliated in 1996, and we believe that this virus brought about the collapse of the pandora moth population. The defoliation produced by the larvae has caused concern, but trees are only bare for a short time until the current year's growth of needles appears later in the summer. We anticipate the long-term effects of the infestation will be minimal, with very low tree mortality in some areas. Due to greatly diminished larval populations, there was no special aerial survey conducted for the pandora moth in 1998. Defoliation was extremely light and would not have been visible from the air. Some larval feeding was noted near Little Walker Mountain, 10 miles south of Crescent on the Deschutes National Forest.

Douglas-fir Tussock Moth, *Orgyia pseudotsugata*

Hosts: Douglas-fir, true firs

The larvae of tussock moths feed on foliage of several tree species, but only four are considered primary hosts: Douglas-fir, grand fir, white fir, and subalpine fir. Early instar larvae feed on current year's foliage as the shoots elongate. Later instar larvae feed on all foliage. Following two years of no reported activity, we observed a small 19-acre pocket of visible defoliation on private lands in northeastern Washington.

The Douglas-fir Tussock Moth (DFTM) Early Warning Trapping System is a system of over 350 plots scattered throughout Washington and Oregon. The System was established to indicate general changes population. Results of the trapping in 1998 indicate that Douglas-fir tussock moth populations continue to increase throughout the Region. Since 1995, traps have indicated a general increase in several areas, primarily on parts of the Pine Ranger District (RD), south of Enterprise, Oregon, in northeastern Oregon, and north central Washington, southwest of Tonasket. Larval sampling and egg mass searches in the area in Northeastern Oregon in 1998 indicated that populations were still in sub-outbreak stage, but based of the trend of the traps, we could begin to see DFTM defoliation in some areas in 1999. In 1997, 11 plots had an average of 25 moths or more per trap; in 1998 51 plots had an average of 25 moths or more per trap. In addition to the areas identified in 1997, additional areas with increases include the Methow Valley and the Sanpoil portion of the Colville Indian Reservation in Washington; and the Bear Valley and portions of the Prairie City RD on the Malhuer National Forest, portions of the Heppner and Pomeroy RD on the Umatilla, and state and private land in the Klamath District of the Oregon Department of Forestry. These areas will be monitored closely and additional cocoon and larval sampling be conducted in 1999.

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 increased from approximately 166,000 acres in 1997 to over 486,000 acres in 1998. Over 78 percent of the area reported with visible defoliation caused by western spruce budworm occurred on Yakama Indian Reservation lands. Over 27,000 acres of defoliation was detected on the Gifford-Pinchot National Forest, compared to less than 7,000 acres reported in 1997. Approximately 73,000 acres of adjoining state and private lands were also affected. In addition to significant increases in affected acres, there was an observable intensification of cumulative damage in areas previously mapped during aerial survey. However, ground surveys conducted by field crews indicate that the extent and severity of budworm was actually less than indicated by aerial survey.

Western Hemlock Looper, *Lambdina fiscellaria lugubrosa*

Hosts: Western hemlock, Douglas-fir, Sitka spruce, Pacific silver fir

The primary host for hemlock looper is western hemlock, although it will also feed on other conifer species and understory shrubs found in association with western hemlock. Intense, repeated defoliation can result in tree mortality. Outbreaks typically will last 3 years and are kept in check by natural biological controls.

Approximately 1,100 acres of hemlock looper defoliation were reported in 1998. Over 900 acres of activity were reported on the Mt. Baker-Snoqualmie National Forest and a 150-acre site within the North Cascades National Park. The defoliation was mapped during the annual region-wide aerial survey and was not verified on the ground.

Non-indigenous Insects

Balsam Woolly Adelgid, *Adelges piceae*

Hosts: True firs

The balsam woolly adelgid (BWA) is a sucking insect that is native to Europe 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 and branches, or quickly by infesting the bole. It also causes gouting of branch tips. Balsam woolly adelgid activity was observed on 2,500 acres in 1998, a decrease of approximately 7,000 acres from 1997 reported levels. The majority of activity occurred in Mt. Rainier National Park, which experienced a slight increase in the number of acres visibly affected. 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.

In 1998, a Forest Health Monitoring survey was initiated. This is a ground survey of the host type throughout Washington and Oregon to confirm occurrence and distribution and determine effects on host species and changes in local ecosystems. In 1998, the ground survey focused primarily on lands in northwestern Oregon and southwestern Washington, the Olympic National Park and the Cascade Range in northern Oregon. In addition, permanent plots that were established in the early 60's were revisited to collect information on continued BWA activity and effects. The permanent plots indicate that environment plays a significant role in the fluctuations of BWA populations; which is evident, 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 National Park, there may be occasional population increases, followed by a decline to less damaging levels. The BWA ground survey will continue along coastal Washington and Oregon, as well as in the Puget and Willamette Valleys in 1999.

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, three eradication projects totaling 770 acres were conducted using ground and aerial applications of *Bacillus thuringiensis* (Bt). The gypsy moth survey in 1998 resulted in trap catches of 53 individuals. Of those, all were identified as the European strain. Eradication projects are planned for 1999 at two sites with an estimated 57 acres.

In Oregon, two eradication projects were conducted using two ground applications of Bt on 30 acres. Twenty-three moths were trapped in 1998 in Oregon, and all have been identified as the European strain. One site in Beaverton 2 encompassing an estimated 19 acres is proposed for eradication in 1999 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 was observed in portions of the Blue Mountains in 1996. Even though the survey timing is not ideal for detecting defoliation caused by this insect, the region-wide aerial survey mapped 166 acres in 1997 and over 4,500 acres in 1998. Approximately 800 acres were mapped on Malheur National Forest, over 2,300 acres on Mt. Hood and an additional 1,200 acres within the Umatilla Reporting Area.

Introduced parasites released in the Pacific Northwest in the early 1960's and established years ago, along with a couple of 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 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).