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Department of Agriculture

Forest Service
Pacific Northwest Region

Oregon
Department of Forestry

Forest Health Highlights In Oregon – 2003

June 2004

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Front cover: White fir mortality in southern Oregon; 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. They 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 support ecological processes such as decomposition and nutrient cycling. They create openings, enhance tree species diversity, and provide food and habitat that many animals depend on. A healthy forest is not free of insects, diseases, disturbances, and tree defects.

This report informs readers about major insect and disease activity levels in Oregon in 2003. For additional information to locate or identify specific damage or to obtain information on management techniques to reduce impacts from forest insects and diseases, contact the Oregon Department of Forestry's Forest Health Program (see back page).

Aerial Survey

Several cooperative aerial surveys are conducted each year in Oregon, including the statewide aerial detection survey and other special surveys of specific agents. For the first time, in 2003, all surveys flown in Oregon used a digital sketch mapping system developed by the USDA Forest Service, Forest Health Technology Enterprise Team (Figure 1). Use of digital sketch mapping has greatly increased the accuracy of the survey and allowed the rapid summary of damage data at the end of each day.

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 (Figure 2).

In addition, since 1996, the Oregon Department of Forestry has conducted a special survey for Swiss needle cast, a foliage disease affecting Douglas-fir. Approximately 3 million acres in western Oregon are flown in the late spring to map Swiss needle cast damage. Maps for both the statewide and Swiss needle cast surveys are sent to interested landowners and are also available to the public. In 2003, maps summarizing data from these two surveys also became available on the USFS Region 6 web site (http//www.fs.fed.us/r6/nr/fid/data.shtml).

The second special cooperative survey flown in 2003 was for the sudden oak death pathogen, *Phytophotra ramorum*. Sudden oak death was first found in Oregon in Curry County in 2001. During

Figure 1 – The sketchmapper operates the software via the touchscreen. Photo by USDA Forest Service.

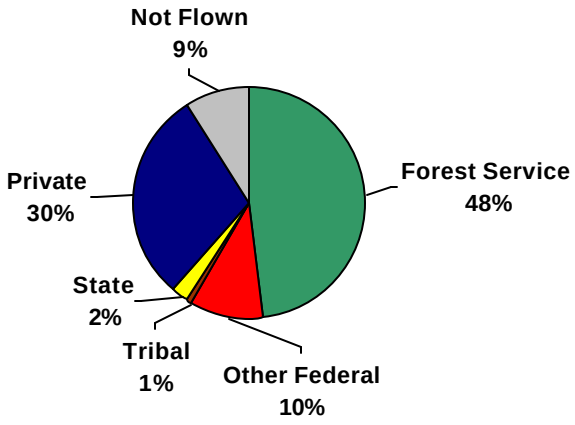
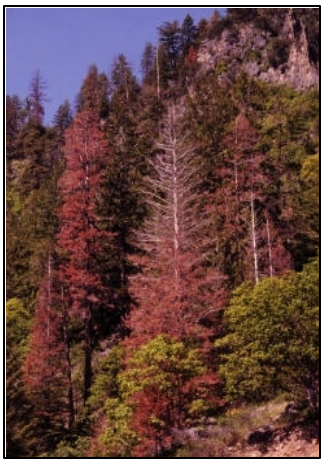


Figure 2 – Forested acres in Oregon surveyed by air in 2003, by land ownership category.

this survey, observers map the approximate location of dead or dying tanoak from a fixed-wing aircraft, and follow-up with helicopter flights to pinpoint the locations. All suspect trees are then checked by ground crews for disease presence. In 2003, two fixed-wing/helicopter surveys were conducted (325,000 and 528,000 acres). Two additional helicopter surveys of 6,500 acres each were conducted for intensive monitoring of tanoak mortality, within the quarantine and eradication zone near Brookings.

Drought Conditions

In 2003, most areas of Oregon received below normal precipitation, as measured by the surface water supply index. The previous two years have also been relatively dry conditions in southwestern and eastern Oregon. Periods of below normal precipitation are one of the factors predisposing trees to bark beetle attack.



Bark beetle outbreaks associated with drought events typically follow a predictable scenario. Initially bark beetle infestations are concentrated in dry, low elevation forests, typically pine type. When dry conditions persist for several years, beetle outbreaks gradually spread to the wetter mixed conifer forests dominated by true fir or Douglas-fir (Figure 3). This pattern explains most of the increased tree mortality detected by the 2003 aerial survey.

Figure 3 – White fir killed by the fire engraver beetle on a drought prone site in eastern Oregon. Photo by Oregon Department of Forestry.

Insects

Bark beetle damage in Oregon increased from 347,452 acres in 2002 to 570,770 acres in 2003. The largest increase in tree mortality occurred in true fir stands in eastern and southwestern Oregon. Drought prone sites in southwest Oregon also showed increases in Douglas-fir and incense cedar mortality, caused by flatheaded borers and bark beetles.

The total acreage affected by defoliating insects increased from 76,510 acres in 2002 to 125,888 acres in 2003. Most of this increase occurred because aerial surveyors are using a new signature (search image) for detecting balsam woolly adelgid infestations in subalpine fir stands. In 2002, pandora moth defoliated 24,447 acres of lodgepole pine in northern Klamath County. Because pandora moth has a two-year life cycle, we will not know if this outbreak is continuing until the spring of 2004.

The possible impact of exotic insects on native forests and urban trees is always a threat to forest health. A new exotic bark beetle, *Scolytus schevyrewi*, was collected for the first time in Oregon during 2003. It has also been found in several other western states and is known to infest hardwoods.

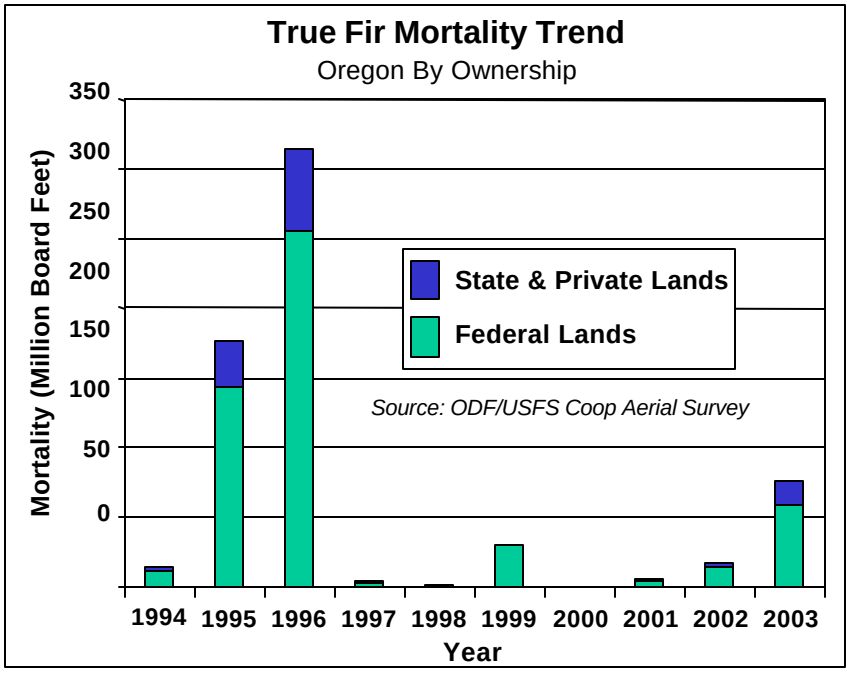


Figure 4 – Volume loss in true fir caused by fir engraver beetle as detected during annual aerial surveys.

Fir Engraver Beetle
(Scolytus ventralis)

True fir mortality, caused by fir engraver beetle, increased dramatically in southwestern and eastern Oregon (Figures 5 & 6). Even areas of northwest Oregon, particularly around the edges of the Willamette Valley, have experienced higher levels of true fir mortality over the last two years. This is the first statewide fir engraver beetle outbreak in decades, but so far this outbreak is not as damaging as past, more localized outbreaks in Klamath and Lake Counties during the early 1990's (Figure 4). Based on the persistence of dry conditions in 2003, it is likely that elevated levels of true fir mortality will continue into 2004. Several years of below-normal precipitation triggered the outbreak and it will end when wetter conditions return.

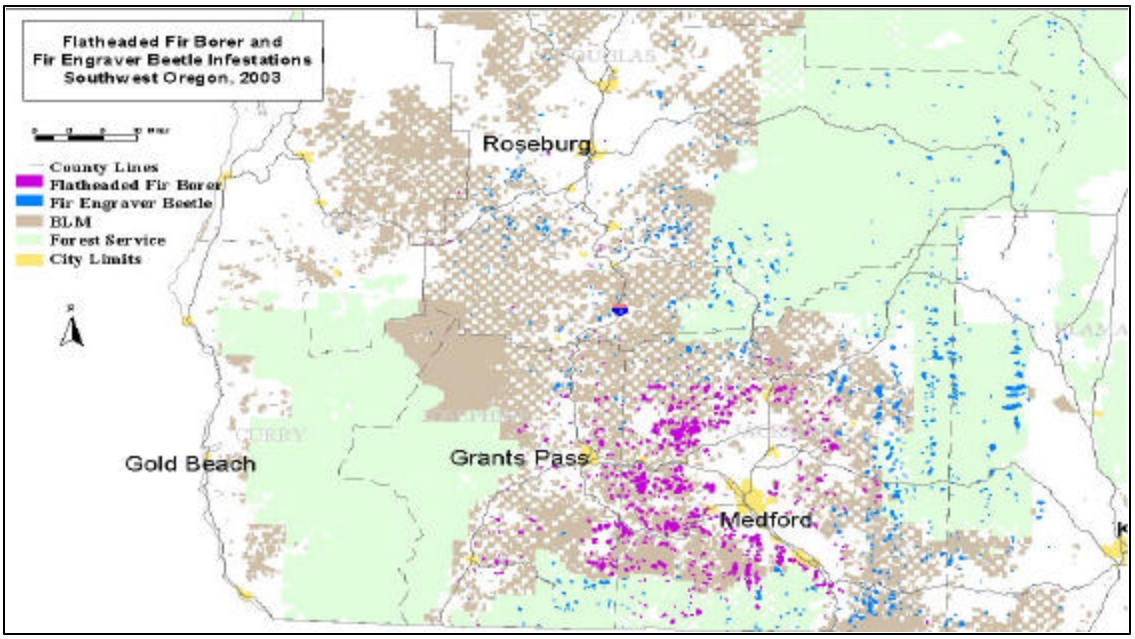


Figure 5 – Distribution of true fir mortality from the fir engraver beetle infestations and Douglas-fir mortality from the flatheaded fir borer attacks in southwest Oregon as detected by the annual aerial survey.

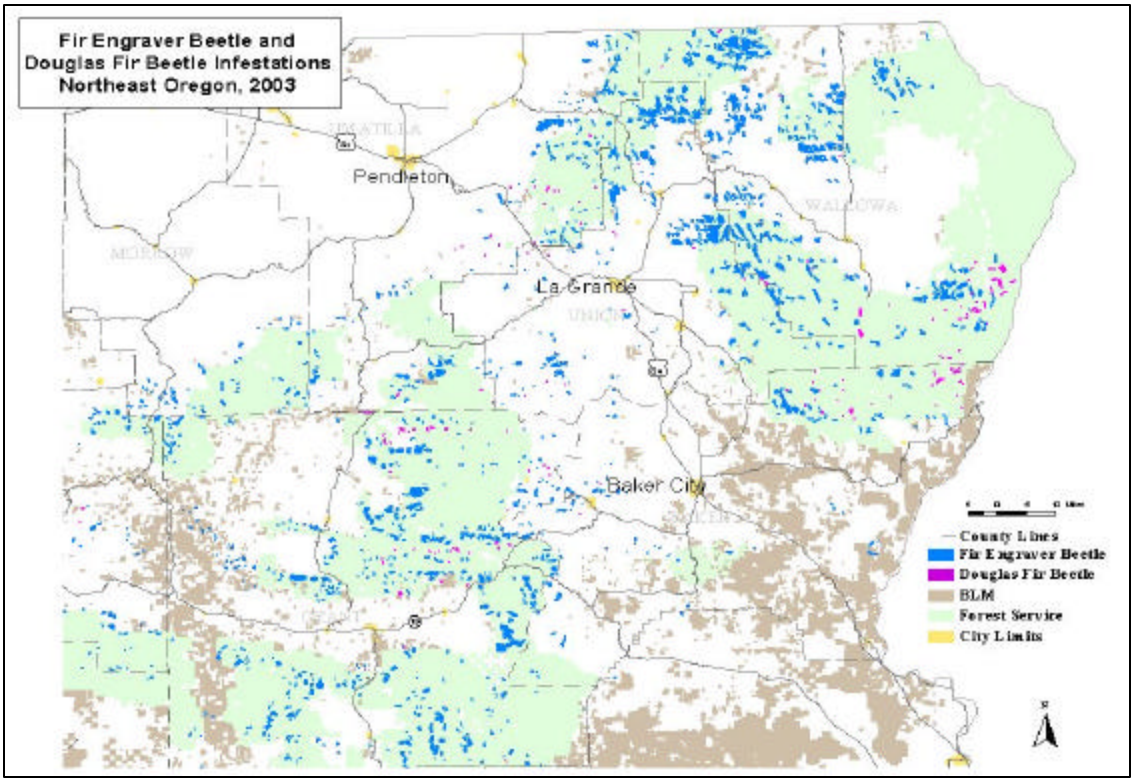


Figure 6 – Distribution of true fir mortality and Douglas-fir mortality in northeast Oregon from bark beetle infestations as detected during the annual aerial survey.

Figure 7 – Flatheaded fir borer larva feeding in the inner bark of Douglas-fir. Photo by Oregon Department of Forestry.

Flatheaded Fir Borer *(Melanophila drummondi)*

Douglas-fir mortality increased at low elevation sites between Ashland and Grants Pass during the second year of a flatheaded fir borer outbreak (Figure 5). Most of the trees affected are under 100 years old and growing on sites that are overstocked, drought prone or better suited for growing ponderosa pine or hardwoods. The larvae of this beetle mine in the inner bark of trees much like bark beetles, but never bore into the sapwood (Figure 7). Flatheaded fir borer outbreaks in southern Oregon are almost always associated with disturbance events such as drought, storm damage, or fire. The flatheaded fir borer outbreak increased from 24,868 acres in 2002 to 55,210 acres in 2003, virtually all of it in southwestern Oregon.

Balsam Woolly Adelgid *(Adelges piceae)*

The balsam woolly adelgid (BWA), introduced from Europe in the 1920's, causes long-term decline in the health and vigor of subalpine fir stands (Figure 8). Over the decades, BWA has spread to most of the subalpine fir sites in Oregon and has caused extensive tree mortality. There is accumulating evidence that BWA infestations are eliminating subalpine fir from sites where it has been an important pioneer tree species. High elevation subalpine fir stands in Oregon were once believed to be immune from BWA infestations because of colder temperatures. However, signs of BWA infestation are now encountered in high elevation stands, possibly indicating the effect of warmer temperatures on BWA distribution. In 2003 the aerial survey detected 109,159 acres of BWA-infested stands, up from the 35,328 acres mapped in 2002 (Figure 9). Most of this increase likely is due to the improved ability of aerial surveyors to detect damage.

Figure 8 – Dying crowns and a blackish color are symptoms of balsam woolly adelgid infestation in subalpine fir. Photo by Oregon Department of Forestry.

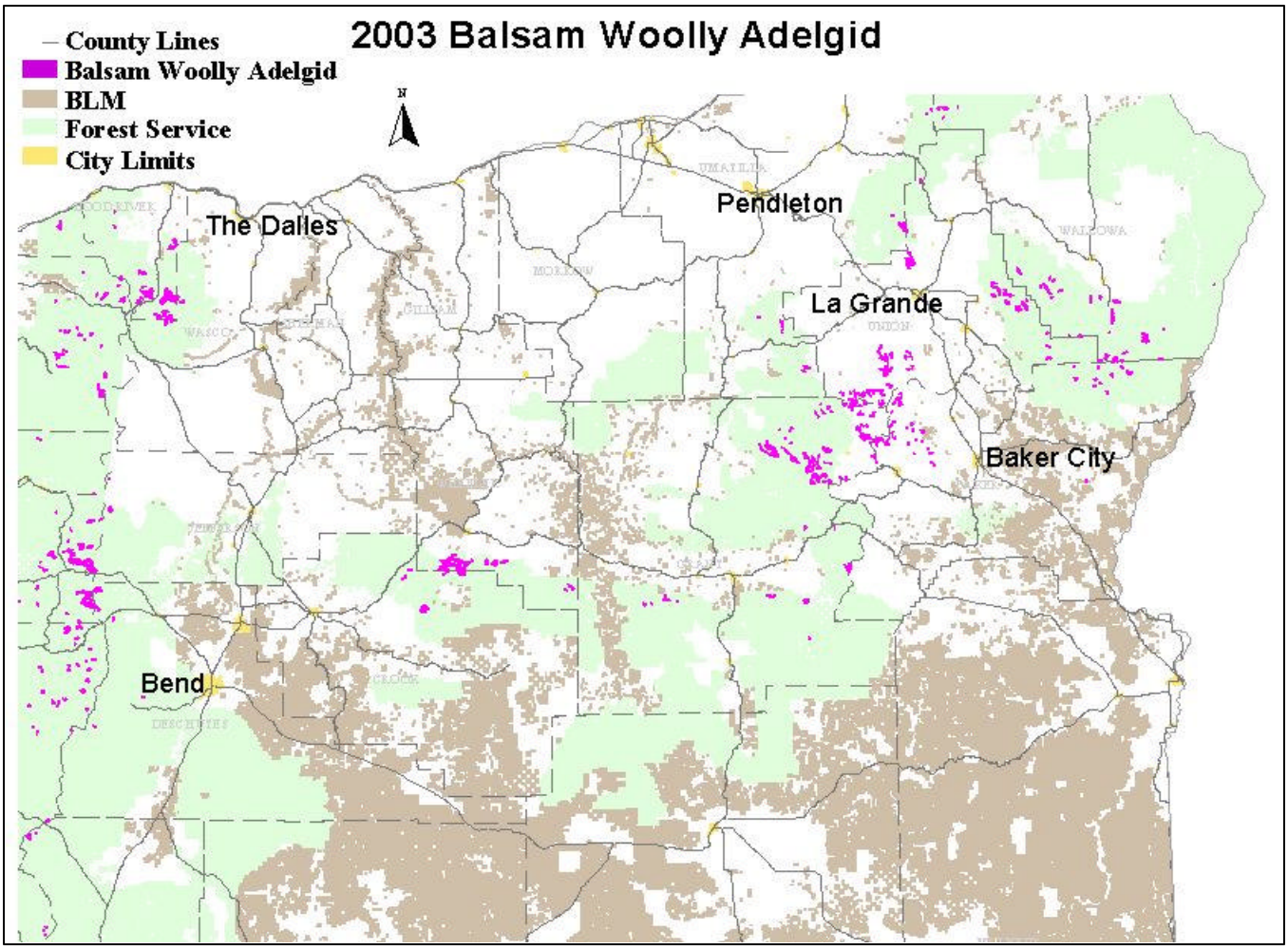


Figure 9 – Areas of balsam woolly adelgid infestation as detected by the 2003 aerial survey.

California Fivespined Ips (*Ips paraconfusus*)

The Ips species was not considered a significant forest pest in the Willamette Valley until quite recently. With over 700,000 ponderosa pine seedlings planted annually, pine is becoming a much more common sight on marginal agricultural and forest land in the Willamette Valley and pine pests are also becoming more important. There were a couple of reports in 2003, of landowners harvesting merchantable pines accidentally triggering Ips outbreaks, by creating piles of green slash at the wrong time of the year (Figure 10). Fresh slash is the preferred breeding material of Ips. When fresh slash is abundant, bark beetle populations may increase to levels where they attack and kill standing green trees.

Figure 10 – Young Willamette Valley ponderosa pine killed by the California Fivespined Ips in 2003.

Bronze Birch Borer (*Agrilus anxius*)

For the first time, bronze birch borer infestations were found in ornamental birch in western Oregon at locations in Corvallis and Portland (Figure 11). This native insect has always been present in eastern Oregon where native birch trees occur, but has not previously been detected in western Oregon where native birch is absent. Ornamental birch has been extensively planted in western Oregon since the 1970's, however, and these mature host trees now provide an extensive food base for the bronze birch borer that historically was not present. In eastern Oregon, there were increasing reports of bronze birch borer attacks on ornamental birch during 2003 (Figure 12). Drought stress, a common event in eastern Oregon, is one of the factors weakening birch and making it more susceptible to borer attack.

Figure 11 – Dying branches in the upper crown of birch trees are often a symptom of bronze birch borer infestation.

Banded Elm Bark Beetle (*Scolytus schevyrewi*)

The Oregon Department of Agriculture trapped this exotic bark beetle in Oregon for the first time, near Ontario, in 2003. Host trees for this beetle are reported to include Siberian elm and Russian olive, both hardwoods commonly planted in eastern Oregon. *Scolytus schevyrewi* has been trapped in several other western states, indicating it has probably been present in North America for more than a decade. At this time, it is not known whether this insect is a vector (carrier) for Dutch elm disease, or if it is capable of attacking and killing mature, drought-stressed, but otherwise healthy trees.

Figure 12 – Emergence holes, D-shaped and 5 mm wide, in the bark of declining birch trees are a visual sign of a bronze birch borer infestation.

Diseases

Swiss Needle Cast
(*Phaeocryptopus gaeumannii*)

Swiss needle cast is a disease of Douglas-fir foliage caused by the native fungus *Phaeocryptopus gaeumannii*. It causes needles to turn yellow and fall prematurely from trees, ultimately reducing tree growth and survival (Figures 13 and 14). Tree mortality is rare, occurring only after many years of defoliation.

Figure 13 - Douglas-fir branch defoliated by Swiss needle cast. Photo by Oregon Department of Forestry.

Figure 14 - Sparse crown of 25-year-old 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 15). The 2003 aerial survey showed 270,000 acres with severe to moderate damage, a slight decrease compared to 2002 (Figure 16). Permanent plot data for the period 1998 to 2003 suggests a very slight reduction in damage from Swiss needle cast, as indicated by increased foliage retention.

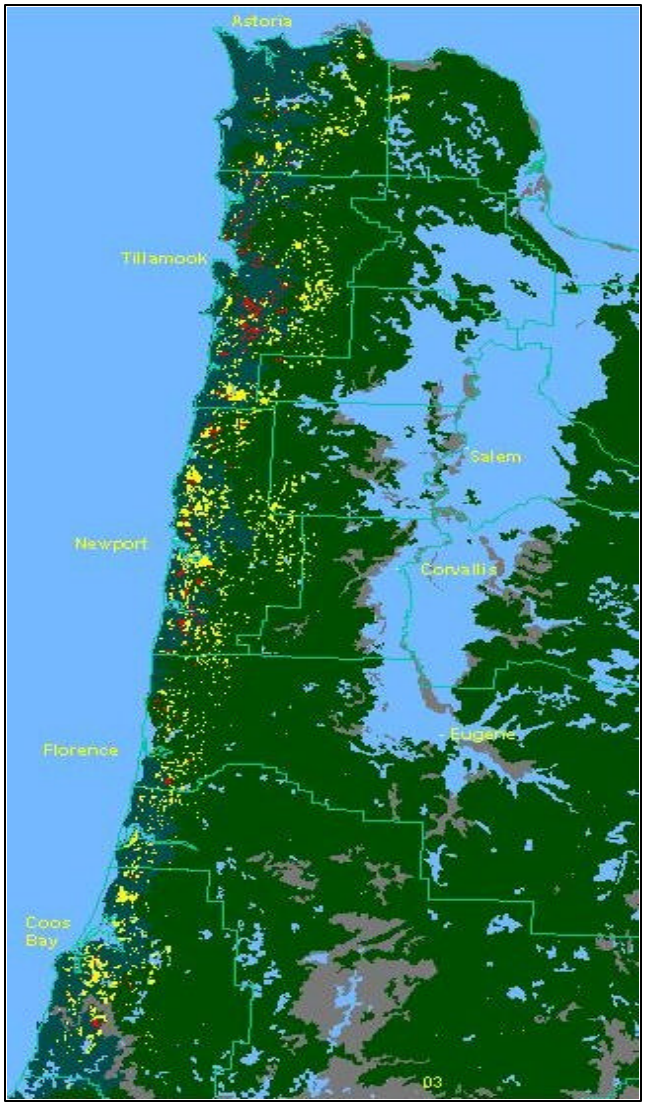


Figure 15 - Areas of Douglas-fir forest with symptoms of Swiss Needle Cast detected in the 2003 aerial survey.

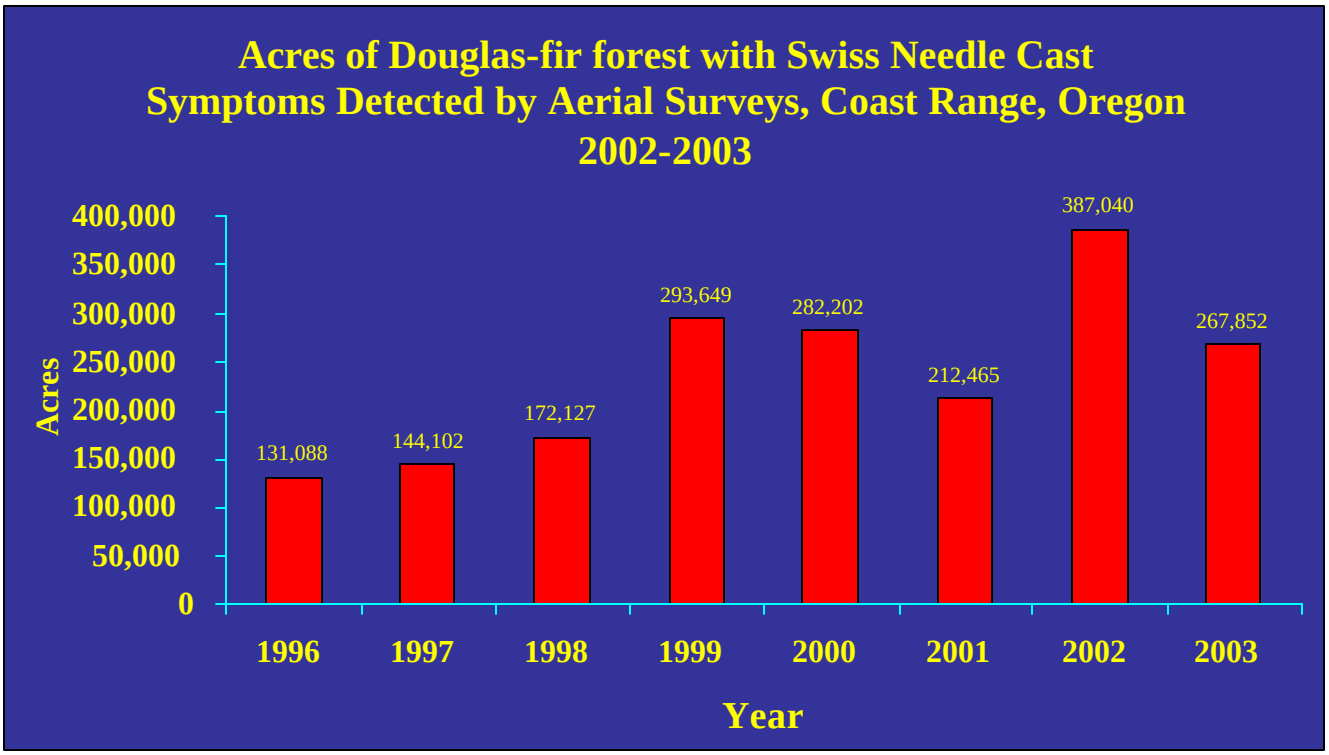


Figure 16 - Trend in the number of acres of Swiss needle cast mapped in aerial surveys between 1996 and 2003 in the Coast Range of Oregon

The lack of a consistent trend of increasing damage from SNC is encouraging, but the overall poor needle retention in western Oregon suggests a continuing severe growth reduction from Swiss needle cast. 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 increases the risk of catastrophic fire.

Sudden Oak Death (SOD, *Phytophthora ramorum*)

Sudden Oak Death (SOD), caused by the non-native pathogen *Phytophthora ramorum*, is a newly discovered disease that causes considerable mortality of tanoak, coast live oak, California black oak, and has damaged more than 30 other plant species in California since 1995. The pathogen can kill trees by causing lesions on the main stem (Figure 17), or it can cause leaf blight and shoot dieback (Figure 18). *P. ramorum* is known to occur only in California, Oregon, and several European countries.

Figure 17 – Stem lesion on tanoak caused by Phytophthora ramorum. Photo by Oregon Department of Forestry.

Figure 18 - Leaf blotch on pacific rhododendron caused by Phytophthora ramorum. Photo by Oregon Department of Forestry.

P. ramorum was first discovered in Oregon by aerial survey in July 2001. As of January 2003, *P. ramorum* had been found at 21 forest sites (48 acres) near Brookings, Curry County, Oregon. During 2003, through numerous ground and aerial surveys, 12 new infested sites were discovered. Infected trees also were found near the perimeter of 8 previously known infested sites. Most infected trees discovered in 2003 occurred within 0.1 mile of existing SOD sites. However, three new infested sites were found 1.8, 0.8, and 0.25 miles distant from the nearest known site. All new sites tended to occur either very close to, or in a northerly direction from, previously known infestations. This distribution follows the prevailing rainy season wind direction, suggesting aerial or vector spread. The new occurrences of *P. ramorum*, discovered in 2003, added approximately 12 acres to the area undergoing eradication treatments, and prompted the Oregon Department of Agriculture to increase the area under quarantine for SOD from 9 mi^2 to 11 mi^2 (Figure 20).

Since 2001, we have been attempting to eradicate *P. ramorum* by cutting and burning all host plants on infested sites (60 acres total). Post treatment monitoring has shown that *P. ramorum* survived cutting and burning on approximately half of the eradication sites, and usually was found on stump sprouts of infected trees that were cut during the eradication. In 2003, sprouts and stumps within all non-federal eradication sites were treated with herbicide to kill sprouts and prevent re-sprouting (Figure 19).

Figure 19 - Treating tanoak sprouts on Sudden Oak Death eradication site 1 year after initial cut and burn. Photo by Oregon Department of Forestry.

Streams and rainwater also were monitored for presence of *P.ramorum*. *P. ramorum* was detected in several streams associated with eradication sites, and rarely in streams not clearly associated with known infestations. *P. ramorum* was recovered from rainwater collections for the first (and only) time in December 2003, near an infected tree that had not been cut.

P. ramorum also was found in six ornamental plant nurseries in Oregon during 2003. All plants were destroyed and the eradication appears to have been successful.

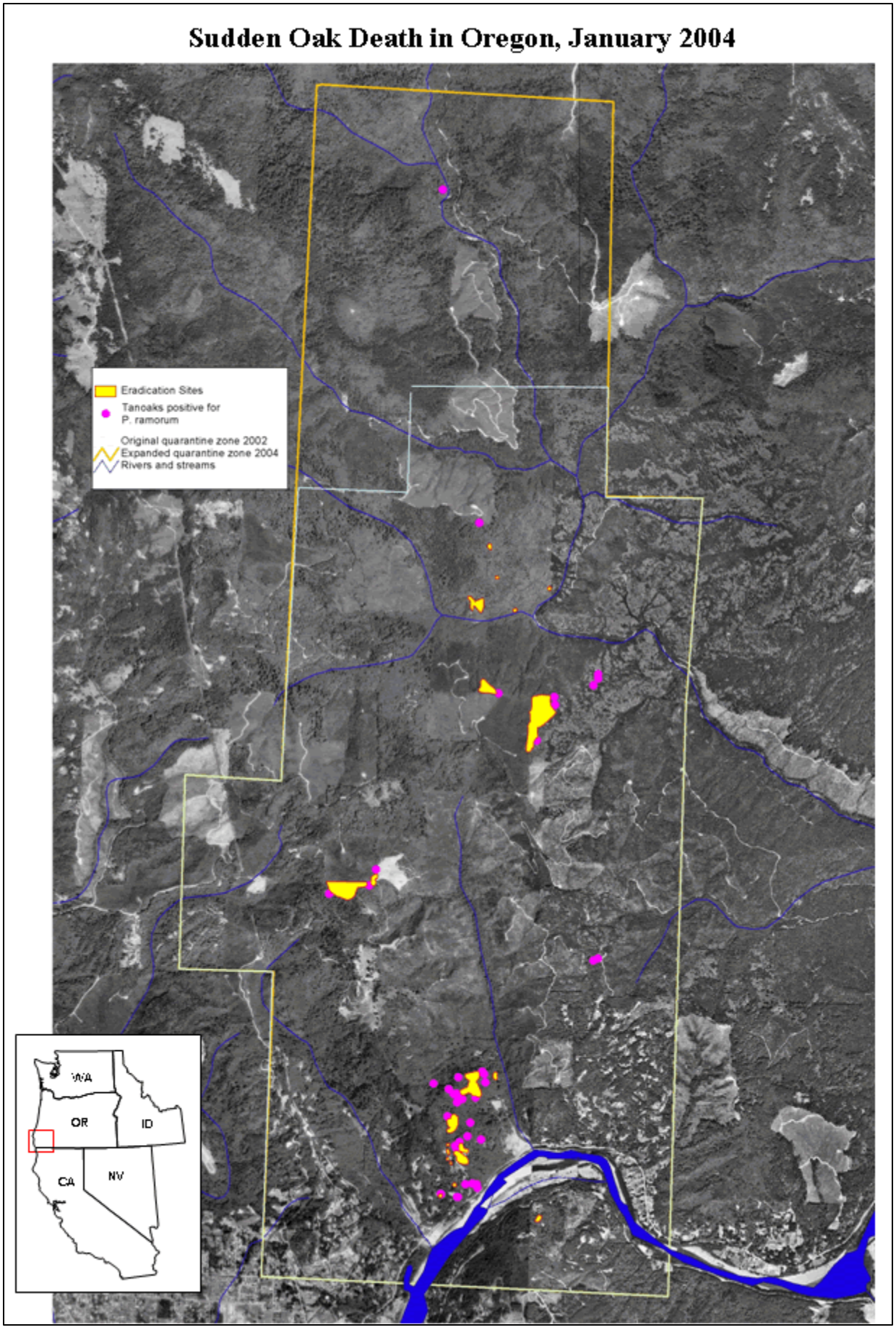


Figure 20 - Location of Sudden Oak Death patches in Oregon, infected trees discovered in 2003, and the area regulated by ODA and USDA - APHIS quarantines. All areas shown have been cut and burned.

Root Diseases

Root diseases continue to affect Oregon forests, in many cases causing substantial damage. The degree of damage often reflects past fires exclusion and other management practices, 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 particularly damaging to Douglas-fir and true fir. 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.

White Pine Blister Rust

(Cronartium ribicola)

White pine blister rust has been present in Oregon since the 1920's and continues to cause extensive damage to all native 5-needle pines. 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 silviculture and the development of disease-tolerant seedlings.

Port-Orford-Cedar Root Disease

(Phytophthora lateralis)

Port-Orford-cedar root disease was first identified in the Port-Orford-cedar forests of southwestern Oregon in 1952. Since then the disease has expanded throughout the range of Port-Orford-cedar. Recent advances by the USDA Forest Service and Oregon State University in screening trees for genetic resistance offers renewed hope for the species. Management focuses on preventing additional spread through sanitation, seasonal road closures, and planting genetically resistant seedlings.

Other Damage

Weather

Most of Oregon experienced a prolonged period of below normal precipitation in 2003, continuing above normal levels of drought-related tree mortality. Overstocked stands, trees growing on disturbed soil, and off-site plantings suffered the most damage. The effect of the October 2002 sudden extreme low temperature event also was noticeable as increased numbers of dead and dying trees during the 2003 growing season. Of particular note was the widespread damage to western juniper in central Oregon (Figure 21), and incense cedar in southern Oregon.

Figure 21 -Western juniper damaged by low temperatures in October 2002 turned brown early in the 2003 growing season. Photo by Oregon Department of Forestry.

Figure 22 - Western red cedar tree with bark peeled by a black bear. Photo by Oregon Department of Forestry.

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 (Figure 22). Partial peeling can reduce growth rate and vigor, and introduce decay, which lowers wood quality and eventually may result in mortality.

Based on the statewide aerial survey, bear damage occurred on approximately 32,500 acres of forestland in 2002, and 60,000 acres in 2003. 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 flown annually in parts of western Oregon since 1993, which show that the number of acres mapped with recent mortality from bear damage averages more than 20,000 acres per year. The 2003 survey showed damage levels considerably higher than in previous years (Figure 23).

Analysis of the aerial survey data suggests that much of this increase was due to agents other than bear, such as root disease and drought conditions, but the causal agents cannot be identified with certainty without ground-verification.

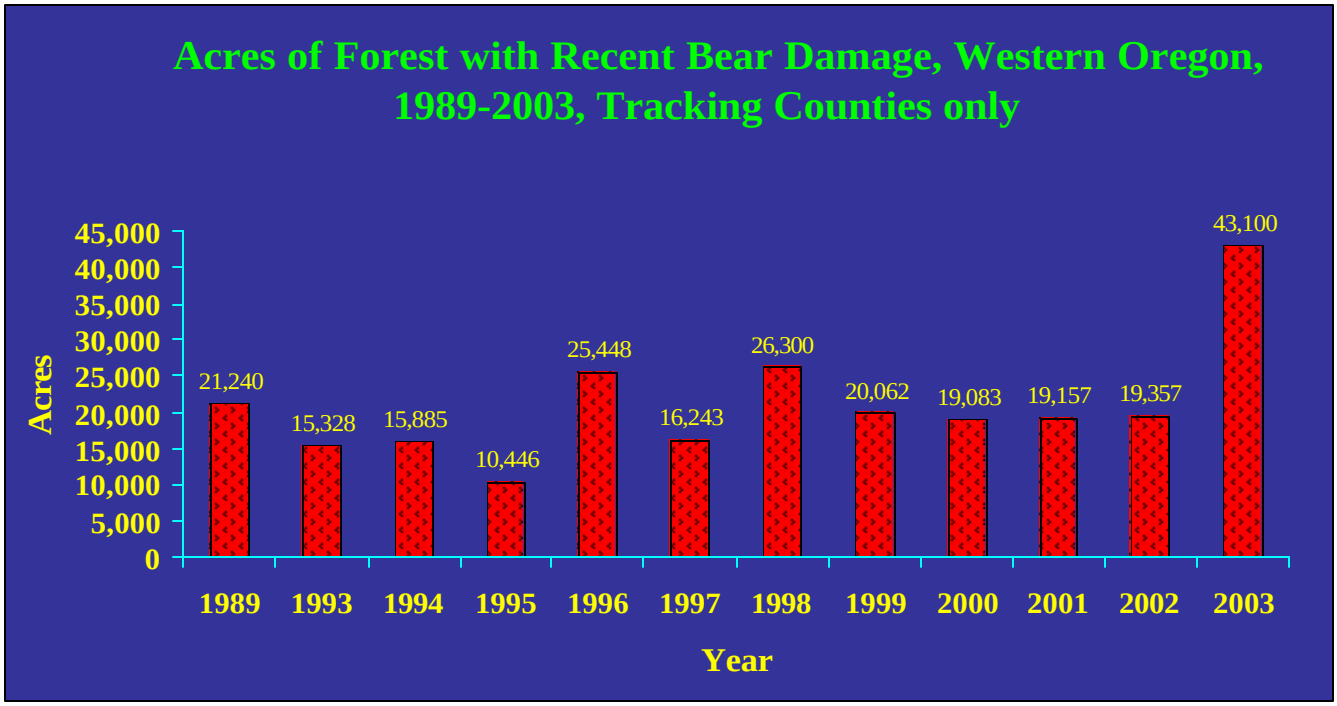


Figure 23 - Trend in bear damage in western Oregon as estimated by aerial survey with ground verification, 1989-2003.

Ozone Monitoring

Oregon Department of Forestry and the USDA Forest Service cooperate on a national ozone-monitoring program. Each year, indicator plants are monitored in 36 sampling hexagons distributed throughout the state. To date, ozone injury to plants has not been detected in any of the Oregon plots.

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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