United States
Department
Of Agriculture

Forest Service

Forest Health Protection

March 2002

Forest Insect and Disease Conditions in the United States 2000

Healthy Forests Make A World of Difference

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PREFACE

This is the 50th annual report prepared by the U.S. Department of Agriculture Forest Service (USDA Forest Service) of the insect and disease conditions of the Nation's forests. This report responds to direction in the Cooperative Forestry Assistance Act of 1978, as amended, to conduct surveys and report annually on insect and disease conditions of major national significance. Insect and disease conditions of local importance are reported in regional and State reports.

The report describes the extent and nature of insect- and disease-caused damage of national significance in 2000. As in the past, selected insect and disease conditions are highlighted in the front section of the report. Maps are provided for some pests showing affected counties in the East and affected areas in the West. Graphs are provided for some pests showing acreage trends over the last several years. Also provided are tables showing acreages affected for selected pests by State by year for the last 5 years.

The second section of the report brings together insect, disease, and abiotic agent damage from each affected region under the organism's or agent's name. The organisms and agents are arranged alphabetically in the appropriate section--

- insects--native;
- insects--nonnative;
- diseases--native;
- diseases--nonnative;
- diseases--origin unknown;
- declines and complexes;
- seed orchard insects and diseases;
- nursery insects and diseases; and
- abiotic damage.

These categories are listed in the table of contents; there is no index.

The information in this report is provided by the Forest Health Protection Program of the USDA Forest Service. This program serves all Federal lands, including the National Forest System and the lands administered by the Departments of Defense and Interior. Service is also provided to tribal lands. The program provides assistance to private landowners through the State foresters. A key part of the program is detecting and reporting insect and disease epidemics and the effects of wind, air pollution, floods, droughts, and other agents. Detection surveys are conducted on a regular basis by State and Forest Service program specialists.

For additional information about conditions, contact the Forest Service office listed on the next page (see map for office coverage) or your State forester.

The Forest Service also prepared "America's Forests: 1999 Health Update," which highlights major forest health concerns. The report deals with exotic (nonnative) pests, the rural-urban-wildland interface, and the effects of weather and air pollution on forests.

The report is available on the Internet at:

www.fs.fed.us/foresthealth/annual_i_d_conditions/index.html

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This report is also available on the Internet at:
www.fs.fed.us/foresthealth/annual_i_d_conditions/index.html

CONTENTS

EXECUTIVE SUMMARY

Introduction

About one-third of the Nation's land area, 736.7 million acres, is forested; 380.3 million acres in the East and 356.4 million acres (including Alaska) in the West. Nationwide, these forests provide economic, social, and environment benefits. Native and nonnative (exotic) insects and diseases, as well as abiotic influences, affect the health and productivity of the forests.

Highlighted below are some of the major native insects and diseases of concern. Also highlighted are some nonnative insects and diseases that have been introduced into the United States. These pests either are causing serious damage or have the potential to do so.

Insects: Native

Southern pine beetle - affected acreage increased from 6.2 million acres in 1999 to 12.1 million acres in 2000.

Mountain pine beetle - affected acreage increased from 384,700 acres in 1999 to 465,900 acres in 2000.

Spruce budworm - defoliation in Alaska decreased from 700 acres in 1999 to almost no acres in 2000. In the Great Lakes area, defoliation decreased from 70,000 acres in 1999 to 28,500 acres in 2000.

Western spruce budworm - defoliated acreage increased from 528,900 acres in 1999 to 618,300 acres in 2000.

Spruce beetle - the infestation in Alaska further declined to 86,000 acres in 2000. Spruce beetle activity was generally low in the West but populations seem to be building in some areas.

Insects: Nonnative

Asian longhorned beetle – in 2000, spot infestations were reported at O'Hare Airport. Eradication measures continue in both New York and Chicago.

Gypsy moth (European) - defoliated acreage increased from 524,800 acres in 1999 to 1,623,500 acres in 2000.

Common European pine shoot beetle - found in Ohio in 1992, this beetle is now known to occur in 11 States from New Hampshire to Wisconsin. The beetle is a threat to Christmas tree growers.

Hemlock woolly adelgid - introduced into Virginia in 1950, this insect now occurs from North Carolina to southern New England, killing hemlock trees in 3 to 5 years.

Pink hibiscus mealybug - first discovered in Grenada in 1994, this insect is spreading throughout the Caribbean. In 1997, it was discovered on the main island of Puerto Rico. It is now found on more than 25 Caribbean islands.

Diseases: Native

Fusiform rust - is the most damaging disease of pines in the South, affecting an estimated 13.9 million acres of pine.

Dwarf mistletoes - are native parasitic plants that grow on conifers and are the most serious disease of trees in the West. An estimated 28.8 million acres of conifers are infested.

Root diseases - are among the most serious pests in the West, especially in areas where root diseases and bark beetles work together.

Diseases: Nonnative

White pine blister rust - introduced around the turn of the 20th century, it now occurs throughout the ranges of the five-needled pines and has caused extensive tree mortality.

Beech bark disease - introduced into North America about 1890, this disease is killing beech trees from Maine to Pennsylvania, with outlying areas in Virginia, West Virginia, North Carolina, and Tennessee.

Diseases: Origin Unknown

Dogwood anthracnose - first found in the 1970s, the disease is now in 22 Eastern States as well as Washington, Oregon, and Idaho. The disease kills both woodland and ornamental dogwoods, although resistant dogwoods are available at many nurseries.

Butternut canker - this casual fungus was identified in the late 1970s and occurs throughout most of the range of butternut. Much of the butternut resource has been destroyed, especially in the South. Resistance work is underway.

Part 1 National Highlights

Part 1 contains more information on selected insects and diseases, including some maps, tables, and graphs.

Part 2 Conditions by Agent

Part 2 provides more detailed information about the insects and diseases discussed here as well as others. The report also describes abiotic factors, such as wind and drought, that damage forests. Abiotic factors often predispose the trees to insect and disease buildups.

Part 1 National Highlights

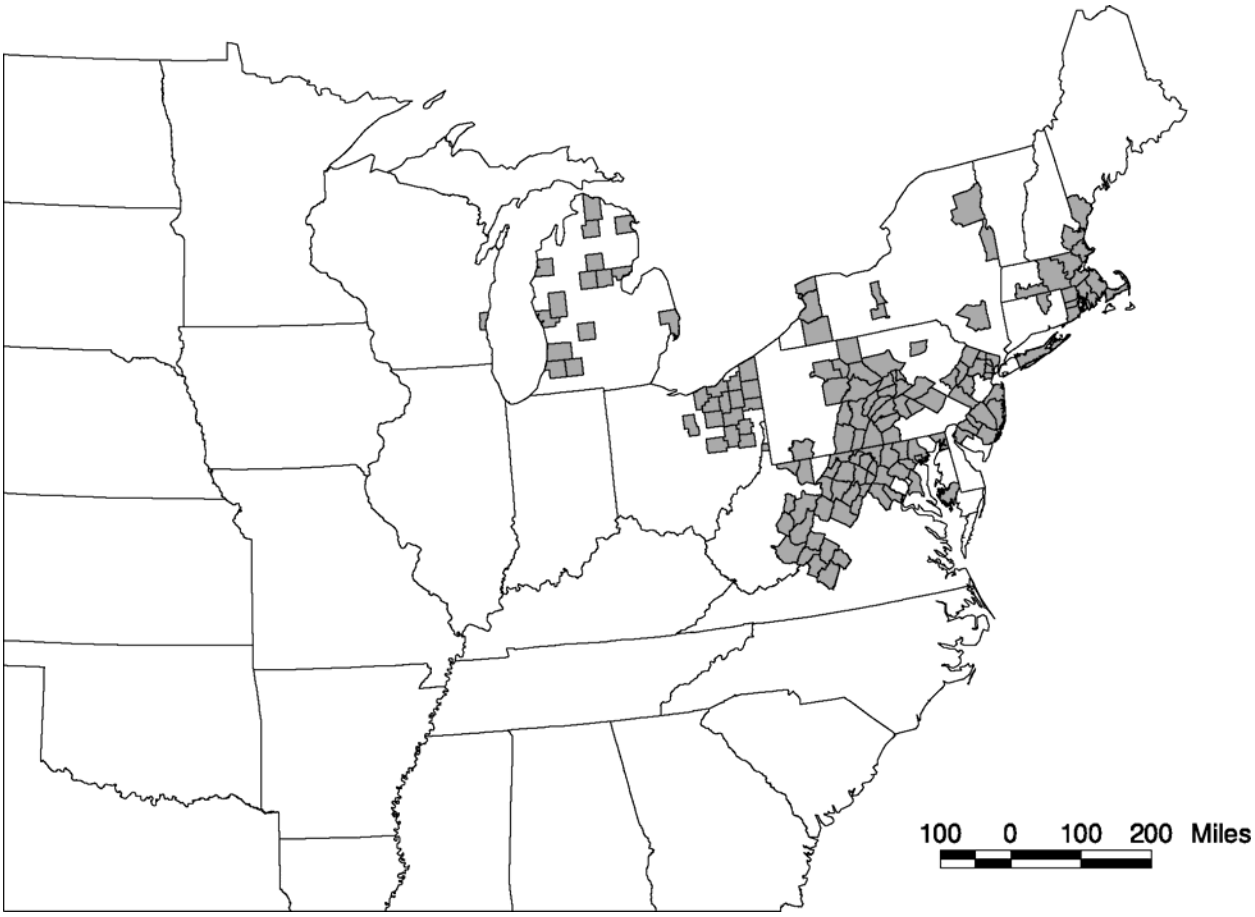
Insect Conditions Highlights

Gypsy moth

Lymantria dispar was intentionally brought into the Boston, Massachusetts, area from France in 1869 to start a silk industry. The moth escaped and continues to spread to the south and west. In 2000, all or parts of 15 States and the District of Columbia are considered infested. The infested States extend from New England to Virginia, West Virginia, Ohio, and Michigan.

Defoliation in the East increased from 524,800 in 1999 to 1,623,500 acres in 2000. Acreage defoliated declined in Michigan and Ohio but increases were reported in 12 States. The most notable increases occurred in Pennsylvania, with an increase of 561,400 acres; West Virginia, with an increase of 323,100 acres; and New Jersey, with an increase of 131,900 acres. Maryland, Massachusetts, New York, Rhode Island, and Virginia also reported significant increases in defoliation over 1999.

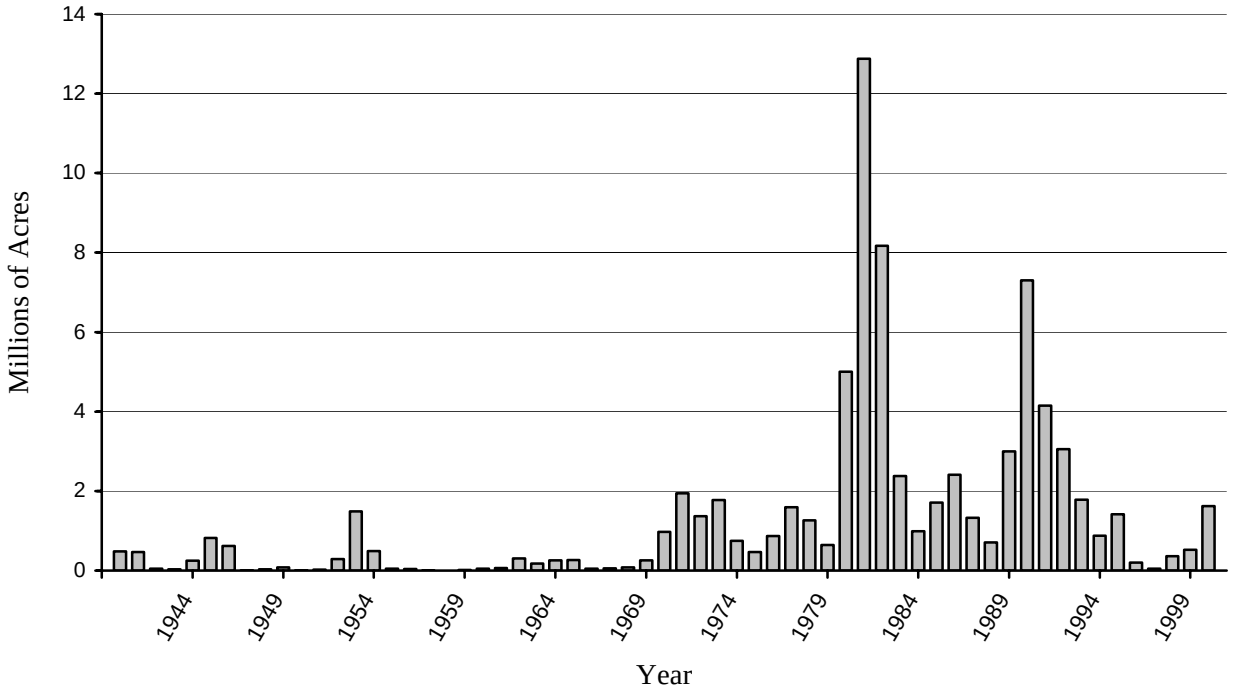
Eastern Counties Where Gypsy Moth (European) Defoliation Was Reported, 2000



Acres of Aerially Detected Gypsy Moth (European) Defoliation, 1996-2000

State	1996	1997	1998	1999	2000
Connecticut	1,400	0	0	0	200
Delaware	500	0	0	0	0
Maine	100	0	0	0	2,500
Maryland	11,200	700	500	1,200	23,200
Massachusetts	7,000	100	12,900	9,800	64,100
Michigan	5,000	36,900	301,700	176,600	106,300
New Hampshire	0	0	0	0	100
New Jersey	27,800	1,900	1,800	1,400	133,300
New York	16,300	2,200	9,400	6,000	27,500
Ohio	49,000	5,000	1,600	48,200	23,600
Pennsylvania	6,700	0	31,600	281,600	843,000
Rhode Island	4,000	0	3,000	0	5,500
Vermont	0	0	0	0	0
Virginia	0	0	0	0	71,000
Washington, DC	0	0	0	0	0
West Virginia	70,700	500	800	0	323,100
Wisconsin	0	0	0	0	100
Total	199,700	47,300	363,300	524,800	1,623,500

Gypsy Moth (European) Defoliation, 1940-2000



Southern pine beetle

Dendroctonus frontalis, a native insect, is the most destructive of the eastern species of bark beetles. Southern pine beetle populations are epidemic in some parts of the South almost every year. Infestations usually start in trees weakened by disease, lightning strikes, excessive age, storm damage, or other stress factors. Populations can build quickly as there are three to seven generations per year. Shortleaf, loblolly, Virginia, and pitch pines are preferred hosts.

Southern pine beetle activity rapidly escalated over much of the South in 2000 with the affected acreage increasing from 6,158,700 acres in 1999 to 12,132,400 acres in 2000. The most heavily impacted area continued to be the State of Alabama with 26,437 infestations spread across 58 of Alabama's 67 counties. However, Florida, Georgia, Kentucky, North Carolina, South Carolina, Tennessee, and Virginia all reported significant increases in beetle activity. By contrast, Louisiana and Texas did not report a single infestation.

Southern pine beetle was found infesting Chihuahua and Apache pines in southern Arizona in 2000, causing tree mortality on 11,705 acres. This is the largest outbreak of this type ever recorded in Arizona.

*Outbreak level is defined as having one or more multi-tree infestations per 1,000 acres of host type.

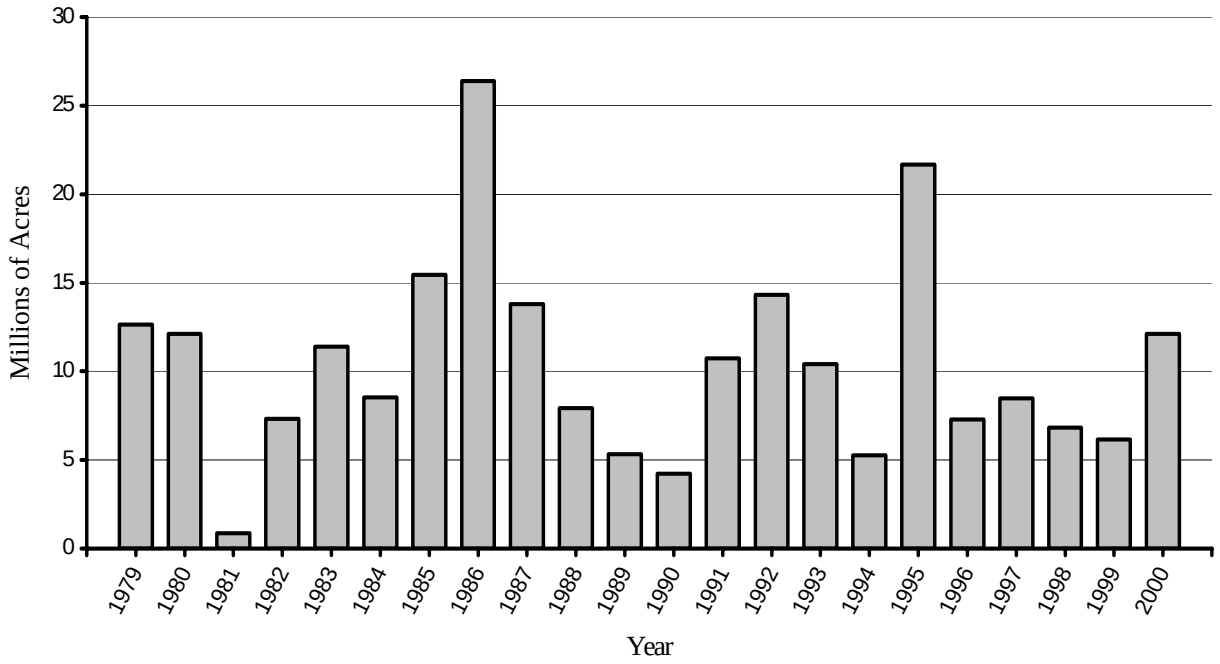
Counties Where Southern Pine Beetle Outbreaks Were Reported, 2000

Acres (in thousands) of Southern Pine Beetle Outbreaks, 1996-2000*

State	1996	1997	1998	1999	2000
Alabama	1,177.9	4,535.5	5,241.3	5,002.0	6,936.1
Arizona	0.0	0.0	0.0	0.0	11.6
Arkansas	1,420.6	0.0	0.0	0.0	0.0
Florida	0.0	401.1	0.0	40.0	321.3
Georgia	101.3	312.9	65.0	171.0	1,067.0
Kentucky	0.0	0.0	0.0	0.0	220.6
Louisiana	165.3	110.0	228.0	0.0	0.0
Mississippi	1,150.9	892.1	73.0	0.0	210.6
North Carolina	747.1	702.3	234.0	252.0	437.9
Oklahoma	0.0	0.0	0.0	0.0	0.0
South Carolina	2,496.6	843.0	944.0	8.7	1,218.3
Tennessee	41.2	30.3	35.0	685.0	1,441.0
Texas	0.0	649.6	0.0	0.0	0.0
Virginia	0.0	0.0	0.0	0.0	268.0
Total	7,300.9	8,476.8	6,820.3	6,158.7	12,132.4

* Acres of outbreak are acres of host type having one or more multi-tree spots per 1,000 acres.

Southern Pine Beetle Outbreaks, 1979-2000



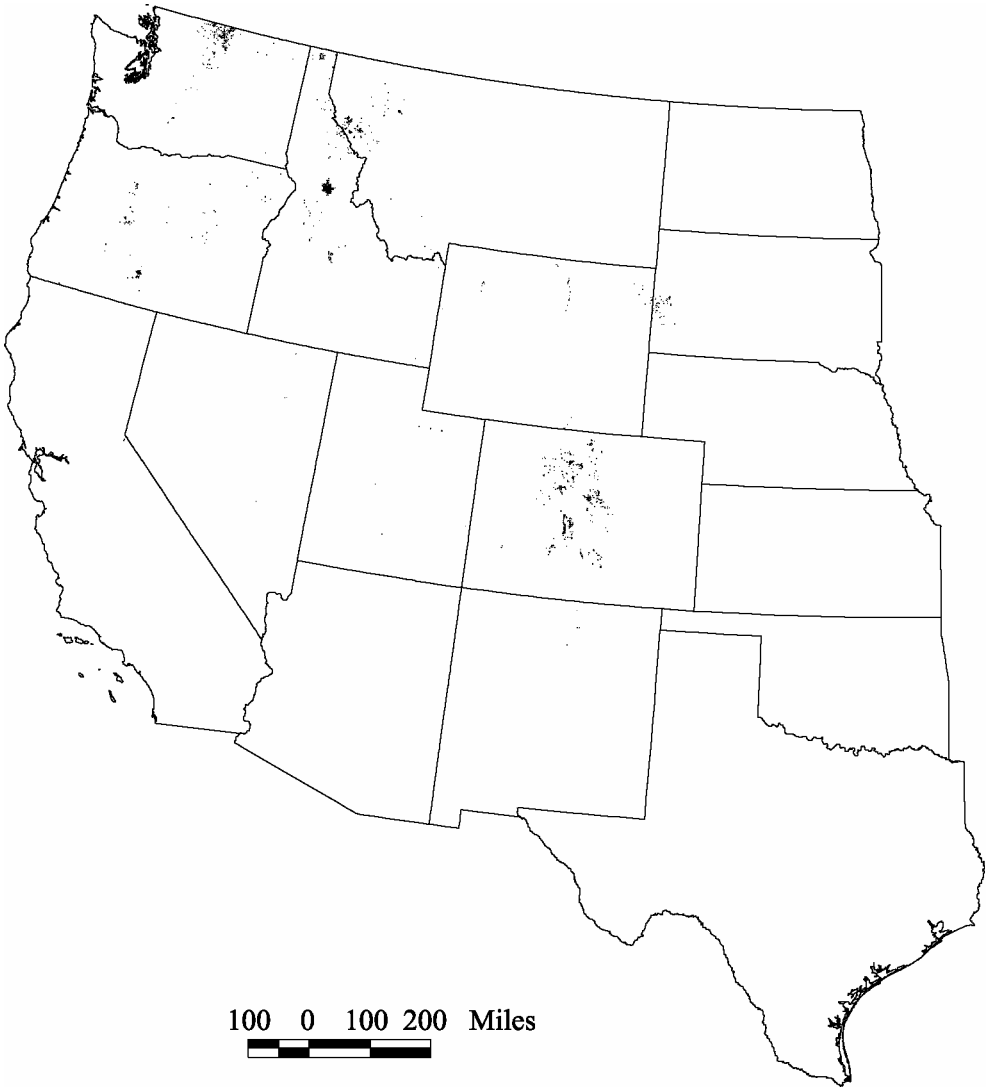
Mountain pine beetle

Dendroctonus ponderosae is a native bark beetle that attacks lodgepole, ponderosa, sugar, western white, and other pines. The beetle ranges throughout western pine forests from Canada into Mexico. Beetles infest mature lodgepole pine and both mature and overstocked stands of other pines.

Mountain pine beetle populations increased in northern Idaho for the fourth consecutive year from 66,600 acres in 1999 to 108,000 acres in 2000. About 95 percent of the beetle-killed trees are lodgepole pine. Beetle-damaged acreages almost doubled in Colorado, from 71,800 acres in 1999 to 139,500 acres in 2000. Populations also seem to be increasing in Wyoming and California.

In the Pacific Northwest, affected acreages are holding steady with 109,700 acres affected in 2000 compared to 111,148 acres in 1999.

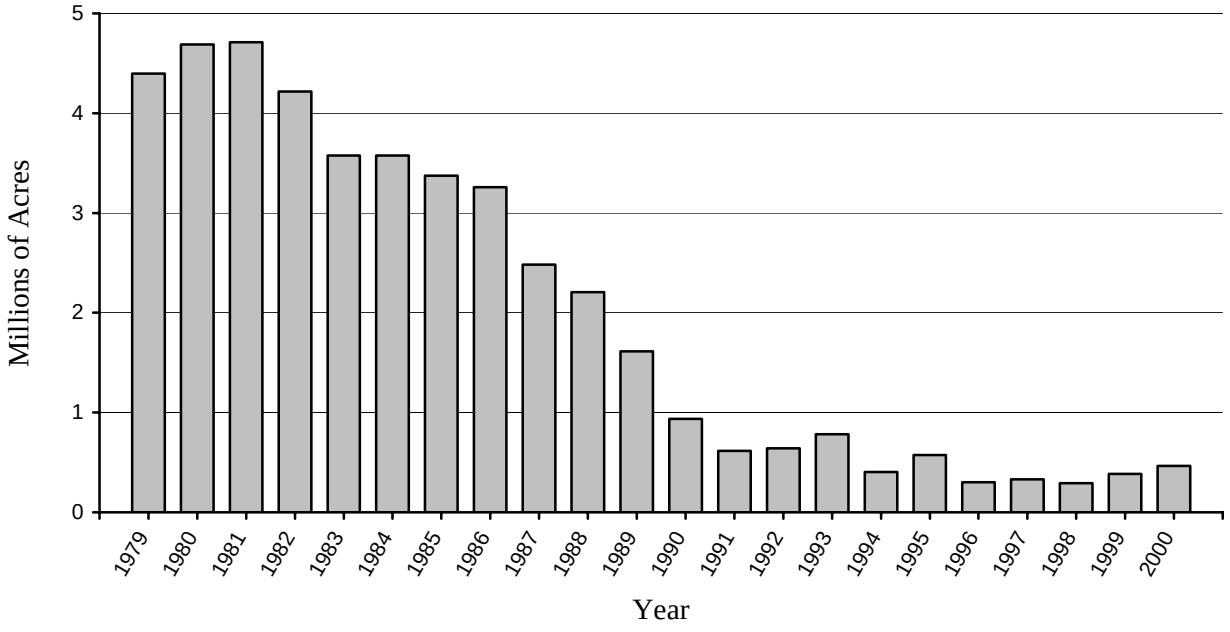
Mountain Pine Beetle Outbreak Areas, 2000



Acres (in thousands) of Mountain Pine Beetle Outbreak, 1996-2000

State	1996	1997	1998	1999	2000
Arizona	2.2	10.0	7.4	0.0	0.0
California	25.1	15.2	26.8	9.7	30.4
Colorado	12.8	22.2	23.1	71.8	139.5
Idaho	33.4	54.0	81.6	84.3	122.3
Montana	27.6	33.4	39.2	77.4	40.6
Nevada	0.0	0.0	0.0	1.4	0.8
New Mexico	1.1	0.1	0.0	0.0	0.0
Oregon	112.6	82.3	65.5	46.2	43.6
South Dakota	2.2	9.4	10.0	19.0	13.9
Utah	24.6	20.9	4.5	3.7	2.2
Washington	56.7	74.7	30.3	65.0	63.1
Wyoming	1.7	6.7	2.5	6.2	9.5
Total	300.0	328.9	290.9	384.7	465.9

Mountain Pine Beetle Outbreaks, 1979-2000



Spruce budworm

Choristoneura fumiferana is a native insect found in northern New England, New York, Pennsylvania, the Great Lakes Region, and Alaska. Balsam fir is the preferred host, but the insect also feeds on white, red, and black spruce. Topkill and tree mortality may result from budworm feeding. Outbreaks generally begin in extensive and continuous areas of mature and overmature balsam fir.

In 2000, the only heavy defoliation reported was in Saint Louis County in extreme northern Minnesota. Defoliation declined in Minnesota from 70,000 acres in 1999 to 28,500 acres in 2000. This is the 47th consecutive year of budworm defoliation in Minnesota. There were 551 acres of moderate defoliation in Essex County, New York. The number of moths caught in pheramone traps remains low in Maine and New Hampshire. However, in Vermont the number of moths caught in traps increased dramatically to the highest level since 1983.

Eastern Counties Where Spruce Budworm Defoliation Was Reported, 2000

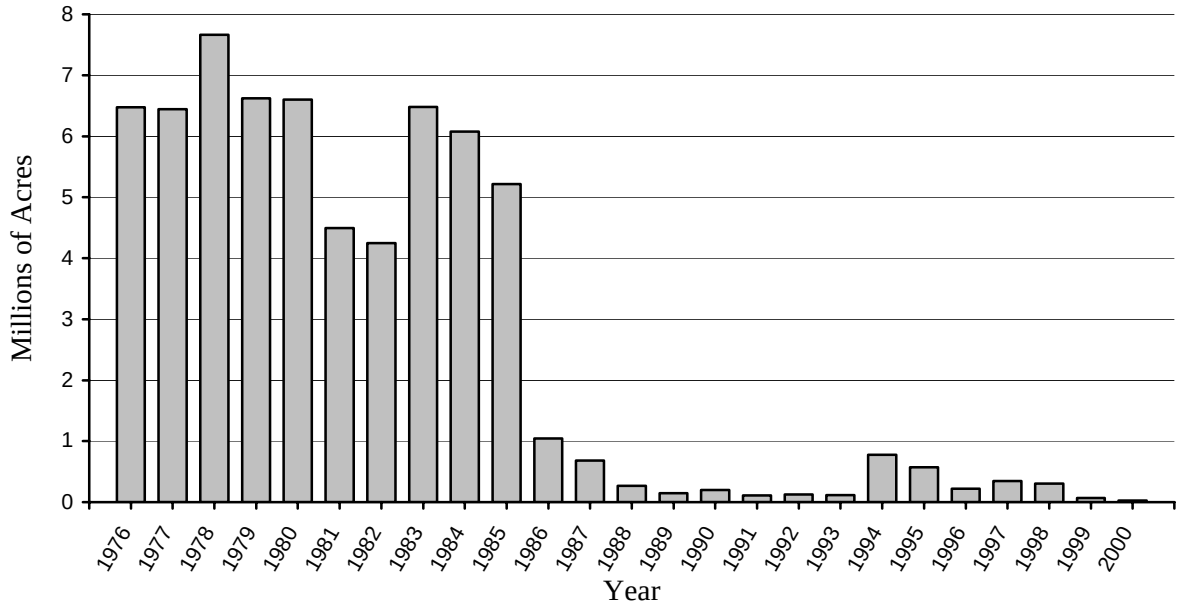
Acres (in thousands) of Aerially Detected Spruce Budworm Defoliation in the Eastern United States, 1996-2000

State	1996	1997	1998	1999	2000
Maine	0.0	0.0	0.0	0.0	0.0
Michigan	12.9	61.6	33.0	0.0	0.0
Minnesota	207.6	276.2	256.4	70.0	28.5
New Hampshire	0.0	0.0	0.0	0.0	0.0
New York	0.0	0.0	0.0	0.0	0.0
Pennsylvania	2.0	0.0	0.0	0.0	0.0
Vermont	0.0	0.0	0.0	0.0	0.0
Wisconsin	0.0	9.6	16.1	0.0	0.0
Total	222.5	347.4	305.5	70.0	28.5

Acres (in thousands) of Aerially Detected Spruce Budworm Defoliation in Alaska, 1996-2000

State	1996	1997	1998	1999	2000
Alaska	235.9	38.4	87.8	0.7	0.0

Spruce Budworm Defoliation in the Eastern United States, 1976-2000

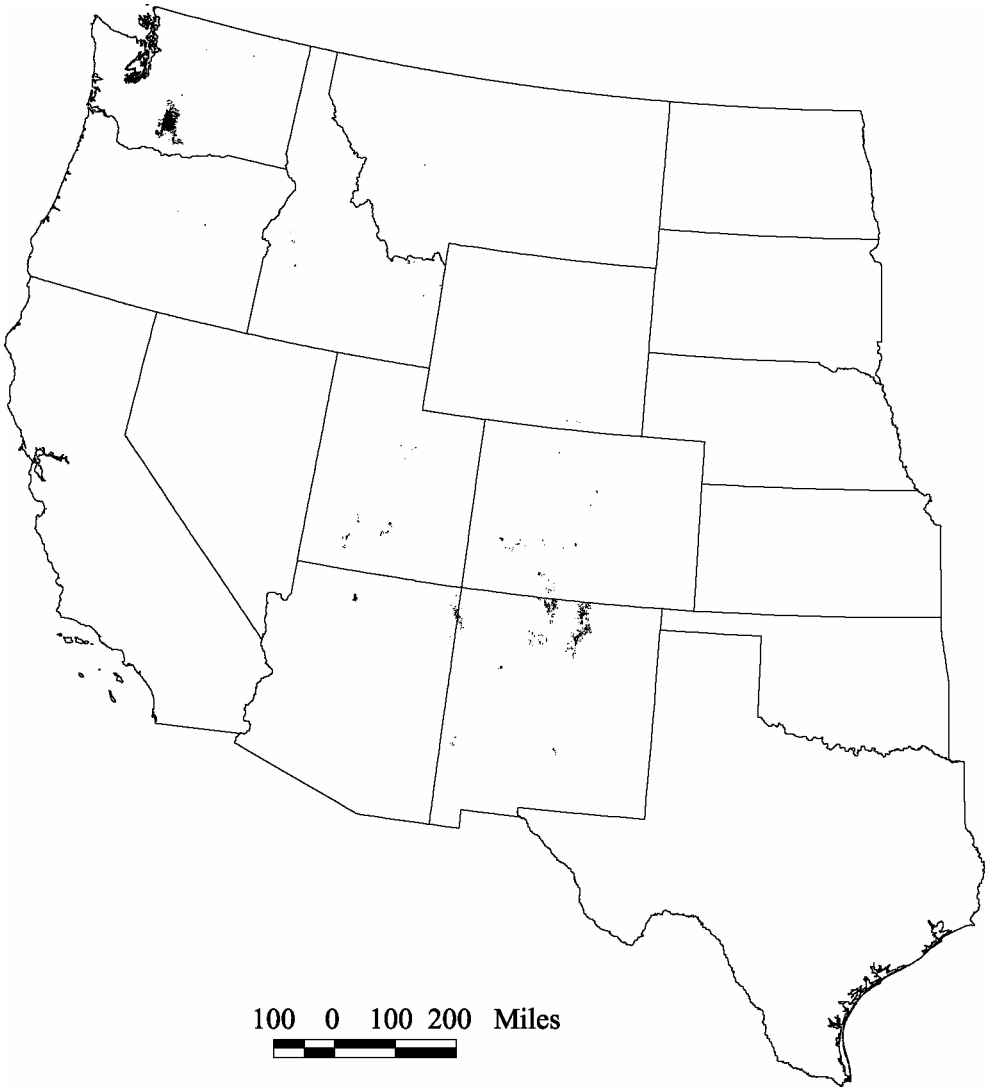


Western spruce budworm

Choristoneura occidentalis is a native insect occurring in the Rocky Mountains from Arizona and New Mexico north to Idaho and Montana and also in Washington and Oregon. The insect causes topkill, growth loss, and some tree mortality. The budworm feeds primarily on Douglas-fir and true firs.

In the Pacific Northwest, areas of aerially visible defoliation increased 384,600 acres in 2000 after a decline to 189,700 acres; almost all the affected acres were in Washington. No budworm-caused defoliation was observed from the air in northern Idaho and only 400 acres were reported in Montana, however, pheromone trap counts continue to increase, indicating a population build-up in the area. Defoliated acres in southwestern Colorado dropped by half, from 41,000 acres in 1999 to 20,600 acres in 2000. In southern Idaho and Utah, defoliation increased from 4,800 acres in 1999 to 21,100 acres in 2000. This is the first re-occurrence of detectable damage from this insect in south Idaho since 1987. Budworm defoliated 192,225 acres in Arizona and New Mexico in 2000, down from 292,925 acres in 1999.

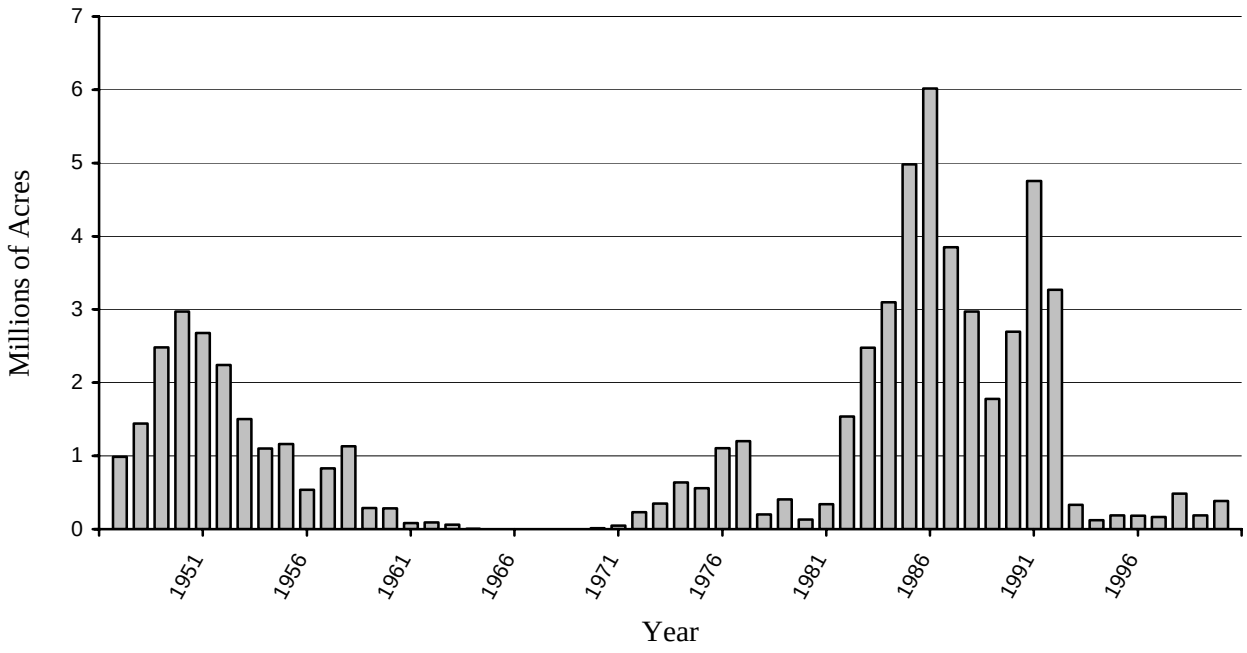
Western Spruce Budworm Defoliation Areas, 2000



Acres (in thousands) of Aerially Detected Western Spruce Budworm Defoliation, 1996-2000

State	1996	1997	1998	1999	2000
Arizona	3.0	1.1	10.1	10.2	25.8
California	0.0	0.0	0.0	0.0	0.0
Colorado	21.8	0.0	15.8	41.0	20.6
Idaho	0.0	0.0	0.0	3.6	4.4
Montana	0.0	0.0	0.0	0.0	0.4
New Mexico	123.9	197.1	310.5	282.6	165.0
Oregon	1.0	0.0	0.0	0.0	0.9
Utah	0.0	0.0	19.9	1.2	16.7
Washington	183.2	165.9	486.8	189.7	383.7
Wyoming	0.0	0.0	0.0	0.6	0.8
Total	332.9	364.1	843.1	528.9	618.3

Western Spruce Budworm Defoliation in the Pacific Northwest Region (R-6), 1947-2000



Hemlock woolly adelgid

Adelges tsugae was introduced into the east coast near Richmond, Virginia, in 1950. The adelgid poses a serious threat to eastern hemlock and Carolina hemlock; tree mortality usually occurs 3 to 5 years after attack. By the early 1990s, the adelgid had spread into 11 States from North Carolina to Massachusetts, causing extensive hemlock decline and tree mortality. The adelgid continues to spread in the north with new townships and counties added to the list of those with infested hemlock.

The adelgid was introduced into the west coast from Asia in 1924 and is now found in British Columbia, Washington, Oregon, and California. The adelgid appears to be innocuous in the West as little damage is reported.

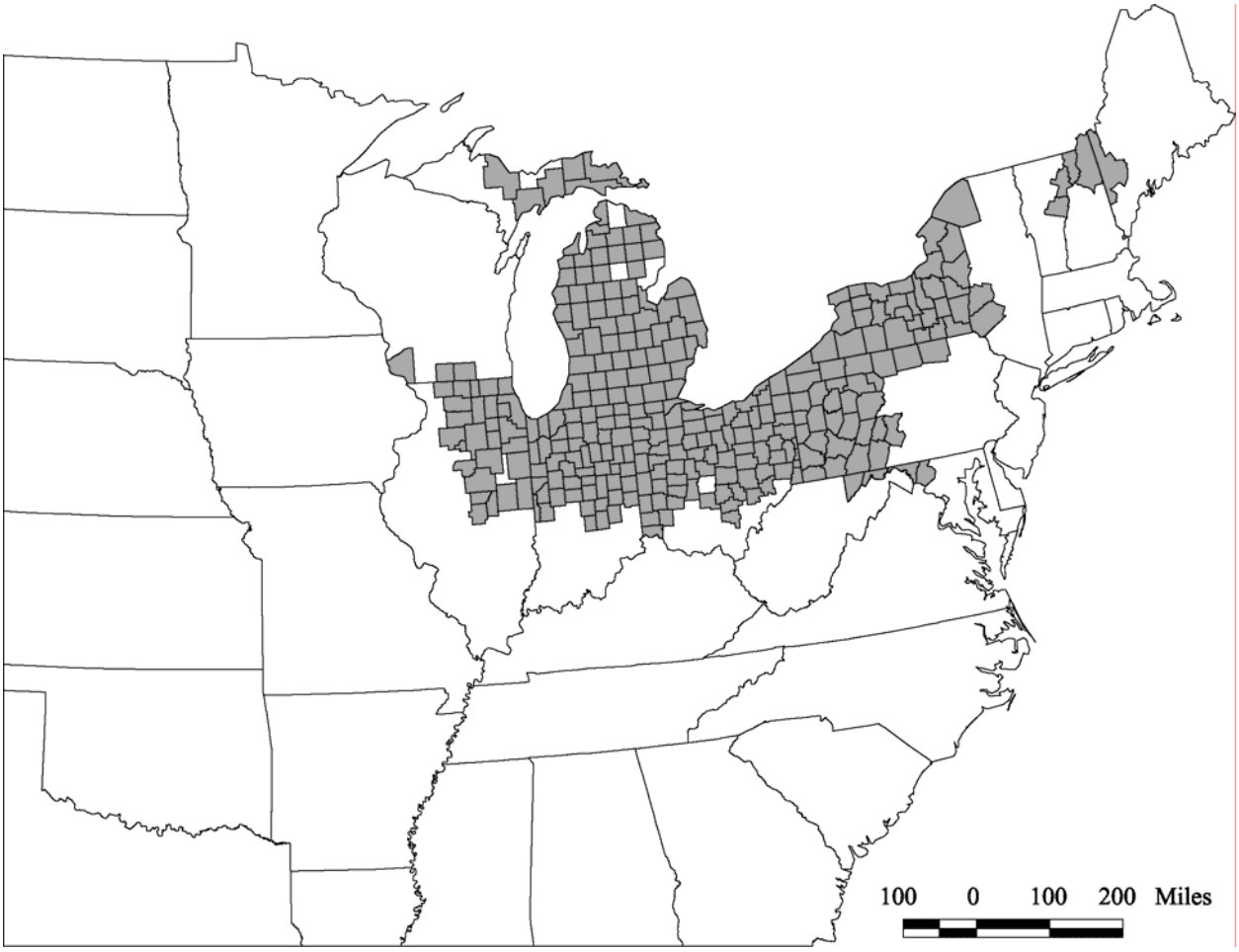
Eastern Counties Where Hemlock Woolly Adelgid Was Reported, 2000

Common European pine shoot beetle

Tomicus piniperda is an introduced insect discovered in a Christmas tree plantation near Cleveland, Ohio, in 1992. The beetle prefers Scotch pine, but feeds on other pines as well. The beetle damages weak and dying trees and feeds in the new growth (shoots) of healthy trees. Thus far, the beetle is a problem mainly to Christmas tree growers. In its native Europe and Siberia, the beetle causes serious damage to trees in burned-over areas and areas experiencing severe drought.

State and Federal quarantines have been imposed to prevent the movement of this beetle, which was found in six States in 1993. As of 2000, the beetle has been found in 11 northeastern States. No new States were added to the list in 2000, but the beetle was found in 28 new counties.

Eastern Counties Where The Common European Pine Shoot Beetle Was Reported, 2000



Spruce beetle

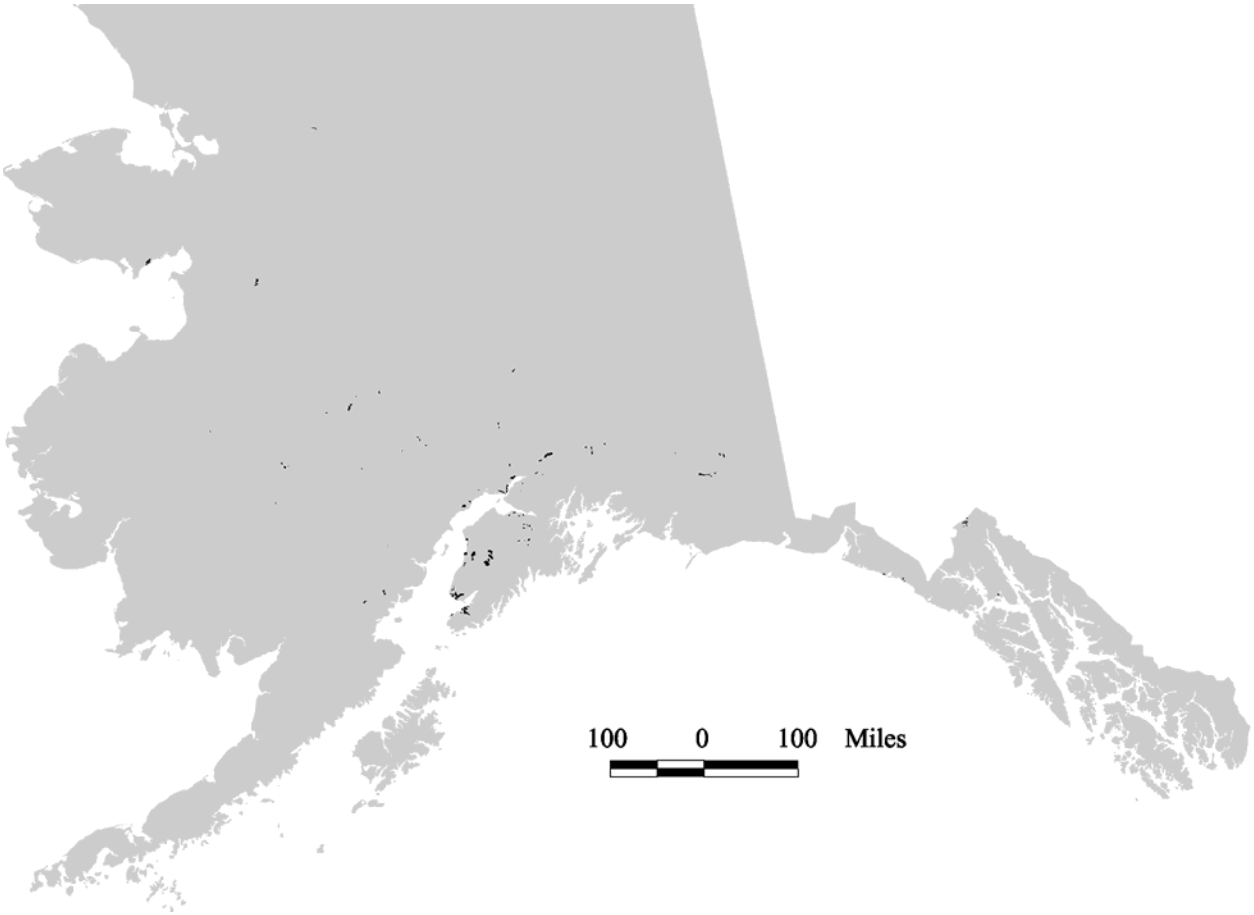
Dendroctonus rufipennis is a native insect that occurs across North America from Maine to Alaska and south in the Rocky Mountains to Arizona. Spruce beetle is the most significant mortality agent of mature spruce. Populations also build up in windthrown trees. Besides killing merchantable trees, infestations affect habitat quality for wildlife and fish, reduce scenic quality, and increase fire hazard.

The infestation in Alaska further declined in 2000 to 86,000 acres from the peak 1.13 million acres in 1996. The 2000 acreage is the lowest in the past 11 years. There are still some spots of heavy activity.

Elsewhere in the West, spruce beetle activity was generally low; however, in Colorado beetle populations are building in the extensive areas of blowdown and moving into green standing trees all along the western slope. In Utah and parts of Wyoming, populations and resulting damage are increasing dramatically.

In Maine the beetle infestation remains along the central Maine coast.

Spruce Beetle Active and Newly Infested Areas in Alaska, 2000



Disease Conditions Highlights

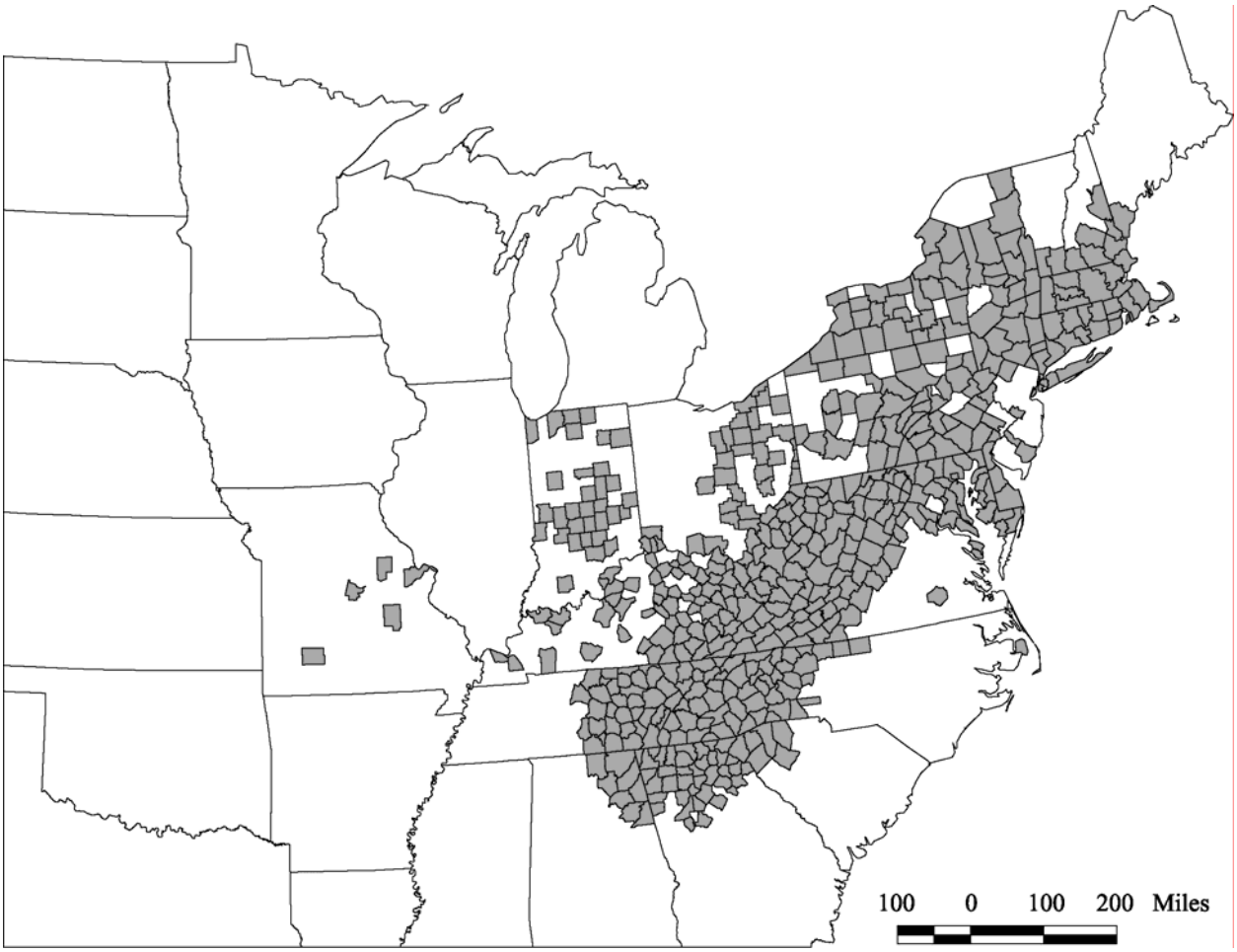
Dogwood anthracnose

Discula destructiva, the fungus that causes dogwood anthracnose, is of unknown origin. First discovered in the Pacific Northwest in 1976, the disease is confirmed in Idaho, Oregon, and Washington. Although the Pacific dogwood is more susceptible to the fungus than the eastern dogwood, drier summers in the West reduce the number of infection cycles. Significant mortality has occurred, but the problem is not as severe as it is in the East.

In the East, the fungus was first found in southeastern New York in 1978. By 1994, this disease was found in 22 States from Maine to Georgia and west to Indiana and Missouri. The range of dogwood extends from southern Maine to Florida and west to Michigan and eastern Texas.

Dogwood anthracnose continues to intensify within the infested counties in the South, and infections were found in three new counties; one each in Kentucky, North Carolina, and Virginia. In the Northeast, diseased dogwoods have been found in every county in Maryland, West Virginia, and Delaware.

Eastern Counties Where Dogwood Anthracnose Was Reported, 2000



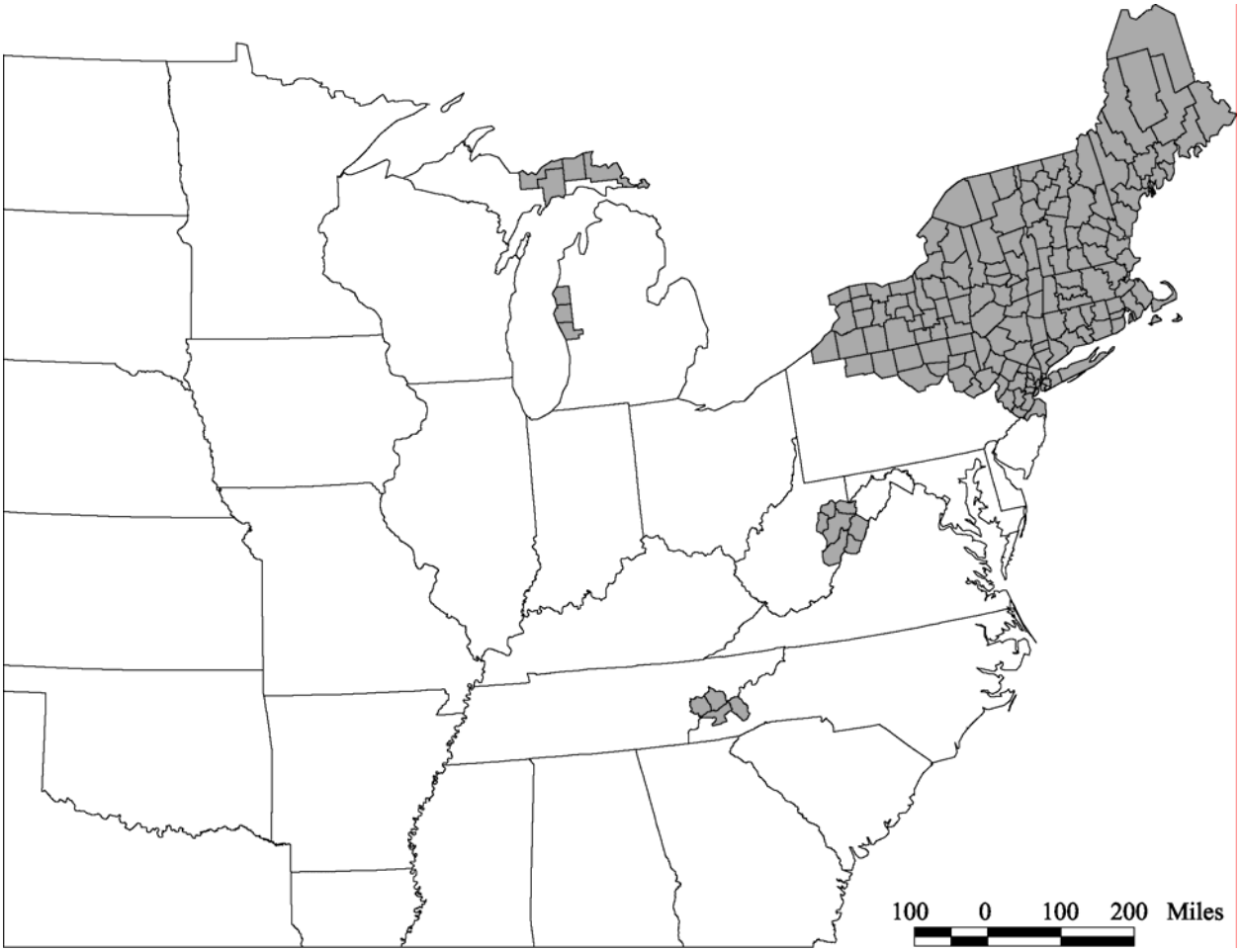
Beech bark disease

Beech disease results when bark--attacked and altered by the beech scale, *Cryptococcus fagisuga*--is invaded and killed by the fungus *Nectria coccinea* var. *faginata*. The scale, and probably the fungus, was accidently brought to Nova Scotia, Canada, about 1890. By 1932, the disease was killing trees in Maine. It continued to advance south and west into northeastern Pennsylvania.

In 1981, a large area of infested American beech was found in West Virginia well ahead of the advancing front of the disease. Beech mortality was reported in northern Virginia by the mid 1980s. In 1994, the disease was affecting approximately 100 acres in three counties on the North Carolina-Tennessee border (within the Great Smoky Mountains National Park). This infestation was about 300 miles southwest of its previously known distribution.

Tree mortality continues to intensify within the affected counties in the South, and at a greater rate than predicted. Significantly, the disease was reported during 2000 for the first time on both peninsulas of Michigan. The range of American beech is from Maine to northwest Florida, and west to eastern parts of Wisconsin and Texas.

Eastern Counties Where Beech Bark Disease Was Reported, 2000

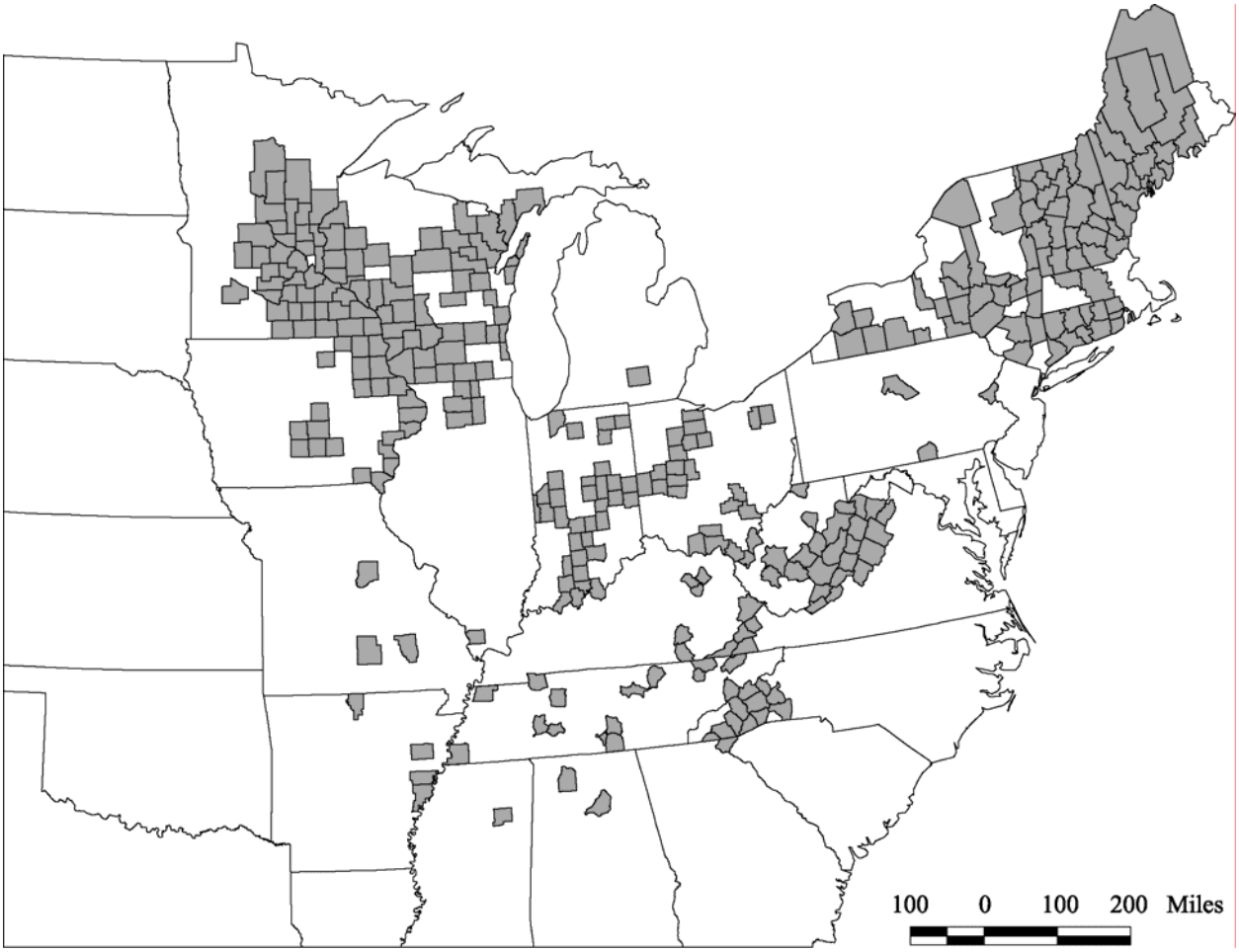


Butternut canker

Sirococcus clavigignenti-juglandacearum is the fungus that causes butternut canker; the origin is unknown. Symptoms of the disease have been recognized since the early 1900s, but the casual fungus was not identified until the late 1970s. The range of butternut is from Maine to Georgia on the east, and west to Minnesota and Arkansas. Butternut is not an abundant tree in any part of its range.

The disease is found throughout most of the range of butternut and is a serious threat to the survival of the species--killing large trees, saplings, and regeneration. It is estimated that 77 percent of the butternut trees in North Carolina and Virginia have been killed and in Connecticut, 92 percent of monitored trees are infected. Trees exhibiting resistance to the disease have been found in five States from Virginia to Arkansas. These trees are being propagated for host resistance studies. In addition, several States have implemented harvesting guidelines or moritoriums in an attempt to preserve resistant stock. There are no known control measures.

Eastern Counties Where Butternut Canker Was Reported, 2000



Fusiform rust

Cronartium quercuum f. sp. *fusiforme*, a native fungus, continues to be the most damaging disease agent of loblolly and slash pines in the South. The disease disfigures and kills trees up to pole size and results in much stem breakage. The disease is damaging in both plantations and natural stands.

An estimated 13.9 million acres of pines are affected. Acres are classified as affected if more than 10 percent of the trees have potentially lethal cankers. Georgia has the greatest amount of the disease, with 4.6 million acres (49 percent) of the host type affected. Genetic selection of resistant planting stock is leading to significant improvement in field survival and stand quality.

Acres (in thousands) Affected by Fusiform Rust, 2000*

State (survey year)	National Forest System	Other Federal	State and Private	Total
Alabama (90)	7.1	0.0	1,704.2	1,711.3
Arkansas (95)	4.9	0.0	280.5	285.4
Florida (95)	35.3	6.8	1,426.3	1,468.4
Georgia (89)	38.0	102.8	4,452.9	4,593.7
Louisiana (91)	85.0	18.4	1,554.9	1,658.3
Mississippi (94)	118.0	60.0	1,043.0	1,221.0
North Carolina (90)	4.9	7.8	956.2	968.9
Oklahoma (93)	0.0	0.0	33.9	33.9
South Carolina (95)	46.0	59.0	1,332.2	1,437.2
Texas (92)	21.8	0.0	397.3	419.1
Virginia (92)	0.0	0.0	59.3	59.3
Total	361.0	254.8	13,240.7	13,856.5

* Acres with greater than 10 percent infection.

Dwarf mistletoes

Arceuthobium spp. are parasitic plants that invade the branches and stems of host trees. These parasites are associated with much of the tree mortality in the West. Conifers on about 29.0 million acres of western forests are infested. Dwarf mistletoe infection reduces tree growth and seed crops and kills tops, branches, and entire trees. Growth loss totals about 164 million cubic feet of wood annually. Most of the volume loss is caused by 7 of the 19 dwarf mistletoe species. These species occur on Douglas-fir, lodgepole pine, true fir, western hemlock, western larch, and two species on ponderosa pine.

In the past, fire helped reduce the incidence of dwarf mistletoes. Fire exclusion has had the inadvertent effect of allowing dwarf mistletoes to increase in severity.

Acres (in thousands) in the West Affected by Dwarf Mistletoes, 2000

State (survey year)	National Forest System	Other Federal	State and Private	Total
Alaska*	3,060.0	0.0	340.0	3,400.0
Arizona (85-89)	1,040.0	674.0	25.0	1,739.0
California (80-90)	2,283.0	69.0	1,911.0	4,263.0
Colorado (96)	638.0			638.0
Idaho - North (70-80)**	478.0	10.0	224.0	712.0
Idaho - South (94)**	2,600.0			2,600.0
Montana (70-80)	1,694.0	123.0	602.0	2,419.0
New Mexico (97)	1,440.0	348.0	581.0	2,369.0
Nevada (94)	49.0			49.0
Oregon (67)	1,137.0	43.0	2,760.0	3,940.0
Utah (94)	410.0			410.0
Washington (97)	2,703.3	505.0	2,470.0	5,678.3
Wyoming (97)	560.1			560.1
Total	18,092.4	1,772.0	8,913.0	28,777.4

* Commercial acreage only in Alaska.
** Idaho-North is in Region 1, and Idaho-South is in Region 4.

Part 2 Conditions by Damage Agent by Region

Insects: Native

Baldcypress leafroller,
Archips goyerana (formerly reported as fruittree leafroller, *A. argyrospila*)

Region 8: Louisiana

Host(s): Baldcypress

In 2000, a new species was described (baldcypress leafroller, BCLR) and the common name approved for what was formerly known as the fruittree leafroller (FTLR). FTLR still exists as a species complex, but the insect that defoliates baldcypress is now considered a distinct species. In 2000, 170,000 acres of mixed baldcypress stands in southern and southeastern Louisiana were defoliated by the BCLR. Approximately 40,000 acres were severely defoliated resulting in greater than 50 percent loss of radial growth. Dieback and scattered mortality continue to plague areas in Assumption, St. James, and St. Martin Parishes. Permanently flooded areas are most severely impacted.

Balsam gall midge,
Paradiplosis tumifex

Region 9/Northeastern Area: Maine, New Hampshire, Vermont

Host(s): Balsam fir

Although balsam gall midge has little or no impact on forest trees, it caused very significant damage to the Christmas tree and wreath industries in Maine where populations of this pest remained moderate to high. High populations were scattered throughout New Hampshire. In Vermont, damage remained high in Christmas tree plantations and on wild balsam fir trees.

Black turpentine beetle,
Dendroctonus terebrans

Region 8: Regionwide

Host(s): Loblolly pine, longleaf pine, slash pine, shortleaf pine

Again in 2000, summer drought throughout the southern States resulted in higher than normal black turpentine beetle activity. This insect is most evident in trees stressed by drought, logging injury, root compaction, and similar disturbance. High activity was reported in Florida, Louisiana, North Carolina, South Carolina, Tennessee , and Texas.

Buck moth,
Hemileuca maia

Region 8: Louisiana, Virginia

Host(s): Live oak, other hardwoods

Buck moth defoliation of live oak has been a problem in New Orleans for a number of years. It continues to be locally abundant in the city and of particular concern in the Federal Historic Districts. Defoliation was widespread in 2000 and moth populations have been on the increase for the past 3 years. Pheromone trapping of adult moths is being used to identify hot spots for further evaluation. In Virginia, populations routinely fluctuate considerably, and were at locally high densities in 2000.

Douglas-fir beetle,
Dendroctonus pseudotsugae

Region 1: Idaho, Montana

Host(s): Douglas-fir

Extreme fire conditions in western Montana in 2000 prevented completion of aerial detection surveys over significant areas infested by Douglas-fir beetle (DFB) -- notably the Bitterroot National Forest. While beetle damage estimates for 2000 may be incomplete we believe that regionwide, DFB populations were reduced from 1999 when an estimated 508,000 trees had been killed on more than 187,200 acres. In 2000, the infested area had declined to just over 167,100 acres. Faded Douglas-fir, those killed in 1999 or in some cases earlier, totaling more than 400,100 trees, were still quite prevalent on the Idaho Panhandle, Clearwater, and Nez Perce National Forests in northern Idaho, and the Kootenai and Lolo National Forests in western Montana. With few exceptions, some on the Kootenai and Gallatin National Forests in Montana, areas ground surveyed revealed fewer new attacks in 2000 than in 1999. While DFB populations were declining in most areas, the fires of 2000 could reverse that trend. A vast amount of fire-weakened Douglas-fir, present on the Bitterroot, Helena, Lolo, and Kootenai National Forests, may prove to be the source of resurging DFB populations within the next 2 to 3 years.

Region 2: Colorado, Wyoming

Host(s): Douglas-fir

In Wyoming, DFB killed 25,971 trees on 7,636 acres along the North Fork and Clarks Fork of the Shoshone River in the Shoshone National Forest in 2000. Spots (50 trees or more) were observed along the side drainages of the North Fork of the Shoshone River. DFB continues to remain at endemic levels in the Bighorn National Forest in Wyoming. DFB is still making an appreciable impact on State-trust lands in Fremont County, Wyoming. State-trust and private lands near Enos Creek and South Pass lost approximately 60 Douglas-fir in 2000 to DFB. There are endemic levels of DFB on State-trust lands in the southern Bighorn Mountains and in southwest Wyoming. In Colorado, DFB killed an estimated 8,579 trees on 13,191 acres**.** The South Platte Ranger District is still the hotspot for this insect along the Front Range. Chronic infestation on State and private land continues in the Trout Creek Pass/Chubb Park area of Chaffee County. Thirty-two percent of the total DFB mortality occurred in the lower South Platte River watershed (2,794 trees on 5,078 acres). DFB also continues to kill trees that survived the 1996 Buffalo Creek fire. Recent DFB activity is evident on the Saguache Ranger District of the Rio Grande National Forest (3,632 trees on 6,738 acres), where Douglas-fir forests have been repeatedly defoliated by western spruce budworm, *Choristoneura occidentalis*, for the past 14 years.

Insects: Native

Region 3: Arizona, New Mexico

Host(s): Douglas-fir

Douglas-fir beetle-caused tree mortality in the Southwest decreased from 3,315 acres in 1999 to 1,815 in 2000. In Arizona, DFB-caused tree mortality occurred on the Apache-Sitgreaves (50 acres), Coconino (1,545 acres), Coronado (10 acres), and Kaibab (35 acres) National Forests; Fort Apache Indian Reservation (5 acres); and 5 acres on private lands. In New Mexico, DFB-related mortality was detected on the Carson (40 acres), Gila (30 acres), and Santa Fe (95 acres) National Forests.

Region 4: Idaho, Nevada, Utah, Wyoming

Host(s): Douglas-fir

Mortality remained static with 64,600 trees killed by the beetle in 2000 compared to 68,400 trees in 1999. Outbreaks were located on the Sawtooth, Boise, Salmon-Challis, Caribou, Targhee, and Payette National Forests in southern Idaho. In Utah outbreaks were located on the Manti-LaSal, Ashley, Dixie, Fishlake, Uinta, and Wasatch-Cache National Forests. Mortality on the Bridger-Teton National Forest in western Wyoming was static at 5,500 trees killed on 2,500 acres.

Region 5: California

Host(s): Douglas-fir

Douglas-fir beetle killed individual or small groups of trees in the Railroad Gulch area of Mendocino County, near Camp Creek west of Mount Shasta City, near Boulder Creek on the northern edge of the Marble Mountain Wilderness, and south of the Van Duzen River near Dinsmores.

Region 6: Oregon, Washington

Host(s): Douglas-fir

Douglas-fir beetle activity was detected on more acres, at somewhat greater intensities for the third straight year. Activity was reported on 127,970 acres with an average of 1.67 trees per acre in 2000 compared with 106,902 acres with an average of 1.41 trees per acre in 1999.

Increased levels of activity were detected on all ownerships except private lands and State lands in Oregon. The Wallow-Whitman reporting area reported twice as many acres, due in part to a more detailed survey conducted with a helicopter. Other areas reporting greater than 10,000 acres included the Rogue River and Willamette reporting areas. Continuing activity in northeastern Oregon and in other parts of the region is associated with either recent fires or with windstorm breakage or blowdown that has occurred the past couple of years. DFB populations, though widespread on the northern portion of the Wallowa-Whitman National Forest, have been largely prevented from damaging several high value old-growth and late and old structure stands on the Pine Ranger District through aggressive treatments with bark beetle pheromones. Treatment in stands will occur again in 2001. In addition, other bark beetle pheromone treatments in stands within the Galena Watershed on the Malheur National Forest the past 2 years have dramatically reduced new attacks on Engelmann spruce by spruce beetle, and on Douglas-fir by DFB. These treatments will also occur again in 2001. Predisposing tree stresses caused by repeated years of defoliation by western spruce budworm, Douglas-fir tussock moth, drought, and overstocking may result in relatively high levels of DFB activity in the next few years. Another year of slightly increased levels of DFB-caused mortality is expected for the summer of 2001.

In Washington, reported acres affected on the Okanogan reporting area increased from 1,797 acres in 1999 to 10,593 acres in 2000 and affected acres on the Colville Indian Reservation and Colville reporting area nearly doubled over 1999 levels. Increased levels reported in these areas were due in part to improved sketchmapping capabilities of a digital sketchmapping system.

Douglas-fir tussock moth,
Orgyia pseudotsugata

Region 1: Idaho, Montana

Host(s): Douglas-fir, true firs

Douglas-fir tussock moth (DFTM) populations reached outbreak proportions in parts of Idaho and Montana. Aerial surveys in Montana detected 11 acres of defoliation on the Flathead Indian Reservation. Aerial surveys in northern Idaho reported 54,753 acres defoliated near the town of Potlatch, Idaho, on the Palouse Ranger District of the Clearwater National Forest and adjacent State, private, and reservation lands. Additional defoliation is anticipated in northern Idaho in 2001, and the Idaho Department of Lands is evaluating control options on State and private lands.

Region 2: Colorado

Host(s): Douglas-fir, true firs

An unusual infestation of tussock moth in about 100 acres of white fir on the north side of Raton Mesa was discovered by logging crews who complained of itching during harvest operations. Heavy defoliation occurred during 2000. Western spruce budworm co-existed in the stand and contributed to the defoliation.

Region 4: Idaho, Nevada, Utah

Host(s): Douglas-fir, true firs

Total acreage defoliated in 2000 by DFTM in Region 4 increased slightly from 17,000 acres when the current outbreak began in 1999, to 18,620 acres in 2000. However, 9,200 acres were in the high defoliation category. Defoliation was severe on Bureau of Land Management, State of Idaho, and private Douglas-fir forests in the Owyhee Mountains of southwest Idaho. Over 500 acres were defoliated on the Fishlake National Forest in central Utah, up from 100 acres in 1999. On the Humboldt National Forest in northern Nevada, 50 acres of subalpine fir were defoliated in the Jarbidge Mountains, which coincidentally in 1927 was the first location in the United States where the insect was reported. Pheromone bait trap catches were in the high category on the Weiser and Council Ranger Districts of the Payette National Forest in central Idaho.

Region 5: California

Host(s): White fir

The outbreak of 1999 in northeastern California declined due to natural controls. Follow-up surveys of egg masses and larvae, along with lack of defoliation, confirmed that the population had collapsed. No activity was observed or reported elsewhere in the State.

Region 6: Oregon, Washington

Host(s): Douglas fir, true firs

Since 1995 the DFTM early warning system has indicated a trend for increasing populations. This prompted a large-scale sampling effort in critical resource areas during 1999 and 2000, which helped identify the areas on the Umatilla and Wallowa-Whitman National Forests where populations were highest or would be in outbreak in 2000. Portions of over 250,000 acres of high value areas with critical resource concern were sampled for tussock moth populations in 2000. In addition, suppression treatment of tussock moth populations with the viral insecticide, TM BioControl-1, occurred on over 39,000 acres of critical resource areas of concern on the Wallowa-Whitman and Umatilla National Forests in June and July of

2000. Treatments effectively reduced tussock moth populations on areas treated. While damage from these outbreaks usually cannot be avoided entirely even with treatment, it can be limited to some extent by prompt action.

Other forests with plots indicating sub-outbreak or outbreak populations include the Malheur, Ochoco, Okanogan, and Wenatchee National Forests. Larval sampling for DFTM was carried out extensively on the Ochoco and Winema National Forests in order to determine if suppression would be necessary in 2001. On the Winema National Forest, larval populations were low. On the Ochoco National Forest, however, larval numbers were considerably higher, prompting an autumn cocoon survey in areas indicating sub-outbreak populations. Results from the cocoon survey predict no tussock moth populations above the sub-outbreak level in 2001 on the Ochoco National Forest. Although no tussock moth defoliation was noted in 2000, larval sampling will once again be conducted in critical areas on the Ochoco National Forest in the spring of 2001. Autumn cocoon surveys verified populations on the Okanogan National Forest, which indicate the need for further evaluation to determine the need for suppression in 2001.

During the 2000 aerial detection survey, approximately 219,774 acres of visible defoliation were mapped, compared with 21,180 acres mapped in 1999. Mapped intensities varied from 193,703 acres in the light category to 24,473 acres in moderate and only 1,598 acres in the heavy category. The defoliation occurred in the Blue Mountains with the vast majority mapped on Federal lands within the Umatilla and Wallowa-Whitman reporting areas. Approximately 4,400 acres, however, were mapped on private lands in Oregon. In spite of ground observations of considerable defoliation, the aerial survey mapped very few acres of defoliation on the Okanogan National Forest.

Eastern tent caterpillar,
Malacosoma americanum

Region 9/Northeastern Area: Indiana, Maine, New Jersey, Ohio, Pennsylvania, Vermont, West Virginia

Host(s): Black cherry, maple, beech, birch, crab apple

For the first time since forest pest conditions have been recorded in Indiana, an outbreak of eastern tent caterpillars completely defoliated most black cherry trees regardless of their size in the south-central part of that State. The defoliation was not limited solely to trees along roads and fencerows, but extended into yards around homes and forest trees as well. Because black cherry in this part of Indiana is a small component of the forest, no acreage estimate was made about the extent of this outbreak. This defoliator damaged cherry and crab apple trees in nurseries in Hunterdon County, New Jersey. In Ohio, cherry trees were completely defoliated in portions of Adams, Athens, Brown, Fairfield, Meigs, Perry, Pike, Scioto, and Vinton Counties. Maple, beech, and birch trees on 2,500 acres in Bedford and Blair Counties, Pennsylvania, had damaged foliage or shoots. Light to moderate defoliation was observed over most of West Virginia with heavy populations reported in Putnam, Kanawha, Lincoln, and Boone Counties. Population densities rose in Maine in 2000, but defoliation was light overall. In Vermont, light defoliation was common.

Fall cankerworm,
Alsophila pometaria

Region 8: North Carolina, Virginia

Host(s): Various oak species

In both Virginia and North Carolina, local outbreaks declined. In recent years, the City of Charlotte, North Carolina, sustained heavy defoliation requiring direct control, but this year, population levels were very low, and no control was deemed necessary. Fall cankerworm populations declined to the lowest recorded levels in a decade in northeast Tennessee in 2000.

Region 9/Northeastern Area: Maine, Maryland, Massachusetts

Host(s): Maples, oaks, other hardwoods

Light to moderate defoliation of maples, singly and in groups, occurred in the Maryland suburbs of Washington, DC. The communities of Cheverly, College Park, and Accokeek had nuisance levels of caterpillars in the spring accompanied by spotty defoliation. In Maine, populations collapsed to endemic levels in 2000. Noticeable defoliation occurred in Plymouth and Norfolk Counties, Massachusetts.

Fall webworm,
Hyphantria cunea

Region 5: California

Host(s): Pacific madrone

The fall webworm defoliated madrones of all sizes in the Coast Range from Clear Lake to the Oregon border. Defoliation and web making were intensive enough in the Trinity and Klamath River drainages to be picked up by aerial survey. Other hosts defoliated in some areas were alder, Oregon ash, black walnut, and apple.

Region 9/Northeastern Area: Maine, Maryland, New Hampshire, Pennsylvania, Vermont

Host(s): Apple, ash, beech, birch, black cherry, cherry, elm, other hardwoods

Fall webworm caterpillars were much less numerous than in previous years in the central and western parts of Maryland. This defoliator damaged maple, beech, and birch trees on approximately 30,000 acres in Lycoming, Potter, and Tioga Counties, Pennsylvania. Populations and damage in Maine were extremely high, especially in the southwestern counties (Cumberland, York, Oxford) where more than 10,000 acres were affected. Many trees were totally stripped and webbed by mid-August and populations caused spotty defoliation elsewhere in Maine. Populations were low throughout New Hampshire. Populations continue to be high throughout Vermont.

Fir engraver beetle,
Scolytus ventralis
Dryocoetes confusus

Region 1: Idaho, Montana

Host(s): Grand fir

Fir engraver-caused mortality in grand fir stands continued at low, nearly endemic levels, in northern Idaho and western Montana in 2000. In 1999, an estimated 10,500 trees had been killed on 9,400 acres -- most on the Idaho Panhandle National Forest and to a lesser extent on the Nez Perce National Forest. In 2000, those figures were 3,000 beetle-killed trees on about 2,500 acres, most of which were recorded on the Clearwater National Forest. Only minor amounts were observed on other forests in northern Idaho and western Montana.

Insects: Native

Region 3: Arizona, New Mexico

Host(s): White fir, subalpine fir

Fir engraver beetle activity increased regionwide from 3,770 acres in 1999 to 6,150 acres in 2000. Tree mortality on Federal lands in Arizona was detected on the Apache-Sitgreaves (1,160 acres), Coconino (2,840acres), Coronado (70 acres), and Tonto (45 acres) National Forests. In New Mexico, fir engraver beetle-related mortality occurred on the Carson (85 acres), Gila (1,020 acres), Lincoln (45 acres), and Santa Fe (670 acres) National Forests; Jicarilla Apache Tribal Lands (10 acres); and 205 acres on State and private lands.

Region 4: California, Idaho, Nevada, Utah

Host(s): Grand fir, red fir, subalpine fir, white fir

Only 2,200 dead trees were observed during aerial surveys in 2000, compared to 26,000 dead trees reported in 1999. Most of this mortality occurred on the Humboldt National Forest in Nevada. Mortality was particularly heavy on the Ely Ranger District. Mortality remained low in Utah with 550 trees killed on the Dixie and Fishlake National Forests. No significant mortality was observed in southern Idaho.

Region 5: California

Host(s): White fir, red fir

True fir mortality related to fir engraver attackes continued to decline throughout northeastern California -- only a few isolated pockets of mortality were detected. Background rates of mortality occurred elsewhere throughout the range of the true firs of California.

Region 6: Oregon, Washington

Host(s): True firs

Fir engraver activity decreased from 34,791 acres (2.45 trees per acre) mapped in 1999, to 6,215 acres (0.79 tree per acre) in 2000. The majority of mortality occurred on Federal ownerships. Approximately 800 acres were mapped on private lands, most of which occurred in Washington State. Highest levels were reported on the Umatilla and Wenatchee National Forests. The most dramatic decrease was reported on the Fremont reporting area (from 11,372 acres to just 19 acres). Increased levels of activity may be expected in areas experiencing defoliation by Douglas-fir tussock moth and western spruce budworm.

Forest tent caterpillar, *Malacosoma disstria*

Region 8: Louisiana, North Carolina, South Carolina, Texas

Host(s): Tupelo gum, upland hardwoods

Defoliation occurred on 46,000 acres of forested wetlands in Ascension, Livingston, St. James and St. John Parishes in southeastern Louisiana. Defoliation was severe on 32,000 acres resulting in growth reduction of approximately 50 percent of radial growth. In South Carolina, 257,610 acres were defoliated. Damage was worst in the Conagree, Santee, Pee Dee, and Wacamaw river basins. Sixty-thousand acres were completely defoliated along the Roanoke River in North Carolina. In Texas, local infestations of the forest tent caterpillar occurred but no serious outbreaks were observed.

Region 9/Northeastern Area: Maine, Minnesota, Michigan, New Hampshire, Vermont, Wisconsin

Host(s): Aspen, basswood, pin oak, sweetgum, other hardwoods

Defoliation occurred in Minnesota over more than 2,000,000 acres, up from nearly 500,000 acres in 1999. The outbreak in the Upper Peninsula of Michigan defoliated over 700,000 acres, up from 163,000 acres in 1999. Wisconsin sustained over 100,000 acres of defoliation, up from 47,000 acres in 1999. In Maine, New Hampshire, and Vermont, the endemic populations in 2000 caused no visible defoliation.

Fruittree leafroller,
Archips argyrospilus

Region 5: California

Host(s): California black oak

The fruittree leafroller continued to defoliate California black oak in the San Bernardino Mountains. It is anticipated that oak mortality will occur as a result of 2 years of defoliation, drought, and to a lesser extent, high levels of mistletoe (*Phoradendron villosum*) infection on certain trees. The fruittree leafroller population in the San Bernardino Mountains may have equaled or exceeded the large outbreak of 1951-1953.

Hemlock looper (fall flying),
Lambdina fiscellaria

Region 9/Northeastern Area: Maine, Massachusetts, New Hampshire, New York, Vermont

Host(s): Eastern hemlock, balsam fir, white spruce

For the first time in Maine since the last hemlock looper outbreak (1989-1993), a small area of looper defoliation was found in the Town of York (York County). About 100 acres of mature hemlock received moderate defoliation in this area. Many reports that looper moths were flying in large numbers were noted in forested areas of east coastal, central, and northern Maine. In Massachusetts, abundant moth flights were observed, but no defoliation was found. In New Hampshire, moths were abundant in hemlock stands throughout the State, but very light defoliation was seen only in Cheshire County. In New York, large numbers of moths were observed in Rensselaer County without causing significant defoliation. Neither damage nor significant larval populations occurred in Vermont, but moths were commonly observed.

Jack pine budworm,
Choristoneura pinus

Region 9/Northeastern Area: Michigan

Host(s): Jack pine

In Michigan, over 18,000 acres were defoliated compared with 10,500 acres in 1999.

Insects: Native

Jeffrey pine beetle,
Dendroctonus jeffreyi

Region 4: California, Nevada

Host(s): Jeffrey pine

Jeffrey pine beetle activity dropped on the Toiyabe National Forest and Lake Tahoe Basin Management Area with only 105 trees killed in 2000 compared to 700 trees reported killed by the bark beetle in 1999.

Region 5: California

Host(s): Jeffrey pine

Jeffrey pine beetle activity continued to decline throughout northeastern California. Elsewhere, low rates of Jeffrey pine mortality continued in the southern Sierra Nevada Mountains while in southern California, mortality caused by this beetle appeared to be higher in 2000 than in 1999.

Jumping oak gall wasp,
Neuroterus saltatorius

Region 9/Northeastern Area: Indiana, Missouri

Host(s): Bur oak, white oak

Brown leaves with many wasp galls were visible on heavily infested trees in eastern Missouri for the third consecutive year. By mid- to late summer of 2000, this foliar damage and associated leaf drop were evident over 592,440 acres in Lincoln, Pike, St. Charles, and Warren Counties, Missouri, immediately northwest of St. Louis. This infestation has shifted from the much larger area to the south of St. Louis, which was affected in 1999. By contrast, the 1 million acres similarly affected by this insect in the southcentral part of Indiana during 1999 disappeared after the first year to the point where foliar damage was reported on only a single white oak tree in 2000.

Large aspen tortrix,
Choristoneura conflictana

Region 9/Northeastern Area: Maine, Michigan, Minnesota, Pennsylvania, Vermont

Host(s): Bigtooth aspen

In Pennsylvania, bigtooth aspen trees on 100 acres had damaged foliage or shoots. The large aspen tortrix defoliated only 2,579 acres across Michigan in 2000, down from nearly 400,000 acres in 1999. The 63,942 acres of defoliation reported in Minnesota was down from 336,170 acres in 1999. Scattered and very light defoliation was observed across northern Maine and Vermont.

Locust leafminer,
Odontota dorsalis

Region 9/Northeastern Area: Maine, New Hampshire, Ohio, Pennsylvania, Vermont, West Virginia
Host(s): Black locust

Locust leafminer severely damaged host trees in portions of Ohio during the late summer. Statewide in Pennsylvania, noticeable defoliation occurred on approximately 1,000,000 acres. In most of the Eastern Panhandle counties of West Virginia, the first generation of this defoliator during June caused moderate to heavy defoliation, but the second generation during August added only minimal defoliation. Locust leafminer defoliation was moderate to extreme throughout the range of black locust in Maine, but only light in the central part of New Hampshire. In scattered southeastern Vermont locations, black locust trees with a history of defoliation, died after being defoliated again this year.

Lodgepole pine needleminer,
Coleotechnites milleri

Region 5: California
Host(s): Lodgepole pine

Populations of lodgepole needleminer started to increase in several areas of Yosemite National Park in 1993-1994 and this expansion continued in 2000. Large population increases in sample plots suggest there will be visible defoliation along Highway 120 and along all the major trails leading south, west, and north from Tuolumne Meadows. Increasing tree mortality is expected in areas that have been defoliated over the past several years.

Maple leafcutter,
Paraclemensia acerifoliella

Region 9/Northeastern Area: Maine, New Hampshire, Vermont
Host(s): Sugar maple

In Maine, populations of this moth and its damage remained light and diffused again in 2000 within roughly the same area infested in 1999. In New Hampshire, approximately 2,300 acres of moderate to heavy defoliation occurred in Grafton and Sullivan Counties. Populations of this moth increased substantially in Vermont causing heavy late-season defoliation statewide.

Maple trumpet skeletonizer,
Epinotia aceriella

Region 9/Northeastern Area: Maine, New Hampshire, Vermont
Host(s): Sugar maple

Damage was locally moderate in Maine, and moderate to heavy in Cheshire, Sullivan, Grafton and Coos Counties, New Hampshire. The similar abundant larval populations of this moth over the last 2 years in Vermont occasionally have caused heavy damage to sugar maple stands.

Mountain pine beetle,
Dendroctonus ponderosae

Region 1: Idaho, Montana

Host(s): Lodgepole pine, ponderosa pine, other pines

Mountain pine beetle (MPB) populations once again increased significantly in 2000. In 1999, nearly 144,000 acres were infested (up from 115,000 acres infested in 1998), on which an estimated 640,000 trees were killed. In 2000, more than 708,600 trees were killed on approximately 149,200 acres--including all host species, found on lands of all ownerships. More than 94 percent of those beetle-killed trees were lodgepole pine. The most expansive outbreak in the region is on the Nez Perce National Forest in north-central Idaho, where slightly more than 76,000 acres were affected, most in lodgepole pine stands. In 1999, an average of five trees per acre were killed and mapped as faders in 2000 (more than 381,000 trees). The next most seriously affected stands were on the Lolo National Forest in western Montana, where nearly 30,000 acres were infested. There, infestations in lodgepole pine stands are more intense, with an average of eight trees per acre being killed (more than 218,000 trees). Both outbreaks appeared to be intensifying. Significant outbreaks continued on the Idaho Panhandle National Forest (28,500 acres), Flathead National Forest (5,500 acres), Clearwater National Forest (2,500 acres), and Flathead Indian Reservation (4,000 acres). Overall, populations are still active in lodgepole pine stands in several areas and are likely to increase on the Lolo and Flathead National Forests in Montana, and parts of the Idaho Panhandle and Nez Perce National Forests in northern Idaho. Significant amounts of whitebark pine mortality, caused by MPB, were recorded on the Idaho Panhandle National Forest, not far south of the U.S./Canada border. Beetle-caused mortality in ponderosa pine stands, regionwide, is not extreme; but is of concern in some areas on the Bitterroot, Lolo, and Lewis & Clark National Forests; and the Flathead, Rocky Boys, Fort Belknap, and Crow Indian Reservations, in Montana.

Region 2: Colorado, South Dakota, Wyoming

Host(s): Ponderosa pine, lodgepole pine, limber pine

In Colorado, over 273,405 trees on 139,330 acres were killed by MPB in 2000. The single largest area of mortality is located in ponderosa pine in the upper Arkansas Valley, between Salida and Buena Vista along the eastern foothills of the Sawatch Range. Also in the Arkansas Valley, lodgepole pines are being infested in the Twin Lakes and Fooses Creek areas. Chaffee, Grand, Eagle, Saguache, and Jackson Counties as well as the Front Range have the highest MPB attributed mortality in Colorado. Near Pinyon Mesa, west of Grand Junction, direct control efforts appear to be significantly decreasing a localized infestation consisting of a few hundred trees. The MPB population in the Black Hills of South Dakota is expanding rapidly and moving distances of at least ¼ mile to infest new locations. Tree mortality caused by MPB has risen dramatically over the last 4 years from 5,219 trees killed in 1997 to 36,202 trees killed in 2000. This increasing trend is expected to continue into 2001. The majority of the infestation is confined to national forest lands, but greater impacts to private and State lands are anticipated in 2001. The Sturgis watershed area is hard hit with the beetle and water quality could be threatened. Wyoming State Forestry conducted aerial surveys of Casper Mountain (Natrona County) in October and recorded approximately 147 ponderosa pines killed by mountain pine beetle on private and county property. Teton County, particularly the Jackson area, currently has endemic levels of MPB. Mountain pine beetle is causing considerable damage in ponderosa pine in the lower foothills starting from Kaycee in Johnson County and proceeding north to Dayton/Ranchester areas in Sheridan County. State and private property mortality totals in the Black Hills in Wyoming included 1,286 ponderosa pines killed on 1,298 acres. The eastern edge of the Bighorn National Forest recorded relatively high levels of MPB. In 2000, there were 8,700 trees killed by MPB. Approximately 6,970 limber pine over 3,951 acres were killed in 2000. Some of these limber pine were thought to be affected by white pine blister rust and impacted by limber pine decline.

Region 3: Arizona, New Mexico

Host(s): Ponderosa pine

Mountain pine beetle-caused tree mortality increased from 195 acres in 1999 to 810 acres in 2000. All of the tree mortality in 2000 was recorded in New Mexico on the Carson (585 acres) and Santa Fe (195 acres) National Forests; Taos Pueblo Tribal Lands (20 acres); and 10 acres of State and private lands.

Region 4: California, Colorado, Idaho, Nevada, Utah, Wyoming

Host(s): Limber pine, lodgepole pine, Jeffrey pine, ponderosa pine, western white pine, whitebark pine

Mountain pine beetle-caused mortality increased regionwide, from 11,000 trees in 1998 to 23,700 trees in 1999, to 43,000 trees in 2000. The largest outbreaks in the region were located in lodgepole pine stands on the Sawtooth National Recreation Area and Salmon-Challis National Forests in central Idaho with a combined total of 20,000 trees killed. Impact was most severe to the recreation and fisheries resources. Trees along the Salmon River and Redfish Lake provide shade and scenic beauty for recreationists as well as shade to moderate temperatures for spawning endangered salmon species. On the Toiyabe National Forest in western Nevada and eastern California, 2,300 trees were killed, mostly in overstocked, high-elevation whitebark or western white pine stands. In Utah, MPB-caused mortality decreased in ponderosa pine on the Dixie National Forest but increased in lodgepole pine stands on the Wasatch-Cache and Ashley National Forests. On the Bridger-Teton National Forest in western Wyoming 1,600 lodgepole pines were killed.

Mortality of whitebark and limber pines attributed to MPB attacks continued in 2000 with 10,300 trees killed, down from 12,100 trees killed in 1999. Most of this mortality was in high elevation whitebark pine stands in southern Idaho where the rare pine stands are declining mostly because of: white pine blister rust infections; interruption of normal fire cycles; invasion of shade-tolerant species and consequent overstocking; overmaturation of stands; and the mountain pine beetle. These high elevation ecosystems are highly valued and important for watershed stability, recreation, and wildlife purposes. The heavy whitebark pine seeds are also an important food source for numerous birds and small mammals, as well as food for the threatened and endangered grizzly bear.

Region 5: California

Host(s): Limber pine, lodgepole pine, ponderosa pine, sugar pine, western white pine, whitebark pine

Large individual sugar pines continue to die in northern California. Besides the beetle, probably the largest factor involved is the encroachment of understory trees and brush. Fire-related injures also contributed in some situations. Scattered lodgepole pine mortality attributed to MPB and host age and size was detected in the Thousand Lakes Wilderness, Lassen National Forest. Limited chronic areas of lodgepole pine mortality remained on the Truckee and Sierraville Ranger Districts, Tahoe National Forest, and in the Lake Tahoe Basin. Mortality associated with the MPB remained low throughout the Sierra Nevada south of Lake Tahoe. In southern California, MPB caused higher ponderosa and sugar pine mortality in some areas than in 1999.

Region 6: Oregon, Washington

Host(s): : Jeffrey pine, lodgepole pine, ponderosa pine, sugar pine, western white pine, whitebark pine

Combined activity in all host types decreased slightly from 111,148 acres with an average of 3.63 trees per acre in 1999 to 106,447 acres affected with an average of 2.88 trees per acre in 2000. Significant decreases in western white pine and ponderosa pine types were offset by slight increases in whitebark pine, sugar pine, and lodgepole pine types.

Acres affected in the whitebark pine type increased slightly from 3,036 acres in 1999 to 3,607 acres in 2000. Approximately a third of the affected acres were mapped in the Eagle Cap Wilderness of the

Wallowa-Whitman National Forest. In this instance, ground checks indicated that white pine blister rust was responsible for the majority of the mortality. Another third of the acres were mapped on Forest Service lands on the Okanogan National Forest, approximately evenly split between general forest lands and designated wilderness areas. Additionally, the trend in 2000 indicated an increase in affected acres mapped on private and State lands in Washington.

Acres mapped in the ponderosa type decreased on all ownerships from 17,641 acres in 1999 (1.11 trees per acre) to 6,847 acres (1.0 tree per acre) in 2000. The most heavily affected areas in the ponderosa pine type shifted from private lands to Forest Service lands within the Malheur, Umatilla, and Okanogan reporting areas. The most significant decrease in acres affected in the ponderosa pine host type occurred on private lands in central Oregon and northeast Washington.

Activity in sugar pine increased from 1,248 acres in 1999 to 1,714 acres in 2000, but at the same intensity (0.18 tree per acre). The majority of reported mortality occurred on Forest Service lands on the Rogue River and Siskiyou National Forests where MPB continues to kill significant numbers of large, old sugar pines in overstocked mixed conifer stands.

Activity in western white pine decreased across all ownerships from 4,597 acres (0.64 tree per acre) in 1999 to 1,122 acres (1.15 trees per acre) in 2000. Most significant decreases were reported on Idaho Panhandle National Forest lands within the State of Washington.

Activity in lodgepole pine increased in reported acreage from 84,588 in 1999 to 93,145 in 2000, but at lower reported intensities (4.47 trees per acre in 1999 to 3.17 trees per acre in 2000). A reported decrease in acres affected occurred on the Deschutes National Forest (18,915 in 1999 to 7,478 in 2000) . The infestation occurs primarily along the Cascades Lakes Highway between Elk Lake and Lava Lake. An increase in acres affected on the Fremont National Forest (214 in 1999 to 15,061 in 2000) was reported. Tree mortality was heavy on Winter Rim on the Paisley Ranger District. Additionally, private lands within the Fremont reporting area went from 722 acres in 1999 to over 8,400 acres in 2000. Reported high levels of mortality continued on the Okanogan National Forest with over 48,000 acres averaging 3.94 trees per acre killed. Dense stand conditions continue to predispose areas to mountain pine beetle infestations.

Nantucket pine tip moth,
Rhyacionia frustrana

Region 8: Regionwide

Host(s): Loblolly pine, shortleaf pine

Tip moth problems were most pronounced in Virginia and North Carolina. North Carolina infestations were worsened by unusually dry weather. In Virginia, the tip moth seems to have evolved into a persistent problem in the Coastal Plain and Piedmont. South Carolina populations declined slightly from 1999. Tip moth populations increased in southwest Tennessee and on the Cumberland Plateau on planted loblolly pine in 2000. Some plantations showed over 50-percent infestation. In Texas, tip moth infestations remained high but static (about 75 percent tips infested). Infestations increased markedly in July-September after the drought took hold.

Oak leaftier,
Croesia semipurpurana

Region 9/Northeastern Area: Maine, Pennsylvania, West Virginia

Host(s): Black oak, northern red oak, scarlet oak

Defoliation by oak leaftier in association with the oak skeletonizer, *Bucculatrix ainsliella*, was fairly widespread across southern Maine in 2000 compared to the light and spotty defoliation in 1999. Surveys revealed 766 acres of defoliation and 53 acres of tree mortality to red oaks in Tioga County, Pennsylvania. In West Virginia, egg surveys were conducted during January and February in Barbour, Pendleton, Pocahontas, Randolph, and Tucker Counties, but the few eggs found resulted in the light and spotty defoliation only in Randolph, Pocahontas, and Pendleton Counties.

Orange-striped oakworm,
Anisota senatoria

Region 9/Northeastern Area: New Jersey, Pennsylvania

Host(s): Black oak, red oak

Oak trees over thousands of acres in coastal New Jersey were heavily defoliated in residential areas of Ocean and Atlantic Counties. Ground surveys revealed moderate to heavy defoliation to tree species in the red oak group on 123,900 acres in Adams, Bedford, Blair, Cumberland, Dauphin, Franklin, Fulton, Huntingdon, Juniata, and Mifflin Counties, Pennsylvania.

Oystershell scale,
Lepidosaphes ulmi

Region 9/Northeastern Area: Maine, Vermont

Host(s): Beech

In Maine, populations of oystershell scale remained moderate to high on American beech in central and eastern Maine. High populations and resulting branch mortality were noted in the Brownville and Millinocket areas of Maine. Populations in a monitoring plot in Vermont jumped to the highest levels recorded since 1995.

Pine colaspis beetle,
Colaspis pini

Region 8: Regionwide

Host(s): Southern pines

Colaspis beetle damage was reported on 9,000 acres in Carroll and Hemphill Counties in Mississippi in 2000. This beetle also caused significant, but localized defoliation to pine plantations in central Louisiana. In Texas, an area of about 3,800 acres in Hardin and Jefferson Counties was defoliated.

Pine engraver beetles, *Ips* spp.

Region 1: Idaho, Montana

Host(s): Ponderosa, lodgepole, other pines

Most pine engraver beetle activity in the region in 2000 was recorded in ponderosa pine stands on the Idaho Panhandle National Forest in northern Idaho. Total mortality in 1999 was estimated at just over 3,000 ponderosa pines killed on nearly 1,200 acres; and 6,200 lodgepole pines on 1,400 acres. Although estimated mortality decreased in 2000 (trees killed in 1999), there is a possibility of increasing mortality in 2001 because of unusually warm and dry weather during summer 2000, and the number of fire-affected ponderosa pine stands, especially in western Montana. For 2000, beetle-caused mortality was estimated at 600 ponderosa pines on approximately 200 acres, most on the Idaho Panhandle and Nez Perce National Forests. Approximately 40 lodgepole pines on about 20 acres were killed in the Beaverhead National Forest in southwestern Montana.

Region 2: Wyoming

Host(s): Ponderosa pine

Ips bark beetle is severely impacting smaller-sized ponderosa pines on State-trust sections in northeast Wyoming. Large patches of beetle-killed trees are also being observed on private property in this area.

Region 3: Arizona, New Mexico

Host(s): Ponderosa pine, piñon pine

Ponderosa pine mortality caused by *Ips* increased significantly from 2,520 acres in 1999 to 11,965 acres in 2000. In Arizona, *Ips*-caused tree mortality was detected on the Apache-Sitgreaves (475 acres), Coconino (15 acres), Coronado (2115 acres), Kaibab (10 acres), Prescott (145 acres), and Tonto (725 acres) National Forests; Saguaro National Monument (285 acres); Fort Apache (120 acres), Haulapai (5 acres), Navajo (35 acres), and San Carlos (210 acres) Indian Reservations; and 20 acres on State and private lands. These figures may be artificially low for Arizona due to late season fading, after most of the aerial detection surveys were completed. In New Mexico, *Ips* beetles killed trees on 6,360 acres of the Gila National Forest, 340 acres of the Jicarilla Apache Tribal Lands, and 1,105 acres of State and private lands.

Region 4: Idaho, Nevada, Utah

Host(s): Lodgepole pine, ponderosa pine

Mortality due to pine engraver beetles remained low throughout the region. Only 700 trees were killed by the beetles in 2000, mostly on the Boise National Forest in southern Idaho. Activity is often associated with western pine beetle during prolonged droughts.

Region 5: California

Host(s): Coulter pine, knobcone pine, lodgepole pine, pinyon pine, ponderosa pine

Most of the activity from pine engravers was observed in southern California. Mortality was high in overstocked, off-site, and/or exotic plantations. In northern California, pine engravers were recovered from dead and dying shore, Bishop, and Monterey pines in coastal areas.

Region 6: Oregon, Washington

Host(s): Ponderosa pine

Pine engraver activity decreased considerably from 3,037 acres with 8,802 trees killed in 1999 to 247 acres with 255 trees killed in 2000. Practically all reported mortality was on the Okanogan National Forest.

Region 8: Regionwide

Host(s): Loblolly pine, shortleaf pine, slash pine

Drought conditions during the growing season across much of the South led to another year of higher-than-normal levels of *Ips* pine engraver beetle activity. Small groups of *Ips*-killed trees were scattered throughout the forest stands; consequently, losses are difficult to quantify. In the Gulf Coastal States, activity increased into late summer and early fall. In Arkansas, *Ips* mortality was heavy, and scattered as usual, except in Conservation Reserve Program plantations in the Delta where fairly large groups of trees were killed. Many urban pines were also killed. Louisiana surveys in 2000 found 75 multiple-tree infestations. In addition, thousands of small spots and single trees were scattered statewide. Engraver damage was judged to be comparable to southern pine beetle damage in most years. Mississippi reported a great deal of damage in younger plantations, especially into the fall. *Ips* activity was high for a second straight year in Texas in 2000, particularly on the western edge of the piney woods region. A survey of 2 million acres in four counties estimated over $1.8 million in timber loss, mostly in sawtimber stands. In the Carolinas and Florida, drought predisposed trees to unusually heavy pine engraver losses. In South Carolina, *Ips* spots sometimes numbered 500 trees. Infestations were often located in overstocked, over-mature trees. In South Carolina *Ips*, black turpentine beetle, and southern pine beetle infestations were frequently found together. Florida *Ips* losses were exceptionally high compared to the norm. Here too, damage was typically associated with trees being stressed by a variety of factors ranging from overstocking to over maturity to root compaction.

Pine needleminer,
Exoteleia pinifoliella

Region 9/Northeastern Area: Pennsylvania

Host(s): Pines

In Pennsylvania, aerial surveys found 4,463 acres of noticeable pine defoliation caused by pine needleminer in Carbon and Lycoming Counties.

Pine reproduction weevil,
Cylindrocopturus eatoni

Region 5: California

Host(s): Ponderosa pine

Mortality caused by the pine reproduction weevil declined significantly in pine plantations on the Groveland District, Stanislaus National Forest, and the Marposa District, Sierra National Forest.

Pine sawflies,
Neodiprion spp.
Diprion spp.

Region 8: Arkansas, Florida, Louisiana, North Carolina, Texas, Virginia

Host(s): Southern pines

Several species of the pine sawfly were active across the South in 2000. Defoliation by the loblolly pine sawfly (*Neodiprion taedae linearis)* occurred in two areas in Arkansas, although it was light. In Louisiana, the loblolly pine sawfly outbreak in the north-central part of the State dramatically subsided. Populations of the loblolly pine sawfly declined in west and middle Tennessee. In Virginia, the loblolly pine sawfly was evident at various locations throughout the central Coastal Plain and Piedmont. Infestations of the blackheaded pine sawfly (*N. excitans*) declined to low levels in east Texas counties. In Florida, the redheaded pine sawfly (*N. lecontei*) caused severe (greater than 75 percent) defoliation in relatively small, but numerous scattered areas in 2000. Overall, Florida activity was more evident than at any time over the past 10 years. Damage was most pronounced in young (less than 15 years) longleaf and slash pine plantations. Because of the drought that exacerbated sawfly defoliation impact, one industrial landowner aerially treated a large plantation. In North Carolina, this pest species persisted in the western part of the State, but there was no noticeable population change over last year. Populations of the red-headed pine sawfly increased on Virginia pine Christmas trees in north-central Tennessee and on loblolly pines in west Tennessee.

Pitch moths,
Synanthedon sequoiae
Dioryctria spp.

Region 5: California

Host(s): Monterey X knobcone pine, ponderosa pine, single-leaf pinyon pine

Damage was observed on Monterey X knobcone saplings in a plantation on the north slope of the San Bernardino Mountains. Damage from *S. sequoiae* was observed on mature pine in May Valley, San Jacinto Mountains, and *Dioryctria* spp. infested pinyon in the Santa Rosa Mountains. In northern California, hundreds of trees in an isolated stand of low elevation ponderosa pine along Paynes Creek, Tehama County were heavily infested. About 10 percent of these show severe decline.

Red oak borer,
Enaphalodes rufulus

Region 8: Arkansas

Host(s): Northern red oak, black oak

Red oak borer attacks increased dramatically in 2000 in north-central Arkansas in association with severe drought for the third consecutive year. Populations are now at unprecedented levels. Damage was evident and contributed to drought-related mortality in red oaks. Degradation of lumber from attacked trees can lower product values.

Red turpentine beetle,
Dendroctonus valens

Region 5: California

Host(s): Jeffrey pine, ponderosa pine

This bark beetle has been common in wildfire and prescribed burn areas in northeastern California during the past 4 years. It was also found associated with trees infested with *Ips paraconfusus* and trees charred by the wildfires of 1999 in southern California. An unusual occurrence was found in or adjacent to research plots in a plantation in Siskiyou County. Thinning over the past 4 years provided good breeding sites -- fresh stumps -- and presumably deep soil tilling/ripping attracted beetles to living trees in and adjacent to the plots.

Roundheaded pine beetle,
Dendroctonus adjunctus

Region 3: Arizona, New Mexico

Host(s): Ponderosa pine

Roundheaded pine beetle-caused tree mortality regionwide increased slightly from 1,700 acres in 1999 to 2,235 acres in 2000. In Arizona, roundheaded pine beetle-killed trees were detected on the Coronado National Forest (2,235 acres). No roundheaded pine beetle-caused tree mortality was detected in New Mexico in 2000.

Scarlet oak sawfly,
Caliroa quercuscoccineae

Region 9/Northeastern Area: Pennsylvania, West Virginia

Host(s): Black oak, pin oak, red oak

Approximately 1,000 acres of red oak were affected by scarlet oak sawfly in Tioga County, Pennsylvania. In West Virginia, damage was most severe on 18,400 acres in Lewis and Upshur Counties, but only light and spotty in Barbour, Mason, Preston, and Cabell Counties.

Southern pine beetle,
Dendroctonus frontalis

Region 3: Arizona

Host(s): Apache pine, Chihuahua pine

Southern pine beetles (SPB), along with engraver beetles were found infesting Chihuahua and Apache pines in southern Arizona in 2000. Southern pine beetle-caused tree mortality was detected on the Coronado National Forest (11,620 acres); Chiricahua National Monument (20 acres); and on 65 acres of private land. This is the largest outbreak of this type ever recorded in Arizona.

Insects: Native

Region 8: Regionwide

Host(s): Loblolly pine, shortleaf pine, slash pine, longleaf pine, Virginia pine, pitch pine, table mountain pine, eastern white pine

In 2000, SPB populations rapidly escalated in the Southern Region. The mild winter and extended drought exacerbated the SPB situation by providing optimum habitat for this native forest pest. The outbreak currently covers portions of Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee, and Virginia on federal, State, and private ownerships. It will likely go down as one of the largest outbreaks in history. By contrast, there was not even a single SPB infestation reported in Louisiana, Texas, Arkansas, and Oklahoma. Compared to 1999, the number of SPB infestations in Region 8 increased by more than four times (from 13,152 spots to 59,209 spots) and the number of affected acres increased by almost two times (from 7,055,000 to 12,121,000 acres).

The most heavily impacted area was the Alabama. There were 26,437 infestations statewide and 58 of Alabama's 67 counties experienced outbreak level populations. Due to depressed timber markets, drought, and increasing number of SPB spots, only 40 percent of of the spots were controlled; many of these were treated by the cut and leave method. The northwestern part of the State was most affected, with five counties detecting more than 1,000 spots each. The National Forests in Alabama (especially the Bankhead and Oakmulgee Ranger Districts) were heavily impacted. Over 8,000 acres of pines were killed in the Sipsey Wilderness alone.

The southern Appalachian Mountain area in Georgia, Tennessee, North Carolina, Kentucky, and Virginia was also devastated. Periodically, SPB attacks hosts other than its favored southern yellow pines. Such was the case in 2000 in the mountains, where eastern white pine was commonly killed, and beetles actually attacked Norway spruce and eastern hemlock in western North Carolina. Much of the yellow pine killed was in the relatively rare pitch pine and table mountain pine types, raising concerns for loss of significant portions of these species' genetic base. The outbreak in southeastern Kentucky and southwestern Virginia was the first in 25 years. The losses were very significant on the Daniel Boone National Forest in southern Kentucky. The beetles killed between 75 and 90 percent of the habitat in the colony clusters of the red-cockaded woodpecker, a Federally listed endangered species. The beetle was in outbreak status in roughly the entire eastern half of Tennessee, as well as the counties bordering Mississippi.

In South Carolina, financial losses due to SPB reached $40 million – the second worst year on record. The Piedmont area of the State experienced the highest losses. In Georgia, 11 northern counties were in outbreak status. Infestations in the northern Atlanta metro area kept urban foresters and arborists busy.

In Florida, SPB activity also reached record proportions. There were more infestations (1,172) in more counties (21), causing more dead trees (1.2 million) at a greater financial cost ($15.7 million) than ever previously recorded in the State. Impact was exacerbated by severe drought that stressed the trees. The urban-wildland interface outbreak in the Brooksville-Hernando County area was especially challenging to foresters and extension personnel.

Region 9/Northeastern Area: Delaware, Maryland, Ohio

Host(s): Loblolly pine

No significant active SPB hot spots were detected over the entire southern part of Delaware. Southern pine beetle populations continue to remain low in southern Maryland, and as of August, no infested pines were reported. One SPB infestation discovered in Adams County, Ohio, late this year killed about 1 acre of planted loblolly pine trees. A series of mild winters followed by the drought in 1999 probably allowed this southern species to spread north and infest trees in Ohio.

Spruce beetle,
Dendroctonus rufipennis

Region 1: Idaho, Montana

Host(s): Englemann spruce

Spruce beetle populations once again remained low throughout the region in 2000, with infested area decreasing by about half regionwide. In northern Idaho, less than 250 infested acres were recorded. Most occurred as small and scattered groups of beetle-killed Englemann spruce on the Idaho Panhandle, Nez Perce, and Clearwater National Forests. In western Montana, the infested area decreased from about 800 acres in 1999 to just over 200 acres in 2000. Those infested acres were found on the Gallatin, Flathead, and Kootenai National Forests, and in Glacier National Park. Slightly more than 650 trees were killed throughout the region.

Region 2: Colorado, Wyoming

Host(s): Engelmann spruce

Spruce beetle populations attacked standing trees all along the western slope of Colorado, moving out of extensive areas of blowdown on the Routt, White River, Grand Mesa, and Rio Grande National Forests. Also, spruce beetle populations continue to build in Conejos, Garfield, and Eagle Counties. Chronic localized mortality continues on State and private lands in Jefferson and Clear Creek Counties in Colorado in blue spruce growing along small streams prone to high spring runoff and subsequent root damage. Examples are West Chicago Creek southeast of Georgetown and South Turkey Creek northeast of Conifer. In Wyoming, severe spruce beetle activity continued in many side drainages of the North and South Forks of the Shoshone River. An estimated 129,479 trees were killed on 16,919 acres. This infestation extends into Regions 1 and 4. Minor occurences of spruce beetle have been noted near blowdown areas on the Bighorn National Forest amounting to about 1,320 killed trees on 1,211 acres. A build up of spruce beetle populations was reported for the Snowy Range of south-central Wyoming in 2001. This area has experienced recent (1998 and 1999) windthrow in the spruce cover type.

Region 3: Arizona, New Mexico

Host(s): Spruce

Spruce beetle-caused tree mortality in the Southwest increased slightly from 5,015 acres in 1999 to 5,990 acres in 2000. In Arizona, spruce beetle-killed trees were detected on the Apache-Sitgreaves (60 acres) and Coronado (730 acres) National Forests; and Fort Apache (35 acres) and Navajo (265 acres) Indian Reservations. In New Mexico, spruce beetle-caused tree mortality occurred on the Carson (955 acres), Cibola (245 acres), Gila (140 acres), Lincoln (795 acres), and Santa Fe (2,480 acres) National Forests; Mescalero Apache Tribal Lands (40 acres); Santa Clara (25 acres) and Taos Pueblo(170 acres) Indian Reservations; and 50 acres of State and private land.

Region 4: Idaho, Nevada, Utah, Wyoming

Host(s): Spruce

Spruce beetle was responsible for more tree mortality in the Intermountain Region than any other insect. The number of trees killed was 83,400 compared to 66,200 in 1999. The largest infestations are still located in Utah where 46,000 trees were killed on the Manti-LaSal National Forest and nearly 17,000 were killed on the Dixie National Forest. Mortality was also observed on the Fishlake, Ashley, Uinta, and Wasatch-Cache National Forests. On the Bridger-Teton National Forest, in western Wyoming, the insect population exploded from 100 trees killed in 1999 to 6,500 trees killed in 2000. No significant mortality was observed in southern Idaho national forests.

Insects: Native

Region 6: Oregon, Washington

Host(s): Engelmann spruce

All reported spruce beetle-caused mortality in Oregon and Washington in 2000 was in Engelmann spruce. Reported trees killed increased from 1,769 in 1999 to over 3,800 in 2000. Field information from the Okanogan National Forest indicates that due to the timing of the survey a sizeable outbreak was missed on that forest. The majority of mortality occurred on Forest Service lands within the Okanogan, Wenatchee, Umatilla and Wallowa-Whitman reporting areas. In other areas, spruce beetle activity was lightly scattered in the host type. Low levels of spruce beetle activity are due, in part, to the gradual removal of preferred host trees by previous infestations.

Region 10: Alaska

Host(s): Black spruce, Lutz spruce, Sitka spruce, white Spruce

Aerial surveys conducted during 2000 indicated a continuation of the downward trend in spruce beetle damage. Statewide, approximately 86,000 acres of new spruce beetle activity was aerially detected in 2000 as compared to the peak of beetle activity in 1996 of 1.1 million acres. The overall decline in new spruce beetle activity is a common trend in areas that are now depleted of large-diameter spruce host material.

Smaller scale spruce beetle infestations are still occurring in previously undisturbed areas. Most notable are the infestations mapped around Elim and Sleetmute, two new infested areas on the west side of the State. While these infestations are relatively small, this is the first time spruce beetle infestations have been mapped around Elim, a coastal community on Norton Sound. Infestations in the southwest portion of the State occur infrequently and are usually of a localized nature.

Region 9/Northeastern Area: Maine

Host(s): White spruce, red spruce

The condition in many of Maine's coastal spruce stands continued to gradually decline in 2000. The most immediate cause of spruce stand deterioration remains the spruce beetle, *Dendroctonus rufipennis*, but several predisposing factors (overstocking, overmaturity, lack of management, poor site) affect tree condition and longevity in these stands. The current spruce beetle infestation remains confined almost entirely to the central Maine coast around Penobscot Bay.

Spruce budworm, *Choristoneura fumiferana*

Region 9/Northeastern Area: Maine, Minnesota, New Hampshire, New York, Vermont

Host(s): Balsam fir, white spruce, red spruce, black spruce, hemlock

In Maine, monitoring of low level spruce budworm populations continued in the form of field observations, a statewide light trap network, and pheromone baited traps. No larvae were found and no defoliation was detected. The number of budworm caught per trap decreased from 1.7 in 1999 to 0.4 in 2000 making the 2000 catch the lowest since 1995. In New Hampshire, no defoliation was detected and pheromone trap catches were very low. A total of 1,727 adult moths were caught in 93 traps in New York. Also, 551 acres were moderately defoliated in Essex County, New York. In Vermont, there was no noticeable defoliation and the number of moths caught in pheromone traps increased dramatically to the highest counts since 1983. The 28,481 acres of significant defoliation in northeastern Minnesota forests this year was much below the 69,620 acres reported in 1999. This year represented the 47th consecutive year of spruce budworm defoliation in Minnesota.

Striped alder sawfly,
Hemichroa crocea

Region 9/Northeastern Area: Maine, Vermont

Host(s): Birch, alder

Populations of this sawfly rose sharply in 2000 and defoliated spotty areas over several thousand acres across central Maine during July and August. This insect also caused moderate to heavy defoliation of paper birch on several hundred acres in Orleans and Essex Counties, Vermont.

Texas leaf-cutting ant,
Atta texana

Region 8: Louisiana, Texas

Host(s): Southern pines, hardwoods

In 2000, localized defoliation of pine plantations caused by Texas leaf-cutting ant occurred in east Texas and central Louisiana on sites with deep sandy soil. Populations of these ants remain fairly static from year to year. A new ant bait, Volcano®, was given a special local need registration by the Texas Department of Agriculture last fall. A single application can eliminate an ant colony in as little as 4 weeks.

Variable oak leaf caterpillar,
Lochmaeus manteo

Region 8: Florida, Tennessee

Host(s): Laurel oak

Thousands of acres across five counties were defoliated in Florida. While there was no evidence of mortality, the outbreak was a serious nuisance and generated many public inquiries to forestry and extension officials. Variable oak leaf caterpillar defoliated over 900 acres of oak/hickory and oak/pine forests in southwest Tennessee in 2000.

Region 9/Northeastern Area: New Jersey

Host(s): Oaks

Severe defoliation was detected on 595 acres in three areas of Ocean County near Barneget, New Jersey.

Western balsam bark beetle,
Dryocoetes confusus

Region 2: Colorado, Wyoming

Host(s): Subalpine fir

This tree-killing bark beetle is part of a complex of organisms that results in sub-alpine fir decline (see later section on this decline). It is therefore not possible to determine exactly how much fir mortality should be attributed solely to bark beetle activity. However, observations of concentrated, recent mortality

immediately adjacent to windthrow from the past 4 to 6 years were made in 2000 on the northern portion of the Routt National Forest in Colorado and on the Bighorn National Forest in Wyoming. In the former case, the outbreak first appeared in 2000. In the latter, field visits verified that the sudden increase in fir mortality asociated with windthrow was due to western balsam bark beetle. This increase in activity by the western balsam bark beetle associated with windthrow on the Routt National Forest has not been reported in Region 2 before this year.

Western pine beetle, *Dendroctonus brevicomis*

Region 1: Idaho, Montana

Host(s): Ponderosa pine

Ponderosa pine mortality, attributed to western pine beetle, declined once again. About 2,000 beetle-killed trees were recorded on 1,500 acres -- down from approximately 7,400 trees on 7,200 acres in 1999. Most mortality -- more than 1,100 acres -- was observed in northern Idaho. Elsewhere in the region, western pine beetle-caused mortality was light and quite scattered. There is a potential for western pine beetle populations to increase in 2001. Large amounts of fire-weakened ponderosa pine, resulting from widespread fires in 2000 and drier-than-normal conditions, have created conditions conducive to beetle population survival and expansion -- especially in western Montana.

Region 3: Arizona, New Mexico

Host(s): Ponderosa pine

Western pine beetle-caused tree mortality increased significantly from 2,605 acres in 1999 to 30,385 acres in 2000. The greatest increase was in New Mexico. Mortality in Arizona occurred on the Apache-Sitgreaves (305 acres), Coconino (35 acres), Kaibab (5 acres), and Tonto (10 acres) National Forests; Fort Apache (295 acres), Navajo (390 acres) and San Carlos (210 acres) Indian Reservations; Bureau of Land Management lands (45 acres); Grand Canyon National Park (5 acres); 10 acres in Canyon de Chelly National Monument; and 25 acres of State and private lands. In New Mexico, western pine beetle-caused tree mortality was detected on 12,215 acres of the Gila National Forest, and 135 acres of State and private lands. Western pine beetle, in combination with *Ips* beetles, killed trees on 13,050 acres of the Lincoln National Forest and 3,650 acres of Mescalero Apache Tribal Lands.

Region 4: Idaho

Host(s): Ponderosa pine

No mortality due to western pine beetle was recorded in 2000 in the Intermountain Region.

Region 5: California

Host(s): Coulter pine, ponderosa pine

Mortality caused by the western pine beetle was either scattered or uncommon throughout California. Mortality spots were small and reported primarily from the Plumas and Shasta-Trinity National Forests.

Region 6: Oregon, Washington

Host(s): Ponderosa pine

Acres affected by western pine beetle activity decreased from 11,726 acres (1.51 trees per acre) in 1999 to 6,993 acres (2.20 trees per acre) in 2000. Decreases were noted in both large and pole-sized ponderosa pine throughout much of the region. Roughly half of the mapped mortality was on private lands with the majority of the mortality occurring in pole-sized stands. Areas most heavily affected were mapped within the Malheur, Wenatchee, and Northeast Washington reporting areas. Other areas with notable levels of mortality include private lands within the Northeast Washington reporting area and Indian Reservation lands within the Colville and Yakima reporting areas.

Western spruce budworm, *Choristoneura occidentalis*

Region 1: Idaho, Montana

Host(s): Douglas-fir, Engelmann spruce, true firs

Defoliation from western spruce budworm was detected on the Beaverhead-Deerlodge and Helena National Forests in Montana during the 2000 aerial survey flight. A small area of defoliation was detected during the 1998 aerial survey, but none was found in 1999. In northern Idaho**,** no defoliation was observed during the 2000 aerial survey flight. Light to moderate defoliation was observed during ground surveys on the Beaverhead-Deerlodge National Forest in Montana. Pheromone trap counts increased in 2000 at all locations that were trapped. Trap catches on the Helena National Forest and the Lubrecht Experimental Station increased to 164 moths in 2000, up from 107 in 1999. Two budworm permanent plot sites on the Beaverhead-Deerlodge National Forest (Moffet Mountain and State Mine Park) were trapped in 2000. Moffet Mountain trap counts increased from 64 moths in 1999 to 230 moths in 2000. Trap catches at State Mine Park increased from 2 moths in 1999 to 42 moths in 2000. Steadily increasing pheromone trap catches may signify the beginning of a budworm outbreak cycle especially if the relatively mild winters and warm, dry summers, which favor budworm population increases, continue.

Region 2: Colorado

Host(s): Douglas-fir, Engelmann spruce, blue spruce, true firs

An estimated 20,654 acres of forest was defoliated by western spruce budworm in southwestern Colorado in 2000. This is about half the acres reported in 1999 and about the same as the number of acres defoliated in 1998. Most of the western spruce budworm activity occurred throughout the Sangre de Cristo and Wet Mountains in Costilla, Custer, Fremont, Las Animas, and Saguache Counties. New areas of defoliation in Colorado were reported on the Front Range in Jefferson and Park Counties in 2000. The outbreak on Douglas-fir in Hinsdale County, adjacent to Lake City, Colorado, appears to have ended. In southern Wyoming in 2000, about 924 acres were defoliated in the Medicine Bow Mountains.

Region 3: Arizona, New Mexico

Host(s): True firs, Douglas-fir, spruce

Western spruce budworm decreased regionwide from 292,925 acres in 1999 to 192,225 acres in 2000. In Arizona, western spruce budworm defoliation was detected on the Kaibab National Forest (1,525 acres); Grand Canyon National Park (5,170 acres); Canyon de Chelly National Monument (40 acres); and Navajo Indian Reservation (20,395 acres). In New Mexico, western spruce budworm defoliation continued to occur on the Carson (79,165 acres), Cibola (2,965 acres), Gila (2,310 acres), Lincoln (1,075 acres), and Santa Fe (21,915 acres) National Forests; Jicarilla (3,925 acres) and Mescalero Apache (165 acres) Tribal

Lands; Santa Clara (90 acres) and Taos Pueblo (3,560 acres) Indian Reservations; and 49,925 acres of State and private lands in northern New Mexico.

Region 4: Idaho, Utah

Host(s): Douglas-fir, true firs

Defoliation caused by western spruce budworm populations increased from 4,800 acres in 1999 to 21,100 acres in 2000. The increase was most apparent on the Dixie National Forest in southern Utah where defoliation caused by the foliage-chewing insect jumped from 900 acres recorded in 1999 to almost 14,000 acres in 2000. In Idaho, western spruce budworm defoliation was observed last year on the Dubois Ranger District of the Targhee National Forest. This was the first re-occurrence of the insect in Idaho since 1987 when the epidemic population crashed following a July frost. In 2000, almost 5,000 acres were defoliated in total on the Boise, Payette, Sawtooth, and Targhee National Forests.

Region 6: Oregon, Washington

Host(s): Douglas fir, true firs, Engelmann spruce, western larch

Areas of aerially visible defoliation caused by western spruce budworm increased from approximately 189,700 acres in 1999 to 384,567 acres in 2000. Approximately 78,200 acres were reported in the light category, 128,458 in the moderate, and 177,900 acres in the heavy category. Increases occurred over all ownerships in the reported outbreak in Washington State. Two new infestations were reported on Forest Service lands within the Ochoco (513 acres) and Malheur (354 acres) reporting areas in Oregon. Following are some noteworthy reporting area trends: Wenatchee increased from 10,726 acres in 1999 to 121,236 acres in 2000, Yakima increased from 152,302 acres in 1999 to 219,386 acres in 2000, Glenwood decreased slightly from 13,574 acres in 1999 to 13,113 acres in 2000, and Gifford-Pinchot increased from 13,111 acres in 1999 to 29,763 acres in 2000.

Insects: Nonnative

Asian longhorned beetle,
Anoplophora glabripennis

Region 9/Northeastern Area: Illinois, Maryland, New Jersey, New York, Ohio

Host(s): Ash, birch, black locust, elm, horse chestnut, maple, poplar, willow

Spot infestations of Asian longhorned beetle in Illinois were reported at O'Hare Airport during 2000. Surveys with bucket trucks and tree climbers improved the detection of infested trees, and lightly infested trees were more readily found during 2000. In the Chicago area, 181 trees were destroyed during 2000 compared to 1,243 trees destroyed in 1999. An operational insecticide project was implemented during the summer of 2000. Imidacloprid was applied (trunk and soil injections) to more than 11,000 host trees around the known infestations. Over 1,450 infested trees have been removed in the Chicago area to date. No beetles were reported in the Mid-Atlantic States of Maryland, New Jersey, and Ohio. However, awareness projects focusing on recognition and reporting this serious exotic pest of maples were developed in these States for tree professionals in arboriculture and urban forestry. This destructive insect was discovered in New York, in Brooklyn and on Long Island, during the summer of 1996. Since then, other infestations were discovered in Queens, Manhattan, Bayside, and Islip. A Federal quarantine encompasses all known infested areas in Chicago and New York including all newly discovered infested areas. Many of the trees in these areas appear to have been infested for several years. Hardwoods, especially maples, are the preferred hosts of this insect. In an effort to eradicate the insect, surveys continue around the perimeter of the known infestation to identify and remove newly infested trees. Tree planting continues to provide greenery in neighborhoods as the infested trees are cut down and removed from the site.

Balsam woolly adelgid,
Adelges piceae

Region 1: Idaho

Host(s): Grand fir, subalpine fir

Aerial survey data estimate 56,426 acres infested by the balsam woolly adelgid (BWA) in northern Idaho in 2000. Actual infested acres are probably higher with some areas not yet displaying crown symptoms. Areas with the heaviest infestations occur on the St. Joe, Clearwater, and Nez Perce National Forests and adjacent State, private, and Bureau of Land Management lands. Subalpine fir of all ages and size classes are killed. Extensive gouting and bole infestations occur on grand fir, but to date no grand fir over 5 inches in diameter has been documented as being killed by the adelgid. Regeneration mortality of both subalpine and grand fir is high, resulting in forest type conversions in some areas. Continued surveys to delimit the distribution of the BWA and damage assessment surveys are planned in the near future.

Region 6: Oregon, Washington

Host(s): True firs

Balsam woolly adelgid activity was observed on 7,100 acres in 1999, compared with 6,300 acres in 2000. The majority of reported activity occurred within the Wenatchee, Mount Hood, and Deschutes reporting areas.

In 1998, a Forest Health Monitoring ground survey was initiated to confirm its occurrence and distribution in the host type throughout Washington and Oregon; and determine effects on host species and changes in

local ecosystems. To date, a total of 1,038 plots have been established in the two States. The ground survey was completed for Oregon. This year's survey found BWA in all the northeast Oregon counties with forest land, a fact that had not been reported previously. Damaging BWA infestations were found in sub-alpine fir stands on the Umatilla National Forest; some include stem infestations on younger trees and obvious signs of crown deterioration on larger trees.

Two important results of the survey are: 1) BWA has nearly eliminated subalpine fir from sites where it is acting as a pioneer species in disturbed and harsh environments, such as old lava flows and avalanche tracks where subalpine fir is the only species capable of growing, and 2) almost all grand fir in low valleys and coastal streams west of the Cascades has been affected and is disappearing from low elevation environments.

Region 8: North Carolina, Tennessee, Virginia

Host(s): Fraser fir

Fraser fir has a very limited range in the southern Appalachian Mountains and appears almost exclusively in pure stands on the highest mountain peaks or in combination with red spruce at somewhat lower elevations. Since the first introduction of the balsam woolly adelgid, approximately 64,700 acres of Fraser fir (essentially 100 percent of the type) have been affected. The insect attacks trees of all age classes, but prefers the older fir trees. Adelgid populations were again high in 2000.

Region 9/Northeastern Area: Maine, Vermont, West Virginia

Host(s): Balsam fir

This introduced species continues to kill and deform fir across southern Maine as populations increase and spread inland. If this expansion continues, this species could be a serious problem in high value stands to the north as well as to homeowners and Christmas tree growers of Maine. In Vermont, populations were very noticeable on the stems of balsam fir in Essex and Caledonia Counties for the first time in many years. Balsam fir trees in Pocahontas, Randolph, and Tucker Counties, West Virginia, showed more obvious signs of dieback and decline from this phloem-feeding pest in comparison to previous years.

Browntail moth, *Euproctis chrysorrhoea*

Region 9/Northeastern Area: Maine

Host(s): Red oak

Data from the annual winter survey show the browntail moth populations to be declining over most of Maine, but intensifying locally in the northern portions of Casco Bay. Webs were located as far east as Stonington and south to Ogunquit, but numbers were much lower in 2000 than in 1999. Increasing populations of this pest, high enough to warrant control in 2001, most likely will be found in the more northern portions of Casco Bay at Freeport and Harpswell.

Common European pine shoot beetle,
Tomicus piniperda

Region 2: Colorado, Kansas

Host(s): Pine

In Colorado, no European pine shoot beetles were detected in traps deployed by Colorado State University's Department of Bioagricultural Science and Pest Management. In Kansas, no pine shoot beetles were found in traps or during surveys conducted by the Kansas Department of Agriculture.

Region 9/Northeastern Area: Delaware, Indiana, Illinois, Maine, Maryland, Michigan, New Hampshire, New York, Ohio, Vermont, Wisconsin

Host(s): Scotch pine, white pine, pines

Surveys of 94 Christmas tree plantations in Delaware did not find any pine shoot beetle adults. This exotic species previously found in Allegheny, Garrett, and Washington Counties, Maryland, was found for the first time in Frederick County. In Ohio, pine shoot beetle surveys conducted in cooperation with Animal and Plant Health Inspection Service (APHIS) personnel yielded 17 new quarantine counties. This brings the total to 71 out of 88 counties in Ohio under quarantine. In 2000, two new counties were added in Illinois (Macon, DeWitt), and six new counties in Indiana (Boone, Clinton, Johnson, Parke, Shelby, and Vermillion). In Michigan and Wisconsin, this pest continues to be a problem in pine plantations. In Maine, trapping surveys were conducted for this beetle in 1999 and 2000 in central and southern counties. A single beetle was trapped for the first time this year in Oxford County, but it was not found in any infested trees. The Maine Forest Service is working with surrounding jurisdictions, APHIS, and the Canadian Food Inspection Agency to address quarantine issues associated with this pest. In New Hampshire, the one beetle found in a pheromone trap in Coos County represents the second year a single beetle has been found in the State, but as yet no infested trees have been found . In New York, where the insect was first found in 1993, 32 counties across the State are known to be infested and a Federal quarantine remains in effect in these areas. No damage to pines was detected in Vermont, but an adult trapped in Caledonia County was a new county record.

Gypsy moth (European),
Lymantria dispar

Region 1: Idaho, Montana, North Dakota, Wyoming

Host(s): Hardwoods

Cooperative detection monitoring for the gypsy moth in Region 1 with the APHIS and State Departments of Agriculture, Forestry, and Lands continued in 2000. A network of strategically located pheromone-baited traps was placed throughout all States in Region 1. On Federal lands in Region 1 in 2000 no gypsy moths were caught. There was one moth trapped in Montana, none in Idaho. The trapping program will continue in Region 1 next year.

Region 2: Colorado, Kansas, Nebraska, South Dakota, Wyoming

Host(s): Hardwoods

In Colorado, a total of 1,729 detection traps and 319 delimitation traps were deployed by all agencies. A total of six single male moths were trapped, two of which could be considered associated with catches the previous year. No serious situations are thought to exist. Delimitation trapping for areas around all 2000 positive traps is planned for 2001, with Estes Park, Colorado, being the most likely situation involving an

egg mass importation. In Kansas, the Department of Agriculture trapped seven male moths at a nursery in Johnson City. This is the first multiple trap catch of this insect in the State. It is suspected that these moths came from infested nursery stock brought in from Michigan. One moth was caught at Perry Lake and probably represents a "hitch hiker." Additional trapping will be conducted in 2001. Trapping throughout the State resulted in catching four male moths. Two moths were on the eastern border and two were in private Black Hills camping areas. The catches are attributed to movement of tourists from infested areas. A total of seven viable egg masses were found on Christmas trees imported from Michigan this winter. Approximately half the trees were destroyed prior to sale and news reports were distributed to have people check their trees prior to disposal. The areas where the trees were sold will be trapped more intensely in 2001. In Wyoming, no adult gypsy moths were captured during 2000. Delimiting trapping in Ten Sleep and Worland due to multiple catches in 1999 yielded no catches in 2000. There have been no catches in 1999 and 2000 at the F.E. Warren Air Force Base in Cheyenne after multiple catches occurred in 1996, 1997, and 1998. Regulatory incidents, may have resulted in the movement and planting of infested nursery stock from Michigan into Wyoming and Colorado. In addition, Christmas trees bearing gypsy moth egg masses were found in South Dakota and Nebraska. Because these situations may lead to incipient infestations, increased trapping and regulatory review is planned for 2001.

Region 3: Arizona, New Mexico

Host(s): Hardwoods

No adult male gypsy moths were captured in Arizona or New Mexico in 2000.

Region 4: Idaho, Nevada, Utah

Host(s): Hardwoods

The gypsy moth was first detected in Utah in 1988. Between 1989 and 1993 almost 72,000 acres of Federal, State, and private lands were treated with *Bacillus thuringiensis* (Bt). In 1995, after two years of intensive pheromone trapping resulted in no moth captures, the gypsy moth was declared eradicated. In 1997, 46 moths were captured in Salt Lake City and one moth on the adjacent Wasatch-Cache National Forest. In 1998 the Utah Department of Agriculture, in cooperation with the Forest Service, treated 801 acres.

In 1999, 764 acres in Salt Lake County were aerially treated using Bt. There were three applications made at 5- to 7-day intervals. Treatment was 95 percent effective with only one gypsy moth caught in the treatment block. Five additional single-moth catches occurred but all were outside the treatment area. In 2000, a 10-acre mass-trapping grid was installed around each positive catch using nine pheromone traps per acre. Only one moth was caught. In 2001, the general pheromone trap detection grid scheme will be resumed throughout Utah. A small area using a delimitation trap array will be employed around the one positive gypsy moth trap site.

Region 5: California

Host(s): Hardwoods

Thirty-three male moths were trapped in 2000 by personnel of the California Department of Food and Agriculture. The detection trap catches by county were: Los Angeles 1, Marin 17 (quarantine traps), Orange 1, Sacramento 1, San Diego 7, San Mateo 2, Shasta 1, Ventura 2 and Yolo 1. This is four counties more than in 1999. Trap densities around these finds were increased from three traps per square mile to 25 traps per square mile. There were no reported properties with egg masses or pupal cases.

Region 6: Oregon, Washington

Host(s): Oaks, apple, sweetgum, other hardwoods

While no defoliation has been observed in either State, pheromone traps continue to catch moths. These catches represent either new introductions or populations not completely eradicated by previous treatments. In Washington, two eradication projects totaling 26 acres were conducted using ground applications of *Bacillus thuringiensis* (Bt). An area (725 acres) where an Asian gypsy moth adult and a new eggmass were found was aerially treated three times with Bt. The gypsy moth survey in 2000 resulted in trap catches of 92 individuals. All were identified as the European strain. An eradication project is planned for 2001 at one site with an estimated 29 acres.

In Oregon, one eradication project was conducted using two ground applications of Bt on 19 acres. Eight European gypsy moths were trapped in 2000 in Oregon. One site in Ashland, encompassing an estimated 160 acres is proposed for eradication in 2001 using three aerial applications of Bt followed by mass trapping. In 2000, one Asian gypsy moth was trapped in the Forest Park area of Portland, Oregon. A 910-acre eradication project surrounding that capture site is proposed for 2001.

Region 8: Arkansas, Georgia, North Carolina, Tennessee, Virginia

Host(s): Hardwoods, especially oak species

In 2000, aerial surveys detected over 70,000 acres of defoliation by gypsy moth in Virginia. Due in part to drought, the effects of the *Entomophaga maimaiga* fungal outbreak subsided and gypsy moth populations rebounded throughout its eastern range. Consequently, the potential for limited local area defoliation in Virginia is greater for next year than it was for 2000.

In 1998 in North Carolina and Georgia, 23,000 acres in and around the town of Highlands, NC, were treated as part of a gypsy moth eradication project. Follow-up trapping showed very few moths and no treatment is planned there in 2001.

Tennessee lists three infested counties (Scott, Cumberland, and Sevier) all of which have ground eradication projects underway. Two counties (Monroe and Campbell) showed noteworthy increases in trap catches, triggering heavier trapping grid densities in 2001.

In Arkansas, delimiting trapping was successful in eradicating gypsy moth from Carroll and Marion Counties (no moths were caught in the 2000 trapping effort). In Newton County, 10 male moths were caught and another year of delimiting trapping is planned for 2001 in that county. In addition, an 80-square-mile detection trapping block was established surrounding the delimiting trapping area to help define current infestation boundaries. No other treatments are currently planned.

The Gypsy Moth Slow-the-Spread Pilot Project moved toward operational status in 2000. Trapping and treatments were carried out in eight States from North Carolina to Wisconsin. Within the boundaries of the Southern Region, 9,090 acres were treated in eastern North Carolina and 24,640 acres in eastern and western Virginia. Additional monitoring and treatment activities will be carried out in 2001.

Fiscal year 2000 was the first year that Congress provided full funding to the Forest Service for operational implementation of the strategy to slow the spread of the gypsy moth (STS). The integration of STS into the USDA's national policy for managing the gypsy moth will reduce spread rates of this nonnative pest from a historical average of 13 miles per year to less than 5 miles per year. The USDA (Forest Service and Animal and Plant Health Inspection Service) and State partners located along the leading edge of gypsy moth populations cooperatively implement STS.

Currently the States of Michigan, Wisconsin, Illinois, Indiana, Ohio, West Virginia, Kentucky, Virginia and North Carolina are actively involved in STS and Minnesota and Iowa will join the program in the near future. A band of land along the leading edge of the generally infested area totaling approximately 56 million acres was brought under comprehensive management during 2000. An additional 34 million acres behind this active management band were monitored less intensively to measure the program's effect on spread. During 2000, STS State partners detected and delineated more than 100 distinct gypsy moth colonies within the STS area, which triggered treatment of 177,842 acres during the spring and summer of

2000. STS State partners deployed 75,000 pheromone traps during 2000 to evaluate the effectiveness of the 2000 treatments, and to detect or delineate newly established colonies that may require treatment in 2001.

Region 9/Northeastern Area: Connecticut, Indiana, Maine, Maryland, Massachusetts, New Hampshire, New York, Michigan, New Jersey, Ohio, Pennsylvania, Rhode Island, Vermont, West Virginia, Wisconsin

Host(s): Apple, aspen, basswood, black walnut, northern red oak, pin oak, red oak, white oak

In Connecticut, above-average precipitation starting in April and continuing throughout July most likely contributed to the decline of gypsy moth populations during the summer of 2000. *Entomophaga maimaiga*, the pathogenic fungus that has been killing gypsy moth larvae throughout the region since 1989, grows best under moist conditions. Indiana reported defoliation on only single yard trees in DeKalb and Steuben counties, but larvae collected on these were enough to establish the presence of *Entomophaga maimaiga* and the gypsy moth nucleopolyhedrosis virus for the first time in that State. Gypsy moth populations are increasing in southern and central Maine and larval feeding is likely to result in widespread defoliation of hardwoods in 2001. A July aerial survey delineated 2,543 acres of hardwood defoliation exceeding 66 percent, the largest extent of defoliation seen since 1993. In Massachusetts, noticeable defoliation occurred on 64,000 acres, the highest record since 1994. In Maryland, 23,231 acres of defoliation were reported in Allegany, Baltimore, Carroll, Cecil, Dorchester, Frederick, Howard, Montgomery, Prince Georges, and Washington Counties. In New Jersey, 15 of the 21 counties reported approximately 133,215 acres of defoliation. In the generally infested part of Ohio, nearly 23,544 acres were defoliated in 16 counties. West and south of the generally infested area in Ohio, the gypsy moth is moving toward the Columbus metropolitan area. In Pennsylvania, approximately 842,981 acres of defoliation were reported in 29 counties concentrated in the central part of the State. In West Virginia, 323,036 acres of defoliation were reported in 16 counties, mostly in the Eastern Panhandle and along the Virginia border. Defoliation on other Federal lands amounted to 6,528 acres as follows: 407 acres in Maryland (Chesapeake Marshlands National Wildlife Complex, Catoctin Mountain Park, and Harper's Ferry National Historic Park); 453 acres in New Jersey (Delaware Water Gap, Earle Naval Weapons Station and Picatinny Arsenal); 277 acres in Ohio (Cuyahoga Valley National Recreation Area, Mosquito Creek Lake, and Ravenna Training and Logistics Center); 5,387 acres in Pennsylvania (Alvin R. Bush Dam, Letterkenny Army Depot, and Raystown Lake); and 4 acres in West Virginia at Harper's Ferry NHP. Gypsy moth populations decreased nearly 50 percent in Michigan where defoliated acres went from 176,625 acres in 1999 to 106,329 acres in 2,000. In eastern Wisconsin (Brookfield and Milwaukee), where gypsy moth is established, the population continues to increase. A few communities have begun to experience defoliation such as occurred on 30 acres in oak dominated parkland in Outagamie County, Wisconsin. In New Hampshire, very light defoliation was scattered over 100 acres of Rockingham County. Defoliation acreage in New York has been relatively low in recent years; however, 27,500 acres were defoliated by gypsy moth in the State in 2000, most notably in Ulster County. In Rhode Island, an area of 5,500 acres was heavily defoliated. No significant defoliation was observed in Vermont.

Hemlock woolly adelgid,
Adelges tsugae

Region 8: North Carolina, Virginia

Host(s): Eastern hemlock, Carolina hemlock

Hemlock woolly adelgid (HWA) threatens the entire range of hemlock, and is found throughout Virginia wherever hemlock is abundant, with the exception of six counties in the southwestern portion of the State that are not yet infested. Six northern North Carolina counties are infested. Two new North Carolina counties, Alamance and Alleghany, were added to the list in 2000.

Region 9/Northeastern Area: Connecticut, Maine, Massachusetts, Maryland, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, West Virginia

Host(s): Eastern hemlock

In Maryland, HWA continues to move westward and new populations can now be found at Rocky Gap State Park, Allegany County. In New Jersey, HWA populations declined by over 95 percent in some areas due to extremely cold temperatures in January; however, despite this decline, hemlock mortality occurred in the northwest corner of the State. In Pennsylvania, HWA damaged approximately 2,883 acres in Monroe, Northampton, and Pike Counties. HWA moved west and south in Pennsylvania and was reported for the first time in Fulton, Sullivan, Union, and Wyoming Counties. In West Virginia, HWA was reported in two new counties (Mercer and Summers). Elsewhere in West Virginia where HWA has been established for a while, the hemlock resource was impacted more severely by both HWA and 1999 drought, which caused severe needle loss and lower branch dieback at numerous sites. HWA was first introduced into Connecticut in 1985 and now occurs there statewide. HWA was identified in 10 ornamental outplanting sites in the central, coastal, and southern Maine counties of Penobscot, Hancock, Knox, Lincoln, Sagadahoc, and York. Surveys and searches conducted in areas surrounding each of the infested ornamental sites failed to find signs or symptoms of HWA in nearby native hemlocks. In Massachusetts, infestations were found in 20 new communities, including a first-time find in Berkshire County. In New Hampshire, HWA was found for the first time on approximately 50 trees in Portsmouth, New Hampshire (Rockingham County) where it is currently being eradicated. In New York, HWA was not found in any new counties during 2000; however, it had spread to other towns in counties where it was previously found. The damage from the HWA throughout Rhode Island has been compounded by another exotic hemlock pest, the elongate hemlock scale, *Fiorinia externa*, and by drought conditions lingering from 1999.

Larch casebearer, *Coleophora laricella*

Region 1: Idaho, Montana

Host(s): Western larch

In 2000, visible defoliation caused by larch casebearer decreased significantly in many western larch stands throughout northern Idaho and western Montana. Increases evident in 1999, when approximately 14,000 acres showed some level of defoliation, did not continue in 2000. Only a few areas exhibited current or new defoliation in 2000. Most areas defoliated in 1999 showed little or no casebearer activity in 2000. Most noticeably affected areas remained on the Idaho Panhandle National Forest in northern Idaho where slightly more than 400 acres of defoliation were recorded. A few areas on the Lolo and Kootenai National Forests in western Montana had defoliation noticeable from the ground, but it was not mapped during aerial detection surveys. Ground collections made from 1997 through 2000 showed continued low parasitism rates in most casebearer populations; at least when compared to similar surveys conducted during the 1970s, the last time populations were unusually high. Current parasitism levels do not seem high enough to totally account for population declines, but other causes have not been determined. Surveys indicated that few areas will experience noticeable defoliation in 2001. Casebearer populations are sufficiently high in only a few areas to warrant continued population monitoring.

Region 6: Oregon, Washington

Host(s): Western larch

After years of negligible damage, larch casebearer-caused defoliation of western larch slowly increased in the late 1990s to 15,836 acres reported in 1999. Ideal timing for larch casebearer surveys in the Pacific Northwest is in June, however, most of the surveys in larch type occurs in late July through early September. Approximately 7,000 acres were mapped in 2000. The majority of the observed defoliation was mapped within the Mount Hood (5,524 acres) and Colville (833 acres) reporting areas.

Introduced parasites released in the Pacific Northwest in the early 1960s and established years ago, along with needle diseases on larch, helped maintain low levels of casebearer for many years. As casebearer populations declined, so did the introduced parasites. Parasites are expected to respond to the increasing casebearer population, although there may be several more years of defoliation before they increase to effective levels.

Larch sawfly,
Pristiphora erichsonii

Region 10: Alaska

Host(s): Eastern larch, Siberian larch

Larch sawfly was detected on approximately 65,000 acres in 2000; a significant reduction from nearly 190,000 acres in 1999. Larch mortality is occurring throughout the range of larch in Alaska. Alaska Cooperative Extension, Integrated Pest Management technicians also noted localized defoliation of Siberian larch, an ornamental, in the Anchorage area. This is the first time the sawfly has been recorded south of the Alaska Range and no doubt represents an accidental introduction. Efforts are being undertaken to eradicate this pest from these urban areas.

Lerp psyllid,
Eucalyptolyma maideni

Region 5: California

Host(s): Eucalyptus species

A new lerp psyllid was found in the Anaheim and Santa Monica areas. The “lerps” created by this psyllid look nothing like those formed by the redgum lerp psyllid. A search for biological control agents from Australia is underway.

Pear thrips,
Taeniothrips inconsequens

Region 9/Northeastern Area: Maine, New Hampshire, Vermont

Host(s): Red maple, sugar maple

Populations remained low and spotty in Maine in 2000. In New Hampshire, damage observed during ground surveys was light and scattered. Populations were down in Vermont from 1999 and little defoliation occurred.

Pink hibiscus mealybug,
Maconellicoccus hirsutus

IITF: Puerto Rico, Virgin Islands

Host(s): Hibiscus, many other species

The pink hibiscus mealybug (PHM) continued to spread in 2000, and has now reached over 25 Caribbean Islands. It was detected in Puerto Rico in 1997, but has thus far been confined to the eastern region. Frequent monitoring surveys are conducted, assisted by the Forest Service. To date, no infestations have been identified on the Caribbean National Forest. It appears that parasitoids may have been introduced simultaneously with the PHM, reducing the impacts in Puerto Rico. With support from the Forest Service and Animal and Plant Health Inspection Service, the Puerto Rico Department of Agriculture continues to rear and release parasitoids. Surveys show that population reductions of 85-90 percent have been achieved at the parasite release sites. An increase in populations of the predaceous ladybug, *Cryptolaemus,* has also served to reduce damage and limit the spread of the mealybug. The PHM thus far has not been detected in Florida.

Red pine scale,
Matsucoccus resinosae

Region 9/Northeastern Area: Connecticut, Massachusetts

Host(s): Red pine

Red pine scale occurs statewide in Connecticut and was recently found in Hamden County, Massachusetts.

Redgum lerp psyllid,
Glycaspis brimblecombei

Region 5: California

Host(s): *Eucalyptus camaldulensis, E. radis, E. globulus, E. diversicolor, E. sideroxylon*

Redgum lerp psyllid has been found in several new locations and now occurs in practically all California counties with redgum eucalyptus.

Satin moth,
Leucoma salicis

Region 9/Northeastern Area: Maine, Vermont

Host(s): Aspen

Defoliation of woodland aspen trees in Maine by satin moth increased in 2000 for the third consecutive year. The infestation continued to expand from the previously infested areas in central Penobscot and Piscataquis Counties, Maine. Over the last 3 years, the defoliation in Maine has increased from 150 acres of moderate to heavy defoliation in 1998 to 3,767 acres in 1999 to 5,337 acres in 2000. In Vermont, defoliation was mostly light and less area was affected than in 1999.

Smaller Japanese cedar longhorn beetle
Callidiellum rufipenne

Region 9/Northeastern Area: Connecticut

Host(s): Northern white-cedar, juniper

The smaller cedar longhorn beetle, a native to Japan, Korea, Taiwan, and eastern China, was first seen in the United States in Milford, Connecticut, in 1998 in the branch of a live arborvitae, *Thuja occidentalis.* A quarantine remained in effect in several northeastern counties. Cedar trap logs have been used by the northeastern States to detect this exotic pest.

Spruce aphid,
Elatobium abietinum

Region 3: Arizona, New Mexico

Host(s): Spruce

Spruce aphid was active in Arizona in 2000 with 156,880 acres defoliated. No defoliation had been recorded in 1999. Defoliation was recorded on the Apache-Sitgreaves National Forest (69,290 acres); Fort Apache Indian Reservation (87,510 acres); 15 acres of private land and 65 acres of State Trust land. Ground surveys also revealed populations on the Coconino and Coronado National Forests. No spruce aphid activity was detected in New Mexico.

Region 10: Alaska

Host(s): Sitka spruce

In 2000, 37,500 acres of defoliation were detected in southeast Alaska, nearly as many acres as in 1998. Seventy-five percent of these acres were on national forest lands. This outbreak is the fourth in the last decade. Outbreaks in southeast Alaska are usually preceded by mild winters. Spruce trees in urban settings and along marine shorelines are most seriously impacted. Defoliation by aphids cause reduced tree growth and can predispose the host to other mortality agents, such as the spruce beetle. Some mortality is occurring in the urban setting where development has caused rooting zone disturbance, stress factors are present, and spruce beetle is a contributing causal agent. Nonurban, forested areas have small patches of localized tree mortality as a result of severe (100 percent) defoliation.

Diseases: Native

Annosus root disease,
Heterobasidion annosum

Region 1: Idaho, Montana

Host(s): Douglas-fir, grand fir, ponderosa pine, subalpine fir, western hemlock

Annosus root disease is common in ponderosa pine stands in western Montana. Most damage is concentrated in lower elevations where ponderosa pine is the dominant tree species and past harvesting of large trees has been common. Presence of annosus root disease in ponderosa pine stands greatly decreases the potential for managing ponderosa pine. These sites are usually too dry to effectively grow alternative tree species therefore, preventing the introduction and subsequent increase of annosus root disease is crucial for managing ponderosa pine. Annosus root disease is widespread at low levels on Douglas-fir and true firs in mixed conifer stands throughout western Montana and northern Idaho. It is frequently found in association with other root diseases.

Region 2: Colorado, Nebraska

Host(s): Eastern redcedar, jack pine, ponderosa pine, white fir

Annosus root disease has scattered distribution in white fir in the mixed conifer cover type throughout southern Colorado. In campgrounds, the disease creates hazardous conditions by increasing the probability of tree failure. In Nebraska, the disease is affecting jack pine, ponderosa pine, and redcedar plantings.

Region 3: Arizona, New Mexico

Host(s): True firs, ponderosa pine

Root and butt rot pathogens are responsible for approximately 10 percent reduction in volume regionwide, with annosus root disease accounting for roughly 20 percent of this loss. Annosus root disease is found in ponderosa pine sites along the Mogollon Rim in north and central Arizona, and Point of Pines on the San Carlos Indian Reservation in southern Arizona. The disease is found in many true fir forests throughout the region.

Region 4: California, Idaho, Nevada, Utah, Wyoming

Host(s): Bitterbrush, chokecherry, Douglas-fir, Jeffrey pine, lodgepole pine, ponderosa pine, spruce, true firs

Heterobasidion annosum can be found throughout the region, but mostly as a saprophyte on dead trees, stumps, roots, and cull logs or fallen stems. The fungus occasionally kills young ponderosa pine, especially in plantations on droughty soils.

Region 5: California

Host(s): Conifers, some hardwoods

Annosus root disease was confirmed in scattered pockets of dead and dying red and white fir in several stands near Croney Ridge, Grindstone District, Mendocino National Forest, and in scattered pockets of dead and dying white fir along the 2-mile segment of the Deer Mountain Road west of Deer Mountain Snowpark (Goosenest District, Klamath National Forest).

Diseases: Native

Region 6: Oregon, Washington

Host(s): True firs, ponderosa pine, western hemlock

Annosus root disease causes losses in many partially cut white and grand fir stands in southern and eastern Oregon and eastern Washington. Damage is often especially severe in subalpine fir, and is associated with smaller stumps than other true fir species. Mortality is high where annosus root disease and fir engravers operate as a complex. The Region 6 Current Vegetation Survey requires examination of cut stumps. This has led to increased reporting and awareness of annosus root disease on many national forests. In eastern portions of the Region, where many stands were cut 10-20 years ago, trees surrounding cut stumps are dying. Disease severity is expected to increase with time. Annosus root disease was observed with increasing frequency in stands that are predominantly ponderosa pine on drier sites in eastern Washington and Oregon, and in true fir species in mixed conifer and true fir stands throughout southwest Oregon.

S-Type annosus continues to occur throughout the subalpine fir and grand fir type, especially in stands that have a history of partial cutting. For the last 12 years, many vegetation treatments in northeastern Oregon have required the treatment of stumps with borax as part of the contract specifications. A 2000 survey of 15 grand fir stands with past harvest activity on the Yakama Indian Reservation found 80 percent of sampled stumps had been colonized by *H. annosum*. Nineteen percent of grand fir trees in 0.01-acre plots centered around sampled stumps were infected.

P-Type annosus of ponderosa pine tends to occur in cases of planted offsite stock, severely compacted soils, and poor growing sites. Most annosus in ponderosa pine is found on the Malheur National Forest in the southern Blue Mountains associated with xeric poor quality sites. The incidence of P-Type annosus is expected to decline in the future with improved management guidelines and decline of large tree harvest.

Reports of the disease in mountain hemlock and Pacific silver fir in high-elevation stands in the Cascade Range are also increasing. Annosus root disease in low-elevation western hemlock stands primarily causes butt rot. Impacts are expected to be low unless stands are managed at rotations greater than 120 years.

Region 8: Regionwide

Host(s): Southern pines

Localized mortality and growth loss occurred throughout the South in 2000 due to annosus root disease. Alabama and Texas reported continuing localized losses, with the Texas infections occurring mostly in the northeast corner of the State. In North Carolina, annosus root disease killed southern pine in scattered areas, and was also reported on coastal redcedar. Mountain sites in western North Carolina also saw pockets of mortality. In South Carolina, annosus root disease was responsible for mortality across 5,000 acres of Conservation Reserve Program lands. Impact was exacerbated by drought.

Region 9/Northeastern Area: Wisconsin

Host(s): Red pine

Annosus root disease, which had first been reported in Wisconsin in 1993 killing trees in a red pine plantation in Adams County, was discovered in eight "pockets" (infection centers) in four counties of this State during 2000.

Armillaria root disease,
Armillaria spp.

Region 1: Idaho, Montana

Host(s): Douglas-fir, other conifers

Armillaria spp. is the most broadly distributed of the root pathogens and the most important disease agent, overall. It usually occurs in conjunction with annosus root disease, laminated root rot, or brown cubical root and butt rot. *Armillaria* can kill conifers of all species when they are young, but only Douglas-fir, subalpine fir, and grand fir remain highly susceptible throughout their lives. Consequently, the damage is much greater in the latter species where severe disease often renders formerly forested sites to long-term shrub fields.

Region 2: Colorado, South Dakota, Wyoming

Host(s): Engelmann spruce, Colorado blue spruce, Douglas-fir, hardwoods, lodgepole pine, ponderosa pine, subalpine fir, white fir

Armillaria root disease is the most common root disease in the region. Its impacts continue to be especially evident in the mixed conifer and spruce-fir cover types. *Armillaria* is among the key causal agents contributing to subalpine fir decline, which accounts for the most tree mortality in the Rocky Mountain Region. *Armillaria* incidence in developed recreation sites in Colorado has resulted in heightened awareness among resource managers and numerous tree removal projects. Also in Colorado on the Routt National Forest, many standing spuce selected for attack by spruce beetles emerging from windthrow were found to be infected by *Armillaria*. Although no acreages are available, *Armillaria* is building up in State sections in northeast Wyoming (Crook and Weston Counties). Permanent plots have been established to assess the role of this and other root diseases.

Region 3: Arizona, New Mexico

Host(s): Douglas-fir, ponderosa pine, true firs, spruce, aspen

Armillaria root disease accounts for about 80 percent of the root disease mortality in Region 3. The disease is more common in mixed-conifer and spruce-fir forests than in ponderosa pine forests. The long-term spread and effects of this and other root diseases is being monitored on several sites using a series of permanent plots.

Region 4: Idaho, Nevada, Utah, Wyoming

Host(s): Douglas-fir, grand fir, pine, spruce, subalpine fir

Evidence of Armillaria root disease can be found throughout the region but functioning primarily as a weak pathogen or saprophyte causing little direct mortality. In southern Utah, it may act as a primary pathogen, killing mature and immature ponderosa pine and mature fir and spruce on cool sites at high elevation.

Region 5: California

Host(s): Conifers, some hardwoods

Armillaria root disease was found associated with dead understory, suppressed, and stressed western hemlocks in Jedediah Smith and Prairie Creek State Parks, and Redwood National Park.

Diseases: Native

Region 6: Oregon, Washington

Host(s): Conifers

The most serious losses from Armillaria root disease have occurred east of the Cascade Range in mixed conifer stands. Armillaria root disease continues to be the most severe root disease in northeastern Oregon. It is also the most commonly encountered root disease in eastern Washington. Mortality continues in both disturbed and undisturbed stands. True firs and Douglas-fir sustain the most losses. However, in localized areas, ponderosa pine mortality is significant.

Disturbance and conversion to more susceptible hosts have caused this root disease to increase in occurrence and severity over historic conditions. The world's largest known root disease clone (2,400 acres) has been confirmed on the Malheur National Forest in eastern Oregon. This clone and the adjacent associated Armillaria root disease complex is being investigated by scientists with the Pacific Northwest Research Station, and Oregon State University. A number of other large concentrations of Armillaria root disease are known to exist throughout the Blue Mountains.

In mid- to high-elevation stands in the Cascades of southwestern Oregon, Armillaria root disease causes mortality of several conifer species. Mortality on lower slopes west of the Cascades and in the Coast Range is usually confined to younger, stressed trees. Assessing species resistance on a site-by-site basis and discriminating for the more resistant species during stand management activities are considered the most effective means of limiting spread and mortality.

Black stain root disease,
Leptographium wageneri
Ophiostoma wageneri

Region 3: New Mexico

Host(s): Pinyon pine, Douglas-fir

Both *Leptographium wageneri* var. *wageneri*, affecting piñon, and. *L wageneri* var. *pseudotsugae*, affecting Douglas-fir, are rare in the Southwestern Region. The former has only been confirmed in two isolated areas in northern New Mexico, while the latter has been observed on a single site in southern New Mexico.

Region 4: Idaho, Nevada, Utah

Host(s): Pinyon pine

Aerial detection and follow-up ground surveys have discovered about two-dozen black stain root disease centers in pinyon pine stands in the Intermountain Region. The perennial infections cause periodic mortality of individual pinyon pine over 50 acres of the Bureau of Land Management Burley District in southern Idaho. In Utah and Nevada, where the host is more prevalent, the infected acreage totals 1,150-acres on the Humboldt and Toiyabe National Forests in Nevada, and 1,350-acres of the Dixie and Manti-LaSal National Forests in Utah.

Region 5: California

Host(s): Douglas-fir, Jeffrey pine, pinyon pine, ponderosa pine

Pockets of black stain root disease were found in stressed Douglas-fir south of the Van Duzen River near Dinsmores and in Tannery Campground at Trinity Lake. Incidence was found to have increased dramatically in 30 second-growth Douglas-fir stands on the Happy Camp District, Klamath National Forest. About 40 disease centers have been located about a mile southwest of Prattville in Plumas County and about 20 new centers have been located 3 miles east of Willow Creek Campground on the Modoc National Forest.

Region 6: Oregon, Washington

Host(s): Douglas fir, ponderosa pine

In southwestern Oregon, blackstain root disease is the most commonly encountered disease in Douglas-fir plantations. High-risk areas are those where disturbances, such as road building or soil compaction, have occurred or where road maintenance equipment injured roadside Douglas-firs. Infected larger individuals are found scattered in previously entered forest stands.

Blackstain root disease continues to be observed on ponderosa pine east of the Cascades; it is widespread on the southeastern portion of the Malheur National Forest. Some smaller localized infestations are known in other portions of the Blue Mountains. Blackstain root disease is seen infrequently in eastern Washington. Relationships with natural and prescribed fire, vector insects, and management strategies are being investigated by Pacific Northwest Research Station scientists.

Brown cubical root and butt rot,
Phaeolus schweinitzii

Region 1: Idaho, Montana

Host(s): Douglas-fir, other conifers

Brown cubical root and butt rot is common on mature Douglas-fir throughout its range. Damage occurs mainly as defect and growth loss, rather than mortality, although it is often associated with endemic levels of Douglas-fir bark beetle.

Cytospora canker,
Cytospora abietis

Region 5: California

Host(s): Red fir, white fir

Cytospora canker was widespread and severe near South Fork Mountain on the Shasta-Trinity and Six Rivers National Forests and at Dry Lake Mountain, north of the old Oak Knoll Ranger Station, Klamath National Forest.

Diplodia blight of pines,
Sphaeropsis sapinea (*Diplodia pinea*)

Region 5: California

Host(s): Gray pine, ponderosa pine

Shoot dieback due to Diplodia blight was observed again on ponderosa pines in the upper Sacramento River Canyon. The level of damage was similar to 1999 frequencies. Branches of old growth ponderosa pines were killed in the Goodyears Bar area on the North Yuba River, Sierra County, and there were reports of the disease on ponderosa pine in the West Point and Wilseyville areas of Calaveras County.

Dwarf mistletoes, *Arceuthobium* spp.

Region 1: Idaho, Montana

Host(s): Douglas-fir; lodgepole pine, ponderosa pine, limber pine, whitebark pine, western larch

Lodgepole pine dwarf mistletoe infests approximately 2 million acres (28 percent) of the lodgepole pine type in Region 1 and causes about 18 million cubic feet of growth reduction annually. Douglas-fir dwarf mistletoe infests about 0.6 million acres (13 percent) of Douglas-fir, reducing growth by approximately 13 million cubic feet annually. Western larch dwarf mistletoe occurs on about 0.8 million acres (38 percent) of western larch stands, and reduces annual growth by over 15 million cubic feet. Dwarf mistletoe is locally heavy in ponderosa pine stands around Coeur d'Alene, Idaho, and along the Spokane River drainage in northern Idaho. Limber pine and whitebark pine are heavily infected in localized areas in Montana, with infection being most prevalent east of the Continental Divide.

Region 2: Colorado, Wyoming

Host(s): Douglas-fir, lodgepole pine, ponderosa pine

Dwarf mistletoes cause the greatest amounts of disease losses in the Rocky Mountain Region. Program emphasis continues for landscape-scale surveys and resulting suppression projects where dwarf mistletoe impacts are unacceptable (e.g., developed recreation sites and wood fiber production areas). The disease is especially a concern in developed recreation sites where mortality and severe deformities can lead to structural instability and increased hazard to recreationists. In one campground, 48 percent of trees were rated as moderate to high hazard and 77 percent of lodgepole pine were moderately to severely infected with the parasite. A project was initiated to deal with this situation.

In Colorado, dwarf mistletoe infests approximately 20 percent of the ponderosa pine stands in Colorado's Front Range. Mountain pine beetle populations are currently expanding in many parts of Colorado and together with the presence of dwarf mistletoes, are complicating managers' abilities to meet certain resource management goals. In Wyoming, lodgepole pine dwarf mistletoe is common in the Shoshone National Forest with the majority located at the southern end of the Wind River and Washakie Ranger Districts. Mistletoe is widespread and is a concern throughout these two national forests. A road-plot survey of roads through lodgepole pine stands in the Bighorn National Forest indicated that dwarf mistletoe incidence has increased from 36 percent reported in 1979 to 44 percent in 1999. On State and private lands dwarf mistltoe continues to be a problem in the Green Mountains of Fremont County with approximately 5,000 acres of lodgepole pine being infested.

Region 3: Arizona, New Mexico

Host(s): Pines, Douglas-fir, spruce, true firs

Dwarf mistletoes continue to be the most widespread and damaging agents in the Southwest. Although the abundance and distribution of dwarf mistletoes changes little from year-to-year, incidence is believed to have increased over the past century due to fire suppression and certain management activities. Regionwide, approximately 2.2 million acres of commercial ponderosa pine forested land is infected, contributing to an estimated 25 million cubic feet of volume loss. Although no estimates are available for other host species, infection is heavy in certain areas.

Region 4: Idaho, Nevada, Utah, Wyoming

Host(s): Douglas-fir, pine, true firs, spruce, western larch

Dwarf mistletoes remain the most widespread and frequently observed disease within the Intermountain Region. Regional incidence by major host species is estimated as follows: lodgepole pine 50 percent,

ponderosa pine 20 percent, and Douglas-fir 20 percent infected. These numbers represent the percentage of host stands having some level of infection.

Region 5: California

Host(s): Douglas-fir, pines, true firs

Douglas-fir, gray pine, hemlock, pinyon pine, red fir and white fir dwarf mistletoes were reported from California. There was high and conspicuous mortality of gray pine on the Greenhorn District, Sequoia National Forest. Scattered gray pine mortality was obvious throughout areas adjacent to Lake Isabella. Trees of all sizes were dead or dying, but most were the largest trees in the stands. According to local foresters, once trees began showing symptoms of dieback, they usually faded rapidly and sometimes appeared dead within a period of a few weeks. The most common and consistent factor was a severe rate of mistletoe infection. Many pines had multiple infections on almost every one of their branches. Relatively low levels of pine engravers and woodborers were found associated with some of the dying pines. Additional reports of gray pine mortality were confirmed in the western foothills of the Sierra Nevada and in general, gray pine mortality was greatest in the southern Sierra near Kernville and lessened with travel northward. Mortality and damage associated with the other dwarf mistletoes were not out of the ordinary

Region 6: Oregon, Washington

Host(s): Conifers

Dwarf mistletoes are present on approximately 9.5 million acres of forested lands in the Pacific Northwest Region. Their status changes little from year to year. However, long-term impacts, including reduced growth, mortality, deformity, and top-kill, are significant, particularly in unmanaged stands. Most conifer species are affected to some degree. Douglas-fir dwarf mistletoe is abundant east of the Cascades and in southwestern Oregon. Western larch dwarf mistletoe causes significant effects in northeastern Oregon and eastern Washington. The intensity of dwarf mistletoes in eastern Oregon and Washington and in southwest Oregon is closely related to fire ecology. Lack of frequent, periodic fire in the last century has allowed infection levels to increase on many sites, especially those where mistletoe was not culturally controlled. New management policies including green tree retention requirements, and restrictions on silvicultural treatment of certain sensitive areas and large diameter trees will reduce sanitation opportunities, and allow mistletoe intensification in the future.

Region 10: Alaska

Host(s): Western hemlock

Hemlock dwarf mistletoe is an important disease of western hemlock in unmanaged, old-growth stands throughout southeast Alaska as far north as Haines. Hemlock dwarf mistletoe continues to cause growth loss, top-kill, and mortality in old-growth forests; its impact in managed stands depends on the abundance of large infected trees remaining on site after harvesting. The incidence of dwarf mistletoe varies in old-growth hemlock stands in southeast Alaska from stands in which every mature western hemlock tree is severely infected to other stands in which the parasite is absent. The dominant small-scale (canopy gap) disturbance pattern in the old forests of coastal Alaska favors the short-range dispersal mechanism of hemlock dwarf mistletoe and may explain the common occurrence of the disease here. Infection of Sitka spruce is uncommon and infection of mountain hemlock is rare. The disease is uncommon on any host above elevations of approximately 1,000 feet. The aggressive heart rot fungus *Phellinus hartigii* has been found associated with large mistletoe brooms on western hemlock.

Diseases: Native

Region 9/Northeastern Area: Maine, New Hamphire, New York, Vermont

Host(s): Black spruce, red spruce, white spruce

Severe damage resulting from infection by dwarf mistletoe continued to occur in stands of white spruce in coastal areas of Maine. Evidence of significant mistletoe infestation was noted on coastal headlands and islands from Machias in the east to the Boothbay region in the west. Dwarf mistletoe also frequently occurred on black spruce in inland bogs, and on red spruce in many forest situations. In New Hampshire, New York, and Vermont, dwarf mistletoe infection remained at the same levels noted in previous years.

Elytroderma needle blight,
Elytroderma deformans

Region 1: Idaho, Montana

Host(s): Ponderosa pine, lodgepole pine

Localized areas of heavy infection from Elytroderma needle blight were seen across western Montana in 2000. Elytroderma has been heavy in several areas of western Montana for a number of years: Jette Lake area north of Polson, Bitterroot Valley south of Missoula, and the Belt Creek Canyon east of Great Falls.

Region 5: California

Host(s): Ponderosa pine, Jeffrey pine

Elytroderma needle blight continues to be widespread on Jeffrey pines in the Laguna Mountain area of the Cleveland National Forest.

Fusiform rust,
Cronartium quercuum f. sp. *fusiforme*

Region 8: Regionwide

Host(s): Southern pines, especially loblolly and slash pines

Fusiform rust is the most damaging disease of loblolly and slash pine in the South. Other pine species may also be infected, but generally display little damage or mortality. An estimated 13.9 million acres of loblolly and slash pine have at least 10 percent of the trees infected. Georgia is the most heavily impacted State, with 4.6 million acres (49 percent of host type) affected. Texas surveys showed that the disease has declined there during the past few years. Exceptionally dry weather over much of the South over the last 2-3 years should have resulted in lower-than-normal levels of new rust infections in young pines.

Laminated root rot,
Phellinus weirii

Region 1: Idaho, Montana

Host(s): Douglas-fir, grand fir

Laminated root rot is most severe on sites that historically may have supported mostly western white pine and western larch. These tree species have been replaced by highly susceptible Douglas-fir, grand fir, and subalpine fir with consequent increases in this pathogen. Like *Armillaria*, and usually in conjunction with

Armillaria and/or annosum root disease, this pathogen often converts formerly forested sites to long-term shrub fields.

Region 6: Oregon, Washington

Host(s): Conifers

Laminated root rot is the most serious forest tree disease west of the Cascade Mountains in Washington and Oregon. Overall, an estimated 8 percent of the area with susceptible host species is affected in this portion of the region. Locally, 15 to 20 percent of an area may be affected. East of the Cascades, laminated root rot affects mixed conifer stands north of the Crooked River in central and northeastern Oregon and throughout eastern Washington. Effects of the disease include significant changes in species composition, size, and structure. Regeneration of susceptible species in root disease centers may not grow beyond sapling and pole size. Hardwood trees and shrubs, which are immune to the fungus, often increase their site occupancy.

Oak wilt,
Ceratocystis fagacearum

Region 2: Nebraska, Kansas

Host(s): Red oak, bur oak

Oak wilt continues to be a problem in forests along the eastern edge of the State of Nebraska. Only a few cases were reported in extreme northeastern and southeastern Kansas.

Region 8: Arkansas, Kentucky, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia

Host(s): Live oaks, red oaks

Oak wilt continues to be a devastating tree killer in 60 counties in central Texas. Urban, suburban, and rural oaks are affected. Live oak is a premier shade tree species in the region and is highly valued for beauty, shade, and wildlife benefits. The Texas Forest Service completed the 13th year of a cooperative suppression project. Since the project's inception, more than 2.4 million feet (greater than 450 miles) of barrier trenches have been installed around 2,065 oak wilt infection centers in 34 counties. In North Carolina, activity has been increasing for the past 2 years. Surveys in 2000 showed that there are 33 active oak wilt infection centers involving 53 confirmed infected trees in 5 western North Carolina counties. This area has been documented as having active oak wilt since 1951. In 2000, White and Putnam Counties in Tennessee were aerially surveyed to detect oak wilt activity; no new infection centers were discovered.

Region 9/Northeastern Area: Illinois, Iowa, Indiana, Minnesota, Michigan, Missouri, Ohio, West Virginia

Host(s): Black oak, bur oak, pin oak, red oak, scarlet oak

Oak wilt killed numerous trees in northern Ohio this year, particularly at two disease centers in Cuyahoga and Portage Counties. In West Virginia, aerial oak wilt surveys were conducted in the same counties previously flown for the past 6 years. Active oak wilt disease centers were concentrated in Grant and Hardy Counties, West Virginia. In Minnesota, oak wilt increased in Sherburne and Wright counties due to the previous years' storms, and oak wilt was reported for the first time in Pine County. Oak wilt continued to increase in Michigan in scattered pockets around the Upper Peninsula and northern Lower Peninsula. In Wisconsin, more oak wilt pockets were found this summer in Spread Eagle, Florence County, where all the new sites were located within 1 mile of last year's infection center. Oak wilt caused tree mortality across Iowa with 388 new infected acres reported in 2000.

Ponderosa pine needle cast, *Lophodermella* spp.

Region 3: Arizona, New Mexico
Host(s): Ponderosa pine

Ponderosa pine needle cast was detected on 18,245 acres in 2000, an almost two-fold increase over 1999 when 9,410 acres were recorded. No needle cast was recorded in Arizona. In New Mexico, needle cast was detected on 16,070 acres of State and private lands and on 2,175 acres of the Santa Fe National Forest.

Stem decay, *Basidiomycetes* (many)

Region 10: Alaska

Host(s): All tree species

In southeast Alaska, approximately one-third of the gross volume of spruce/hemlock forests is defective due to heart and butt rot fungi. These extraordinary effects occur where long-lived tree species predominate as in the old-growth forests. The great longevity of individual trees allows ample time for the slow-growing fungi to cause significant amounts of decay. Wood decay fungi play an important role in the structure and function of southeast Alaskan old-growth forests where fire and other forms of catastrophic disturbance are uncommon. By predisposing large old trees to bole breakage, these fungi serve as important disturbance factors that cause small-scale canopy gaps. A completed study investigated how frequently fungi enter wounds of different sizes and the rate of subsequent decay in these wounded trees. Generally, larger, deeper wounds and larger diameter breaks in tops result in a faster rate of decay. Results indicate that heart rot development is much slower in southeast Alaska than in the Pacific Northwest.

Stem decay is the most important cause of volume loss and reduced wood quality in boreal Alaskan hardwood species. Stem decay is considered a limitation on the availability and cost of harvesting timber. In south-central and interior Alaska, incidence of stem decay fungi increases as stands age and is generally high in stands over 100 years old. Stem decay fungi will limit harvest rotation age of forests that are managed for wood production purposes. Studies are currently underway in paper birch forests to identify the most important stem decay fungi and assess the relationships among decay, stand age, presence of decay indicators, and site factors.

Swiss needle cast, *Phaeocryptopus gaumannii*

Region 6: Oregon, Washington

Host(s): Douglas-fir

Swiss needle cast, a fungal disease of Douglas-fir foliage, continues to infect Douglas-fir west of the Cascade Mountain. Over the last several years, a distinctive yellowing of foliage, needle loss, and growth reduction have been observed in coastal Douglas-fir plantations in Oregon and Washington. A combination of favorable climate, plantation age, and genetics may be the cause of severe disease symptoms seen in recent years. In the spring of 2000, 283,000 acres of Douglas-fir forest along the Oregon coast and 410,000 acres in Washington, with obvious symptoms of the disease, were mapped during a special aerial survey. Although this is a decrease of about 12,000 acres in Oregon from the 1999 survey, it would be premature to say that the epidemic there has peaked. Estimates of affected acreage vary from year to year for many reasons including timing of the survey flight and annual variations in disease development due to weather conditions. The 2000 survey mapped a significant increase of symptomatic trees south of Florence, Oregon,

compared to the results of 1999. Ground surveys indicated that Swiss needle cast was present in all Douglas-fir stands throughout the survey area at various levels.

Tomentosus root disease,
Inonotus tomentosus (Fr.) Teng.

Region 10: Alaska

Host(s): Lutz spruce, Sitka spruce, white spruce

In south-central and interior Alaska, tomentosus root rot causes growth loss and mortality of spruce in all age classes. Root disease fungi are capable of spreading from tree to tree through root contacts. Infected trees are prone to uprooting, bole breakage, and outright mortality due to the extensive decay of root systems and lower tree bole. Volume loss due to root diseases can be substantial, up to one-third of the gross volume. In managed stands, root rot fungi are considered long-term site problems because the fungi can remain alive and active in large roots and stumps for decades, impacting the growth and survival of susceptible host species on infected sites. The disease appears to be widespread across the native range of spruce in south-central and interior Alaska, but to date, has not been found in southeast Alaska.

True mistletoes,
Phoradendron spp.

Region 5: California

Host(s): Hardwoods, white fir

True (leafy) mistletoes continue to cause dieback and decline in both hardwoods and conifers in developed recreation sites on all national forests in southern California.

Western gall rust,
Endocronartium harknessii

Region 2: Colorado, South Dakota, Wyoming

Host(s): Lodgepole pine, ponderosa pine

Western gall rust is common throughout Colorado and Wyoming on lodgepole pine and on ponderosa pine in the Black Hills of South Dakota. One stand in northern Colorado was intensely surveyed and 35 percent of the crop trees had main stem cankers. This stand has been surveyed at intervals over the past 40 years. A large increase in infection level to this rust has been noted within the past 15 years.

Diseases: Nonnative

Beech bark disease,
Nectria coccinea var. faginata

Region 8: North Carolina, Tennessee, Virginia

Host(s): American beech

Beech bark disease was not found in any additional counties in 2000, but the disease continues to intensify within the currently affected areas. Beech bark disease was first reported in the Great Smoky Mountains National Park in 1994. However, the first mortality in the South was reported as early as the mid-1980s in northern Virginia. This is well outside the previous known distribution. Tree mortality continues to intensify in Tennessee along the Appalachian Trail and in Blount, Cocke, and Sevier Counties within the Great Smoky Mountains National Park. The disease has intensified at a greater rate than predicted, and is spreading downslope toward the Cherokee National Forest.

Region 9/Northeastern Area: Connecticut, Maine, Massachusetts, Michigan, New Hampshire, New York, Pennsylvania, Rhode Island, Vermont, West Virginia

Host(s): American beech

Beech bark disease disease, now found in a large area of the northeastern United States, was introduced to Maine in the early 1930s. It continued to spread and kill or reduce the quality of beech stems throughout the region. However, the disease does not threaten to eliminate beech from the northeastern forests because some trees are resistant, and even susceptible trees sprout profusely from roots when they are damaged, killed, or harvested. Significantly, this disease was reported during 2000 for the first time in both peninsulas of Michigan. The presence of the beech scale, *Cryptococcus fagisuga*, was confirmed in Ludington State Park, along the Lake Michigan shore in central Lower Peninsula. Subsequently, it was discovered in several areas in the Upper Peninsula as well. Beech mortality and decline are associated with the scale in both locations with the causal agent *Nectria galligena* confirmed in the Upper Peninsula of Michigan.

Dutch elm disease,
Ophiostoma (=Ceratocystis) ulmi and *Ophiostoma novo-ulmi*

Region 1: Idaho, Montana, North Dakota

Host(s): American elm

Dutch elm disease continued to spread in urban areas in North Dakota and Montana. Montana's highest losses are occurring in the cities of Billings and Great Falls. In North Dakota, heavy losses have occurred in both urban areas and in naturally occurring American elms in riparian zones. In Idaho, this disease is common in many communities along the Snake River in southern Idaho, and is slowly working its way into northern Idaho communities. It was discovered in Moscow in 1990, but an aggressive treatment program has limited losses to only a few trees per year for the past several years. It has also been discovered in several nearby communities -- Genesee, in Idaho; Palouse and Pullman, in Washington.

Region 2: Colorado, Kansas, Nebraska

Host(s): American elm

Dutch elm disease losses in urban areas of Colorado, concentrated on the eastern plains, were much below historical levels. While positive cases of the disease are down, possibly correlating with hot/dry weather, surveys indicate an increase in branch dieback and other so-called "broodwood" for the smaller European elm bark beetle vector. If and when moisture cycles become favorable for Dutch elm disease, the potential for losses is considered great. Dutch elm disease continues to be a problem in riparian areas and cities throughout Nebraska. Kansas had numerous reports of Dutch elm disease across much of the State, which is normal.

Region 8: Regionwide

Host(s): American elm

Scattered, localized mortality due to Dutch elm disease continues to occur at low severity levels in urban and wild populations of elm.

Region 9/Northeastern Area: Areawide

Host(s): American elm

Symptoms of Dutch elm disease were conspicuous throughout the Northeastern States. Many old elms that escaped the initial wave of infection now succumb each year, at least partially because more aggressive strains of the disease organism have developed. In Wilmington, Delaware, surveys established that Dutch elm disease incidence increased within the city. Twenty percent of approximately 250 total American elms showed varied types of symptoms. In the District of Columbia, disease surveys conducted on the remaining 8,000 American elms planted throughout the Nation's Capital revealed a disease incidence of 4.9 percent. Infected American elms there have been either pruned or removed in order to help minimize the spread of the disease. In Maryland and Ohio, road surveys determined a continued Dutch elm disease presence in American elms throughout these States. In the Lake States, this disease is endemic throughout the region.

European larch canker, *Lachnellula willkommii*

Region 9/Northeastern Area: Maine

Host(s): Larch

European larch canker, first found on native larch (tamarack) in southeastern Maine in 1981, is now thought to have been in the State since the 1960s. Because larch canker has the potential for serious damage to both native larch stands and reforestation projects using nonnative larches, Maine and other States continue to maintain this disease under State and Federal quarantine.

Littleleaf disease,
Phytophthora cinnamomi

Region 8: Alabama, Georgia, Kentucky, North Carolina, South Carolina, Tennessee, Virginia

Host(s): Loblolly pine, shortleaf pine

Littleleaf disease continues to cause growth loss and mortality across the piedmont areas of the affected States. Shortleaf pine is highly susceptible, while loblolly pine is also affected, but at a later age. Many of the stands that were converted from shortleaf to loblolly to reduce the impact of this disease are now reaching their age of susceptibility. These stands are often attacked by bark beetles once they have been weakened by the root infection.

White pine blister rust,
Cronartium ribicola

Region 1: Idaho, Montana

Host(s): Limber pine, western white pine, whitebark pine

White pine blister rust causes extensive tree mortality throughout the range of western white pine. Mortality of naturally occurring regeneration has virtually eliminated western white pine from many forests. This has resulted in major changes in historical transitions in forest types over broad areas. In moist habitat types, where white pine was historically the dominant species, it has been replaced by climax species such as grand fir, hemlock, and western redcedar. Efforts to restore white pine are concentrated on planting genetically improved stock. We are currently intensifying monitoring efforts to gain a better understanding of how well the improved stock is holding up in the field. In addition, pruning lower branches from natural regeneration is being conducted on a large scale because it can greatly improve survival in some areas.

Blister rust is also causing extensive mortality in high-elevation five-needle pines. Recent surveys in northern Idaho and western Montana high-elevation forests have found infection rates in whitebark pine regeneration of up to 90 percent. There is a growing concern that severe losses of large-diameter whitebark pine due to insects coupled with regeneration losses due to blister rust may have significant impacts on water and wildlife in these fragile ecosystems.

Region 2: Wyoming

Host(s): Limber pine, whitebark pine

White pine blister rust is at low to moderate levels in Wyoming and was discovered in northern Colorado in 1999. Permanent plots for long-term monitoring of the disease were established on the Bighorn and Medicine Bow National Forests in Wyoming; these plots were remeasured in 2000 and the data will be used for monitoring and modeling purposes. Infection levels ranged from 18 to 66 percent of sampled limber pines.

Region 3: New Mexico

Host(s): Southwestern white pine

Blister rust occurs throughout most of the range of southwestern white pine in the Sacramento Mountains, adjoining White Mountains, and nearby Capitan Mountains of southern New Mexico. This area includes two districts of the Lincoln National Forest and the Mescalero-Apache Indian Reservation. Infected white pines are also located on Gallinas Peak, Cibola National Forest, about 50 miles north of the Capitans.

Region 4: California, Idaho, Nevada, Wyoming

Host(s): Limber pine, whitebark pine, bristlecone pine, western white pine, sugar pine

White pine blister rust is common throughout its hosts' range in southern Idaho and western Wyoming. It is present in the western portion of the Intermountain Region in California and Nevada proximal to Lake Tahoe. No infection has been found or reported in Utah. Five-needled pine trees and stands are of low occurrence and frequency in the Intermountain Region. Often relegated to high alpine areas, these pines grow slowly but provide important ecosystem functions such as providing shade and stabilization of snow retention for watershed integrity, recreation, aesthetics, and wildlife habitat and usage.

Region 5: California

Host(s): Sugar pine, western white pine, whitebark pine

Within the Mountain Home Demonstration State Forest, an area affected by the new virulent race of white pine blister rust has expanded west of the forest headquarters and northeast of the headquarters into the general Balch Park area. This virulent race was first detected at Mountain Home in 1996.

Region 6: Oregon, Washington

Host(s): Western white pine, sugar pine, whitebark pine

Cronartium ribicola was introduced to the west coast in 1910. Its impacts include top-kill, branch flagging, and tree mortality. While much of the mortality associated with this disease occurred earlier in the 20th century, its impacts are still great in wild populations of five-needled pines throughout their range. Locally, this disease, in combination with mountain pine beetle, still kills many host trees. Of particular concern are the effects of blister rust in whitebark pine at high elevations in the Cascades and Blue and Wallowa Mountains, and in sugar pine in Southwest Oregon where about 45 percent of stands with host components are affected.

Attempts have been made to aerially identify areas symptomatic of blister rust beginning in 1994. Although blister rust is known to occur extensively throughout the range of susceptible host type, observers mapped approximately 3,100 acres in both 1999 and 2000. Blister rust symptoms are difficult to distinguish from the more easily observed effects of mountain pine beetle. With the exception of blister rust in whitebark pine (which grows at higher elevations and in more open conditions), blister rust is very difficult to detect from the air. The bulk of the reported 3,100 acres mapped in 2000 fell within the Wenatchee and Okanogan National Forests.

An on-going study of whitebark pine stands in eastern Washington has found that 81 percent of the trees are alive, most mortality is more than 10 years old, and in trees greater than 9 inches DBH. Thirty-four percent of the mortality is attributed to blister rust. Ground surveys indicate that blister rust is common in whitebark pine communities in the Seven Devils (Idaho), Elkhorn, and Wallowa Mountains, but scarce in the Strawberry Mountains, and all of northeastern Oregon. A recent survey of whitebark pine along the Pacific Crest National Scenic Trail on the Umpqua National Forest estimated that 50 percent of the whitebark pine were infected by white pine blister rust. Ninety percent of the infected trees had potentially lethal cankers. Topkill caused by blister rust was common.

The Colville National Forest is pruning western white pine plantations to reduce the incidence of lethal blister rust infections.

Region 9/Northeastern Area: Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island, Vermont, Minnesota, Michigan, West Virginia, Wisconsin

Host(s): Eastern white pine

White pine blister rust remained common, but static at moderate levels throughout the Northeastern Area. In Mercer, Monroe, Pocahontas, and Summers Counties, West Virginia, white pine forests over 9,973 acres

were surveyed for this disease. Ground surveys found active blister rust cankers on 144 trees in these West Virginia counties. Blister rust is endemic throughout the range of white pine in the Great Lakes region where the risk of infection is highest. The question of the validity of risk zone maps for white pine blister rust was addressed this year in a comparison study of disease incidence across Wisconsin's four risk zones. Stem cankers occurred on an average of 4.8 percent of surveyed trees, whereas branch cankers were observed on another 3 percent. Incidence levels of rust were significantly higher for trees bordering the edge of plantations where the alternate host, *Ribes*, was present in adjacent woods or fencerows. The proximity of *Ribes* had the greatest influence on the incidence of this disease. The average incidence of infection statewide in New Hampshire was 2.4 percent. In New York, the rust fungus was believed to persist at varying levels of infection with wild *Ribes* species. In Maine, high quality pine timber on 2,970 acres was scouted for *Ribes* plants in the Androscoggin County towns of Livermore, Livermore Falls, Leeds, Greene, and Turner and 1,285 *Ribes* plants were destroyed. Infection levels in Vermont varied and incidence levels as high as 60 percent were found in one pole-sized stand.

Diseases: Origin Unknown

Butternut canker,
Sirococcus clavigignenti-juglandacearum

Region 8: Regionwide

Host(s): Butternut

Butternut canker has been in the South for at least 40 years and is believed to have killed 3 of every 4 butternuts in North Carolina and Virginia. The fungus kills trees of all ages. Butternut canker is expected to spread and kill most of the resource, including regeneration. The species will be replaced by other species on these sites (e.g., black walnut). It is too early to project the benefits of selection and breeding. However, trees exhibiting resistance have been found in Arkansas, North Carolina, Tennessee, Kentucky, and Virginia.

Region 9/Northeastern Area: Areawide

Host(s): Butternut

Incidences of butternut canker continue to occur throughout the Northeastern Area. In Connecticut, 92 percent of monitored butternut trees were infected across the State. Butternut canker was first found in Maine in 1993, and by 2000 had been found in most of Maine except Washington County. In some States, butternut harvesting guidelines are in effect and even harvesting moratoriums exist because there is considerable evidence that resistant individual butternut trees are present within the native population. In New Hampshire, the disease was prevalent statewide. The State continued a project to graft butternut trees that seem to exhibit resistance to butternut canker. This disease has been found in 29 counties in New York. Existing infestations of the canker were reported throughout Rhode Island. In Vermont, the disease was common on butternut trees statewide.

Dogwood anthracnose,
Discula destructiva

Region 8: Alabama, Georgia, Kentucky, North Carolina, South Carolina, Tennessee, Virginia

Host(s): Flowering dogwood

Dogwood anthracnose continues to intensify within its range, although the hot, dry summer weather in 2000 reduced its impact in some States. The cool, wet fall and winter will likely increase the risk in 2001. Three new counties with dogwood anthracnose infection in urban areas were reported in 2000: Harrison County, Kentucky; Lincoln County, North Carolina; and Portsmouth County, Virginia.

Region 9/Northeastern Area: Areawide

Host(s): Flowering dogwood

This disease has spread throughout the range of flowering dogwood in the Northeastern States. The incidence of dogwood anthracnose continued to be prevalent in all three Delaware counties with dead and dying dogwood trees quite noticeable in many areas of the State. Dogwood anthracnose was found in all counties in Maryland. Diseased and dying trees were found in all counties in West Virginia. A new record

for this disease was found in Erie County, New York, bringing the total number of infected counties to 31in that State.

Pitch canker,
Fusarium circinatum

Region 5: California

Host(s): Bishop pine, Douglas-fir, Monterey pine, Monterey pine x knobcone pine

The California Board of Forestry's Coastal Pitch Canker Zone of Infestation is still in effect, and the disease is still a management concern within the zone. Incidence of branch flagging appears to be less than in the several years following initial detection within California in 1986. Populations of several of the insect vectors could be at lower levels. Screening for genetically resistant native and ornamental Monterey pine continued. Recent detection surveys have not found the disease north of Mendocino County, or in central valley counties. Updates on pitch canker within California can be found at the following internet address: www.frap.cdf.ca.gov/pitch_canker/.

Region 8: Regionwide

Host(s): Southern pines

Only scattered trees across the region are infected, but impacts of pitch canker can be locally significant. In Georgia, pitch canker continues to be associated with pine plantations near chicken houses. The ammonia released from the brood houses creates conditions on the trees conducive to infection. The damage is usually confined to the area within the plantation nearest exhaust fans. All species of southern yellow pine (slash, longleaf, and loblolly) are affected. Chicken houses are becoming a common sight throughout the coastal plain of Georgia. Thus, problems with pitch canker are expected to increase there, especially during droughts. Similar problems have been noted in North Carolina when chicken waste has been used as fertilizer in pine plantations.

Port-Orford-cedar root disease,
Phytophthora lateralis

Region 5: California

Host(s): Pacific yew, Port-Orford-cedar

Port-Orford-cedar root disease continues to cause tree mortality in the upper Sacramento River Canyon, but no new areas of infestation have been found. Branch tips were collected from living trees within infested areas and are being tested for disease resistance.

A new infestation was identified near the intersection of Aikens Creek and the old Bluff Creek Road, Six Rivers National Forest, about 2.5 miles from previous known locations. Introduction of the disease may have been by bough collectors. The disease is continuing to spread and intensify within known infested areas along the little Ball Hills Trail in Redwood National Park.

Region 6: Oregon

Host(s): Port-Orford-cedar

Port-Orford-cedar root disease causes mortality of Port-Orford-cedar in southwestern Oregon. Where it has been introduced, the disease causes extensive mortality on sites favorable for infection and spread of its waterborne spores, especially along creeks, in low-lying areas, and below roads where water is channeled. The annual aerial survey reported evidence of the disease on over 4,300 acres (1.48 trees per acre) in 1999, compared with over 5,200 acres (0.97 tree per acre) in 2000. Within these areas, mortality was distributed in scattered pockets or individual trees. On National Forest System lands, slightly less than 10 percent of all Port-Orford-cedar is infected.

Sudden oak death, *Phytophthora ramorum*

Region 5: California

Host(s): California black oak, coast live oak, tanoak

Formerly listed as tanoak and oak decline, this condition is now referred to as "sudden oak death." This new species of Phytophthora has been isolated from affected hosts in the following six counties: Monterey, Santa Cruz, San Mateo, Marin, Napa, and Sonoma. There are other causes of mortality in the area such as *Armillaria mellea*; however, the number of dead trees precludes sampling all mortality for the new pathogen. For specifics on the disease and its occurrence and research updates from the California Oak Mortality Task Force, visit the following internet address: www.suddenoakdeath.org.

Declines and Complexes

Aspen defoliator complex

Western Tent Caterpillar
Malacosoma californicum
Large Aspen Tortrix
Choristoneura conflictana
Black Leaf Spot
Marssonina populi
Weather Related Damages

Region 3: Arizona, New Mexico

Host(s): Aspen

Aspen defoliation caused by a complex of insects, diseases, and abiotic factors decreased almost three-fold from 171,200 acres in 1999 to 63,510 acres in 2000. In Arizona, aspen defoliation occurred on the Apache-Sitgreaves (11,990 acres), Coconino (815 acres), Kaibab (7,535 acres), Prescott (5 acres), and Tonto (290 acres) National Forests; Fort Apache (9,145 acres), Navajo (8,125 acres) and San Carlos (80 acres) Indian Reservations; Bureau of Land Management lands (20 acres) and Grand Canyon National Park (355 acres); and 90 acres of private land. In New Mexico, this complex of defoliators was observed on the Carson (4,480 acres), Cibola (760 acres), Lincoln (560 acres), Santa Fe (6,970 acres), and Gila (635 acres) National Forests; Jicarilla (260 acres) and Mescalero Apache (315 acres) Tribal Lands; Taos Pueblo Indian Reservation (20 acres); and 11,060 acres of State lands in central and northern New Mexico.

Chaparral decline

Region 5: California

Host(s): Chaparral

Chaparral dieback remains extensive in areas on the Mountaintop District, San Bernardino National Forest, and on private lands in the San Jacinto Mountains, Riverside County.

Elm yellows

Region 9/Northeastern Area: Maryland, Ohio, Pennsylvania, West Virginia

Host(s): American elm, slippery elm

In Maryland and Ohio, roadside surveys reported elm yellows in the crown of scattered elms. In Maryland, the disease did not extend eastward beyond Frederick County. In Pennsylvania, the disease was found in several more counties so that now most of the State is affected. In West Virginia, the disease both this year and last has been confined to about 300,000 acres in Morgan, Berkeley, and Jefferson Counties.

Incense-cedar dieback,
Cause undetermined

Region 5: California

Host(s): Incense-cedar

Mortality of incense-cedar in southern California has been increasing over the past few years, and is at a level that is generating concern from State and Federal forestry employees and the public. On pole-size trees the top usually dies first – sometimes with a few branches along one side of the tree – and then the whole tree dies. Saplings may be killed entirely, or have the tops die first, then the entire crown. Bark beetles, presumably *Phloeosinus* spp., are sometimes found, but appear to be secondary. No pathogens have as yet been found to be associated with this mortality. Mortality has been observed over the range of the species in the San Bernardino and San Jacinto Mountains.

Larch casebearer,
Coleophora laricella
Larch Needle Cast,
Meria laricis
Larch Needle Blight,
Hypodermella laricis

Region 6: Oregon, Washington

Host(s): Western larch

Larch needle blight and larch casebearer, which are reported as a complex because of their similar signatures as viewed from the air, declined from 15,836 acres reported in 1999 to less than 7,000 acres in 2000. Larch needle cast increased from 1,924 acres in 1999 to 10,539 acres in 2000, still well below the approximately 65,000 acres reported in 1998. The Mount Hood and Wenatchee National Forests and the Warm Springs Indian Reservation accounted for over 97 percent of the reported acres affected by larch needle cast. Concentrations of infections were quite localized and mainly involved dense thickets of seedlings and saplings. These foliage diseases were most severe in stands of western larch growing in moist grand fir and moist subalpine fir plant associations as well as in riparian areas

Larch stressors

Eastern larch beetle
Dendroctonus simplex
Larch casebearer
Coleophora laricella
Larch sawfly
Pristiphora erichsonii
Variable water levels

Region 9/Northeastern Area: Maine, Vermont

Host(s): Eastern larch

In Maine, native eastern larch and some larch hybrids, continue to exhibit high levels of stress from several factors, including insect defoliators and significantly fluctuating water levels. Areas of mortality continued to increase slightly in 2000. Nearly complete defoliation by larch sawfly has persisted in scattered larch

stands since 1997. Two successive seasons of defoliation has caused branch, top, and whole tree mortality in several areas. In Vermont, larch decline continued in locations where larch casebearer damage has been periodic and the eastern larch beetle often attacked defoliated trees in these stands.

Limber pine decline

Region 1: Montana

Host(s): Limber pine

Limber pine mortality is continuing across scattered locations in central and eastern Montana. In some stands on the Lewis and Clark National Forest, nearly 100 percent mortality has been observed. Data from permanent plots indicate that the mortality is strongly associated with severe defoliation from Dothistroma needle blight, caused by *Dothistroma septospora*. Defoliation from *Dothistroma* was less severe at some locations in 2000. However, defoliation from *Lophodermella arcuata* was severe and widespread. Continued mortality is expected. Other factors thought to be contributing to this decline are winter damage, drought, and competition-related stress.

Oak decline

Region 8: Regionwide

Host(s): Oaks, other hardwoods

The severe summer drought of 1998-1999 continued into 2000. Oaks were particularly impacted in the Ozark and Ouachita Mountains of Arkansas where widespread red oak mortality occurred throughout the north-central part of the State. Oak decline was also severe in the southern Appalachian Mountains, with North Carolina and Virginia incurring heavy losses on south-facing slopes. Similarly, Tennessee noted increased loss of both red and white oak, with white oaks especially hard hit. In Georgia, oak mortality was heaviest on rocky ridges and side slopes in the mountains. Drought is just one component of oak decline, a syndrome resulting in dieback and mortality of dominant and co-dominant mature oaks. Other causal factors are stressors, including frost, defoliation by insects (including the gypsy moth); hypoxylon canker; and secondary pests such as Armillaria root disease and two-lined chestnut borers. Oak decline and gypsy moth have been shown to interact: severe defoliation by gypsy moth can induce oak decline in previously unaffected areas, and in areas of pre-existing oak decline, gypsy moth defoliation causes increased mortality. Host, age, and site conditions also play a role. In the Ozark and Ouachita Mountain areas, an extremely high population of red oak borer is associated with oak decline and mortality (see Native Insects, Red oak borer). Oak decline is on the rise in Tennessee, but at a lower rate of increase than in 1999. This syndrome is believed to have caused 2 percent mortality in some southwest Tennessee counties. Impact in 2000 was exacerbated by drought, which caused greatest impacts on dry, south-facing slopes. The syndrome is frequently associated with *Hypoxylon* canker, especially in western and middle Tennessee.

Subalpine fir decline

Region 2: Colorado, Wyoming

Host(s): Subalpine fir

Subalpine fir decline was the most widespread damage detected in Region 2 in 2000. It is poorly understood, but it is thought that a combination of insect (western balsam bark beetle, *Dryocetes confusus*) and disease (*Armillaria* or other root diseases) play a role in tree decline and mortality. In Colorado, an

estimated 586,554 recently killed trees on 207,315 acres were detected by aerial survey. In Wyoming, the totals are 100,881 trees on 44,143 acres. An enlarged aerial survey of the Bighorn National Forest showed that roughly 72,069 subalpine fir located on 33,142 acres are affected by subalpine fir decline. A total of 7,759 trees on 4,200 acres were affected by this decline in the Shoshone National Forest. In the Bighorn and Shoshone National Forest, fir decline is increasing and will continue to become a more significant problem. It may be that windthrow from a few years ago is partially responsible for this increase on these national forests and on the Routt National Forest in Colorado (see the section on western balsam bark beetle).

Subalpine mortality complex

Region 1:

Host(s): Subalpine fir

Areas in which subalpine fir mortality (not attributed to balsam woolly adelgid) were observed remained high in 2000. Because of fire-related adjustments to aerial detection surveys, many areas containing epidemic levels of mortality in recent years were not flown in 2000. Direct comparisons of infested areas from 1999 to 2000 were, therefore, not feasible. Had all areas known to harbor western balsam bark beetle populations been flown, the infested area likely would have exceeded that recorded in 1999. Much of the mortality occurring on these high-elevation sites results from varying combinations of root diseases, bark beetles, and perhaps other factors such as climatic change. The most significant single factor, however, is thought to be mortality directly or indirectly caused by western balsam bark beetle (*Dryocoetes confusus*). In 1999, more than 80,800 acres showed some level of mortality -- generally 1 to 2 trees per acre. On most, western balsam bark beetle was regarded as the primary causal agent. In 2000, an estimated 74,200 acres, on which more than 91,300 subalpine firs had been killed, were recorded. Forests most affected were the Idaho Panhandle and Nez Perce National Forests in northern Idaho, and the Beaverhead National Forest in western Montana.

Yellow-cedar decline

Region 10: Alaska

Host(s): Yellow-cedar

Decline and mortality of yellow-cedar persists as one of the most spectacular forest problems in Alaska. Approximately 478,500 acres of yellow-cedar decline have been mapped across an extensive portion of southeast Alaska. Ground surveys show 65 percent of the basal area of yellow-cedar is dead on this acreage. Research suggests that the total acreage of yellow-cedar decline has been increasing very gradually; the slow increase in area (less than 3 feet/year) has been a result of the expansion of existing decline into adjacent stands. Most stands contain snags that died up to 100 years ago, recently killed cedars, dying cedars (with yellow, red, or thinning crowns), healthy cedars, and other tree species. Yellow-cedar snags accumulate on affected sites and forest composition is substantially altered as yellow-cedar die, giving way to other tree species. Regionwide, this excessive mortality of yellow-cedar may lead to diminishing populations (but not extinction) of yellow-cedar, particularly when the poor regeneration of the species is considered. Salvage opportunities for this valuable resource are now being recognized.

All research suggests that contagious organisms are not the primary cause for this extensive mortality. Some site factor, probably associated with poorly drained anaerobic soils, appears to be responsible for initiating and continuing cedar decline. Two hypotheses have been proposed to explain the primary cause of death in yellow-cedar decline: 1) Toxins are produced by decomposition in the wet, organic soils, or 2) shallow fine roots are damaged from freezing, associated with climatic warming and reduced insulating snowpack in the last century.

Seed Orchard Insects and Diseases

Coneworms,
Dioryctria amatella
Dioryctria clarioralis
Dioryctria disclusa
Dioryctria merkeli

Region 8: Regionwide

Host(s): Southern pines

Coneworms again caused approximately a 25-percent cone loss in untreated areas of a pine seed orchard in Texas in 2000.

Pitch canker,
***Fusarium subglutinans* f. sp. *pini (=F. circinatum* Nirenberg & O'Donnell)**

Region 8: Regionwide

Host(s): Southern pines

About 10 percent of the cone crop in the Texas State seed orchard was affected by pitch canker in 2000.

Seed bugs,
Leptoglossus corculus
Tetyra bipustata

Region 8: Regionwide

Host(s): Southern pines

Seed bugs were abundant in untreated pine seed orchards in Texas in 2000, damaging about 24 percent of seed.

Southern cone gall midge,
Cecidomyia bisitosa

Region 8: Florida

Host(s): Slash pine

An unusual outbreak of southern cone gall midge, an extremely infrequent pest problem, continued to cause undesirable losses in one industrial seed orchard in Nassau County for the second year in a row. Among susceptible clones examined, average infestation rates of first year conelets ranged from 19-65 percent. Individual ramets exhibited infestation rates of 0-100 percent. Most infested conelets fail to reach maturity or yield any viable seed at harvest. The estimated value of seed lost in 2000 was $4,600.

Southern cone rust, *Cronartium strobilinum*

Region 8: Florida

Host(s): Slash pine

Cone rust continued to cause problems in several industrially owned slash pine seed orchards. Infection levels ranged from 4-11 percent.

Nursery Insects and Diseases

Abiotic damage,

Region 6: Oregon

Host(s): Conifers

At the Dorena Genetics Resource Center, 3-year-old seedlings on the south side of white pine blister rust test blocks were scorched from heat and drought during the summer. Ninety percent of the infected trees had potentially lethal cankers.

Cranberry girdler moth,
Chrysoteuchia topiaria

Region 1: Idaho

Host(s): Douglas-fir, western larch, Engelmann spruce

The cranberry girdler moth is a continual problem at the USDA Forest Service Nursery in Coeur d'Alene, Idaho. This insect causes damage to bareroot Douglas-fir, western larch, and Englemann spruce seedlings by feeding on root crown tissues just below the ground level. Pheromone monitoring traps are used to determine adult populations; based on population monitoring, insecticide applications may be used periodically to limit damage.

Region 6: Oregon

Host(s): Conifers

Trapping for adult cranberry girdler moths at the USDA J. Herbert Stone Nursery showed significant numbers above the threshold. Both the true fir and Douglas-fir were treated with one application of chlorpyrifos. The treatment was made earlier in the season, and was more effective than in previous years. Damage levels detected at packing for these species were less than 5 percent.

Cypress canker,
***Seiridium* spp.**

Region 6: Oregon

Host(s): Port-Orford-cedar

Cypress canker caused stem cankers and branch mortality on several Port-Orford-cedar at the Dorena Genetics Resource Center. All the infected trees were destroyed.

Damping-off,
Fusarium spp.
Pythium spp.

Region 6: Oregon

Host(s): Conifers

The USDA J. Herbert Stone Nursery experienced less than 5 percent mortality to damping-off. Fumigation, early sowing, deep watering, and delayed fertilization helped control damping-off. Pythium damage was seen in a small patch of sugar pine plug+1's.

Region 8: Regionwide

Host(s): Southern pines

Damping-off is the most common disease problem facing southern nurseries. Loss of seedlings to damping-off varies greatly from year to year owing to the interaction of pathogenic fungi (species of *Fusarium*, *Pythium*, *Rhizoctonia,* and *Phytophthora*) and environmental conditions. Seedling losses can be severe when germination is slow due to cold, wet weather. Losses in 2000 were lower than normal due to the very dry weather, which inhibits fungus development. Nevertheless, North Carolina reported scattered damping-off in southern yellow pine and white pine seedbeds.

Fusarium root disease,
Fusarium spp.

Region 1: Idaho, Montana

Host(s): Conifers

Damage levels during 2000 were normal at most nurseries. *Fusarium* diseases are most commonly controlled by pre-plant soil fumigation in bareroot nurseries and seed and fungicide treatments in container nurseries.

Region 6: Oregon

Host(s): Conifers

The USDA J. Herbert Stone Nursery experienced a slightly higher incidence (5+ percent) of mortality due to root and shoot Fusarium infections during the 1+0 year due to high growing season temperatures. Cooling by irrigation helped to limit losses. Two seedlots of western white pine were severely diseased, because nonfumigated soil was inadvertantly mixed into the seedbeds by the bedformer at the time of sowing.

Gray mold,
Botrytis cinerea

Region 1: Idaho, Montana

Host(s): Western larch, Engelmann spruce, western red cedar, western white pine

Botrytis cinerea is an important disease of container-grown western larch, Englemann spruce, western red cedar, and western white pine seedlings in container nurseries in Region 1. Damage from this pathogen during 2000 was about average; some western larch seedlots were extensively damaged at one nursery. This disease is best prevented by careful monitoring and sanitation procedures. When the disease is discovered, fungicide applications, alternating several different chemicals, are implemented. *Botrytis* can also cause important damage to cold-stored seedlings after lifting and prior to outplanting. Storing seedlings at below-freezing temperatures and rapidly thawing them prior to outplanting restricts pathogen development.

Region 6: Oregon

Host(s): Conifers

There were no significant losses at the USDA J. Herbert Stone Nursery or Dorena Genetics Resouce Center due to Botrytis.

Lygus,
Lygus hesperus

Region 6: Oregon

Host(s): Conifers

Trapping at the USDA J. Herbert Stone Nursery showed high numbers of adult lygus insects, and damage thresholds were reached. Three treatments of Pydrin were made on the 1+0 crop from late June through July. After this, bug-vac treatments were repeated every 7-10 days until late September. Lygus damage at the time of packing was negligible.

Phomopsis needle blight,
Phomopsis spp.

Region 2: Nebraska

Host(s): Eastern redcedar , Rocky Mountain juniper

In Nebraska, Phomopsis blight, *Phomopsis juniperovora*, caused minimal damage to the eastern redcedar and Rocky Mountain juniper crops at Bessey Nursery during 2000. Blighted 2-0 seedlings from 1999 were lifted and outplanted in Nebraska, Iowa, and South Dakota. The survival of these damaged seedlings will be monitored for 2 years and results used to improve seedling production and marketing at the nursery. Work still continues at Bessey Nursery to find an alternative to presow methyl bromide fumigation of soils for destroying soil-borne pathogens. Several nursery beds were treated with methyl bromide, dazomet, and solarization, then planted with Eastern redcedar in 1998. Analyses for seedling quality and soil pathogen populations were done throughout the study and will be summarized in 2001.

Phytophthora root rot,
Phytophthora spp.

Region 1: Idaho

Host(s): Western larch

Root diseases caused by *Phytophthora cactorum* and *P. megasperma* were damaging in low, poorly drained portions of 2-0 western larch seedbeds at the USDA Forest Service Nursery in Coeur d'Alene, Idaho, in 2000. Affected seedlings were treated with fungicide drenches, which helped reduce disease impacts.

Pythium root disease,
Pythium spp.

Region 1: Idaho, Montana

Host(s): Conifers

Root diseases caused by *Pythium* spp. are common in poorly drained portions of bareroot seedling beds. Root diseases of bareroot western larch seedlings associated with *P. irregulare*, *P. ultimum*, and *P. aphanidermatum* were damaging at the USDA Forest Service Nursery in Coeur d'Alene, Idaho, during 2000. Affected beds were treated with fungicide drenches, which reduced disease severity.

Rhizoctonia needle blight,
***Rhizoctonia* spp.**

Region 8: Regionwide

Host(s): Longleaf pine

Losses due to Rhizoctonia needle blight were reported from North Carolina in 2000, but not at abnormal levels. Over 85,000 seedlings were lost to this disease in 2000 in South Carolina's Taylor State Tree Nursery.

Rough bullet gall

Region 2: Colorado

Host(s): Bur oak

Rough bullet gall caused by a cynipid wasp (*Disholcaspis quercusmamma*) is now widespread on ornamental bur oaks throughout the Front Range area of Colorado. Presumably this is the source of the infestation at the Colorado State Forest Service Nursery in Fort Collins and has resulted in culling of entire oak seedling crops in recent years.

Shothole leaf fungus
Blumeriella (=Coccomyces) spp.

Region 2: Colorado

Host(s): Chokecherry

In Fort Collins, Colorado, chokecherry (*Prunus virginiana*) in the Colorado State Forest Service Nursery is beginning to experience problems with a shothole leaf fungus (*Blumeriella (=Coccomyces) spp.)* not seen in past years

Storage molds

Region 6: Oregon

Host(s): Conifers

There were no significant storage mold incidences noted during the past season. Freezer storage is recommended for most clients.

Tip dieback,
Sirococcus strobilinus

Region 1: Idaho

Host(s): Conifers

During 2000, extensive tip dieback caused by *S. sirococcus* occurred on 2-0 ponderosa and lodgepole pine seedlings at the USDA Forest Service Nursery in Coeur d'Alene, Idaho. The disease caused more damage than normal because of prolonged cool, wet spring weather that persisted in northern Idaho. Fungicide applications were not very effective in limiting disease buildup until warmer and drier weather occurred in early summer.

Abiotic Damage

Air pollution

Region 5: California

Host(s): Jeffrey pine, ponderosa pine

Twenty-seven ozone injury trend plots on the Sequoia National Forest were assessed for foliar injury. In the 2 years since the plots were last rated, 9 plots showed increased injury, 7 showed less injury, and 11 experienced no change. Most changes were slight and do not represent any major shifts in injury patterns. Low elevation plots remain the most severely impacted and high elevation plots generally have very little chlorotic mottle.

Drought effects

Region 3: Arizona

Host(s): Ponderosa pine, live oaks, manzanita

Discoloration believed to be due to drought occurred on 124,634 acres in Arizona. Damage occurred in ponderosa pine and shrubland habitats. Discoloration occurred on the Apache-Sitgreaves (11,945 acres), Coconino (28,968 acres), Coronado (4,628 acres), Kaibab (31,164 acres), Prescott (32 acres), and Tonto (4,828 acres) National Forests; Hualapai (90 acres), Navajo (30,397 acres), White Mountain Apache (7,086 acres), and San Carlos (15 acres) Tribal Lands; Bureau of Land Management lands (27 acres); Grand Canyon National Park (2,818 acres) and Canyon de Chelly (129 acres) and Walnut Canyon (82 acres) National Monuments; Navajo Army Depot (64); and State (152) and private lands (2,209).

Region 8: Regionwide

Host(s): All species

Drought conditions prevailed over much of the South again in 2000, for the third consecutive year.

In Texas, temperatures reached record high levels with 105-110 degrees occurring over several days at a stretch. Seedling mortality was high on many tracts planted during the winter of 1999-2000. Cone mortality of 50 percent of second-year cones in the State seed orchard near Jasper was attributed to the record drought and heat. Drought has led to higher than normal populations of *Ips* pine engraver beetles (see Native Insects, Pine engraver beetle) and increased oak decline and dieback (see Declines/Complexes, Oak decline).

Georgia suffered some of the worst drought on record in 2000. Georgia Forestry Commission officials estimate that loblolly and slash pine seedling mortality averaged 30 percent. Among longleaf pine seedlings, mortality sometimes reached 90 percent, but statewide, survival rates averaged 36 percent. Nearly 149 million seedlings died in Georgia due to drought. The estimated value of lost trees was nearly $4.5 million. The drought, in combination with hypoxylon canker, also killed an estimated 154,000 oaks in Georgia.

Drought was less intense in Tennessee in 2000 than in the previous two summers, but the cumulative effect caused continued mortality in the oak/hickory forest type. In west Tennessee, the drought caused noticeable yellow poplar decline and mortality.

In Florida, a third successive year of drought occurred across virtually the entire State. As a result, the State saw a dramatic increase in stress-related pest activity and associated tree mortality or damage.

Abiotic Damage

Among the secondary insects and diseases proliferating in the weakened trees were *Ips* beetles, black turpentine beetle, redheaded pine sawfly, Kermes scale, two-lined chestnut borer, ambrosia beetles, and hypoxylon canker.

Region 9/Northeastern Area: Delaware, Indiana, Maryland, Massachusetts, Missouri, New York, Ohio, New Jersey, Pennsylvania, Rhode Island, Vermont, West Virginia

Host(s): Red oak, hardwoods, softwoods

In the mid-Atlantic region, the wet spring of 2000 improved growing conditions for trees over the marginal growing conditions that existed during the severe drought of the previous year. However, the lingering effects of the 1999 drought persisted in the oak forests of Delaware where red and white oaks showed stress symptoms by refoliating early in the year. Likewise, trees in Pike County, Pennsylvania, showed symptoms of dieback and decline on 460 acres. In Indiana, the drought of 1999 was so debilitating that certain tree species (yellow poplar and oaks) showed significantly altered crown conditions (reduced density and increased transparency) on about half the State's 4.5 million forested acres. The growth of yellow poplar in all size classes declined to such a degree in south central Indiana, that foresters favored their selective removal during harvesting. In Missouri, the impacts of continuing record-setting drought conditions was the overriding forest health concern this year as warm, dry weather patterns initiated in July 1999 generally continued throughout the winter and spring of 2000. Except for a break in the dry weather patterns from the wettest June on record, the hot and dry conditions returned in late summer to southern and western Missouri. Despite high precipitation amounts in June and near normal rainfall in some areas later in the year, subsoil moisture levels remained low in many locations. By November 2000, some locations in southern Missouri had an accumulated precipitation deficit of more than 20 inches. Many trees, especially street trees, in Massachusetts showed signs of stress from the 1998 and 1999 drought. Some trees in southeastern New York and the Lower Hudson Valley showed the effects of stress caused by the 1999 drought. The most severe effects appeared on ridge tops and other areas with shallow soils. Northern white cedar, eastern white pine, and eastern hemlock mortality in the Lake George and Lake Champlain region occurred. Many tree species in Rhode Island showed signs of drought stress from the previous three growing seasons. Green ash and white ash were particularly affected, with thin tufted crowns. In Vermont, symptoms incited by the 1999 drought were observed on a variety of species, especially ash, maple, hemlock, red spruce, and white pine. The symptoms were especially common for trees growing on disturbed, wet, or shallow sites, or those with physical wounds.

Fire

Region 8: Florida, Oklahoma

Host(s): All species

For the third year in a row, fire (both wildfire and prescribed burns) generated an inordinate incidence of tree mortality. This situation was aggravated by the drought. Besides outright fire-caused mortality, many trees succumbed to secondary insects and diseases that exploited the trees' fire-weakened condition. Massive wildfires throughout Oklahoma from August through October 2000 caused mortality, but also predisposed trees to a variety of opportunistic pathogens and insects. The long-term effects of the fires will be monitored throughout 2001.

Flooding

Region 8: North Carolina

Host(s): All species

Although there was no noteworthy flooding in North Carolina in 2000, foresters continued to monitor stands damaged in 1999 for secondary insect and disease problems such as southern pine beetle and root rots. These problems have yet to manifest themselves, but history has shown that in time, stressed forest stands will develop problems associated with insects and diseases that take advantage of the weakened state of the trees.

Frost

Region 9/Northeastern Area: Pennsylvania

Host(s): American beech

In Pennsylvania, frost damaged American beech foliage on 100,000 acres in Tioga County and discolored foliage on another 455 acres in Lackawanna County.

Ice/snow damage

Region 8: Arkansas, Oklahoma, Texas

Host(s): All species

The winter of 2000 may well go down in history as the year of ice for several western Gulf States. Two major ice storms hit portions of northeast Texas, southeast Oklahoma, and much of central and southern Arkansas. The storms occurred on December 14 and 24. One to two inches of ice accumulation bowed, broke, and uprooted trees. Hundreds of thousands of acres of young pine plantations were completely destroyed and will have to be replanted. Texas authorities estimated a loss of $46 million in timber values in four northeastern counties. In Oklahoma, widespread damage to trees was reported across about 6 million acres in 39 counties. The long-term impacts of this storm will be a significant factor in Oklahoma's forests for the next 5-7 years.

Region 9/Northeastern Area: Maine, New Hampshire, New York, Vermont

Host(s): Various hardwoods and conifers

Throughout the affected area, most surviving trees damaged by "The Ice Storm of 1998" showed significant crown recovery. Tree species that can sprout from damaged portions of their crowns displayed lush foliage because of the substantial spring and early summer moisture. Species that recovered best from the significant crown loss in 1998 include white ash, red oak, and sugar maple. Despite the fact that certain trees lost up to 75 percent of their crowns during the ice storm, new crowns subsequently developing in these stunted trees appear normal. Several other species, such as aspen and red maple, showed a lesser degree of crown improvement. By contrast with these hardwoods, softwood species that lost significant portions of their crowns showed little or no crown recovery. Several hardwood species such as birch and American beech apparently lack the ability to rebuild their crowns significantly through sprouts, and consequently, have shown little or no recovery.

Salt damage

Region 5: California

Host(s): Lodgepole pine

Many roadside lodgepole pine trees are showing extreme symptoms of salt damage along Interstate 80 between Donner Lake and Blue Canyon. Needle tip dieback is very apparent on trees within about 50 feet of the roadsides.

Weather

Region 2: Colorado, South Dakota

Host(s): Various

Areas of unexplained ponderosa pine yellowing in Colorado were noted during aerial and ground surveys in Ute Pass (west of Colorado Springs), Aiken Canyon (south of Colorado Springs) and the Beulah area of the Wet Mountains. Much of the Front Range experienced heavier than normal fall needledrop from ponderosa pine and other conifers, presumably in response to the previous hot, dry winter and summer periods.

In South Dakota, a large hail storm damaged around 2,000 acres in the Black Hills. Damage varied considerably and the health of the trees is still to be determined. Ponderosa pine affected by the hail may become infested with diplodea or *Ips*. The oaks and other hardwood species will probably survive with minimal setbacks. A wind/snow event occurred in April of 2000. This storm affected most of the eastern and southern Black Hills. It impacted about 661 square miles of private land. This amounts to 423,040 acres of private land containing about 5,288 miles of State and private roadway.

Region 5: California

Host(s): Incense-cedar, pines, white fir

About 15,000 acres of natural regeneration within the 1994 Cottonwood Wildfire suffered winter injury due to low temperature. Seedlings range in age up to 6 years and in height up to 3.5 feet. About 30 percent of the seedlings had some dead foliage and a very small percentage (less than 1 percent) were killed. The regeneration is dominated by pines, but all species were affected. By late August most of the injured seedlings had active shoot growth.

Region 5: California

Host(s): Blue oak, Douglas-fir, maples, Monterey pine, redwood

Maple leaf scorch occurred in late spring and early summer along Indian Creek, North Fork of the Feather River, and North Yuba River drainages in Plumas and Sierra Counties. It was also reported to be heavy in the Magalia/Paradise area, Butte County.

Branch tip dieback occurred on southern and western exposures of ornamental Douglas-firs, Monterey pines, and redwoods in Mendocino and Sonoma Counties after exposure to two consecutive days of mid-June temperatures of 110 to 118 degrees F. Leaves of mature blue oaks near Ukiah were also scorched.

Wind

Region 2: Colorado, Wyoming

Host(s): Engelmann spruce

Over the last 4 years, wind events have created large amounts of blowdown in high elevation spruce throughout the western slope of Colorado. This blowdown has contributed to the increase of spruce beetle populations in the area. Spruce beetle moved from the blowdown into green standing trees in 2000 and mortality in green standing trees is expected to increase dramatically in 2001 and 2002.

Region 8: Tennessee, Texas

Host(s): Southern pines, hardwoods

An April 23 tornado touched down in Harrison County, Texas, near Marshall causing a narrow, 5-mile-long strip of broken and twisted timber. A tornado damaged 500 acres of red oak, white oak, and yellow pines in a northcentral State forest in Stewart County, Tennessee.

Region 9/Northeastern Area: Minnesota**,** New Hampshire, New York, Pennsylvania, Wisconsin

Host(s): Various hardwoods species

Wind damage in Minnesota this year dropped dramatically to 1,740 acres from the 465,882 acres of catastrophic damage in 1999. Trees on 50 acres blew down along the edge of Umbagog Lake in Coos County, New Hampshire. On another 600 contiguous acres in Essex County, New York, extensive branch breakage was common from a late August windstorm. A 20-acre area of maple, beech, and birch trees in Potter and Tioga Counties, Pennsylvania, was damaged by high winds. Wind and hail damage from three separate storms affected 208,583 acres across Wisconsin.

Appendixes

Appendix A

Forested Areas*

About one-third of the Nation's land area, 736.7 million acres, is forested -- 380.3 million acres (52 percent) in the East, 227.3 million acres (31 percent) in the continental West, and 129.1 million acres (17 percent) in Alaska. By ownership nationwide, 42 percent of the acreage is in public ownership and 58 percent is in private ownership. Of the public ownership, 20 percent is in the East, 48 percent in the continental West, and 32 percent in Alaska. In contrast, 75 percent of the private ownership is in the East, 18 percent in the continental West, and 7 percent in Alaska.

Eastern hardwood forests make up 74 percent of all the forested acreage in the East. The largest component of the eastern hardwood forest type is oak-hickory, which occupies 130 million acres, or 34 percent, of the eastern forested acreage and is found in the South and the southern half of the North.

The beech-birch-maple forests occur on 51 million acres, or 13 percent, of the eastern forests and are located in the North.

The oak-pine forests occupy 32 million acres, or 8 percent, of the eastern forested acreage and are located in the South, as are the oak-gum-cypress forests, which occur on 29 million acres, or 8 percent, of the eastern forested acreage.

The aspen-birch forests occupy 17 million acres, or 4 percent, of the eastern forested acreage and are located in the North. The elm-ash-cottonwood forests on 15 million acres, or 4 percent, of the forested acreage are bottom land forests in both the North and South. Other forest types occupy 13 million acres, or 3 percent, of the forested acreage in the East.

Eastern softwood forests make up the remaining 26 percent of the eastern forested acreage. The loblolly-shortleaf pine forests occupy 50 million acres, or 13 percent, of the eastern forested acreage and occur in the South. Also in the South are the longleaf-slash pine forests, which cover 14 million acres, or 4 percent, of the forested lands.

The spruce-fir forests are on 20 million acres, or 5 percent, of the forested lands and the white-red-jack pine forest on 15 million acres, or 4 percent, of the forest lands; both are in the North.

Western hardwood forests occupy 49 million acres, or 14 percent, of the western forested acreage, including that in Alaska. The primary species are oaks in California, aspen in the Intermountain Region, and red alder in the Pacific Northwest.

Western softwood forests make up 86 percent of all the western forests. Douglas-fir forests occupy 43 million acres, or 12 percent, of the western forest lands. Douglas-fir is found throughout much of the West except Alaska.

Ponderosa pine forests occupy 31 million acres, or 9 percent, of the forested acreage; the species is present through much of the West. Lodgepole pine is also found throughout much of the West. It is most abundant in the Intermountain Region, occupying 18 million acres, or 5 percent, of the forested acreage.

Hemlock-Sitka spruce forests are found on the Pacific Slope in Oregon and Washington and along coastal Alaska. These forests occupy 16 million acres, or 5 percent, of the forested lands. The fir-spruce forests occupy 60 million acres, or 17 percent, of the acreage and are mid-to-high elevation forests throughout the West.

The other softwoods group is made up primarily of black spruce stands in interior Alaska and occupies 70 million acres, or 20 percent, of the forested land in the West.

The pinyon juniper type occupies 48 million acres, or 14 percent, of the forested acreage.

Other western types (western white pine, larch, redwood, chaparral, and nonstocked areas) occupy 17 million acres, or 5 percent, of the western forested acreage.

* Data may not add to totals because of rounding

From: Powell, Douglas S.; Faulkner, Joanne L.; Darr, David R.; Zhu, Zhiliang; MacCleery, Douglas W. 1993. Forest resources of the United States, 1992. General Technical Report RM-234. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. 132p.+map. [Revised, June 1994]

Appendix B

Reporting Area

Reporting area is defined as an area of land designated by the name of the Federal or tribal land (in most cases) included in the area, but also contains intermingled and adjacent lands of all ownerships. Reporting areas border on each other to include all lands. The name of the reporting area defines its location; for example, the Mount Hood reporting area includes the Mount Hood National Forest and vicinity.