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Department of Agriculture

Forest Service
Pacific Northwest Region

Oregon
Department of Forestry

Forest Health Highlights In Oregon – 2004

March 2005

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Front cover: *Sudden Oak Death Eradication near Brookings on the southern Oregon coast, photo by Oregon Department of Forestry*

Introduction

Insects and disease pathogens cause significant tree mortality, growth loss, and damage to large volumes of potential wood products each year. This can reduce management options for landowners, and contribute to hazardous forest fire conditions. However, these disturbance agents are a natural and necessary part of forest ecosystems. They contribute to decomposition and nutrient cycling, create openings which enhance vegetative diversity and create additional wildlife habitat. A healthy forest is never free of insects, disease, disturbances, and tree defects.

The Oregon Department of Forestry works cooperatively with the U.S. Forest Service in aerial surveys, insect & disease detection, mapping, monitoring, and eradication. This report provides information about major insect and disease activity levels in Oregon in 2004. For additional information, or for specific questions, please contact the forest specialists listed on the back page of this report.

Aerial Survey

Several aerial surveys are conducted each year in Oregon, including the statewide aerial detection survey, and separate surveys for Swiss needle cast and sudden oak death (SOD). All surveys flown in Oregon now use an advanced digital sketch mapping, which adds increased accuracy of the survey and allows rapid summarization and reporting of damage data on a daily basis.

The statewide aerial survey is flown each year to detect tree damage and mortality, primarily from insects, on all forest land. Approximately 28 million acres are flown during the survey with 40% of the acres belonging to state and private landowners and the remaining 60% federally owned. In 1996 the Oregon Department of Forestry initiated a separate late spring survey for Swiss needle cast, a foliage disease affecting Douglas-fir, over almost 3 million acres in western Oregon. Maps for both the statewide and Swiss needle cast surveys are sent to interested landowners and are also available to the public. The 2004 maps of both the statewide survey and Swiss needle cast surveys were posted on the Forest Service website (http//www.fs.fed.us/r6/nr/fid/data.shtml) and sent to interested landowners.

Another aerial survey was initiated in 2001 to detect tanoaks killed by the sudden oak death fungus, Phytophthora ramorum, which was first found in Curry County in 2001. During this survey observers detect dead or dying tanoak and suspect trees are then checked by ground crews for disease presence. In 2004 two surveys with fixed wing aircraft covered 308,000 acres and 296,000 acres. Following the fixed wing surveys, helicopter surveys were conducted to pinpoint suspect tree locations. The helicopter surveys in 2004 covered 300,000 acres and 290,000 acres, respectively, and provided the precise coordinates needed by ground crews to find trees. Then an additional helicopter survey of 120,000 acres was conducted for intensive monitoring of tanoak mortality within the quarantine and eradication zone.

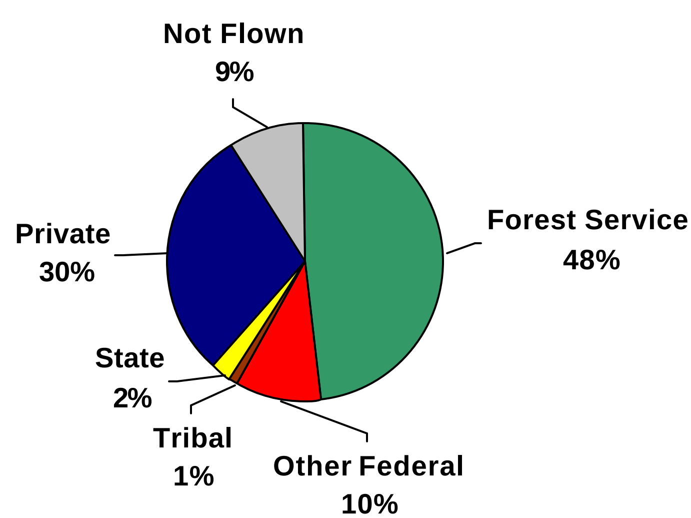


Figure 1 – Forested acres in Oregon surveyed by air in 2004, by land ownership category.

Drought Conditions

The lingering effects of drought could be seen over much of Oregon's low and mid-elevation forests in 2004. Even the Willamette Valley experienced drought effects in the form of western red cedar mortality on drier sites (Figure 2). Symptoms of decline in red cedar included a gradual thinning of foliage in the upper crown, which progressed downward until tree death. Bark beetles and borers could be found in the declining cedar, but they did not appear to be the cause of tree mortality. Another unusual drought related event in 2004 was shore pine and grand fir mortality in coastal Curry County. In this case, bark beetles appeared to be the causal agents. Overall, tree mortality caused by bark beetle in Oregon increased from 570,000 acres in 2003 to 709,408 acres in 2004 (Figure 3).

Figure 2 – Western red cedar mortality from drought near Molalla, Oregon. Photo by Oregon Dept. of Forestry

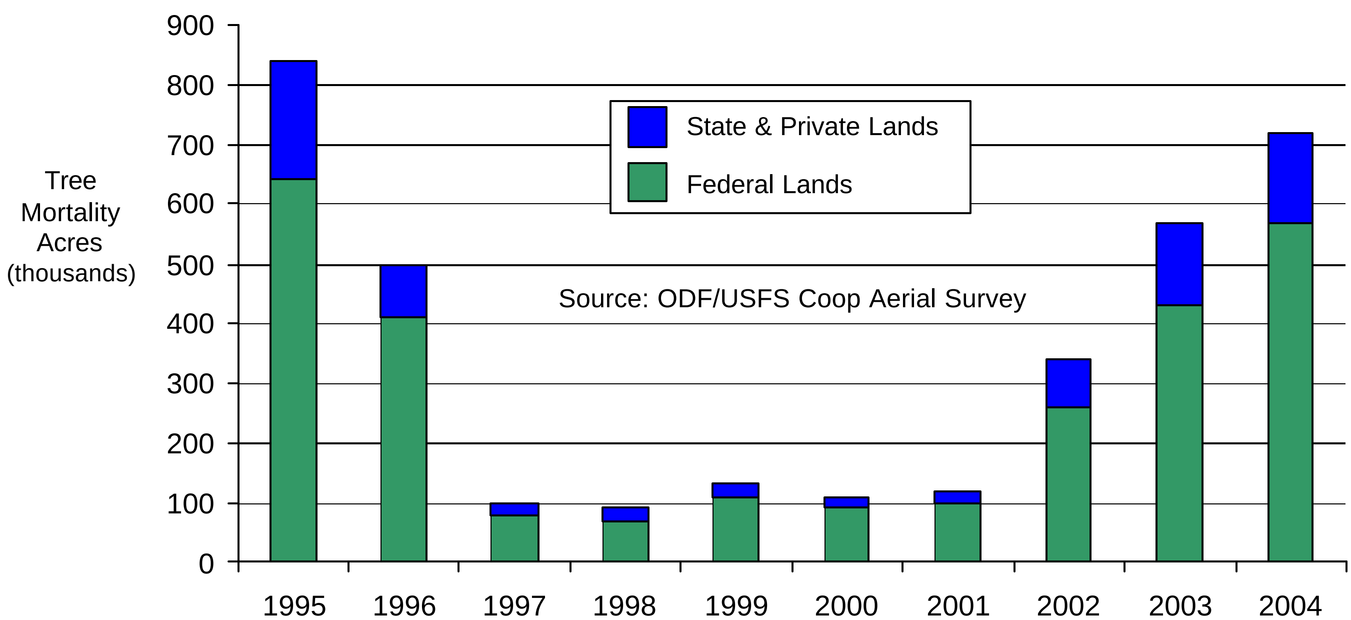


Figure 3 – Acres infested with bark beetles in Oregon as detected during annual aerial surveys.

Insects

Fir Engraver Beetle
(Scolytus ventralis)

In 2004 true fir mortality was detected on 371,915 acres statewide. This was an increase from the 308,959 acres infested in 2003. Grant County in eastern Oregon and lower elevation true fir stands in southwest Oregon (Figure 4) were areas with major increases in true fir mortality. Even true fir stands on the edges of the Willamette Valley have been susceptible to fir engraver beetle attacks during this drought. Typically fir engraver beetle outbreaks subside when wetter conditions return.

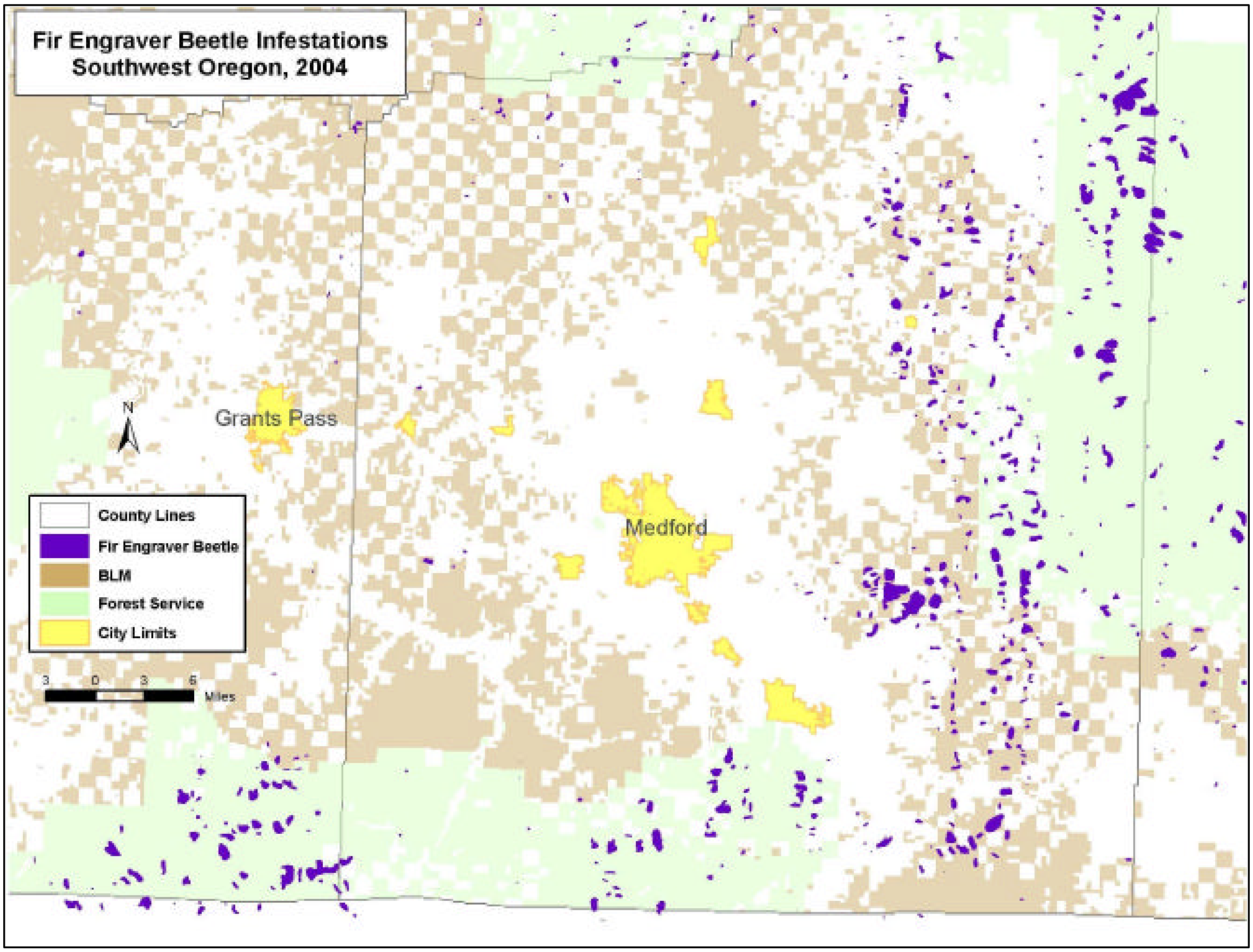


Figure 4 – Distribution of true fir mortality in southwest Oregon from bark beetle infestations as detected during the annual aerial survey.

Western Pine Beetle, Mountain Pine Beetle and Ips
(Dendroctonus brevicomus, D.ponderosae, and Ips spp.)

Ponderosa pine mortality detected by aerial surveys reached its highest point in almost a decade (Figure 5) with most of the increases occurring in Central and Northeast Oregon. When ground crews examined pockets of dying ponderosa pine, western pine beetle was identified as causing most of the tree mortality. Ips infestations were detected on over 8,000 acres in 2004, the most damage since 1993. Ponderosa pine damaged by snow and wind-storms in 2003-04 has led to a large increase in Ips breeding material in many areas of eastern Oregon. Both western pine beetle and Ips are associated with elevated levels of pine mortality during drought events.

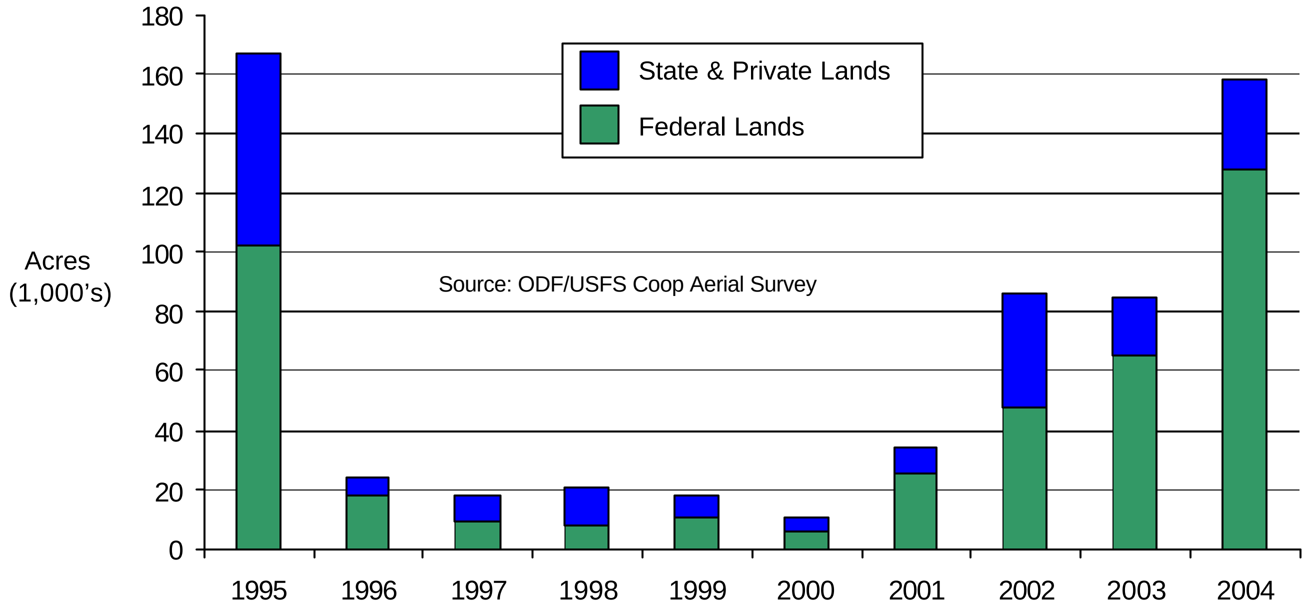
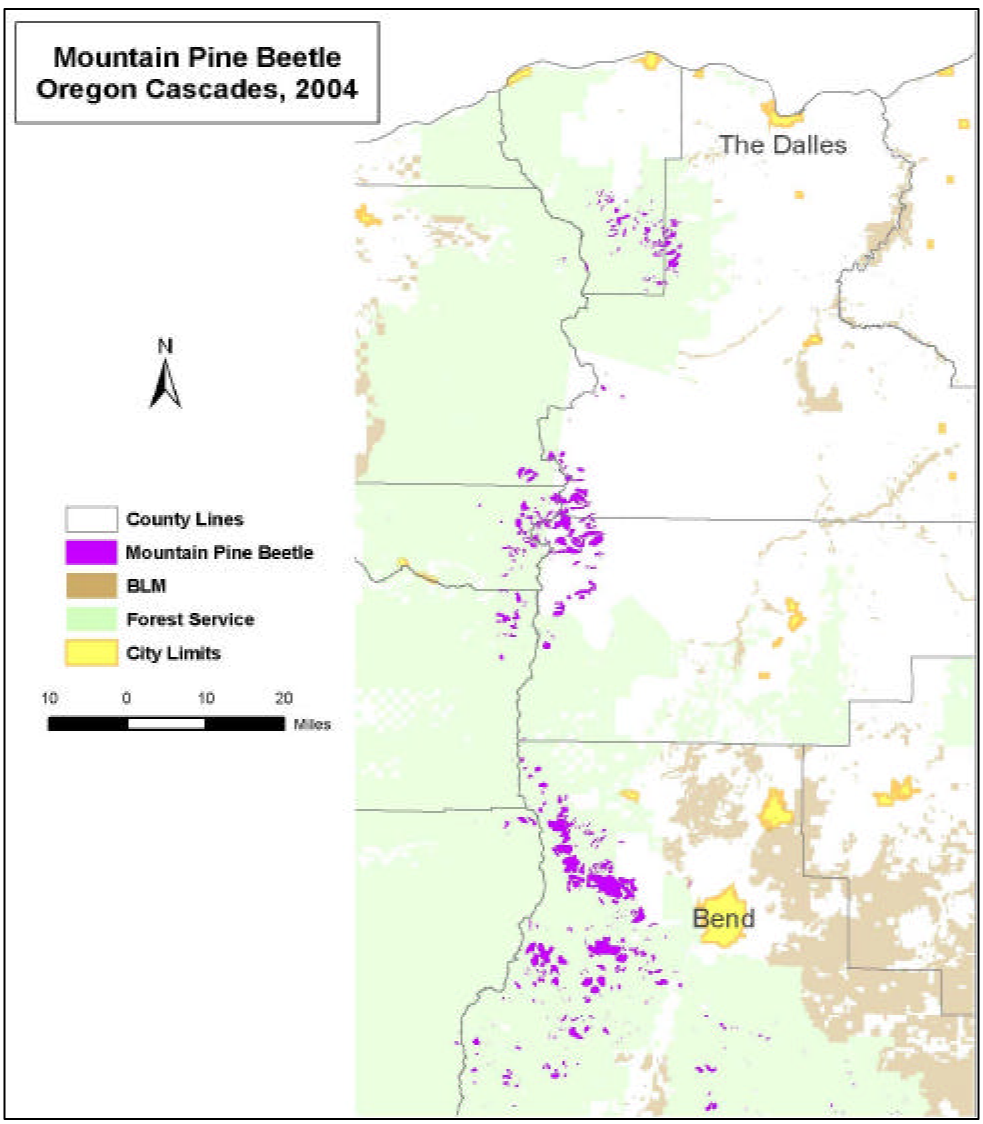


Figure 5 – Acres of ponderosa pine infested with bark beetles in Oregon as detected during annual aerial surveys.



Mountain pine beetle outbreaks in lodgepole pine stands are usually landscape level events, driven by the presence of large trees in overstocked stands. Most of the lodgepole pine mortality in Oregon is concentrated along the east slope of the Cascades from just south of Bend, northward to the east flank of Mt. Hood (Figure 6). The areas affected by mountain pine beetle infestations in 2004 increased to over 156,000 acres. The potential for large fires following mountain pine beetle outbreaks is high, and will pose a threat to some east-slope watersheds.

Figure 6 – Distribution of lodgepole pine mortality from mountain pine beetle as detected during the annual aerial survey.

Pandora Moth
(Coloradia pandora)

A pandora moth outbreak that started in 2002 with 24,000 acres of defoliation has now spread to 87,000 acres, that includes both lodgepole and ponderosa pine stands in northern Klamath County (Figure 7). Few signs of virus infection in the pandora moth population have been reported, so a new cycle of defoliation covering a larger area could occur in 2006. The growth in acreage of this outbreak closely parallels the 1990 outbreak that occurred south of Bend. Past pandora moth outbreaks affecting ponderosa pine resulted in little tree mortality, but some reduction in growth.

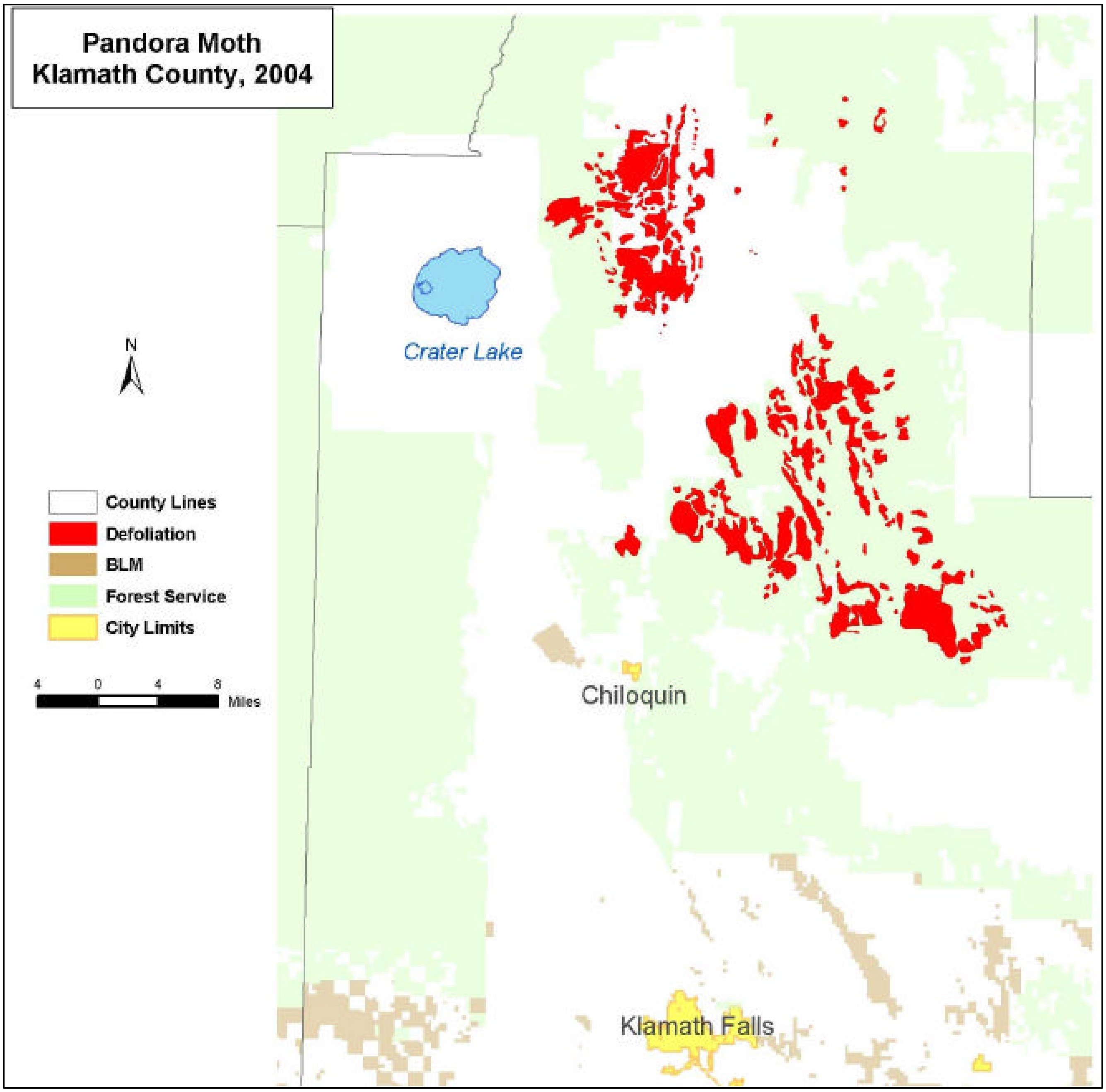
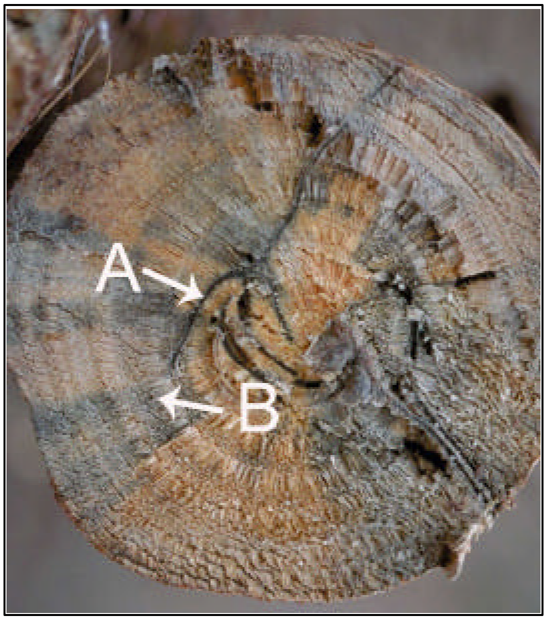


Figure 7 – Areas of lodgepole pine defoliated by pandora moth as detected during aerial surveys.



Eurasian Ambrosia Beetle
(Xylosandrus crassiusculus)

The Oregon Department of Agriculture trapped over 100 specimens of this exotic beetle for the first time in 2004, near The Dalles. The probable source of the beetles is a wood processing facility, utilizing hardwood imported from the southeastern states. Xylosandrus crassiusculus is known to attack over 200 woody trees and shrubs. Unlike most other ambrosia beetles, it is capable of attacking and killing apparently healthy small diameter hardwoods (Figure 8). If this beetle becomes established in Oregon, it has the potential to be a pest of orchard and ornamental trees as well as native hardwoods.

Figure 8 – Small diameter hardwood infested by the Eurasian ambrosia beetle. A – beetle gallery, B – areas of bluestain. Photo by Oregon Department of Forestry

Diseases

Sudden Oak Death
(Phytophthora ramorum)

Sudden Oak Death (SOD), caused by the non-native pathogen Phytophthora ramorum, is a relatively new disease that since 1995 has caused considerable mortality of tanoak, coast live oak, California black oak, and infects more than 30 other plant species in California. The pathogen, which spreads by wind and rain, can kill trees by causing lesions on the main stem (Figure 9), or it can cause leaf blight and shoot dieback (Figure 10). P. ramorum is known to occur in forests only in California, Oregon, and in two European countries. In Oregon, P. ramorum was first discovered in July 2001 at five sites on the southwest coast near the town of Brookings. Aerial photos of the area indicate that the pathogen was present at one of the sites since 1997 or 1998.

Figure 9 – Stem lesion on tanoak caused by Phytophthora ramorum. Photo by Oregon Department of Forestry

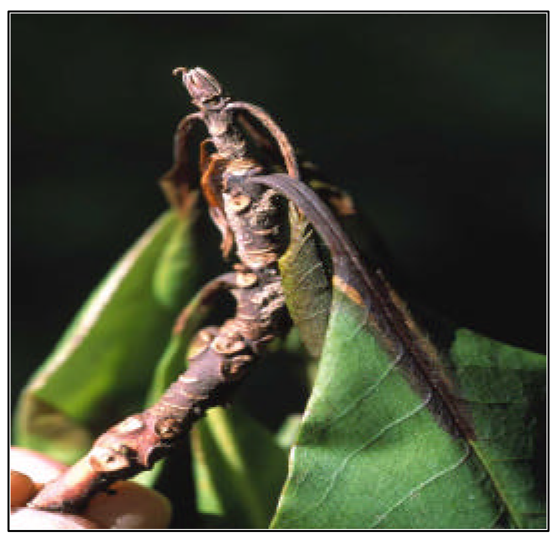


Figure 10 – Leaf blotch on pacific rhododendron caused by Phytophthora ramorum. Photo by Oregon Department of Forestry

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 (Figure 11), and treating the stumps to prevent sprouting. Any vegetation sprouting from stumps following the initial treatment is destroyed mechanically or with herbicides. As of the end of 2004, eradication was in progress on approximately 42 sites, totaling 70 acres (Figure 12).

Figure 11 – Eradication of the Sudden Oak Death pathogen, Phytophthora ramorum in southern Oregon. Photo by Oregon Department of Forestry

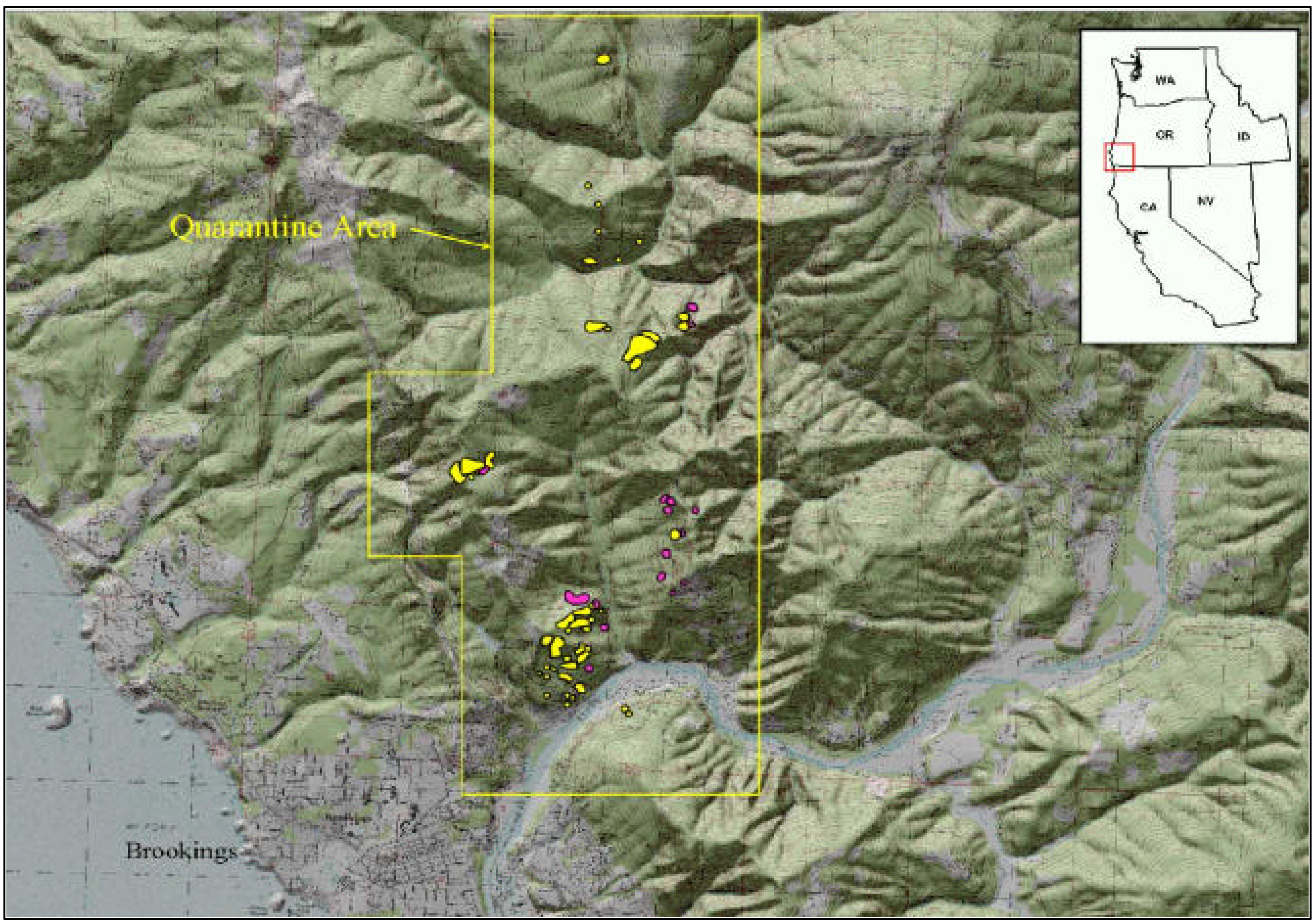


Figure 12 – Location of Sudden Oak Death eradication sites and Quarantine area in southwest Oregon, December 2004. Yellow = 2001-2003 sites; magenta - 2004 sites. All areas shown have been cut and burned.

P. ramorum has persisted on many infested sites despite eradication efforts. On approximately 50 percent of the sites the pathogen survived the initial treatment and was present in stump sprouts of host vegetation one or more years after treatment. Similarly, P. ramorum was recovered from soils at several eradication sites, but with very low frequency. P. ramorum also was detected in several streams associated with eradication sites, and almost never in streams not associated with known infestations.

Repeated and extensive aerial surveys with 100 percent ground-verification and several ground surveys have failed to detect the pathogen in Oregon forests beyond the limited area near Brookings. Each year most new infected trees occurred within 0.1 mile of eradication sites, a pattern consistent with aerial spread via wind and rain. The number of new infected trees discovered each year has decreased since we first discovered the pathogen in Oregon (Figure 13). It appears that the eradication effort has reduced inoculum levels and slowed spread of the pathogen. As of the end of 2004 the area under federal and state quarantine remained at 11 mi^2 (Figure 12).

Sudden Oak Death in Southwest Oregon

	# Trees	# of Sites		Area Treated	
Year	Infected	New	Cumulative	New	Cumulative
2001	100+	9	9	40	40
2002	85	12	21	8	48
2003	48	12	33	12	60
2004	30	9	42	10	70

Figure 13 – Sudden Oak Death in southwest Oregon: number if infected trees discovered each year, number of infested sites, and number of acres undergoing eradication.

Swiss Needle Cast
(Phaeocryptopus gaeumannii)

Swiss needle cast (SNC) is a disease of Douglas-fir foliage caused by the native fungus Phaeocryptopus gaeumannii. It causes needles to turn yellow and fall prematurely from the tree, ultimately reducing tree growth and survival (Figures 14 and 15). Tree mortality is rare, occurring only after many years of defoliation. Growth loss due to Swiss needle cast in the Oregon Coast range is estimated at more than 100 million board feet per year. In addition to growth loss and some mortality, Swiss needle cast reduces stand management options, hinders the development of stand structures and wildlife habitat, and may increase the risk of catastrophic fire.

Figure 14 – Black fruiting bodies of the Swiss needle cast fungus, Phaeocryptopus gaeumanni, on the underside of Douglas-fir foliage. Photo by Oregon Department of Forestry

Figure 15 – Sparse crowns of mature Douglas-fir damaged by Swiss needle cast, western Oregon. Photo by Oregon Department of Forestry

Since the late 1980's, the disease has become particularly damaging to Douglas-fir forests on the west slopes of the Oregon Coast range (Figure 16). The 2003 and 2004 surveys mapped SNC symptoms on 270,000 and 176,000 acres respectively, continuing a recent trend of decreasing area with symptoms of SNC (Figure 17). The 2004 survey did not extend inland quite as far as it had in previous surveys, and it covered 20 percent fewer acres than it did in 2003 (the survey extends inland only as far as observers can detect symptoms). Some of this decrease in acres mapped may have resulted from recent changes in forest management such as clearcutting severely damaged stands and widespread planting of hemlock and cedar. On the other hand, the 2004 survey was particularly challenging for observers. SNC symptoms were rather late developing, and an early bud-flush confounded observation. Cloudy conditions during the narrow survey window also made observation and mapping unusually difficult.

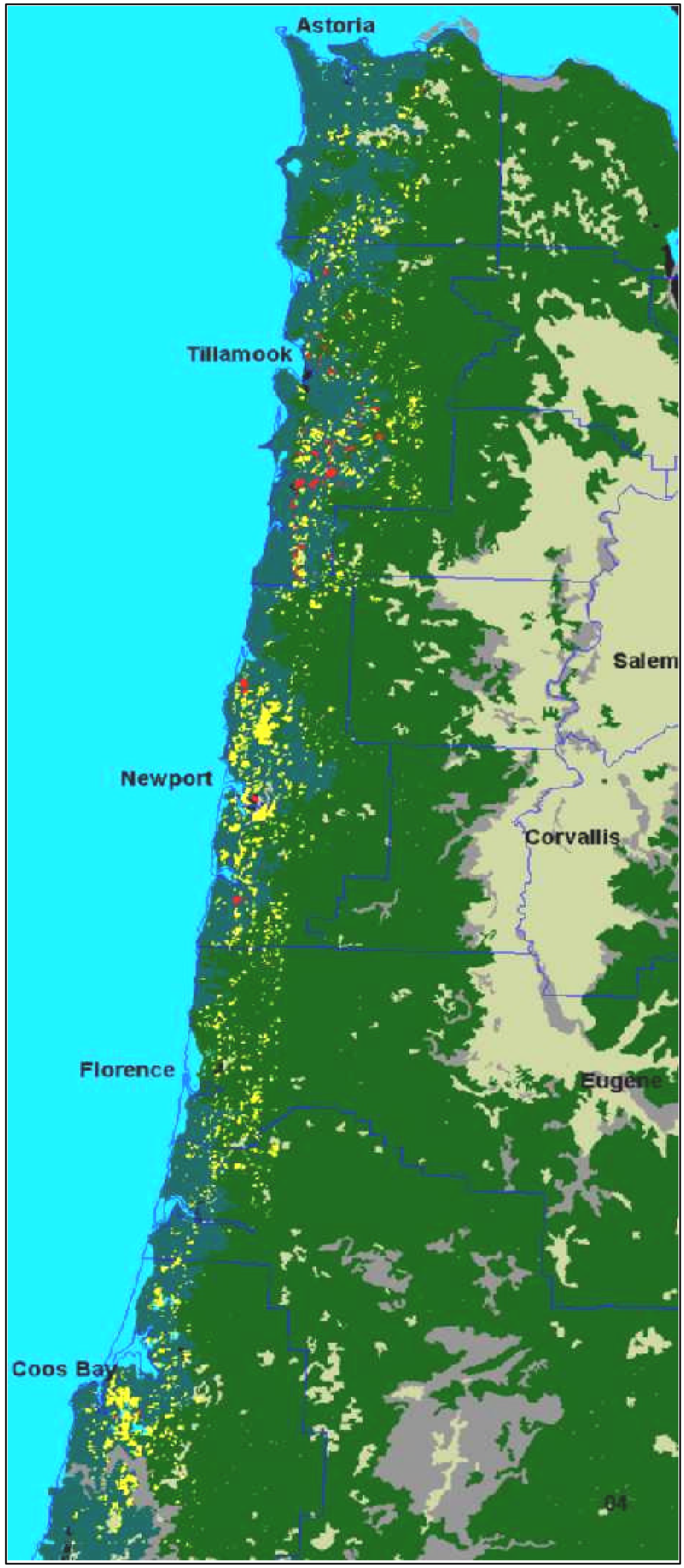


Figure 16 – Areas of Douglas-fir forest with symptoms of Swiss Needle Cast detected in the 2004 aerial survey. Yellow = moderate damage, red = severe damage.

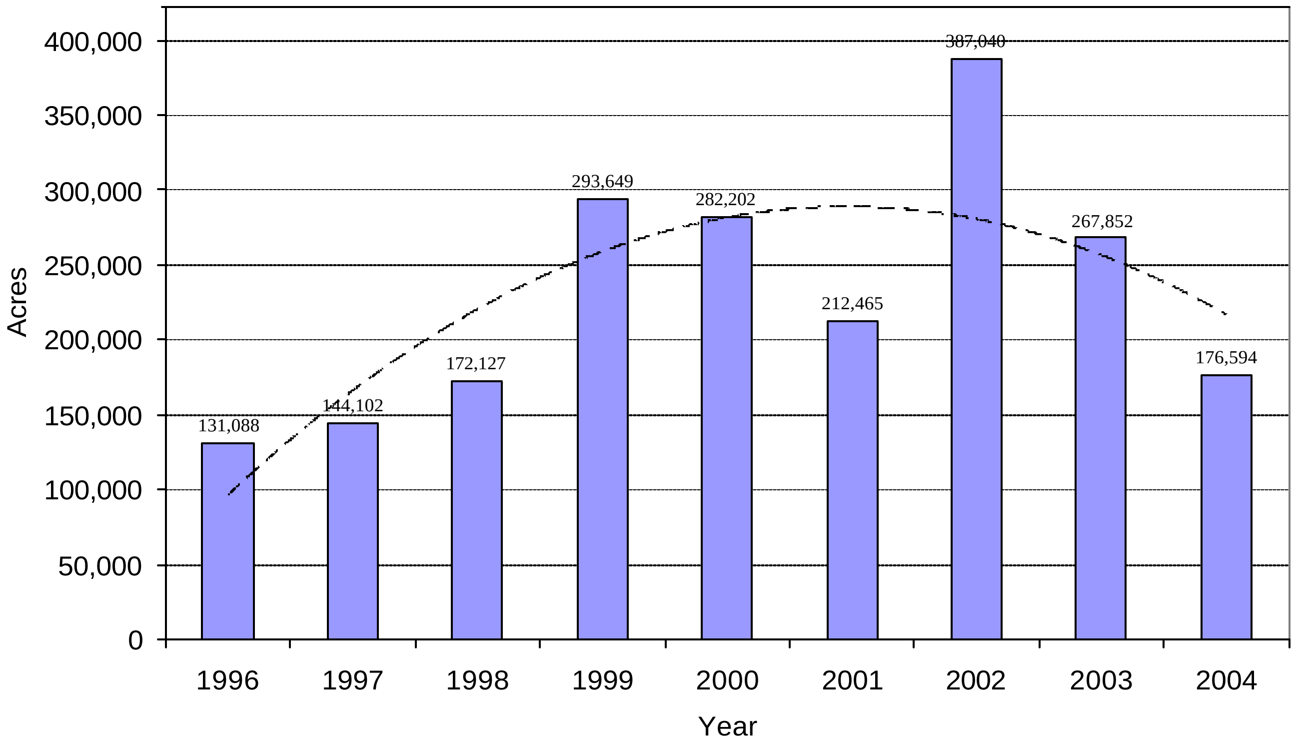


Figure 17 – Trend in the number of acres of Swiss needle cast mapped in aerial surveys between 1996 and 2004 in the Coast Range of Oregon.

The total amount of forest affected by Swiss needle cast is far greater than indicated by the aerial survey. The aerial survey does, however, provide a reasonable depiction of the extent of moderate to severe damage, coarsely documents trends in damage over time, and establishes a zone in which forest management should take into account the effects of the disease.

Permanent plot data in northwest Oregon for the period 1998 to 2004 suggests a recent slight reduction in damage from Swiss needle cast as indicated by increased foliage retention and improved tree volume growth. Even though the permanent plot and aerial survey trends might be encouraging, an impressively large area of Douglas-fir forest continues to experience significant growth loss from Swiss needle cast.

Figure 18 – Pruned blister-rust resistant western white pine plantation in western Oregon. Photo by Oregon Department of Forestry

White Pine Blister Rust *(Cronartium ribicola)*

White Pine Blister Rust, caused by the non-native fungus Cronartium ribicola, has been present in Oregon since the 1920's and continues to cause extensive damage to all native 5-needle pines (western white pine, sugar pine, white-bark pine, and limber pine). Recent interest has focused on the sensitive and unique high elevation white-bark pine forests near timberline, which are particularly threatened because of their unique ecology. Disease management is based on cultural methods such as pruning and stand-density manipulation, and the production of disease-tolerant seedlings through selective breeding (Figure 18).

Other Damage

Bear Damage

In the Pacific Northwest, black bears damage forest trees in the spring of the year by peeling the bark and eating the succulent inner tissue. If the entire circumference of the bole is peeled, the tree will die. Partial peeling can reduce tree growth and vitality, and introduce decay that lowers wood quality and eventually may result in mortality. In young Douglas-fir plantations, up to 50 percent of trees can be killed or damaged by bears, although the average level of damage is much lower (Figure 19).

In the 2004 statewide aerial survey, bear damage was mapped on approximately 34,000 acres of forestland; 70 percent on state and private lands, and 30 percent on federal lands. This estimate is based on the aerial observer's determination of bear damage, with no ground verification to confirm the cause of tree mortality (root diseases, insects, and other agents also cause tree mortality).

Long term trends in bear damage are determined from aerial surveys of parts of western Oregon flown annually since 1993. The number of acres with recent mortality from bear damage is estimated by adjusting aerial survey data with ground verification data. The 2003 and 2004 surveys estimated 43,000 and 37,000 acres with bear damage, respectively, which is considerably higher than the 20,000-acre average of previous years (Figure 20). Analysis of the aerial survey polygon size distribution (bear damage is more likely in large polygons than in small polygons) suggests that much of this increase probably was due to agents other than bear, such as root disease and drought conditions.

Figure 19 – Tree mortality caused by black bear in young Douglas-fir stand, western Oregon. Photo by Oregon Department of Forestry

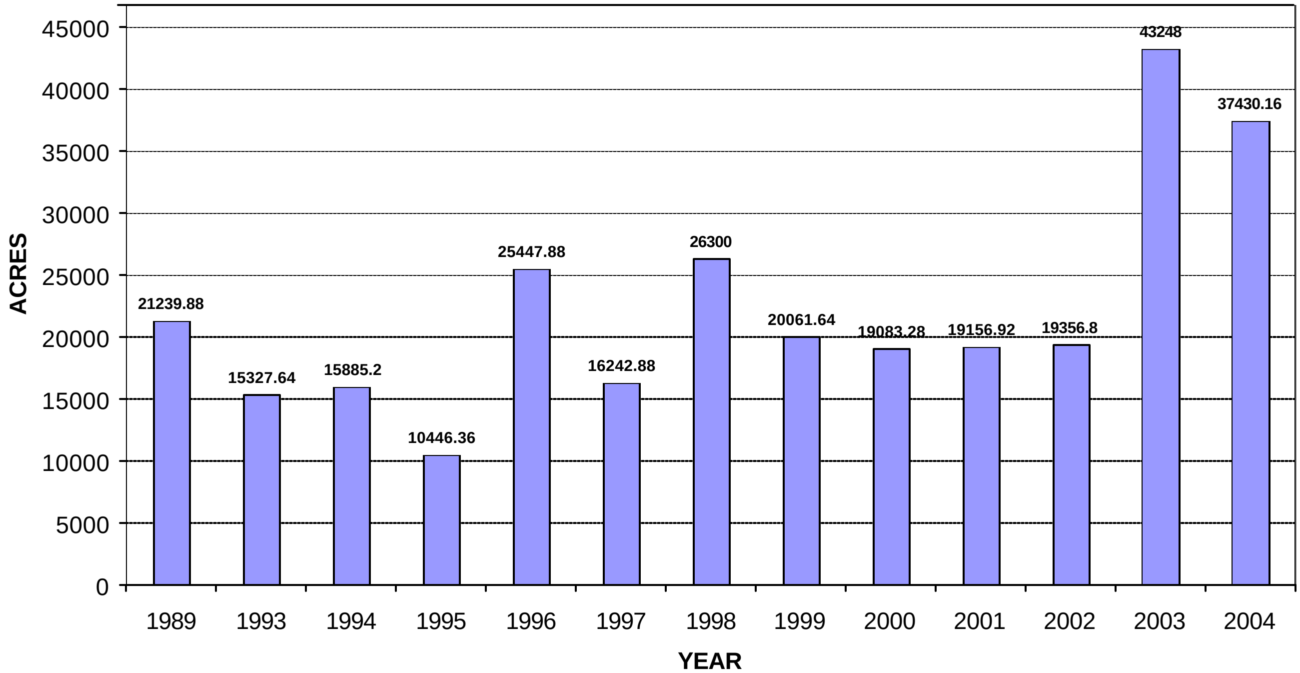


Figure 20 – Trend in bear damage in western Oregon as estimated by aerial survey with ground verification, 1989-2004.

Root Diseases

Several root diseases continue to affect Oregon forests, in many cases causing substantial damage. The degree of damage often reflects past management practices and fire exclusion, which have resulted in overstocked stands with a large component of disease-prone shade-intolerant species. Laminated root rot is the most destructive of these root diseases statewide, and is most damaging to Douglas-fir, true firs, and mountain hemlock. Armillaria root disease and Annosum root disease are particularly damaging in southern and Eastern Oregon. Root diseases do not lend themselves to detection by aerial survey, so annual damage trends are lacking. Manipulating the composition of stands to favor disease-tolerant tree species can mitigate root disease losses.

Notes

Contacts and Additional Information

If you have questions about forest insect and disease activity in Oregon, please contact one of these regional or field offices:

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