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Forest Service
Pacific Northwest Region

Oregon
Department of Forestry

Washington Department
of Natural Resources

Forest Insect and Disease Highlights in Oregon and Washington, 1999

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 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.

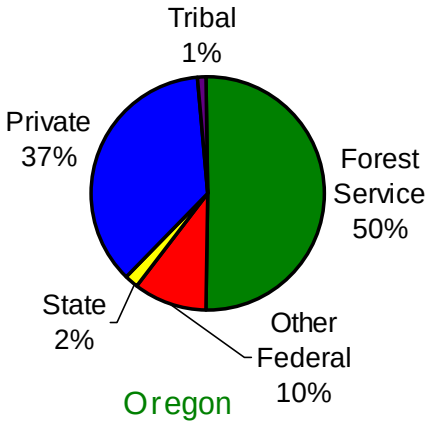
Each observer looks at the trees below and two miles out from the plane on his or her side. They record the number of trees affected and the likely cause of damage or mortality.

Aerial view of defoliation caused by western spruce budworm. Photo source unknown.

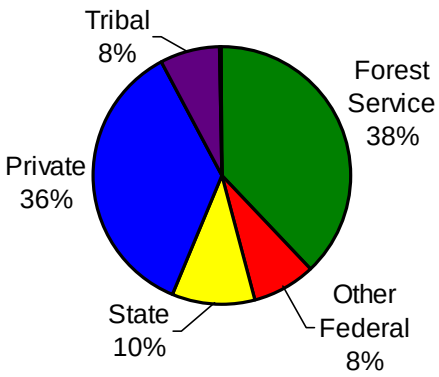
In 1999, approximately 28,100,000 acres were surveyed in Oregon (99.7% of all forested lands in Oregon) and 20,900,000 acres were surveyed in Washington (99.8% of all forested lands in Washington). Aerial survey information is transferred to electronic GIS layers and distributed to major forest landowners, 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 1999, special surveys were flown during the spring for Swiss Needle Cast along the northwest coast of Oregon and the southwest coast of Washington. Also, Oregon Department of Forestry conducted special surveys in June for mortality and bear damage in western Oregon and Port-Orford cedar mortality in southwest Oregon.

Forested Acres Surveyed by Air in 1999



Oregon



Washington

Oregon Highlights

Diseases

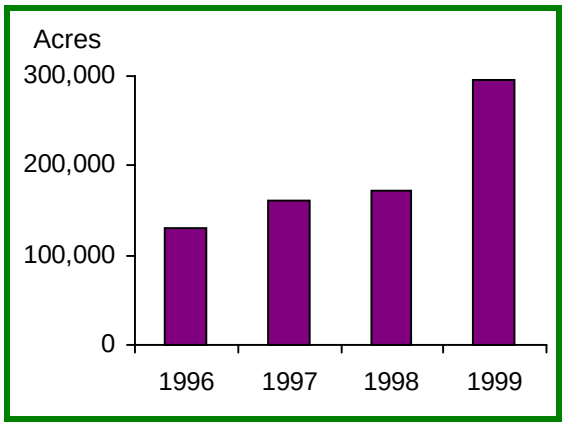
The most important current forest disease problem remains Swiss needle cast, which affects thousands of acres of Douglas-fir forest in coastal Oregon. Root diseases and dwarf mistletoes, although not highly visible, continue to affect forests throughout the state.

A succession of years with wet, mild conditions generally has favored foliage diseases in conifers in most parts of the state, but damage usually is not sustained (except for Swiss needle cast). In some areas periodic excessive rainfall and unusual temperature extremes during 1998 and 1999 have contributed to tree damage and mortality from water stress.

Swiss Needle Cast

Swiss needle cast is a disease of Douglas-fir foliage caused by the fungus *Phaeocryptopus gaeumannii*. It causes needles to turn yellow and fall prematurely from the tree, ultimately reducing tree growth and survival. Tree mortality is rare. The pathogen is native to Oregon and infects only Douglas-fir. The disease is called "Swiss" needle cast because it was first described in Switzerland in the 1920s on planted Douglas-fir.

For the past four years aerial surveys of the Coast Range have shown a dramatic increase in the area of Douglas-fir forest showing symptoms of Swiss needle cast. Most of the damaged stands are located along the north coast, particularly in Tillamook County, but damage extends south almost to the California border.

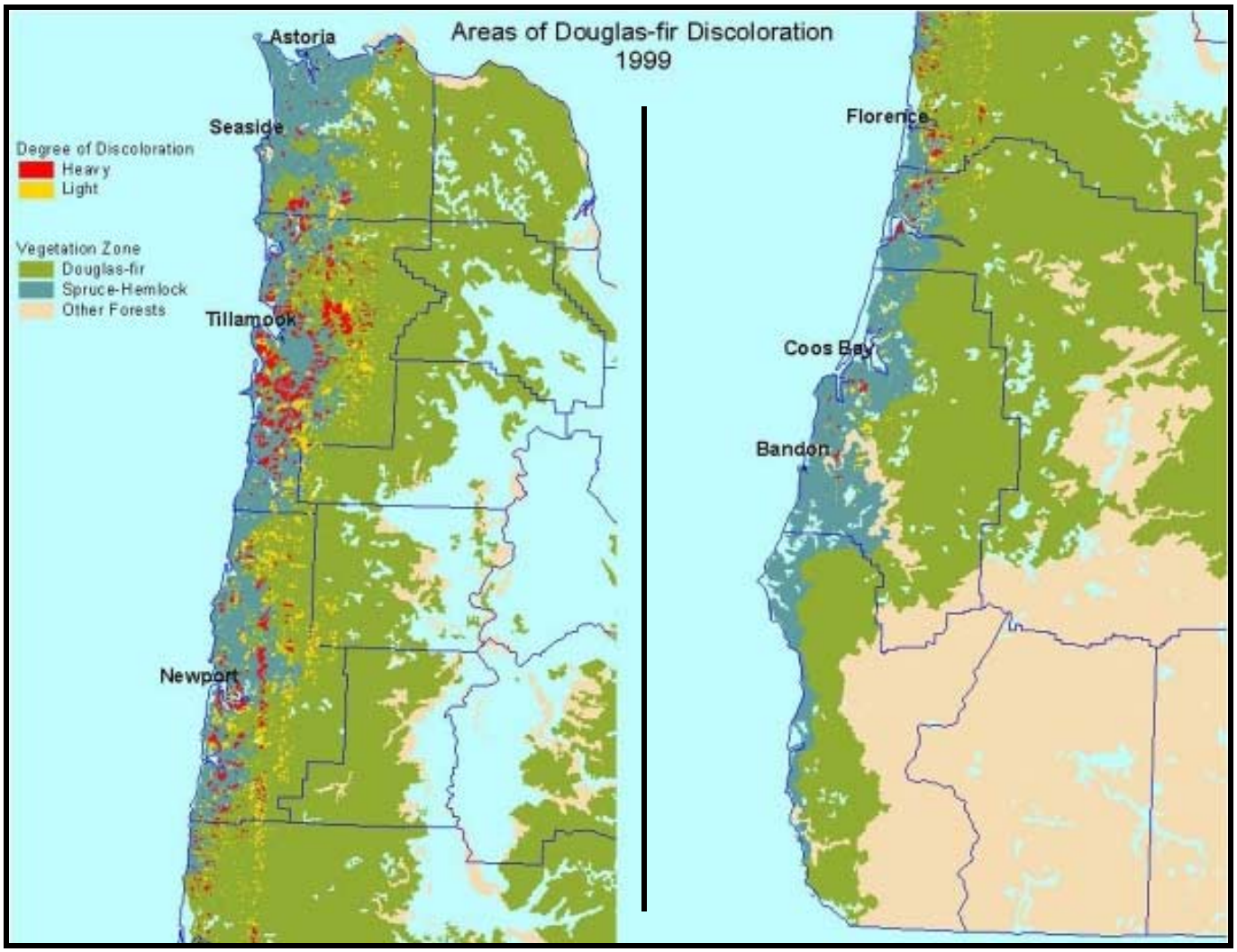


Trend in the number of acres with obvious symptoms of Swiss needle cast mapped in aerial surveys.

The first Swiss needle cast aerial survey (1994) mapped concentrated damage in Tillamook County, and scattered, lightly damaged stands from Toledo to Astoria, with most damage occurring within 12 miles of the coast.

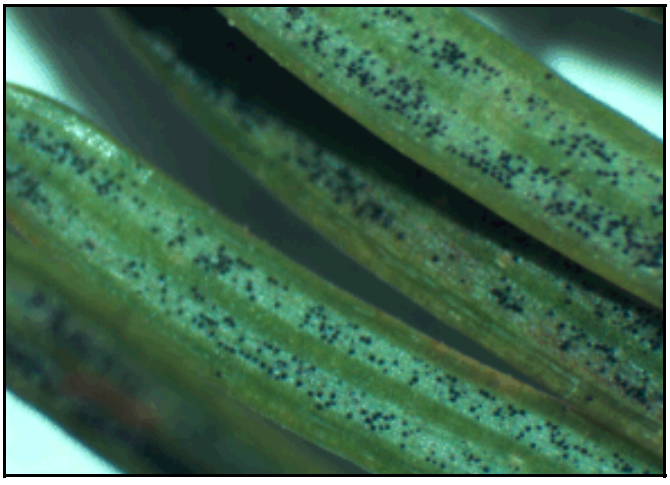
A more extensive survey in 1996 mapped disease symptoms on about 130,000 acres, all within 15 miles of the coast. The areas showing disease symptoms have increased each year through 1999.

Obvious symptoms of the disease now occur nearly 30 miles inland from the coast in some locations. Survey flights over the Cascade Range in 1999 detected no areas with obvious symptoms of Swiss needle cast, although the disease does occur there.



Map of western Oregon showing areas with obvious symptoms of Swiss needle cast as detected in an aerial survey in April and May of 1999. Map by Mike McWilliams, Oregon Dept. of Forestry.

Swiss needle cast causes Douglas-fir foliage to turn yellow and fall prematurely from the tree. Photo by Oregon Department of Forestry .



Fruiting bodies of the fungus that causes Swiss needle cast appear on the underside of Douglas-fir needles. Photo by Oregon Department of Forestry.

Water Stress in Douglas-fir

Dead branches, dead tops and dead Douglas-fir trees were unusually abundant and widespread in 1999. The most obvious symptom was the sudden appearance of red-brown foliage from late winter through early summer. The pattern of branch death on trees often was very disorderly, with dead branches occurring in the top, bottom or throughout the crown. Damage was by far most common in young Douglas-fir (usually less than about 30 years old). Drought-tolerant species such as Ponderosa pine were damaged less frequently than Douglas-fir or true fir. Douglas-fir generally does not tolerate extreme drought conditions or waterlogged soils as well as Ponderosa pine.

Douglas-fir trees with dead tops, a symptom of water stress. Photo by Oregon Department of Forestry.

Damage occurred throughout the state and was particularly noticeable in interior southwest Oregon (Rogue-Umpqua Basin) and in the Willamette Valley. Damage was most severe in urban areas, on the fringe of forested areas, and on shallow, rocky, or droughty soil types, and on very wet or seasonally flooded sites.

The primary cause of the branch and tree death described above is water stress inside the tree. Most water stress in trees results from a lack of available soil moisture due to drought. Water stress inside a tree also can result from excessive soil moisture. In waterlogged or flooded soils, tree roots are deprived of oxygen and may be killed or damaged to the point that they can no longer absorb water and nutrients efficiently. As the soil dries, the damaged root system cannot support the water needs of the top of the tree.

Individual branch death on Douglas-fir often appears the year following extreme drought. Photo by Oregon Department of Forestry

Low levels of water stress reduce stem and root growth. As water stress increases, production of defensive chemicals decreases, thereby increasing a tree's susceptibility to insects and pathogens. Under severe drought conditions, water content may drop to a critical level where trees are irreversibly damaged and entire trees or just portions of the tree may die. Tops of trees and branch tips often die first because they are farthest from the water-absorbing roots. Even though the damage may occur in late summer or fall, the symptoms usually are not visible until the following late winter or spring.

1998 Weather: The weather during 1998 contributed to water stress in western Oregon trees. April and May were extremely wet months. Many rainfall records were set in May. Many sites that were not wet under normal or dry conditions became waterlogged or flooded. This excess soil moisture damaged roots, predisposing trees to water stress when dry conditions returned.

Following the wet spring, the period from July through early October was extremely dry, with above average temperatures in much of western Oregon. Precipitation in the Rogue/Umpqua Basin and the Willamette Valley was far below normal. Several high temperature records were set in August and September. The persistent low rainfall and periodic acute high temperatures caused extreme water stress in trees, especially on sites with other factors such as heavy clay soils, soil disturbance or competing vegetation.

Relatively warm temperatures continued through November, but unusually low temperatures occurred suddenly throughout the state during the week before Christmas. Even coastal areas experienced several consecutive days of below-freezing temperatures. The warm periods of November slowed the acclimation of trees to low temperatures, rendering them particularly susceptible to the low temperatures that followed. The low temperatures killed or damaged tissues, eventually resulting in tree death or dieback that was not visible until early 1999.

Entire trees or parts of trees may die because of too much or too little water, or both. Photo by Oregon Department of Forestry.

Root Diseases and Dwarf Mistletoes

Root diseases (caused by fungi) and dwarf mistletoes (parasitic plants) usually do not cycle through major outbreaks like the insect pests and foliage diseases, but they continually exert major influences on forests. As natural disturbance agents, their effects on forests may be positive, negative or neutral, depending on management objectives. In some cases they may enhance stand structure and provide wildlife habitat. However, in many cases their effects are detrimental and pose difficult forest management challenges.

The most important native root diseases in Oregon are laminated root rot, armillaria root disease, and black stain root disease. Port-Orford-cedar root disease is caused by an exotic pathogen and has caused tremendous damage to Port-Orford-cedar in southwestern Oregon. These diseases will continue to kill trees for the foreseeable future and any trends that develop likely will reflect how well forests are managed.

Dwarf mistletoes infest most Oregon conifers and are particularly abundant in eastern and southern Oregon. They reduce tree growth and eventually kill trees. On the positive side, they provide food and habitat for certain wildlife species. They can be managed through silvicultural methods and in many cases intensive management has brought them to acceptable levels. However, poor forest management can greatly increase the unwanted impacts of these pathogens on management objectives.

Foliage Diseases

Various foliage diseases affect Oregon's forests. Most of these fluctuate considerably in response to local weather conditions that favor infection and disease development. Although they can cause significant damage to trees if outbreaks are sustained (e.g., Swiss needle cast), usually they are highly visible for a short period without causing significant long-term damage.

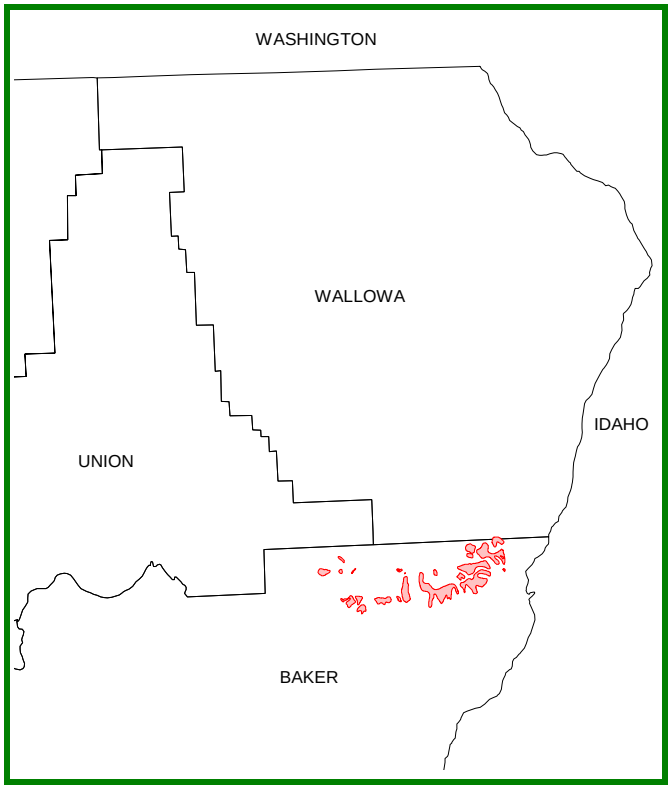
Aerial surveys in 1999 showed areas of lodgepole pine needle cast and larch needle blight in eastern Oregon, both of which increase during years of abnormally wet weather in spring and early summer. Some growth impact is expected from these diseases, but they do not threaten tree survival.

Insects

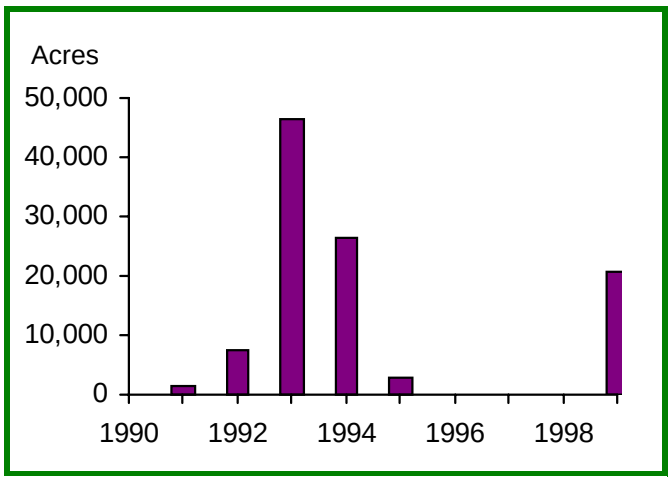
Several outbreaks of defoliating insects were detected in eastern Oregon by the 1999 aerial survey. These included a new Douglas-fir tussock moth outbreak in true fir and Douglas-fir stands, the first major larch casebearer outbreak in many years, and a third year of white fir defoliation by the Modoc budworm in Lake County.

Douglas-fir Tussock Moth

The most important defoliator activity detected in 1999 is a Douglas-fir tussock moth outbreak on 21,071 acres of the Wallowa-Whitman National Forest just north of Halfway. Tussock moth outbreaks typically last three to four years and severely defoliated trees often die. A major tussock moth outbreak is usually followed by bark beetle outbreaks that continue to kill trees even after defoliation stops.



Map of northeast Oregon showing areas with Douglas-fir tussock moth defoliation in 1999 (red). Map by Mike McWilliams, Oregon Department of Forestry.



Douglas-fir tussock moth defoliation trend in eastern Oregon over a 10-year period. Defoliation from 1992-1995 represents an outbreak north of Burns on the Malheur National Forest.

Because some areas of the Wallowa-Whitman already have an ongoing Douglas-fir beetle outbreak, there is concern that beetle populations will quickly move into trees weakened by defoliation. To minimize defoliation, pesticides must be applied in the early stages of a tussock moth outbreak. As a result, the U. S. Forest Service is preparing an environmental impact statement that would allow treatment of selected stands with a biological insecticide in July 2000. More information on the Douglas-fir tussock moth is available at www.odf.state.or.us/fa/fh/ fhn/tuskmoth.pdf.

Mature tussock moth larvae have distinctive dark tufts of hair and a body color that is a light cream or dark brown. Photo by Pacific Northwest Region, USDA Forest Service.

Larch Casebearer

Larch casebearer, an introduced insect from Europe, invaded northeast Oregon's forests during the 1960s and 70s. Repeated defoliation of western larch reduces radial growth and weakens trees so they may die from other causes.

Early spring feeding by larch casebearer larvae causes a yellowing of larch foliage in May. Photo by Oregon Department of Forestry.

In 1999, aerial surveys of northeast Oregon detected the first larch casebearer outbreak in more than two decades. This new outbreak covers 15,279 acres and consists of scattered stands where larch is a major component.

Modoc Budworm

A Modoc budworm outbreak is in its third year in the Warner Mountains east of Lakeview. The estimated area of white fir defoliation in 1999 was 25,492 acres. Modoc budworm outbreaks last three to four years and defoliated trees usually suffer only minor top kill and reductions in radial growth.

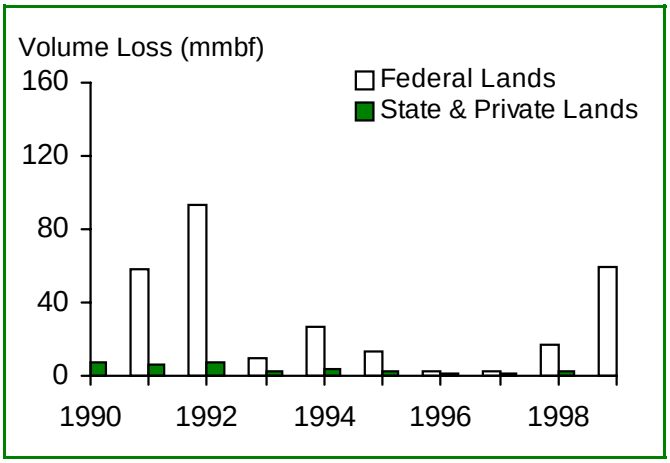
Douglas-fir Beetle

For the first time since the 1960s there is a major Douglas-fir beetle outbreak in western Oregon. In 1998 the area with tree mortality from the Douglas-fir beetle was estimated at 3,814 acres, but by 1999 the area had grown to 34,188 acres.

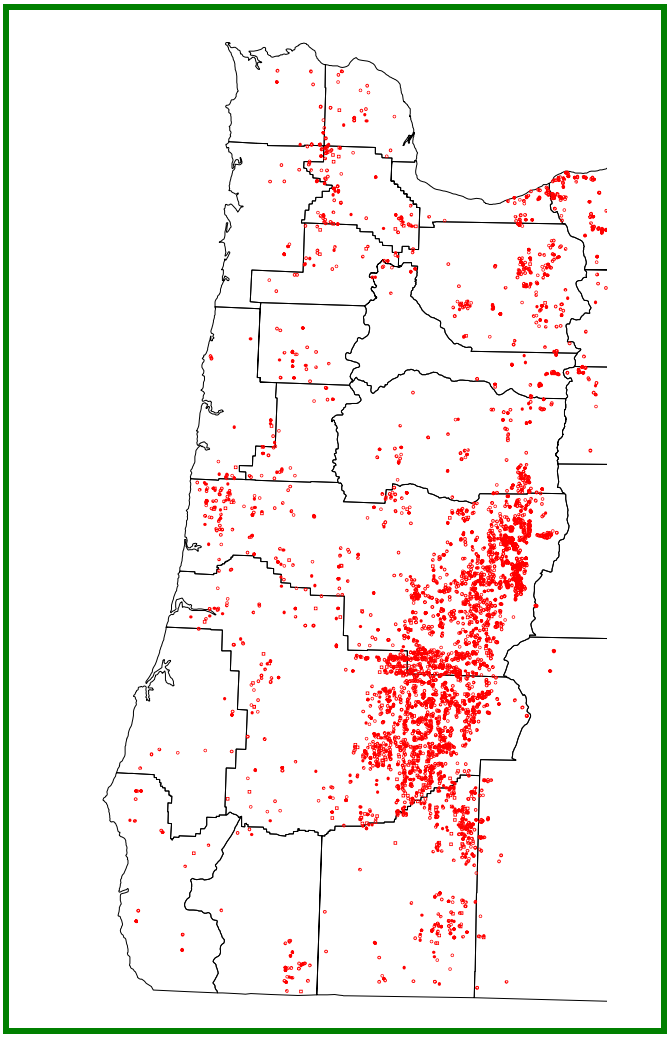
Most of the Douglas-fir mortality in eastern and western Oregon is concentrated on federal lands. In most areas the origin of the outbreak is trees damaged by the 1996 storms that became breeding material for the Douglas-fir beetle. In parts of eastern Oregon, trees damaged by fires in 1996 have also provided breeding material for the Douglas-fir beetle and allowed beetle populations to reach outbreak levels.

Aerial view of trees killed by Douglas-fir beetle. Tree mortality from beetle attacks occur in scattered spots. Photo by Oregon Department of Forestry.

Typically Douglas-fir beetle outbreaks last two to three years before populations subside, but a succession of powerful storm events since 1996 have created a supply of windthrow that may sustain high beetle populations for additional years. More information on the Douglas-fir beetle is available at www.odf.state.or.ustfa/fh/fhn/dfbeetle.pdf.



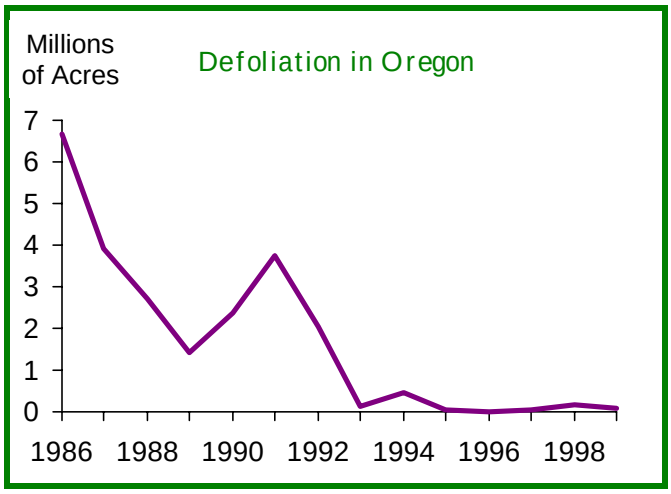
Douglas-fir mortality trend from Douglas-fir beetle attacks. High levels of tree mortality in 1990-2 were caused by a bark beetle outbreak following years of western spruce budworm defoliation.

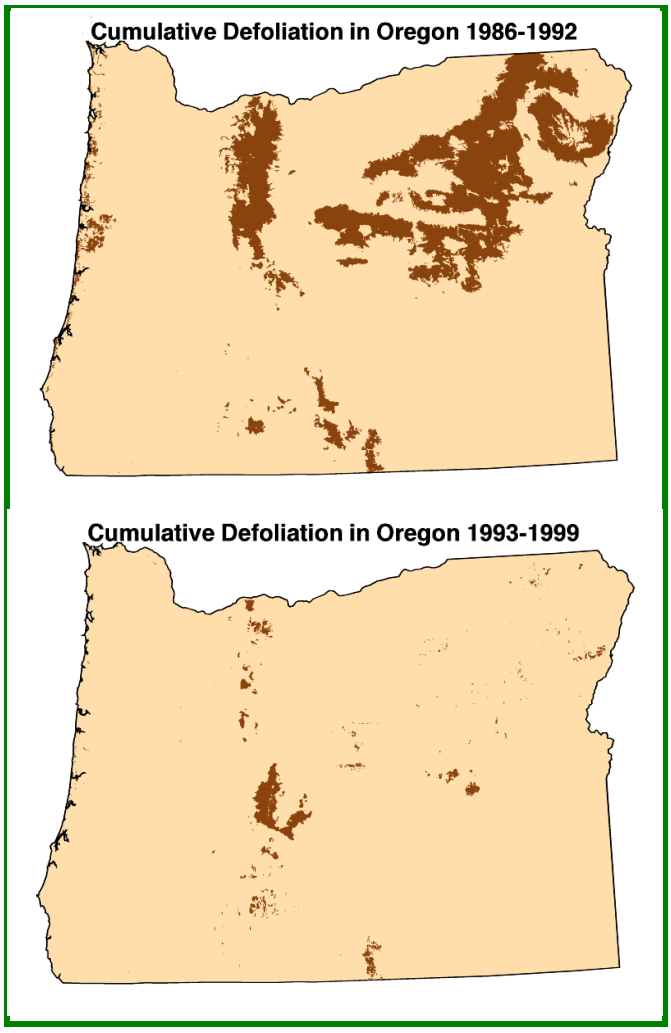


Map of areas of tree mortality caused by the Douglas-fir beetle in 1999, based on aerial survey data. Areas with infestation are not to scale. Map by Mike McWilliams, Oregon Dept. of Forestry.

Defoliation Trends

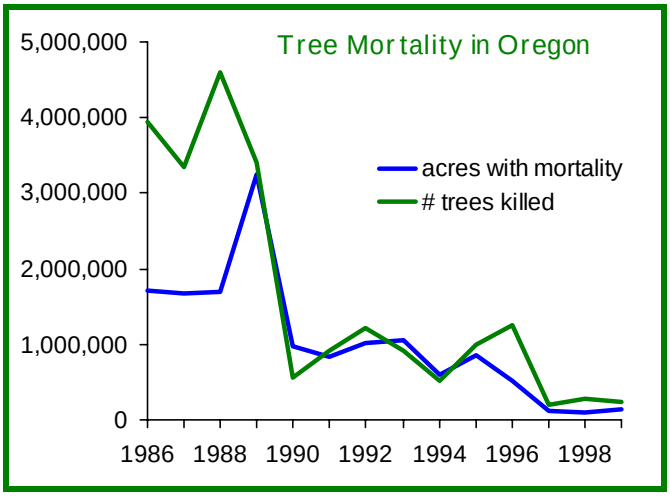
Western spruce budworm activity in eastern Oregon was relatively high in the late 1980's and early 1990's, accounting for much of the visible defoliation during that time. Since 1993, defoliation has remained at low levels throughout Oregon.

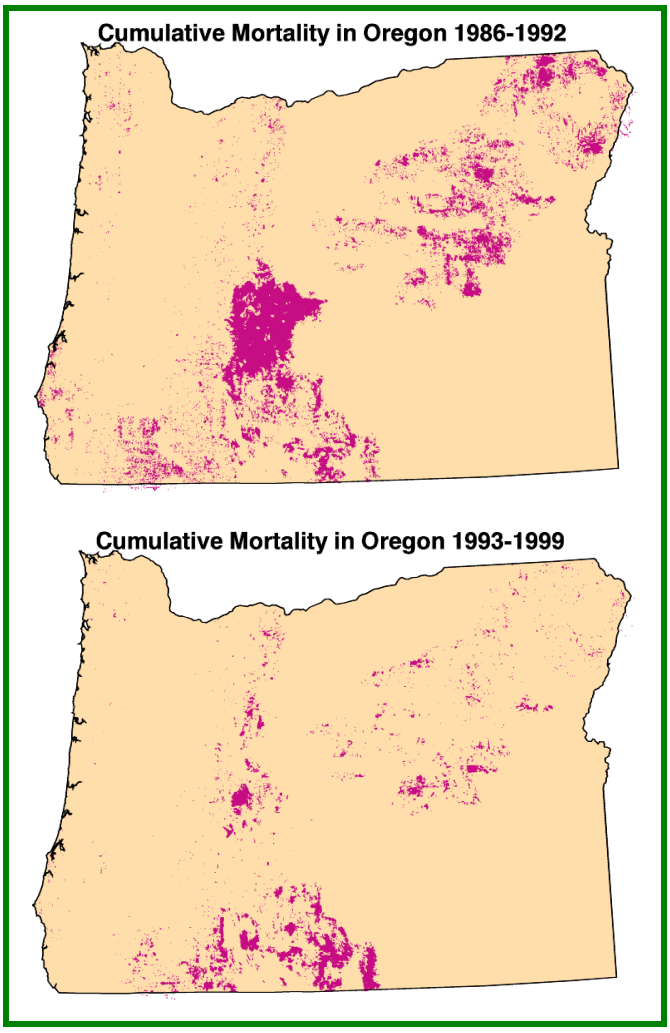




Tree Mortality Trends

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.





Washington Highlights

Diseases

Swiss needle Cast

The current poor condition of many coastal Douglas-fir forests in Oregon has been attributed to Swiss needle cast disease (SNC). This disease also is found in non-coastal forests of Washington, but there is still some question as to the extent of damage. For the second year, special aerial survey flights were made in southwestern Washington to record the extent and the severity of the disease. This survey was conducted from April 27 through May 26, 1999. The survey area extended from the Columbia River north to Aberdeen and Elma, and from the Pacific Ocean east to the Capitol State Forest and the Cowlitz County line. An additional area of 0.5 million acres from Renton to Darrington was also flown on May 4.

1999 was more cloudy and cool than 1998. Thus the survey was delayed for two weeks midway into the project, and extended into late May. At that time, the whole countryside looked obviously brown in color; the resulting area with damage recorded was much larger and more contiguous.

A total of approximately 2.3 million acres were flown. Symptoms of SNC were detected on over 200,000 acres, compared to 44,500 acres in 1998. Most of the 200,000 acres were classified "Light", while almost 20,000 acres were classified "Heavy". All recorded damage was in the southern coastal area of Washington. Other observations made during the aerial survey include:

- The area between Renton and Darrington showed no signs of visible yellowing.
- The overall appearance of virtually all stands appears poorer than last year.
- Signatures for SNC become less pronounced further inland.
- The presence of hemlock in stands can confuse disease detection.
- Trees on south-facing slopes are, generally, more negatively impacted by SNC.
- The extended summer drought of 1998, and a large number of windstorms last winter, may also be degrading overall stand appearance.

Douglas-fir plantation with sparse foliage caused by Swiss needle cast disease. Photo by Washington Department of Natural Resources.

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 rarely 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 underway to determine the growth impacts of SNC on Douglas-fir plantations. Conditions still persist that favor disease development. These conditions are:

- A pathogenic fungus
- Vast acreage of a susceptible Douglas-fir
- A moist, temperate climate.

Information about biology:
willow.ncfes.umn.edu/pubs/howtos/ht_df- ndlcst/ndlcst.htm
Other online information:
www.fs.fed.us/r6/nr/fid/widweb/wid-fold.htm#fd-9

Root Diseases

Root diseases continue to be the most significant on-going forest health problems in Washington. These agents are 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 windthrow or bark beetles). The most economically important root rots in Washington are:

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.

Information about biology:
willow.ncfes.umn.edu/fidl-armillaria/armillaria.htm
Other online information:
www.fs.fed.us/r6/nr/fid/widweb/wid-rd.htm#rd-2

Laminated Root Rot occurs on approximately eight percent of the commercial forest lands in Washington and Oregon, and causes a 40- to 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.

Information about biology:
www.fs.fed.us/r6/nr/fid/fidls/fidl159.htm
Other online information:
www.fs.fed.us/r6/nr/fid/widweb/wid-rd.htm#rd-5

Tree trunk affected by laminated root rot. Photo by Washington Department of Natural Resources.

Annosum Root and Butt Rot occurs 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.

Information about biology:
www.fs.fed.us/r6/nr/fid/fidls/annosus.pdf
Other online information:
www.fs.fed.us/r6/nr/fid/widweb/wid-rd.htm#rd-1

Root disease detection and management is critical for long term management of forest stands. **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. You may order by calling 1-800-723-1763.

Miscellaneous Diseases

Pacific Madrone Decline Complex: Pacific madrone has had several years of cumulative damage from a combination of leaf rust, leaf blight, leaf miner and leaf skeletonizer. Mature trees have been defoliated, weakened or partially killed. However, in 1999 the madrone generally had better appearance than the last several years.

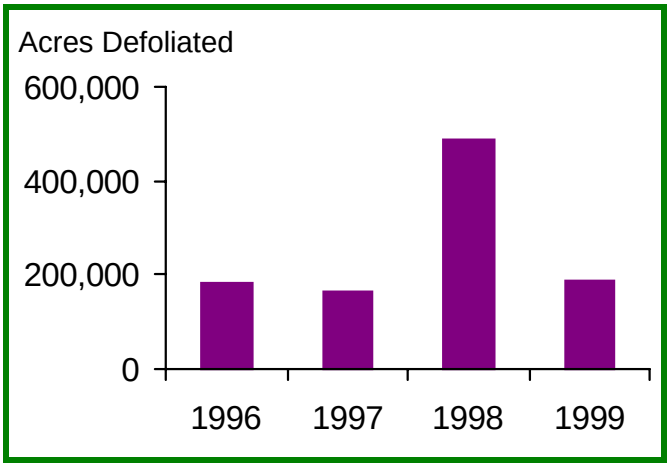
Information about biology:
http://students.washington.edu/melliott/

Pacific madrone tree affected by leaf insects and fungi. Photo by Washington Department of Natural Resources.

Larch Needle Cast: Larch has been hard hit with cumulative seasons of heavy larch case bearer, *Meria* and *Hypodermella* infections. Damage in 1999 appeared less severe. The aerial survey, however, occurs too late in the year to observe the peak signature of these agents.

Information about biology:
www.fs.fed.us/r6/nr/fid/widweb/wid-fold.htm#fd-5

Western larch branch with needles killed by foliage disease. Photo by Washington Department of Natural Resources.



Acres defoliated by western spruce budworm in Washington, as detected during aerial surveys

Hardwood Decline: The cottonwood along the eastern slopes of the Cascades was heavily infected with *Melampsora* rust in 1998, but in 1999 they appeared unaffected.

White Pine Blister Rust is an exotic disease that continues to damage western white pine and whitebark pine. It can progress slowly and appears to have weakened whitebark pine in several areas to the point that mountain pine beetles are actively killing trees. This is of special concern since whitebark pine is a very slow growing species which is crucial to alpine wildlife and ecosystems and is almost irreplaceable. In addition to the mortality which was recorded, a broad scattering of western white pine mortality was observed, but was not captured well during the survey because they did not occur in groups meeting the minimum threshold of five or more dead trees.

Online information:
www.fs.fed.us/r6/nr/fid/widweb/wid-rust.htm#rust-8

Insects

Western Spruce Budworm

Significant budworm activity in 1999 occurred in the Glenwood area, south of Mt. Adams. This infestation began in 1984, and is now unprecedented in duration. In recent years hundreds of thousands of acres have been affected.

For the last several years, suppression projects have aerially applied *Bacillus thuringiensis* var. *kurstaki,* a naturally occurring bacteria lethal to moth and butterfly larvae which eat it. Forest management activities to reduce budworm host trees have also been conducted in this area. Management is complicated by habitat protection requirements for the Northern spotted owl. Meanwhile, the budworm infestation continues. Douglas-fir beetle is present in areas where repeated defoliation has weakened trees.

Defoliation caused by western spruce budworm. Photo by Washington Department of Natural Resources.

Information about biology:
willow.ncfes.umn.edu/fidl-wsb/fidl-wbw.htm
Other online information:
www.fs.fed.us/r6/nr/fid/widweb/wid-def.htm#def-6

Douglas-fir Tussock Moth

Douglas-fir tussock moth pheromone-baited traps around the Colville Indian Reservation, Lake Chelan, and Glenwood showed alarmingly high trap catches in 1998, but no defoliation was detected in Washington during this year's aerial survey. In contrast, portions of the Blue Mountains in northeast Oregon showed more than 21,000 acres of new defoliation in 1999.

Defoliation caused by Douglas-fir tussock moth. Photo by Washington Department of Natural Resources.

Pheromone trap catches continued to be high in Okanogan, Chelan, Lincoln and Columbia counties in 1999. Larval and cocoon sampling indicates that defoliation is likely in some Washington portions of the Blue Mountains in 2000. Either this outbreak will subside without major effects in Washington, or we will see defoliation in 2000.

Information about biology:
http://willow.ncfes.umn.edu/fidl-tussock/fidl-tuss.htm
Other online information:
http://www.fs.fed.us/r6/nr/fid/dftmweb/

Douglas-fir Beetle

Douglas-fir beetle is at outbreak levels in parts of Spokane, Pend Oreille, Stevens, and Ferry counties. This outbreak began when beetle populations built up in broken and injured trees created by the ice and snowstorms of 1996-1997. Drought in summer 1998 stressed mature trees in this area and may have contributed to beetles successfully killing standing trees in 1998 and 1999. 24,217 acres of Douglas-fir beetle activity were detected in this area in the 1999 aerial survey. Mortality in standing trees continues, but is likely declining. About 50,500 acres of Douglas-fir beetle activity were detected statewide in 1999.

Tree mortality caused by Douglas-fir beetle. Photo by Washington Department of Natural Resources.

Information about biology:
http://www.fs.fed.us/r6/nr/fid/fidls/fidl5.pdf
Other online information:
http://www.fs.fed.us/r6/nr/fid/widweb/wid-bb.htm#bb-1

Pine Bark Beetles

The most active pine bark beetles in Washington are mountain pine beetle, western pine beetle and Ips beetles. Their activity was especially intense around and north of Spokane. Beetle populations have grown to outbreak levels due to tree breakage in the 1996-1997 winter storms, combined with vast areas of overstocked, moisture-stressed forests. Approximately 8,000 acres of damaged ponderosa, lodgepole, whitebark, and western white pine trees were recorded in parts of Spokane, Pend Oreille, Stevens, and Ferry counties in 1999.

Lodgepole pines killed by mountain pine beetle. Photo from FIDL 2, USDA Forest Service, Amman et al. 1989.

The outbreak of mountain pine beetle infesting mature lodgepole pine on the east slopes of the north Cascades (Loomis State Forest, Okanogan National Forest, Pasayten Wilderness Area) continues, but is decreasing. In much of the area, the bulk of susceptible host trees, large diameter lodgepole pine, have already been successfully attacked and killed.

Mountain pine beetle also affects whitebark pine, a slow-growing alpine species currently weak-

Information about biology:
http://www.fs.fed.us/r6/nr/fid/fidls/fidl2.htm
Other online information:
http://www.fs.fed.us/r6/nr/fid/widweb/wid-bb.htm

Miscellaneous Insects

Spruce Aphid: The outbreak of spruce aphid along the coast almost completely subsided this year, but not without lingering effects. Sitka spruce trees with thin, sparse foliage attest to the extent of last year's infestation. Unfortunately, the aerial survey could not capture this event well because so little foliage is left on the trees. It will also be difficult for the aerial survey to detect whether spruce bark beetle subsequently damages weakened trees.

Information about biology:
http://www.for.nau.edu/usfs/r3_fpm/insects/elat.html
Other online information:
http://www.fs.fed.us/r6/nr/fid/widweb/wid-suck.htm#suck-6

Black Pineleaf Scale: This insect/disease complex chronically infects some ponderosa pine forests adjacent to fruit orchards or roads, and has been primarily attributed to spray drift and dust. However, in 1999 these scales were also observed by ground surveys on dry sites where chemicals and dust were not factors.

Information about biology:
http://www.fs.fed.us/r6/nr/fid/fidls/fidl91.htm

Balsam Woolly Adelgid: Few current infestations of balsam woolly adelgid were observed for the second year in a row. However, there were ground observations of stem infestations in the Blue Mountains near Dayton, Washington.

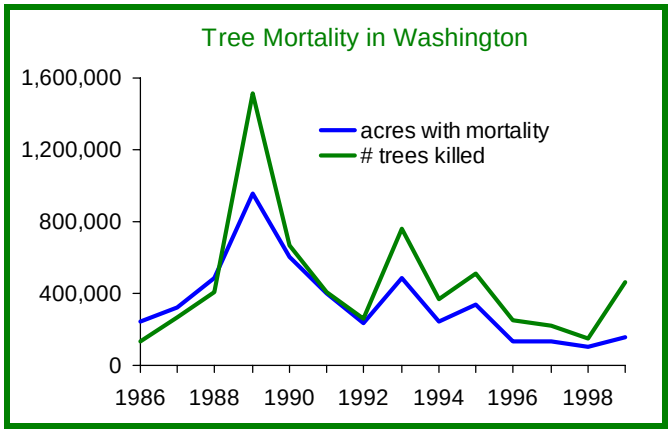
Subalpine firs affected by balsam woolly adelgid. Photo by Dave Overhulser, Oregon Department of Forestry.

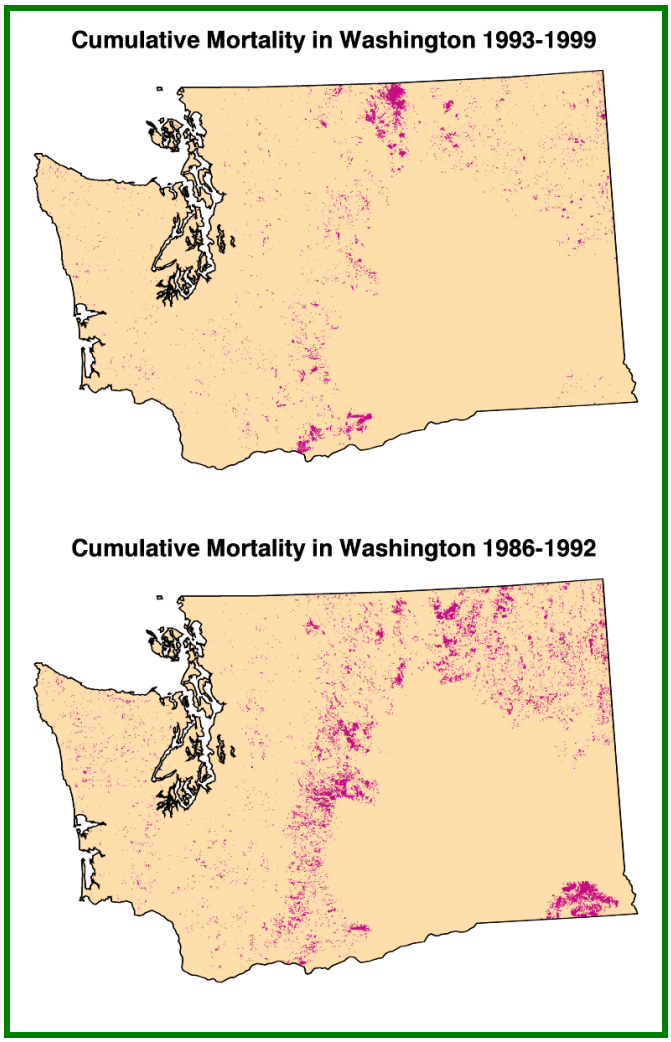
Stem infested with balsam woolly adelgid, Willamette National Forest. Photo by Dave Overhulser, Oregon Department of Forestry.

Information about biology:
http://fhpr8.srs.fs.fed.us/idotis/insects/bwa.html
Other online information:
http://www.fs.fed.us/r6/nr/fid/widweb/wid-suck.htm#suck-5

Tree Mortality Trends

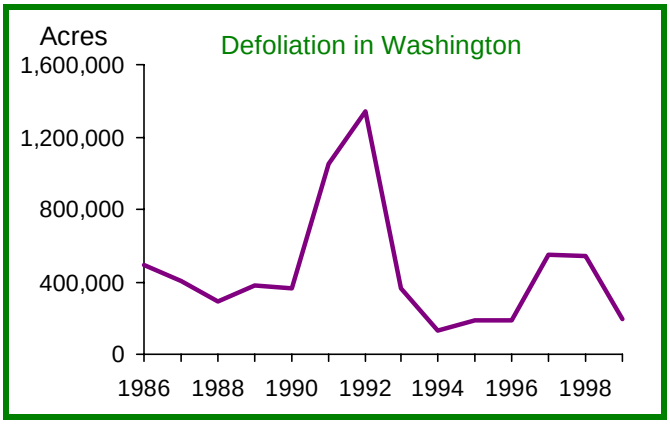
Overall, mortality in Washington has decreased over the past 15 years, due mainly to decreases in bark beetle-caused mortality. Drought periods in the late 1980s and early 1990s, coupled with overstocked stands, contributed to increased mortality from insects and diseases.

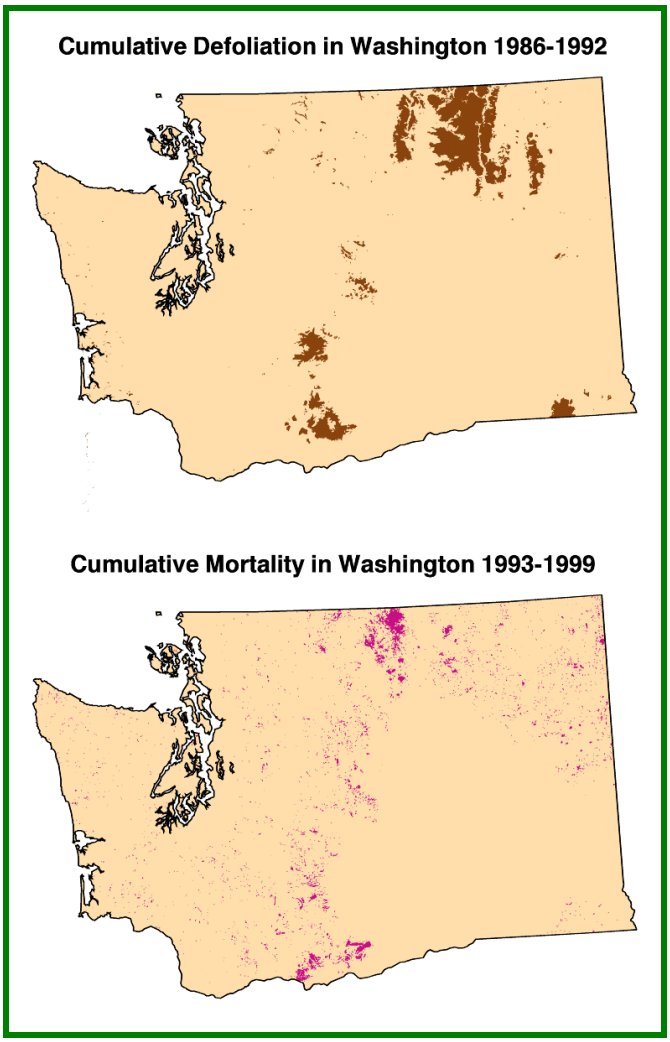




Defoliation Trends

Defoliation – primarily from western spruce budworm – has decreased in the last 15 years over much of eastern Washington. The Glenwood area, south of Mount St. Helens, is the exception, where defoliation from western spruce budworm has been high since 1996.





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
Salem, OR 97310
(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

Department of Natural Resources
P.O. Box 47037
Olympia, WA 98504-7037
(360) 902-1691 (Karen Ripley)
902-1692 (Dan Omdal)
902-1320 (Jeff Moore)
(509) 684-7474 (Karen Johnson)
Email: forest_health@wadnr.gov

Forest Service

Forest Health Monitoring Program

Washington and Oregon
Forestry Sciences Laboratory
P.O. Box 3890
Portland, OR 97208-3890
(503) 808-2034 (Sally Campbell)
email: scampbell01@fs.fed.us
http://www.fs.fed.us/pnw/fia/fhmpage/

Forest Insects & Diseases (WA and OR)

Pacific Northwest Region, Natural Resources
P.O. Box 3623
Portland, OR 97208-3623
(503) 808-2913 (Ken Snell)
email: ksnell@fs.fed.us
website: http://www.fs.fed.us/r6/nr/fid/

Blue Mountains Service Center

northeastern Oregon
Forestry Sciences Laboratory
1401 Gekeler Lane
La Grande, OR 97850
541-962-6544 (Craig Schmitt)
962-6546 (Don Scott)
962-6574 (Lia Spiegel)
clscmitt@fs.fed.us, dwscott@fs.fed.us,
lspiegel@fs.fed.us

Central Oregon Service Center

Deschutes National Forest
1645 Highway 20 East
Bend, OR 97701
541-383-5701 (Andy Eglitis) or
541-383-5591 (Helen Maffei)
aeglitis@fs.fed.us or hmaffei@fs.fed.us

Southwest Oregon Service Center

J. Herbert Stone Nursery
2606 Old Stage Road
Central Point, OR 97529
541-858-6125 (Don Goheen)
858-6126 (Ellen Goheen)
858-6124 (Katy Marshall)
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Wenatchee Service Center

northeastern & north central Washington
Forestry Sciences Laboratory
1133 N. Western
Wenatchee, WA 98801
(509) 662-4335: ext. 777 (Jim Hadfield),
ext. 749 (Paul Flanagan),
ext. 768 (Roy Magelssen)
jshadfield@fs.fed.us, pflanagan@fs.fed.us,
rmagelssen@fs.fed.us

Westside Service Center

western Oregon and Washington
Mount Hood National Forest
16400 Champion Way
Sandy, OR 97055
(503) 668-1475 (Bruce Hostetler),
668-1476 (Keith Sprengel),
668-1477 (Beth Willhite)
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