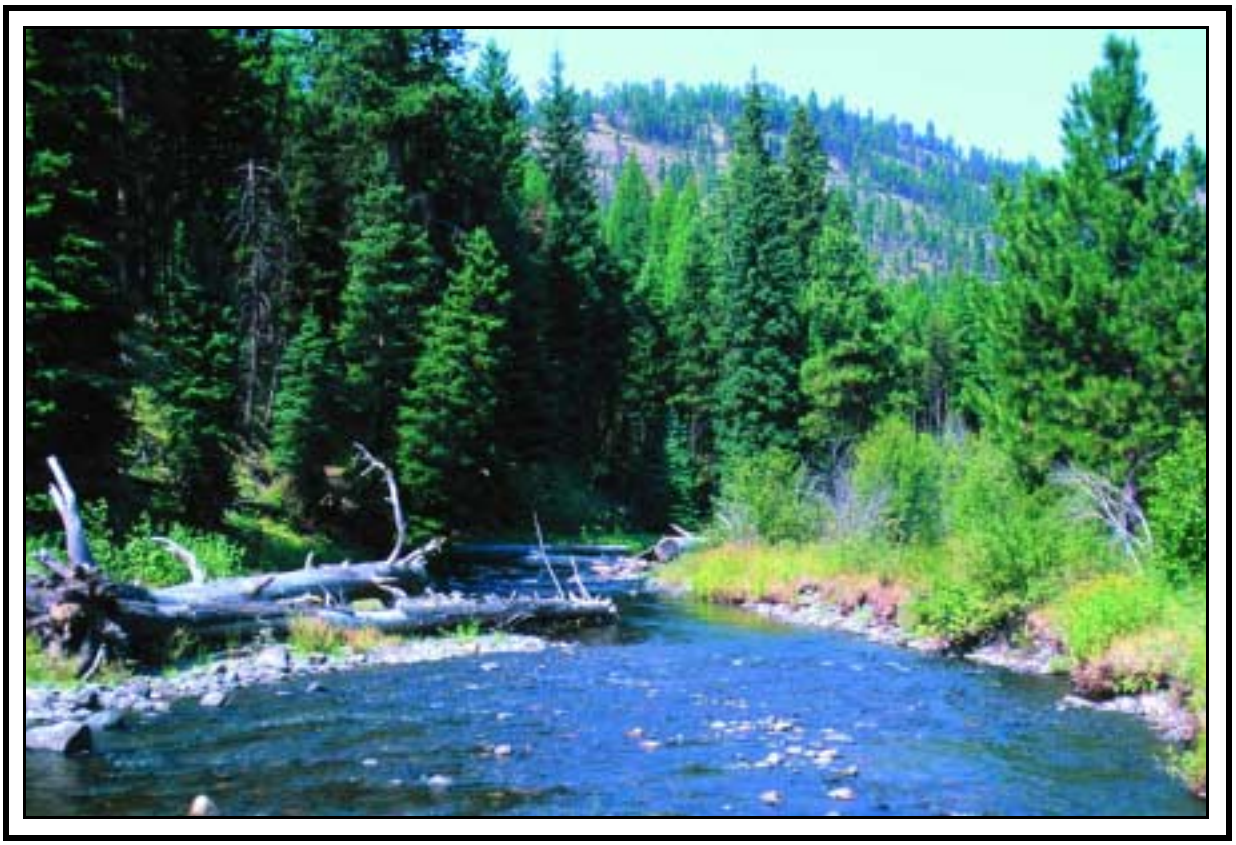
United States
Department of Agriculture

Forest Service
Pacific Northwest Region

Oregon
Department of Forestry

Washington Department
of Natural Resources

Forest Insect and Disease Highlights in Oregon and Washington, 2000



Tom Iraci

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Introduction

In the West, forests have been shaped by disturbances: geological events (such as the eruption of Mount St. Helens), climate, fire, insects, diseases, and animal and human activity. The health of our forests is affected by the frequency and severity of disturbance and whether the changes from disturbances are acceptable or desirable to people.

Forest Health

"A healthy forest can renew itself vigorously across the landscape, recover from a wide range of disturbances, and retain its ecological resilience while meeting current and future needs of people for values, uses, products, and services."

Adapted from: Forest Health Policy, USDA Forest Service, 1997

In Washington and Oregon, certain disturbances - such as insect and disease activity - have been monitored for many years. More recently, data has been gathered on a number of other attributes of forest health by inventory and monitoring programs such as Forest Inventory and Analysis, Forest Health Monitoring, and Current Vegetation Survey. This report focuses mainly on insect and disease impacts, one part of the larger picture of forest health.

The primary insect and disease monitoring activity in Oregon and Washington, from which much of the information in this report is derived, is the annual insect and disease aerial survey. This survey is conducted cooperatively by Oregon's Department of Forestry, Washington's Department of Natural Resources, and USDA Forest Service's Pacific Northwest Region. The aerial survey examines all forestlands of Washington and Oregon between the first part of July and early to mid- September.

During aerial survey, two observers ride on opposite sides of a small plane, which travels at approximately 110 mph at least 500 feet above the trees. The plane flies in a 4-mile grid pattern. Each observer looks at the trees below and two miles out from the plane on his or her side. They record the number of trees affected and the likely cause of damage or mortality.

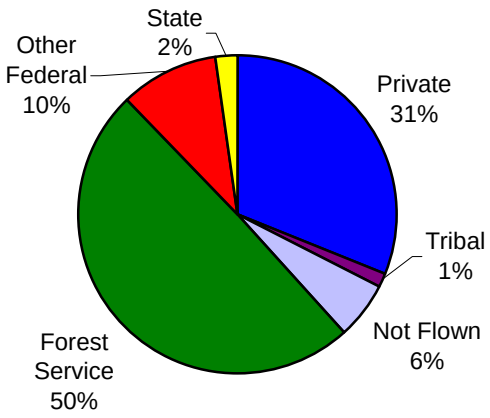
View of defoliated forests from an aerial survey plane. Photo by Keith Sprengel, USDA Forest Service.

In 2000, approximately 26,500,000 acres were surveyed in Oregon (94% of all forested lands in Oregon) and 20,450,000 acres were surveyed in Washington (97% of all forested lands in Washington). Aerial survey information is transferred to electronic GIS layers and distributed to major forest landowners, land managers, and extension agents throughout the state. Annual damage maps for Washington and Oregon are available as GIS layers (http://www.fs.fed.us/r6/nr/fid/data.htm). More information about aerial survey can be found at the following website: http://www.fs.fed.us/foresthealth/id/detect.html

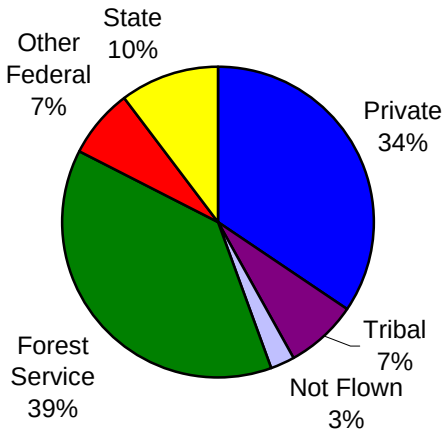
Special aerial surveys are also conducted (either cooperatively or by the individual agencies) to collect data on damage that that may need to be surveyed more intensively or may not be visible during the regular survey.

In 2000, special surveys were flown during the spring for Swiss Needle Cast along the west coast of Oregon and the southwest coast of Washington. Oregon Department of Forestry also conducted a special survey in June for mortality and bear damage in western Oregon.

Forested Acres Surveyed by Air



Oregon



Washington

Oregon Highlights

Diseases

The major disease infestation detected by aerial and ground surveys continues to be Swiss Needle Cast. Sudden Oak Death, a newly detected disease affecting oak trees in California, is a threat to Oregon's oak. Root diseases and dwarf mistletoe continue to cause tree mortality and growth loss throughout Oregon's forests but also play a beneficial role for wildlife and contribute to ecosystem function and diversity.

Swiss Needle Cast

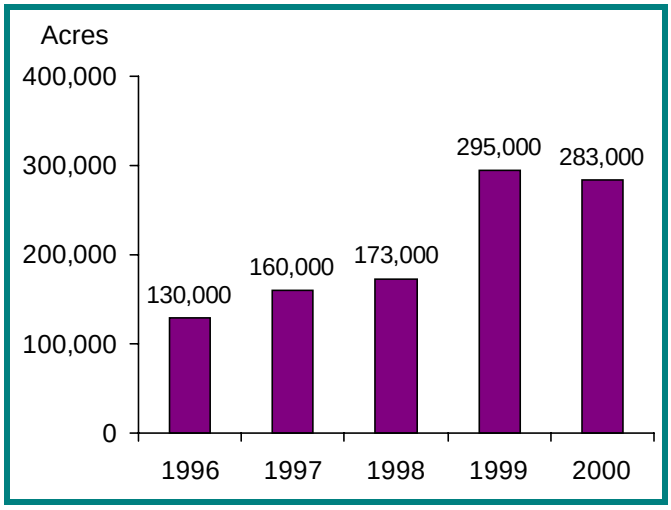
Since the 1980's, the Swiss needle cast epidemic has become more and more evident in Douglas-fir forests of the Coast Range. Disease incidence and severity have increased dramatically during this time. Recent aerial surveys and permanent monitoring plots show sustained damage in the Coast Range, and there is some evidence that the disease is increasing in parts of the Cascade Mountains.

The severity of damage varies greatly, ranging from stands with nearly complete defoliation to those with barely perceptible damage. Nearly one million acres of forest in Oregon are affected by this disease to some degree, with losses in tree volume growth approaching 100 million board feet per year.

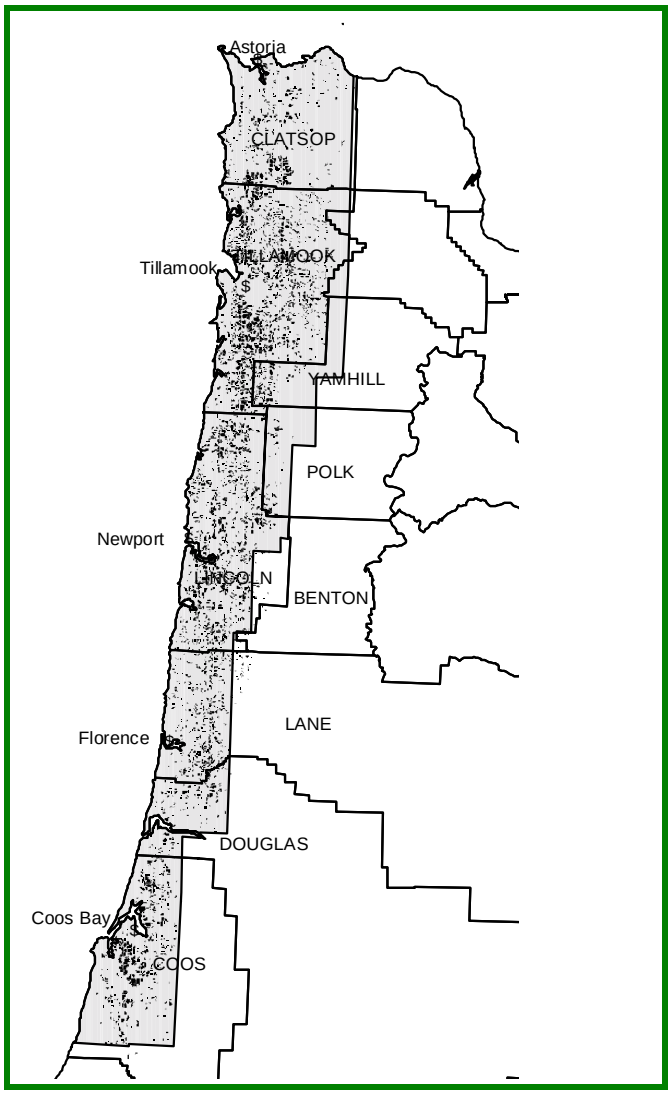
Loss of Douglas-fir needles caused by Swiss needle cast. Photo by Oregon Department of Forestry.

Although the results of the 2000 survey suggest a flattening or decrease in the amount of forest with symptoms of Swiss needle cast, it would be premature to say that the disease has peaked. The inherent variability of symptom development from year to year and the use of the new sketch mapping technology could easily explain the small change in acres mapped between 1999 and 2000. Similarly, data from permanent plot monitoring have shown no significant improvement in the condition of stands during the past few years.

Numerous ongoing research projects are coordinated through the Swiss Needle Cast Cooperative at Oregon State University. Current management strategies in the Coast range rely on replacing Douglas-fir with other tree species such as hemlock, cedar, spruce, noble fir, and alder.



Acres of Douglas-fir forest with Swiss needle cast symptoms detected by aerial survey in Oregon



Distribution of Swiss needle cast in western Oregon in 2000, as detected during aerial surveys. Map by Mike McWIlliams, Oregon Department of Forestry.

Sudden Oak Death

Unusually large numbers of coast live oak (*Quercus agrifolia*), black oak (*Q. kelloggii*), and tanoak (*Lithocarpus densiflorus*) trees are dying in coastal areas of California. This epidemic, referred to as sudden oak death (SOD) was first reported in Marin County, CA in 1995. Trees are dying in urban and rural forests, in state parks, a wilderness area, on private lands and town centers. Many thousands of trees have already died. Currently the disease is confined to six counties in the San Francisco Bay Area.

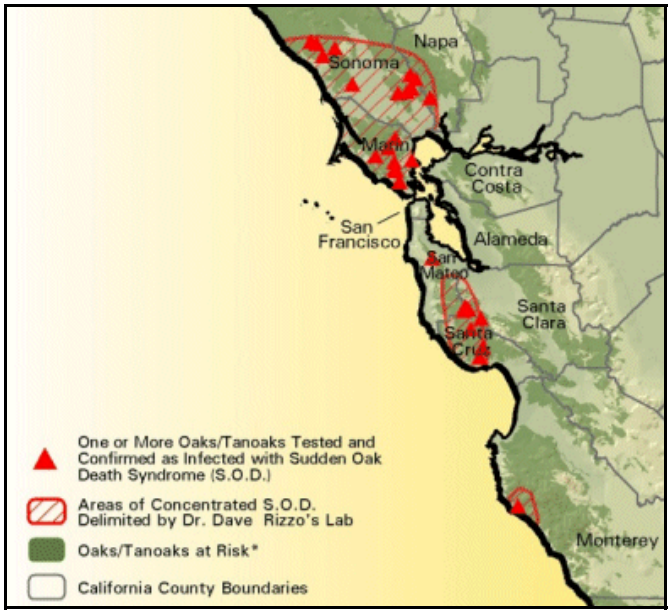
Tanoak in southwest Oregon with SOD-like canker and bleeding. SOD fungus was not isolated from this tree. Photo by Ellen Goheen, USDA Forest Service.

The disease is caused by a previously undescribed species of *Phytophthora,* a fungus that causes many plant diseases worldwide. Because the disease is spreading rapidly, it appears that the causal organism may not be native to coastal forest ecosystems. In addition to fear of spread throughout western oak forests, there is much concern that the organism could be transported to the deciduous forests of the eastern United States and cause widespread mortality.

Susceptible host species occur throughout southwest Oregon, but it is not known for certain if the disease or the pathogen occurs in Oregon. So far limited aerial and ground surveys have not detected the disease. Additional surveys are planned for 2001.

To help prevent accidental spread of the disease to Oregon, the Oregon Department of Agriculture issued an emergency quarantine in January 2001

which prohibits nursery stock, logs, lumber, firewood, wood-chips and other plant products of tanoak, black oak, coast live oak, and rhododendrons from infested counties in California.



Distribution of Sudden Oak Death in California. Ffrom a map produced by J. Schweitzer for CAMFER, USB — Sudden Oak Death Task Force website.

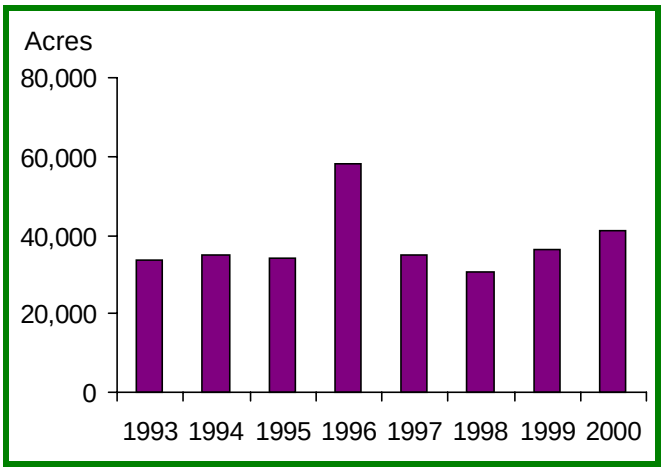
Animal Damage

Bear Damage

In the Pacific Northwest, black bears damage forest trees in the spring 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 growth rate and vigor, introduce decay, which lowers wood quality, and eventually may result in mortality.

Tree mortality surveys have been flown annually since 1993 and show that the number of acres mapped as having recent mortality from bear damage averages about 34,000 acres per year. The 2000 survey showed damage levels similar to previous years. Oregon Department of Forestry has just completed a ground–verification project to strengthen the link between aerial observations and actual tree damage.

Tree trunk with bark peeled away by bears. Photo by Oregon Department of Forestry.



Forest land with bear damage in northwest Oregon. Estimate for each year is based on ground verification data collected in 1989.

Insects

The major insect infestations detected by aerial survey in 2000 include Douglas-fir tussock moth and Douglas-fir beetle outbreaks in northeast Oregon and a Douglas-fir beetle outbreak along the west slope of the Cascades. The Oregon Department of Forestry, in cooperation with the Forest Service and Washington Department of Natural Resources, also completed a ground survey to detect the spread of balsam woolly adelgid, a significant introduced pest of true fir.

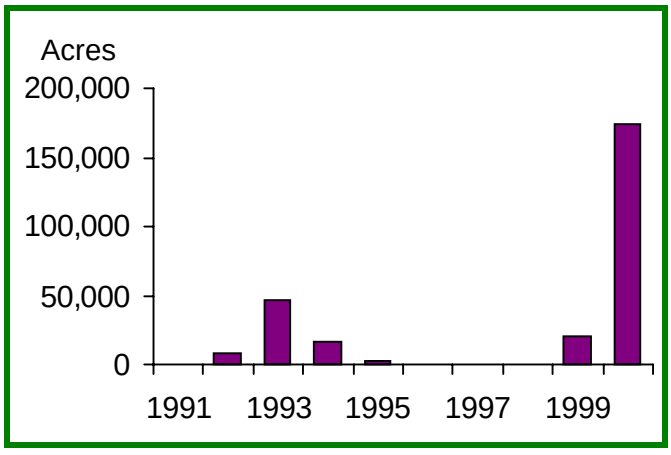
Douglas-fir Tussock Moth

The Douglas-fir tussock moth (DFTM) is a native defoliator of Douglas-fir and true firs. Past outbreaks have caused significant defoliation and tree mortality. Human allergic reactions to DFTM can impact the use of recreation areas. Outbreaks typically last four years with most of the damage occurring in the first two years.

Trees defoliated by Douglas-fir tussock moth. Photo by Washington Department of Natural Resources.

In 2000, DFTM defoliation spread to 174,197 acres, primarily on land managed by the Wallowa-Whitman and Umatilla National Forests. This was a dramatic, but not unexpected, increase from the 21,071 acres defoliated in 1999.

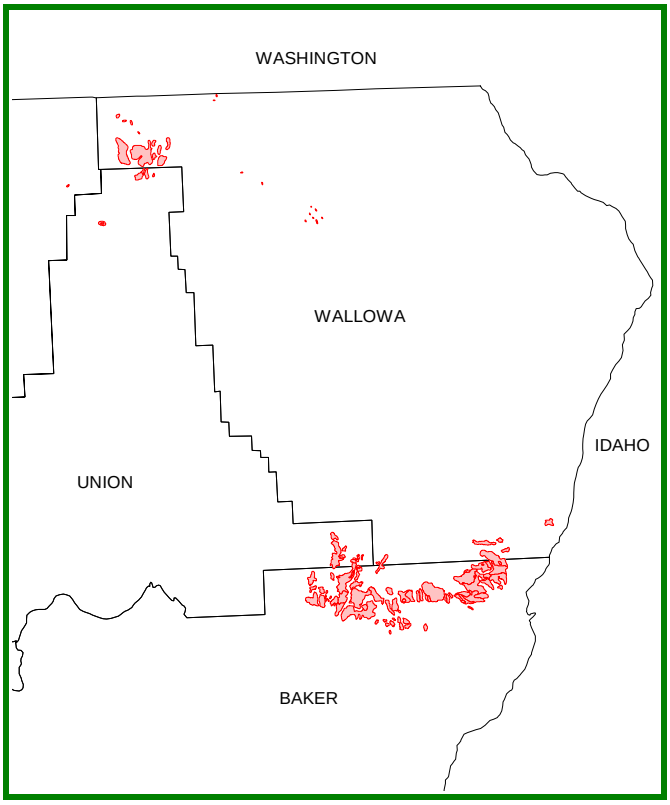
Areas currently affected by defoliation also have an ongoing Douglas-fir beetle outbreak. There is concern that trees weakened by defoliation will be highly susceptible to beetle attack.



Douglas-fir tussock moth defoliation in Oregon, as recorded during aerial surveys

The USFS responded to the outbreak by spraying 39,392 infested acres with TM Bio-Control, a virus specifically infecting tussock moth larvae. Most of the areas treated were habitat for threatened and endangered species, campgrounds, old growth reserves, or community watersheds.

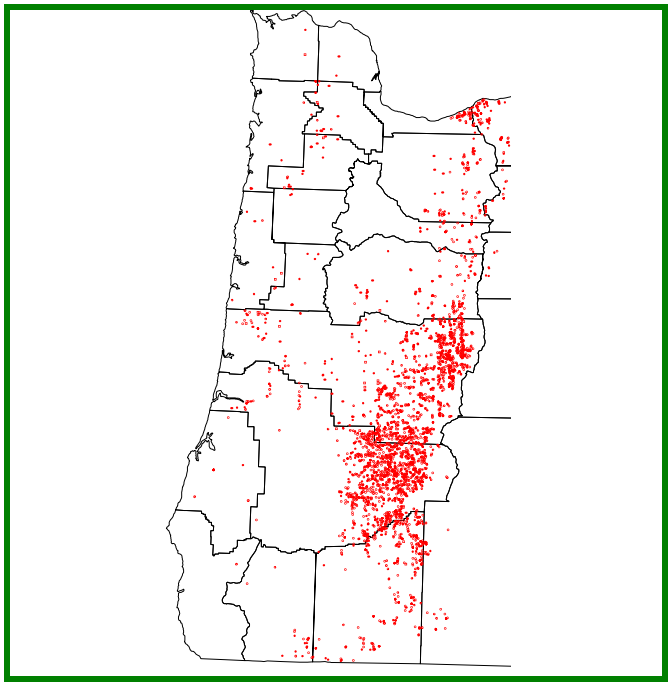
Preliminary indications are that the spray project was successful at reducing defoliation, but final results will not be known until the fall of 2001. There is no plan to treat additional federal acres in Oregon with pesticide in 2001.



Distribution of defoliation by Douglas-fir tussock moth in 2000, as detected during aerial surveys. Map by Mike McWilliams, Oregon Department of Forestry.

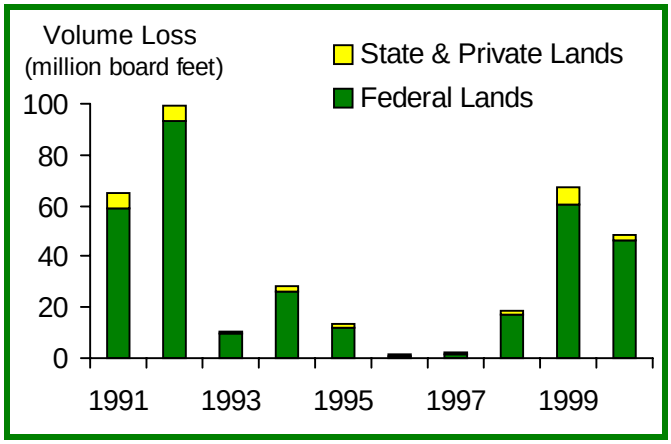
Douglas-fir Beetle

Douglas-fir beetle outbreaks typically develop in unmanaged areas having trees with a DBH >14" and >80 years old. Factors contributing to outbreaks include fire damage, windthrow, snow breakage, defoliation, and root disease. Beetles initially infest trees damaged by these factors, and their populations increase to levels that can kill standing trees. Tree mortality is concentrated in pockets (a few to hundreds of trees). The current outbreaks started with trees blown down or damaged by fires in 1996.



Distribution of Douglas-fir beetle in 2000, as detected during aerial surveys. Map by Mike McWilliams, Oregon Department of Forestry.

Most of the area affected by the current outbreak is federal land in Douglas, Lane, and Wallowa Counties. The current size of the outbreak is 57,354 acres with 27,066 of these infested acres occurring in western Oregon. This is the largest Douglas-fir beetle outbreak seen in western Oregon in several decades.



Douglas-fir mortality trend in Oregon by ownership.

Douglas-fir beetle outbreaks usually last 2 – 4 years, but with winter storms creating additional blowdown and trees weakened by tussock moth defoliation, the current outbreak could be prolonged. Damage to Douglas-fir stands can be controlled by salvage of windthrow and infested trees or protecting down or standing trees with a beetle repellent (methylcyclohexonone or MCH).

Balsam Woolly Adelgid

The balsam woolly adelgid (BWA) is a European insect that first appeared in Oregon in the 1920's. Like aphids, adelgids insert a stylet into plant tissues and suck nutrients from the phloem. In the case of BWA, feeding takes place on thin bark portions of a tree's bole and branches.

Tree bole infested with balsam woolly adelgids. Photo by Dave Overhulser, Oregon Department of Forestry.

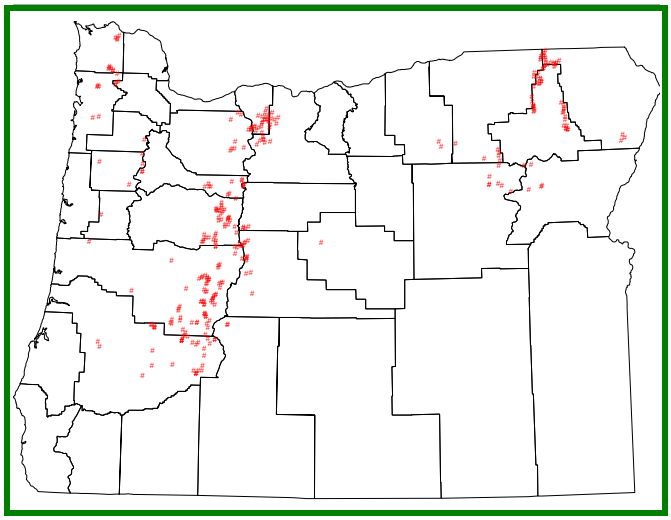
By the 1950's and 1960's dramatic outbreaks of BWA occurred in the Cascades and caused true fir mortality over thousands of acres. Since then, tree mortality has subsided to lower levels.

Subalpine firs killed by balsam woolly adelgid. Photo by Dave Overhulser, Oregon Department of Forestry.

The long-term impacts of adelgid infestations have been substantial and include eliminating most of the grand fir at low elevations in the Willamette Valley and the disappearance of sub-alpine fir from some high elevation areas where it is an important pioneer tree species. In addition, foresters have become reluctant to plant Pacific silver fir because of its susceptibility to BWA damage.

Early ground and aerial surveys showed that BWA infestations were generally confined to western Oregon and the Cascades. There was speculation that BWA might not spread into eastern Oregon since BWA are flightless and rely on wind born dispersal of the crawler stage. An additional factor once thought to limit the spread of BWA in eastern Oregon was its susceptibility to mortality from prolonged exposure to freezing temperatures.

This year the Oregon Department of Forestry completed an extensive ground detection survey for the presence of BWA as part of a larger cooperative study with the Forest Service and Washington Department of Natural Resources. True firs were examined at 857 locations throughout the state. True fir at 322 plots (38%) showed symptoms of BWA infestation.

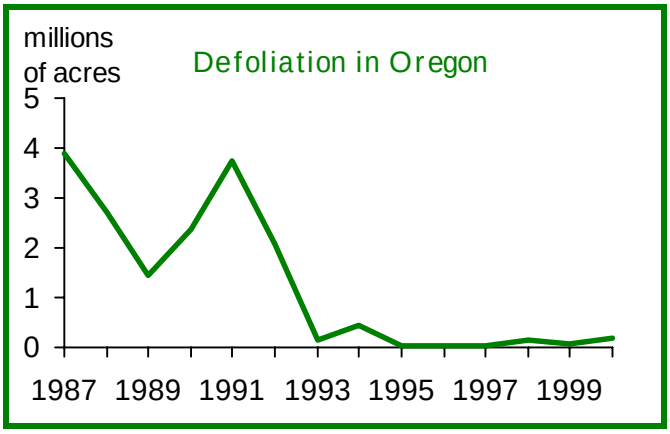


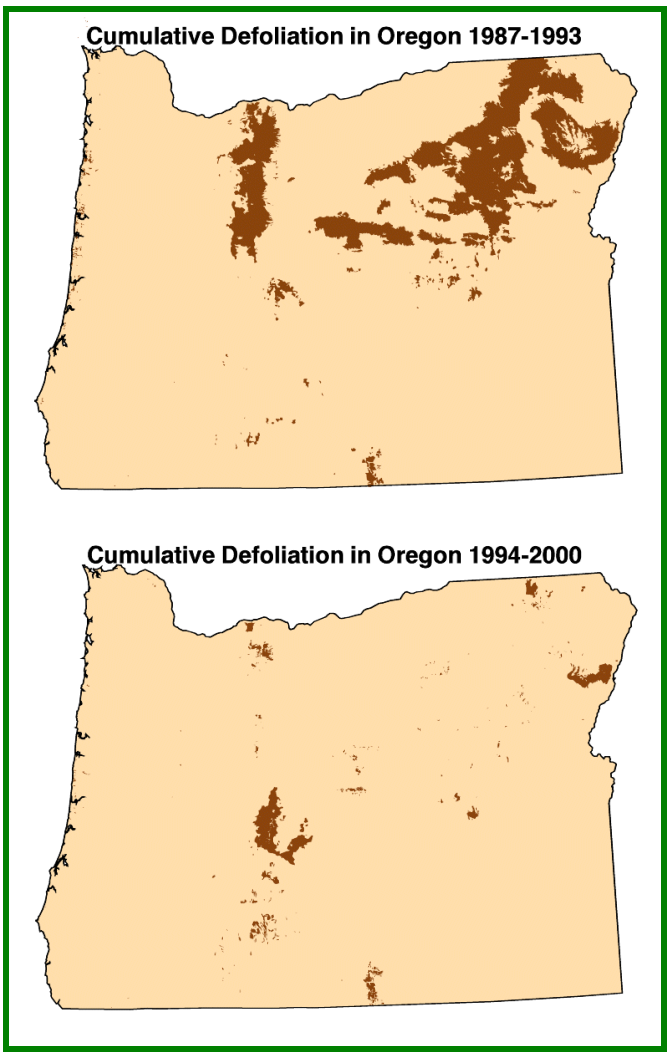
Positive Detections of balsam woolly adelgid in Oregon in 2000. Map by Mike McWilliams, Oregon Department of Forestry.

Since the 1960's, BWA has spread to most of the counties in northeast Oregon. This insect has also spread to Idaho where it is causing high levels of sub-alpine fir mortality at low elevations.

Defoliation Trends

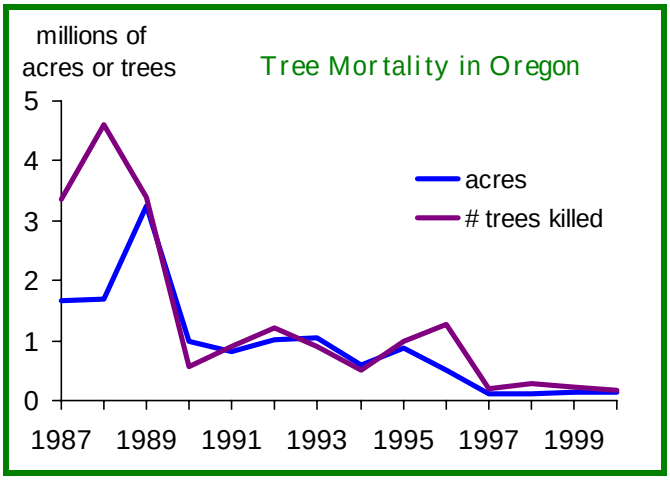
Since 1993, defoliation in Oregon has generally remained at low levels. Douglas-fir tussock moth defoliated about 175,000 acres in northeast Oregon in 2000.

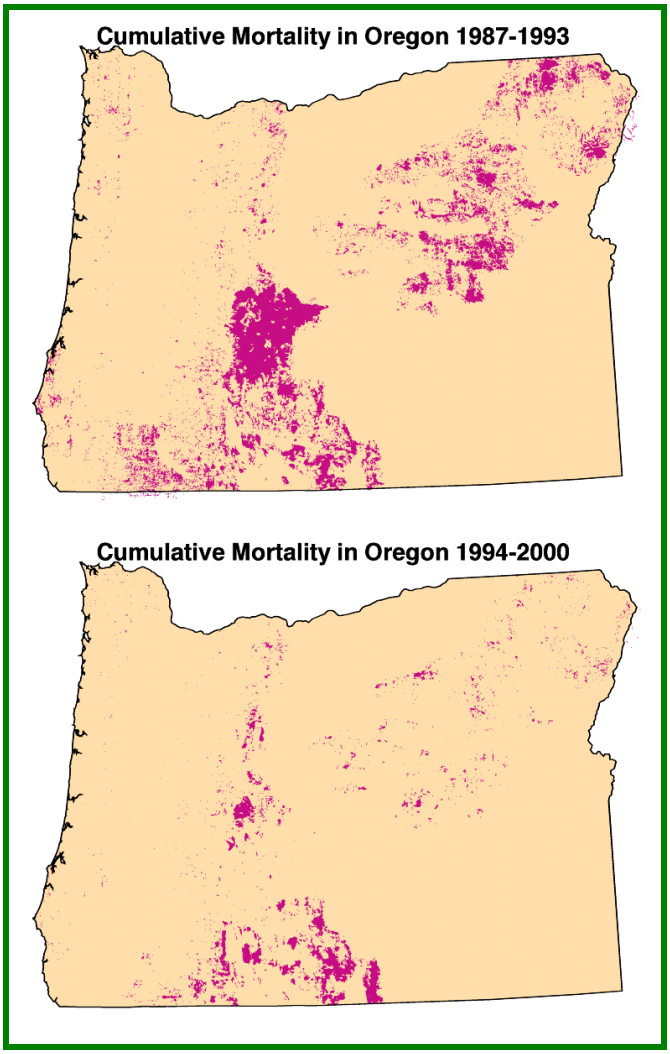




Mortality Trends

Overall trends show decreases in mortality in Oregon over the past 15 years, due mainly to decreases in bark beetle-caused mortality as drought conditions eased. However, mortality of Douglas-fir associated with 1996 storms was seen in localized areas in 1999 and 2000.





Washington Highlights

Diseases

Root Diseases

Root disease continues to be the most significant on-going forest health problem in Washington. Root disease is often difficult to detect and expensive to mitigate. Root rot infections cause increased tree mortality, loss of vigor, lowered timber quality and increased susceptibility to other agents (such as wind throw or bark beetles). However, root disease also plays a role in nutrient recycling, plant diversity, and wildlife habitat.

There are several different root rots in Washington, but the most economically and ecologically important ones are:

Armillaria Root Disease: Armillaria root disease is the most common and widely distributed root disease in Washington. Ponderosa pine, grand fir, noble fir and Douglas-fir are most susceptible. Armillaria is generally an opportunist, taking advantage of weak trees. It is also capable of killing vigorous, healthy trees.

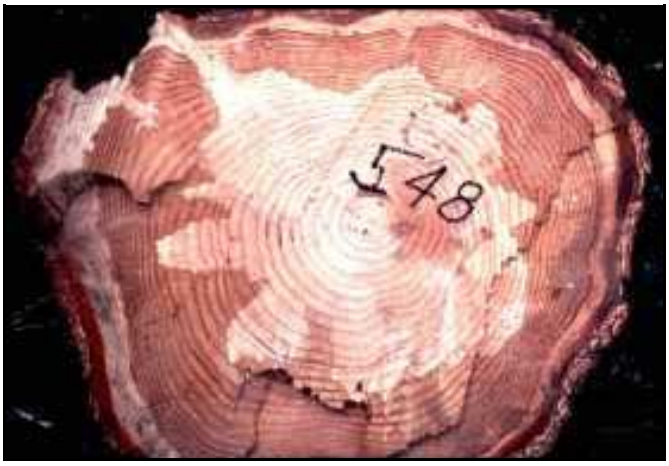
Armillaria can be identified by its thin white mycelial fan in the cambium layer just inside the bark of the tree. Photo by Washington Department of Natural Resources.

Annosum Root and Butt Rot: Annosum root and butt rot occurs in forests throughout Washington. It can be associated with very old stands. In younger stands, since it infects freshly cut stumps via airborne spores, its presence can be influenced by the frequency and intensity of thinning. Western hemlock, grand fir, Sitka spruce and Pacific silver fir are the most susceptible hosts.

Annosum can be identified by a white stringy or spongy mass containing numerous small black flecks. Photo by Washington Department of Natural Resources.

Laminated Root Rot: Laminated root rot occurs on about eight percent of the commercial forest lands in Washington and Oregon, and causes a 40-70 percent reduction in wood volume in affected areas. The primary hosts of this pathogen are Douglas-fir and grand fir, but other true firs and western hemlock are also susceptible.

Laminated root rot can be identified by separations along the annual rings of the wood. Photo by Washington Department of Natural Resources.



Early stages of decay caused by laminated root rot can be identified by distinct staining of the sapwood. Photo by Walt Thies, USDA Forest Service.

Armillaria Biology: http://willow.ncfes.umn.edu/pubs/fidls/armillaria/armillaria.htm
Other Armillaria information: http://www.fs.fed.us/r6/nr/fid/wid-rd.htm#rd-2

Annosum biology: http://www.na.fs.fed.us/spfo/pubs/fidlwest.htm
Other Annosum information: http://www.fs.fed.us/r6/nr/fid/wid-rd.htm#rd-1

Laminated root rot biology: http://www.fs.fed.us/r6/nr/fid/fidls/fidl159.htm
Other Laminated root rot information: http://www.fs.fed.us/r6/nr/fid/wid-rd.htm#rd-5

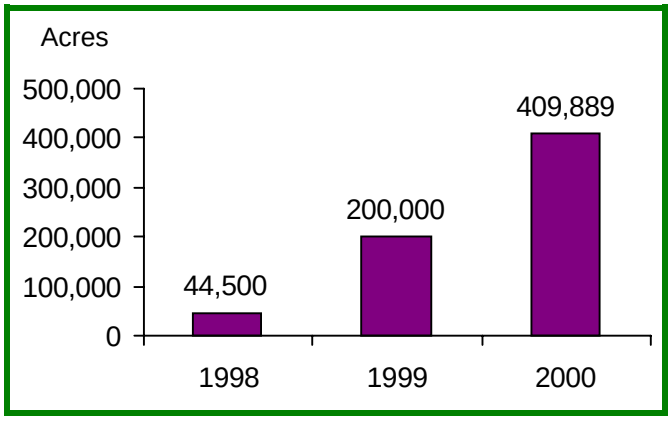
The Rotten Truth, an award winning documentary video produced jointly by the DNR, WSU Cooperative Extension, UW College of Forest Resources, and the USDA Forest Service, is currently available for $24.95 per copy to assist those interested in identifying and managing common forest root rots of the Pacific Northwest. Order by calling 1-800-723-1763.

Swiss Needle Cast

Needle diseases are caused by fungi. Sporulation, spread, and infection by these fungi are frequently restricted to a specific season, and successful infection depends on whether conditions are favorable at the time. Needle casts are a type of needle disease. Infection causes premature death and shedding of needles, resulting in reduced growth and occasional mortality if infections are repetitive or severe.

Aerial view of a Douglas-fir plantation affected by Swiss needle cast. Photo by Oregon Department of Forestry.

For the third consecutive year, a special aerial survey was conducted to document the presence and intensity of Swiss Needle Cast (SNC) in coastal Douglas-fir. However, the survey in 2000 was flown later in the spring due to weather constraints. Almost 2 million acres were surveyed in western Washington, and for the first time, the areas north of Aberdeen to the Hoh River Delta were surveyed. Trees with dense crowns and only minor yellowing were classified as "Light", and accounted for 131,422 acres. Trees with sparse crowns and yellow to brown foliage were classified as "Heavy", and accounted for 278,467 acres.



Acres of Douglas-fir forest with Swiss needle cast symptoms detected by aerial surveys

Consistent with earlier surveys, SNC was observed throughout the Douglas-fir forests of western Washington. Based on the criteria of crown color, needle retention and height growth, disease severity across western Washington is currently light to moderate.

Most stands are retaining three years worth of needles and are not being visibly damaged, despite the continued presence of the fungus. Investigations are currently underway to determine the growth impacts of SNC on Douglas-fir.

Swiss needle cast biology: http://www.na.fs.fed.us/spfo/pubs/howtos/ht_df-ndlcst/ndlcst.htm

SNC surveys: http://www.wadnr.gov/htdocs/rp/forhealth/swissneedle.html

Other information: http://www.fs.fed.us/r6/nr/fid/widweb/wid-fold.htm#fd-9

Animal Damage

Bear Damage

A sharp increase in bear damage was detected, most noticeably on the Capitol State Forest, south of Olympia, and in young plantations southwest of Mt. Rainier National Park. Bears peel bark from the trees and feed on the vascular tissues, partially or completely girdling the stems.

When bears come out of hibernation, they will often peel bark from a tree and feed on the spring sugars in the cambium (notice the vertical teeth marks). Photo by Washington Department of Natural Resources.

Insects — Defoliators

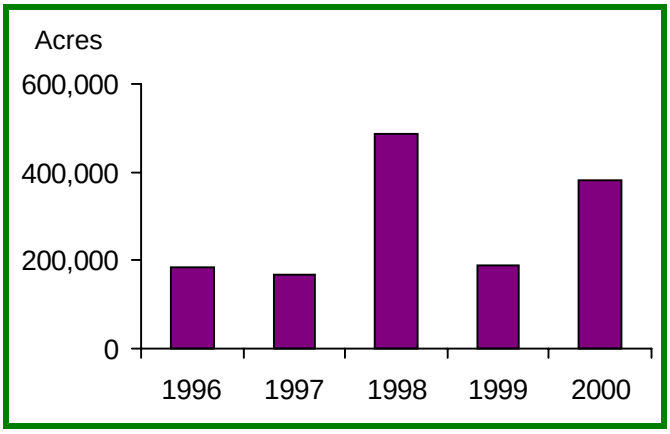
Outbreaks of insect defoliators, such as the western spruce budworm and Douglas-fir tussock moth, cause growth loss, top kill, and tree mortality. Although vigorous trees can survive several years of severe defoliation with only growth loss, weaker trees may be killed by just a single or few years of defoliation. Defoliated trees that do survive become more susceptible to attacks by bark beetles.

Western Spruce Budworm

The spruce budworm outbreak east of Mt. Adams, which began in 1984, showed an impressive spread to the west and north from previous years. Areas of heavy defoliation in 2000 extended to Bumping Lake and Chinook Pass, more than 20 miles north of its detection in 1999. Hundreds of thousands of acres have been affected the past several years.

A healthy branch (bottom) compared to a branch defoliated by western spruce budworm. Photo by Washington Department of Natural Resources.

Approximately 8,000 acres of state and private land north of Glenwood, and 4,000 acres of Yakama Indian Nation land received aerial spray applications using *Bacillus thuringiensis kurstaki*. Such direct control measures are being used in conjunction with forest management activities to alter budworm-susceptible stand characteristics and reduce current and future spruce budworm impacts.



Defoliation by western spruce budworm detected during aerial surveys in Washington

Western spruce budworm biology: http://willow.ncfes.umn.edu/pubs/fidls/westbw/fidl-wbw.htm

Other budworm information: http://www.fs.fed.us/r6/nr/fid/widweb/wid-def.htm#def-6

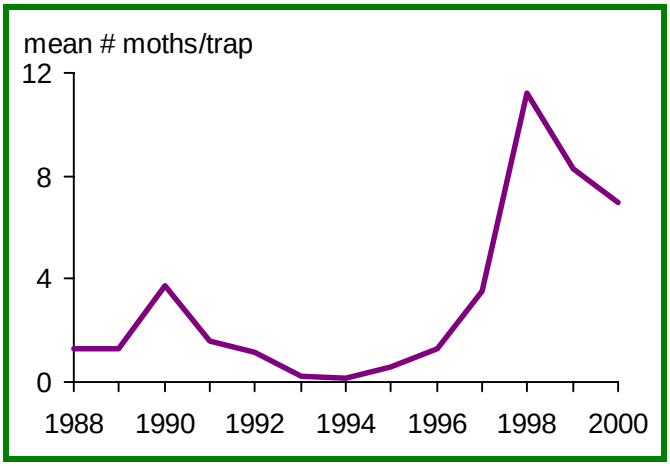
Douglas-fir Tussock Moth

An outbreak of Douglas-fir tussock moth caused defoliation in the Blue Mountains of northeastern Oregon and southeastern Washington in 2000.

Adult Douglas-fir tussock moth females have only small pads for wings and cannot fly. They are laden with eggs which they often lay right on or by the pupal case from which they recently emerged. Photo by Washington Department of Natural Resources.

The US Forest Service conducted an aerial application of TM Biocontrol-1. TM Biocontrol-1 is a naturally occurring virus that only affects tussock moths. Approximately 40,000 acres of federal land were treated, including 3,912 acres sprayed in Washington near Walla Walla along Mill Creek. The level of natural virus and added virus are

likely to cause the population throughout the Blue Mountains to collapse in 2001. Light forest defoliation occurred at Kamiak Butte County Park, north of Pullman. The park is about five miles east of the Idaho border and damage was likely associated with the current outbreak north of Moscow ID.



Number of adult male tussock moths caught in pheromone traps in Washington

Pheromone trap catches continued to be high in Okanogan and Chelan counties in 2000. Larval and cocoon sampling indicates that forest defoliation is likely in the Upper Methow Valley in 2001. The US Forest Service plans to treat federal land in the Early Winters, Wolf Creek and Eightmile Creek areas with aerial applications of virus if populations are high in 2001.

Douglas-fir tussock moth biology: http://willow.ncfes.umn.edu/pubs/fidls/tussock/fidl-tuss.htm

Douglas-fir tussock moth in the Pacific Northwest: http://www.fs.fed.us/r6/nr/fid/dftmweb/

Insects — Bark Beetles

Bark beetles are a large and diverse group of insects that live and mine between the bark and wood of trees and shrubs. The most destructive ones are a few that attack the main stem of living trees. Continuously present in mature forests, mortality from bark beetles is typically scattered in old or weakened trees.

Outbreaks develop when conditions are adverse for trees, such as after prolonged periods of drought or storms that damage large areas of trees and create an abundance of blowdown. This blowdown is prime breeding habitat for beetles. Healthy green trees will be killed while bark beetle populations remain high.

Douglas-fir Beetle

Douglas-fir beetle mortality continued at outbreak levels in parts of Spokane, Pend Oreille, Stevens, and Ferry counties in 2000. The outbreak followed ice and snowstorms in 1996-1997 that created areas of broken trees and windthrow for breeding and population buildup. Although down from 1999, the Douglas-fir beetle continues to kill large numbers of mature Douglas-fir with 70,653 acres affected in 2000.

Adult Douglas-fir beetle with eggs. Photo by Washington Department of Natural Resources.

Statewide, stands of overstocked and drought-stressed Douglas-fir provide abundant host material. Additionally, increased damage from the Douglas-fir beetle is likely where defoliation by western spruce budworm or Douglas-fir tussock moth has occurred, weakening trees.

Douglas-fir beetle biology: http://www.fs.fed.us/r6/nr/fid/fidls/fidl5.pdf

Other Douglas-fir beetle information: http://www.fs.fed.us/r6/nr/fid/widweb/wid-bb.htm#bb-1

Spruce Beetle

A spruce beetle outbreak was detected in 2000 near Tiffany Mt. in north-central Washington. Federal and state land managers found mortality in large-diameter Engelmann spruce, occurring both in pure stands and mixed with other conifers, covering several hundred square miles.

Large quantities of blowdown from winter storms of 1996-1997 fueled the outbreak. A large part of the outbreak occurred in roadless or restricted use areas, hampering earlier detection from the ground. When Engelmann spruce are killed by spruce beetles, needles are not as colorful as the needles of many other species of beetle-killed conifers, making aerial detection difficult.

Spruce beetle biology: http://willow.ncfes.umn.edu/pubs/fidls/sprucebeetle/sprucebeetle.htm

Other spruce beetle information: http://www.fs.fed.us/r6/nr/fid/widweb/wid-bb.htm#bb-7

Pine Bark Beetles

Pine beetle (mountain pine beetle, western pine beetle, and *Ips*) activity east of the Cascades decreased in 2000 from 1999 levels. Notable concentrations of mortality occurred around Spokane where beetle populations grew to outbreak levels following tree breakage from 1996-1997 winter storms.

The mountain pine beetle outbreak in mature lodgepole pine on the East slopes of the North Cascades (Loomis State Forest, Okanogan National Forest, Pasayten Wilderness Area) continued in 2000, but showed a decrease from 1999. In much of the area, the bulk of susceptible host trees, large-diameter lodgepole pine, have already been successfully attacked and killed. The 2000 aerial survey recorded 67,567 acres of pine bark beetle mortality statewide, down from 86,794 acres in 1999.

Mountain pine beetle biology: http://www.fs.fed.us/r6/nr/fid/widweb/wid-bb.htm#bb-4

Western pine beetle biology: http://www.fs.fed.us/r6/nr/fid/widweb/wid-bb.htm#bb-8

Other bark beetles: http://www.fs.fed.us/r6/nr/fid/widweb/wid-bb.htm

Western Balsam Bark Beetle

Significant amounts of mortality in subalpine fir were observed this year, especially in the North Cascades. As these isolated pockets of trees mature, they become more susceptible to decline, especially where balsam wooly adelgid is active. Mortality on 10,996 acres caused by a complex of organisms that include western balsam bark beetle was mapped in the last two years (1999 and 2000).

Western balsam bark beetle biology: http://www.pfc.cfs.nrcan.gc.ca/hforest/pests/wbbbeetl.html

Other western balsam bark beetle information: http://www.fs.fed.us/r6/nr/fid/widweb/wid-bb.htm#bb-9

Weather

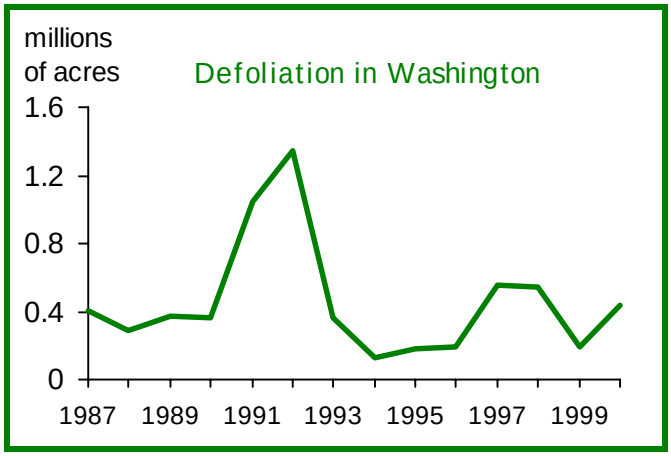
Ice storms occurring in the winter of 1996/97 caused widespread damage to forest trees in Washington. The winter of 1998 was an El Niño event of warmer than usual ocean temperatures that resulted in above-average precipitation and several flooding events. The 1999/2000 winter was a weak La Niña event characterized by warmer than usual ocean waters resulting in a warmer but wetter winter. Furthermore, the last three summers had below-normal precipitation in most areas with the summer of 2000 being the nation's worst wildfire season in 50 years.

Wind damage, fire, and flooding can either kill trees outright or weaken them, making them susceptible to insect or pathogen attack. Prolonged drought can also predispose trees to insects and disease.

Trees with tops broken during the ice storms of 1996-97. Photo by Washington Dept. of Natural Resources.

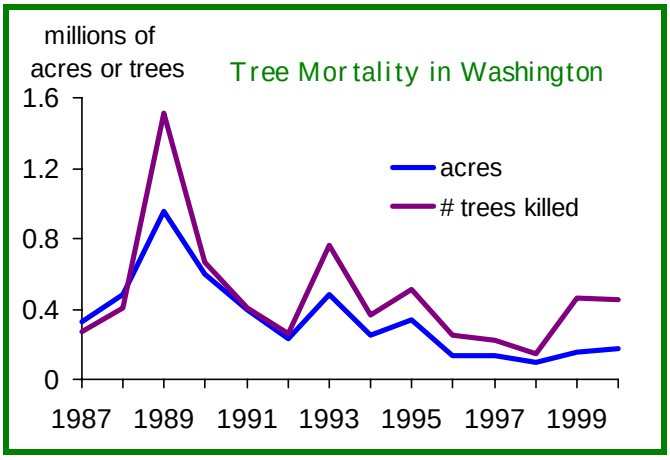
Defoliation Trends

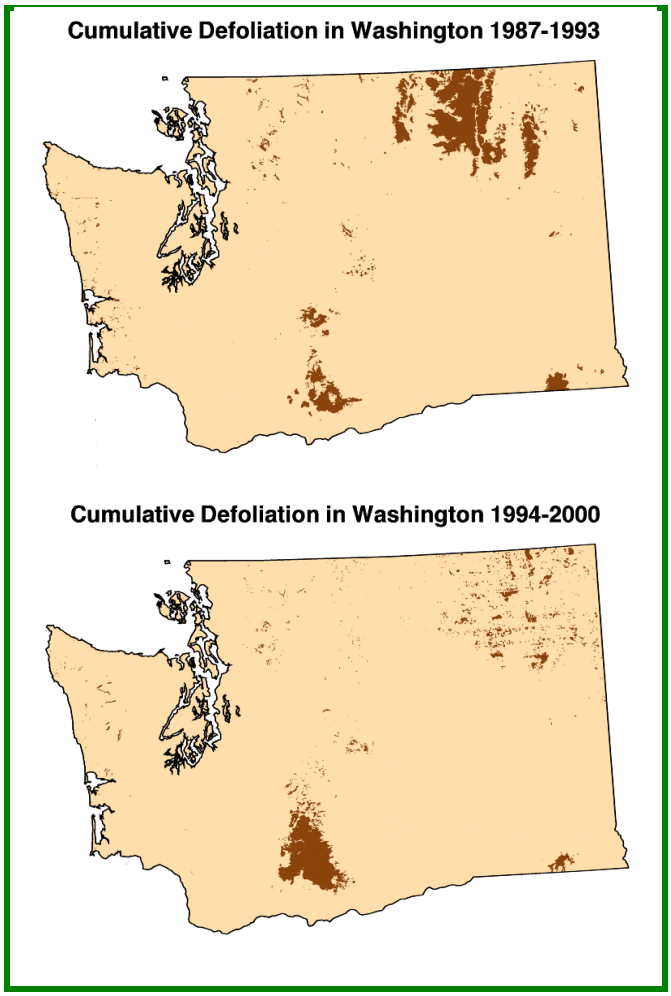
After peaking in 1992, defoliation in Washington has remained at relatively low levels. In 2000, Douglas-fir tussock moth defoliated about 46,000 acres in southeast Washington and western spruce budworm defoliated about 384,000 acres in the southeastern and southcentral portions of the state.

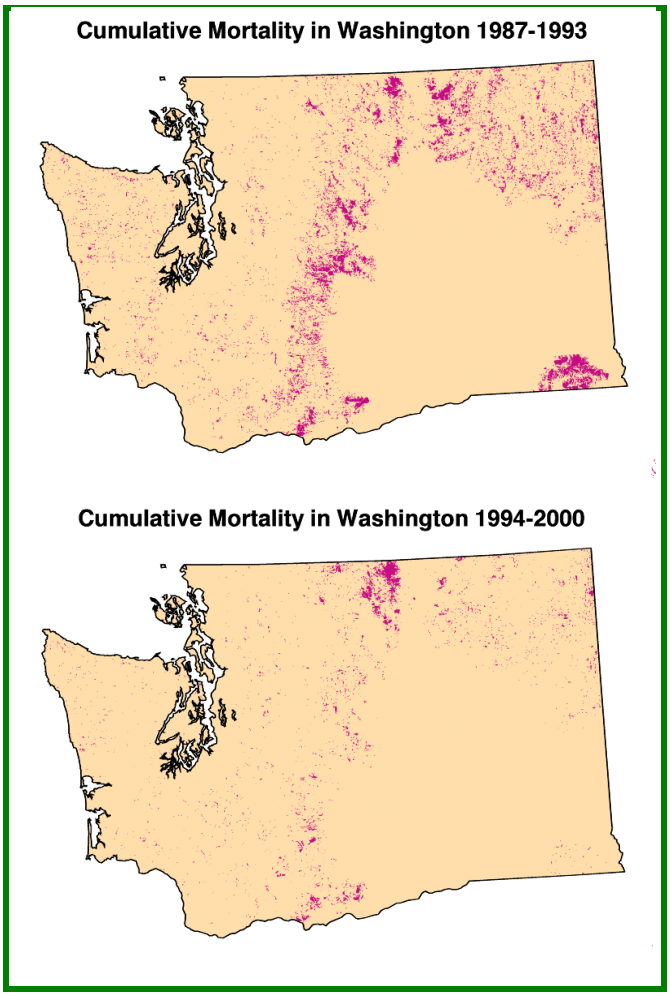


Tree Mortality Trends

Overall, mortality has decreased over the past 15 years as bark beetle-caused mortality has decreased. Drought periods in the late 1980s to early 1990s, coupled with overstocked stands, contributed to increased mortality from insects and diseases. Tree mortality associated with winter storms of 1996/97 has been seen in localized areas throughout the state in 1999 and 2000.







Contacts and Additional Information

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

States

Oregon

Forest Health Protection

Department of Forestry
2000 State Street, Bldg. 4A
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(503) 945-7398 (Jim Mair)
945-7397 (Alan Kanaskie)
945-7395 (Mike McWilliams)
945-7396 (Dave Overhulser)
Email: jmair@odf.state.or.us
http:\\www.odf.state.or.us/fa/FH/id.htm

Washington

Forest Health Program

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P.O. Box 47037
Olympia, WA 98504-7037
(360) 902-1691 (Karen Ripley)
902-1692 (Dan Omdal)
902-1320 (Jeff Moore)
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Forest Service

Forest Health Monitoring Program

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Forest Insects & Diseases (WA and OR)

Pacific Northwest Region, Natural Resources
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Southwest Oregon Service Center

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Westside Service Center

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