United States
Department
of Agriculture

Forest Service

Forest Health Protection

February 2003

Forest Insect and Disease Conditions in the United States 2001

Healthy Forests Make A World of Difference

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PREFACE

This is the 51st 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 2001. 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 USDA Forest Service office listed on the next page (see map for office coverage) or your State forester.

The USDA 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.

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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 remained at a high level as one of the worst southern pine beetle outbreaks ever recorded continued. Beetle populations in some areas were so high that large numbers of eastern white pine were killed. Over 12.3 million acres were affected in 2001 compared to about 12.1 million acres in 2000.

Mountain pine beetle – affected acreage increased from 465,900 acres in 2000 to 849,300 acres in 2001.

Spruce budworm – activity remained at a very low level in 2001; only 23,000 acres of defoliation were recorded compared to 28,500 acres in 2000.

Western spruce budworm – defoliation acreage continued to increase slowly, from 618,300 acres in 2000 to 783,700 acres in 2001.

Spruce beetle – spruce beetle activity increased in all areas of the West, even in Alaska where 1.85 million acres were affected over the last 6 years.

Insects: Nonnative

Asian longhorned beetle – eradication efforts continue in New York and Chicago. Only one adult beetle was observed in Chicago in 2001.

Gypsy moth (European) – gypsy moth activity continued at a high level in 2001, with 1,706,000 acres of defoliation recorded. In 2000, gypsy moth defoliation totaled 1,623,500 acres.

Common European pine shoot beetle – this beetle, first found in Ohio 10 years ago, continued to spread in 2001. Currently, it has been detected in 13 States from Maine to Wisconsin. No significant impact has yet been reported in the United States.

Hemlock woolly adelgid – populations of this very serious pest increased alarmingly in 2001 and now threatens almost the entire range of eastern hemlock.

Pink hibiscus mealybug – first discovered in Grenada in 1994, this insect has since spread to the U.S. Virgin Islands and Puerto Rico. Florida remains uninfested.

Diseases: Native

Fusiform rust – is the most damaging disease of pines in the South, affecting an estimated 13.8 million acres of loblolly and slash pines.

Dwarf mistletoes – are native parasitic plants that occur on a wide range of conifers and are the most serious diseases of trees in the West. Tree species most affected include ponderosa pine, Douglas-fir, lodgepole pine, western hemlock, western larch, and true firs. Dwarf mistletoes are usually host-specific and have patchy distributions within stands and across larger landscapes. An estimated 28.8 million acres have some level of infection.

Diseases: Nonnative

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

White pine blister rust – introduced around the turn of the 20th century, it now occurs throughout the ranges of five-needled pines and has caused extensive tree mortality. Some areas of the West, notably Arizona, Utah, and portions of California, Nevada, Colorado, and New Mexico, remain rust free.

Diseases: Origin Unknown

Butternut canker – the fungus that causes this disease was identified in the late 1970s and can be found throughout most of the natural range of butternut. The pathogen kills large trees, saplings, and regeneration causing multiple cankers under the bark that merge and kill the tree. This disease is a serious threat to the survival of the species.

Sudden oak death – caused by *Phytophthora ramorum*, this recently recognized disease is killing oaks and other plant species in California and a small portion of southwestern Oregon. First reported in 1995, the disease has been confirmed in coastal areas north and south of San Franciso and in southwestern Oregon.

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 2001, 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.

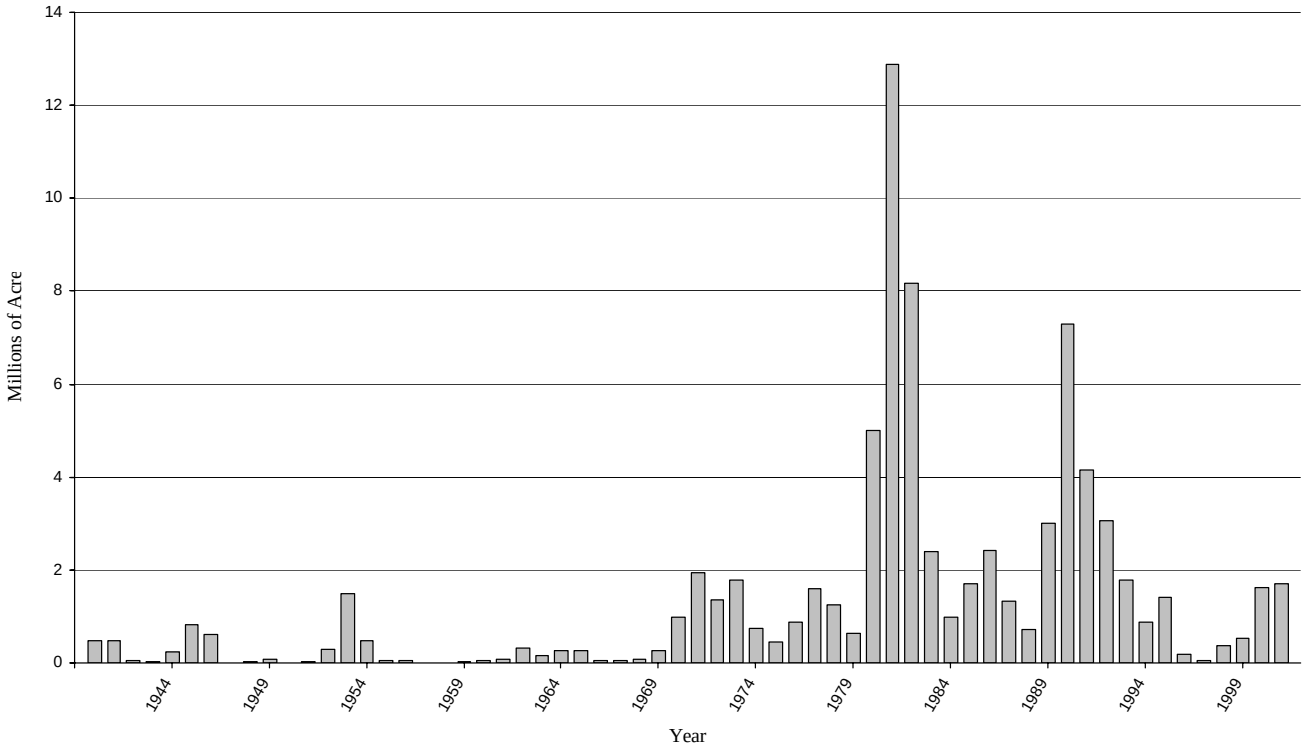
Defoliation in the East increased from 1,623,500 acres in 2000 to 1,706,100 acres in 2001. Acreage defoliated declined in Massachusetts, Michigan, and Pennsylvania but increases were reported in 12 States. The most notable increases occurred in Virginia, with an increase of 369,000 acres; and West Virginia, with an increase of 280,700 acres. Maine, Maryland, New Hampshire, New York, Ohio, Rhode Island, and Wisconsin also reported significant increases in defoliation over 2000.

Eastern Counties Where Gypsy Moth (European) Defoliation Was Reported, 2001

Acres of Aerially Detected Gypsy Moth (European) Defoliation, 1997-2001

State	1997	1998	1999	2000	2001
Connecticut	0	0	0	200	400
Delaware	0	0	0	0	0
Maine	0	0	0	2,500	29,500
Maryland	700	500	1,200	23,200	46,200
Massachusetts	100	12,900	9,800	64,100	48,000
Michigan	36,900	301,700	176,600	106,300	0
New Hampshire	0	0	0	100	8,500
New Jersey	1,900	1,800	1,400	133,300	140,800
New York	2,200	9,400	6,000	27,500	50,900
Ohio	5,000	1,600	48,200	23,600	42,500
Pennsylvania	0	31,600	281,600	843,000	283,700
Rhode Island	0	3,000	0	5,500	8,000
Vermont	0	0	0	0	100
Virginia	0	0	0	71,000	440,000
Washington, DC	0	0	0	0	0
West Virginia	500	800	0	323,100	603,800
Wisconsin	0	0	0	100	3,700
Total	47,300	363,300	524,800	1,623,500	1,706,100

Gypsy Moth (European) Defoliation, 1940-2001



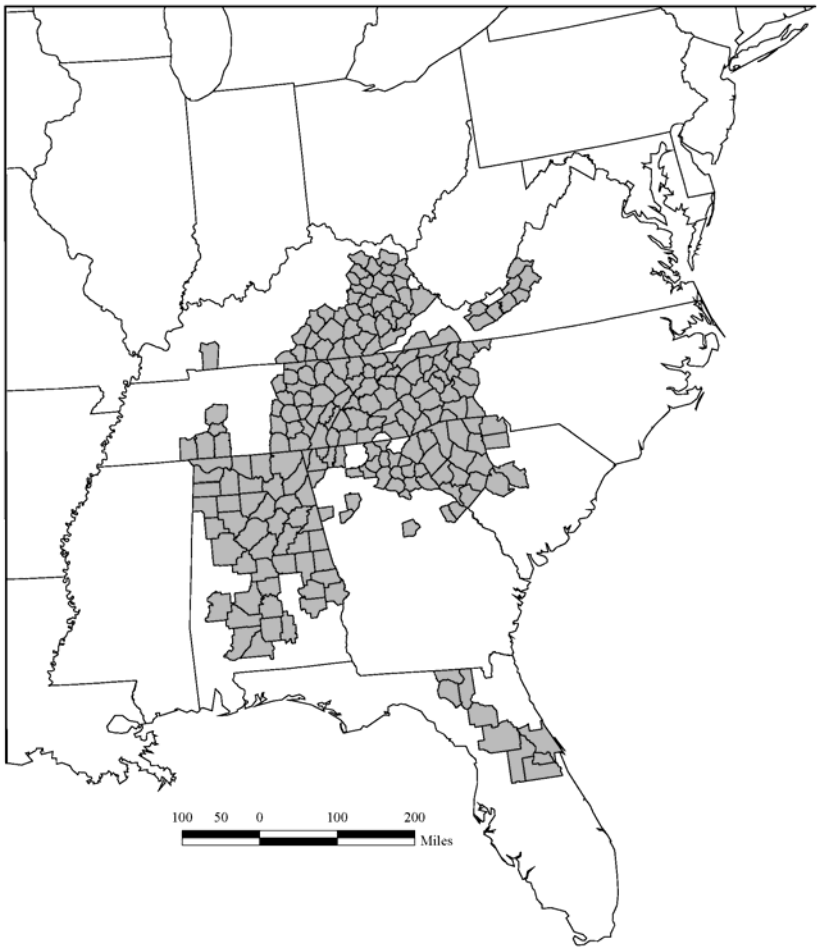
Southern pine beetle

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 remained at very high levels over much of the South in 2001 with the affected acreage increasing slightly from 12,132,400 acres in 2000 to 12,194,000 in 2001. The southern Appalachian Mountain area in Virginia, Kentucky, Tennessee, North Carolina, South Carolina, and Georgia were hit very hard. Here the beetle attacked hosts other than its favored southern yellow pines, killing eastern white pine and Norway and red spruce at higher elevations. The epidemic in Alabama continued in 2001 with 11,945 infestations spread across 45 of Alabama's 67 counties. By contrast, Arkansas, Louisiana, Oklahoma, and Texas did not report a single infestation.

*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, 2001

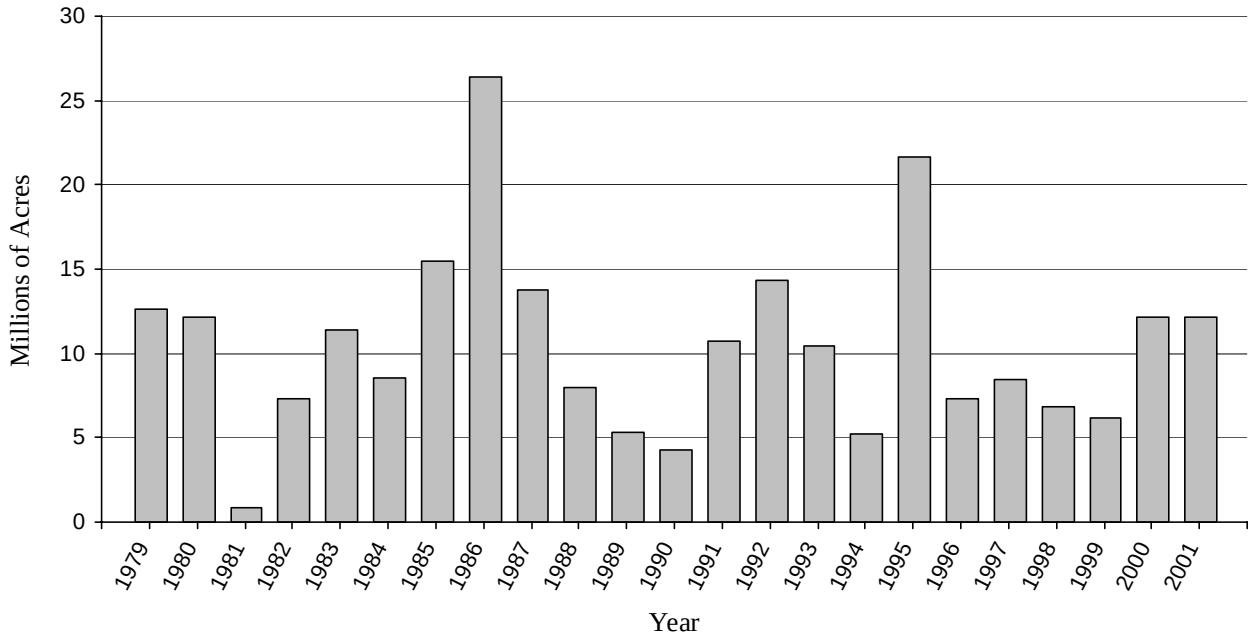


Acres (in thousands) of Southern Pine Beetle Outbreaks, 1997-2001*

State	1997	1998	1999	2000	2001
Alabama	4,535.5	5,241.3	5,002.0	6,936.1	4,876.0
Arizona	0.0	0.0	0.0	11.6	0.0
Arkansas	0.0	0.0	0.0	0.0	0.0
Florida	401.1	0.0	40.0	321.3	916.0
Georgia	312.9	65.0	171.0	1,067.0	1,407.0
Kentucky	0.0	0.0	0.0	220.6	767.0
Louisiana	110.0	228.0	0.0	0.0	0.0
Mississippi	892.1	73.0	0.0	210.6	0.0
North Carolina	702.3	234.0	252.0	437.9	797.0
Oklahoma	0.0	0.0	0.0	0.0	0.0
South Carolina	843.0	944.0	8.7	1,218.3	1,727.0
Tennessee	30.3	35.0	685.0	1,441.0	1,425.0
Texas	649.6	0.0	0.0	0.0	0.0
Virginia	0.0	0.0	0.0	268.0	276.0
Total	8,476.8	6,820.3	6,158.7	12,132.4	12,191.0

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

Southern Pine Beetle Outbreaks, 1979-2001

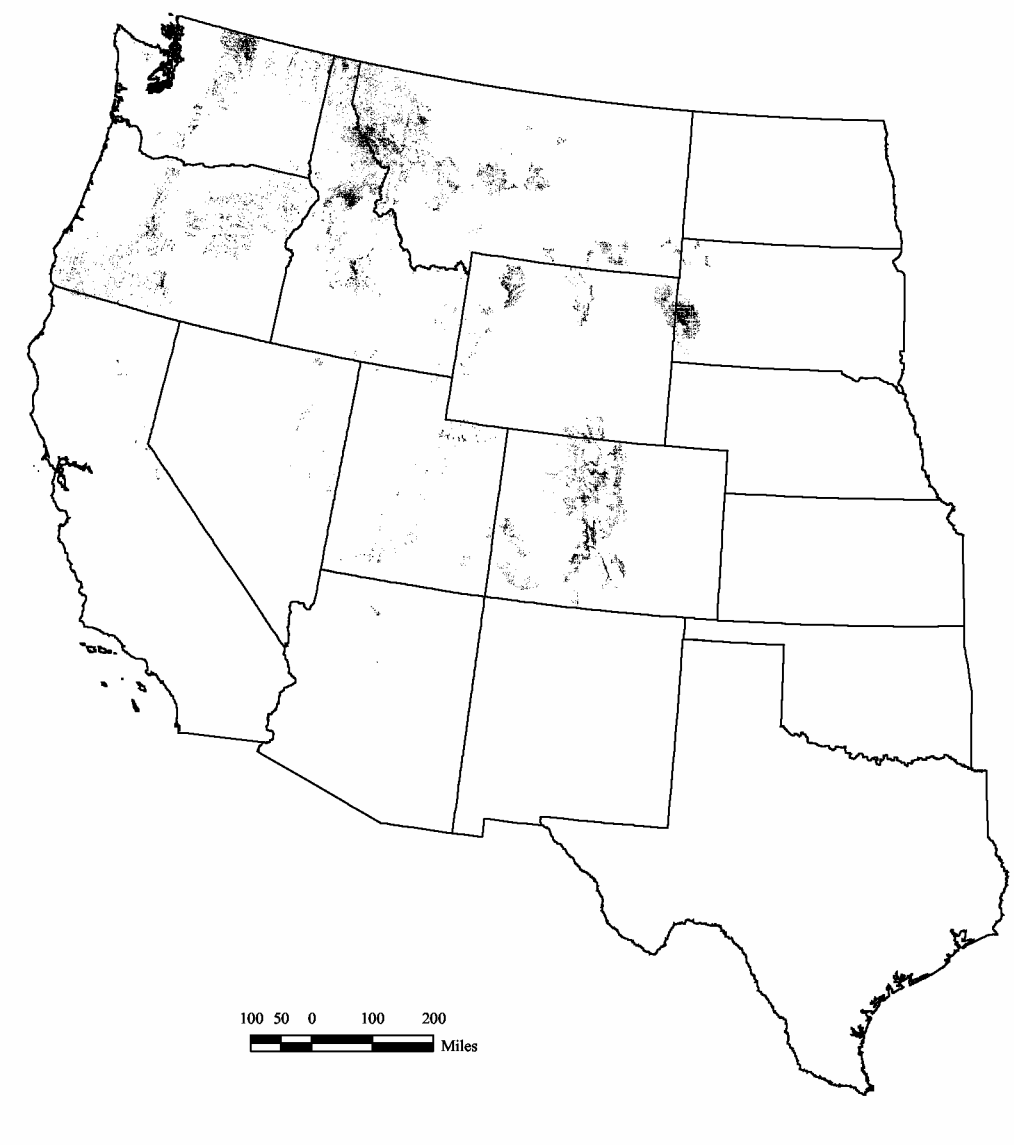


Mountain pine beetle

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 dramatically throughout the West with affected acreage increasing from 465,900 acres in 2000 to 849,300 acres in 2001. In many States, affected acreage more than doubled over 2000. Only in California did the level of infestation remain stable. The magnitude of this outbreak has not been seen Westwide since 1990.

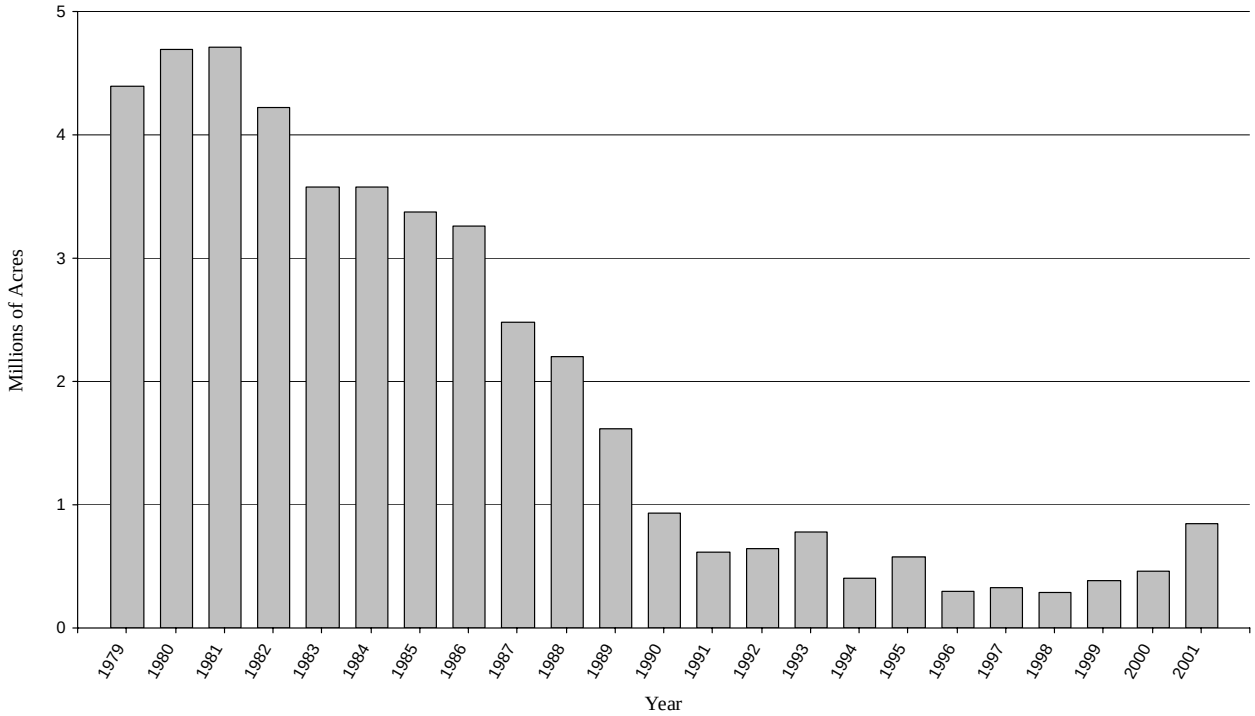
Mountain Pine Beetle Outbreak Areas, 2001



Acres (in thousands) of Mountain Pine Beetle Outbreak, 1997-2001

State	1997	1998	1999	2000	2001
Arizona	10.0	7.4	0.0	0.0	0.0
California	15.2	26.8	9.7	30.4	29.6
Colorado	22.2	23.1	71.8	139.5	151.2
Idaho	54.0	81.6	84.3	122.3	170.0
Montana	33.4	39.2	77.4	40.6	111.7
Nevada	0.0	0.0	1.4	0.8	1.2
New Mexico	0.1	0.0	0.0	0.0	0.0
Oregon	82.3	65.5	46.2	43.6	76.3
South Dakota	9.4	10.0	19.0	13.9	102.2
Utah	20.9	4.5	3.7	2.2	17.3
Washington	74.7	30.3	65.0	63.1	134.8
Wyoming	6.7	2.5	6.2	9.5	55.0
Total	328.9	290.9	384.7	465.9	849.3

Mountain Pine Beetle Outbreaks, 1979-2001

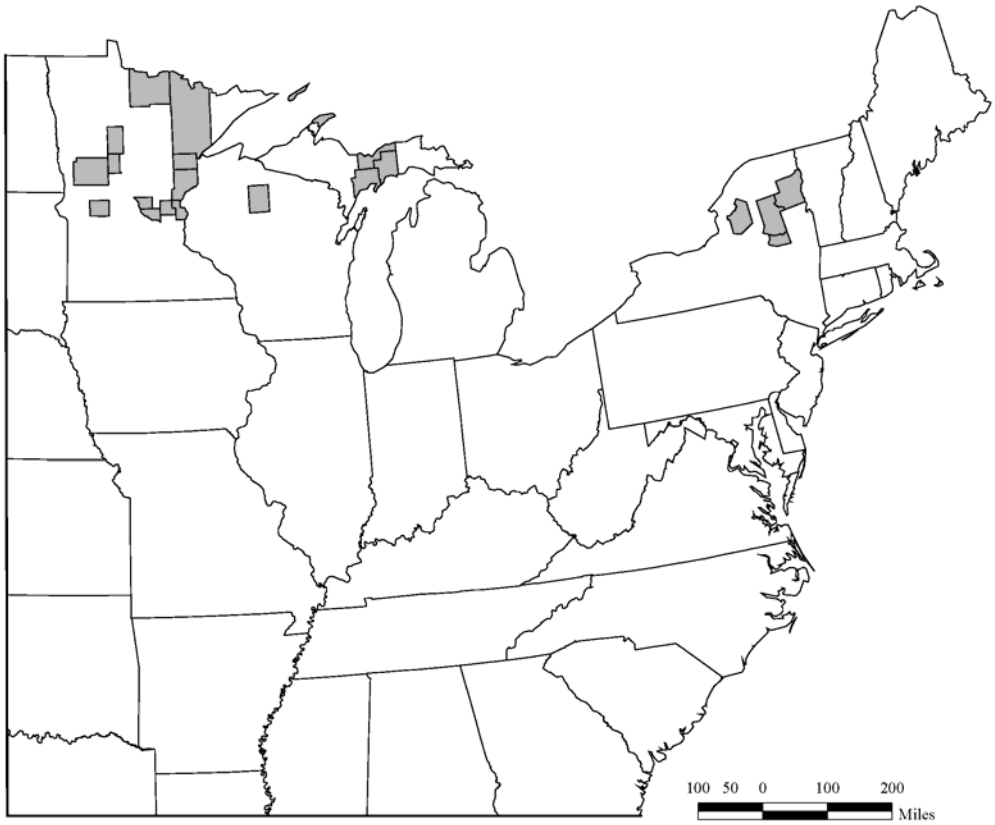


Spruce budworm

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 2001, the only heavy defoliation reported was in northern Minnesota, where defoliation declined from 28,500 acres in 2000 to 18,900 acres in 2001. This is the 48th consecutive year of budworm defoliation in Minnesota. There was 3,300 acres of defoliation reported in Michigan, and 800 acres in Wisconsin. No defoliation was reported in Alaska for the second consectutive year.

Eastern Counties Where Spruce Budworm Defoliation Was Reported, 2001



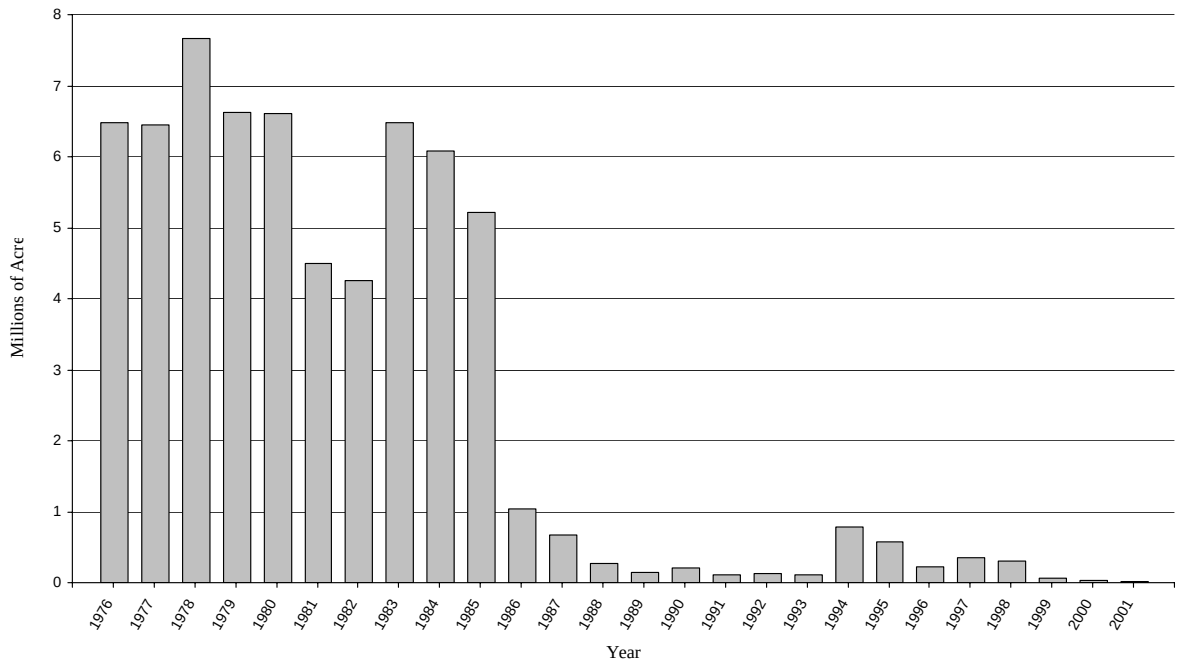
Acres (in thousands) of Aerially Detected Spruce Budworm Defoliation in the Eastern United States, 1997-2001

State	1997	1998	1999	2000	2001
Maine	0.0	0.0	0.0	0.0	0.0
Michigan	61.6	33.0	0.0	0.0	3.3
Minnesotta	276.2	256.4	70.0	28.5	18.9
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	0.0	0.0	0.0	0.0	0.0
Vermont	0.0	0.0	0.0	0.0	0.0
Wisconsin	9.6	16.1	0.0	0.0	0.8
Total	347.4	305.5	70.0	28.5	23.0

Acres (in thousands) of Aerially Detected Spruce Budworm Defoliation in Alaska, 1997-2001

State	1997	1998	1999	2000	2001
Alaska	38.4	87.8	0.7	0.0	0.0

Spruce Budworm Defoliation in the Eastern United States, 1976-2001



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.

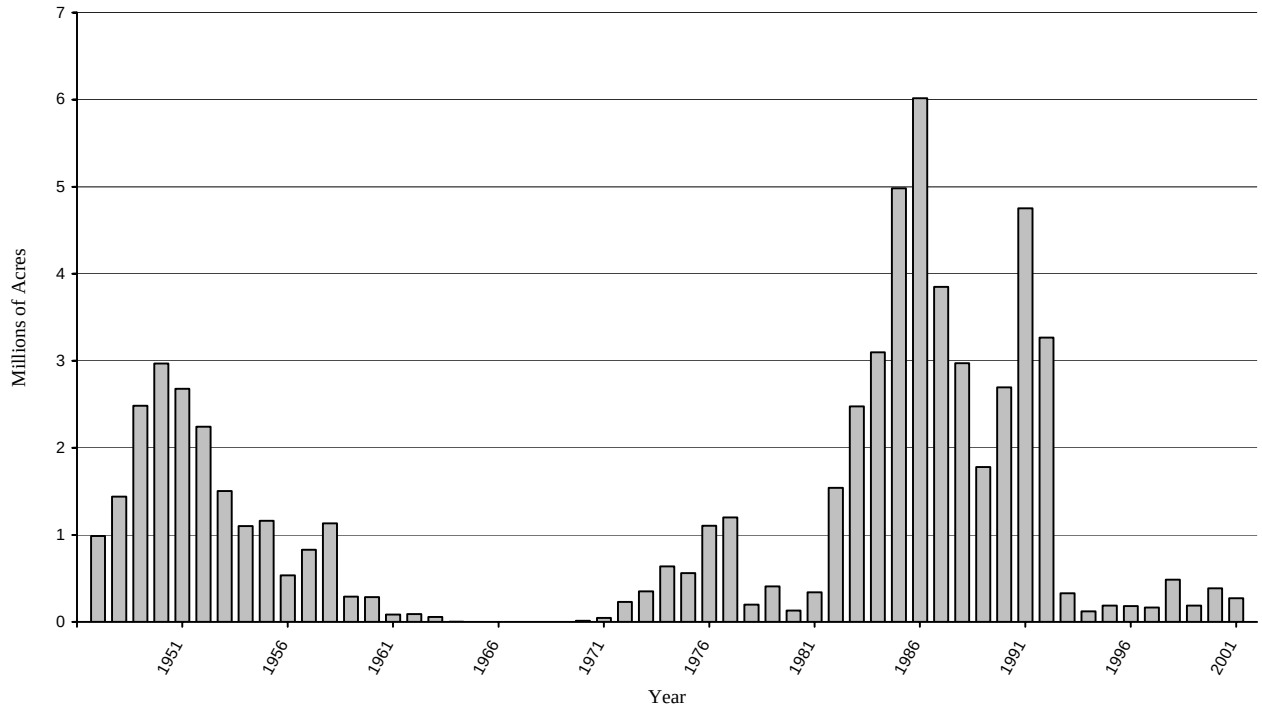
After 2 years of decline, budworm defoliation in New Mexico increased significantly, from 165,000 acres in 2000 to 445,300 acres in 2001. In the Pacific Northwest, areas of aerially visible defoliation decreased from 384,600 acres in 2000 to 272,100 acres in 2001; almost all the affected acres were in Washington. Defoliation in Idaho declined slightly, however in Montana where defoliation increased from 400 acres in 2000 to 1,200 acres in 2001, populations seem to be continuing to build.

Western Spruce Budworm Defoliation Areas, 2001

Acres (in thousands) of Aerially Detected Western Spruce Budworm Defoliation, 1997-2001

State	1997	1998	1999	2000	2001
Arizona	1.1	10.1	10.2	25.8	14.1
California	0.0	0.0	0.0	0.0	0.0
Colorado	0.0	15.8	41.0	20.6	35.8
Idaho	0.0	0.0	3.6	4.4	4.2
Montana	0.0	0.0	0.0	0.4	1.2
New Mexico	197.1	310.5	282.6	165.0	445.3
Oregon	0.0	0.0	0.0	0.9	0.2
Utah	0.0	19.9	1.2	16.7	10.2
Washington	165.9	486.8	189.7	383.7	271.9
Wyoming	0.0	0.0	0.6	0.8	0.8
Total	364.1	843.1	528.9	618.3	783.7

Western Spruce Budworm Defoliation in the Pacific Northwest Region (R-6), 1947-2001



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.

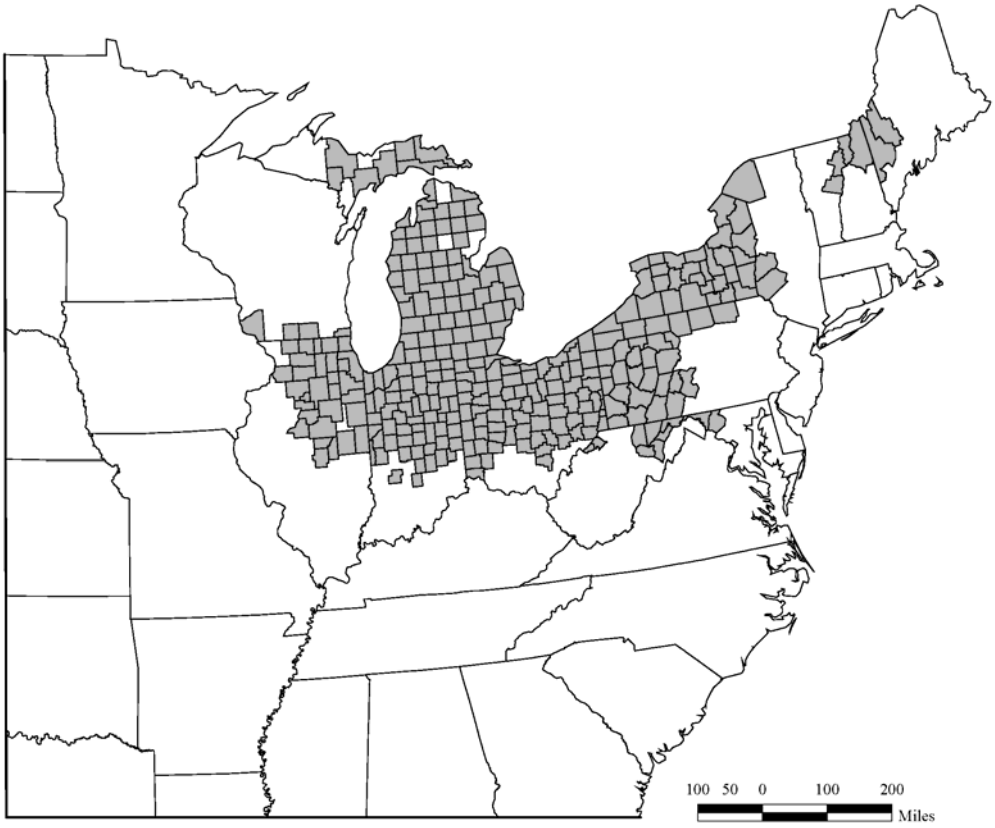
Eastern Counties Where Hemlock Woolly Adelgid Was Reported, 2001

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 reduce the movement of this beetle, which was found in six States in 1993. As of 2001, the beetle has been found in 11 Northeastern States. No new States were added to the list in 2001, but the beetle was found in 13 new counties.

Eastern Counties Where The Common European Pine Shoot Beetle Was Reported, 2001



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.

Areas of active spruce beetle in Alaska increased in 2001 to 105,000 acres after declining to 86,000 in 2000. This is still far below the peak of 1.13 million acres in 1996. Spruce beetle activity is expected to persist until weather conditions, lack of adequate host material, or other disturbances reduce their populations.

Elsewhere in the West, spruce beetle activity in Oregon and Washington increased from 3,200 acres in 2000 to 24,900 acres in 2001. In Utah and parts of Wyoming, populations and resulting damage continued to increase dramatically.

Spruce Beetle Active and Newly Infested Areas in Alaska, 2001

Disease Conditions Highlights

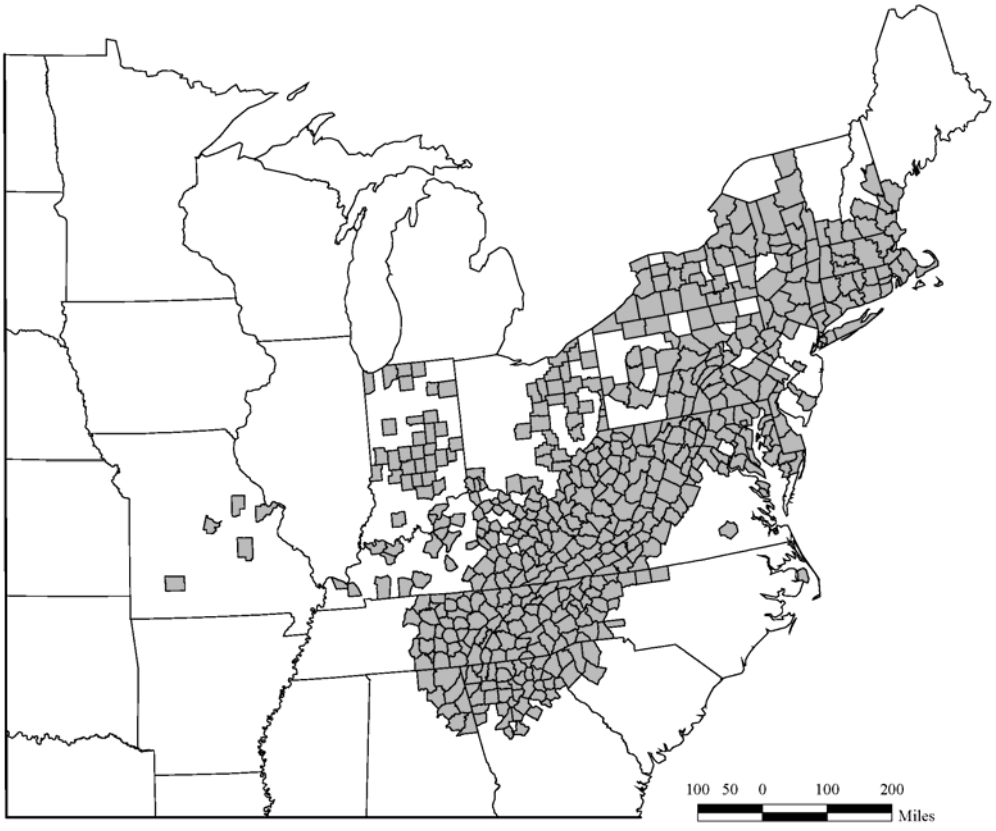
Dogwood anthracnose

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, 2001



Beech bark disease

Beech bark disease is caused by the interaction of the beech scale, *Cryptococcus fagisuga* and one or more fungi in the genus *Nectria*. The scale insect creates wounds in the tree that are colonized by fungi such as *Nectria coccinea* var. *faginata*. The scale, and probably the fungus, was accidentally brought to Nova Scotia, Canada, in about 1890. The native fungi *Nectria galligena* and *Nectria ochroleuca* can also invade wounds caused by the scale, inciting the disease. 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. In 2000, the scale was found in Michigan, more than 200 miles from its previous known location in northeastern Ohio. Both *Nectria galligena* and *Nectria coccinea* var. *faginata* have been found in Michigan, causing disease and killing beech trees. Although the scale has been present in Ohio for some time, the disease, which requires both the scale and the presence of the canker-causing *Nectria* fungi, has not yet been identified in Ohio.

Tree mortality continues within the affected counties throughout the western and southern extent of the disease, and at a greater rate than predicted. The range of American beech extends from Maine to northwest Florida, and west to eastern parts of Wisconsin and Texas.

Eastern Counties Where Beech Bark Disease Was Reported, 2001

Butternut canker

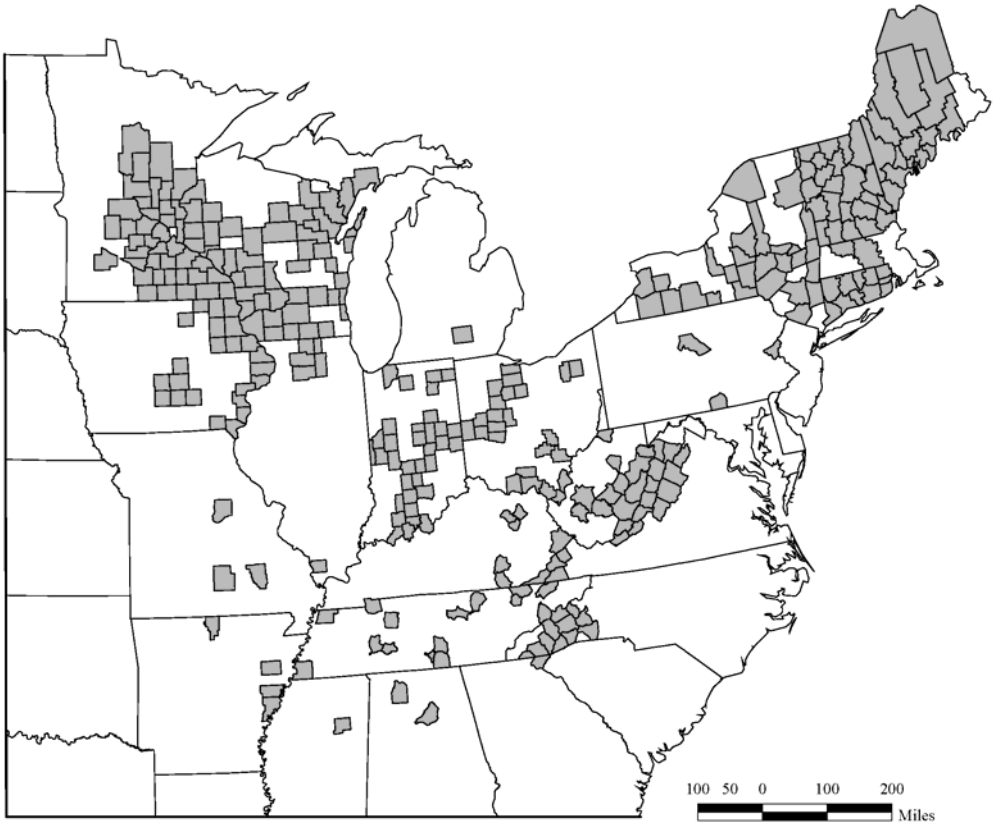
Butternut canker is caused by the fungal pathogen *Sirococcus clavigignenti-juglandacearum.* The origin of the pathogen is unknown, but because of its severe impact on butternut, it is likely that it was introduced into North America. Symptoms of the disease have been recognized and reported in 1967 in Wisconsin, but the causal fungus was not identified until the late 1970s. The native range of butternut extends from Maine to Georgia and west to Minnesota and Arkansas. Butternut is usually found scattered in a variety of cover types, and is not abundant in any part of its range.

The disease is found throughout the range of butternut, and is a serious threat to the survival of the species.

The pathogen kills large trees, saplings, and regeneration, causing multiple cankers under the bark that merge and girdle the tree. 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 that appear to exhibit resistance to the disease have been found in most States where the trees grow. Many of these trees are being propagated for host resistance studies.

Several States have implemented harvesting guidelines or moratoriums in an attempt to preserve genetic variability in the species and to ensure that potentially resistant trees are not removed. There are no viable control measures for this disease.

Eastern Counties Where Butternut Canker Was Reported, 2001



Sudden oak death

Sudden Oak Death is a recently recognized disease that is killing oaks and other plant species in California and a small portion of southwestern Oregon. First reported in 1995, the disease has been confirmed in the coastal areas north and south of San Francisco, and in southwestern Oregon. The pathogen responsible for the disease, a fungus-like organism called *Phytophthora ramorum*, is also found in Germany and the Netherlands, where it is causing a recently identified disease on rhododendron and viburnum.

On oaks, *P. ramorum* is a bark pathogen, it causes necrotic, often girdling cankers that can lead to mortality on tanoak, coast live oak, California black oak, and Shreve oak. The pathogen also causes leaf spots and/or twig dieback on California bay laurel, rhododendron, big leaf maple, Pacific madrone, huckleberry, California buckeye, manzanita, toyon, California honeysuckle and California coffeeberry. Under moist conditions, the pathogen sporulates profusely on tanoak, bay, rhododendron, and other species so these "foliar" hosts serve as important reservoirs of inoculum.

The disease is widespread in coastal California and is found commonly in two forest types: in the understory of coast redwood (*Sequoia sempervirons*) forests on tanoak and in coastal evergreen forests on oaks, madrone (Arbutus menziesii), California bay laurel, and other species. In California, Sudden Oak Death has been confirmed in scattered locations along the Pacific coast in Monterey County north into Mendocino County. All confirmations are within 50 miles of the Pacific Coast. Marin and Santa Cruz Counties are heavily infested and dead and dying trees are common in the wildland/urban interface in backyards, parks, and open space greenbelts. Special aerial and ground surveys conducted by the USDA Forest Service and Oregon Department of Forestry in July 2001 detected the pathogen on approximately 40 acres in coastal southern Oregon, just north of the California border. A cooperative program involving State and Federal agencies as well as private landowners is underway to eradicate *Phytophthora ramorum* from the known infested sites in Oregon. Since Sudden Oak Death is still a rather new forest disease, there remains much to learn about its host preferences and distribution.

More information may be found at www.na.fs.fed.us/SOD or at www.suddenoakdeath.org.

Table of known hosts of *Phytophthora ramorum*, 2001

Common name	Scientific name
big leaf maple	*Acer macrophyllum*
California bay laurel	*Umbellularia californica*
California black oak	*Quercus kellogii*
California buckeye	*Aeculus californica*
California coffeeberry	*Rhamnus californica*
California honeysuckle	*Lonicera hispidula*
coast live oak	*Quercus agrifolia*
huckleberry	*Vaccinium ovatum*
madrone	*Arbutus menzeisii*
manzanita	*Arctostaphylos manzanita*
rhododendron	*Rhododendron spp.*
Shreve oak	*Quercus parvula, var. shreveii*
tanoak	*Lithocarpus densiflorus*
toyon	*Heteromeles arbutifolia*

The pathogen has also been recovered from arrow wood (*Viburnum*) in Germany and the Netherlands.

Counties Where Sudden Oak Death Was Reported, 2001

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, 2001*

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 infect the aerial portions of host trees. They affect most conifer species in the West and spruces in the Northeast, causing branch distortions, reduced stem growth, and decreased longevity. Infection by these native plants is generally considered to be the most widespread and economically damaging tree disease in the West. Dwarf mistletoe infection does appear to benefit some wildlife species.

Commercial trees most affected include Douglas-fir, lodgepole pine, true fir, western hemlock, western larch, and ponderosa pine. Dwarf mistletoes are usually host-specific and have patchy distributions within stands and across larger landscapes. Over 28 million acres of western forests have some level of infection. Losses are estimated at around 164 million cubic feet of wood annually.

Dwarf mistletoes are amenable to cultural treatments, although infected areas are often more difficult to manage than uninfected areas. The overall incidence and severity of this disease are thought to have increased over the past century due to fire suppression.

Acres (in thousands) in the West Affected by Dwarf Mistletoes, 2001

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	244.0	732.0
Idaho - South (94)**	2,600.0			2,600.0
Montana (70-80)	1,694.0	123.0	600.0	2,417.0
New Mexico (97)	1,140.0	348.0	581.0	2,069.0
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	17,792.4	1,772.0	8,931.0	28,495.4

* 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

Ambrosia beetles,
Monarthrum scutellare and *M. dentiger*

Region 5: California

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

Ambrosia beetle attacks on tanoak, coast live oak, and California black oaks along the northern California coast were associated with dying trees that exhibited symptoms similar to those manifest for Sudden Oak Death. However, Sudden Oak Death has not been confirmed north of southern Mendocino County, California.

Bagworm moth,
Thyridopteryx ephemeraeformis

Region 9/Northeastern Area: West Virginia

Host(s): Black locust, boxelder, miscellaneous conifers

In West Virginia, light to moderate populations caused moderate defoliation to boxelder, black locust, and miscellaneous conifers statewide.

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

Region 8: Louisiana

Host(s): Baldcypress

In 2001, 110,000 acres of mixed baldcypress stands in southern and southeastern Louisiana were defoliated by the baldcypress leafroller. Approximately 53,000 acres were severely (greater than 50 percent) defoliated. The predominant impact of this defoliation is loss of radial growth, although dieback and scattered mortality occurred in some 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

In Maine, population levels of this pest dropped significantly in 2001, with a corresponding drop in the number of Christmas tree growers reporting control projects in the spring. This pest had been very abundant in the previous 3 years and many growers had to resort to the use of pesticides to control this midge throughout that time period. High populations were scattered throughout New Hampshire. In Vermont, damage remained high in Christmas tree plantations and on wild balsam fir trees. The infestation

is lasting longer, with heavier damage, than previous infestations, and damage is expected to continue in some stands in 2002.

Balsam shoot boring sawfly,
Pleroneura brunneicornis

Region 9/Northeastern Area: Maine, Vermont

Host(s): Balsam fir, Fraser fir

In Maine, damage resulting from this pest was very light and populations were generally low on balsam and Fraser fir in commercial Christmas tree farms. In Vermont, damage was less common than in 2000, with only light damage detected.

Balsam twig aphid,
Pleroneura brunneicornis

Region 9/Northeastern Area: Maine, Vermont

Host(s): Balsam fir

Light to moderate populations of this pest could be found over much of Maine in 2001 with levels high enough to warrant treatment on many Christmas tree farms. Populations appear to be increasing as indicated by more widespread damage within forest stands across central and eastern portions of the State. In Vermont, populations increased dramatically with heavy damage to Christmas trees statewide.

Black turpentine beetle,
Dendroctonus terebrans

Region 8: Regionwide

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

Again in 2001, summer drought throughout the eastern South resulted in higher-than-normal black turpentine beetle activity. Areas of exception were Mississippi, Tennessee, and Texas. In western Tennessee, populations were notably lower than last year. In Georgia, some of the most intense activity was noted in thinned loblolly plantations. This insect is most evident in trees stressed by drought, logging injury, root compaction, and similar disturbance.

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. The insect population was found to be decreasing in 2001; pheromone trapping recovered only 1.3 moths per trap as

compared to 2.8 moths per trap in 2000. In Virginia, populations routinely fluctuate considerably and were at locally high densities in 2001.

California flatheaded borer,
Melanophla californica

Region 5: California

Host(s): Jeffrey pine, ponderosa pine

The California flatheaded borer was found in recently killed Jeffrey pines in the Laguna and San Bernardino Mountains.

California oakworm,
Phryganidia californica

Region 5: California

Host(s): Live oaks, tanoak, chinkapin

The California oakworm defoliated live oak along the Smith River, in the Hoopa Indian Reservation and along Highway 101 near Redway, Briceland and Whitethorn. Light to moderate defoliation was found on live oaks in the Cow Mountain Recreation Area east of Ukiah. Coast live oaks were heavily defoliated in the Oak Hills area outside of Castroville and in scattered areas elsewhere in Monterey County.

Cherry lace bug,
Corythucha pruni

Region 9/Northeastern Area: Pennsylvania

Host(s): Black cherry

Black cherry trees on approximately 2,000 acres in Greene and Washington Counties, Pennsylvania, exhibited very noticeable yellow-green discoloration from this insect late in the season.

Douglas-fir beetle,
Dendroctonus pseudotsugae

Region 1: Idaho, Montana

Host(s): Douglas-fir

Douglas-fir beetle (DFB) populations, though declining somewhat in northern Idaho, continued to increase in many parts of western Montana. That was particularly true on forests that had significant acreages affected by fire in 2000. Fire-affected Douglas-fir stands on the Bitterroot and Helena National Forests were especially heavily infested by DFB. In other areas, beetle populations remained high simply because environmental conditions were favorable. In total, throughout the region, more than 200,500 acres remained infested by DFB to some extent, up considerably from the 167,000 acres reported in 2000. In western Montana, infested area increased to 82,200 acres; while the area affected by DFB in northern Idaho

declined to just under 115,000 acres. The Idaho Panhandle National Forest still had more than 67,000 acres infested; the Bitterroot National Forest had 35,700 infested acres; the Kootenai National Forest had 32,300 acres infested; the Lolo National Forest 17,200 acres; the Flathead National Forest had 14,900 acres; the Clearwater National Forest 14,500 acres; and the Nez Perce National Forest 11,600 acres. Most areas in northern Idaho and western Montana forested by mature Douglas-fir stands harbored some level of DFB-caused mortality. Regionwide, more than 351,000 beetle-killed Douglas-fir were recorded.

Region 2: Colorado, Wyoming

Host(s): Douglas-fir

A large infestation that began in the early 1990s in Douglas County, Colorado, has subsided with only 2,202 trees killed in 2001. A few small infestations were reported at Placerville (San Miguel County) and near Powderhorn (Mesa County) with 6,700 trees killed. In Wyoming, the west and east fronts of the Bighorn Mountains are experiencing increased beetle populations. Drought conditions in the Absaroka Mountain Range and the Owl Creek Mountains have led to an increase in DFB activity. Aerial surveys show the acreage infested on the northern parts of the Shoshone National Forest has increased from 7,636 acres in 2000 to 11,575 acres in 2001.

Region 3: Arizona, New Mexico

Host(s): Douglas-fir

DFB mortality in the Southwest increased from 1,815 in 2000 to 3,125 acres in 2001. In Arizona, DFB mortality was recorded on the Apache-Sitgreaves (150 acres) and Coconino (1,965 acres) National Forests. In New Mexico, DFB-caused tree mortality was detected on the Carson (75 acres), Cibola (100 acres), Gila (180 acres), Lincoln (15 acres), and Santa Fe (405 acres) National Forests; Jicarilla Apache (50 acres), Mescalero Apache (65 acres), and Santa Clara Pueblo (45 acres) tribal lands; and the Valles Caldera National Preserve (75 acres).

Region 4: Idaho, Nevada, Utah, Wyoming

Host(s): Douglas-fir

Mortality increased in the region from 64,600 trees in 2000 to 73,300 trees in 2001. In Utah, the Ashley and Uinta National Forests had the heaviest outbreaks. National forests in southern Idaho with the heaviest outbreaks included the Targhee, Boise, and Salmon-Challis. Mortality on the Bridger-Teton National Forest in western Wyoming remained static at 5,600 trees. No mortality was detected on the Humboldt-Toiyabe National Forest in Nevada.

Region 5: California

Host(s): Douglas-fir

The DFB killed scattered, mistletoe-infested Douglas-firs along the upper Sacramento River and west of Mount Shasta.

Region 6: Oregon, Washington

Host(s): Douglas-fir

DFB activity was detected on more acres, at somewhat greater intensities for the fourth straight year. Activity was reported on 147,123 acres with an average of 2.73 trees per acre compared with 127,970 acres with an average of 1.67 trees per acre in 2000. Increased levels of activity were detected on all ownerships.

Insects: Native

Reported trees killed on the Colville Indian Reservation and Colville reporting area more than doubled over 2000 levels. Other reporting areas with significant levels of DFB activity included: Wallowa-Whitman, Wenatchee, Okanogan, and Yakama Indian Reservation lands. Predisposing tree stresses caused by repeated years of defoliation by western spruce budworm, Douglas-fir tussock moth, and overstocking may result in relatively high levels of DFB activity in the next few years.

Douglas-fir tussock moth, *Orgyia pseudotsugata*

Region 1: Idaho, Montana

Host(s): Douglas-fir, true firs

In northern Idaho aerial survey results report 141,873 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. This is more than double the 54,753 acres with defoliation observed in 2000. In the spring of 2001, an aerial spray project was conducted on private and State lands. The Idaho Department of Lands coordinated the spray program in which 60,224 acres were treated with Dimilin and 16,268 acres were treated with *Bacillus thuringiensis.* Additional defoliation is anticipated in north Idaho and the Idaho Department of Lands is evaluating control options on State and private lands. In Montana, 12 acres of Douglas fir tussock moth (DFTM) defoliation were reported on private lands on the Flathead Indian Reservation.

Region 4: Idaho, Nevada

Host(s): Douglas-fir, true firs

Total acreage defoliated in 2001 by DFTM in Region 4 was 15,600, a decrease from the 18,620 acres detected in 2000. Most of this damage occurred on Bureau of Land Management, State of Idaho, and private Douglas-fir forests in the Owyhee Mountains of southwest Idaho. On the Humboldt National Forest in northern Nevada, 3,900 acres were found heavily defoliated on the Jarbidge Ranger District. This is a substantial increase from the 50 acres of defoliation recorded in 2000.

Region 5: California

Host(s): White fir

Trap catches indicate that populations will remain low in 2002.

Region 6: Oregon, Washington

Host(s): Douglas-fir, true firs

The DFTM outbreak, which began in 1999, continued into 2001. During the 2001 aerial detection survey, approximately 52,840 acres of visible defoliation were mapped, as compared to 219,774 acres mapped in 2000, and 21,180 acres mapped in 1999. Most of the 220,000 acres of defoliation in 2000 occurred on the Wallowa-Whitman reporting area. In 2001, the outbreak subsided in the Wallowa-Whitman reporting area where only 5,500 acres of defoliation were mapped; however, defoliation increased in new areas. Mapped intensities varied from 11,067 acres in the light category to 22,335 acres in moderate and 19,439 acres in the heavy category. Only 1,598 acres were mapped in the heavy category in 2000. The majority of the mapped acres were within the Umatilla reporting area; 17,579 acres on non-designated lands on the Umatilla National Forest, 27,180 acres in the Wenaha-Tucannon Wilderness Area, and an additional 479 acres on private lands. Defoliation was also mapped on 900 acres of mixed ownership within the Okanogan reporting area and approximately 5,500 acres within the Wallowa-Whitman reporting area, the

majority of which was on Forest Service lands. A new outbreak was detected and mapped on Tekoa Mountain in northeast Washington (290 acres on private land).

Cocoon sampling and egg mass sampling in the fall of 2000 identified suboutbreak populations on portions of the Okanogan National Forest, and 16,690 acres were aerially treated with TM BioControl-1, the viral insecticide of the DFTM. The treatment objectives were to prevent suboutbreak populations from reaching outbreak levels in 2002. Larval mortality in treated areas was 90.6 percent compared to 69.4 percent natural mortality in untreated areas. Defoliation did not exceed 10 percent in either treated or untreated areas.

Follow-up monitoring was done in 2001 on the areas of the Wallowa-Whitman and Umatilla National Forests that were treated with TM BioControl-1 in 2000. One year after treatment larval populations were low. Defoliation, top-kill, and mortality were nearly absent in 2001 based on repeat monitoring of 2000 plots. No tree mortality occurred in treated and untreated analysis units on the Umatilla National Forest as a result of tussock moth defoliation in 2001. Tree mortality on the treated units on the Wallowa-Whitman National Forest amounted to 1.6 percent or less of re-sampled defoliation plot trees while tree mortality on untreated units was 0.2 percent or less. All tree mortality recorded on defoliation plots was caused by a combination of defoliation and Douglas fir beetles or fir engravers.

The Douglas-fir Tussock Moth Early Warning System indicates increases in trap catches in areas in south central Oregon, primarily within the Fremont National Forest.

Eastern tent caterpillar,
Malacosoma americanum

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

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

In Maryland, eastern tent caterpillar caused localized defoliation Statewide. Webbing or tents in wild cherry and crabapple were especially numerous in Atlantic, Bergen, Burlington, Camden, Gloucester, Mercer, Monmouth, and Ocean Counties, New Jersey. In Ohio, cherry trees were completely defoliated in portions of Adams, Athens, Fairfield, Hocking, Noble, Pike, and Scioto Counties. Moderate to severe defoliation observed over most of the State. Nucleopolyhedrosis virus was reported in the southwestern and northern panhandle counties. In Maine, populations continued to rise in 2001, but defoliation was again light. In Vermont, light defoliation was common.

Fall cankerworm,
Alsophila pometaria

Region 8: North Carolina, Tennessee, Virginia

Host(s): Various oak species

In eastern Tennessee, the fall cankerworm, in association with the green fruitworm and oak leaftiers, defoliated about 200 acres of upland hardwood in Monroe County. Additional defoliation was reported in two counties near Knoxville. In North Carolina, populations in the Charlotte area, consistently very heavy in recent years, were low in 2001. Likewise, Virginia populations were relatively low in 2001.

Insects: Native

Region 9/Northeastern Area: Maine, Maryland, Massachusetts, West Virginia

Host(s): Maples, oaks, other hardwoods

Fall cankerworms in suburban Washington, DC, declined dramatically in Cheverly, University Park, and College Park. The communities of Greenbelt and Takoma Park had nuisance levels of caterpillars with some spotty defoliation. In Maine, populations and defoliation remained low in 2001. Very little defoliation was documented in Norfolk County, Massachusetts. The results of sticky trap surveys indicate that populations in this area have been reduced to endemic levels. Noticeable defoliation was observed on 422 acres on Nantucket Island and reports were received about a very heavy moth flight in Plymouth County.

Fall webworm, *Hyphantria cunea*

Region 2: Colorado

Host(s): Hardwoods

Narrowleaf cottonwoods, and to a much lesser extent Plains cottonwood and boxelder maple, along the Arkansas River between Canon City and Salida, Colorado, were completely defoliated during late summer. Heavy defoliation and branch dieback have been noted on these trees almost every year. Other areas with heavy fall webworm activity include the lower elevations of most foothills drainages, areas of the eastern plains, and the Grand Junction area.

Region 5: California

Host(s): Pacific madrone, Oregon ash

The fall webworm defoliated madrones in the Klamath and Trinity River drainages and in interior Mendocino and southeastern Humboldt Counties. Defoliation was generally less intensive than in 1999 or 2000. Defoliation of Oregon ash was common along the Trinity and Klamath Rivers.

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

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

Fall webworm caterpillars continued to be less numerous than in previous years throughout the area. This defoliator, which damaged over 30,000 acres of maple, beech, and birch trees in 2000, caused damage on only 100 acres in Blair County in 2001. In West Virginia, spotty and light to moderate defoliation occurred Statewide this year.

In Maine, populations remained high again in 2001 but seemed to be spottier. The tents and defoliation were more pronounced over approximately 10,000 acres in Cumberland, York, and southern Oxford counties and locally elsewhere. Populations increased significantly over 2000 in central and western Massachusetts. By mid August many trees were completely defoliated and webbed. Populations were non-existent throughout New Hampshire. This insect was widely observed throughout Vermont, but populations were down from 2000.

Fir engraver beetle,
Scolytus ventralis
Dryocoetes confusus

Region 1: Idaho, Montana

Host(s): Grand fir

Fir engraver-caused mortality in grand fir stands increased in northern Idaho but remained at low, endemic levels in western Montana in 2001. Total grand fir killed by fir engraver increased to 11,485 trees on 14,806 acres regionwide compared to only 3,000 killed trees on 2,500 acres in 2000. Most of the current mortality (9,024 acres) occurred on the Clearwater National Forest. Nearly 2,500 acres were recorded on the Idaho Panhandle National Forest and over 1,000 acres on the Coeur d'Alene Indian Reservation. Moisture in the year 2000 was less than normal throughout much of northern Idaho and probably contributed to the increase in fir engraver activity. Northern Idaho also has a high amount of root disease that predisposes grand fir to fir engraver attack.

Region 3: Arizona, New Mexico

Host(s): White fir, subalpine fir

Tree mortality in the region increased somewhat in 2001 to 7,385 acres versus 6,150 acres in 2000. In Arizona, fir mortality was recorded on the Apache-Sitgreaves (1,445 acres), Coconino (4,265 acres), Kaibab (80 acres), and Tonto (10 acres) National Forests; Grand Canyon National Park (125 acres); and Fort Apache Indian Reservation (5 acres). In New Mexico, fir mortality was reported on the Carson (200 acres), Cibola (335 acres), Gila (50 acres), Lincoln (15 acres), and Santa Fe (560 acres); Jicarilla Apache (100 acres), Mescalero Apache (80 acres), and Santa Clara (5 acres) tribal lands; and 190 acres of State and private lands.

Region 4: California, Idaho, Nevada, Utah

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

A significant increase in mortality occurred from only 2,200 trees in 2000 to 17,100 trees in 2001. Most of this damage occurred on the Humboldt National Forest in Nevada, particularly on the Ely Ranger District. In Utah, mortality increased from 550 trees in 2000, to 4,300 trees in 2001, with the Dixie, Fishlake, and Manti-LaSal National Forests sustaining the highest mortality. No significant mortality was observed in southern Idaho.

Region 5: California

Host(s): White fir, red fir

The trend in true fir mortality related to fir engraver attacks reversed direction in 2001 and began to rise in northeastern California. However, true fir mortality and top-kill associated with the fir engraver remained at background levels in the Sierra Nevada Mountains south of Lake Tahoe.

Region 6: Oregon, Washington

Host(s): True firs

Fir engraver activity increased from 6,215 acres (0.79 trees per acre) mapped in 2000 to 20,291 acres (1.75 trees per acre) in 2001. Increases occurred across all ownerships with the exception of a slight decrease on State lands in Washington. The majority (64 percent) of mapped mortality occurred on Forest Service lands. Approximately 3,900 acres were mapped on the Yakama Indian Reservation and 2,200 acres on

other private lands, the majority of which occurred in Oregon. Highest levels were reported within the Willamette and Wenatchee reporting areas. The Colville Indian Reservation was the only reporting area showing a significant decrease in acres of mapped mortality.

Flatheaded fir borer, *Melanophila drummondi*

Region 5: California

Host(s): Douglas-fir, western hemlock

Mature and pole-size Douglas-firs north of Callahan (Siskiyou County) were subject to top-kill, branch dieback, and mortality from attacks by the flatheaded fir borer. Low site quality and dry spring weather appeared to be contributing factors.

Forest tent caterpillar, *Malacosoma disstria*

Region 4: Utah

Host(s): Gambel oak, aspen

On the Salt Lake, Ogden, and Logan Ranger Districts of the Wasatch-Cache National Forest in northern Utah, over 1,000 acres of aspen were defoliated by the forest tent caterpillar in 2001.

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

Host(s): Tupelo gum, upland hardwoods

Defoliation occurred on 112,000 acres of forested wetlands in Ascention, Livingston, St. James and St. John Parishes in southeastern Louisiana. This defoliation was severe (50 percent) on 38,000 acres. In North Carolina, 40,000 acres were defoliated along the Roanoke River, with 500 acres classified as "heavily defoliated." In South Carolina, 169,000 acres were again defoliated in 2001 in the Congaree, Santee, Pee Dee, and Wacamaw River basins.

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

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

Defoliation exploded in 2001 in the Lake States. Defoliation occurred in Minnesota on more than 7.4 million acres, up from 2.0 million in 2000. The population in the Upper Peninsula of Michigan exceeded 2.4 million acres, up from 700,000 acres in 2000. Wisconsin sustained over 5.7 million of defoliation, up from 100,000 acres in 2000. Defoliation occurred on white oak trees in Adams and Scioto Counties, Ohio.

In Maine, populations remained low with no defoliation in 2001. In New Hampshire, no defoliation was reported and no moths were trapped. In New York, this insect caused about 4,500 acres of defoliation of sugar maple in Sullivan County. In Vermont, populations remain low with no defoliation.

Fruittree leafroller,
Archips argyrospilus

Region 5: California

Host(s): California black oak

In southern California, the fruittree leafroller was extremely numerous on California black oak in the San Bernardino Mountains for the third consecutive year, though not quite as abundant as in 2000. Approximately 25,600 acres had visible defoliation. Another 4,000 acres were probably infested but were not ground checked. About 2,500 acres previously infested were not infested in 2001. Oak mortality and branch dieback were observed and may be a result of 3 years of defoliation.

Giant bark aphids,
Longistigma caryae

Region 8: Texas

Host(s): Oaks

In December 2001, an unusual outbreak of the giant bark aphid began across most of eastern Texas and persisted into 2002. This aphid is known to occur in the eastern half of the United States and is the largest aphid in North America. The aphids are primarily feeding on oaks and seem to favor water and live oaks. Aphids suck plant juices and excrete large quantities of honeydew, a clear, sticky, sugary liquid. An unsightly gray-black sooty mold often grows on the honeydew. Even with large numbers of aphids present, their feeding is not expected to cause serious harm to the trees.

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

The heavy moth activity noted in the fall of 2000 produced significant larval populations and defoliation in many portions of southern, central, and eastern Maine in 2001. During late summer aerial survey flights, 26,807 acres of heavy to severe hemlock looper defoliation were mapped. In Massachusetts, moderate feeding was observed in Hampden and Berkshire Counties. Approximately 500 acres were treated aerially with Bt in one State owned campground. Pheromone traps placed in areas where defoliation was observed indicated the population had collapsed. No defoliation occurred in New Hampshire and no moths were trapped. In New York, large numbers of adult moths were found in spruce budworm traps, however no significant defoliation of hemlock was detected. Neither damage nor significant larval populations occurred in Vermont, but moth flight was heavy in the fall of 2000.

Jack pine budworm,
Choristoneura pinus

Region 9/Northeastern Area: Michigan

Host(s): Jack pine

In Michigan, over 118,000 acres were defoliated in 2001, up significantly from 18,000 acres reported in 2000. No defoliation was reported in Wisconsin in 2001, compared to18,129 acres in 2000.

Jeffrey pine beetle,
Dendroctonus jeffreyi

Region 4: California, Nevada

Host(s): Jeffrey pine

Jeffrey pine beetle activity once again declined on the Toiyabe National Forest and Lake Tahoe Basin Management Area, with only 30 trees killed in 2001 compared to 105 trees reported killed in 2000.

Region 5: California

Host(s): Jeffrey pine

Jeffrey pine beetle activity increased throughout the Jeffrey pine type in northern California. However, Jeffrey pine mortality remained at low levels in the southern Sierra Nevada and only pockets of mortality were observed on the east shore of Lake Tahoe and on the Inyo National Forest. As in 2000, Jeffrey pine beetle continued to kill Jeffrey pines in the San Bernardino Mountains at moderate rates.

Jumping oak gall wasp,
Neuroterus saltatorius

Region 9/Northeastern Area: Missouri, New York, Ohio, Pennsylvania, West Virginia

Host(s): Bur oak, white oak

Foliar damage from the jumping oak gall wasp *(Neuroterus saltatorius)* virtually disappeared in Missouri in 2001, down from almost 600,000 acres in 2000. The gall also disappeared in Indiana, down from an estimated 1 million acres in 2000.

In Ohio, damage to white oak was documented for the first time. Over 14,000 acres were defoliated in eight southeastern Ohio counties. In Bradford and Tioga Counties, Pennsylvania, this insect damaged oak foliage on approximately 400 acres. Severely infested white oaks turned completely brown and lost foliage prematurely by mid-summer from infestations in West Virginia. The outbreak situation occurred in 41 counties of West Virginia and may threaten the white oak resource; all but the easternmost counties were affected.

This insect caused some mild damage to ornamental white oaks in Broome County, New York. This may represent the first report of jumping oak gall wasp in the State.

Locust leafminer,
Odontota dorsalis

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

As usual, locust leafminer caused localized defoliation of black locust throughout the State of Maryland. In West Virginia, moderate to heavy defoliation and bronzing of foliage occurred in most eastern and northern panhandle counties by mid-June.

In Maine, locust leafminer populations and resultant defoliation remained moderate to extreme in 2001 and this pest has now moved throughout the State where its favored host, black locust, may be found. Defoliation was observed throughout Massachusetts. Most noticeable were the black locust stands adjacent to the interstate highways. Defoliation was heavy in the central part of New Hampshire. In Vermont, there were isolated pockets of moderate and heavy damage in the Champlain and Connecticut River valleys.

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 2001. Population increases were seen at 20 of 28 monitoring plots. The largest increases were observed adjacent to existing high-density populations near Tenaya Lake and Tenaya Gap. Aerial surveys in October found approximately 15,000 acres of low-severity defoliation and about 25,000 acres of high-severity defoliation. Tree mortality continued around May Lake and some tree mortality is occurring around Sunrise High Sierra Camp Lodge and campground developments. Severe weather in early July and a parasitic wasp may help reduce populations in some areas in the 2001-2003 generation.

Maple leafcutter,
Paraclemensia acerifoliella

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

In Maine, populations of this species remained low and spotty and have moved little since 1999. An extremely heavy infestation was observed in Massachusetts on about 200 acres in northwestern Franklin County. In New Hampshire, approximately 735 acres of moderate defoliation occurred in Grafton County. In Vermont, populations remained high. Heavy late-season defoliation occurred in scattered locations statewide, especially in central Vermont. Populations were expected to be lower in 2002, as many larvae died in the mining stage.

Insects: Native

Maple trumpet skeletonizer,
Epinotia aceriella

Region 9/Northeastern Area: Vermont
Host(s): Sugar maple

In Vermont, populations decreased from 2000, with only light damage observed.

Modoc budworm,
Choristoneura retiniana

Region 5: California
Host(s): White fir

Only one instance of defoliation was observed in 2001 – light defoliation west of Lily Lake on the Warner Mountain Ranger District, Modoc National Forest.

Mountain pine beetle,
Dendroctonus ponderosae

Region 1: Idaho, Montana
Host(s): Lodgepole pine, ponderosa pine, other pines

For the first time in nearly 10 years, when almost 80,000 acres were infested in 1992, mountain pine beetle (MPB) has once again become the most frequently encountered and damaging bark beetle in the region. Populations continued to expand in lodgepole stands on the Nez Perce and St. Joe National Forests in Idaho and the Lolo, Flathead, and Beaverhead-Deerlodge National Forests in western Montana. Hundreds of thousands of acres of lodgepole pine are becoming increasingly susceptible, and weather conditions are proving to be more and more conducive to beetle survival. Both phenomena have enabled beetle populations to increase significantly in the last few years. While MPB populations affecting other host species are significant in some areas, notably whitebark pine stands in northern Idaho and ponderosa pine stands in eastern Montana, more than 95 percent of the MPB-infested areas are in aging lodgepole pine stands. In total, for all affected hosts, infested area has increased from slightly more than 149,000 acres in 2000 to over 236,580 acres regionwide in 2001. Nearly 2.2 million host trees were killed in 2000—recorded as "faders" in 2001. The most expansive outbreak in the region exists on the Nez Perce National Forest in north-central Idaho, where nearly 1.1 million lodgepole pines were killed on slightly more than 83,200 acres. The next most seriously affected stands were on the Lolo National Forest in western Montana, where almost 69,000 acres were infested to some extent. There, infestations in lodgepole pine stands are slightly more intense, with an average of more than 13 trees per acre being killed (more than 915,000 trees). Both outbreaks appeared to be increasing. Significant outbreaks continued on the Idaho Panhandle National Forest (37,400 acres, of which more than 10,300 acres were in whitebark pine stands), Flathead National Forest (14,500 acres), Clearwater National Forest (1,900 acres), and Flathead Indian Reservation (8,200 acres). Overall, populations are still active in lodgepole pine stands in several areas, especially 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 mountain pine beetle, 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 (18,900 acres); but is of concern in some areas on the Bitterroot, Lolo, and Lewis and Clark National Forests and on 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, whitebark pine, pinyon pine

MPB increased dramatically throughout the Rocky Mountain Region. In Colorado, tree mortality increased from 273,400 trees in 2000 to 458,000 trees in 2001. One primary hot spot continues to be the Upper Arkansas Valley (Chaffee County) near Buena Vista, Colorado, and adjacent South Park (Park County). Large portions of the wildland-urban interface between Buena Vista and Salida have been impacted with ponderosa pine mortality as high as 80 percent in some stands. Interestingly, a relatively large number of piñon pine intermingled near infested ponderosa pines also were attacked and caused concern on private land from Nathrop south to Poncha Springs. Populations of mountain pine beetle are increasing on the northern portion of Uncompahgre Plateau of the Grand Mesa-Uncompahgre-Gunnison National Forest. Outbreaks of mountain pine beetle are causing increased mortality in lodgepole pine stands on Federal and private lands in Eagle, Grand, Jackson, Larimer, Pueblo, and Summit Counties.

The tree mortality in the Black Hills increased from 40,000 trees in 2000 to 273,300 trees in 2001. Much of this was concentrated in the Beaver Park area west of Sturgis, South Dakota, but there were numerous other areas throughout the Black Hills where activity increased.

Wyoming had over 111,000 trees killed in 2001 with most of the damage located in Park, Carbon, and Crook Counties in State, private, and Federal land ownerships. MPB played a significant role in limber and whitebark pine decline on the Shoshone National Forest. Dwarf mistletoe, white pine blister rust, and MPB are leading to the decline of over 58,000 acres of 5-needle pines.

Region 3: Arizona, New Mexico

Host(s): Ponderosa pine

MPB-caused ponderosa pine mortality increased from 810 acres in 2000 to 2,270 acres in 2001. In Arizona, 25 acres of MPB-caused mortality occurred on Grand Canyon National Park. In New Mexico, trees killed by the MPB were detected on the Carson (1,500 acres) and Santa Fe (490 acres) National Forests; Jicarilla Apache (100 acres), Picuris Pueblo (30 acres), Santa Clara Pueblo (5 acres), and Taos Pueblo (60 acres) tribal lands; and the Valles Caldera National Preserve (60 acres).

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

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

MPB-caused mortality vastly increased regionwide from 43,000 trees killed in 2000 to 180,800 trees killed in 2001. The largest outbreaks in the region were located in lodgepole pine stands on the Sawtooth National Recreation Area and the Salmon-Challis National Forest in central Idaho with a combined total of 90,700 trees killed, up from 20,000 in 2000. 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, 4,100 trees were killed in 2001 compared to 2,300 in 2000. This mostly occurred in overstocked, high-elevation whitebark or western white pine stands. In Utah, MPB-caused mortality increased in ponderosa pine on the Dixie National Forest, and increased in lodgepole pine stands on the Wasatch-Cache and Ashley National Forests. On the Bridger-Teton National Forest in western Wyoming, 7,300 lodgepole pines were killed in 2001 compared to 1,600 in 2000.

Mortality of whitebark and limber pine attributed to MPB attacks continued in 2001 with 38,200 trees killed, compared to 10,300 in 2000. 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, overmature 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

In northern California, MPB activity in lodgepole pine continued in known chronic areas during 2001. Activity in ponderosa and sugar pine increased this year compared to the past few years as drought conditions returned.

Mortality associated with the MPB remained at low levels throughout most of the southern Sierra Nevada Mountains and adjacent foothills. However, activity in lodgepole pine continued in the Lake Tahoe Basin with mortality pockets at south shore locations. Pockets of mortality also were found on the Stanislaus and Inyo National Forests.

MPB was one factor contributing to the high incidence of sugar pine mortality in the San Jacinto Mountains in southern California. Some mortality of sugar and ponderosa pine in the San Bernardino Mountains was also associated with MPB.

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 doubled from 2000 levels. In 2001, 211,129 acres with an average of 5.68 trees per acre were reported compared with 106,447 acres affected with an average of 2.88 trees per acre in 2000. Significant increases across all ownerships were reported in western white pine, ponderosa pine, whitebark pine, and lodgepole pine types.

Acres affected in the whitebark pine type increased significantly from 3,607 acres (0.89 trees per acre) in 2000 to 18,891 acres (3.07 trees per acre) in 2001. A little less than half the affected acres were mapped in wilderness areas of Oregon and Washington, primarily within the Eagle Cap, Pasayten, and Alpine Lakes Wilderness Areas. Ascertaining exact cause of damage is difficult from an aerial platform; however, many acres of mapped damage within the Okanogan, Wenatchee, and Wallowa-Whitman reporting areas were also mapped as infected with white pine blister rust.

Significant increases of acres mapped in the ponderosa type occurred on all ownerships. In 2001, 36,341 acres (1.34 t/a) were mapped, compared with 6,847 acres (1.0 trees per acre) in 2000. Most significant increases were reported on the Okanogan, Fremont, and Malheur reporting areas, accounting for more than 63 percent of the mapped damage regionwide.

Activity in sugar pine increased for the third straight year from 1,714 acres in 2000 to 1,988 acres in 2001, but at a slightly lower reported intensity (0.14 trees per acre, compared with 0.18 trees per acre in 2000). The majority of reported mortality occurred on Forest Service and Bureau of Land Management lands within the Rogue River and Siskiyou reporting areas. Additionally, over 400 acres of blister rust were mapped within these same reporting areas.

Activity in western white pine increased across all ownerships from 1,122 acres (1.15 trees per acre) in 2000 to over 16,300 acres (1.23 trees per acre) in 2001. Most significant increases were reported on Forest Service lands on the Okanogan, Colville, and Panhandle National Forest reporting areas within the State of Washington.

Tree mortality in lodgepole pine increased across all ownerships except private lands. Total reported affected acres increased from 93,145 in 2000 (3.17 trees per acre) to 137,516 (7.79 trees per acre) acres in 2001. A substantial increase in acres affected within the Okanogan (84,748) and Deschutes (15,498) reporting areas was recorded, accounting for approximately 72 percent of the regionwide mapped mortality. General forest lands of the Okanogan National Forest, as well as lands within the Pasayten Wilderness Area, continue to have the largest outbreaks.

Nantucket pine tip moth,
Rhyacionia frustrana

Region 8: Regionwide

Host(s): Loblolly pine, shortleaf pine

Tip moth problems were noteworthy in Virginia, North Carolina, Tennessee, and South Carolina. North Carolina infestations were classified as "moderate" this year. Consistent with last year's report, Virginia populations seem to have evolved into a persistent problem in the coastal plain and piedmont. South Carolina populations were again high, especially in 3 to 5-year-old plantations on old agricultural sites. About 8,500 acres in South Carolina were reported infested, with some areas exhibiting 100 percent infestation rates. In Tennessee, an unusual fourth generation was reported in the north-central part of the State. Significant damage was also reported from western Tennessee on loblolly pine seedlings. Mississippi experienced large acreages of tip moth damage in Grenada and Holmes Counties. Infestation levels in Texas have been static since 1999, with some isolated areas having as much as 75 percent tip infestation.

Oak bark beetles,
***Pseudopityophthorus* spp.**

Region 5: California

Host(s): Coast line oak

There were several reports of black oak and interior live oak being attacked and killed by oak bark beetles, probably *P. pubipennis*, in the Redding area, Shasta County.

Oak leaftier,
Croesia semipurpurana

Region 8: Florida, Tennessee

Host(s): Oaks

In Florida, a March outbreak of the oak leaftier in two heavily people-populated areas (St. Petersburg and Deland) caused extensive defoliation. While there appears to be no significant harm to the trees, concern by the public generated many calls to extension service and State forestry agency personnel. As noted above, oak leaftiers were also a component of a multi-species defoliator outbreak in eastern Tennessee.

Region 9/Northeastern Area: Maine, West Virginia

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

Surveys for oak leaftier eggs were conducted in Barbour, Pendleton, Pocahontas, Randolph, and Tucker Counties in late winter, but few eggs were found and only light and spotty defoliation occurred in the spring. Defoliation by this and a variety of other oak feeders remained static in Maine in 2001, the same as 1999 and 2000 levels. Damage was light to moderate but very spotty.

Insects: Native

Orange-striped oakworm,
Anisota senatoria

Region 9/Northeastern Area: Connecticut, Maryland, New York, Pennsylvania, Rhode Island

Host(s): Black oak, red oak

Localized infestations occurred in Carroll and Howard Counties in Maryland. This late season defoliator affected over 3,100 acres of oaks in Cumberland County, Pennsylvania. Over 2,000 acres were defoliated in Connecticut in Windham County. In New York, this insect defoliated oaks in areas of Suffolk County totaling about 2,000 acres late in the growing season. Many of the affected trees had already been defoliated earlier in the year by gypsy moth. In Rhode Island, 5,500 acres of oaks in the central part of the State were defoliated.

Oystershell scale,
Lepidosaphes ulmi

Region 9/Northeastern Area: Maine, Vermont

Host(s): Beech

In Maine, this locally aggressive and destructive pest seems to remain chronic in beech stands across the State, with outbreaks occurring in different areas and with differing degrees of severity. Populations decreased in northern Vermont, but increased in the southern part of the State.

Pacific tent caterpillar,
Malacosoma constrictum

Region 5: California

Host(s): Blue oak

Some blue oaks along ridge tops in the Cottonwood area, Shasta County, were completely defoliated, but overall defoliation was light.

Pine colaspis beetle,
Colaspis pini

Region 8: Regionwide

Host(s): Southern pines

This beetle caused localized defoliation to pine plantations in central Louisiana, particularly eastern Rapides Parish, in 2001. No significant damage occurred, but defoliation is unsightly, causing landowner concerns.

Pine engraver beetles, *Ips* spp.

Region 1: Idaho, Montana

Host(s): Ponderosa pine, lodgepole pine, other pines

Pine engraver beetle activity was at very low levels in the region in 2001; most activity occurred in ponderosa and lodgepole pine stands in northern Idaho. Total mortality increased slightly in 2001 from the estimated 600 trees killed on about 200 acres to a total of approximately 1,200 trees of on just fewer than 350 acres. While recorded mortality did increase somewhat in 2000, we anticipated the increase may have been higher because of a continuation of unusually warm and dry weather for the past few years in most reporting areas. We may yet experience increases in beetle-killed trees due to environmental conditions and the number of fire-affected ponderosa pine stands in western Montana. The Clearwater National Forest, in northern Idaho, recorded the most engraver beetle-affected acres in the region—158 in lodgepole pine stands and another 27 in ponderosa pine. A total of 375 trees were killed on the forest. An estimated 275 trees were killed on about 70 acres on the Nez Perce Indian Reservation. No other reporting area recorded more than 20 affected acres.

Region 2: Colorado, Nebraska, South Dakota, Wyoming

Host(s): Ponderosa pine, pinyon pine

Recent wildfires and severe storms created suitable habitat for *Ips pini* population increases in the Black Hills of South Dakota and Wyoming. Over 171, 500 trees were killed on 34,900 acres in 2001. Green tree attacks increased to levels that have not historically been seen in this area. Many of the most severely affected areas are in the wildland-urban interface.

Major piñon mortality is occurring in the southwest corner of Colorado in Montezuma County. The primary organism in these trees is piñon ips (*Ips confusus*). Some of these trees are also suffering from blackstain root disease and drought. Current mortality totals at least 5,000 trees. *Ips* beetles caused piñon mortality in Las Animas and Garfield Counties.

Ips beetles, mostly *I. pini* and other larger species (probably *I. calligraphus* and *I. knausi*) are causing mortality in the northern part of Colorado Springs and a nearby pocket of 68 acres (estimated 400 dead trees) on the Air Force Academy.

Ips beetles continue to kill trees severely stressed by jack pine budworm in the Halsey Unit of the Nebraska National Forest. Populations of jack pine budworm have declined on the forest but *Ips* beetles attacked these severely defoliated stands in 2001. Other areas of Nebraska report ips activity near logging slash or recently cut firewood.

Region 3: Arizona, New Mexico

Host(s): Ponderosa pine, piñon pine

Ponderosa pine mortality caused by *Ips* beetles increased from 11,965 in 2000 to 83,960 acres in 2001. In Arizona, ponderosa pine mortality due to *Ips* beetles was reported on the Apache-Sitgreaves (755 acres), Coconino (315 acres), Kaibab (35 acres), Prescott (8,090 acres) and Tonto (23,605 acres) National Forests; Grand Canyon National Park (5 acres); Bureau of Land Management lands (100 acres); Fort Apache (6,705 acres), Navajo (75 acres), and San Carlos (25,335 acres) Indian Reservations; and 895 acres of State and private lands. Piñon ips-caused tree mortality was recorded on the Apache-Sitgreaves (10 acres), Coconino (3,350 acres), and Kaibab (470 acres) National Forests; 2,300 acres of Bureau of Land Management land; and Fort Apache (60 acres) and Navajo (5 acres) Indian Reservations. In New Mexico, *Ips*-caused ponderosa pine mortality was detected on the Carson (275 acres), Cibola (1,640 acres), Gila (11,705 acres), Lincoln (1,370 acres), and Santa Fe (680 acres) National Forests; Jicarilla Apache tribal lands (295 acres);

and State and private lands (2,080 acres). Approximately 10,960 acres of piñon ips beetle-caused tree mortality also occurred on State and private ownerships.

Region 4: Idaho, Nevada

Host(s): Lodgepole pine, ponderosa pine

Mortality due to pine engraver beetles increased throughout the region. A total of 2,400 trees were killed in 2001 in contrast to 700 killed the previous year. This damage occurred primarily on the Ely and Ruby Mountain Ranger Districts on the Humboldt National Forest, with minor damage detected on the Boise and Payette National Forests in southern Idaho. Activity is often associated with western pine beetle during droughts.

Region 5: California

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

A large increase in pine engraver activity was noted throughout northeastern California during 2001, particularly of the pine engraver, *Ips pini*, on the east side of the Sierra Nevada and southern Cascade Mountains. More mortality caused by *Ips pini* and drought was detected during 2001 than throughout the protracted drought period of the late 1980s and early 1990s. Elsewhere in California, a small amount of top-killing was observed on the Mammoth District, Inyo National Forest. The pinyon ips (*Ips confusus*) was associated with some singleleaf pinyon mortality south of Lake Crowley, Mono County. Increasing singleleaf pinyon mortality was also reported in the vicinity of the south fork of the Kern River in Tulare County.

Ips species were found in drought-stressed, off-site pine plantings in southern California. Pinyon ips populations were high in the eastern end of the San Bernardino Mountains where singleleaf pinyon in the vicinity of the Palm fire continued to be killed. Population buildup on fire-killed trees, drought, and a falling water table from housing development are suspected contributing factors. Pinyon ips and drought were also primary mortality agents for pinyon mortality in parts of Los Angeles County.

Region 6: Oregon, Washington

Host(s): Ponderosa pine

Pine engraver activity increased over 2000 levels from only 247 acres to over 1,700 acres mapped in 2001. The majority of the mortality was mapped on the Rogue River and Okanogan reporting areas. Half of the affected acres mapped were private lands split between Oregon and Washington with the majority of the remaining acres mapped on Forest Service lands within the Okanogan and Wenatchee reporting areas.

Region 8: Regionwide

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

Another year of drought contributed to high populations of *Ips* beetles throughout much of the region. The heaviest impact was in Florida, southeast Georgia, and South Carolina. Florida losses were again exceptionally high compared to the norm, and were often associated with other stress factors such as overstocking, root compaction, and poor soils. In South Carolina, *Ips* infestations were often associated with southern pine beetle, and *Ips* spots were at first often misidentified as SPB infestations during aerial surveys. Ground checks proved otherwise. North Carolina infestations were worst in the mountains, foothills, and western piedmont, especially on dry sites. As in South Carolina, infestations were often mixed in with southern pine beetle. Virginia reported slightly elevated population densities in 2001. Nevertheless, Tennessee witnessed a noteworthy decline in *Ips* populations, especially in the middle part of the State, where abundant rainfall apparently helped increase stand vigor and resistance to beetle attack.

Populations also declined somewhat in Louisiana, with 48 large multiple-tree spots detected. In addition, hundreds of single-tree or small spots were scattered across the State. Very low levels of engraver beetle activity were reported in Mississippi, and levels in Arkansas and Texas dropped dramatically from 2000 with a return to more normal rainfall.

Pine needle sheathminer, *Zelleria haimbachi*

Region 5: California

Host(s): Ponderosa pine

In general, damage from this sheathminer was less in 2001 than in 2000 in both the War Memorial plantation and the Pondosa Burn plantation, Siskiyou County.

Pine sawflies, *Neodiprion* spp. *Diprion* spp.

Region 5: California

Host(s): Ponderosa pine

Several ponderosa pine plantations on the Klamath and Shasta-Trinity National Forests were defoliated in 2001.

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

Host(s): Southern pines

Populations of the loblolly pine sawfly (*Neodiprion taedae linearis)* were up in southern Arkansas with heavy defoliation in parts of Brady, Calhoun, Dallas, and Union Counties. Tennessee noted that populations of this species increased in scattered areas across the north-central part of the State, but were at lower levels than reported in 2000 in the west. Defoliation declined significantly in Louisiana, with only scattered occurrences reported from older plantations in Caldwell, Jackson, LaSalle and Winn Parishes. Black-headed pine sawflies (*N. excitans*) defoliated a 60-acre tract in George County, Mississippi, and there were occasional reports from other areas of the State. In North Carolina, there were several reported outbreaks of this species in northeastern counties in 12- to 20-year-old pine plantations. Florida recorded another year of redheaded pine sawfly (*N. lecontei*) activity, but infestations were far less significant compared to those of the year 2000. Most damage again occurred in young (less than 15 years) longleaf and slash pine plantations. Tennessee also reported scattered, but increased populations of the redheaded pine sawfly across the State. In the North Carolina mountains, there were drought related outbreaks of *Diprion similis*, the introduced pine sawfly.

Ponderosa needleminer,
Coleotechnites ponderosae

Region 2: Colorado

Host(s): Ponderosa pine

This insect continues at high levels throughout the forested portions of the Black Forest in Elbert, Douglas, and El Paso Counties. Tip damage occurs to the distal half of old needles, which does not severely damage the tree. This symptom is sometimes confused with mountain pine beetle fading.

Region 6: Oregon

Host(s): Ponderosa pine

Reported needleminer damage declined for the third straight year following the 1998 outbreak of over 24,000 acres. In 2000, about 1,900 acres were mapped as compared to slightly less than 500 acres in 2001. The majority of the mapped activity occurred on private lands in central Oregon. The crown symptoms of yellowing caused by larval mining seemed to be more pronounced along the edges of meadows and the surrounding lowland forests. Parasitoids are expected to continue to increase in number and eventually bring the needleminer population back in check.

Red oak borer,
Enaphalodes rufulus

Region 8: Arkansas, Georgia, South Carolina

Host(s): Northern red oak, black oak

Red oak borer attacks continued at extremely high levels in 2001 in north central Arkansas in association with oak decline initiated by severe drought in 1998-2000. Populations are now at unprecedented levels. Damage contributed to drought-related mortality in red oaks and degrade in lumber from attacked trees sharply reduced product values. Mortality, especially in red oaks, is now at unprecedented levels, and there is great concern about the impacts on oak forests across the State. Red oak borer adults emerged in 2001, and with a 2-year life cycle will infest trees until re-emerging in 2003. In central Louisiana, some red oak borer activity was noted in conjunction with oak decline in bottomland hardwoods. The borer attacked red and scarlet oak in the piedmont of South Carolina. In combination with drought stress, it contributed to some mortality. Georgia also reported problems with the red oak borer (and other borers) associated with the drought and trees growing on poor sites.

Red turpentine beetle,
Dendroctonus valens

Region 2: South Dakota

Host(s): Ponderosa pine

Populations of red turpentine beetle have increased dramatically due to large fires in the Black Hills. Many of the heavily fire scorched trees have been infested but there has been little movement from fire scorched trees into green trees.

Region 5: California

Host(s): Jeffrey pine, ponderosa pine

This bark beetle has been common in wildfire and prescribed burn areas and at the edges of root disease centers over the past 5 years in northern California. It is commonly associated with other bark and engraver beetles. In southern California, it was observed on pines weakened by drought, annosus root disease, and dwarf mistletoe.

Reproduction weevils,
Hylobius pales
Pachylobius picivorous

Region 8: North Carolina, South Carolina, Texas

Host(s): Southern pines

Weevil feeding contributed to the loss of 1,050 acres of newly-planted pines in the South Carolina coastal plain. In North Carolina, damage generally remained light to moderate throughout the State, with only limited scattered heavy infestations. Weevil activity remained low in Texas during 2001, probably because most plantings were replantings of stands where seedlings were killed during the recent drought (delayed planting ameliorates weevil damage risk).

Roundheaded pine beetle,
Dendroctonus adjunctus

Region 3: Arizona, New Mexico

Host(s): Ponderosa pine

Roundheaded pine beetle-caused tree mortality in the region increased slightly to 3,670 acres in 2001 compared to 2,235 acres in 2000. In Arizona, roundheaded pine beetle mortality was recorded on 2,140 acres of the Coronado National Forest. In New Mexico, mortality was detected on the Lincoln National Forest (690 acres) and Mescalero Apache tribal lands (840 acres).

Scarlet oak sawfly,
Caliroa quercuscoccineae

Region 9/Northeastern Area: West Virginia

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

In West Virginia, scarlet oak sawfly surveys were conducted in Kanawha, Putnam, Mason, Wayne, Cabell, and Lewis Counties periodically throughout the season. Compared to the 18,400 acres defoliated in 2000, defoliation this year was extremely light with little or no pest activity reported.

Southern pine beetle,
Dendroctonus frontalis

Region 8: Regionwide

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

In 2001, southern pine beetle (SPB) populations continued at very high levels in the Southern Region. The extended drought exacerbated the SPB situation by providing optimum habitat for this native forest pest. The outbreak covered portions of Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee, and Virginia on Federal, State, and private ownerships. It will be recorded as one of the largest outbreaks in history. On the contrary, there was not even a single SPB infestation in the entire States of Louisiana, Texas, Arkansas, and Oklahoma. Compared to 2000, the number of SPB infestations in Region 8 remained virtually constant (60,628 spots to 58,839 spots) as did the number outbreak acres (12,191,000 acres to 12,342,415 acres).

The southern Appalachian Mountain area from southwestern Virginia and southern Kentucky to eastern Tennessee and western North and South Carolina to northern Georgia was devastated. SPB attacked hosts other than its favored southern yellow pines. Eastern white pine was commonly killed, and significant infestaions occurred in Norway and red spruce at the higher elevations. Suppression of individual SPB infestations was limited by poor markets and lack of accessibility. Many infestations were hundreds of acres in size.

In Virginia, over 270,000 trees were killed by SPB in 762 infestations across 15 counties (10 of which were in outbreak status). Kentucky also reported another very bad SPB year, with 3,513 infestations tallied in 45 counties, 41 of which were in outbreak status. Most losses were in the drought-ravaged mountains, with impacts greatest on south-facing slopes and shallow soils. A large number of eastern white pines have also been lost in Kentucky – so much so that the log home industry, an important source of employment in many rural areas, has been severely affected.

In Tennessee, although beetle populations began to decline in the southern Appalachians, the losses over the past 2 years have been devastating. More abundant rainfall reversed the 3-year pattern of summer and fall droughts. Nevertheless, there were more spots east of Nashville and north of Knoxville.

In North Carolina, there was a 98 percent increase in infestations over year 2000 (1,951 to 3,871). While activity decreased slightly in the mountains, losses in the western piedmont and foothills more than offset this improvement. In all, 32 North Carolina counties were infested, with 22 classified in outbreak status. North Carolina foresters and botanists expressed concern about the loss of low population tree species such as table mountain pine and red spruce. Because of poor markets, only 5 percent of trees were salvaged.

In South Carolina, financial losses reached $76 million – the second worst year of financial losses on record. Most SPB activity was confined to the western piedmont, foothills, and mountains where 19 counties were in outbreak status. Very poor salvage markets hampered effective control.

Alabama remained a hot spot for beetle activity, the State's third straight year for epidemic populations. Statewide 11,945 spots were detected with 45 counties considered epidemic. This a reduction from the record setting 26,407 in 2000, but still is a very high level of activity.

Florida's nightmare year of 2000 actually grew worse in 2001. The State's problems were compounded by infestations throughout much of the wildland-urban interface (e.g., the Gainesville-Alachua County area), which took the brunt of much of the outbreak. The situation was aggravated by drought and poor salvage markets. Beetle activity and associated problems were so severe, widespread, and intense, that the Florida Commissioner of Agriculture declared the situation an "incident," and convened a task force to address the problem. Unprecedented infestations occurred in Lake Orange, Seminole, Sumter, and Volusia Counties – none of which had any previous record of SPB infestations. Nine counties in central and northeastern Florida were epidemic, more than twice the number ever previously experienced. In all, Florida recorded 2,892 infestations in 34 counties. Some 3.5 million trees were lost at an estimated cost of $38.4 million.

Georgia reported 28 counties epidemic in the northern part of the State. Salvage efforts were complicated by inaccessibility and poor wood markets. Georgia recorded 4,863 spots in 2001.

In western Gulf States, beetle populations remained low. Mississippi detected only 79 spots statewide, and no spots were detected in Arkansas, Louisiana, Oklahoma, and Texas.

Region 9/Northeastern Area: Delaware, Maryland, New Jersey, Ohio, West Virginia

Host(s): Austrian pine, loblolly pine, Scotch pine, Virginia pine

No significant active SPB hot spots were detected over the entire southern part of Delaware. SPB populations continue to remain low in southern Maryland. In Ohio, SPB infestations occurred in Lawrence, Hocking, and Pike Counties on planted loblolly, Scotch, and Austrian pines and in naturally occurring Virginia pine. The first confirmed occurrence of this beetle in New Jersey was reported from Belle Plain State Forest, Cape May County. Ohio's infestation coincided with an outbreak in northern Kentucky probably a result of a warm winter and the recent drought. SPB populations were monitored in six southern Ohio counties (Adams, Gallia, Jackson, Lawrence, Pike, and Scioto) using Lindgren funnel traps baited with frontalin and turpentine. In West Virginia, the SPB killed one or two trees at scattered spots in four western counties in 2001. The last outbreak of SPB in West Virginia occurred in 1993 and 1994. Lindgren funnel traps with the standard lures for predicting population trends were used in Greenbrier, Pleasants, Kanawha, Jackson, and Wayne Counties. While several SPB adults were trapped, clerid beetle counts were numerous enough to predict a declining or static trend for 2002.

Spruce beetle,
Dendroctonus rufipennis

Region 1: Idaho, Montana

Host(s): Englemann spruce

The number of spruce beetle-killed trees more than doubled in 2001 compared to 2000 but still remained low throughout the region; about 1,660 trees were recorded on 885 acres regionwide. The largest amount of mortality occurred in Montana on the Gallatin National Forest where 565 trees were killed on 287 acres and on the Kootenai National Forest where 385 trees were killed on 170 acres. Only 190 trees were recorded on about 220 acres in all of northern Idaho. In 2000, 650 trees were killed on about 450 acres regionwide.

Region 2: Colorado, Wyoming

Host(s): Engelmann spruce

In Colorado, an estimated 16,500 trees were dead or fading due to spruce beetle attacks. Spruce beetle activity was most abundant in Routt County, in and around Steamboat Springs. The Routt National Forest blowdown event provided abundant host material and triggered the current spruce beetle outbreak. Brood beetles left the felled trees and have infested thousands of standing spruce on Federal lands. Infestations on private land are increasing but remain limited at this time. Control actions are being undertaken to limit beetle buildup at the Steamboat Springs Ski Area and in other high value developed reaction sites. Spruce beetle losses are expected to increase on other Federal lands in Colorado due to scattered blowdown in Eagle, Garfield, Gunnison, and Hinsdale Counties.

Spruce beetle killed roughly 243,900 Engelmann spruce on 65,300 acres in Wyoming during 2001. This is a significant increase over 2000 when 138,745 trees were killed on 17,874 acres.

Insects: Native

Region 3: Arizona, New Mexico

Host(s): Spruce

Spruce beetle-caused tree mortality increased slightly from 5,990 acres in 2000 to 6,215 acres in 2001. In Arizona, spruce beetle mortality occurred on the Apache-Sitgreaves (10 acres) and Coronado (630) National Forests; the Navajo Indian Reservation (55 acres), and on 5 acres of State lands. In New Mexico, spruce beetle-related tree mortality occurred on the Carson (1,230 acres), Cibola (135 acres), Lincoln (745 acres), and Santa Fe (2,515 acres) National Forests; Taos Pueblo tribal lands (360 acres); the Valles Caldera National Preserve (20 acres); and 510 acres of State and private lands.

Region 4: Idaho, Nevada, Utah, Wyoming

Host(s): Spruce

Spruce beetle was responsible for more tree mortality in 2001 in the Intermountain Region than any other insect. The number of trees killed in 2001 totaled 270,300, which more than tripled the previous year's tally of 83,400. The largest infestations are still located in southern Utah, where 117,000 trees were killed on the Manti-LaSal National Forest, and 116,000 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, insect populations declined, resulting in a decrease in mortality from 6,500 trees in 2000 to 590 trees in 2001. Spruce beetle damage in southern Idaho national forests resulted in 4,800 trees killed, with the highest numbers detected on the Boise National Forest.

Region 6: Oregon, Washington

Host(s): Engelmann spruce

All reported mortality in Oregon and Washington in 2001 was in Engelmann spruce. Acres affected increased for the third straight year from over 3,200 (1.18 trees per acre) in 2000 to approximately 24,900 (4.14 trees per acre) in 2001. Variability in foliar signatures and early needle drop combined with other mortality agents occurring in mixed stands creates difficult observational conditions. Due to these variables it is suspected that actual mortality is probably much higher than reported. The vast majority of mortality occurred on Forest Service lands within the Okanogan reporting area. Other reporting areas with significant mortality include the Colville National Forest, Colville Indian Reservation, and the Wenatchee National Forest. In other areas, spruce beetle activity was lightly scattered in the host type.

Region 10: Alaska

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

Areas of active spruce bark beetle infestation increased from 86,038 acres in 2000 to 105,048 acres in 2001. The infestations are in stands that have been previously undisturbed and/or are adjacent to ongoing infestations and continue to provide a source of suitable breeding material for the beetle. Spruce beetle activity is expected to persist in these areas until weather conditions, lack of adequate host material, or other disturbances reduce their populations. The previously infested areas (1,845,000 in the last 6 years) remain at moderate to high risk for potential catastrophic wildfire due to the large volume of beetle-killed spruce, both standing-dead and down.

Region 9/Northeastern Area: Maine

Host(s): White spruce, red spruce

The condition of many of Maine's coastal spruce stands continued to gradually decline in 2001. The most immediate cause of spruce stand deterioration continues to be spruce beetle but only where trees have been predisposed by drought, poor site, overmaturity, and other stressors such as wind damage.

Spruce budworm,
Choristoneura fumiferana

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

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

In Maine, where low level spruce budworm populations continued in 2001, no larvae were found and no defoliation was detected. However, spruce budworm moth catch in the statewide network of light traps was the highest since 1989. In New Hampshire, no defoliation was detected and pheromone trap catches were very low. In New York, total trap catch for this insect in 2001 was 1,833 insects from 93 traps. Moderate defoliation was reported in the northern portion of the State, but no acreage figures are available. In Vermont, there was no noticeable defoliation and the number of moths caught in pheromone traps decreased from 2000.

Northeast Minnesota sustained 18,889 acres defoliated, down from 28,481 in 2000. This is the 48th consecutive year of spruce budworm defoliation in Minnesota. Michigan reported 3,300 acres defoliated. Wisconsin reported only 800 acres defoliated.

Sycamore lace bug,
Corythucha cilitra

Region 9/Northeastern Area: Pennsylvania

Host(s): Sycamore

Sycamore trees on approximately 500 acres in Greene County, Pennsylvania, were noticeably discolored from the feeding of this insect.

Texas leaf-cutting ant,
Atta texana

Region 8: Louisiana, Texas

Host(s): Southern pines, hardwoods

In 2001, localized defoliation of pine plantations occurred in east Texas and west 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 registered for use in Texas in 1999 and in Louisiana in 2000 and provides excellent control. A single application can eliminate an ant colony in as little as 4 weeks.

Truncated true Katydid,
Paracryptophyllus robustus

Region 8: Texas

Host(s): Post oak

In July 2001, about 500 acres of post oak forest in Lee County, Texas, were defoliated by an unusual outbreak of the truncated true katydid. Trees suffered little from this defoliation.

Twig beetles,
Pityophthorus spp.

Region 5: California

Host(s): Pine

Heavy infestations of twig beetles occurred in singleleaf pinyon pine in the Devil's Punchbowl National Area and County Park, Los Angeles County. Young Jeffrey pines were attacked in a plantation on Frazier Mountain, Los Padres National Forest.

Variable oak leaf caterpillar,
Lochmaeus manteo

Region 8: Florida

Host(s): Oak

In 2001, the variable oak leaf caterpillar again caused thousands of acres of defoliation during July and August in three Florida counties (Gilchrest, Suwanee, and Columbia). While there is not evidence of mortality, the damage generated many calls by concerned landowners to extension agents and foresters.

Region 9/Northeastern Area: New Jersey, Pennsylvania

Host(s): Oaks

Complete defoliation of oak was observed on several thousand acres in Ocean County, New Jersey. The damage in 2001 was greater and extended over a larger area than in 2000. In Pennsylvania, 13,772 acres were defoliated by variable oakleaf caterpillars in Potter and Tioga Counties.

Western black-headed budworm,
Acleris gloverana

Region 10: Alaska

Host(s): Western hemlock, mountain hemlock, Sitka spruce, white spruce

In 2001, black-headed budworm defoliation affected 51,000 acres of white spruce and hemlock in Alaska. Approximately 30,000 acres of white spruce were defoliated in the Wood River-Tikchik State Park north of Dillingham. Approximately 21,000 acres of hemlock were defoliated in Prince William Sound. Budworm populations appear to be highly susceptible to adverse weather conditions.

Western oak bark beetle,
Pseudopityophthorus pubipennis

Region 5: California

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

This bark beetle was found killing diseased and declining tanoak, coast live oak, and black oak along the coast from Monterey County north to the Oregon border. Throughout northern coastal California, this beetle was associated with mortality of tanoak infected with *Armillaria mellea*.

Western pine beetle,
Dendroctonus brevicomis

Region 1: Idaho, Montana

Host(s): Ponderosa pine

Ponderosa pine mortality attributed to western pine beetle decreased slightly in 2001; but more acres were affected. In 2000, about 2,000 beetle-killed trees had been recorded on 1,500 acres. That increased to just over 2,400 acres; but fewer than 1,700 trees were killed in 2001. Most mortality–on nearly 1,800 of those acres–was observed on the Idaho Panhandle National Forest in northern Idaho. Elsewhere in the region, western pine beetle-caused mortality was light and quite scattered. There remains the potential for western pine beetle populations to increase in 2002. Large amounts of fire-weakened ponderosa pines, 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

Tree mortality attributed to this insect increased from 30,385 acres in 2000 to 35,265 acres in 2001. In Arizona, western pine beetle mortality was detected on the Apache-Sitgreaves (3,840 acres), Coconino (30 acres), and Kaibab (15 acres) National Forests; Walnut Canyon National Monument (5 acres); Fort Apache (365 acres), Navajo (30 acres), and San Carlos (40 acres) Indian Reservations; and 50 acres of State and private lands. In New Mexico, significant activity was detected on the Cibola (2,730 acres) and Gila (27,545 acres) National Forests' Isleta Pueblo tribal lands (475 acres), and 140 acres of State and private lands.

Region 4: Idaho

Host(s): Ponderosa pine

Observations detected a total of 260 trees killed by western pine beetle this year on the Salmon-Challis and Payette National Forests in southern Idaho.

Region 5: California

Host(s): Coulter pine, ponderosa pine

Ponderosa pine mortality increased in northwestern California because of drought stress, but spots remain scattered. Mortality was also scattered in northeastern California while in the southern Sierra Nevadas, mortality associated with the western pine beetle continued at low levels and was restricted to scattered

individual trees and small groups of ponderosa pine. In southern California, mortality was high in Coulter pine in the San Jacinto Mountains.

Region 6: Oregon, Washington

Host(s): Ponderosa pine

Acres affected by western pine beetle activity increased from 6,993 acres (2.20 trees per acre) in 2000 to 18,602 acres (1.21 trees per acre) in 2001. Increases were noted mostly in large pines with relatively insignificant changes in pole-sized ponderosa pines from 2000 levels. Approximately 89 percent of the mapped mortality occurred in Washington. Areas most heavily affected on private lands were mapped within the Ochoco, Glenwood, and northeast Washington reporting areas. Forest Service lands most heavily affected were the Ochoco, Okanogan, and Panhandle National Forests. Approximately 4,200 acres on the Yakama and 1,400 acres on the Colville Indian Reservations were also mapped.

Western spruce budworm, *Choristoneura occidentalis*

Region 1: Idaho, Montana

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

In 2001, aerial surveyors mapped 1,300 acres of defoliation by the western spruce budworm (WSB) east of the continental divide on the Helena National Forest. Because of the recent low population levels of WSB in Montana, the annual pheromone trapping program for WSB in the region was limited in scope for 2001. There was a significant increase in the number of moths caught at several trapping sites, while number of moths caught at other sites decreased slightly or remained relatively unchanged. In one stand on the Beaverhead-Deerlodge National Forest, 133 moths were caught in 10 traps in one small stand.

Region 2: Colorado, Wyoming

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

Colorado had an increase in WSB affected acreage from 20,654 in 2000 to 35,700 in 2001. Even with this increase, WSB activity was reduced due to a series of late frosts that killed much of the new growth on Douglas-fir, white fir, and other hosts. The southern portion of the Uncompahgre Plateau in Colorado has seen significant levels of WSB defoliation in Englemann spruce. This activity is also evident to the east of the Plateau where spruce in the vicinity of Ouray, Colorado, were defoliated. Currently, there is little mortality associated with this defoliation.

Region 3: Arizona, New Mexico

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

WSB defoliation more than doubled regionwide, increasing from 192,220 acres in 2000 to 472,100 acres in 2001. In Arizona, WSB defoliation was recorded on the Apache-Sitgreaves (70 acres) and Kaibab (9,515 acres) National Forests; Grand Canyon National Park (40 acres); and the Navajo Indian Reservation (4,540 acres). In New Mexico, WSB defoliation was detected on the Carson (290,610 acres), Cibola (5,750 acres), Gila (4,860 acres), Lincoln (1,420 acres), and Santa Fe (55,415 acres) National Forests; Jicarilla Apache (3,135 acres), Mescalero Apache (30 acres), Picuris Pueblo (45 acres), and Taos Pueblo (9,285 acres) tribal lands; and on approximately 74,835 acres of State and private lands.

Region 4: Idaho, Utah

Host(s): Douglas-fir, true firs

Across the Intermountain Region, defoliation caused by WSB decreased from 21,100-acres in 2000 to 13,200-acres in 2001. The Dixie National Forest in southern Utah showed a reduction of 14,000-acres in 2000, to 7,900-acres in 2001. On Utah's Fishlake National Forest, 1,500 acres of heavy defoliation was detected for this year. In Idaho, 3,800-acres of defoliation ranging from light to heavy was observed on the Boise and Targhee National Forests.

Region 6: Oregon, Washington

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

Areas of aerially visible defoliation decreased from approximately 384,567 acres in 2000 to 272,114 acres in 2001. Approximately 100,606 acres were reported in the light category, 123,823 in the moderate, and 47,685 acres in the heavy category. The increase in the light category and decrease in the heavy category from 2000 levels reflects a northwest expansion of the outbreak toward Bumping Lake and the American River near the Yakima/Pierce county line in Washington State. Decreases occurred on all ownerships except within Mt. Rainier National Park, which went from 39 acres in 2000 to approximately 6,000 acres in the vicinity of Cowlitz Divide and Chinook River. New areas of visible defoliation were recorded in the Alpine Lakes and Pasayten Wilderness Areas. Reported acres of visible defoliation doubled in William O. Douglas and Norse Peak Wilderness Areas. Following are some noteworthy reporting area trends: Wenatchee reported 121,236 acres in 2000, 123,189 acres in 2001; Yakima had 219,386 acres in 2000, 116,242 acres in 2001; Glenwood had 13,113 acres in 2000, 4,880 acres in 2001; and Gifford-Pinchot went from 29,763 acres in 2000 to 21,217 acres in 2001. Defoliation trends reported by land ownership in the Pacific Northwest are 212,203 acres Indian Nation lands in 2000 compared to 115,648 acres in 2001; an increase for the third straight year from 125,892 acres in 2000 to 127,424 acres in 2001 on combined Federal lands; a decrease from 18,448 acres in 2000 to 15,866 acres in 2001 on State lands; and a decrease from 28,024 acres in 2000 to 13,176 acres in 2001 on private lands.

White pine weevil,
Pissodes strobi

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

Host(s): Eastern white pine

This perennial problem continued to seriously limit the growth of white pine in Maine where no treatment was applied. Severe damage was readily noted in 2001. Weevil damage continues to be an annual problem in New Hampshire. In Vermont, there was generally less damage than normal.

Yellowheaded spruce sawfly,
Pikonema alaskensis

Region 9/Northeastern Area: Maine

Host(s): Spruce

In Maine, there were scattered reports of a slight resurgence of yellowheaded spruce sawfly defoliation in 2001. The heaviest defoliation was observed on ornamentals and individual open-grown roadside trees across much of the State. Defoliation in plantations was generally light and no control projects were undertaken.

Insects: Nonnative

Asian longhorned beetle,
Anoplophora glabripennis

Region 8: Texas

Host(s): Hardwoods

An adult beetle was collected inside a warehouse at the Port of Houston in 2000. Intensive surveys of vegetation in the vicinity of the warehouse in 2001 revealed no evidence of infestation. USDA Animal and Plant Inspection Service personnel conduct detailed inspections of wood packing material from China to find and prevent accidental introduction of this unwanted wood boring beetle.

Region 9/Northeastern Area: Illinois, New York

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

Surveys with bucket trucks and tree climbers at O'Hare Airport revealed no additional trees since 2000. Overall, a total of 1,527 trees have been destroyed, only 5 in 2001.

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 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.

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 professional arborists likely to encounter this insect.

Balsam fir gall midge,
Paradiplosis tumifex

Region 5:

Host(s): True firs

Previously unknown in California, this midge has now been confirmed by the California Department of Food and Agriculture as present in far northern California.

Balsam woolly adelgid,
Adelges piceae

Region 1: Idaho

Host(s): Grand fir, subalpine fir

Aerial survey data estimate 51,551 acres infested by the balsam woolly adelgid (BWA) in northern Idaho in 2001. This number is a decrease in infested acres of about 5,000 acres from 2000 (56,426 acres infested reported in 2000). Actual infested acres are probably higher since some areas may not yet be 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 land. 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 having been killed by BWA. 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 4: Idaho

Host(s): True firs

First detected in Idaho in 1983 near Couer d'Alene, this near-microscopic insect is capable of killing fir trees in ornamental, forest, or Christmas-tree plantation settings. The host range includes native grand fir and subalpine firs along with white firs planted in landscape settings. Since establishment, the insect's traditional host range in Idaho had been restricted to a roughly 250-mile band in northern Idaho between the Salmon and St. Joe Rivers. However, in 2001 the insect was found killing four subalpine firs in residential settings in Cascade and McCall, Idaho.

Region 6: Oregon, Washington

Host(s): True firs

BWA activity was observed on 50,824 acres in 2001, a significant increase compared with the reported 6,300 acres in 2000. Favorable environmental conditions during the winter and spring of 2001 supported increased levels of activity. Reporting areas with significant acreage of mapped damage include: Gifford-Pinchot in the vicinity of Mt. Adams, Mt. Baker-Snoqualmie, Okanogan, Umatilla, Wallowa-Whitman, Wenatchee, Willamette, Yakama Indian Reservation, Mt. Rainier, and Olympic National Parks. Regionally, the vast majority of reported, visible activity occurred in subalpine fir stands of federally owned lands.

In 1998, a Forest Health Monitoring Program 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. A set of permanent plots indicate that environment plays a significant role in the fluctuations of BWA populations; and that BWA can result in significant ecological impacts on some sites over time by eliminating host species. The BWA survey has been completed in Oregon. Additional surveys in Washington are planned for 2002.

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 BWA, approximately 64,700 acres of Fraser fir have been

affected. The insect attacks trees of all age classes, but prefers the older fir trees. Adelgid populations were again high in 2001.

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

Host(s): Balsam fir

This introduced species continues to kill and deform fir in 26 balsam fir stands at high elevation sites in West Virginia. BWA populations remain a chronic problem on balsam fir in many stands in southern and central Maine. In recent years, the woolly trunk phase has reappeared, as well as the gouty symptoms, and seems to be causing more rapid mortality locally in a few forest stands. In Vermont, populations remained noticeable on the stems of balsam fir in Essex and Caledonia Counties.

Birch leafminer,
Fenusa pusilla

Region 9/Northeastern Area: New Jersey

Host(s): Gray birch, white birch

In New Jersey, gray and white birch trees across the State were observed turning brown in high numbers in 2001.

Browntail moth,
Euproctis chrysorrhoea

Region 9/Northeastern Area: Maine

Host(s): Red oak

In Maine, there is a continued reduction in the total area infested, with about 6,000 acres affected. There are very limited numbers of overwintering webs being located outside of the Casco Bay area in Hancock and York Counties. However, it appears that the trend for 2002 could be a continued rise in populations in the Casco Bay region where control measures will likely be initiated over a much greater area than in 2001.

Common European pine shoot beetle,
Tomicus piniperda

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

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

In 2001, a total of 55 counties were reported infested in Indiana, 71 in Michigan, 4 in Wisconsin, and 30 in Illinois. Two new counties were added in Illinois in 2001 (Marshall and Tazewell), and four in Indiana (Brown, Hendricks, Owen, and Fayette).

Delaware did not find any pine shoot beetle adults during 2001. Pine shoot beetle surveys were conducted in 10 Maryland counties in 2001. This exotic pest has now been found in Allegany, Frederick, Garrett, and Washington Counties. In Ohio, pine shoot beetle surveys were conducted throughout the State. To date, 71 out of 88 counties are under quarantine. In Pennsylvania, this beetle has been found in 30 counties in

the west and northern parts of the State. To date, in West Virginia, this beetle has been found only in the four northern panhandle counties of Brooke, Hancock, Marshall, and Ohio and in two north central counties of Tyler and Tucker.

In Maine, two beetles were trapped during the survey conducted in 2001. One was collected at the same trap site in northern Oxford County where a beetle was trapped in 2000; the other was trapped at a Rangeley trap site. No infested trees or damage were found in 2000 and 2001. Oxford county was placed under an interim Federal quarantine in July 2001. In New Hampshire, 12 beetles were caught in pheromone traps in Coos County. To date no infested trees have been found in the State. In New York, this beetle is primarily a problem in pine Christmas tree plantations. First found in western New York in 1993, the insect now occurs across most of the State. A total of 32 counties are now known to be infested. No new counties were found to be infested in 2001. The areas where the insect has been found are under a Federal quarantine in an attempt to reduce spread. In Vermont, no damage to pine was detected. Two adults were trapped in Caledonia County. No beetles were caught in traps placed in Franklin, Lamoille, Chittenden, Grand Isle, Orange, Orleans, Windham, and Washington Counties.

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 USDA Animal and Plant Health Inspection Service, State Departments of Agriculture, Forestry, and Lands continued in 2001. A network of strategically located pheromone-baited traps was placed throughout all States in the region. On Federal lands in Region 1, in one gypsy moth was caught in a trap at the Swiftcurrent campground in Glacier National Park, Montana, and one suspected gypsy moth was caught in a trap in Yellowstone National Park, Wyoming. On State lands in Region 1, two moths were caught in Idaho, and two moths were trapped in Wilson, Wyoming, while no moths were caught on State lands in Montana, North Dakota, and South Dakota. The trapping program will continue next year.

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

Host(s): Hardwoods

Four moths were caught in delimitation traps in the northwest Denver area in 2001 near Arvada and Jefferson Counties. This area had a single positive catch in 2000. Positive catches were also made in Mineral, El Paso, and Larimer Counties of Colorado. No moths were found in Kansas or Nebraska during 2001. USDA Animal and Plant Health Inspection Service used delimiting traps near in Teton County in Wyoming and found six adult moths. These moths are suspected “hitch-hikers.”

Region 3: Arizona

Host(s): Hardwoods

Two male gypsy moths were captured in a detection trap in Payson, Arizona, in 2001. A delimiting trapping grid was planned for 2002. No male gypsy moths were trapped in New Mexico in 2001.

Region 4: Idaho, 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 2 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 1 moth on the adjacent Wasatch-Cache National Forest. In 1998, the Utah Department of Agriculture, in cooperation with the USDA Forest Service, treated 801 acres.

In 1999, 764 acres in Salt Lake City County were aerially treated using Bt. There were three applications made at 5-7 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. Two new captures were made in Duchesne County at a campground on the Ashley National Forest, and delimitation trapping was scheduled for 2001. In 2001, the general pheromone trap detection grid scheme was resumed throughout Utah, with the exception of delimitation trappings in Salt Lake and Duchesne Counties. One male moth was caught in a separate location in Duchesne County for 2001, so first year delimitation traps were installed in 2002. For 2002, placement of pheromone detection traps within the general grid scheme will continue. No moths were detected on cooperative surveys with State forest health agencies in western Wyoming or Nevada. However, one moth was caught in the southeastern Idaho town of Thornton.

Region 5: California

Host(s): Hardwoods

California Department of Food and Agriculture trapped five male moths in 2001. The detection trap catches by county were Madera–1, Orange–1, San Diego–2, Siskiyou–1. This is 3 counties and 33 moths less than counts in 2000. One San Diego find was within the eradication treatment area in 2000 and the trap density in the area continued at protocol levels of 50 traps per square mile. The find in Siskiyou County occurred at the Lava Bed National Park Visitor Center and the find in Madera County was along highway 41 near Oakhurst. In both instances the trap density was increased to 25 traps per square mile in a four square mile area around the find. No moths were trapped within the spring treatment area in Novato, Marin County. No properties with egg masses or pupal cases were found in 2001.

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, one eradication project totaling 15 acres was conducted using ground applications of *Bacillus thuringiensis* var *kurstaki* (Btk). The gypsy moth survey in 2001 resulted in trap catches of 27 individuals. All were identified as the European strain. An aerial eradication project using Btk was planned for 2002 at one site with an estimated 560 acres.

In Oregon, two eradication projects were conducted using three aerial applications of Btk. One site in Ashland, encompassing an estimated 160 acres was treated in 2001 for European gypsy moth, and one 900-acre area in Portland was aerially treated for Asian gypsy moth. No gypsy moths were caught in 2001 in the eradication areas. Seven European gypsy moths were trapped in 2001. No eradication projects were planned for 2002.

New introductions are expected to continue as long as European gypsy moth populations in the Eastern United States persist, and people move from that generally infested area to the Pacific Northwest. Asian gypsy moth introductions are expected to occur as trade increases with countries in the Pacific Rim.

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

Host(s): Hardwoods, especially oak species

In 2001, aerial surveys detected over 440,000 acres of defoliation by gypsy moth in Virginia. Populations were highly variable due in part to continued drought, the effects of an *Entomophaga maimaiga* fungal outbreak and the gypsy moth nucleopolyhedrosis virus. Gypsy moth populations noticeably increased in the central and eastern portions of the State. Virginia Department of Agriculture and Consumer Services (VDACS) conducted aerial suppression activities on approximately 35,000 acres in 2001. With the increase in populations in 2001, the potential for defoliation was greater the following year. Treatments were planned for approximately 65,000 acres in 2002.

Trapping surveys in North Carolina revealed no new infestations. Delimiting trapping of the pheromone flake eradication blocks treated in 2000 (Clay, Jackson, and McDowell Counties in western North Carolina) caught several single moth captures in each of the blocks. Final delimiting trapping for these blocks were completed in 2002. No moths were captured in 2001, the final year for the delimiting trapping of the 23,000 acre pheromone flake eradication treatment (1999) in and around Highlands, North Carolina and a portion of Georgia. North Carolina has no treatments planned in 2002.

In Tennessee, two more counties have been added to the list of infested counties (Monroe and Campbell) making a total of 5 infested counties in the State (Scott, Cumberland, Sevier, Monroe and Campbell). As a result of an increase in trap captures, an aerial treatment is proposed for Campbell county (8,500 acres) and ground treatments are proposed for Monroe and Scott Counties in 2002. Follow-up trapping will continue in Cumberland and Scott Counties where ground treatments were conducted in 2001.

In Arkansas, delimiting trapping of 80 square mile grid Carroll, Marion and Newton Counties caught 3 moths in a single trap. As a result, this area will be reduced, in 2002, to cover a 5 square mile area for delimit trapping. Additional detection trapping across the State produced four moths near Mountain View (Stone County) in separate traps; two were caught near Hot Springs, and two near Camden. No treatments are planned.

The Slow the Spread Project (STS) conducted aerial treatments in seven States. Within the boundaries of the Southern Region, 1,200 acres were treated in eastern North Carolina and 65,000 acres were treated in eastern and western Virginia. STS treatments are planned for Virginia in 2002; however, no treatments are planned for North Carolina.

Region 9/Northeastern Area: Connecticut, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, 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, nearly 400 acres were defoliated in 2001. Presence of *Entomophaga maimaiga*, kept the defoliation low. This is the second year that gypsy moth populations increased in southern and central Maine and larval feeding resulted in widespread defoliation on 29,500 acres in 2001. Feeding was very intense in portions of York and Cumberland Counties with heavy defoliation of sapling and pole size white pine in many locations. A total of 46,500 acres were defoliated by the gypsy moth in the State of Maryland. In Massachusetts, defoliation increased from the 2000 level to 48,000 acres, including the Cape Cod National Seashore. Field staff reported the presence of *Entomophaga maimaiga* in many of the infested areas. Fall egg mass surveys documented viable egg masses on the outer edges of the areas defoliated. It is expected that defoliation will be reduced in 2002. In New Hampshire, approximately 8,500 acres in Rockingham, Merrimack and Carroll Counties were defoliated. Although eggmass counts and sightings of male moths seems to be increasing, larvae killed by the Entomophaga fungus were found throughout the State in 2001. The incidence of this defoliator in New York has been relatively low across most of the State recent years, partially due to *Entomaphaga maimaga*, which attacks the larvae and helps to keep populations low. However, Long Island was exceptionally hard hit in 2001. It is estimated that 40,000 acres on Long Island alone experienced moderate to severe defoliation. Other areas in southeastern New York were impacted to a lesser extent, bringing the total number of acres defoliated to roughly 50,800, including 831 acres affected at West Point. In parts of the Adirondacks, high larval populations were reported, but little significant defoliation. For New Jersey, gypsy moth defoliated 140,900 acres.

Gypsy moth defoliated approximately 42,500 acres in Ohio, 8,000 acres in Rhode Island, and 3,700 acres in Wisconsin. The 283,700 acres of gypsy moth defoliation reported in Pennsylvania was surpassed by the 603,800 acres in West Virginia. In Vermont, 100 acres were defoliated.

Hemlock woolly adelgid, *Adelges tsugae*

Region 8: North Carolina, Virginia

Host(s): Eastern hemlock, Carolina hemlock

Populations of the hemlock woolly adelgid (HWA) increased alarmingly in 2001. This insect threatens the entire range of eastern hemlock, and is found throughout Virginia wherever hemlock is abundant with the exception of 6 counties in the southwestern portion of the State. In North Carolina, 11 new counties were reported infested with the HWA in 2001—Ashe, Burke, Caldwell, Graham, Jackson, Macon, Mitchell, Swain, Watauga, and Yancey—constituting a major population movement southwestward. An established population was also found in Oconee County, South Carolina, near the Chattooga River. Because of the strong influence of spring northward-migrating songbirds in spreading this insect, the entire range of Carolina hemlock (*Tsuga caroliniana*) is now at risk, and this species could be extirpated from the wild within as little as 5 years. Eastern hemlock (*T. canadensis*), an important riparian and middle-elevation wildlife habitat component, is also now at risk of extirpation throughout the southern Appalchians.

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

Host(s): Eastern hemlock

All three of Delaware's counties have HWA. In Maryland, HWA continues to slowly move westward and can now be found in 14 counties and Baltimore City. In New Jersey, adelgid populations are found in every county. In Pennsylvania, HWA can be found in 39 counties within the natural range of hemlock. Hemlock defoliation occurred on 4,528 acres in five counties. Hemlock discoloration and damaged foliage occurred on another 358 acres in three counties. In West Virginia, HWA was reported in 3 new counties (Tucker, Randolph, and Raleigh) bringing the total to 16 counties where this exotic pest occurs.

In Connecticut, this pest occurs in all 169 towns. A statewide detection effort was launched against the HWA in Maine, following up on infested nursery stock outplanted from Connecticut in 1999. The insect was identified at 10 ornamental outplanting sites in central, coastal, and southern Maine in Penobscot, Hancock, Knox, Lincoln, Sagadahoc, and York Counties in 2000. In 2001, this pest was detected and again treated for eradication in 15 sites in York, Penobscot, and Waldo Counties. At this time the insect is not established in Maine on native hemlocks. Eleven new communities in Massachusetts were confirmed to have infestations this year bringing the total known infested communities to 120 or 34 percent of the State's communities. The State continued releasing the predator *Pseudoscymnus tsugae* at two locations. Some mortality has been observed in isolated areas of Bristol County. In New Hampshire, three infested locations were found in Rockingham County and are currently being eradicated. For the second straight year, no new county records were found for this insect in New York in 2001. However, new town records were found. The elongate hemlock scale continues to be found widely in southeastern New York, often on trees also infested by the hemlock woolly adelgid and/or the circular hemlock scale. The locations of new town records indicate that the infestation continues to spread, and it is anticipated that new county records for Delaware and Scoharie Counties could be located in 2001. Stands that have been infested for several years continue to suffer dieback, decline and mortality. Infestations continue in Rhode Island.

Larch casebearer,
Coleophora laricella

Region 1: Idaho, Montana

Host(s): Western larch

In 2001, there were no areas in western Montana or northern Idaho where visible defoliation caused by larch casebearer was recorded. As recently as 1999, approximately 14,000 acres showed some level of defoliation. Those infested acres declined to only a few hundred in 2000. In 2001, a minor amount of defoliation was noted from ground observations in northern Idaho, but none was recorded during annual aerial detection surveys. Ground collections conducted from 1997 through 2000 showed still low parasitism rates in most casebearer populations; at least when compared to similar surveys conducted during the 1970s, the last time casebearer populations were unusually high. Parasitism levels did not seem high enough to totally account for population decline, but other causes were not determined. Two areas were ground-surveyed in 2001, where some defoliation was noticed—near St. Maries and Sandpoint, Idaho. In the latter, parasitism rates had increased. Because populations have decreased to endemic-like levels, ground surveys in both northern Idaho and western Montana have been discontinued. Affected areas will be occasionally monitored for a resurgence of populations; but we anticipate only minor amounts of widely scattered defoliation in 2002.

Region 6: Oregon, Washington

Host(s): Western larch

After years of negligible occurrence, larch casebearer-caused defoliation of western larch slowly increased in the late 1990s to 15,836 acres reported in 1999. Ideal timing for a larch casebearer survey in the Pacific Northwest is in June, however, most of the surveys in larch type occur in late July through early September. Approximately 4,500 acres were mapped in 2001 compared to 7,000 acres mapped in 2000. The vast majority of the observed damage in 2001 was mapped within the Wallow-Whitman (1,244 acres) and Warm Springs Indian Reservation (3,055 acres) reporting areas. In contrast, Mt. Hood (5,524 acres) and Colville (833 acres) reporting areas had the highest levels of reported activity in 2000.

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.

Region 9/Northeastern Area: Michigan, Minnesota, Pensylvania

Host(s): Tamarack, Japanese larch

Larch casebearer now occurs throughout the range of larch species. In 2001, there was a significant outbreak in the Lake States. Michigan sustained over 22,000 acres of defoliation, Minnesota over 15,000 acres, and Wisconsin reported 66 acres. A 50-acre plantation of Japanese larch in Schuylkill County, Pennsylvania, was defoliated by this insect.

Larch sawfly,
Pristiphora erichsonii

Region 10: Alaska

Host(s): Eastern larch, Siberian larch

In 2001, larch sawfly activity continued a decline that began in 1999 when sawfly populations impacted nearly 450,000 acres. This year, larch sawfly defoliation fell to 17,821 acres, down from the 64,859 acres reported in 2000. The steady decline of this infestation is due to massive mortality incurred by native larch in interior Alaska. The larch sawfly has continued its advance southward affecting ornamental Siberian larch plantings on the Kenai Peninsula.

This pest of native larch in interior Alaska was first noted in and around Anchorage in 1999 and has apparently established a solid foothold south of the Alaska Range into south-central Alaska's urban and community forest areas. This expansion was likely from an accidental introduction of the sawfly into south-central Alaska. Expansion of the larch sawfly has been swift and it appears that eradication is not feasible or practical.

Lerp psyllid,
Eucalyptolyma maideni

Region 5: California

Host(s): Eucalyptus species

This new lerp psyllid continues to spread in southern California.

Pear thrips,
Taeniothrips inconsequens

Region 9/Northeastern Area: New Hampshire, Vermont

Host(s): Red maple, sugar maple

In New Hampshire there was no noticeable defoliation. In Vermont, populations increased, with scattered moderate to heavy defoliation in the central part of the State. Overwintering populations going into 2001 had increased, but rapid spring development minimized damage in many regions.

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 2001, and has now reached over two dozen Caribbean Islands. It was detected in Puerto Rico in 1997, but has been confined to the eastern region. Frequent monitoring surveys are conducted, assisted by the USDA 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 mealybug, reducing the impacts in Puerto Rico. With support from the USDA Forest Service and Animal and Plant Health Inspection Service, the Puerto Rico Department of

Agriculture continues to rear and release parasitoids. Surveys continue to show that population reductions of 85-90 percent have been achieved at the parasite release sites. Because of the large number of known host species in Florida, extension agents continue to carefully monitor for this pest. Fortunately, the PHM has not been detected there.

Red pine scale,
Matsucoccus resinosae

Region 9/Northeastern Area: Connecticut, Massachusetts

Host(s): Red pine

This pest occurs statewide in Connecticut and was recently found in Hampden County, Massachusetts, but no new infestations were found in 2001.

Red-haired pine bark beetle,
Hylurgus ligniperda

Region 9/Northeastern Area: New York

Host(s): Pine

Overwintering adults of this insect were discovered at a Christmas tree farm in Monroe County, New York, in late 2000. Subsequent surveys of eight surrounding counties located no insects. The red-haired pine bark beetle feeds mainly on dead material, but may be capable of spreading black stain fungi to live trees during maturation feeding.

Redgum lerp psyllid,
Glycaspis brimblecombei

Region 5: California

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

This exotic now occurs in practically all California counties with red gum eucalyptus. Parasitoid natural enemy establishment is confirmed in eight California counties: Alameda, Los Angeles, Monterey, Orange, Santa Clara, San Diego, San Mateo, and Ventura (See: www.cnr.berkeley.edu/biocon/dahlsten/rglp/RLP-news).

Satin moth,
Leucoma salicis

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

Host(s): Aspen

In Maine, defoliation of both quaking and bigtooth aspen increased again in 2001 for the fourth consecutive year. The infestation continued its expansion in central Penobscot and Piscataquis Counties, up from 5,337 acres in 2000 to 12,900 acres in 2001. In New Hampshire, heavy defoliation was reported in the central part of the State. In Vermont, populations increased from 2000, with isolated areas of heavy defoliation in Orange and Windsor Counties.

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.

Spruce aphid,
Elatobium abietinum

Region 3: Arizona

Host(s): Engelmann spruce, blue spruce

Spruce aphid, while present in Arizona, was not in outbreak in 2001. However, tree mortality resulting from defoliation in 2000 was recorded on 46,550 acres in Arizona. Mortality was detected on the Apache-Sitgreaves National Forest (10,305 acres); Fort Apache Indian Reservation (36,230 acres); and 15 acres of State and private lands. No spruce aphid activity was observed in New Mexico.

Region 10: Alaska

Host(s): Sitka spruce

In 2001, spruce aphids infested 20,200 acres, a slight decrease over 2000's acreage of 39,400. This continued outbreak affected beach-fringe trees on the mainland of southeast Alaska and a few islands from Yakutat Bay to Wrangell, a distance of approximately 360 miles. The most notable urban area outbreaks were in Juneau and Wrangell with tree mortality occurring in Juneau.

Unnamed bark beetle,
Hylurgops palliatus

Region 9/Northeastern Area: Pennsylvania

Host(s): Pine, larch, spruce

This European bark beetle was recovered for the first time in North America in a forest stand of Norway spruce, Scotch pine, and red pine in Erie, Pennsylvania. Prior to 2001, this species has been the third most frequently intercepted exotic bark beetle at ports in the United States. This species is known to breed in log stumps and basal portions of dead and dying host trees in Europe. The threat that it represents to these conifer hosts in the United States and Canada is uncertain. Surveys in 2002 should determine the extent of its presence in and around Erie, Pennsylvania.

Diseases: Native

Anthracnose,
Gnomonia spp.

Region 9/Northeastern Area: Vermont, West Virginia

Host(s): American sycamore, beech, birch, London plane, maple, oak, other hardwoods

Anthracnose disease of hardwoods was widespread throughout West Virginia, but caused only light damage. Moisture conditions in West Virginia influenced the severity of this disease. Although the spring weather was very moist, there were long, dry spells between summer rains. In Vermont, damage was much lighter than 2000 due to dry growing season conditions, and only scattered light damage was observed.

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, so 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 north Idaho. It is frequently found in association with other root diseases and appears to be involved in a decline of subalpine fir in high elevations.

Region 3: Arizona, New Mexico

Host(s): True firs, ponderosa pine

This root disease fungus is common in the region, functioning as both a pathogen and a saprophyte. It causes scattered mortality in spruce-fir, mixed conifer, and ponderosa pine forests throughout the region. Mortality rates are typically highest in young regeneration.

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

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

This fungus 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 fir in recreational areas of the Klamath and Shasta-Trinity National Forests. The pathogen continues to create scattered pockets of dead

and dying ponderosa pine on McCloud Flats, Shasta-Trinity National Forest, where it has been found for more than two decades.

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 Six 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, in true fir species in mixed conifer, and true fir stands throughout southwest Oregon.

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 considered low unless stands are managed at rotations greater than 120 years.

Region 8: Regionwide

Host(s): Southern pines

In Georgia, annosus root disease has increased throughout the State on high hazard sites in older Conservation Reserve Program (CRP) plantations that have been thinned. Similarly in South Carolina, annosus was troublesome on CRP sites, with 17 industrial landowners requesting evaluations by the South Carolina Forestry Commission in 2001. The commission recommended clear cutting and replanting 1,500 acres.

Region 9/Northeastern Area: Wisconsin

Host(s): Red pine

Annosus root disease was first reported in 1993 as a cause of mortality in a red pine plantation in Adams County. In 2000, a total of eight "pockets" (infection centers) had been found in four counties in Wisconsin. Biological control trials were initiated in 2001.

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 root disease 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 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. Permanent plots have been established to assess the role of this and other root diseases in the region.

Region 3: Arizona, New Mexico

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

Armillaria is the most common (and the most easily recognized) root disease fungus in the region, functioning as both a pathogen and a saprophyte. It causes scattered mortality in spruce-fir and mixed conifer forests throughout the region. Some ponderosa pine sites, particularly those on pumice-derived soils, sustain significant mortality. Mortality rates are typically highest in young regeneration. Permanent plots have been established to assess the role of this and other root diseases.

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 higher elevations.

Region 5: California

Host(s): Conifers, some hardwoods

Dozens of tanoaks in the Soquel Demonstration State Forest (Santa Cruz County) were killed by a combination of *Armillaria mellea* and *Phytophthora ramorum* infections and attacks by the western oak bark beetle. Minor incidence of Armillaria root disease was found elsewhere in association with dying tanoak, coast live oak, and California black oak infected with *P. ramorum*. Other minor instances of Armillaria were found in Chinquapin (Mendocino County) and Monterey pine (Santa Cruz County).

Region 6: Oregon, Washington

Host(s): Conifers

The most serious losses from this 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 has been confirmed on the Malheur National Forest in eastern Oregon and is about 2,400 acres. 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 throughout the Blue Mountains.

Diseases: Native

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 controlling 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 revealed 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 the host is more prevalent, infecting 1,350 acres on the Dixie and Manti-LaSal National Forests in Utah, and 150 acres on the Humboldt and Toiyabe National Forests in Nevada.

Region 5: California

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

New pockets of black stain root disease were found in Modoc, Lassen, and Siskiyou Counties. In surveys conducted during 2000 and 2001, incidence of black stain root disease was found to have increased dramatically in 40 second-growth Douglas-fir stands on the Happy Camp Ranger District, Klamath National Forest.

Region 6: Oregon, Washington

Host(s): Douglas fir, ponderosa pine

In southwestern Oregon, black stain 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.

Black stain 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. Black stain root disease is seen infrequently in eastern Washington. Pacific Northwest Research Station scientists are investigating relationships with natural and prescribed fire, vector insects, and management strategies.

Botryosphaeria canker,
Botryosphaeria dothidea

Region 5: California

Host(s): Green leaf manzanitas

A high percentage of green leaf manzanitas over large areas of the Lassen National Forest had some or all of their branches killed by this pathogen in the winter and spring of 2001. The conditions leading to this phenomenon are unknown. Most of the manzanitas recovered over the summer.

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 is mainly due to defect and growth loss, rather than mortality, although it is often associated with endemic levels of Douglas-fir bark beetle. It is frequently found in association with other root diseases, especially Armillaria, in dead trees.

Region 3: Arizona, New Mexico

Host(s): Douglas-fir, other conifers

Brown cubical root and butt rot is common on old Douglas-fir in many parts of the region. It causes defect and can contribute toward blowdown.

Region 5: California

Host(s): Douglas-fir

Scattered wind throw, stem breakage, and mortality were found in large Douglas-fir in a proposed thinning unit along Forest Service Road 19N07, Siskiyou County. Numerous signs and symptoms of *P. schweinitzii* were noted in the Mud Flow Research Natural Area on McCloud Flats, Shasta-Trinity National Forest.

Cercospora blight,
Cercospora sequoiae* var. *juniperi

Region 2: Nebraska

Host(s): Rocky Mountain juniper, eastern redcedar

Cercospora blight continues to severely defoliate and kill junipers and redcedars in windbreaks in central and eastern Nebraska.

Diseases: Native

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, Klamath National Forest.

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

Region 2: Nebraska, South Dakota

Host(s): Ponderosa pine, Austrian pine, Scotch pine

Sphaeropsis blight caused greater amounts of branch dieback in pine windbreaks and plantations in 2001 because the trees were stressed from 2 years of drought in the Plains. Concern about this disease has increased following the heavy, widespread hail damage that occurred in 2000 and 2001 in Rapid City and Hill City, South Dakota.

Region 5: California

Host(s): Gray pine, ponderosa pine

Shoot dieback caused by this pathogen was observed once again on ponderosa pines in the upper Sacramento River Canyon. Intensity of the disease has decreased at many sites. Two new locations with Diplodia blight were reported in the central and southern Sierra Nevada – one in Tuolumne County on ponderosa pine and one in Tulare County on gray pine.

Drippy nut disease,
Erwinia quercina

Region 5: California

Host(s): Interior live oak

Several reports of drippy nut disease on interior live oak were reported from the Redding area, Shasta County. The disease is caused by the bacterium, *E. quercina*, which gains entrance to acorns through insect entrance holes.

Douglas-fir needle cast,
Rhabdocline pseudotsugae

Region 6: Oregon, Washington

Host(s): Douglas-fir

There was above normal occurrence of Douglas-fir needle cast in Douglas-fir in northeast Washington, especially the Republic area.

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 occurs on 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 occurs on about .6 million acres (13 percent) of Douglas-fir, reducing growth by approximately 13 million cubic feet annually. Western larch dwarf mistletoe occurs on about .8 million acres (38 percent) of western larch stands, and reduces annual growth by over 15 million cubic feet. Dwarf mistletoes are locally severe within 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 higher infection levels east of the Continental Divide.

Region 2: Colorado, Wyoming

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

Lodgepole pine dwarf mistletoe is common throughout the host type in Colorado and Wyoming. The recent mild winters and droughts contributed to dwarf mistletoe caused tree mortality in many areas of the Front Range, Red Feather Lakes, Estes Park, South Park and the foothills west of Colorado Springs. District offices of the Colorado State Forest Service in the Front Range report that 10 percent of public inquiries concerning “sick trees” are mistletoe related. *Arceuthobium vaginatum* continued to be a problem in the Black Forest northeast of Colorado Springs in ponderosa pine. *A. cyanocarpum* played a role in limber pine decline in the Bighorn, Medicine Bow, and Shoshone National Forests.

Region 3: Arizona, New Mexico

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

Dwarf mistletoes continue to be the most widespread and damaging pathogens in the Southwest. Three species of dwarf mistletoe—those affecting ponderosa pine, piñon pine, and Douglas-fir—occur throughout most of the ranges of their hosts, while five other species have more limited distributions. Roughly 2.2 million acres of commercial ponderosa pine forest is infected, resulting in an estimated 25 million cubic foot volume loss annually.

Region 4: Idaho, Nevada, Utah, Wyoming

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

These plant parasites 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

New reports of dwarf mistletoes decreased sharply in 2001. Mountain hemlock dwarf mistletoe was reported on mountain hemlock of all sizes in an old-growth stand of mountain hemlock, red fir, and Brewer spruce along the Pacific Crest Trail about 2 miles north of Etna Summit. Areas of chronic infection

reported were South Fork Mountain (Shasta-Trinity and Six Rivers National Forests) and Dry Lake Mountain (Klamath National Forest).

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. New information about wildlife use of dwarf mistletoe is leading to retention of infected trees in some locations.

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 disease is minimal. 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. The disease is uncommon on any host above elevations of approximately 1,000 feet. We have found the aggressive heart rot fungus *Phellinus hartigii* associated with large mistletoe brooms on western hemlock.

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

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

In Maine, severe damage caused by infection by this parasitic plant continues to occur in stands of white spruce in coastal areas of Maine. Evidence of significant mistletoe infestation was noted in 2001 on coastal headlands and islands from Machias in the east to the Boothbay region in the west. Scattered occurrences continue in New Hampshire, New York, and Vermont.

Elytroderma needle blight, *Elytroderma deformans*

Region 1: Idaho, Montana

Host(s): Ponderosa pine, lodgepole pine

Elytroderma needle blight 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. It is widespread but at generally low levels throughout northern Idaho.

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 little damage or mortality occurs. An estimated 13.8 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. Exceptionally dry weather over much of the eastern South over the last 2-3 years should have resulted in lower-than-normal levels of new infections in young pines, but slow symptom development has prevented verification of this effect.

Incense-cedar rust,
Gymnosporangium libocedri

Region 5: California

Host(s): Incense-cedar

The gelatinous, orange telial stage of incense-cedar rust was unusually abundant in many areas of the Klamath and Shasta-Trinity National Forests in May. Typically, this pathogen only causes minor damage to its host.

Laminated root rot,
Phellinus weirii

Region 1: Idaho, Montana

Host(s): Douglas-fir, grand fir

This disease is most severe on sites that historically may have supported primarily 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 annosus root disease, this pathogen often converts formerly forested sites to long-term shrub fields.

Region 5: California

Host(s): Douglas-fir

Laminated root rot was identified in a proposed thinning unit along Forest Service Road 19N07, 1 mile south of the California-Oregon State line, Klamath National Forest.

Region 6: Oregon, Washington

Host(s): Conifers

Laminated root rot is the most serious forest tree disease west of the Cascade Mountain crest 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 Cascade crest,

Diseases: Native

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.

Lodgepole pine needle cast,
Lophodermella concolor

Region 6: Oregon, Washington

Host(s): Lodgepole pine

Appearance of this needle disease on lodgepole pine is sporadic and strongly influenced by weather conditions. Infected trees will shed foliage prematurely, and vigor and growth may be reduced with successive years of infection. Over 75 percent of the trees with heavy discolorations of the lower crowns of lodgepole pine, typical of lodgepole pine needle cast, were detected on the Wenatchee, Colville, Yakima, and North Cascades National Park reporting areas. Areas mapped as affected by lodgepole pine needle cast in 2001 totaled 5,235 acres, down from the 9,863 acres in 2000.

Madrone canker,
Nattrassia mangiferae and/or *Botryosphaeria dothidea*

Region 5: California

Host(s): Pacific madrone

Incidence and severity of madrone twig and branch canker took a marked upswing in northwestern California in 2001. Cankers were present almost everywhere that madrone grows. The disease was most prevalent and severe where heavy fall webworm feeding occurred in 2000.

Oak wilt,
Ceratocystis fagacearum

Region 2: Nebraska, Kansas

Host(s): Red oak, bur oak

Oak wilt continues to cause mortality in forests along the eastern borders of Kansas and Nebraska.

Region 8: North Carolina, Tennessee, Virginia

Host(s): Live oaks, red oaks

Oak wilt continues to be a devastating tree killer in 60 central Texas counties. 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 a 14th year of cooperative suppression of the disease. Since this project's inception, more than 2.7 million feet (over 500 miles) of barrier trenches have been installed on more than 2,000 oak wilt infection centers in 34 counties. Oak wilt foresters with the Texas Forest Service conducted aerial surveys for oak wilt infection centers over about 658,400 acres in central Texas in 2001.

There was mixed oak wilt activity in the eastern South in 2001. Aerial surveys in Tennessee showed no activity at all in the Cumberland plateau (Cumberland, Putnam, and White Counties). In North Carolina, activity was also down. The North Carolina Division of Forest Resources reported 20 oak wilt infection centers involving 24 trees in Buncombe and Haywood Counties in the mountains. In contrast, Virginia reported a slight increase in oak wilt-caused mortality.

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

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

Oak wilt is endemic across the region. In Minnesota, over 6,000 acres of mortality were reported in 2001. There are over 15,000 acres of active oak wilt in the State, and almost 7,000 acres have been controlled to date. Oak wilt continues to be on the increase in Michigan, scattered around the Upper Peninsula and northern Lower Peninsula. In Wisconsin, almost 2,000 acres of oak wilt were reported in 2001. Oak wilt caused tree mortality continued to occur across Iowa. There were 110 centers with more than 25 infected trees, 281 centers with 3-25 infected trees, and 395 centers with up to 3 trees infected. Missouri confirmed oak wilt in 12 counties in 2001.

Pockets of mortality appeared in Bedford and Fulton Counties, Pennsylvania. Aerial surveys in West Virginia for oak wilt disease found 30 trees in a high disease-incident area in Grant and Hardy Counties. Additional aerial surveys over the four historically oak wilt-free counties of Ohio, Brooke, Tucker, and Webster did not detect any oak wilt disease centers.

Pine wilt,
Bursaphelenchus xylophilus

Region 2: Nebraska, South Dakota

Host(s): Ponderosa pine, Scotch pine, Austrian pine

The incidence of pine wilt was lower in 2001 than it had been in the previous 2 years. About 90 percent of the trees killed in Nebraska are Scotch pines. Serious mortality from pine wilt is occurring mostly in two locations: the southeastern corner near Lincoln, and in western Nebraska near North Platte. Heavy mortality linked to pine wilt nematodes occurred frequently throughout South Dakota, on ponderosa and Scotch pines.

Ponderosa pine needle cast,
Lophodermella spp.

Region 2: Colorado

Host(s): Ponderosa pine

In 2000 and 2001, ponderosa pine across the San Juan National Forest showed foliage discoloration that increased in severity each year since it was first noted in 1999. Damage was reported over a wide area, from the West Fork of the Dolores River to the eastern and southern extent of the Pagosa District and throughout the elevational range of ponderosa pine. There were similar reports from the southern portions of the Grand Mesa-Uncompahgre-Gunnison National Forest; trees of all sizes were discolored, with no consistent crown part more affected than another. Discoloration was mostly of needles 2 years old or older. These needles were eventually lost, leading to thin crowns with poor needle retention in more severe cases.

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 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

Following 3 years of special surveys for Swiss needle cast, Washington Department of Natural Resources elected not to conduct a survey in 2001. The USDA Forest Service conducted a special survey on lands managed by the Quinault Indian Nation. Approximately 16,000 acres were mapped in the severe category and 4,000 acres mapped in the moderate category. Special surveys for Swiss needle cast are in the planning stages for Oregon; no surveys are planned for Washington at this time.

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 1/3 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 3: Arizona, New Mexico

Host(s): Juniper, various hardwoods

These are common in piñon-juniper woodlands throughout the region, and are locally abundant in riparian areas. Heavy infection contributes toward tree mortality, particularly during periods of drought.

Region 5: California

Host(s): Hardwoods, white fir

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

Western gall rust, *Peridermium harknessii*

Region 5: California

Host(s): Bishop pine, Monterey pine, ponderosa pine

This rust continues to cause management concerns in ornamental Monterey and native Bishop pine in north coastal urban, roadside, and recreation sites. Numerous limb and bole infections were noted in ponderosa pine stands in Henry Coe State Park, Santa Clara County.

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 2001, but the disease continues to intensify within currently affected areas. 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 faster rate than predicted and is spreading down slope toward the Cherokee National Forest.

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

Host(s): American beech

This exotic disease, now found in a large area of the northeastern United States, was introduced to Maine in the early 1930s. The disease continues throughout Connecticut. In Maine, this disease continues to kill or reduce the quality of beech stems statewide; however, the disease does not threaten to eliminate beech from the Maine forest because some trees are resistant and even susceptible trees sprout profusely from roots when trees are damaged, killed, or harvested. An increase in mortality has been observed in beech stands infested with beech scale/nectria in Massachusetts. This increase could be related to combination of the recent drought and the presence of the beech scale/nectria. In New Hampshire, the disease is widespread throughout the forest type. The combination of beech bark disease and drought caused discoloration and perhaps some mortality in Cattaraugus and Chautauqua Counties in New York, especially on ridges and other dry sites. In Vermont, chlorosis and dieback was unusually extensive. The 2001 drought made American beech more susceptible to nectria infection; increased symptom expression and beech scale populations remain very heavy in some locations.

The beech scale is widely distributed in west central Lower Peninsula and the central Upper Peninsula of Michigan, along with both species of nectria. The killing front appears to be emanating from Newberry on the Upper Peninsula, and Ludington on the Lower Peninsula. Evaluation and monitoring efforts are underway, as is hazard rating infested trees in recreation areas.

In Lake County, Ohio, the beech scale occurs on American beech on approximately 50 acres in the Holden Arboretum, but no *Nectria* spp. have been discovered. Six counties in the mountainous central portions of West Virginia have wide-spread, established beech bark disease infestations.

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

Region 1: Idaho, Montana, North Dakota

Host(s): American elm

Dutch elm disease (DED) continues to spread in urban areas in Idaho, 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 and wooded draws of western North Dakota. This disease is common in many communities along the Snake

River in southern Idaho and is slowly working its way into northern Idaho communities. Larger cities have had good success with aggressive treatment, but smaller communities do not have resources available to undertake a successful management program and, as a result, may lose the bulk of their native elms.

Region 2: Colorado, Kansas, Nebraska, South Dakota

Host(s): American elm

DED continues to be a problem in riparian areas and cities throughout the Plains. In general, reports from the normal DED areas in eastern Colorado report very low numbers. In the small town of Sterling, Colorado, the disease was confirmed at 11 sites.

Region 8: Regionwide

Host(s): American elm

Localized mortality continues to occur at low severity level in urban and wild populations of elm. North Carolina reported a number of scattered incidents of the disease in 2001.

Region 9/Northeastern Area: Areawide

Host(s): American elm

Again, symptoms of this disease were conspicuous throughout the 20 State region. Many old elms that escaped the initial wave of infection now succumb each year, at least partially because more aggressive strains of the pathogen have developed.

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 European larch canker has the potential to seriously damage both native larch stands and reforestation projects using non-native 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 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 weakened by the root infection.

Some moderation of littleleaf symptoms over time has been reported. It is believed that root penetration of soil hardpans and gradual increases in soil porosity due to increasing biological activity on severely eroded sites will gradually reduce the impact of this disease over a period of a century or more.

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. Efforts to restore white pine are concentrated on planting genetically improved stock. Recent surveys have found some plantations with higher than expected infection levels, but the improved stock consistently outperforms natural regeneration. In addition, pruning lower branches in infected plantations is being conducted on a large scale because it can greatly prolong 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 mountain pine beetle, coupled with regeneration losses due to blister rust, may have significant impacts on water and wildlife in these fragile ecosystems. Region 1 has initiated a major effort to locate phenotypically resistance ("plus") trees for a breeding program.

Region 2: Colorado, South Dakota, Wyoming

Host(s): Limber pine, whitebark pine

Roughly 6,260 acres on the Shoshone and 428 acres on the Bighorn National Forests are impacted by white pine blister rust. White pine blister rust has been confirmed in Big Horn and Washakie Counties, on the west side of Bighorn Mountains, particularly in Ten Sleep Canyon.

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. The disease has been found more recently on Gallinas Peak, Cibola National Forest, 50 miles north of the Capitans. Blister rust has still not been detected in northern New Mexico or in Arizona.

Region 4: California, Idaho, Nevada, Wyoming

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

This introduced disease 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 occur infrequently in the Intermountain Region. Consequently, it is conservatively estimated the disease infects about 25,000 acres of pines 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 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 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 in the Blue and Wallowa Mountains and in sugar pine in southwest Oregon where about 45 percent of stands with host components are affected.

An attempt was made to aerially identify areas symptomatic of blister rust beginning in 1994. Blister rust is known to occur extensively throughout the range of susceptible host type. Observers mapped approximately 14,800 acres in 2001, compared with 3,153 acres in 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. Over 70 percent of the reported acres mapped in 2001 fell within the Wenatchee and Wallowa-Whitman National Forests. Lands within the Yakama Indian Reservation and Okanogan National Forest made up another 20 percent of the reported affected areas. An on-going study of whitebark pine stands in eastern Washington has found that 81 percent of the trees are still alive, most mortality is more than 10 years old, and occurred in trees greater than 9 inches in diameter. Thirty-four percent of the mortality is attributed to blister rust. The Colville National Forest is pruning western white pine plantations to reduce the incidence of lethal blister rust infections. 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 other areas 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 was infected by white pine blister rust. Ninety percent of the infected trees had potentially lethal cankers. Topkill caused by blister rust was common.

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

Host(s): Eastern white pine

Blister rust is endemic throughout the range of white pine in the region. Areas near the Great Lakes are at highest risk of infection. 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. Cankers occurred on 7.1 percent of surveyed trees statewide. 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* proved to be the most significant determinant of rust levels.

This disease remained common, but static at moderate levels in Mercer, Monroe, Pocahontas, and Summers Counties, West Virginia. Maine continues limited control efforts to manage this disease in certain high value pine stands each year. In 2001, 462 acres of high-quality pine timber was scouted for *Ribes* spp. plants in Androscoggin, Oxford, and Cumberland Counties, and a total of 1,075 plants were destroyed. In New York, it is believed to persist at varying levels on infection where wild *Ribes* spp. occurs. In Vermont, cankers and flagging branches remain common. A white pine health evaluation survey will provide incidence data on this disease. The average incidence of infection throughout New Hampshire is 2.4 percent.

Diseases: Origin Unknown

Butternut canker,
Sirococcus clavigignenti-juglandacearum

Region 8: Regionwide

Host(s): Butternut

This disease has been in the South for at least 40 years and is believed to have killed three of every four 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 predict the benefits of selection and breeding on developing resistance to the disease, but trees exhibiting resistance have been found in Arkansas, North Carolina, Tennessee, Kentucky, and Virginia.

Region 9/Northeastern Area: Areawide

Host(s): Butternut

In Connecticut, 94 percent of surveyed trees are infected. The upward trend of this disease is expected to continue in Maine into the foreseeable future. This disease has been found in 36 counties in New York. Where butternut is found, the canker almost always infects it. No new county records were found in 2001. In Vermont, the disease was common on butternut trees statewide. There is considerable evidence that resistant individual butternut trees exist within the native population, and researchers are now beginning to develop strategies to exploit that resistance to protect the species. No new counties were reported elsewhere.

Dogwood anthracnose,
Discula destructiva

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

Host(s): Flowering dogwood

While no new counties were reported infected in the eastern portion of the South in 2001, South Carolina and North Carolina report increased mortality caused by dogwood anthracnose (DWA) in previously infected areas. North Carolina impact plots established in 1981 now show an average of 56 percent DWA-caused mortality. Further west, Logan County, Kentucky, was reported as a new infection site.

Region 9/Northeastern Area: Areawide

Host(s): Flowering dogwood

This disease has spread throughout the range of flowering dogwood in the Northeastern States. A total of 31 counties in New York have been confirmed to be impacted by dogwood anthracnose, however, no new counties were found in 2001.

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. Illinois, Michigan, and Indiana have scattered reports of dogwood anthracnose.

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 remains in effect and the disease is still a management concern within the zone. There have been no reports of significant spread with the Coastal Pitch Canker Zone of Infestation and incidence of branch flagging appears to be less than that characteristic of several years following detection in 1986. Screening for genetically resistant native and ornamental Monterey pine continued in the Ano Nuevo stand. These and other updates on pitch canker within California can be found at: http://frap.cdf.ca.gov/pitch-canker/.

Region 8: Regionwide

Host(s): Southern pines

Only scattered trees across the region are infected, but impacts can be locally significant. In Georgia and South Carolina, pitch canker continues to be associated with pine plantations near chicken and turkey 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. Slash, longleaf, and loblolly pines are affected. Poultry houses are becoming a common sight throughout the coastal plain of Georgia. Thus, problems with pitch canker are expected to increase, especially during droughts. Similar problems have been noted in North Carolina when chicken waste has been used as fertilizer in pine plantations. In Texas, about 10 percent of the cone crop in State seed orchards was affected by pitch canker in both 2000 and 2001.

Port-Orford-cedar root disease,
Phytophthora lateralis

Region 5: California

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

Port-Orford-cedar root disease continued to expand and cause tree mortality in the upper Sacramento River Canyon. New surveys found and mapped many previously unrecorded populations of Port-Orford-cedar and detected new sites with the disease. Port-Orford-cedar is present on the main stem of the Sacramento as far down river as Sims. Additional root disease sites were confirmed in Dunsmuir, Castle Crags State Park, and near Sweetbriar and Sims. Disease was also confirmed on Scott Camp Creek, a tributary of Siskiyou Lake and the Sacramento River. A total of seven infestations have been identified within the drainage, and several other sites are suspect. The disease also continues to spread near Fish Lake on the Orleans Ranger District, Six Rivers National Forest, but no major spread was reported in the coastal areas of Del Norte County.

Region 6: Oregon

Host(s): Port-Orford-cedar

Port-Orford-cedar root disease continues to cause mortality of Port-Orford-cedar on sites with conditions favorable for spread and establishment of the causal pathogen. The annual aerial survey reported evidence of the disease on over 6,300 acres (0.8 trees per acre) in 2001, up slightly from the 5,200 acres (1.0 trees per acre) observed in 2000. Hosts growing in riparian areas, swamps, drainage ditches, and low-lying areas downhill from roads suffer by far the greatest impacts. Trees on about 9 percent of the area within the

limited range of Port-Orford-cedar are affected. Management activities such as road gating during the wet season, washing vehicles before they enter uninfested areas, and roadside sanitation treatments help slow the spread of the pathogen. A major cooperative effort between the Forest Service, Bureau of Land Management, and Oregon State University to develop Port-Orford-cedar that is resistant to *P. lateralis* is showing very promising results.

Sudden oak death,
Phytophthora ramorum

Region 5: California

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

Phytophthora ramorum has been isolated from 15 tree and plant hosts and this list is expected to increase. The known distribution of the pathogen is expanding, and it is known to be present in 10 counties in California: Alameda, Marin, Mendocino, Monterey, Napa, San Mateo, Santa Clara, Santa Cruz, Solano, and Sonoma. It is also known to be present in Curry County, Oregon. All confirmations are within 50 miles of the Pacific Ocean. *P. ramorum's* mode of spread is not completely understood, but researchers have recovered it from rainwater, soil, and leaf litter. The pathogen may be airborne, but this has not been proven scientifically. Proximity to California bay (laurel) increases the likelihood that an oak will be infected.

The new leaflet, *Sudden Oak Death Caused by a New Species, Phytophthora ramorum*, is available at http://www.na.fs.fed.us/SOD. For specifics on the disease and its occurrence and composition and research updates from the California Oak Mortality Task Force, visit the following Internet address: http://www.suddenoakdeath.org.

Region 6: Oregon

Host(s): Tanoak, evergreen huckleberry, Pacific rhododendron

Sudden oak death, caused by *Phytophthora ramorum*, was detected in Curry County, Oregon, in July 2001 during a special aerial survey. Nine sites totaling approximately 40 acres and located in a 5-square-mile area 2 to 3 air-miles northeast of Brookings, Oregon, have been confirmed. The sites, ranging in size from less than 1 acre to approximately 11 acres, include Federal, private industrial, and private non-industrial forest lands. Tanoak (*Lithocarpus densiflorus*), evergreen huckleberry (*Vaccinium ovatum*), and Pacific rhododendron (*Rhododendron macrophyllum*) are affected.

A cooperative program involving State and Federal agencies, as well as private landowners, is currently underway to eradicate *Phytophthora ramorum* from the known sites. Diseased and susceptible plants in the infested areas and a buffer zone surrounding each of the infested areas are being cut, piled, and burned. Extensive post-treatment monitoring of infested sites and surrounding host type is being done.

The Oregon Department of Agriculture has established regulations to reduce the risk of artificial spread of sudden oak death. Movement of host material is prohibited from the infested Curry County properties and the buffer zone around them. Approximately 9 square miles are currently regulated. All plant and plant parts of the known affected species, as well as those plant species that are found to be susceptible in the future, and any associated soil are covered by this regulation. Host materials from any of the infested California counties are prohibited from coming into Oregon unless they have been kiln-dried, heat-treated, or sterilized. Plant products from affected species that originate in counties adjacent to those infested also must be treated or inspected and certified as disease-free. Oak or other susceptible species products coming into Oregon from any other parts of California must have a certificate of origin supplied by the California Department of Food and Agriculture.

Declines and Complexes

Ash decline

Region 9/Northeastern Area: New Hampshire

Host(s): White ash

This decline is scattered throughout New Hampshire with ash yellows as a possible cause.

Ash yellows

Region 9/Northeastern Area: Iowa, Wisconsin

Host(s): White ash, green ash

Ash yellows has been found in 10 counties in Wisconsin: Brown, Calumet, Dane, Door, Sauk, Marathon, Manitowoc, Ozaukee, Sheboygan, and Waukesha. About 60 pockets of yellow were found along the major river drainages in Iowa, principally along the upper Mississippi.

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 the above named complex of insects, diseases, and abiotic factors decreased significantly to 49,720 acres in 2001 vs. 65,510 acres in 2000. In Arizona, aspen defoliation was recorded on the Apache-Sitgreaves (14,150 acres), Coconino (2,100 acres), Kaibab (11,525 acres), and Tonto (10 acres) National Forests; Grand Canyon National Park (910 acres); Bureau of Land Management lands (15 acres); Fort Apache (6,965 acres) and Navajo (3,220 acres) Indian Reservations; and 300 acres of State and private lands. In New Mexico, defoliation was detected on the Carson (640 acres), Cibola (385 acres), Lincoln (165 acres), and Santa Fe (3,515 acres) National Forests; Valles Caldera National Preserve (505 acres); Santa Clara Pueblo (50 Acres); and 5,265 acres of State and private holdings.

Bacterial leaf scorch, *Xylella fastidiosa*

Region 9/Northeastern Area: Delaware, Maryland, New Jersey, West Virginia

Host(s): Northern red oak, scarlet oak, pin oak

Bacterial leaf scorch is now known to occur in New Castle County, Delaware. No surveys were conducted in Kent or Sussex Counties, Delaware. High-valued, urban trees in Annapolis and Ocean City, Maryland, were found to have this disease in 2001. Ground surveys in Mercer, Burlington, Camden, Salem, and Gloucester Counties found ornamental red, pin, and scarlet oaks infected by the bacterium that causes bacterial leaf scorch. Again, aerial and ground surveys determined the disease was more concentrated in urban areas than in woodlands. Surveys for this disease were done in the cities of Huntingdon, Charleston, South Charleston, and at Midway in Jefferson County, West Virginia. To date, this disease only has been confirmed on a red oak tree at the Jefferson County location.

Brown ash decline

Region 9/Northeastern Area: Maine

Host(s): Black ash (brown ash)

Most black ash, *Fraxinus nigra*, (referred to as brown ash in Maine), recovered from the statewide decline that first became apparent in 1989. Recovering trees continued to rebuild their crowns after an extended period of profound decline during the last decade.

Chaparral decline

Region 5: California

Host(s): Chaparral

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

Cytospora canker of true firs, *Cytospora abietis*
Dwarf mistletoe, *Arceuthobium* spp.
Sawfly, *Neodiprion* spp.
Fir engraver beetle, *Scolytus ventralis*

Region 6: Oregon, Washington

Host(s): True firs

The various agents of this complex are widely distributed throughout Oregon and Washington wherever true firs occur. Activity levels of each agent typically fluctuate more-or-less independently among

locations and over time. *Cytospora abietis* is a weak, canker-inducing fungus that attacks stressed trees. It commonly infects branches bearing dwarf mistletoe infections (described below), causing branch death. Conifer-feeding sawfly larvae feed on old foliage, temporarily weakening trees and slowing their growth. Outbreaks are usually sporadic and subside quickly. Fir engraver beetle (described above) activity is strongly associated with tree stress. Over 1,800 acres of this complex were mapped during 2001 in the northern Oregon Cascade Mountains on the Willamette National Forest. Incidence was associated with mature noble fir stands located near ridgetops and is probably related to drought stress.

Elm yellows

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

Host(s): American elm, slippery elm

Elm yellows surveys in Frederick, Washington, and Allegany Counties, Maryland, indicated a lower incidence of the disease than the previous year. In Ohio, roadside surveys reported elm yellows in the crown of scattered elms. In Pennsylvania, the disease was observed in Carbon, Monore, Pike, and Warren Counties. The Pike County location was along U.S. 209 in the Delaware Water Gap National Recreation Area south of Dingman's Ferry. Elm yellows surveys in eight West Virginia counties found elms to show symptoms on slightly over 300,000 acres.

Incense-cedar dieback,
Cause undetermined

Region 5: California

Host(s): Incense-cedar

The mysterious mortality of incense-cedar reported in southern California in 2000 appears to have tapered off.

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 needle cast, which are reported as a complex because of their similar signatures as viewed from the air declined from 10,539 acres reported in 2000 to approximately 5,600 acres in 2001. The Wallowa-Whitman, Colville, Wenatchee, and Warm Springs Indian Reservation reporting areas accounted for over 80 percent of the recorded activity regionwide. Over 55 percent of reported activity occurred on private lands with the remaining areas mapped on federally managed lands. 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 sub-alpine 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, New Hampshire, Vermont

Host(s): Eastern larch

In Maine, drought-like conditions in mid-summer of both 2000 and 2001, along with locally moderate to heavy defoliation by larch casebearer, larch sawfly, and a variety of foliage and/or tip blights and larch beetle, has placed continued stress on larch, especially in central and eastern Maine. Over 700 acres of larch decline were mapped in the northern portion of New Hampshire. In Vermont, larch decline is increasing in northeastern Vermont, with many new areas, following the 1999 and 2001 droughts.

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 needle diseases caused by *Dothistroma septospora* and *Lophodermella arcuata.* 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 1998-2000 continued into 2001. Oak decline was 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 including frost, defoliation by insects (including the gypsy moth), secondary pests such as Armillaria root disease and two-lined chestnut borer, and hypoxylon canker. 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, defoliation by gypsy moth causes increased mortality. Host tree age and site conditions also play a role. Oak decline is on the rise in Tennessee, but at a lower rate of increase than in 2000. This syndrome is believed to have caused 2 percent mortality in some southwest Tennessee counties. Impact in 2001 was exacerbated by drought, which caused its greatest impact on dry, south-facing slopes. The syndrome is frequently associated with hypoxylon canker, especially in western and middle Tennessee.

Drought initiated oak decline of unprecedented magnitude in Arkansas. Particularly impacted were the Ozark and Ouachita Mountains, where widespread red oak mortality occurred, aggravated by red oak borer activity (see Native Insects, Red oak borer). Mortality levels will have severe impacts on oak ecosystems; and are having severe impact on oak sawtimber markets.

Oak tatters

Region 9/Northeastern Area: Wisconsin

Host(s): Bur oak, white oak

Tatters was observed scattered over the southern two-thirds of the State. The exact cause is unknown but possible causes include cold temperature, insects, and herbicides.

Subalpine fir decline

Region 1: Idaho, Montana

Host(s): Subalpine fir

Subalpine fir mortality remained very high in 2001 with nearly 216,000 trees killed on about 90,700 acres regionwide. In 2000, not all areas were flown but an estimated 91,300 red subalpine fir trees were recorded on 74,200 acres. Much of the mortality occurring on these high-elevation sites results from varying combinations of root diseases, bark beetles, and possibly other factors, such as climatic change. The most significant factor, however, is thought to be mortality directly or indirectly caused by western balsam bark beetle (*Dryocoetes confusus*). The pathogenic fungus carried by western balsam bark beetle, *Ophiostoma dryocoetidis*, appears to cause mortality even when trees are only lightly attacked by the beetles. Most of the current tree mortality occurred on the Idaho Panhandle (91,860 trees on 37,230 acres) and Nez Perce (84,470 trees on 21,000 acres) National Forests in northern Idaho. Other forests with significant subalpine fir mortality include the Clearwater National Forest in Idaho and the Gallatin, Beaverhead, Flathead, and Lewis & Clark National Forests in western Montana.

Region 2: Colorado, Wyoming

Host(s): Subalpine fir

The condition can be found in nearly all stands of subalpine fir and can be a significant challenge for management in developed recreation areas. In Wyoming, 70,000 subalpine fir trees on 36,000 acres of the Bighorn National Forest and 20,000 trees on 10,000 acres of the Shoshone National Forest were affected by this decline in 2001. An increase of 600 acres of subalpine fir decline was observed on State lands in central and southwest Wyoming.

Region 4: Idaho, Nevada, Utah, Wyoming

Host(s): Subalpine fir

Decline and die-off of subalpine firs started in the late 1980s in the Intermountain Region, and peak mortality periods occurred during the mid-1990s with over a million trees killed by the unknown malady. No primary pathogens and/or insects have been consistently identified as the casual organisms for the disease. The best theory is that the cumulative effects of several environmental factors that include drought, heat stress, and winter drying, compounded by overstocked and overmature stand conditions cause the mortality.

Sugar maple decline

Region 9/Northeastern Area: Pennsylvania

Host(s): Sugar maple

Since the mid-1980s, the health and decline of sugar maple in northern Pennsylvania has been associated with several droughts and several insect defoliations across the unglaciated and glaciated regions of the Allegheny Plateau. Studies across elevational gradients in this region have shown that low soil pH adversely influences tree growth and crown vigor as well as seed crop frequency and abundance in these stands already stressed by insect defoliators and drought.

Tanoak decline

Region 5: California

Host(s): Tanoak

Hundreds of small to mature tanoaks are declining and dying from Annapolis in Sonoma County to north of Gualala, Mendocino County. The trees do not have the canker symptoms associated with sudden oak death and samples tested for *P. ramorum* have been negative. Most affected sites are on ridges where no other tree or shrub species in the vicinity are overtly affected.

White pine decline

Region 9/Northeastern Area: Maine, New Hampshire

Host(s): White pine

In Maine, the status of pines affected seems to have stabilized in 2001. Following the drought of 1995, white pines with symptoms of this disease declined and died on sites where rooting depth has been restricted. Previously symptomatic trees have survived and there was also very little additional mortality. Declining trees are still evident in New Hampshire in areas where it was previously observed, in some cases in association with the fungus *Caliciopsis pinea*.

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 per 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. Site factors, 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:

- Toxins are produced by decomposition in the wet, organic soils, or
- 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

In 2001, coneworms continued to cause significant losses to improved seed crops in southern orchards, primarily loblolly pine. In central Louisiana, a bumper crop of longleaf pine cones was harvested; however, inventory samples revealed that 63 percent of the cones where infested with and destroyed by coneworms. Much of this loss occurred between May and July, indicating substantial attacks on maturing cones likely due to *D. amatella*. Other samples taken from loblolly orchards in Florida, Texas, and Louisiana indicated losses of 15-70 percent from coneworm. Losses in unsprayed orchards in Texas remained static at about 35-45 percent. Losses in treated orchards were considerably less.

Pine catkin sawfly,
***Xyela* spp.**

Region 8: Louisiana, Texas

Host(s): Southern pines

An unusual outbreak of this small and seldom seen insect occurred in the spring of 2001 on loblolly pine in central Louisiana and extreme eastern Texas. An unusually large male flower (catkin) crop likely contributed to the outbreak. Infestations of mature larvae were observed at orchards and in private yards under infested trees. Although very abundant, the impact on pollination was likely insignificant.

Pine seedworm,
***Cydia* spp.**

Region 8: Regionwide

Host(s): Southern pines

The inventory of longleaf pine in central Louisiana revealed low but consistent seedworm populations. Estimated loss was 2-3 percent of seed.

Seed bugs,
Leptoglossus corculus
Tetyra bipustata

Region 8: Regionwide

Host(s): Southern pines

Both species of seedbug were abundant in southern pine seed orchards. Inventory samples indicated that seedbugs caused about 25 percent seed loss in untreated orchards. In Tennessee, successful control efforts reduced losses to seedbugs to only 10 pounds of infested seed in 2001.

Southern cone gall midge,
Cecidomyia bisitosa

Region 8: Florida

Host(s): Slash pine

For a third consecutive year, infestations of southern gall midge caused significant losses on an industrial seed orchard in Nassau County, Florida. Infestation rates did decline however, from 55 percent of first year conelets in 2000 to 35 percent in 2001 based on the average of samples taken from identical ramets of susceptible clones.

Western conifer seed bug,
Leptoglossus occidentalis
Coneworm,
Dioryctria abietivorella
Cone beetle,
Conophthorus ponderosae

Region 1: Idaho, Montana

Host(s): Douglas-fir, western white pine, other conifers

Cone and seed insects can cause considerable damage to the seeds of western conifers, significantly reducing seed crops. Though insects are found feeding on a variety of tree species in wild stands, they are especially of concern in blister rust-resistant western white pine seed orchards. The insects that cause the most damage in western white pine are western conifer seed bug, *Leptoglossus occidentalis*, cone beetle, *Conophthorus ponderosae*, and coneworm, *Dioryctria abietivorella*. One or more of these insects are often abundant enough in northern Idaho white pine seed orchards to warrant an insecticidal spray treatment to protect cones. Studies are underway in cooperation with Forest Insect and Disease research to develop cone beetle behavior chemicals for monitoring and control tools for integrated pest management programs.

During 2001 there was the increase in coneworm damage at the tree improvement orchards at Grouse Creek, Idaho and Big Fork, Montana. Based on a continuing evaluation of the current damage levels and the projected crop for 2002, chemical treats are being considered.

Nursery Insects and Diseases

Aphids

Region 6: Oregon

Host(s): Conifers

Monitoring detected a high level of aphids feeding on Port-Orford-cedar container seedlings at the Dorena tree improvement center (DTIC). Seedlings were treated with three successive treatments of Safer Soap.

Black vine root weevil, *Otiorhynchus sulcatus*

Region 6: Oregon

Host(s): Engelmann spruce

Monitoring detected adult weevils around containerized stock adjacent to the shadehouse at the J. Herbert Stone Nursery (nursery) and in one lot of containerized Engelmann spruce. The infested spruce, plus all stock in the shadehouse and adjacent area were treated twice with Asana to prevent the adult weevils from laying eggs. The damage level detected at packing was significantly less than in 2000.

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 Forest Service Nursery in Coeur d'Alene, Idaho. This insect causes damage to bareroot Douglas-fir, western larch, and Engelmann 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 moths at the nursery did not show significant numbers above the threshold, however, significant damage was observed on Douglas-fir and true fir seedlings. Both the true fir and Douglas-fir were treated with one application of chlorpyrifos. Damage levels detected at packing for these species were less than 5 percent.

Initially thought to be caused by *Phytophthora,* damage on western white pine detected in June 2001 at the DTIC appears to be caused by cranberry girdler. A monitoring program was implemented to detect adults in the future.

Cylindrocarpon root disease,
Cylindrocarpon destructans

Region 1: Idaho, Montana

Host(s): Western white pine, whitebark pine

Cylindrocarpon destructans causes root disease of container-grown five-needle pines (western white pine, whitebark pine) at several container nurseries in Region 1. The pathogen causes low levels of root decay, often without eliciting above-ground disease symptoms on affected seedlings. The disease is best controlled by container sterilization with hot water treatments, seed treatments, and periodic fungicide applications.

Cypress canker,
Seridium spp.

Region 6: Oregon

Host(s): Port-Orford-cedar

Cypress canker caused some additional stem cankers and branch mortality on Port-Orford-cedar at the DTIC. The infected material was removed by pruning and the trees were treated with chlorothalonil to prevent further infections. A series of trials are underway to determine precisely when infection is taking place and to evaluate the efficacy of fungicides for treatment.

Damping-off,
Fusarium spp.
Pythium spp.

Region 1: Idaho, Montana

Host(s): Conifers

Damping-off is common in both bareroot and container nurseries in Region 1. Disease levels vary each year because of seedlot differences and weather conditions during periods of seed germination and seedling establishment. Damage is most often controlled by pre-sowing seed treatments (especially prolonged running water rinses and treatments with aqueous solutions of sodium hypochlorite) and application of post-sowing fungicides when germinants are susceptible and temperature and moisture conditions are conducive.

Region 6: Oregon

Host(s): Conifers

The nursery experienced a little more than 5 percent mortality due to damping-off. This was probably due to climatic conditions during the early development of the seedlings. Spring 2001 was warmer and drier than normal. 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): Various species

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 *Phytopthora*) and environmental conditions. Seedling losses can be severe when germination is slow due to cold, wet weather. Losses in 2001 were lower than normal due to the very dry weather, which inhibits fungus development. *Fusarium* and/or *Phytopthora* root rot caused 5-10 percent losses of sawtooth and Shumard oak in West Tennessee in 2001 (a post-emergence problem). In Virginia, *Phomopsis* continues to be a problem on eastern red cedar in Virginia nurseries.

Fusarium root disease, *Fusarium* spp.

Region 1: Idaho, Montana

Host(s): Conifers

Fusarium-associated diseases are generally the most important and damaging diseases of conifer seedling production in both bareroot and container nurseries in Region 1. These fungi are capable of causing several different types of diseases throughout the seedling production cycle. The most damaging *Fusarium* species in bareroot nurseries is *F. oxysporum*, while *F. proliferatum* seems to be the most important pathogen in container operations. Other *Fusarium* spp. are commonly isolated from both diseased and healthy seedlings; some of these are capable of eliciting diseases whereas others are more commonly saprophytes or secondary colonizers of seedling root tissues. Damage levels during 2001 were higher than normal at some nurseries. *Fusarium* diseases are most commonly controlled by pre-plant soil fumigation in bareroot nurseries and seed, container sterilization and fungicide treatments in container nurseries.

Region 6: Oregon

Host(s): Conifers

Several seedlots of western white pine that became infected in 2000 showed severe damage. The infection occurred when non-fumigated soil was inadvertantly mixed into the seedbeds by the bedformer at the time of sowing. Douglas-fir and grand fir container stock at the nursery and seed orchard also experienced some losses due to *Fusarium*.

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, Engelmann spruce, western red cedar, and western white pine seedlings in container nurseries in Region 1. Damage from this pathogen during 2001 was somewhat less than is normally encountered. 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. Pathogen development is restricted by storing seedlings at below-freezing temperatures and rapidly thawing them prior to outplanting.

Region 6: Oregon

Host(s): Conifers

The nursery experienced a *Botrytis* infection that required treatment this season. In recent years *Botrytis* has been successfully controlled through cultural methods and fungicides have not been needed. This season the nursery sprayed once with a combination of Benlate and Botran. The percentage of cull due to *Botrytis* damage was very small.

Larch needlecast,
Meria laricis

Region 6: Oregon

Host(s): Larch

Small cankers and branch dieback caused by *Meria* damaged a small number of plug+1 western larch at the DTIC.

Lygus,
Lygus hesperus

Region 6: Oregon

Host(s): Conifers

Trapping at the nursery showed high numbers of adult lygus bugs, and damage thresholds were reached. Five treatments of Pydrin were made on the 1+0 crop from late June through August. Lygus bug damage at the time of packing was negligible.

Phytophthora root rot,
Phytophthora spp.

Region 1: Idaho

Host(s): Western larch

Root diseases caused by *Phytophthora* spp. were damaging in low, poorly drained portions of conifer seedbeds at the Forest Service Nursery in Coeur d'Alene, Idaho, in 2001. 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 seedlings were not at very high levels during 2001.

Rhizoctonia needle blight, *Rhizoctonia* spp.

Region 8: Regionwide

Host(s): Longleaf pine

Losses were reported from North Carolina in 2001, but not at abnormal levels. Over 50,000 seedlings were lost to this disease in 2001 in South Carolina's Taylor State Tree Nursery.

Spider mite, *Tetranychus* spp.

Region 6: Oregon

Host(s): Aspen

A late-summer infestation of spider mites damaged containerized aspen seedlings at the nursery. Safer Soap, three applications of Kelthane, and one application of Hexagon (an ovicide) were used to control the mites.

Tip dieback, *Sirococcus strobilinus*

Region 1: Idaho

Host(s): Conifers

During 2001, low levels of dieback caused by *S. sirococcus* occurred on 2-0 ponderosa and lodgepole pine seedlings at the Forest Service Nursery in Coeur d'Alene, Idaho. The disease occurred at much lower levels than the previous year.

Abiotic Damage

Air pollution

Region 5: California

Host(s): Jeffrey pine, ponderosa pine

For the past 23 years, the status of ozone injury to pines in trend plots on the Sierra and Sequoia National Forests have been reported. Those 54 plots were evaluated for the last time in 2000. Since the plots were established in 1977, numerous trees have died or the foliage has become unreachable, and this has significantly reduced the number of sample trees. The results from these injury trend plots will be published in 2002.

Region 8: Tennessee

Host(s): All species

Ozone damage was very evident in the Cumberland Plateau and the Knoxville area of Tennessee in 2001.

Bear Damage

Region 5: California

Host(s): Douglas-fir, Port-Orford-cedar, redwood

Many thousands of trees have been killed, top-killed, or damaged by black bears in northern Humboldt and Del Norte Counties over the past few years. The damage has been on the rise the past few years, as have the bear populations. Side drainages of the Smith and Klamath Rivers have been hard hit. Trees mostly affected are redwood, Douglas-fir, and Port-Orford-cedar. Damage was noted on samplings and larger trees and was frequent in second growth redwood stands 30-50 years of age. In affected areas, foresters estimate an average of 25-40 percent of the trees have been damaged. For example, damage to mature Port-Orford-cedar was widespread in a 20-acre area near the headwaters of the East Fork of Pecwan Creek, Orleans Ranger District.

Region 6: Washington

Host(s): Douglas-fir, western hemlock

On Quinault Indian Nation lands in northwestern Washington, the 2001 special aerial survey indicated that 40 percent of Douglas fir stands and 26 percent of Douglas-fir acres, have various numbers of trees girdled by bears. Where bear-caused mortality occurred, it ranged from 0.4 to 118 trees per acre, with an average of 4 trees per acre. The aerial survey only detects trees that have been recently killed by bear feeding. A ground survey on Quinault lands found that at least 3.5 times as many Douglas-fir trees are damaged as killed.

Drought effects

Region 2: Colorado, South Dakota, Wyoming

Host(s): All tree species

Many mixed conifer forests in the higher elevations in Colorado had signs of drought stress and winter drying. Long-term drought, combined with low snowpacks, mild winters, below average monsoon rains, and unusually high late summer temperatures have all contributed to drought stresses on all tree species.

Region 3: Arizona, New Mexico

Host(s): Ponderosa pine

Discoloration of ponderosa pine attributed to drought occurred on about 7,215 acres in 2001. In Arizona, this occurred on the Coconino (3,874 acres) and Prescott (33 acres) National Forests; and on 187 acres of private land. About 3,120 acres of State and private lands were affected in northern New Mexico.

Region 5: California

Host(s): Oak

As the result of an exceptionally dry March, April, May, and early June, foliage of blue oaks throughout the northern Sacramento Valley changed color early this year. Trees of the harshest sites appeared to be the most affected. Internal areas of Humboldt and Del Norte Counties experienced early fall color change of many hardwood species, most notably Oregon white oak and California black oak. California black oak went into dormancy in late August in Lassen County in northeastern California. Browning and premature loss of foliage of blue oaks were reported from several foothill location in the central and southern Sierra Nevada. Loss of leaves began in mid- to late-July and continued through September. Most blue oaks retained some foliage, although some severely affected individuals were almost completely defoliated. Buds on these trees were still viable and the trees are expected to survive.

Region 8: Regionwide

Host(s): All species

Drought conditions prevailed over much of the eastern South for the fourth consecutive year.

Georgia suffered continued drought-caused tree losses. Impacts in nurseries were again severe, with heavy loss of containerized seedlings recorded.

Florida witnessed another year of stress related pest activity and associated tree death/damage. Impact in Florida was especially intense in the northeast. 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, southern pine root weevil (*Hylobius aliradicus*), and hypoxylon canker.

Similar problems occurred in South Carolina where the State recorded its third consecutive 20-inch rainfall deficit.

Much like last year, North Carolina reported a host of drought-related problems, especially in the mountains, foothills, and western Piedmont. Similarly, Virginia continued to experience drought problems with forests and trees across the Commonwealth.

Drought was less intense in Tennessee in 2001 than in the previous three summers, but the cumulative stress continued to cause mortality in the oak/hickory forest type.

Drought abated over much of the western Gulf region in 2001. This may have contributed to a lessening of drought-initiated dieback and decline in susceptible trees.

Region 9/Northeastern Area: Massachusetts, Missouri, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Vermont, West Virginia

Host(s): Various species

Drought conditions eased in 2001. It has been the overriding forest health concern in Missouri for several years. Precipitation was average or above average in northern and western parts of the State, however, many areas have not fully recovered. Oak decline and related wood borer damage has increased in parts of southern Missouri as a result.

The affects of the 1999 drought are prevalent across the forests of Indiana. About 50 percent or more of the 4.5 million acres of forest are suffering damage in the form of altered crown conditions – reduced density and increased transparency.

The species showing crown symptoms are yellow poplar and the oaks. Yellow poplar is showing more problems from drought than other species. In south central Indiana, yellow poplar of all size classes are declining to some degree, such that foresters have begun to remove them from the forest. Reports have also been received that growth rates of declining trees have been severely reduced for the past 10 years.

Drought related stress was reported on 18,000 acres in Michigan and 32,000 acres in Minnesota.

The trend of declining moisture patters prevailed in many regions of Pennsylvania as drought conditions persisted throughout the 2001 growing season. Periods of drought have been occurring regularly since 1988 in the mid-Atlantic region. Oak mortality was significant in Berks County, Pennsylvania. Drought conditions in Ohio remained about the same in 2001. Although the early spring of 2001 had only half the normal precipitation in Ohio, excessive rainfall late in the spring brought soil moisture to near normal levels. In West Virginia, the rainfall during the growing season varied from heavy rains to periodic droughts. The heavy rains technically broke the drought, but the impact of the drought in previous years continued.

As a result of the drought in 1998 and 1999, many trees are still showing signs of stress in Massachusetts. Particularly hard hit were the streets trees and trees growing at higher elevation. In New Hampshire, drought conditions were prevalent throughout the State. Drought was a major factor in forest health for many areas of New York in 2001. Many regions of the State underwent mild to severe drought conditions, As a result, discoloration, branch flagging, and some mortality was observed for various tree species, especially along ridge tops. The dry conditions almost certainly exacerbated the effects of pest and disease problems where they existed. In Vermont, drought damage to hardwoods was widespread, and most noticeable on shallow or excessively drained soils. Precipitation was below normal beginning in late spring, and drought conditions increased throughout the growing season. Symptoms included leaf browning, defoliation, and shoot mortality. All species were affected, with the heaviest damage observed on beech and yellow birch.

Fire

Region 8: Regionwide

Host(s): All species

For the fourth year in a row, fire (both wildfire and prescribed burns) generated a high incidence of tree mortality in Florida, which was further aggravated by the drought. Besides outright fire-caused mortality, many trees succumbed to secondary insects and diseases that exploited the trees' fire-weakened condition. North Carolina reported 27,859 acres burned, much of it from October through December. Tennessee

reported 35,000 acres burned in the eastern part of the State. Many of these fires were arsonist-set in October and November and affected primarily upland hardwoods.

Flooding

Region 9/Northeastern Area: Iowa, Minnesota, West Virginia

Host(s): Various hardwoods and softwoods

Heavy summer rains caused severe flooding in the southern and western counties of West Virginia. Recurring floods damaged trees on over 12,000 acres along the Minnesota and Mississippi river drainages, and scattered losses were reported along the six major river areas in Iowa.

Frost

Region 2: Colorado

Host(s): All tree species

Major late freezes occurred on May 20, 2001, and June 13, 2001, in Colorado. This resulted in foliage loss for many deciduous trees throughout Colorado. Species particularly affected were Gambel oak, aspen, and non-pine conifers. Most of the deciduous hosts refoliated by July, although some aspen stands had "tufted, sparse leaves" by summer's end. Damage occurred to new shoots on firs and spruces in high elevations of Colorado.

Region 4: Utah

Host(s): Gambel oak, aspen

In Utah, frost damage was detected to be causing foliar browning on over 7,800-acres of gambel oak on the Price, Sandpete, Moab, and Monticello Ranger Districts of the Manti-LaSal National Forest. On the Uinta National Forest, over 2,600-acres of aspen and over 4,000-acres of gambel oak sustained frost damage on the Heber, Pleasant Grove, and Spanish Fork Ranger Districts.

Region 8: Tennessee

Host(s): Various species

Scattered frost affected elm, hackberry, sycamore, and cottonwood were reported from upper-middle Tennessee. Severe frost damage in west and upper middle Tennessee caused reduced acorn crops, with corresponding negative impact on wildlife species dependent on acorns for food.

Region 9/Northeastern Area: Massachusetts

Host(s): Red oak, black oak

Approximately 100,000 acres of red and black oak in Massachusetts were severely damaged by a sudden drop in temperature on May 7, 2001. Unusually warm temperatures had been experienced with sufficient moisture to cause the buds to open. The sudden drop in temperature severely damaged the newly emerging foliage, causing nearly 100 percent defoliation of these species in Middlesex, Worcester, Hampden and Hampshire Counties. Other counties experienced some damage but to a far lesser extent. In New Hampshire, in early May, frost damaged 10,159 acres in the southern counties. Damage was concentrated on the upper and outer branches and the trees re-foliated. In Rhode Island, frost damage occurred in May on 54,000 acres affecting oak, hickory, beech, and ash. All counties in rural areas were affected.

Ice/snow damage

Region 2: South Dakota

Host(s): All tree species

A large hailstorm damaged around 1,000 acres in the Black Hills near Rapid City and Hill City, South Dakota in 2001. Damage varied considerably and the long-term health of the trees is unknown. Ponderosa pine affected by the hail was infected with *Sphaeropsis sapinea (Diplodia)* and occasionally attacked by *Ips pini*. The oaks and other hardwood species suffered minimal damages.

Region 5: California

Host(s): California black oak, Douglas-fir, incense-cedar, white fir

A severe hailstorm damaged and defoliated about 300 acres of host along the Pacific Crest Trail in the Marble Mountain Wilderness about 6 miles north of Etna Summit.

Region 8: Arkansas, Oklahoma, Texas

Host(s): All species

Although no significant new ice storms hit the South in 2001, assessment and clean-up of the Christmas 2000 storms across Arkansas, Oklahoma, and Texas continued through early 2001.

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

Host(s): Various hardwoods and conifers

In Maine, New Hampshire, New York, and Vermont, ice damage remains noticeable as trees continue to recover from the January 1998 storm. Tree species that possess the ability to produce sprouts in damaged portions of their crowns displayed lush foliage in 2000 and 2001. Species that have recovered best from significant crown loss include white ash, red oak, and sugar maple. Many trees that lost more than 75 percent of their total crown now have smaller but apparently normal crowns. Ten acres in Chichester, New Hampshire, and 3 acres in Weare were affected. In Vermont, limb breakage was widely scattered, due to heavy wet late winter snow in 2000.

Salt damage

Region 2: Colorado

Host(s): All tree species

Dust-control materials utilizing magnesium chloride are increasingly being used in the mountain road systems in Colorado, with corresponding increases in tree damage. Both coniferous and deciduous hosts have been affected, particularly Engelmann spruce and narrowleaf cottonwood. Trees growing immediately near treated roads (particularly the downhill side) are being adversely affected. Symptoms include foliage tip burn (that becomes accumulatively worse on older needles) and branch/top dieback; both would appear to be consistent with toxic salt accumulations.

Sunscald

Region 5: California

Host(s): Interior live oak

Several reports of sunscald on interior live oak were submitted from the Redding area, Shasta County. This tree is particularly susceptible to damage when shade is lost through branch pruning or removal of nearby trees.

Wind

Region 5: California

Host(s): Maple

Maple leaf scorch occurred in late spring and early summer in Indian Creek, North Fork Feather River, and North Yuba River drainages and along Bucks Lake Road in Plumas and Sierra Counties. Similar damage occurred in 1998 and 2000, when hot winds dried the newly forming maple leaves, while the roots were too cold to supply water to them. Lack of soil moisture may have been partly to blame for the desiccation in 2001.

Region 8: Tennessee, Virginia

Host(s): Southern pines, hardwoods

Winds toppled dead pines onto houses north of Knoxville and uprooted hardwoods in middle Tennessee. One windstorm swath affecting Coffee and Franklin Counties was 200 feet wide and three-quarters of a mile long. Tornado caused damage was reported in Henry County in West Tennessee. In Virginia, high winds in combination with hail and flash floods affected southwestern Virginia in May and July.

Region 9/Northeastern Area: Minnesota**,** Wisconsin

Host(s): Various hardwoods species

Wind damage in Minnesota was down in 2001 to 308 acres, down from 1,740 acres in 2000. The State is still experiencing the effects of the catastrophic blowdown in 1999, which affected 465,882 acres. Salvage and prescribed burning has lowered the fire danger and limited bark beetle outbreaks.

Straight-line wind, hail, and tornado damage affected 61,901 acres across Wisconsin. In 2000, over 200,000 acres were similarly damaged. Initial surveys indicated only 6 percent mortality and 72 percent of trees had less than 50 percent dieback, however, by the end of the year mortality jumped to 66 percent in one stand.

Winter injury

Region 9/Northeastern Area: Minnesota

Host(s): White pine, northern whie cedar

Winter burn was reported on over 1,300 acres in Minnesota.

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.