United States
Department
of Agriculture

Forest Service

Forest Health Protection

August 2004

Forest Insect and Disease Conditions in the United States 2003

Healthy Forests Make A World of Difference

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PREFACE

This is the 53rd 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 2003. The first section of this report highlights emerging insect and disease issues. This is a new section added in 2003. Regional and temporal trends in selected insect and disease conditions are highlighted in the second section of the report. Distribution maps are provided for some pests. Graphs depict acreage trends over the last several years for some pests. Tables show acreages affected for selected pests by State by year for the last 5 years.

The third section of the report brings together insect, disease, and abiotic agent damage reports 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 the 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 USDA 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: 2003 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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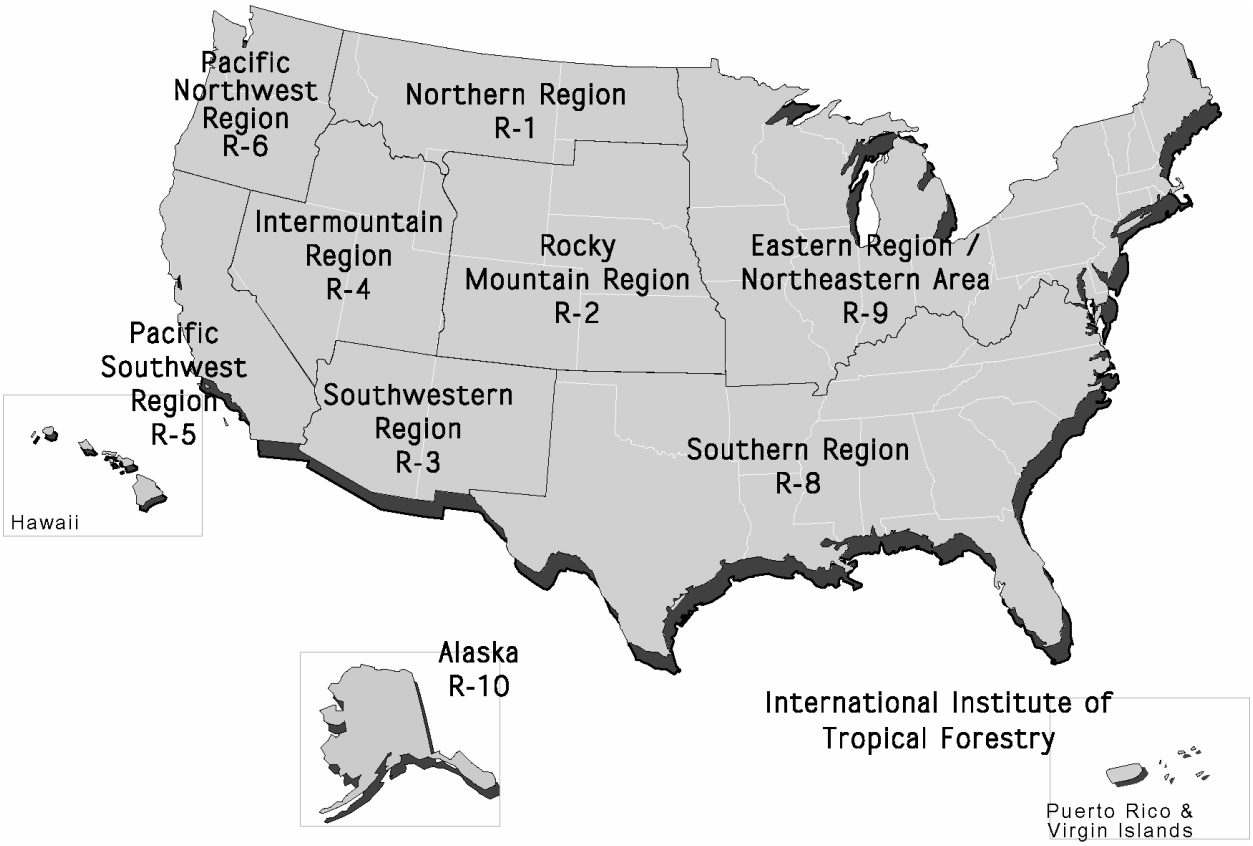
USDA Forest Service Regions and Area



Copies of this report are available from:
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This report is also available on the Internet at:
www.fs.fed.us/foresthealth/current_conditions.shtml

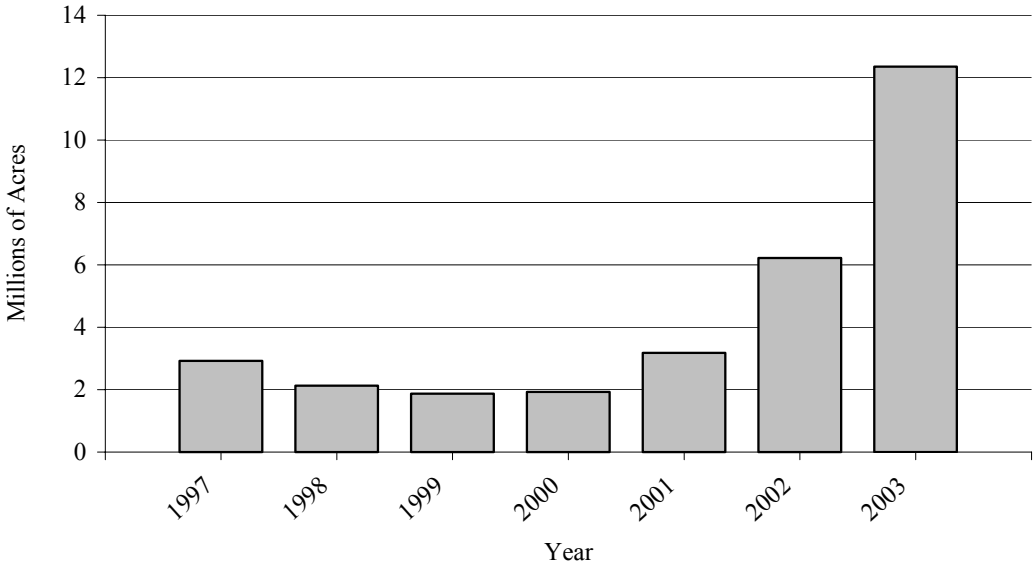
CONTENTS

EXECUTIVE SUMMARY

Introduction

There are approximately 750 million acres of forested land in the United States, about one-third of the total land area (including Alaska and Hawaii). Nationwide, these forests provide numerous economic, social, and environmental benefits to residents of the United States and visitors from abroad.

Native and nonnative (exotic) insects and diseases, as well as abiotic influences, cause significant damages that affect the health and productivity of our forests. The chart below shows how insect- and disease-caused tree mortality has changed over the past 7 years. The recent dramatic rise in mortality is attributed to bark beetle infestations in the West, particularly ips beetles in pinyon pine forests.



Highlighted below are some of the major native insects and diseases of concern as well as 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 – The current southern pine beetle outbreak continued to decline after peaking at almost 13.5 million acres in 2001. About 2.4 million acres were affected in 2003, with outbreak counties being reported in Georgia, New Jersey, and Tennessee.

Mountain pine beetle – Mountain pine beetle outbreaks increased in every State in the West. Affected acreage rose from about 1.5 million acres in 2002 to over 2.2 million acres in 2003.

Spruce budworm – Spruce budworm remained at low levels in 2003, with only small areas of defoliation being reported from Michigan, Minnesota, and Wisconsin.

Western spruce budworm – Overall, defoliation by western spruce budworm increased only slightly from about 617,000 acres in 2002 to about 631,000 acres in 2003. However, Idaho, Montana, and Washington experienced significant increases.

Spruce beetle – Outbreaks were present in Arizona, Colorado, Montana, Utah, and Wyoming. In Alaska, spruce beetle activity decreased to endemic levels.

Insects: Nonnative

Asian longhorned beetle – In Chicago, only one beetle was captured and two infested trees were removed. About 100 infested trees were found in Jersey City. In New York, several new infested locations were discovered, but all these were within the quarantine area.

Gypsy moth (European) – Overall, reported gypsy moth defoliation decreased about 411,000 acres in 2002 to about 251,000 acres in 2003.

Common European pine shoot beetle – The beetle continued to spread from its original introduction site in Ohio. Twelve States are currently infested.

Hemlock woolly adelgid – This insect continued its rapid spread in 2003. Rearing and release of biological control agents continues as rapidly as possible to reduce its damage.

Diseases: Native

Fusiform rust – Rust continues to be the most significant disease of loblolly and slash pine in the South. The Resistance Screening Center in Asheville, NC, tests seed lots for fusiform rust resistance against rust collected in the planting vicinity. Rust resistant families have been developed that produce fewer galls, both in screening trials and field plantations.

Dwarf mistletoes – These are native plants that parasitize western conifers and larch. They have increased due to fire suppression, and the witches' brooms they cause provide fuel ladders that increase fire severity. Drought exacerbates the impact of mistletoe on tree growth and survival. An estimated 28.8 million acres have some level of infestation.

Root diseases – Stress from root disease is frequently an underlying cause of mortality attributed to drought, bark beetles, and defoliators. Different pathogens can cause root disease, depending on regional conditions and host types present.

Diseases: Nonnative

Beech bark disease – Introduced in North America about 1890, this disease continues to spread, killing beech trees from Maine to Michigan, and as far south as North Carolina and Tennessee. The disease is caused by an interaction of fungal pathogens and scale

insects with sucking mouthparts that pierce the tree bark. The disease is killing trees and spreading faster than predicted, with nine Counties in North Carolina and Tennessee affected, and eight Counties in Michigan.

White pine blister rust – Introduced about the turn of the 20th century, it now occurs throughout most of the ranges of white pines, and has caused extensive tree mortality. It affects commercially important white pine, as well as ecologically sensitive high-elevation species. The disease was found this year for the first time on bristlecone pine.

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 13 coastal counties north and south of San Francisco and in one county in southwestern Oregon. The outbreak in Oregon is under an eradication program. Dissemination via nursery stock is a major concern.

Part 1: Emerging Issues

Part 1 contains information on current emerging insect and disease issues.

Part 2: National Highlights

Part 2 contains more information on selected insects and diseases, including some maps, tables, and graphs.

Part 3: Conditions by Damage Agent by Region

Part 3 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: Emerging Insect and Disease Issues

Emerging Issues

Emerald Ash Borer

The emerald ash borer (EAB) (*Agrilus planipennis* Fairmaire*)* is a nonnative insect originally from eastern Russia, northern China, Japan, and Korea that threatens our urban and rural forests. It was unknown on the North American continent until its discovery in the Detroit, MI, area in July 2002. Subsequent surveys showed that it was also present in large numbers in six counties in southern Michigan. This 'core' area was put under quarantine in the fall of 2002. The seven counties adjacent to the core area were quarantined in August 2003. Those seven counties have been designated 'tier 1,' and the Michigan EAB team is aggressively removing both infested and host trees in those areas.

Shortly after EAB was first found in Michigan, an infestation was discovered across the border in Windsor, Ontario, Canada. To contain further spread of EAB there, the Canadian Government has begun cutting and destroying all of the ash trees in a zone 30km x 10km extending from Lake St. Clair to Lake Erie. This "ash free" zone, in concert with an aggressive regulatory program to prevent the artificial movement of infested ash material out of the infested area, is intended to contain the existing infestation so that effective eradication activities can be implemented. In the United States, spot infestations of EAB resulting from the movement of infested nursery stock or firewood from Michigan have been found in Maryland (Prince George's County), Ohio (Defiance, Franklin, Lucas, and Wood Counties), and Virginia (Fairfax County). Efforts are currently underway to eradicate and monitor these spots. The EAB infests walnuts and elms in its native habitat. In North America, EAB is found (so far) only on ash (*Fraxinus* spp.), an abundant tree species in urban areas, rural woodlots, and riparian areas.

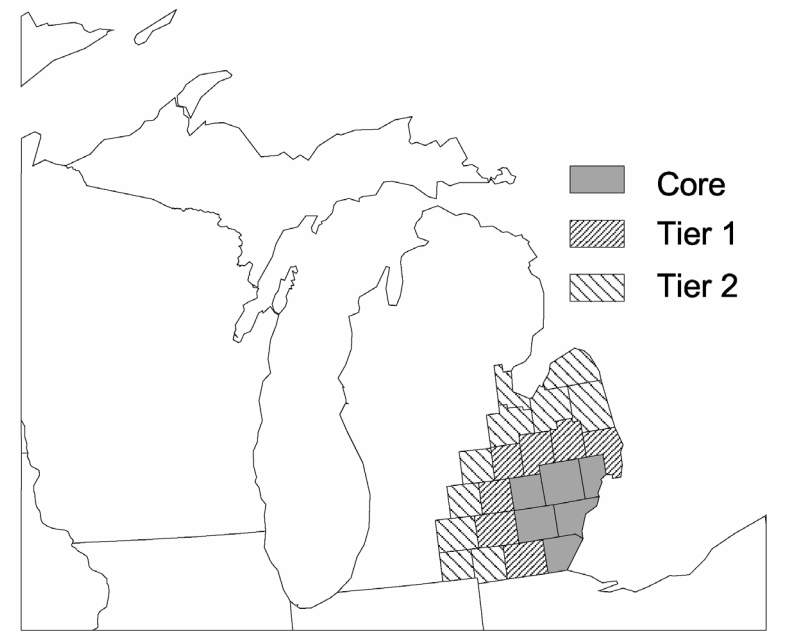
It is estimated that EAB had been present in Michigan for 5-10 years before its discovery. EAB was previously unknown outside of Asia and was not on any exotic pest "watch list."

There was little documentation about EAB biology at first. Evaluations and other studies had to be conducted to fill that information void. Entomologists now know that EAB is more prolific, and has a much longer flight range than another well-known exotic, Asian longhorned beetle, which was found in nearby Chicago, IL, in 1998.

In Michigan, EAB occurs over a broader area than originally estimated. The generally infested area was originally thought to cover about 2,500 square miles. Recent survey data (2003) suggest that the generally infested area probably covers about 4,000 square miles instead. The 10 counties surrounding the current quarantine area have been designated 'tier 2' level. They have an ash species density that is nearly contiguous to the existing EAB infestation and at potential risk. Intensive surveys planned in 2004 will provide a better picture of the scope and location of the EAB generally infested area in Michigan.

The USDA Forest Service is an integral partner, along with the USDA Animal and Plant Health Inspection Service (APHIS) and State authorities, in the eradication effort, providing scientific and technical expertise, including survey, restoration, and public outreach and communications assistance. In 2003, forest health specialists coordinated and implemented EAB surveys outside of Michigan with State forestry and agriculture personnel to examine areas of known ash decline in the States and around nurseries and other places that received infested ash trees from Michigan. EAB detection surveys will be continued and expanded to other States in 2004. Forest Health Protection also supports and conducts critical technology development activities with university and research cooperators to advance our understanding of EAB biology and dispersal habits, chemical control tactics, management strategies, survey techniques, and monitoring among others.

Michigan Counties in the Emerald Ash Borer Quarantine and Control Area (Core and Tier 1) and Tier 2 - 2003



Pinyon Pine Mortality

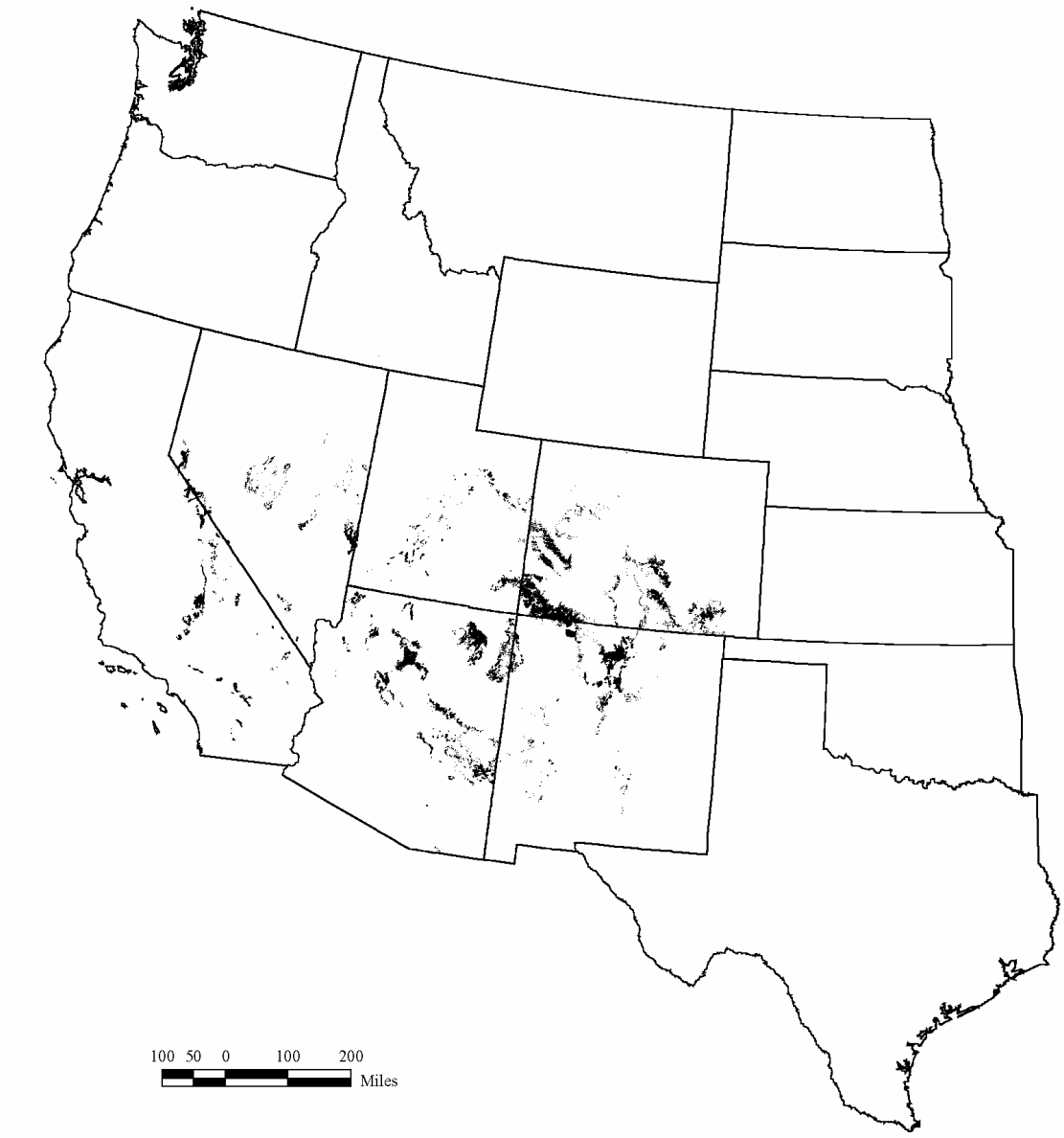
Pinyon pine mortality reached unprecedented levels in 2003 with more than 3.7 million acres of mortality recorded. Observations in previous years indicated that piyon pines were dying at increasing rates in areas of Arizona, California, Colorado, Nevada, New Mexico, and Utah. Late in the summer of 2002 it became evident that a major bark beetle epidemic was in progress. The extensive, prolonged, and severe drought conditions highly stressed pinyon trees and allowed populations of pinyon ips bark beetle to reach epidemic levels.

In 2003, special surveys were conducted to document this drastic event. Results of these surveys are summarized below.

Acres (in thousands) of Aerially Detected Pinyon Pine Mortality, 2001-2003

State	2001	2002	2003
Arizona	6.2	60.2	1,031.1
California		1.0	522.6
Colorado		63.6	814.3
Nevada	1.8	64.4	355.7
New Mexico	11.0	71.2	808.9
Utah	4.0	6.2	207.0
Total	23.0	266.6	3,739.6

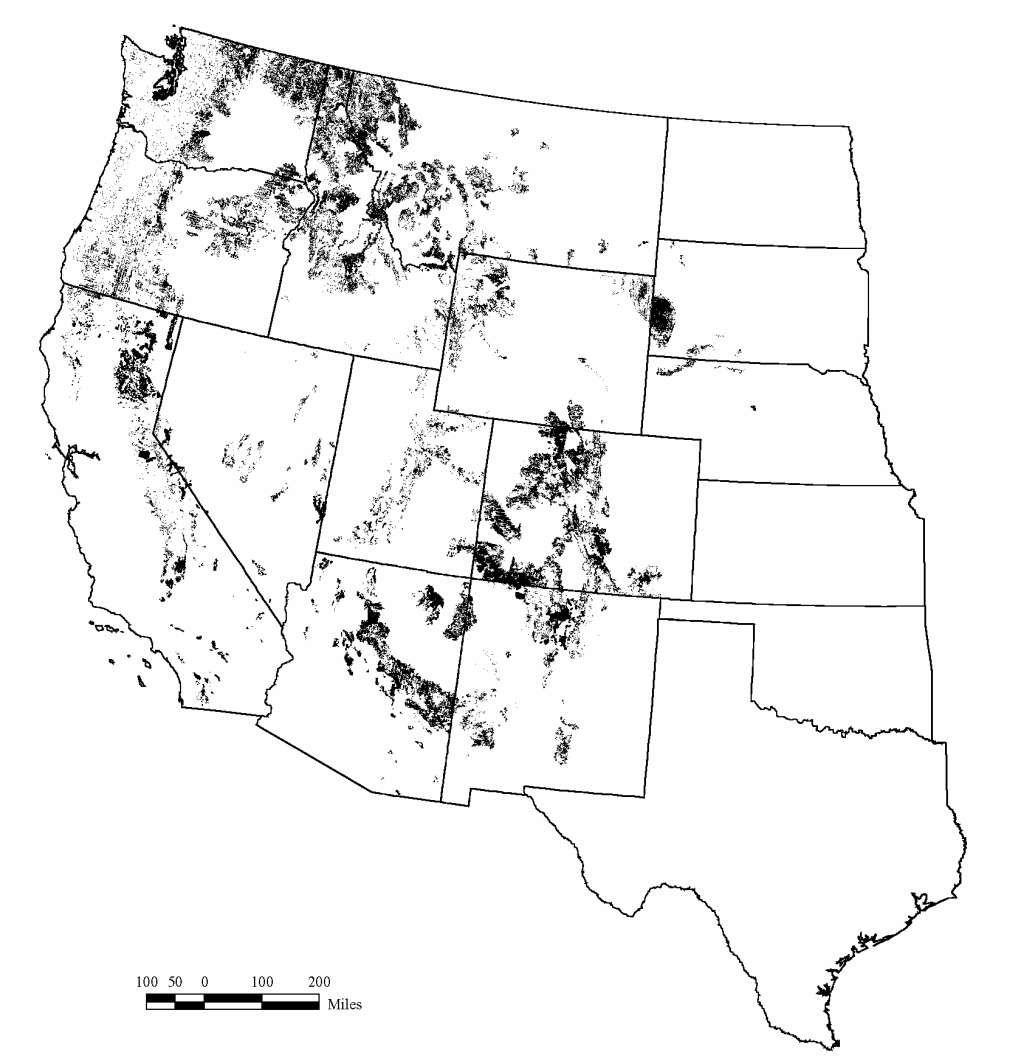
Aerially Detected Pinyon Pine Mortality, 2003



Western Bark Beetles

Tree mortality from bark beetles increased substantially in many parts of the West in 2003, particularly in forests severely stressed by the widespread and prolonged drought and overstocking. This was especially true in the pinyon-juniper woodlands of the Southwest where analysis of tree ring data indicate that the period from 1996 to 2002 may have been the driest in almost 1000 years. Special pinyon-juniper woodland surveys were conducted and the results are described in more detail in a separate section of this report. Bark beetle activity was also high in areas damaged by fire and weather events. Mountain pine beetle, Douglas-fir beetle, and spruce beetle were the direct cause of much of the mortality, but less commonly seen insects such as fir engravers, pine engravers, western pine beetle, Jeffery pine beetle, round-headed pine beetle, western balsam bark beetle, and red turpentine beetle caused substantial damage on almost 2.5 million acres.

Outbreak Areas of All Bark Beetles in the Western United States, 2003

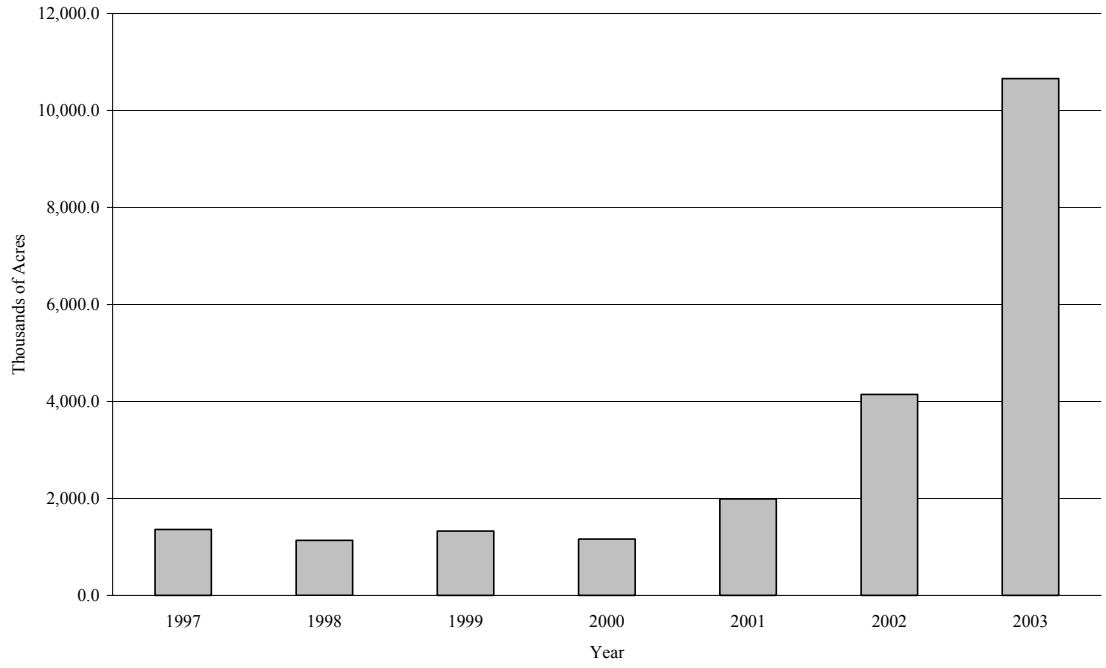


Acres (in thousands) of Aerially Detected Bark Beetle Outbreaks in the Western United States, 1997-2003

Region	1997	1998	1999	2000	2001	2002	2003
1	259.2	281.1	431.7	395.0	546.4	919.6	910.6
2	53.3	141.2	165.6	206.1	446.8	573.3	2,301.7
3	90.7	40.6	20.2	58.7	154.0	716.0	2,596.8
4	170.0	118.4	112.6	95.9	206.0	279.3	918.2
5		47.3	29.0	32.9	77.6	846.6	2,560.2
6	214.2	172.4	279.6	255.6	457.3	750.5	1,255.6
10	573.5	334.8	288.3	120.9	104.2	58.5	115.3
Total	1,360.9	1,135.9	1,326.9	1,165.3	1,992.3	4,143.8	10,658.3

[1] In 1997, Region 5 mortality data listed causal agent as "Unknown," therefore 1997 does not include data for Region 5.

Acres (in thousands) of Aerially Detected Bark Beetle Mortality in the Western United States, 1997-2003



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 Europe, where it is causing nursery problems on rhododendron and viburnum, and recently was discovered attacking landscape trees in affected gardens.

On oaks, *P. ramorum* is a bark pathogen; it causes necrotic, often girdling cankers that can lead to mortality on tanoak, coast and canyon 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, wood rose, 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 sempervirens*) forests on tanoak and in coastal evergreen forests on oaks, madrone, California bay laurel, and other species. In California, Sudden Oak Death has been confirmed in scattered locations along the Pacific coast from Monterey County north into Humboldt 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 behavior in new environments.

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

Counties Where Sudden Oak Death Was Reported, 2003

Table of Proven Hosts for *Phytophthora ramorum* in the United States, 2003

Scientific name	Common name
Acer macrophyllum	bigleaf maple
Aesculus californica	California buckeye
Arbutus menziesii	madrone
Arctostaphylos manzanita	manzanita
Camellia japonica	Japanese camellia
Camellia sasanqua	sasanqua camellia
Hamamelis virginiana	witch hazel
Heteromeles arbutifolia	toyon
Lithocarpus densiflorus	tanoak
Lonicera hispidula	California honeysuckle
Pieris formosa	Himalaya pieris
Pieris formosa x japonica	pieris 'Forest Flame'
Pieris floribunda x japonica	pieris 'Brouwer's Beauty'
Pieris japonica	Japanese pieris
Pseudotsuga menziesii var. menziesii	Douglas-fir
Quercus agrifolia	coast live oak
Quercus chrysolepis	canyon live oak
Quercus kelloggii	California black oak
Quercus parvula v. shrevei	Shreve's oak
Rhamnus californica	California coffeeberry
Rhododendron spp	rhododendron (including azalea)
Rosa gymnocarpa	wood rose
Sequoia sempervirens	coast redwood
Trientalis latifolia	western starflower
Umbellularia californica	California bay laurel, pepperwood, Oregon myrtle
Vaccinium ovatum	evergreen huckleberry
Viburnum x bodnantense	bodnant Viburnum
Viburnum plicatum var. tomentosum	doublefile Viburnum
Viburnum tinus	laurustinus

Table of Plants Associated with *Phytophthora ramorum* in the United States, 2003

Scientific name	Common name, date, and source of report
Abies grandis	grand fir – June 03 (1)
Aesculus hippocastanum	horse-chestnut – Dec 03 (3)
Arbutus unedo	strawberry tree – Dec 02 (7)
Camellia reticulata	camellia – Oct 03 (3)
Camellia x williamsii	camellia – Oct 03 (3)
Castanea sativa	sweet chestnut – Feb 04 (3)
Corylus cornuta	California hazelnut – Dec 02 (5)
Fagus sylvatica	European beech – Dec 03 (3)
Kalmia latifolia	mountain laurel – Fall 02 (3)
Leucothoe fontanesiana	drooping leucothoe - Oct 03 (3)
Pieris formosa var. forrestii	Chinese pieris – Oct 03 (3)
Pieris formosa var. forrestii x Pieris japonica	pieris – Oct 03 (3)
Pittosporum undulatum	victorian box – Dec 02 (6)
Pyracantha koidzumii	Formosa firethorn – Apr 04 (9)
Quercus cerris	European turkey oak - Feb 04 (3)
Quercus falcata	southern red oak – Nov 03 (3)
Quercus ilex	Holm oak – Dec 03 (3)
Quercus rubra	northern red oak – Nov 03 (8)
Rhamnus purshiana	cascara – Dec 02 (4)
Rubus spectabilis	salmonberry – Dec 02 (4)
Syringa vulgaris	lilac – 2003 (3) updated Oct 03
Taxus baccata	European yew – Aug 03 (3)
Toxicodendron diversiloba	poison oak – Dec 02 (4)
Vaccinium vitis-idaea	lingonberry – Poland, 2002 (reported by 3)
Viburnum davidii	David viburnum - Oct 03 (3)
Viburnum farreri (=V. fragrans)	fragrant viburnum – Oct 03 (3)
Viburnum lantana	wayfaringtree viburnum – Oct 03 (3)
Viburnum opulus	European cranberrybush viburnum – Oct 03 (3)
Viburnum x burkwoodii	burkwood viburnum – Oct 03 (3)
Viburnum x carlcephalum x V. utile	viburnum – Oct 03 (3)
Viburnum x pragense	Prague viburnum – Oct 03 (3)

[1] California Department of Food and Agriculture

[2] Oregon Department of Agriculture

[3] Department for Environment, Food, and Rural Affairs, UK

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[5] David Rizzo, University of California – Davis

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[8] Plant Protection Service, Wageningen, Netherlands

[9] Canadian Food Inspection Agency, Canada

Part 2: Historical 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 south and west. In 2002, all or parts of 15 States and the District of Columbia were considered infested. The infested States extend from Maine to Virginia, West Virginia, Ohio, and Michigan.

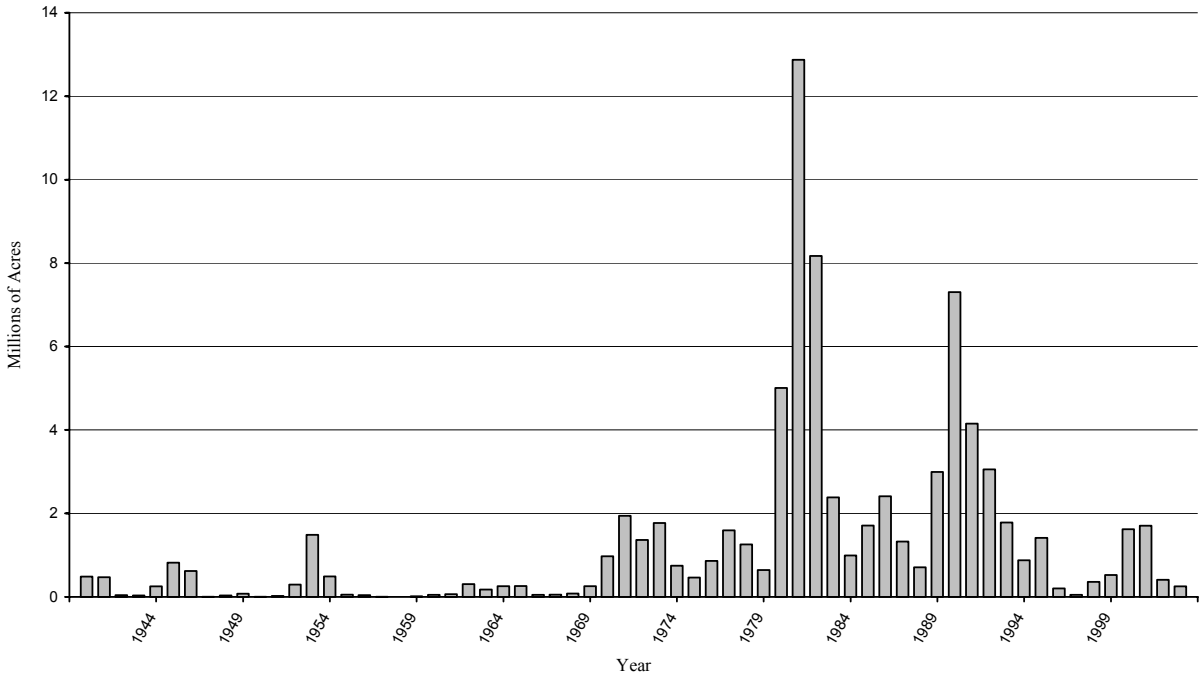
Defoliation in the East decreased from 410,700 acres in 2002 to 250,900 acres in 2003. Slow The Spread and other suppression/eradication projects appear to be successful in 12 Eastern and Southern States. Conneticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont reported no defoliation. Maryland, New Jersey, New York, Pennsylvania, Virginia, and West Virginia all report significantly fewer acres of defoliation by gypsy moth. Defoliation increased in Wisconsin from 37,400 acres in 2002 to 99,000 acres in 2003, and for the first time, oak forests on Michigan's upper peninsula were defoliated enough to be included in aerial surveys.

Eastern Counties Where Gypsy Moth (European) Defoliation Was Reported, 2003

Acres of Aerially Detected Gypsy Moth (European) Defoliation, 1999-2003

State	1999	2000	2001	2002	2003
Connecticut	0	200	400	0	0
Delaware	0	0	0	0	0
Maine	0	2,500	29,500	51,500	0
Maryland	1,200	23,200	46,200	14,000	100
Massachusetts	9,800	64,100	48,000	4,700	0
Michigan	176,600	106,300	0	0	46,800
New Hampshire	0	100	8,500	11,800	0
New Jersey	1,400	133,300	140,800	41,900	5,100
New York	6,000	27,500	50,900	7,100	200
Ohio	48,200	23,600	42,500	2,500	4,100
Pennsylvania	281,600	843,000	283,700	55,800	1,800
Rhode Island	0	5,500	8,000	0	0
Vermont	0	0	100	0	0
Virginia	0	71,000	440,000	51,900	79,900
Washington, DC	0	0	0	0	0
West Virginia	0	323,100	603,800	132,100	13,900
Wisconsin	0	100	3,700	37,400	99,000
Total	524,800	1,623,500	1,706,100	410,700	250,900

Gypsy Moth (European) Defoliation, 1940-2003



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 declined dramatically over much of the South in 2003 with the affected acreage decreasing from 13,455,900 acres in 2001 to 2,403,000 in 2003. Lingering beetle activity continued in western South Carolina and eastern Tennessee. South Carolina reported 18 counties still in outbreak status. Tennessee reported 12 counties.

Maryland and Ohio reported no beetle activity in 2003. New Jersey reported activity in three counties causing approximately 2,500 acres of mortality.

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

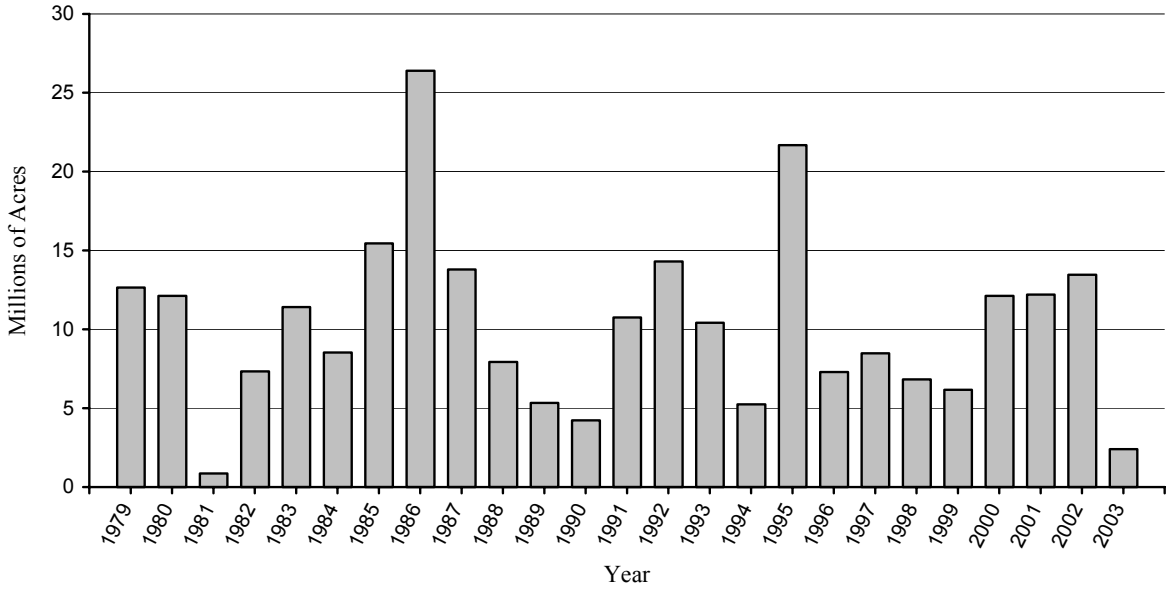
Counties Where Southern Pine Beetle Outbreaks Were Reported, 2003

Acres (in thousands) of Southern Pine Beetle Outbreaks, 1999-2003*

State	1999	2000	2001	2002	2003
Alabama	5,002.0	6,936.1	4,876.0	5,077.0	0.0
Arizona	0.0	11.6	0.0	0.0	0.0
Arkansas	0.0	0.0	0.0	0.0	0.0
Florida	40.0	321.3	916.0	916.0	0.0
Georgia	171.0	1,067.0	1,407.0	2,424.0	85.8
Kentucky	0.0	220.6	767.0	0.0	0.0
Louisiana	0.0	0.0	0.0	0.0	0.0
Mississippi	0.0	210.6	0.0	265.0	0.0
New Jersey	0.0	0.0	0.0	1.9	2.5
North Carolina	252.0	437.9	797.0	935.0	9.2
Oklahoma	0.0	0.0	0.0	0.0	0.0
South Carolina	8.7	1,218.3	1,727.0	2,574.0	1,789.0
Tennessee	685.0	1,441.0	1,425.0	1,197.0	516.9
Texas	0.0	0.0	0.0	0.0	0.0
Virginia	0.0	268.0	276.0	66.0	0.0
Total	6,158.7	12,132.4	12,191.0	13,455.9	2,403.4

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

Southern Pine Beetle Outbreaks, 1979-2003

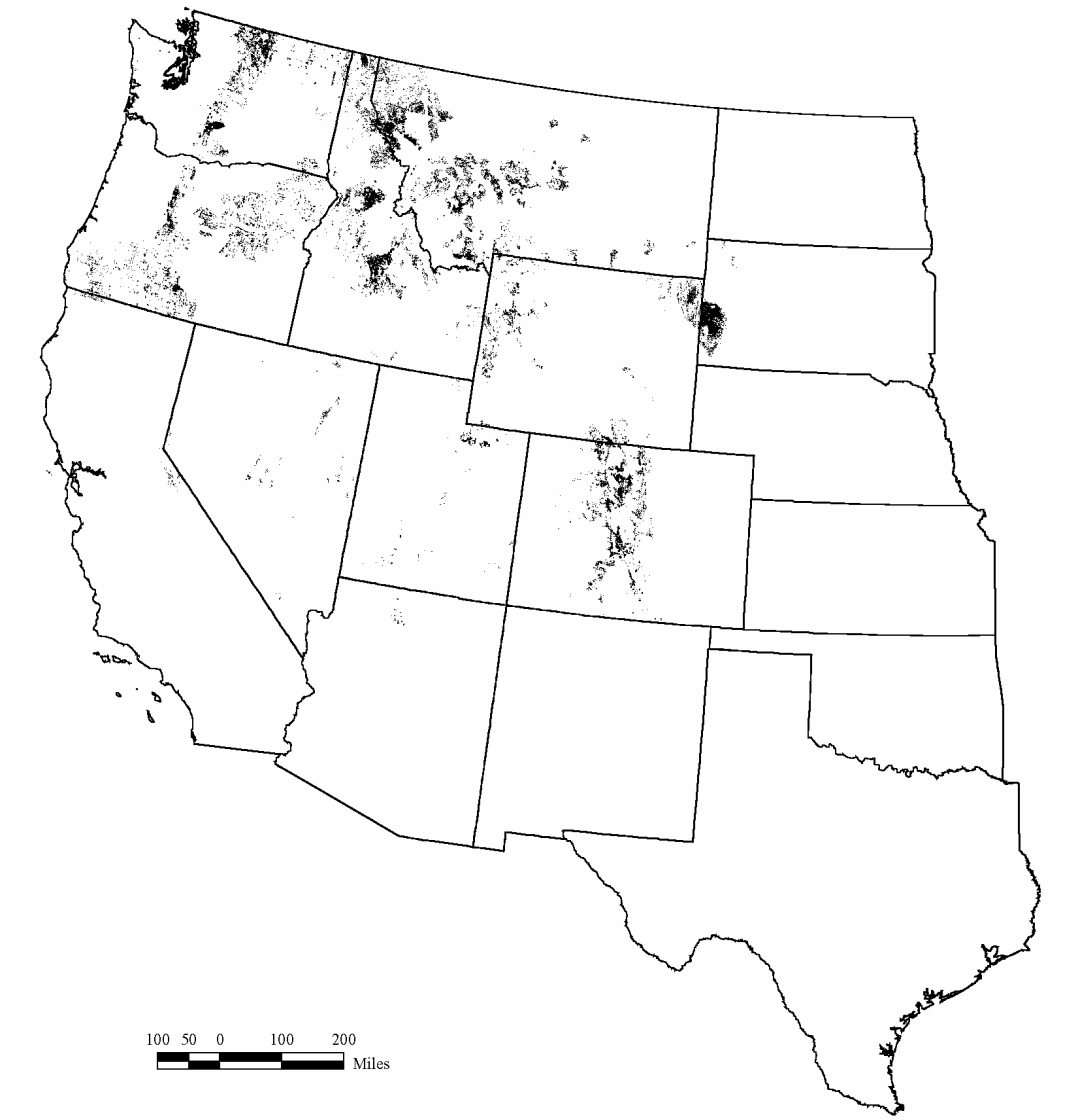


Mountain pine beetle

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

Mountain pine beetle populations increased in every State throughout the West with affected acreage increasing from 1,564,600 acres in 2002 to 2,219,100 acres in 2003. Several areas with large mountain pine beetle outbreaks and epidemics are California, Colorado, Idaho, Montana, Oregon, South Dakota, Washington, and Wyoming. Beetle population increase was particularly high in southern California where the number of infested acres increased from 186,800 acres in 2002 to 614,800 acres in 2003.

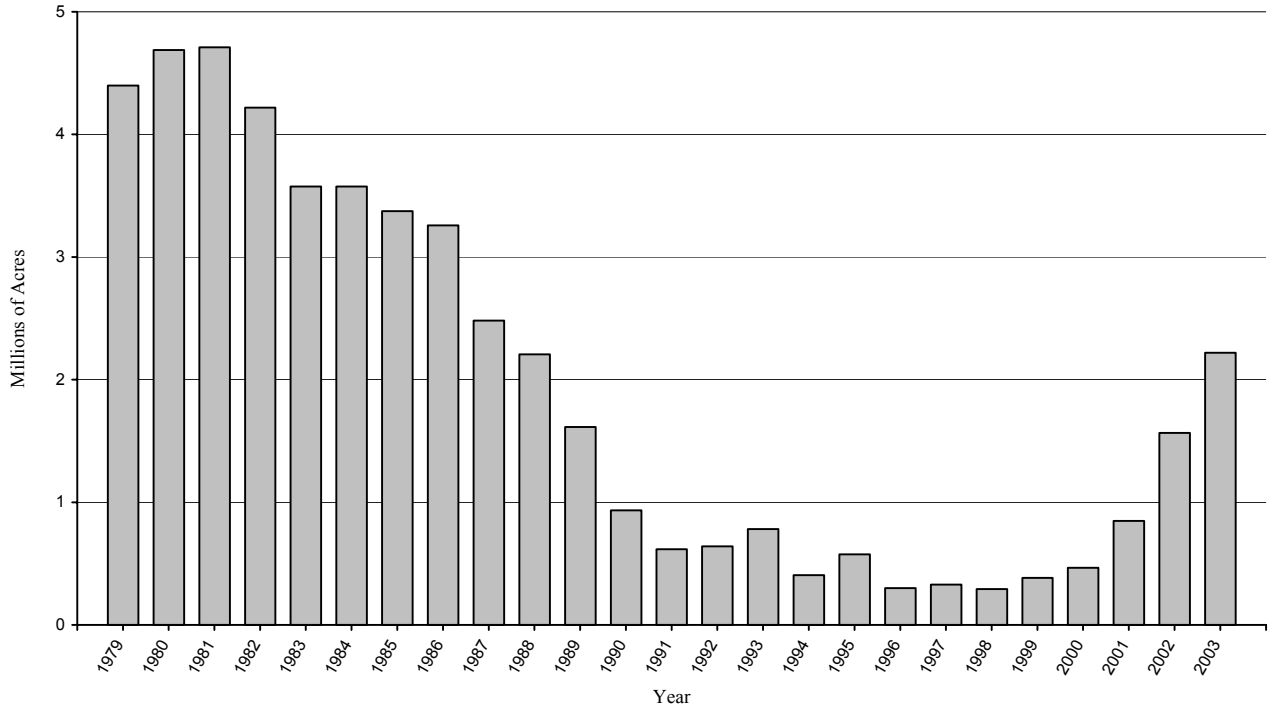
Mountain Pine Beetle Outbreak Areas, 2003



Acres (in thousands) of Mountain Pine Beetle Outbreak, 1999-2003

State	1999	2000	2001	2002	2003
Arizona	0.0	0.0	0.0	0.0	0.0
California	9.7	30.4	29.6	186.8	614.8
Colorado	71.8	139.5	151.2	209.6	227.1
Idaho	84.3	122.3	170.0	339.3	341.9
Montana	77.4	40.6	111.7	249.5	291.2
Nevada	1.4	0.8	1.2	2.6	2.4
New Mexico	0.0	0.0	0.0	3.8	0.0
Oregon	46.2	43.6	76.3	182.3	186.0
South Dakota	19.0	13.9	102.2	102.9	189.6
Utah	3.7	2.2	17.3	26.7	53.4
Washington	65.0	63.1	134.8	173.1	223.8
Wyoming	6.2	9.5	55.0	88.0	88.9
Total	384.7	465.9	849.3	1,564.6	2,219.1

Mountain Pine Beetle Outbreaks, 1979-2003



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.

Populations of spruce budworm in 2003 were low in the Eastern States. However, defoliation was noticeable in portions of Minnesota, Michigan, and on national forest land in Wisconsin. Damage by this insect decreased in Minnesota from 80,300 acres in 2002 to 34,900 acres in 2003. However, defoliation increased in Michigan, from 500 acres in 2002 to 11,800 acres in 2003, and in Wisconsin, from 400 acres in 2002 to 4,000 acres in 2003.

No noticable defoliation was found in Alaska for the fourth straight year.

Eastern Counties Where Spruce Budworm Defoliation Was Reported, 2003

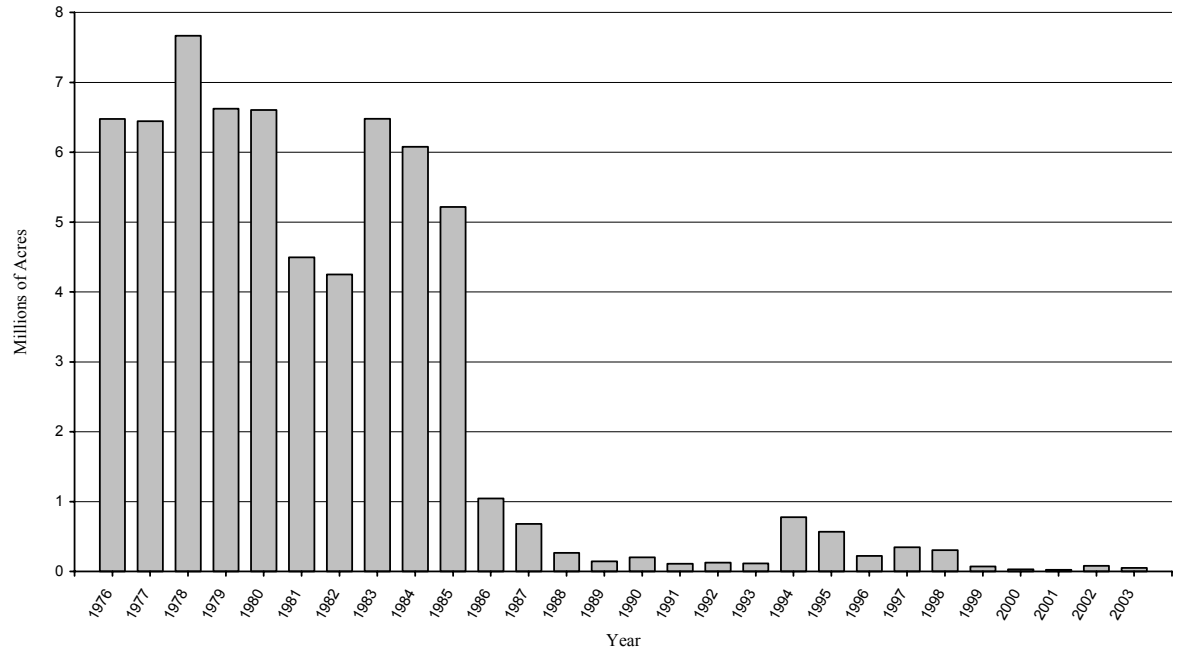
Acres (in thousands) of Aerially Detected Spruce Budworm Defoliation in the Eastern United States, 1999-2003

State	1999	2000	2001	2002	2003
Maine	0.0	0.0	0.0	0.0	0.0
Michigan	0.0	0.0	3.3	0.5	11.8
Minnesotta	70.0	28.5	18.9	80.3	34.9
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	0.0	0.0	0.8	0.4	4.0
Total	70.0	28.5	23.0	81.2	50.7

Acres (in thousands) of Aerially Detected Spruce Budworm Defoliation in Alaska, 1999-2003

State	1999	2000	2001	2002	2003
Alaska	0.7	0.0	0.0	0.0	0.0

Spruce Budworm Defoliation in the Eastern United States, 1976-2003



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.

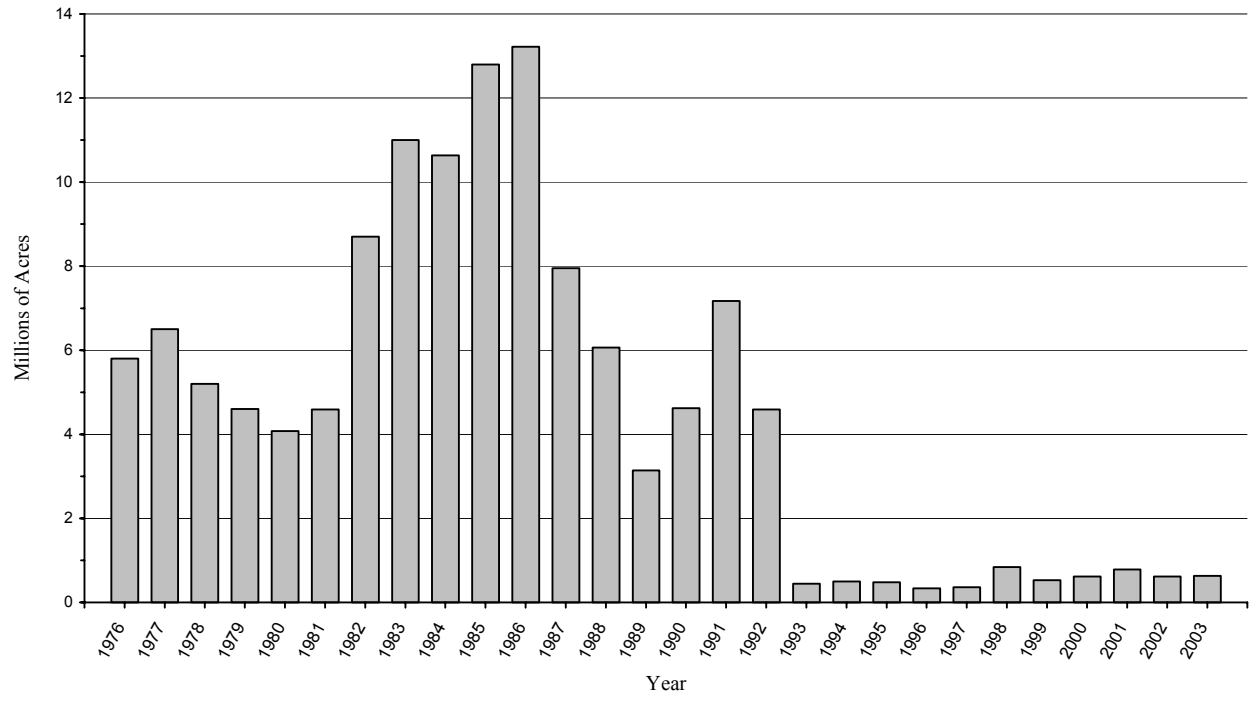
Many of the Western States had minimal impacts from low population levels of western spruce budworm. Overall, acres of defoliation increased slightly from 617,200 acres in 2002 to 630,700 acres in 2003. Colorado and Wyoming saw significant decreases in budworm defoliation. However, Washington, Idaho, and Montana reported seeing significant increases in acres with budworm defoliation. With much of the West experiencing warm and drier weather conditions, western spruce budworm populations are expected to continue to increase.

Western Spruce Budworm Defoliation Areas, 2003

Acres (in thousands) of Aerially Detected Western Spruce Budworm Defoliation, 1999-2003

State	1999	2000	2001	2002	2003
Arizona	10.2	25.8	14.1	11.3	24.0
California	0.0	0.0	0.0	0.0	0.0
Colorado	41.0	20.6	35.8	131.1	20.0
Idaho	3.6	4.4	4.2	22.6	204.1
Montana	0.0	0.4	1.2	52.4	66.0
New Mexico	282.6	165.0	445.3	198.8	143.2
Oregon	0.0	0.9	0.2	1.9	5.5
Utah	1.2	16.7	10.2	7.0	14.7
Washington	189.7	383.7	271.9	57.5	139.9
Wyoming	0.6	0.8	0.8	134.6	13.3
Total	528.9	618.3	783.7	617.2	630.7

Aerially Detected Western Spruce Budworm Defoliation, 1976-2003

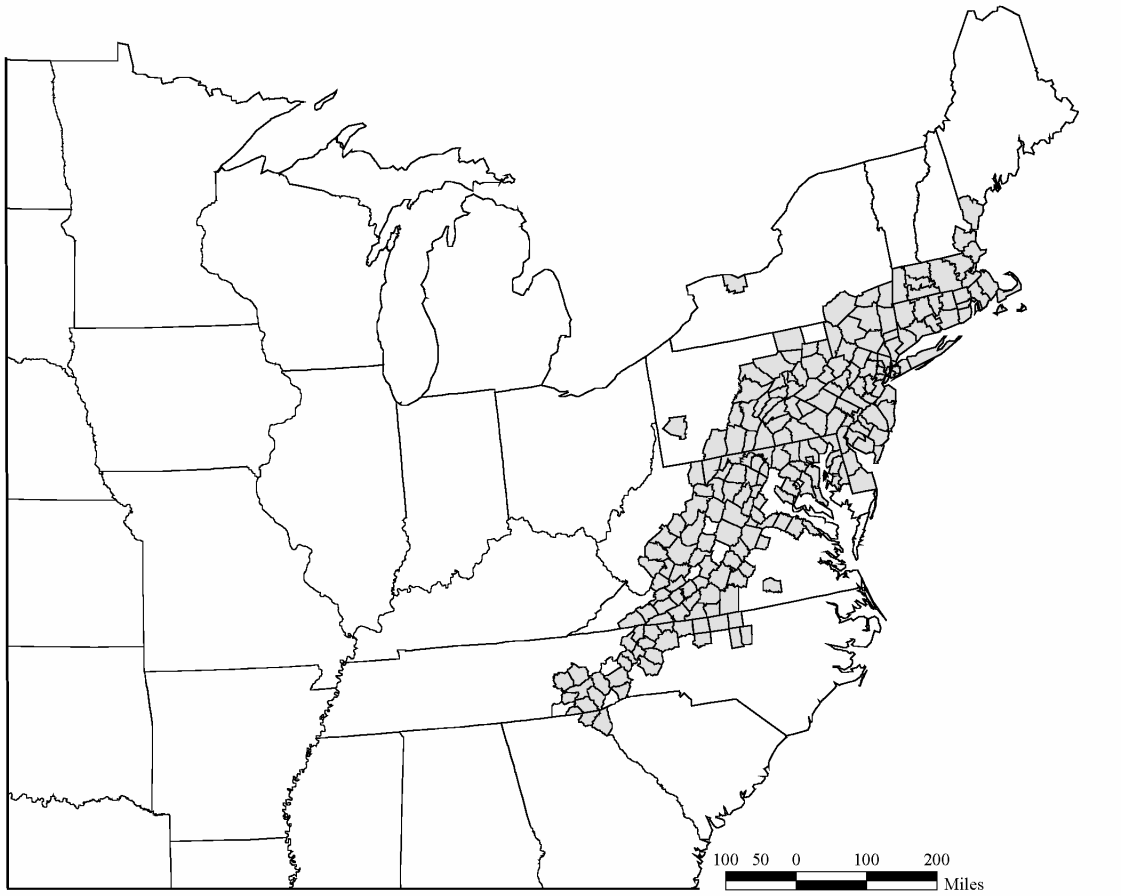


Hemlock woolly adelgid

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 and South with new townships and counties added every year to the list of those with infested hemlock. Its first observed occurance in eastern Tennessee was reported in 2003. The influence of northward-migrating songbirds helps in the spread of this insect to new sites in the Southeast. Shipments of infested hemlocks can be linked to other infestations in the Northeastern States.

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, 2003

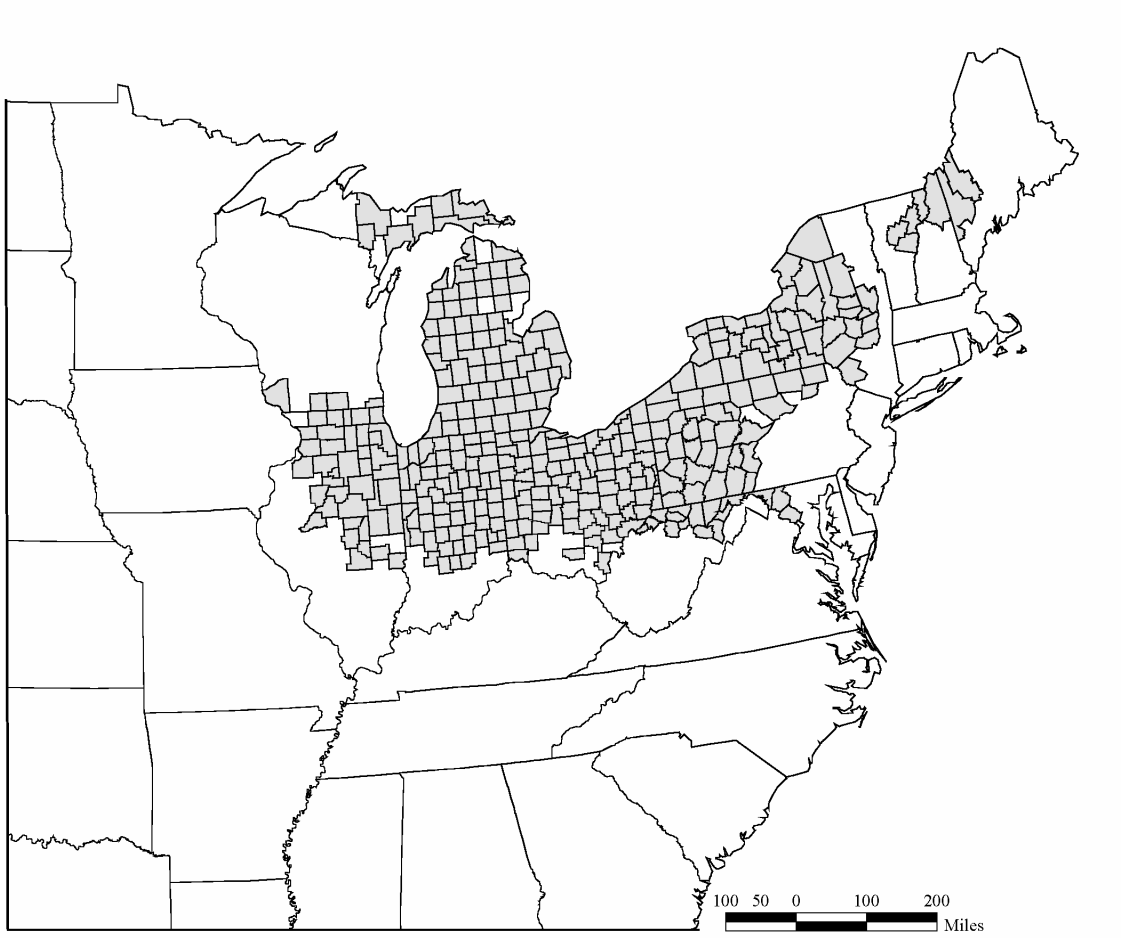


Common European pine shoot beetle

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 sites and areas experiencing severe drought.

State and Federal quarantines have been imposed to reduce the movement of this beetle, which was found in 12 States during 2003.

Eastern Counties Where The Common European Pine Shoot Beetle Was Reported, 2003



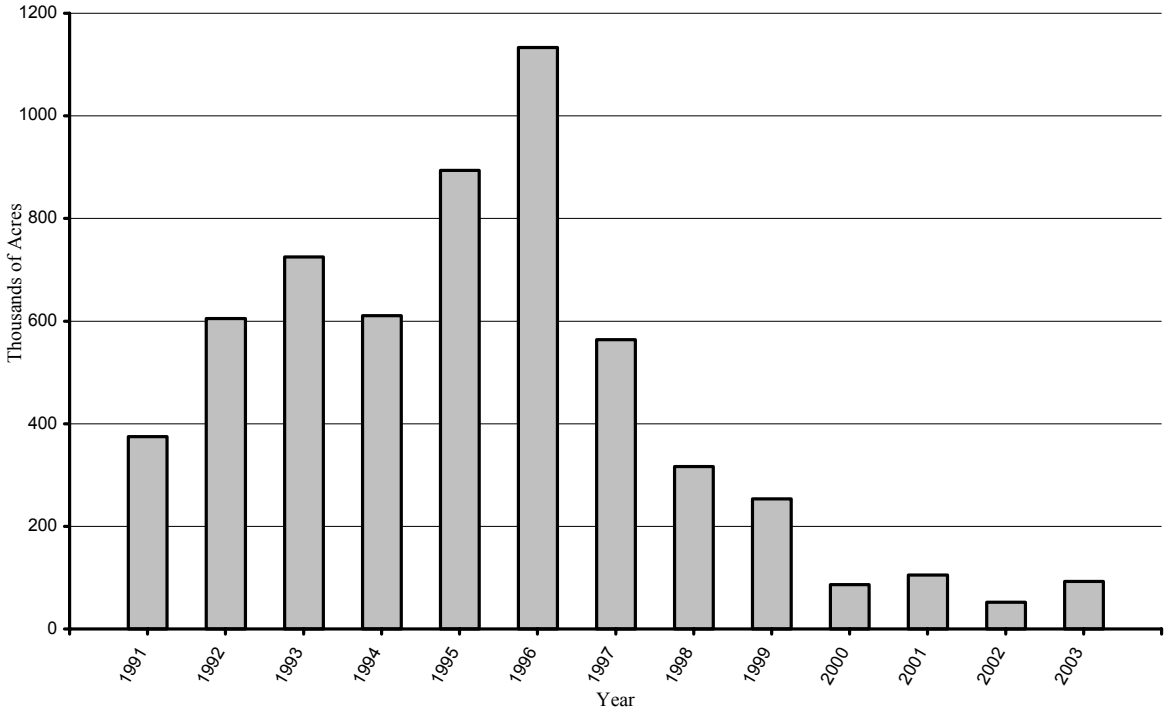
Spruce beetle

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 usually build up in windthrown trees. Besides killing merchantable trees, infestations affect habitat quality for wildlife and fish, reduce scenic quality, and increase fire hazard.

Spruce beetle activity has decreased in Alaska to normal, endemic population levels. In the 1990's, Alaska's spruce beetle epidemic saw rapid acceleration from an endemic level (approx. 150,000 acres) of active beetle caused mortality to a peak of 1.1 million acres in 1996 and then rapidly declined due to lack of suitable host material. This intensive epidemic resulted in mortality exceeding 90 percent of all trees in many drainages and the resulting fuel hazard and fire risk is requiring continued efforts to mitigate.

Outbreaks continue in a few forests in Arizona, Colorado, Montana, Utah, and Wyoming. Throughout much of the West, weather conditions in 2002 were conducive to increases in spruce beetle. Mild winters and warm dry summers have created a situation that has allowed the various populations to significantly increase.

Acres (in thousands) of Aerially Detected Spruce Beetle Active and Newly Infested Areas in Alaska, 1991-2003



Disease Conditions Highlights

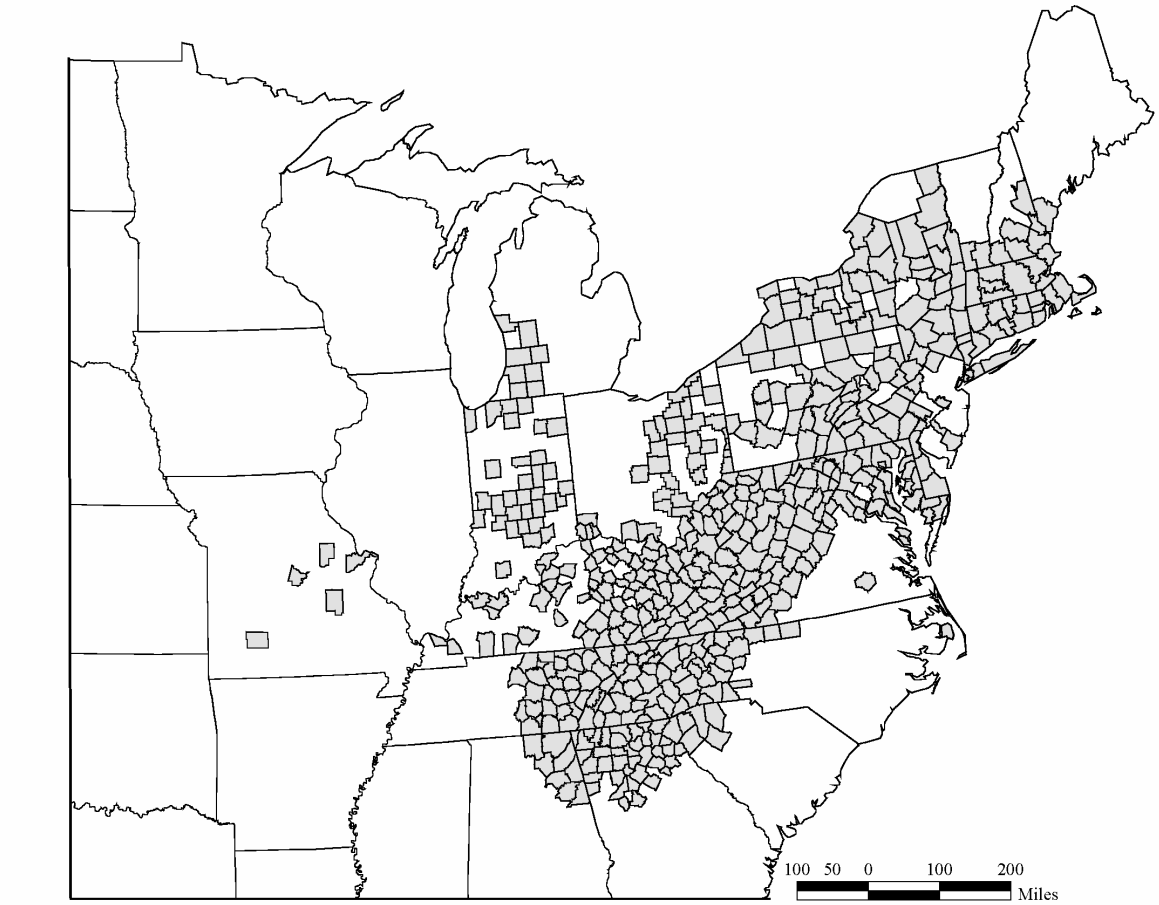
Dogwood anthracnose

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 at the disease front within the infested counties in the South, although in areas long infested, mortality has declined with the decrease in susceptible host. In the Northeast, diseased dogwoods have been found in every county in Connecticut, Delaware, Maryland, Massachusetts, Rhode Island, and West Virginia. New infestations have been reported in Kentucky.

Eastern Counties Where Dogwood Anthracnose Was Reported, 2003



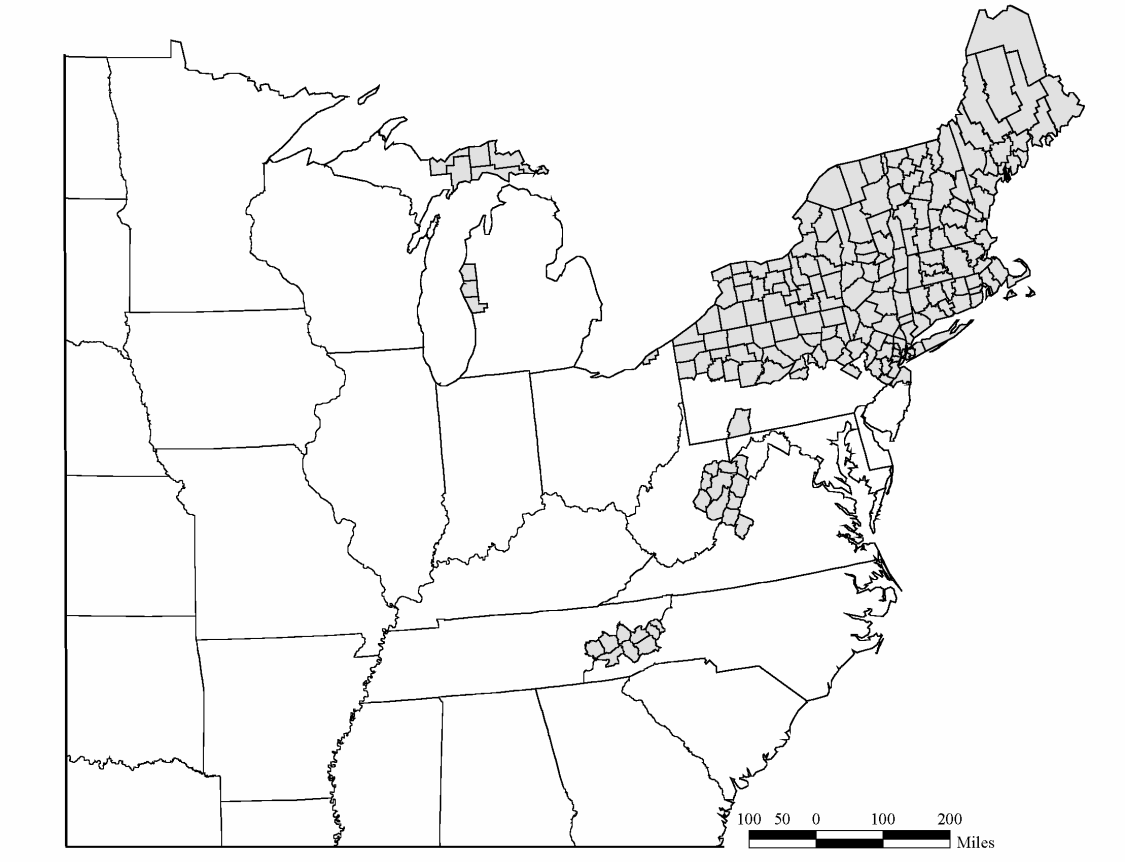
Beech bark disease

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. 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. In 1994, the disease was found 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 2003, mortality continued to intensify, and was spreading downslope toward the Cherokee and Pisgah National Forests at a rate faster than pedicted. In 2000, the scale was found in Michigan, more than 200 miles from its nearest previously known location in northeastern Ohio. Both *Nectria galligena* and *Nectria coccinea* var. *faginata* have been found in Michigan, causing disease and killing an estimated 7.5 million 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 affected areas, 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, 2003



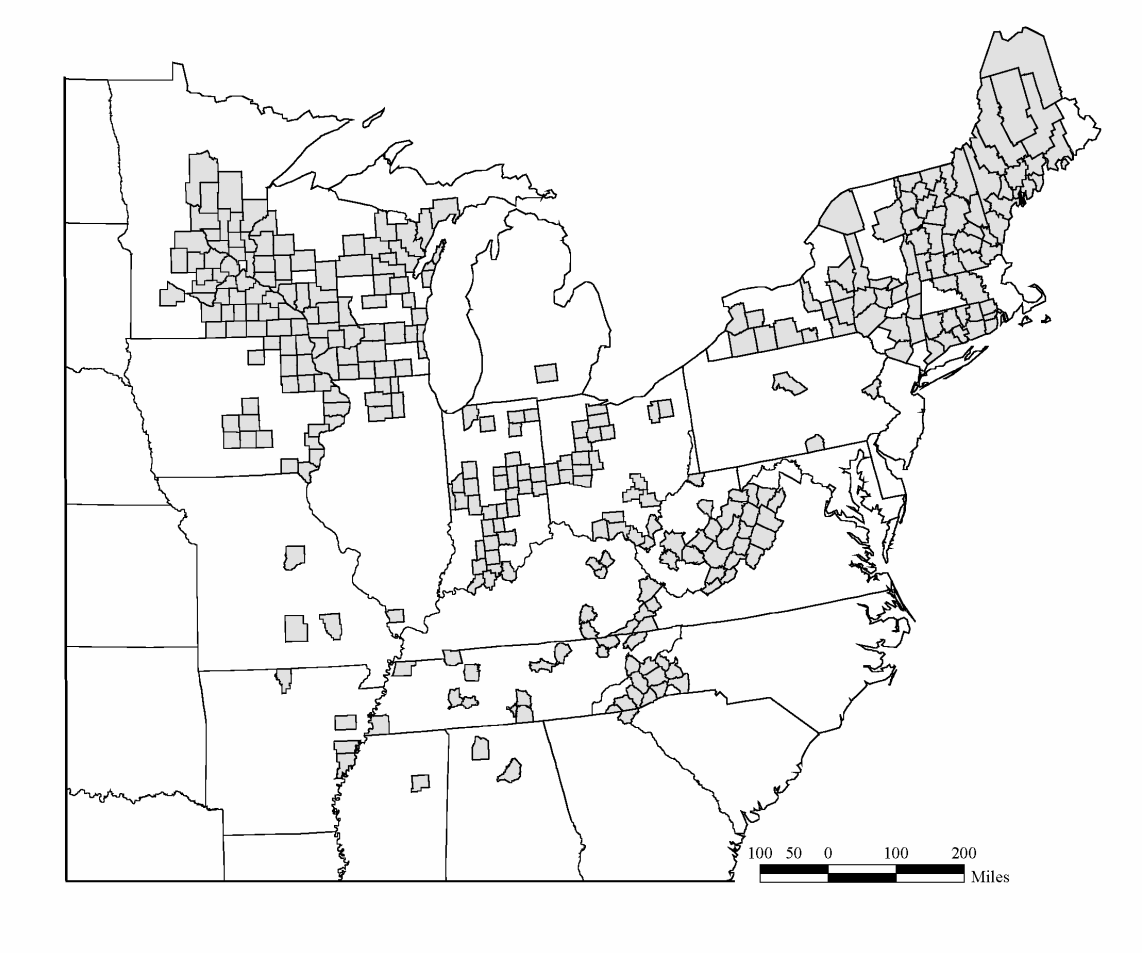
Butternut canker

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 were 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 the northeastern area most of the 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, 2003



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*

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

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 3: Conditions by Damage Agent by Region

Insects: Native

Arborvitae leaf miners,
A complex of four species

Region 9/Northeastern Area: Maine

Host(s): Northern white-cedar

In Maine, populations of these perennial pests of arborvitae were at destructive levels of varying degrees across the State. Arborvitae in northwestern Maine and eastern Washington County sustained the heaviest damage in 2003. Many infested native stands as well as ornamentals showed signs of stress and increased mortality especially on sites affected by recent drought. Woodborers, bark beetles, and shoestring root rot seem to be the opportunists that pushed trees over the brink.

Aspen leaf blotch miner,
Phyllocnistis populiella

Region 10: Alaska

Host(s): Aspen, balsam poplar, black cottonwood, birch, alder

Aspen leaf blotch miner infestations increased for the second consecutive year. A total of 351,058 acres were infested by the leaf miner in 2003. This constitutes a 15-percent increase over 2002 levels. Of particular note, is the geographic spread of these infestations. In 2002, 91 percent of the defoliated aspen was confined to the Yukon Flats National Wildlife Refuge. In 2003, this area only accounted for 65 percent of the total area affected statewide. Active infestations have expanded and intensified along the Porcupine River. The 20,000-acre infestation reported near Delta Junction in 2002 was primarily confined this year to several discreet areas in and around Delta Junction. In 2003, leaf miner activity in the upper Tanana River Valley has more than doubled in size to nearly 50,000 acres. Though the area around Delta Junction itself has experienced a decline of nearly 50 percent in acres affected, the leaf miner has broadened its range down the Alaska Highway, extending to Tanacross. A third area of significant activity is located near Fairbanks.

Bagworm moth,
Thyridopteryx ephemeraeformis

Region 9/Northeastern Area: West Virginia

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

In Connecticut, there were only a few reports, all from the mid-State area, and on various tree species. In West Virginia light populations were reported on miscellaneous conifers statewide.

Baldcypress leaf roller,
Archips goyerana

Region 8: Louisiana

Host(s): Baldcypress

In 2003, 138,500 acres of mixed baldcypress stands in southern and southeastern Louisiana were defoliated by the baldcypress leaf roller. (Ascension, Assumption, Iberia, Iberville, LaFourche, St. Charles, St. James, St. John the Baptist, St. Martin, and Terrebonne Parishes.) Approximately 57,400 acres were severely defoliated (greater than 50 percent). The primary impact of this defoliation is loss of radial growth, producing an estimated growth loss of 0.1 MBF per acre. Dieback and scattered mortality occurred in some areas. Permanently flooded areas were most severely impacted.

Balsam gall midge,
Paradiplosis tumifex

Region 9/Northeastern Area: Maine, Vermont

Host(s): Balsam fir

This pest may cause significant damage to the Christmas tree and wreath industries of Maine, but population levels were low throughout the State in 2003. The population in Vermont collapsed.

Balsam shoot boring sawfly,
Pleroneura brunneicornis

Region 9/Northeastern Area: Maine, Vermont

Host(s): Balsam fir, Fraser fir

No survey was conducted on this insect in Maine in 2003 and there were no reports of significant damage in Christmas tree plantations. Damage in native stands was spotty and generally light. Very little damage on Christmas trees was reported in Vermont.

Balsam twig aphid,
Mindarus abietinus

Region 9/Northeastern Area: Maine, Vermont

Host(s): Balsam fir

In Maine, population levels of this insect were down with trace to light damage being reported in forest stands. Populations in many Christmas tress farms were controlled due to a low tolerance for damage in competitive tree markets. Damage has not had a significant impact on the wreath brush harvest in 2003. Very little damage on Christmas trees was reported in Vermont.

Birch leaf roller,
Epinotia solandriana

Region 10: Alaska

Host(s): Paper birch, willow, alder, aspen, black cottonwood

Defoliation attributed to the birch leaf roller more than tripled this year, from 53,000 acres in 2002, to 185,020 acres in 2003. Although some new infestations were identified in 2003, much of this year's increase is attributable to expansion of preexisting activity, particularly near Mount Susitna, approximately 50 miles northwest of Anchorage. This infestation has spread to the northeast and now covers much of the forested areas between the Yentna and Susitna Rivers, from Mount Susitna to the town of Willow. Two other areas of birch leaf roller activity found during this year's survey were a 1,747-acre outbreak on the Kogrukluk River 30 miles northeast of Upnuk Lake, and a 126-acre infestation on the Yukon River approximately 50 miles downriver from Tanana.

Birch skeletonizer,
Bucculatrix canadensisella

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

Host(s): Birch

Heavy defoliation of birches resulted from feeding by the birch skeletonizer over most of northern and eastern Maine. A gross estimate of the scope of the damage is 750,000 acres of birch type affected in Franklin, Somerset, Piscataquis, Aroostook, Penobscot, Hancock, and Washington Counties. Feeding damage occurred in late August into September and was not expected to cause significant long-term damage to infested trees. Moderate defoliation occurred in Coos County, New Hampshire. Heavy damage in northern and central Vermont was observed on over 17,000 acres.

Black turpentine beetle,
Dendroctonus terebrans

Region 8: Regionwide

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

Much like pine engraver beetles, the black turpentine beetle (BTB) prefers to attack stressed, weakened trees. Stands stressed by multiple factors such as drought and logging injury, compacted soil, or wildfires are especially vulnerable. BTBs are active in the lower 6 to 8 feet of the tree's bole. Although generally present at low population levels, when BTB numbers increase significantly, they are capable of attaining primary pest status, attacking trees with no overt damage or other evidence of susceptibility. Levels of activity were mostly declining or low in 2003, with observed attacks generally involving individual stressed or damaged trees, or those that were also being attacked by *Ips* beetles or southern pine beetle. Florida reported BTB infestations at levels of 10-25 percent in five slash pine plantations 3 to 12 months after these stands had been properly thinned. BTB was also reported sporadically throughout northern parts of the State in association with stressed or injured pines. Georgia reported some increases in BTB activity, associated both with commercial thinnings and with annosum root disease. The Georgia Forestry Commission also reported that the type of equipment used in mechanical thinnings appeared to influence susceptibility of the residual stand to BTB, probably because shears tend to pinch off resin flow, while saw-type cutting heads produce free-flowing resin that attracts the beetles. In South Carolina, BTB activity increased in areas where pine roots suffered from oxygen depletion following excess spring rain. Sites most affected were on loamy soils with subsoil hardpans (old agricultural sites). Losses in some stands exceeded

25 percent. Virginia reported continuing high incidence of BTB activity, especially in the southeastern mountains, apparently due to residual tree stress from the recent protracted drought and a high carry-over population of BTB.

Bruce spanworm,
Operophtera bruceata

Region 9/Northeastern Area: New Hampshire, Vermont

Host(s): Sugar maple, beech

This defoliator was a common occurrence in central and northern New Hampshire. Moderate to heavy defoliation occurred statewide in Vermont. Some stands refoliated and moths were common in the fall.

Buck moth,
Hemileuca maia

Region 8: Louisiana

Host(s): Live oak, other hardwoods

Buck moth defoliation of live oak has been a problem in New Orleans for many years. The moth continues to be locally abundant in the city and of particular concern in the Federal Historic Districts. The insect population in Louisiana was found to be decreasing in 2002, and this trend continued in 2003. On the Cumberland Plateau and central sections of Tennessee, however, reports of buck moth defoliation increased. Virginia reported scattered light-to-moderate buck moth defoliation in 2003.

California budworm,
Choristoneura carnana californica

Region 5: California

Host(s): Douglas-fir

Defoliation was difficult to find on the east side of Trinity Lake, an area where budworm populations have been highly variable over the past 20 years.

California flatheaded borer,
Melanophla californica

Region 5: California

Host(s): Jeffrey pine, ponderosa pine

In southern California, California flatheaded borers were especially common in Jeffrey pines that were not attacked and killed by the Jeffrey pine beetle. Areas of extensive mortality were found in the San Gabriel, San Jacinto, and Santa Rosa Mountains; and on Laguna Mountain. The borer also killed Jeffrey pines in Potrero Park, Los Padres National Forest. Dwarf mistletoe and annosus root disease are frequently associated with the mortality.

California oakworm,
Phryganidia californica

Region 5: California

Host(s): Blue oak, coast live oak, tanoak

Individual coast live oak sustained defoliation in several areas of Monterey and Santa Cruz Counties. Defoliation was also observed in parts of San Luis Obispo County – Nipomo, Los Osos, Cambria (combined estimate of 500 coast live oaks) and around Lake Naciemento (about 500 coast live and blue oaks). Tanoak defoliation in Mendocino County was observed in several dozen trees in the Smithe Grove near Piercy and on about 6 acres near Comptche.

Cedar bark beetles,
***Phleosinus* spp.**

Region 5: California

Host(s): Incense-cedar

Cedar bark beetles were found in small diameter (less than 4 inches) incense-cedars in early summer and caused branch dieback and tree mortality. Most observations were in the Moonlight Valley and Hamilton Mountain areas of the Eagle Lake Ranger District, Lassen National Forest. Cedar bark beetles were also observed in green slash in the Headquarters area of Lassen Volcanic National Park.

Common oak moth,
Phoberia atomaris

Region 9/Northeastern Area: Ohio, West Virginia

Host(s): White oak

In southern Ohio, approximately 8,200 acres were defoliated by this insect and small phigalia (*Phigalia strigatavia*) in Gallia, Hocking, Jackson, Lawrence, Pike, Ross, and Vinton Counties. In West Virginia approximately 3,493 acres of defoliation were reported in Ritchie, Wirt, and Wood Counties. Defoliation was also observed in Wayne, Gilmer, Calhoun, Braxton, Kanawha, Jackson, Lincoln, and Roane Counties. This was the first time that common oak moth was recorded as a primary damaging agent in West Virginia. Other defoliators occurring with the common oak moth were linden looper, small phigalia, half-winged geometer, fall cankerworm, and spring cankerworm.

Cypress weevil,
Eudociminus mannerheimii

Region 8: Florida

Host(s): Baldcypress

About 30 potted baldcypress, approximately 1 inch in diameter, were infested by larvae of the cypress weevil in a commercial ornamental nursery, with damage initially detected in September and October. This small, isolated infestation is notable due to the lack of published information regarding this insect and its

apparent rarity as a commercial nursery or forest pest. Larvae tunneled in both phloem and xylem tissues before boring through the center or the sapling main stems.

Douglas-fir beetle,
Dendroctonus pseudotsugae

Region 1: Idaho, Montana

Host(s): Douglas-fir

Douglas-fir beetle (DFB) populations continued a gradual decline in northern Idaho and parts of northwestern Montana; but populations are still high in many areas and are increasing in central and southwestern Montana — especially on national forests that had significant acreages affected by fires in 2000. Fire-affected Douglas-fir stands on the Bitterroot and Helena National Forests were heavily infested, where ground surveys in 2003 showed higher numbers of new attacks than in 2002. In other areas, beetle populations remained high because environmental conditions — warmer- and drier-than-normal — were so favorable. Despite more moisture in some parts of the region, much of Montana continued an unprecedented long period of near-drought conditions. Throughout the region, more than 200,500 acres were infested by DFB in 2001; reduced in 2002, to just under 97,000 acres. In 2003, nearly 88,800 acres were infested to some extent, but those were recorded on only 82 percent of the area normally flown. Widespread wildfires in the region resulted in nearly 20 percent of the forested area being not surveyed. Most decreases in infested area have occurred in northern Idaho; down to slightly more than 12,200 acres in 2003. Throughout northern Idaho forests, few areas were found with current beetle activity. In western Montana, the infested area had declined to just over 60,200 acres in 2002; but increased to more than 76,500 acres in 2003. The Bitterroot National Forest had some of the more active beetle populations in the region, with the infested area increasing from 12,000 acres in 2002 to more than 34,500 acres in 2003. Forests in northwestern Montana still have beetle-infested areas; but the most active outbreaks are in the central and southwestern portion of the State. In summary, many mature Douglas-fir forests in northern Idaho and western Montana still harbored some level of DFB-caused mortality, but populations are generally declining. Regionwide, more than 130,100 beetle-killed Douglas-fir were recorded the 2003.

Region 2: Colorado, Wyoming

Host(s): Douglas-fir

DFB continues to kill mature trees in areas scattered throughout southern Colorado. An area north of Durango has several hundred trees killed by the beetle. In many cases, DFB activity is occurring in areas of chronic defoliation by western spruce budworm.

DFB was detected in fire-killed trees in the Haymen burn area of Colorado but has not yet been found in adjacent unburned Douglas-fir trees. Conditions are favorable for DFB in this area. DFB continues to cause some mortality in Douglas County in older burned and defoliated areas.

Concurrent epidemics of DFB, mountain pine beetles, and spruce beetle in the same area are extremely rare. This is the situation in the northwestern portions of the Shoshone National Forest and adjacent lands. Each beetle epidemic was in a different phase during 2003.

The western and eastern fronts of the Bighorn Mountains are experiencing outbreaks of DFB. On the western side, populations have increased in both the Shell and Tensleep Canyon areas. Without some sort of management actions, such as sanitation and salvage harvesting, it is likely that up to 70 percent of the Douglas-fir trees along the canyon will be killed.

Approximately 70,900 acres were detected in aerial surveys with tree mortality caused by DFB in Colorado. In Wyoming areas east of the continental divide, 17,600 acres indicated DFB activity.

Insects: Native

Region 3: Arizona, New Mexico

Host(s): Douglas-fir

DFB-caused tree mortality in the Southwest increased dramatically from 2,500 acres in 2002 to 28,740 acres in 2003. In Arizona, DFB mortality was recorded on the Apache-Sitgreaves (1,445 acres), Coconino (5,515 acres), Coronado (50 acres), Kaibab (1,280 acres) and Tonto (1,280 acres) National Forests; Grand Canyon National Park (70 acres); Fort Apache (135 acres) and Navajo (375 acres) Indian Reservations; and State and private lands (215 acres). In New Mexico, DFB-caused tree mortality occurred on the Carson (6,235 acres), Cibola (705 acres), Gila (2,610 acres), Lincoln (665 acres), and Santa Fe (4,330 acres) National Forests; Jicarilla Apache (195 acres), Mescalero Apache (510 acres), Taos Pueblo (365 acres,) Jemez Pueblo (20 acres), Santa Clara Pueblo 340 acres), and Zia Pueblo (30 acres) tribal lands; the Valles Caldera National Preserve (170 acres); and State and private lands (2,415 acres).

Region 4: Idaho, Utah, Wyoming

Host(s): Douglas-fir

DFB caused tree mortality increased dramatically across the region, from 29,700 acres in 2002 to approximately 88,700 acres in 2003. Approximately 46,800 acres were reported in southern Idaho, 20,100 acres in Utah, and 21,800 acres in western Wyoming. The largest concentrations of mortality were located on the Bridger-Teton (over 58,700 trees on nearly 17,200 acres), Caribou-Targhee (over 59,000 trees on over 21,000 acres), Salmon-Challis (over 40,600 trees on nearly 16,000 acres), and Payette (nearly 11,700 trees on nearly 6,000 acres) National Forests although nearly all national forests had some level of tree mortality. Most of the affected Douglas-fir is seriously stressed by continuing drought conditions and/or defoliation by western spruce budworm. Continued mortality is probable.

Region 6: Oregon, Washington

Host(s): Douglas-fir

We saw a lower overall decrease in mortality, from 142,035 acres, 1.49 trees per acre in 2002 to 97,598 acres, 1.68 trees per acre in 2003. Most notable decrease was mapped on the Wallowa-Whitman reporting area, from 29,419 acres, 1.57 trees per acre in 2002 to 5,601 acres, 1.15 trees per acre in 2003. Some of this may be attributable to observer ground checks leading to confirmation and mapping of fir engraver, as signatures are similar.

Areas that saw increases in tree mortality include the Colville reporting area, from 23,204 acres, 2.67 trees per acre in 2002 to 32,309 acres, 2.21 trees per acre, the Colville Indian Reservation, from 6,540 acres, 1.55 trees per acre in 2002 to 5,672 acres, 2.00 trees per acre in 2003, the Gifford-Pinchot reporting area, from 3,626 acres, .99 trees per acre in 2002 to 7,069 acres, 1.23 trees per acre in 2003, the Mount Baker-Snoqualmie reporting area, from 1,926 acres, 1.17 trees per acre in 2002 to 2,714 acres, 1.60 trees per acre in 2003, and finally the Okanogan, from 5,621 acres, 2.89 trees per acre in 2002 to 8,417 acres, 2.72 trees per acre in 2003.

Douglas-fir engraver beetle, *Scolytus unispinosus*

Region 5: California

Host(s): Douglas-fir

This engraver commonly attacked and killed pole-size Douglas-firs or top-killed larger trees in Lake County and inland areas of Mendocino and Humboldt Counties. Attacks were mostly associated with trees having branch and stein cankers from *Dermea pseudosugae* and/or *Phomopsis lokoyae*.

Douglas-fir pole beetle,
Psuedohylesinus nebulosus

Region 2: Colorado

Host(s): Douglas-fir

Pseudohylesinus nebulosus is rarely considered a major pest species, but this insect has killed many hundreds of mature Douglas-fir in the eastern portion of the San Juan National Forest. Undoubtedly drought conditions have allowed this beetle to take advantage of large numbers of susceptible hosts. As the common name indicates, this insect most frequently attacks smaller diameter Douglas-fir, but trees up to 12 inches in diameter are being killed near Pagosa Springs.

This beetle was also detected at high levels during ground surveys of Wet Mountain north of Durango, in the southern San Juan Mountains.

Douglas-fir tussock moth,
Orgyia pseudotsugata

Region 1: Idaho, Montana

Host(s): Douglas-fir, true firs

Defoliation from Douglas-fir tussock moth (DFTM) in northern Idaho dropped from 5,400 acres in 2002 to zero in 2003. This followed an outbreak of tussock moth in Idaho that peaked in 2000. Pheromone trap catches decreased from an average of 71 moths per traps in 2001 to 0.2 moths per trap in 2003. In Montana, defoliation from tussock moth on the Flathead Indian Reservation increased from 52 acres in 2002 to 216 acres in 2003.

Region 3: Arizona, New Mexico

Host(s): Douglas-fir, true firs

No DFTM defoliation was detected in Arizona or New Mexico in 2003.

Region 4: Idaho, Nevada, Utah

Host(s): Douglas-fir, true firs

Total acreage defoliated by DFTM in 2003 increased nearly ten-fold. Over 12,000 acres were defoliated compared to approximately 2,100 acres in 2002. In Idaho, tussock moth defoliation continued on approximately 3,100 acres of Sawtooth National Forest and Bureau of Land Management (BLM) lands near the Nevada/Utah border. The majority of the defoliation (7,800-acres) occurred on the Humboldt-Toiyabe National Forest in Elko County, Nevada.

Region 5: California

Host(s): White fir

Average trap catches for 2003 increased in many plots compared to 2002 catches. Data collected for 163 plots (5 traps per plot) during 2003 revealed 106 (65 percent) plots with an average of less than 25 male moths per trap and 57 plots (35 percent) that averaged 25 or more males per trap. In 2002, only 4 percent of the lots averaged greater than 25 males per trap. Plots that averaged greater than 25 males per trap for 2003 were located on the following ranger districts and national forests: Amador, Placerville and Pacific Ranger Districts (Eldorado National Forest); Hat Creek Ranger District (Lassen National Forest);

Bechwourth and Mt Hough Ranger Districts (Plumas National Forest); Greenhorn and Tule River Ranger Districts (Sequoia National Forest); Bass Lake Ranger District (Sierra National Forest); Calaveras, Miwok and Summit Ranger Districts (Stanislaus National Forest); and Downievile, Foresthill, and Nevada City Ranger Districts (Tahoe National Forest). There were three plots on other ownerships that exceeded 25 moths per trap: Yosemite National Park, on BLM land near Widow Mountain, west of Bieber (Lassen County), and near Hilton in Modoc County. Based on the results of 2003 monitoring, there may be increased activity by the DFTM during 2004 in the Sierra Nevada Range.

Region 6: Oregon, Washington

Host(s): Douglas-fir, true firs

Only 743 acres of defoliation were recorded for DFTM in 2003, a continuing decrease from the 16,655 acres reported in 2002. The DFTM early warning system confirms that populations have returned to endemic levels. Average number of moths trapped for the region remains similar to 2002 at about 1.0 moth per trap. However, trap catches on the Fremont and Winema National Forests and adjacent areas continue to oscillate, increasing to an average of approximately 10.0 moths per trap. These numbers are comparable to the higher trap catches recorded for those forests since the DFTM early warning system was established.

Eastern larch beetle,
Dendroctonus simplex

Region 9/Northeastern Area: Maine, Michigan, Vermont

Host(s): Eastern larch

Pockets of dead and dying larch infested with eastern larch beetle are a common sight throughout the range of larch in Maine but especially in the south and central portions of the State. Because of the variable number of stressors involved in such situations and the small size of the pockets it was difficult to assign an acreage figure to the damage. Poor vigor in many native larch stands will most likely make them increasingly vulnerable to future damage. Populations in eastern and the south central Upper Peninsula of Michigan declined in 2003. This bark beetle became epidemic in tamarack (*Larix laricina*) stressed trees from the drought of 2000-2001 and repeated defoliation by the larch casebearer (*Coleophora laricella*). In Vermont, mortality was noted statewide, especially in the northeastern portion of the State.

Eastern tent caterpillar,
Malacosoma americanum

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

Host(s): Black cherry, crabapple

Reports were very common in Maine and most field personnel felt populations of this pest were very high. Minimal damage was observed in Massachusetts in Essex, Middlesex, and Berkshire Counties. About 30,000 acres of mixed hardwood species were moderately to severely defoliated by a complex of eastern tent caterpillar, forest tent caterpillar, and maple anthracnose in Saint Lawrence County in New York and significant defoliation and tree mortality should be expected in some areas in 2004. Scattered light defoliation occurred statewide in Vermont. In Pennsylvania, black cherry in Tioga County was observed to have damaged foliage as did shoots of maple, beech, and birch. In West Virginia, light to moderate defoliation on black cherry was observed over most of the State. Nucleopolyhedrosis virus was reported primarily in the eastern panhandle counties.

Fall cankerworm,
Alsophila pometaria

Region 8: Kentucky, Tennessee, Virginia

Host(s): Various oaks species

Eastern, southeastern, and central Kentucky experienced an explosion in cankerworm populations, resulting in significant oak defoliation. It is unclear whether this defoliation is a significant contributor to the increased incidence of oak decline and mortality observed in these areas. High cankerworm populations are expected to persist in 2004.

There was an increase in scattered defoliation by fall cankerworms in several counties in northeastern Tennessee, usually found in combination with other inchworm and cutworm defoliators. In Virginia, cankerworm populations were moderate statewide, with several areas of heavy defoliation. Heavily defoliated areas were estimated to total 8,397 acres.

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

Host(s): Maples, oaks, other hardwoods

In Maryland, aerial surveys detected defoliation on approximately 1,953 acres in Carroll, Frederick, Howard, Montgomery, Washington, and Allegany Counties. In Pennsylvania, aerial surveys revealed defoliation on 889 acres in Allegany, Berks, and Dauphin Counties. In West Virginia, spring larval surveys reported light populations of fall cankerworm in Terra Alta in Preston County. No defoliation was observed in Massachusetts this year.

Fall webworm,
Hyphantria cunea

Region 5: California

Host(s): Pacific madrone, Oregon ash

Fall webworm defoliation of madrones in the Klamath and Trinity River drainages was not noticeable in 2003. Most madrones have responded to the abundant precipitation from the previous winter and appear very healthy. Conversely, defoliation of madrones by fall webworm was reported to have increased at various locations on the Foresthill Divide, Placer County; and the Georgetown Divide, Eldorado County.

Region 9/Northeastern Area: New York, Vermont, West Virginia

Host(s): Maple, beech, birch, walnut, apple, ash, black cherry, cherry, elm, other hardwoods miscellaneous hardwoods

A few roadside nests were observed in New York but reports of defoliation by this insect decreased sharply compared to the previous 2 years. In West Virginia, light to moderate defoliation was seen over most of the State. Scattered light defoliation occurred in Vermont.

Fir engraver beetle,
Scolytus ventralis
Dryocoetes confusus

Region 1: Idaho, Montana

Host(s): Grand fir

Fir engraver beetle (FEB)-caused mortality in grand fir stands remained significant in northern Idaho and western Montana in 2003. We believe the continued increase in the number of acres with FEB-caused tree mortality is related to the on-going droughty conditions found in much of the region. Total infested area exceeded 164,000 acres—up from slightly less than 119,000 acres in 2002. On those infested acres, nearly 130,000 trees were killed in 2002 (recorded as faders in 2003). Most of the current mortality occurred in north Idaho, on lands of all ownerships, but concentrated in areas on and adjacent to the Clearwater, Nez Perce, and Idaho Panhandle National Forests. In western Montana, most stands with a significant grand fir component showed high amounts of FEB-caused mortality. Especially noticeable were stands on and adjacent to the Flathead National Forest. Moisture deficits continued throughout the region in 2003. FEB populations will likely remain high until moisture conditions return to normal. Northern Idaho also has a high amount of root disease in many grand fir stands that increases susceptibility to FEB attack.

Region 2: Colorado

Host(s): True firs

FEB caused extensive mortality of white fir along the north slopes of the drainages through the lower elevation forests between Denver and Colorado Springs.

Region 3: Arizona, New Mexico

Host(s): White fir, subalpine fir

FEB-caused tree mortality in the region decreased slightly from 13,725 acres in 2002 to 11,645 acres in 2003. In Arizona, fir mortality was recorded on the Apache-Sitgreaves (5,455 acres), Coconino (2,630 acres), Coronado (750 acres), Kaibab (365 acres), Prescott (70 acres) and Tonto (15 acres) National Forests; Grand Canyon National Park (1,140 acres); Fort Apache (335 acres) and San Carlos (110 acres) Indian Reservations; and 70 acres of State and private lands. In New Mexico, FEB-caused tree mortality in 2003 was detected on the Carson (85 acres), Cibola (490 acres), Gila (20 acres), and Santa Fe (45 acres) National Forests and on 135 acres of Jicarilla Apache Tribal lands.

Region 4: California, Idaho, Nevada, Utah

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

FEB-caused tree mortality is increasing regionwide due to continued drought conditions. Aerial survey recorded approximately 60,620 trees over 26,040 acres in 2003, up from 14,600 trees on approximately 5,200 acres in 2002. However, the 2002 numbers were an underestimation of tree mortality due to restricted surveys as a result of the extreme fire season.

The areas most affected by this insect include the Humboldt-Toiyabe National Forest (over 13,300 trees on nearly 7,000 acres) in Nevada, the Uinta (nearly 7,300 trees on 4,200 acres) and the Manti-La Sal (over 3,600 trees on over 2,100 acres) National Forests in Utah, and the Payette National Forest (nearly 5,000 trees on over 3,100 acres) in Idaho. On BLM lands, approximately 4,200 trees were killed on 1,300 acres in Nevada. Additional tree mortality caused by this insect was also observed on State and private land: about 4,700 trees on 3,100 acres in southern Idaho and approximately 7,900 trees on 2,800 acres in Utah.

Region 5: California

Host(s): White fir, red fir

Populations of the FEB were high in southern California. Attacked true firs usually were infected with true mistletoe, annosus root disease and other insects such as the roundheaded fir borer and often occurred on severe sites. Nevertheless, white fir survived well in many areas, including the mixed conifer forests near Lake Arrowhead, an area of extremely high pine mortality. However, mortality was high in white fir in overstocked stands on Palomar and Hot Springs Mountains in San Diego County.

Region 6: Oregon, Washington

Host(s): True firs

Both Oregon and Washington had over a threefold increase in acres affected and total trees killed by FEB in 2003. FEB-caused mortality increased from 161,229 acres, (0.91 trees per acre) in 2002 to 606,143 acres (1.35 trees per acre) in 2003. Tree mortality increased in almost all reporting areas except Glenwood and Siuslaw.

Areas with significant levels of mortality in 2003 include: Colville reporting area, 120,254 acres (1.84 trees per acre); Umatilla reporting area, 86,955 acres (1.40 trees per acre); Wallowa-Whitman reporting area, 88,043 acres (1.06 trees per acre); Wenatchee reporting area, 45,434 acres (2.11 trees per acre); and Malheur reporting area, 49,617 acres (0.63 trees per acre).

Flatheaded fir borer, *Melanophila drummondi*

Region 5: California

Host(s): Douglas-fir, western hemlock

The flatheaded fir borer and the Douglas-fir engraver caused mortality and top-killing of numerous Douglas-firs in the Trinity and Klamath River drainages. Mortality was most apparent from Big Flat to Willow Creek on the Trinity River and from Horse Creek to Weitchpec on the Klamath River. Most of the mortality was on shallow soils or talus slopes.

Flatheaded wood borer, *Aggrillus* spp.

Region 2: Colorado

Host(s): Oak

Reports indicate an aggressive *Agrillus* spp. is killing drought-stressed ornamental oaks in Front Range communities south of Denver. The insect may be a native species associated with drought stressed Gambel oaks or it may be two-lined chestnut borer, a species native to eastern oaks possibly introduced on nursery stock. Positive identification cannot be made until adults emerge in the spring.

Forest tent caterpillar,
Malacosoma disstria

Region 1: North Dakota

Host(s): Basswood, aspen, hardwoods

Defoliation of mostly aspen in the Turtle Mountains of north-central North Dakota increased from 3,045 acres in 2001 and 4,345 acres in 2002 to 17,719 acres in 2003. This current infestation is the most notable forest tent caterpillar (FTC) activity in the area since much of the Turtle Mountains (195,000 acres) was defoliated in 1977.

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

Host(s): Aspen, Cottonwood

In 2003, FTC defoliation was observed throughout the region affecting approximately 12,400 acres. Defoliation occurred primarily on aspen. The Humboldt-Toiyabe National Forest in Nevada experienced nearly 8,000 acres of defoliation.

Region 8: Louisiana, South Carolina, Texas

Host(s): Tupelo gum, upland hardwoods

Defoliation of tupelo gum occurred on 96,300 acres of forested wetlands (baldcypress/water tupelo forest type) in Ascension, Livingston, St. James, and St. John Parishes in southeasern Louisiana in 2003. This defoliation was severe (greater than 50 percent) on 57,900 acres, a decline from the previous year. South Carolina reported 589,120 acres of defoliation in 11 counties in 2003, a major increase over 2002. The primary river basins affected were the Congaree, Great Pee Dee, Little Pee Dee, Santee, and Wateree, although many swamps outside of the major river bottoms also experienced defoliation. Pure stands of gum were the most seriously damaged, with 100 percent defoliation in many areas; oaks and other hardwoods on the affected acreage suffered more than 50 percent defoliation. In Texas, an unusual outbreak in the lower Trinity, Neches, and Sabine River bottoms that was reported in 2002 abated in 2003. Hosts were primarily sweetgum and oaks.

Region 9/Northeastern Area: Maine, Massachusetts, Michigan, Minnesota, New York, Ohio, Vermont, West Virginia, Wisconsin

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

In Maine, two islands in the Bagaduce River in Penobscot were defoliated in 2003. The islands are predominantly forested with a mix of aspen and red oak. Populations elsewhere in the State remained at endemic levels. The aerial survey in Massachusetts documented 20,501 acres of heavy defoliation from this insect. A check of the historic records indicates that this is the first time that this insect has caused widespread defoliation in the State. The visible defoliation is limited to Bristol and Norfolk Counties, but reports from field staff indicate that a buildup is occurring in Berkshire County. Defoliation occurred in combination with eastern tent caterpillar in New York. There was a statewide increase in larval activity in Vermont with moderate defoliation on 400 acres in Rutland County. In Ohio, there was no significant defoliation this year. In West Virginia, forest tent caterpillar was light to moderate on oak and maple in isolated areas. Populations in the Lake States began to decline in this fifth straight year of defoliation. About 2.5 million acres were defoliated in Minnesota. In Michigan, 167,000 acres were defoliated. This was the tail end of a 4-5 year epidemic, which defoliated 11.5 million acres in its peak year of 2001. Populations collapsed in Wisconsin and defoliation occurred in only a few scattered pockets.

Fruittree leaf roller,
Archips argyrospilus

Region 5: California

Host(s): California black oak

Defoliation by the fruittree leaf roller continued for what may be an unprecedented fifth year in the San Bernardino Mountains. Defoliation was heavy in the same areas infested for the past 4 years, areas totaling about 25,000 to 30,000 acres.

Giant bark aphids,
Longistigma caryae

Region 8: Texas

Host(s): Oaks

The 2002 outbreak of giant bark aphids across most of eastern Texas abated in 2003. No other outbreaks were reported.

Gouty oak gall,
Plagiotrochus punctatus

Region 8: Arkansas

Host(s): Willow oak

An unusually severe outbreak of gouty oak gall has been occurring for several years in the bottomland forest on the Lower Ouachita Wildlife Management Area in Union County in extreme southern Arkansas, affecting about 500 acres. The area is often flooded, putting the trees under stress. These and other factors may be involved in causing mortality.

Grasshoppers,
Various species

Region 8: Oklahoma, Tennessee

Host(s): Oaks, other hardwoods

Damage by grasshoppers in post and blackjack oak stands in central Oklahoma continued in 2003, although the damage was much less severe. Light grasshopper defoliation was also reported in the northern highland rim, Cumberland Plateau, and southeastern sections of Tennessee.

Insects: Native

Hemlock looper (fall flying),
Lambdina fiscellaria

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

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

No significant hemlock looper populations were found in Maine. Populations in 2002 had also declined sharply compared to 2001. The outbreak of 2001 has collapsed completely. Light defoliation on 529 acres was reported in Berkshire County in Massachusetts. Observations made during moth flight indicate a buildup of this insect. A number of moths were caught in traps set for spruce budworm in New York, but no significant defoliation of hemlock was observed. Populations remain low in Vermont.

Jack pine budworm,
Choristoneura pinus

Region 9/Northeastern Area: Michigan, Minnesota, Wisconsin

Host(s): Jack pine

About 18,500 acres were defoliated in Minnesota. This outbreak is new in 2003. Statewide, Michigan sustained nearly 330,000 acres of defoliation, up from 40,000 acres in 2002. Populations began building in the eastern Upper Peninsula in 2000. In 2003, the epidemic spread throughout the Upper Peninsula, with 130,809 acres of jack pine moderately to heavily defoliated. About 1,500 acres were defoliated in northern Wisconsin and populations are expected to increase over the next couple of years.

Jeffrey pine beetle,
Dendroctonus jeffreyi

Region 4: California, Nevada

Host(s): Jeffrey pine

Jeffrey pine beetle activity decreased on the Humboldt-Toiyabe National Forest and within the Lake Tahoe Basin Management Area. Across all ownerships in Nevada and portions of California, in 2003 approximately 600 trees were killed on 400 acres compared to 1,668 trees on 821 acres in 2002.

Region 5: California

Host(s): Jeffrey pine

Activity of the Jeffrey pine beetle continued near 2002 levels from northeastern California southward to the vicinity of Lake Tahoe. Mortality related to Jeffrey pine beetle was generally down from Lake Tahoe to the southern tip of the Sierra Nevada Range.

Populations of Jeffrey pine beetle were high in the San Bernardino Mountains. However, mature Jeffrey pines in these areas of high populations were often killed by pine engravers and/or California flatheaded borers, not Jeffrey pine beetle. No explanation was apparent for this response to available, susceptible hosts.

Jumping oak gall wasp,
Neuroterus saltatorius

Region 9/Northeastern Area: Ohio, Missouri
Host(s): Bur oak, white oak

In Ohio, this insect caused defoliation on trees in Brown and Highland Counties. From 1998-2000 high levels of this insect were reported throughout eastern Missouri on white oaks. Numbers of infested trees declined sharply in 2001 and were at nondetectable levels in 2002. In 2003, leaf damage returned on white oaks in eastern and southeastern parts of the State. Damage was primarily in widely scattered trees or patches of trees.

Juniper budworm,
Cudonigera houstonana

Region 8: Texas
Host(s): Ashe juniper

The unusual outbreak of juniper budworm that defoliated trees in central Texas in 2002 abated in 2003. No other outbreaks were reported.

Lace bugs,
***Corythucha* spp.**

Region 9/Northeastern Area: Connecticut, West Virginia
Host(s): Black cherry, sycamore, oaks

In Connecticut, heavy populations on Ericaceous plants occurred throughout the area. All occurrences were on landscape plants with damage on current year's growth noticeable by August. This is the second big year in a row for lace bugs. In West Virginia, moderate discoloration damage was observed statewide on oak, cherry, and sycamore.

Larch casebearer,
Coleophora laricella

Region 9/Northeastern Area: Pennsylvania, Michigan, Minnesota, Vermont
Host(s): Japanese larch

In Pennsylvania, approximately 100 acres of plantation had symptoms of damaged foliage or shoots in Tioga County. In Minnesota, 1,660 acres were reported affected, down by 40 percent from 2002. Over 21,200 acres were defoliated in Michigan. Moderate defoliation was widely scattered statewide in Vermont.

Large aspen tortrix,
Choristoneura conflictana

Region 9/Northeastern Area: Vermont
Host(s): Bigtooth aspen, aspen

Defoliation was not noted in Vermont this year.

Leaf beetle,
***Chrysomela* spp.**

Region 5: California
Host(s): Hybrid poplars

Hybrid poplars in a dry landscape setting within the Susanville Indian Rancheria sustained foliage damage in early summer from an unknown species of leaf beetle.

Locust leaf miner,
Odontota dorsalis

Region 8: Georgia, Kentucky, North Carolina, South Carolina, Tennessee, Virginia
Host(s): Black locust

While locust leafminer activity was observed across the entire range of the species, the level of damage declined significantly from 2002. The most severe damage reported was on upper slopes in middle and eastern Tennessee and western North Carolina. In Virginia, leafminer damage appeared later than usual in 2003.

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

Populations and the resultant defoliation by this species remained extreme throughout the range of the host in Maine in 2003. No letup is in sight and mortality of black locust on stressed sites is increasing around the State. Very heavy (80 percent) mortality occurred on approximately 5 acres of black locust in the town of Brunswick. In Massachusetts, black locust, mostly along the interstate highways, experienced defoliation. A total of 364 acres of defoliation were recorded. Defoliation was heavy throughout New Hampshire, an increase in severity from 2002. Approximately 1,400 acres of defoliation and discoloration were mapped in Vermont, reflecting a sharp increase in this insect population. Mortality was occurring in some stands. Aerial surveys in Ohio revealed 76 acres of defoliation in Monroe County. In Pennsylvania, ground surveys found locust leafminer damaging foliage of black locust in Susquehanna County.

Lodgepole pine needleminer,
Coleotechnites milleri

Region 5: California
Host(s): Lodgepole pine

The lodgepole needleminer outbreak that started with the 1992-94 generation continued at moderate to high levels in Yosemite National Park in 2003. High levels of defoliation with a relatively low rate of tree mortality occurred throughout previously infested areas. The outbreak extended somewhat in the southern part of the infestation area southwest into the Sunrise and Echo Creek drainages of the upper Merced River watershed. Moderate tree mortality continued in and around the Sunrise High Sierra Camp following continued heavy defoliation.

Maple leafcutter,
Paraclemensia acerifoliella

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

Moderate damage occurred in central Vermont, with light damage in the rest of the State.

Maple trumpet skeletonizer,
Epinotia aceriella

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

There was scattered light defoliation reported in Vermont.

Mountain pine beetle,
Dendroctonus ponderosae

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

Mountain pine beetle-infested areas more than doubled in 2002, and almost certainly would have increased in 2003 had all infested areas been surveyed. Still, mountain pine beetle (MPB) remains the most frequently encountered and damaging bark beetle in the region. Populations continued to expand in lodgepole pine stands on the Saint Joe National Forest in Idaho, but declined by about one-third on the Nez Perce National Forest, due to host depletion. On the Lolo, Flathead, and Beaverhead-Deerlodge National Forests in western Montana populations and acres infested increased—despite a small decline in infested acres recorded on the Lolo National Forest where not all infested areas were surveyed because of wildfires 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 remarkably 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 83 percent of the MPB-infested areas are in aging lodgepole pine stands. In total, for all affected hosts, infested area increased from more

than 149,000 acres in 2000, to 236,580 acres in 2001, and 517,600 acres, regionwide in 2002. Recorded infested area declined slightly in 2003, to 496,200 acres, but only because not all forested areas were flown. More that 340,000 host trees were killed in 2002—recorded as faded trees in 2003. The most expansive outbreak in the region still exists on the Nez Perce National Forest in north-central Idaho, where nearly 117,000 acres were infested. Next most seriously affected stands were on the Lolo National Forest in western Montana, where almost 101,100 acres were infested—up from less than 70,000 acres in 2001. There, infestations in lodgepole pine stands are slightly more intense, with an average of about six trees per acre being killed. The Lolo outbreak appeared to be still increasing in many areas. Significant outbreaks continued on the Idaho Panhandle National Forest, in both lodgepole and whitebark pine stands; and predominantly in lodgepole pine stands on the Flathead and Clearwater National Forests, and Flathead Indian Reservation. In most areas ground surveyed, populations were still active in lodgepole, ponderosa, and whitebark pine stands—especially on the Lolo and Flathead National Forests in Montana; and parts of the Idaho Panhandle and Nez Perce National Forests in northern Idaho. MPB-caused mortality in ponderosa pine stands, regionwide, is not extreme; but is increasing on the Bitterroot, Lolo, and Lewis and Clark National Forests and the Flathead, Rocky Boys, Fort Belknap, and Crow Indian Reservations in Montana. Nearly 46,300 acres of ponderosa pine type were infested in 2003.

Region 2: Colorado, South Dakota, Wyoming

Host(s): Bristlecone pine, limber pine, lodgepole pine, ponderosa pine, pinyon pine, whitebark pine

In general, MPB populations are high throughout the region and able to respond rapidly to large expanses of susceptible hosts. Aerial survey indicated that 227,000 acres in Colorado, 189,700 acres in South Dakota, and 23,500 acres in Wyoming contained trees killed by MPB.

Increased MPB activity in lodgepole pine in north-central Colorado was first detected in 1997 and continues to expand. In Grand County, three major outbreak areas are located around Lake Granby, in the Williams Fork watershed, and in the Troublesome Creek watershed. Lodgepole pine mortality in these areas is very high. Mortality pockets above 10,000 feet are becoming evident and newly infested trees have been noted on higher elevation sites. It appears that recent warmer summers may be pushing up the reported elevation ranges for greater mortality. High visibility areas in Summit County are also seeing expanding MPB activity. Lower elevation lodgepole pine areas on the Routt National Forest are seeing significant expansion of MPB activity especially in the Rock Creek watershed on the Yampa Ranger District.

On the Front Range there is some notable MPB activity in ponderosa pine stands on the Canyon Lakes Ranger District just north of Poudre Canyon. Scattered mortality in ponderosa pine and lodgepole pine throughout the Front Range is due to a combination of MPB and ips beetles. In the southern portion of the State there are two major outbreaks of MPB that have been occurring for the past several years. In Chaffee County, MPB have killed large numbers of ponderosa pine. This outbreak originated in the upper Arkansas River valley, but this activity has spread to the east, roughly following the course of the river, but spreading to the Wet Mountains, the eastern slope of the Sangre de Cristo Mountains, and forested areas to the south of Canon City.

The other major outbreak has occurred in the vicinity of Vail Valley along the Interstate 70 corridor. Here MPB have killed large numbers of their other primary host, lodgepole pine. Mortality was originally concentrated near the Vail ski area and adjacent urban interface areas, but this activity seems to be abating somewhat with stands that are less susceptible and remain fairly intact. Beetle activity now appears to be moving north of the Interstate with areas of increasing mortality in the Redstone Canyon/Piney Lake area. Many of these lodgepole pine stands are at fairly high risk to MPB activity, and significant mortality can be expected into the future.

There are many areas with scattered, fairly intense pockets of MPB activity. Portions of the San Juan, Rio Grande, Gunnison, and Uncompahgre National Forests all have areas of significant mortality due to MPB. While this bark beetle activity is not on a scale represented by either the Arkansas Valley or Vail Valley outbreaks, drought conditions could encourage beetle activity and cause significant epidemics.

MPB has caused intense and extensive ponderosa pine mortality throughout the Black Hills of South Dakota over the last 5 years. Results from annual aerial surveys estimate that over 1 million pines have been killed in South Dakota and Wyoming since 1998. The large and expanding MPB infestation in the Beaver Park area of the northern Black Hills has resulted in many stands becoming depleted of suitable host trees, while beetle populations spread to nearby areas such as Vanocker Canyon, Park Creek, and Kirk Hill. Ground surveys found an overall average of 20 trees per acre killed in the Beaver Park area since 2001, nearly half being currently infested. As available host trees are killed in the Beaver Park area the large beetle populations move into surrounding forest sites. The majority of the infestations are confined to national forest lands, but more private and State lands are now becoming infested.

The area around Deerfield Lake also has a large and expanding MPB infestation. Since 2001, an average of 26 trees per acre have been killed there, with almost 70 percent currently infested. Additional locations where beetle populations are increasing include areas near Custer Peak, Nemo, Coulsen, and Bear Mountain.

The northeast section of Wyoming contains the western edge of the Black Hills National Forest and surrounding forested lands. This area showed considerable tree mortality in ponderosa pine to MPB. Most of the 2003 activity was just scattered mortality although a few areas contained pockets of 25-100 trees killed by MPB. The forest around Devils Tower National Monument also has considerable pine mortality. Ground surveys in some of these counties found an overall average of nine trees per acre killed since 2001 and a relatively static beetle population. Timber sale and sanitation activity and relatively lower density and smaller extent of contiguous, susceptible pine forest are thought to be contributing factors.

MPB suppression work continues to reduce the high population levels of beetles found near Casper and the eastern slope of the Bighorn Mountains in central Wyoming.

The lower elevation lodgepole pine areas on the Medicine Bow National Forest are also seeing significant expansion of MPB activity in the Sierra Madre Mountain Range and in the Rock Creek watershed area.

On Carter Mountain southwest of Cody, MPB populations that increased within whitebark and limber pines are switching to infest adjacent lodgepole pine stands. Whitebark pine mortality near Togwotee Pass is widespread and highly visible on the Shoshone National Forest.

Region 3: Arizona, New Mexico

Host(s): Ponderosa pine

MPB activity in the Southwest decreased significantly from 3,960 acres in 2002 to 190 acres in 2003. All of the MPB-caused tree mortality detected in 2003 occurred in Arizona on the Kaibab National Forest (80 acres) and on 110 acres of the Grand Canyon National Park. No MPB-caused tree mortality was detected in New Mexico.

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

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

MPB-caused tree mortality increased regionwide from approximately 1,217,200 trees on 127,400 acres in 2002 to 1,806,800 trees on 258,800 acres in 2003. The acres for 2002 are an underestimation because Idaho and Utah were only partially surveyed due to the extreme fire season. Three distinct areas comprise the majority of the tree mortality. The largest outbreak area in the region, which began in 1998, killed an additional 1,098,500 lodgepole pine trees over 137,500 acres on the Sawtooth National Recreation Area and Salmon-Challis National Forests in central Idaho. A smaller, more recent outbreak (2001), located on the Bridger-Teton National Forest in Wyoming increased dramatically for the second consecutive year. Tree mortality increased from approximately 14,077 whitebark/limber pine trees killed on 6,466 acres in 2002 to nearly 240,000 lodgepole, whitebark, and limber pine trees killed on over 37,000 acres in 2003. A third outbreak occurs on the Wasatch-Cache and Ashley National Forests in northern Utah. Over 297,000 lodgepole and ponderosa pine trees have been killed on approximately 50,800 acres. Most of the tree mortality occurs along the Mirror Lake Scenic Highway corridor.

Insects: Native

Region 5: California

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

Activity of MPB increased or was about the same as in 2002 in most forests north of Lake Tahoe. Mortality was concentrated in sugar pines, but mortality of whitebark pine, western white pine, ponderosa pine, and lodgepole pine was also reported. Mortality in lodgepole stands continued on the Truckee Ranger District, primarily in trees over 80 years in age and 8 inches in diameter. Southward, mortality was reported in sugar pine on the Sierra and Sequoia National Forests and in lodgepole in developed recreation sites on the Inyo National Forest.

Region 6: Oregon, Washington

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

Fewer trees were reported killed in 2003. In 2003, 409,596 acres were affected, with 4.03 trees per acre, compared to 354,541 acres affected with an average of 5.32 trees per acre in 2002. Overall decrease in mortality was reported in all host types except western white pine.

Tree mortality in lodgepole pine increased in acres, but lower intensity resulted in a decrease in overall tree mortality. Total reported affected acres increased from 208,948 acres (7.75 trees per acre) in 2002 to 240,915 acres (5.92 trees per acre) in 2003. Oregon's affected acreage in 2003, 105,611 acres (3.07 trees per acre), was similar to 2002 acreage, 106,864 acres (6.12 trees per acre), but intensity decreased by half. Washington reported one-third more acres at similar intensities with 135,304 acres (8.13 trees per acre) in 2003 compared to 102,084 acres (9.46 trees per acre) in 2002.

Increases in lodgepole mortality occurred in North Cascades National Park, from 2,328 acres (7.75 trees per acre) in 2002 to 5,627 acres (5.92 trees per acre) in 2003; Yakama Indian Reservation, from 7,799 acres (4.63 trees per acre) in 2002 to 14,684 acres (12.53 trees per acre) in 2003; Wenatchee reporting area, from 11,782 acres (5.57 trees per acre) in 2002 to 14,370 acres (8.94 trees per acre) in 2003; and the Colville reporting area, from 924 acres (4.1 trees per acre) in 2002 to 7,277 acres (2.93 trees per acre) in 2003.

Areas that showed decreases in lodgepole pine mortality include the Okanagon reporting area, from 78,666 acres (10.79 trees per acre) in 2002 to 90,610 acres (8.01 trees per acre) in 2003; Warm Springs Indian Reservation from 19,831 acres (11.47 trees per acre) in 2002 to 21,969 acres (4.85 trees per acre) in 2003; and the Mount Hood reporting area, from 11,516 acres (2.43 trees per acre) in 2002 to 1,076 acres (3.26 trees per acre) in 2003.

Significant increases of acres mapped in the ponderosa type occurred on all ownerships. In 2002, 103,958 acres with an average of 1.47 trees per acre were mapped, compared with 127,321 acres with 1.16 trees per acre in 2003. There was an increase in the number of acres, but overall decrease in number of reported trees killed. Areas where acres infested increased but fewer trees where killed include the Malheur reporting area where infested acres increased from 14,865 acres (1.9 trees per acre) in 2002 to 16,989 acres (0.68 trees per acre) in 2003, and Okanogan reporting area which increased from 13,496 acres (2.79 trees per acre) in 2002 to 20,359 acres (2.09 trees per acre) in 2003. Areas that decreased in both affected acres and intesity included the Deschutes reporting area which decreased from 11,391 acres (2.21 trees per acre) in 2002 to 10,665 acres (0.67 trees per acre) in 2003. Areas with increased mortality include the Ochoco reporting area which increased from 9,027 acres (0.62 trees per acre) in 2002 to 11,366 acres (1.71 trees per acre) in 2003, and Wenatchee reporting area with an increase from 2,507 acres (1.2 trees per acre) in 2002 to 14,417 acres (1.17 trees per acre) in 2003.

Activity in sugar pine increased for the third straight year from 1,714 acres in 2001 to 1,988 acres in 2002, but at a slightly lower reported intensity (0.14 trees per acre in 2003, compared with 0.18 trees per acre in 2002). The majority of reported mortality occurred on Forest Service and BLM lands within the Rogue River and Siskiyou reporting areas.

Activity in western white pine decreased, from 4,656 acres (0.21 trees per acre) in 2002 to 2,160 acres (0.35 trees per acre) in 2003, with less overall mortality. This may be related to this species rapidly decreasing in its ecosystem due to blister rust and MPB. Rogue River reporting area showed a decrease

from 1,640 acres (0.24 trees per acre) in 2002 to 548 acres (0.26 trees per acre) in 2003. The Siskiyou resource area had a decrease from 3,101 acres (0.20 trees per acre) in 2002 to 1,008 acres (0.47 trees per acre) in 2003.

Finally, acres affected in the whitebark pine type decreased from 32,881 acres (3.41 trees per acre) in 2002 to 25,550 acres (2.41 trees per acre) in 2003. The Okanogan reporting area decreased from 22,242 acres (4.14 trees per acre) in 2002 to 8,149 acres (2.12 trees per acre) in 2003. In the Wenatchee reporting area, there were 7,880 acres (2.35 trees per acre) in 2002, increasing to 11,316 acres (3.21 trees per acre) in 2003. The Wallowa-Whitman reporting area had an increase in MPB mortality, from 0 acres in 2002 to 2,823 acres (0.84 trees per acre) in 2003.

Dense stand conditions continue to predispose areas to MPB infestations.

Nantucket pine tip moth,
Rhyacionia frustrana

Region 8: Regionwide

Host(s): Loblolly pine, shortleaf pine

Activity was low or declining throughout most of the region in 2003. Tennessee reported only three generations of tip moths, producing light to moderate defoliation. Some old-field sites in South Carolina suffered 25-50 percent attacks on lateral and terminal branches, although damage was generally lower than in 2002 statewide. Virginia reported chronic heavy infestations.

Oak leaftier,
Croesia semipurpurana

Region 8: Tennessee

Host(s): Oaks

Increased levels of oak leaf tier damage were reported in central and western Tennessee, generally in combination with inchworms. No other significant occurrences were reported.

Region 9/Northeastern Area: Maine, West Virginia

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

In Maine, defoliation levels as a result of feeding by larvae of this species increased slightly in 2003. Red oak defoliation due to leaf shredder feeding was at moderate (60 percent leaf loss) levels on approximately 75 acres on Verona Island in Buckport. Surveys for oak leaftier eggs were conducted again in West Virginia in Barbour, Pendleton, Pocahontas, Randolph, and Tucker Counties in late winter, but no eggs were observed and follow-up summer larval surveys reported very light populations only in Randolph, Tucker, and Pocahontas Counties.

Insects: Native

Orange-striped oakworm,
Anisota senatoria

Region 8: Texas

Host(s): Oaks

A small outbreak of orangestriped oakworm was reported in Angelina, Nacogdoches, Panola, and Shelby Counties. Such outbreaks occur periodically, but generally produce little damage.

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

Host(s): Black oak, red oak

In Connecticut, defoliation detected by aerial survey occurred on 761 acres in Windham County, in the towns of Canterbury and Killingly. Defoliation by these caterpillars on Long Island in New York was severe for the fourth consecutive year. An estimated 2,000 acres of State land centered around the Otis Pike Preserve had some defoliation, much of it severe and following early spring defoliation by gypsy moth and further damage by oak anthracnose. Many of these areas could see extensive patches of tree mortality in 2004. Severe defoliation was also observed on Federal, county, and private lands in the adjacent area. There were three areas of defoliation in central Rhode Island. A total of 1,500 acres were defoliated in Kent County. Populations appear to have collapsed in the late instars. No reports were received from Maryland or West Virginia in 2003. In New Jersey occurrences of this pest were observed on approximately 1,500 acres in Atlantic, Ocean, and Burlington Counties. In Pennsylvania, this late season defoliator caused only light defoliation in Perry County. In West Virginia, there were moderate to heavy infestations in scattered, isolated locations.

Oystershell scale,
Lepidosaphes ulmi

Region 9/Northeastern Area: Maine, Vermont

Host(s): Beech

Heavy defoliation and some tree mortality in Maine were attributed to oyster shell scale along the southwest side of Caribou Lake. Regeneration and co-dominant trees were damaged. There was only light damage in Vermont and populations dropped to very low levels.

Pandora moth,
Coloradia pandora

Region 5: California

Host(s): Jeffrey pine, lodgepole pine

The pandora moth outbreak, first detected in June 2002, continued on the Mammoth and Mono Lake Districts, Inyo National Forest. Adult flight and egg deposition were observed from late-June to mid-August. Early stage larvae and light defoliation on Jeffrey and lodgepole pines were observed over 40,000 acres. Moderate to heavy defoliation is expected in 2004. Pandora moth outbreaks usually last three to four generations and pandora moth activity is anticipated at least through 2006-2007.

Peach bark beetle,
Phloetribus liminaris

Region 9/Northeastern Area: New York

Host(s): Black cherry

The populations of this insect were scattered across the southern tier of New York.

Periodical cicada,
Magicicada septendecim

Region 9/Northeastern Area: West Virginia

Host(s): Hardwoods

In West Virginia, emergence was reported causing damage to foliage and shoots on over 2.4 million acres in 12 southeastern counties. Flagging was heavy and obvious.

Phantom hemlock looper,
Nepytia phantasmaria

Region 6: Oregon, Washington

Host(s): Douglas-fir, western hemlock

Approximately 5,700 acres of defoliation were reported in 2002, however no damage was reported in 2003.

Pine colaspis beetle,
Colaspis pini

Region 8: Louisiana, Virginia

Host(s): Southern pines, ornamental cypress

As in previous years, this beetle caused localized defoliation of pine plantations in eastern and central Louisiana, particularly in eastern Rapides Parish and the southeastern-most parishes. No significant damage occurred, but the defoliation is unsightly and causes landowner concerns. Some mortality of ornamental cypress was noted during droughty periods. Virginia reported light and scattered damage.

Pine engraver beetles, *Ips* spp.

Region 1: Idaho, Montana

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

Although at still relatively low levels considering the abnormally dry conditions in the region, pine engraver beetle-infested area increased somewhat in 2003—up to 6,200 acres, from approximately 1,700 acres in 2002. Most beetle-caused mortality was recorded in ponderosa stands in Montana; however, ponderosa and lodgepole pine stands in northern Idaho were also affected. Throughout the region, a reported 9,200 trees were killed. While recorded mortality increased in 2003, it is a reflection of increased beetle activity in 2002. We believe increased activity is a result of continuing unusually warm and dry weather 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 Nez Perce National Forest and Nez Perce Indian Reservation, in northern Idaho, recorded the most engraver beetle-affected acres in Idaho; while ponderosa pine stands on the Custer National Forest and Flathead Indian Reservation were the most severely impacted in Montana. Few other reporting areas recorded significant outbreaks, although the Northern Cheyenne Indian Reservation, where heavily impacted stands were noted in 2002, was not flown in 2003.

Region 2: Colorado, Nebraska, South Dakota, Wyoming

Host(s): Ponderosa pine, piñon pine, Jack pine, lodgepole pine

Perhaps the most dramatic, recent example of tree mortality in the central Rocky Mountains has been the extensive loss of piñon pine. This outbreak is occurring on a huge scale, with piñon trees being killed in large numbers throughout their range. Several species of piñon are being affected, from New Mexico to California and south into Mexico.

In Colorado, vast areas of *Pinus edulis* have been killed by the bark beetle *Ips confusus*. This mortality has been particularly intense in the southern portion of the State with many thousands of acres experiencing the loss of a high percentage of mature piñon. Again, the drought conditions of the past several years are the root of the situation, but fairly high tree densities and the overall even-age status of the piñon stands are contributing factors.

In the most highly affected, southern portion of the State, many stands have lost 90 percent of the mature piñon. The worst of this mortality occurs in the piñon stands around Durango, Cortez, and Dolores. Moving further north, the mortality is more scattered with some sites of intense mortality.

The future of the outbreak depends greatly upon future weather conditions. Even with weather conditions favorable to healthy piñon, it may take some time before bark beetle numbers return to a more endemic level. In any case, the slow growth of piñon stands means that many areas will not regain a mature piñon component for some time to come.

Aerial survey estimates for 2003 are that 4,193,900 piñon trees have died on approximately 937,000 acres in Colorado.

Ips spp. beetles caused mortality of other pines on drought stressed sites in Colorado. In addition to the massive piñon mortality in the southern and western areas of the State, there was significant damage caused by ips beetles following a spring blizzard along the east slope of the Colorado Front Range. Many broken limbs and damaged tree tops from this storm created much suitable materials for colonization by ips beetles.

Mortality of ponderosa pine due to *Ips pini* and *Ips calligraphus* caused concern for resource managers at the Air Force Academy and Fort Carson. Ponderosa pines at lower elevations along drainages going into the grasslands were most affected. Jefferson, Boulder, Clear Creek, and Gilpin Counties had higher levels of *Ips pini* on small diameter lodgepole pines.

Ips pini was reported at high levels locally in small diameter lodgepole pine in Jefferson, Boulder, Clear Creek, and Gilpin Counties.

Nebraska - Ips populations remained active in jack pine stands that were defoliated by jack pine budworm on the Bessie unit of the Nebraska National Forest. In severely defoliated areas, up to 25 percent of the trees had ips beetle attacks. In the Pine Ridge area, a significant level of mortality caused by ips was noted. Aerial survey estimates of the Nebraska National Forest indicate that about 21,700 ponderosa and jack pines on over 10,000 acres were killed from ips beetles in 2003. If drought conditions continue, ips populations will likely remain very active.

South Dakota - *Ips pini* caused significant amounts of ponderosa pine mortality in the Black Hills and the Pine Ridge Indian Reservation of South Dakota. This recent, unprecedented level of pine engraver beetle activity is a consequence of wildfires, mountain pine beetle, and weather events, such as hail and snow-breakage that has resulted in a tremendous buildup of dead, weakened, and damaged tree material. With a nearly unlimited supply of food, the beetle populations increased significantly. Now that this food supply is becoming less suitable, pine engraver beetles are attracted to healthy trees and these attacks are resulting in significant tree mortality. Many of the areas getting hit hardest by ips in the Black Hills are in the wildland-urban interface. More than 120,700 ponderosa pines on 45,200 acres have died from pine engraver beetles.

The State has conducted several baiting programs to monitor and manage pine engraver populations. Two of the major mills in the State had lures placed around their log piles to trap beetles emerging from infested logs. A golf course experiencing a high population of engraver beetles, and subsequent tree mortality, had the population dramatically reduced by the removal of infested trees, slash disposal, and mass trapping.

Wyoming - Small pockets of ponderosa pine trees were attacked by ips in Weston County of the Black Hills forests. Approximately 1,400 trees were killed on 600 acres.

Region 3: Arizona, New Mexico

Host(s): Ponderosa pine, piñon pine

Ponderosa pines and piñons in Arizona and New Mexico are severely drought stressed. Ips beetle-killed ponderosa pines were detected on 695,130 acres regionwide in 2003 compared to 448,105 acres in 2002. Ips-killed ponderosa pines occurred on the Apache-Sitgreaves (122,575 acres), Coconino (71,815 acres), Coronado (1,070 acres), Kaibab (64,195 acres), Prescott (93,110 acres), and Tonto (161,180 acres) National Forests; Grand Canyon National Park (985 acres); Saguaro (140 acres) and Walnut Canyon (1,805 acres) National Monuments; BLM lands (2,085 acres); Fort Apache (81,020 acres), Hualapai (615 acres), Navajo (33,175 acres), and San Carlos (28,820 acres) Indian Reservations; and 32,160 acres of State and private lands. In New Mexico, ips beetle-caused ponderosa pine mortality was observed on 380 acres of the Santa Fe National Forest.

Piñon mortality caused by *Ips confusus* was detected on 1,914,345 acres regionwide in 2003. This figure is not comparable to the 148,370 acres reported in 2002 because this year's aerial survey flights included large areas of piñon-juniper woodlands not flown in 2002. In Arizona, piñon ips-caused tree mortality was recorded on the Apache-Sitgreaves (145,889 acres), Coconino (148,485 acres), Coronado (815 acres), Kaibab (158,950 acres), Prescott (30,145 acres), and Tonto (23,900 acres) National Forests; Grand Canyon National Park (5,345 acres); Wupatki (375 acres) and Walnut Canyon (45 acres) National Monuments; BLM lands (32,055 acres); Fort Apache (8,240 acres), Hopi (14,585 acres), Hualapai (29,585 acres), Navajo (256,220 acres), Nav-Hopi JUA (131,350 acres), and San Carlos (37,265 acres) Indian Reservations; and 120,285 acres of State and private lands. In New Mexico, piñon ips beetle-caused tree mortality in 2003 was detected on the Carson (277,615 acres), Cibola (9,930 acres), Gila (3,510 acres), Lincoln (6,130 acres), and Santa Fe (64,820 acres) National Forests; on Jicarilla Apache (1,770 acres), Mescalero Apache (150 acres), Ute Mountain (135 acres), Taos Pueblo (50 acres), Laguna Pueblo (60 acres), Cochiti Pueblo (1,825 acres), Jemez Pueblo (6,295 acres), Nambe Pueblo (2,160 acres), San Ildefonso Pueblo (310 acres), Santa Clara Pueblo (3,385 acres), Santo Domingo Pueblo (5,300 acres), Tesuque Pueblo (2,650 acres), and Zia Pueblo (385 acres) Tribal lands; 4,790 acres of other tribal lands identified by the BLM as Indian owned, but not within the boundaries of any reservation or tribal area

provided by the Bureau of Indian Affairs (BIA); 199,880 acres of State and private ownerships; and Bandelier (2,230 acres) and El Malpais (25 acres) National Monuments. Piñon mortality from piñon ips beetles was also detected on BLM (170,165 acres), Bureau of Reclamation (2,675 acres), and Department of Energy (4,570 acres) lands in New Mexico.

Region 4: Idaho, Utah

Host(s): Lodgepole pine, ponderosa pine, pinyon pine

Mortality due to pine engraver beetle remained low throughout the region. However, beetles did kill scattered groups of ponderosa pine, mostly on the Boise National Forest in southwestern Idaho. Within this area, additional ponderosa pine mortality was detected from ground observations in the fall of 2003. Additional mortality was the result of late season adult beetle "feeding" attacks after emerging from infested slash in late August and early September.

In 2003, an extensive survey of pinyon pine was conducted in the western United States to determine the extent of pinyon pine mortality. Over 9 million of the estimated 25 million acres of pinyon in the region were surveyed. As reported by the 2003 survey, over 4.8 million trees have been killed on nearly 469,000 acres; primarily on non-Forest Service lands. In Nevada, nearly 2.5 million trees were killed on approximately 189,200 acres of BLM lands in addition to 218,200 trees on 41,800 acres within the Humboldt-Toiyabe National Forest. In Utah, 1,147,700 trees were killed on 131,500 acres of BLM and BIA lands in addition to 287,200 trees killed on 42,900 acres of the southern Utah national forests. State and private lands in the two States were also heavily impacted. In Nevada, approximately 425,200 trees were killed on 28,300 acres. In Utah, 264,900 trees were killed on nearly 35,300 acres. Historically, pinyon-juniper forests have not been aerially surveyed. However, the dramatic increase in pinyon mortality in 2001 and 2002 resulted in requests by affected national forests to document this widespread mortality. Most of the mortality caused by pinyon ips is the result of a prolonged period of drought.

Region 5: California

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

Reports of pine engravers were few except in southern California. There, pine engravers, including *I. confusus*, *I. paraconfusus* and *I. pini* were epidemic in the San Bernardino Mountains and the Peninsular Ranges. Mortality of singleleaf pinyon caused by the pinyon ips, *I. confusus*, increased dramatically near Lake Baldwin. Some mortality is "normal" in this area because of the frequency of black stain root disease in the pinyon stands. Mortality also occurred in many parts of the singleleaf range along the north slopes of the Transverse Ranges. In a related host, *P*inus *californiarum*, mortality caused by the pinyon ips exceeded 80 percent in some areas of the Santa Rosa Mountains.

Region 6: Oregon, Washington

Host(s): Ponderosa pine

2003 found a decrease in acres affected by pine engraver beetles, but an overall increase in reported trees killed. Numbers went from 9,545 acres (0.92 trees per acre) in 2002 to 7,835 acres (1.54 trees per acre) in 2003. Mortality was scattered throughout the region with approximately 50 percent of the affected acres reported in northeast Washington.

Region 8: Regionwide

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

Reduced levels of pine engraver beetle activity were reported across most of the region. Small spots averaging seven trees each were reported from Tennessee, often in concert with southern pine beetle and

black turpentine beetle. Arkansas and Louisiana reported 16 and 50 spots, respectively. Scattered damage continued in southeastern Oklahoma, generally in only one- or two-tree spots. Little activity was detected in Texas. Virginia reported a decline in Ips activity in comparison to the previous two years. South Carolina reported increased activity on rain-saturated sites, much like that reported for black turpentine beetle.

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

Region 5: California

Host(s): Ponderosa pine

Defoliation was not readily apparent in a large area of ponderosa pine defoliated for the past several consecutive years near the Military Pass Road on the Shasta-Trinity National Forest.

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

Host(s): Southern pines

Florida experienced approximately 1,400 acres of defoliation by the blackheaded pine sawfly in Dixie County. The heaviest damage occurred in July. Reduced defoliation by the loblolly pine sawfly was reported in middle Tennessee, with only six counties affected; defoliation was less than 50 percent except in scattered areas. Redheaded pine sawfly activity was also reduced in Tennessee, especially in the southeastern portion of the State. South Carolina reported several redheaded pine sawfly infestations in young longleaf plantations. The largest covered 25 acres and required insecticide treatment. Virginia reported only a few defoliating sawfly populations in 2003. Mississippi reported two small infestations in Marshall County.

Pinyon needle scale, *Matsucocus acalyptus*

Region 5: California

Host(s): Singleleaf pinyon pine

The outbreak of the pinyon needle scale in the Cuddy and Lockwood Valleys on the Los Padres National Forest continued in the same areas reported in 2002. Pinyons were examined at Ozena Fire Station, but no scales were found on the trees examined. Large numbers of predatory coccinelids were observed flying through the area in May. They appeared to be feeding on the scales and predation may account for low numbers at the fire station.

Red oak borer,
Enaphalodes rufulus

Region 8: Arkansas, Oklahoma, Virginia

Host(s): Northern red oak, black oak

The red oak borer epidemic persisted in 2003 in north-central Arkansas and northeastern Oklahoma in association with oak decline exacerbated by the recent years of drought. The cumulative effects of drought, insects, pathogens, and advanced age in these forests has produced levels of decline from which most trees will not be able to recover. The return of normal precipitation is expected to put downward pressure on the red oak borer population, but mortality and degrade of lumber quality among oaks is already severe. Adult borers emerged in 2003, and with their 2-year life cycle, another emergence will not occur until 2005. Virginia reported chronic low to moderate populations of borers in 2003.

Red turpentine beetle,
Dendroctonus valens

Region 5: California

Host(s): Jeffrey pine, ponderosa pine, singleleaf pinyon pine, sugar pine

Activity of the red turpentine beetle was found in association with other bark beetles and/or with fire-injured trees throughout northeastern California. Trees injured to varying degrees by wildfire and prescribed burns were also attractive to the red turpentine beetles in the southern part of the Sierra Nevada Range. Jeffrey and ponderosa pines on rocky, south-facing slopes along the I-80 corridor from Blue Canyon east to the Sierra Front were also attacked. Reports of this beetle in fresh stumps of thinning operations in Siskiyou County declined. Red turpentine beetle was abundant in many parts of southern California, particularly where the pines were drought stressed.

Reproduction weevils,
Hylobius pales
Pachylobius picivorous

Region 8: Regionwide

Host(s): Southern pines

Reduced levels of attack (1-20 percent seedling mortality) were reported in southeastern Tennessee, the Cumberland Plateau, and in the eastern part of the State south of Knoxville. Severe impacts were noted on a 200-acre tract in Harrison County, Texas, where scattered damage is reported in most years. In South Carolina, weevil damage increased from 2002 levels. Fifteen separate plantations containing approximately 800 acres of loblolly pine seedlings suffered 50-75 percent mortality. Weevil damage was generally low in Virginia, owing to chemical treatment of planted seedlings in high-hazard areas.

Roundheaded pine beetle,
Dendroctonus adjunctus

Region 3: Arizona, New Mexico

Host(s): Ponderosa pine

In Arizona, roundheaded pine beetle-caused tree mortality was recorded on 4,530 acres in 2003 compared to 11,120 acres in acres in 2002. This mortality was detected on the Coronado National Forest. No roundheaded pine beetle activity was recorded in New Mexico.

Scarlet oak sawfly,
Caliroa quercuscoccineae

Region 9/Northeastern Area: West Virginia

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

In West Virginia, incidence of this pest, along with other defoliators, was reported as spotty and heavy in Wayne, Gilmer, Calhoun, Braxton, Kanawha, Jackson, Ritchie, Lincoln, Wirt, and Roane Counties.

Sequoia pitch moth,
Vespamima sequoiae

Region 5: California

Host(s): Monterey pine

Pitch moths are becoming an increasing problem on planted Monterey pine in the Sacramento Valley. The landscape trees are mostly older and lacking vigor. Pitch moths were also observed in permanent plots for monitoring pitch canker in coastal counties.

Southern pine beetle,
Dendroctonus frontalis

Region 8: Regionwide

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

Southern pine beetle (SPB) activity declined dramatically across the region. In 2003, there were 7,646 SPB infestations versus 61,089 in 2002. Residual beetle activity lingered in western South Carolina and eastern Tennessee. There was also an increase on national forest land in Mississippi. Otherwise, most States had no to very low levels of SPB activity.

Tennessee reported 12 counties still in outbreak status with a total of 1,294 spots, but reduced activity was noted, with no spots over 50 trees. South Carolina reported 18 counties still in outbreak status, but only in the single mountain county was the continuing damage considered significant. The majority of activity was early in the year, carrying over from the record setting outbreak of 2002. Alabama reported only 197 spots, Mississippi only 75, while no spots were detected in Arkansas, Louisiana, Oklahoma, or Texas. The SPB outbreak in North Carolina began to collapse in late 2002 with the return of normal precipitation. Only 120 spots were reported statewide in 2003, with most of these concentrated in Cherokee County, in the southwestern tip of the State. The outbreak in Virginia's southwestern mountains and isolated areas of the

central Piedmont also collapsed in 2003. Florida detected only two SPB spots in 2003, representing the lowest level of activity since 1992. Decline of SPB activity corresponded closely with the end of the recent drought.

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

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

In Delaware, no significant active southern pine beetle spots were detected in 2003. However, one small, 11-acre patch at Redden State Forest was clearcut to reduce a localized infestation. In 2003, no southern pine beetle activity was reported in Maryland and Ohio. In New Jersey, southern pine beetle infestations caused approximately 2,500 acres of mortality in Cumberland, Atlantic, and Cape May Counties. In West Virginia, funnel traps were used in Jackson, Lincoln, Wayne, Mingo, Mason, and McDowell Counties. Traps were baited with frontalin lure and a wick bottle containing steamed, distilled turpentine. While several beetles were trapped, clerid counts were numerous enough to rank southern pine beetle populations as declining or static.

Spruce beetle, *Dendroctonus rufipennis*

Region 1: Idaho, Montana

Host(s): Englemann spruce

Spruce beetle-killed trees remained lightly scattered in the region in 2003; despite notable increases on the Gallatin and Kaniksu National Forests. Endemic conditions remained elsewhere in the region, with the exception of a significant outbreak in the southeastern portion of Yellowstone National Park, first recorded in 2002. That outbreak, reported at covering more than 6,000 acres last year, increased to more than 8,700 acres in 2003. Although increasing in extent, the outbreak is not particularly intense—averaging slightly more than 2 trees per acre killed. Still, it appeared to be increasing. A few areas affected by fire in 2000—notably stands on the Beaverhead and Flathead National Forests—had reported higher that normal spruce beetle activity in 2002. That has returned to endemic levels. Most mortality attributed to spruce beetle in Montana was observed on the Gallatin National Forest (730 acres), and in northern Idaho, on the Kaniksu National Forest (550 acres). Very little spruce beetle activity was recorded elsewhere in the region. Including the outbreak in Yellowstone National Park, about 20,000 Engelmann spruce were killed regionwide.

Region 2: Colorado, Wyoming

Host(s): Colorado blue spruce, Engelmann spruce

Over all of Colorado, aerial survey estimates for spruce tree mortality caused by spruce beetle (SB) were 519,700 trees killed on 70,900 acres.

Throughout southern Colorado, the majority of SB activity is occurring in scattered pockets of less than 100 acres, but there are a number of sites where large numbers of mature spruce have been killed over extensive areas. In terms of the scattered activity, there are about 30 known SB sites on the White River, Grand Mesa, Gunnison, Uncompahgre, San Juan, and Rio Grande National Forests.

Hundreds of thousands of spruce were killed in Routt and Jackson Counties as the SB outbreak continues to expand and intensify in the area of the Routt Divide blowdown. Main areas affected are north of Rabbit Ears Pass to the Wyoming border on the Gore Range.

SB killed hundreds of thousands of Engelmann spruce in Wyoming in 2003. Approximately 353,400 trees were killed on 49,900 acres of forest lands. Large pockets of spruce tree mortality caused by this beetle

were observed on the Shoshone and Bridger-Teton National Forests, in Yellowstone National Park, and in the Washakie, Teton, and Absaroka Mountain Wilderness Areas in northwestern Wyoming. These infestations started in the wilderness areas and national park, and now have moved out to impact large areas of State, private, BLM, and national forest lands. In the Bighorn Mountains of north-central Wyoming, several areas near Shell Reservoir and Ten Sleep Canyon are experiencing high levels of SB activity.

SB has expanded exponentially in the last 2 years on the Medicine Bow-Routt National Forest. Many Englemann spruce injured by fire in 2002 in the same area as the 1997 blowdown event have been infested by SB. SB also appear to be increasing in the Elkhead Mountains on the old Bear's Ears Ranger District west of the main blowdown area. Aerial survey likely underestimates this damage due to the more subtle fading of spruce compared to beetle-killed pines. Englemann spruce mortality from SB has also been detected in ground surveys in the high elevation areas of the Snowy Range and Sierra Madre.

Region 3: Arizona, New Mexico

Host(s): Spruce

SB activity in the region decreased nearly two-fold from 43,350 acres in 2002 to 24,355 acres in 2003. In Arizona, SB mortality occurred on the Apache-Sitgreaves National Forest (6,110 acres), Fort Apache (395 acres) and Navajo (3,560 acres) Indian Reservations, and 80 acres of private lands. In New Mexico, SB-caused tree mortality was detected on the Carson (5,840 acres), Cibola (90 acres), Gila (5 acres), Lincoln (115 acres), and Santa Fe (3,285 acres) National Forests; Jicarilla Apache (170 acres), Mescalero Apache (65 acres), and Taos Pueblo (2,825 acres) Tribal lands; Valles Caldera National Preserve (20 acres); and 1,875 acres of State and private lands.

Region 4: Idaho, Utah, Wyoming

Host(s): Spruce

SB-caused tree mortality remained static in 2003. SB killed approximately 149,900 trees over 29,600 acres in 2003 compared to 135,346 trees over 29,000 acres in 2002. Southern and central Utah continue to have the largest infestations with approximately 102,200 trees killed on nearly 24,100 acres. Most of the SB-caused tree mortality occurred on the Manti-La Sal National Forest (over 70,200 trees on 13,600 acres). In Utah, tree mortality also occurred on the Wasatch-Cache (approximately 8,800 trees on 1,500 acres), the Dixie (over 8,300 trees on 2,500 acres), the Ashley (nearly 6,900 trees on 2,900 acres), and the Fishlake (over 5,900 trees killed on 2,400 acres) National Forests. Another large infestation has developed on the Bridger-Teton National Forest in western Wyoming (over 22,300 trees on 2,800 acres).

Region 6: Oregon, Washington

Host(s): Engelmann spruce

All reported mortality in Oregon and Washington in 2002 was in Engelmann spruce. Reported acres affected went from 27,657 acres (11.52 trees per acre) in 2002 to 19,106 acres (7.51 trees per acre) in 2003. The majority of mortality occurred on Forest Service lands within the Okanogan reporting area. Increases include Colville Indian Reservation, from 113 acres (1.34 trees per acre) in 2002 to 2,964 acres (2.69 trees per acre) in 2003, and the Colville reporting area, from 74 acres (1.73 trees per acre) in 2002, to 440 acres (3.45 trees per acre) in 2003. Decreases include the Okanogan reporting area, from 22,914 acres (13.32 trees per acre) in 2002 to 14,156 acres (9.21 trees per acre) in 2003, and the Wenatchee reporting area, from 2,972 acres (4.07 trees per acre) in 2002 to 1,092 acres (2.85 trees per acre) in 2003. The SB outbreak in the Tiffany Mountain area appears to have run its course. Virtually all of the large spruce has been killed on about 187,000 acres. The SB population is expected to return to endemic level in 2004.

Insects: Native

Region 9/Northeastern Area: Maine, Vermont

Host(s): White spruce, red spruce

The condition of many of Maine's coastal spruce stands continued a gradual decline in 2003. SB has been the most immediate cause of spruce stand deterioration since the mid-1990s; however, beetle population levels have gradually declined and losses due to this insect have stabilized. Drought conditions in recent years (1995, 1999, 2001, and 2002) have been a major factor in spruce stand decline and have certainly contributed to the persistence of the beetle outbreak. The current SB infestation remained confined predominantly to the central Maine coast, especially Penobscot Bay. In Vermont there was an increase in beetle population and tree mortality following drought.

Region 10: Alaska

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

SB populations that have taken such a heavy toll on south-central Alaska forests for almost two decades, were at static levels in 2003. Total area of active infestations increased slightly in 2003 (7 percent) to 92,306 acres. Localized, intense activity continues in a few areas of the State. SB populations, however, have returned to endemic levels in the majority of the State. Many areas of the State have been rendered unsuitable for further, large-scale beetle activity due to changes in stand structure and composition. These same areas, however, remain at moderate to high risk for potential catastrophic wildfire due to the large volume of beetle-killed spruce, both standing dead or on the ground. Much of the Copper River Valley, Kenai Peninsula, and the west side of Cook Inlet fall in this category. For the second consecutive year, the overall number of acres affected by SB in the Iliamna Lake area remained static at 25,403 acres. Nearly 4,000 acres of spruce beetle activity were observed in three areas within Katmai National Park. SB activity has been observed scattered throughout the Dillingham and Wood River-Tikchik Lakes State Park areas for several years. These infestations have yet to coalesce into a more widespread outbreak. In 2003, SB infestations were mapped on 17,470 acres, a 54 percent increase from 2002. Kenai Peninsula areas with the most potential for continuing beetle activity are the smaller diameter spruce stands north of the Sterling Highway near the coast, portions of the south side of Kachemak Bay between Port Graham and Sadie Cove, the upper and lower Kenai River lowlands (including Funny River and Killey River drainages), and the south side of Kachemak Bay from Sadie Cove, Tutka Bay, and the coastal areas from Jakolof Bay-Seldovia and English Bay-Port Graham/Nonwalek. SB activity along the Kuskokwim River between McGrath and Sleetmute has increased significantly. For a number of years, small patches of light beetle activity have been noted, particularly between Vinasale Mountain and Nunivak Bar. In 2003, infestations within this area grew considerably in both intensity and distribution.

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

Monitoring of low-level spruce budworm populations continued in Maine in 2003. Monitoring included field observations, a statewide light trap network, and pheromone baited traps that were highly attractive to budworm moths. Field observations were made in 2003, but no larvae were found and no defoliation was detected. No defoliation was reported in New Hampshire and pheromone trap catches were very low. Trap counts for this insect in the Adirondacks in New York were for the most part low to moderate. In Vermont, the number of moths in pheromone traps remained low. About 35,000 acres were defoliated in Minnesota. This is the 50th consecutive year of detectable spruce budworm defoliation in the State. More than 11,000 acres were defoliated in Marquette and Schoolcraft Counties in Michigan's Upper Peninsula and about 200 acres in west-central Lower Peninsula. Areas of light budworm defoliation have been visible for the last

few years. In Wisconsin, 3,982 acres of defoliation was detected by aerial survey in the Nicolet and Chequamegon National Forests.

Texas leaf-cutting ant,
Atta texana

Region 8: Louisiana, Texas

Host(s): Southern pines, hardwoods

Localized defoliation of pine plantations occurs annually in east Texas and west-central Louisiana on sites with deep, sandy soil. Populations of these ants remain relatively stable from year to year.

Variable oak leaf caterpillar,
Lochmaeus manteo

Region 9/Northeastern Area: Maryland

Host(s): Beech

In Maryland, this pest defoliated over 6,600 acres of oak in Saint Marys, Caroline, and Queen Annes Counties. No incidence of this pest was reported this year in Pennsylvania.

Western balsam bark beetle,
Dryocoetes confuses

Region 1: Idaho, Montana

Host(s): Subalpine fir

Western balsam bark beetle-caused mortality in subalpine fir stands decreased according to aerial survey, however, much of this decrease is likely a function of some areas with high populations of the western balsam bark beetle, such as the Beaverhead and Gallatin National Forests in Montana, not being surveyed in 2003. In the areas surveyed, more than 142,000 infested acres were mapped and an estimated 224,000 dead subalpine fir observed. In 2002, with a larger area surveyed, 168,000 acres were mapped as infested. We believe that in many areas populations of western balsam bark beetle are increasing, and that the lower numbers recorded in 2003 are a function of fewer acres surveyed, not actual population trends.

Western black-headed budworm,
Acleris gloverana

Region 6: Oregon, Washington

Host(s): Western hemlock, Sitka spruce, white spruce, true firs, Douglas-fir, mountain hemlock

Acres of defoliation decreased from 2,390 acres in 2002 to 2,247 acres in 2003. Small areas of defoliation were recorded on the Mount Baker-Snoqualmie and Wenatchee reporting areas. In Northeastern Washington, near the Idaho border, 1,252 acres of defoliation were detected that are believed to be a complex of budworms including the western spruce budworms and the western blackheaded budworm.

Insects: Native

Region 10: Alaska

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

Over 16,000 acres of budworm activity was observed in 2003 primarily on white spruce. Light to moderate activity was observed on 11,425 acres of white spruce near Dillingham. In southeast Alaska, 1,237 acres of light to moderate defoliation of western hemlock was observed southwest of Cordova, 193 acres near Petersburg, and 1,853 near Edna Bay. Budworm populations in Alaska have been cyclic, appearing quickly, affecting extensive areas, and then decreasing just as dramatically in a few years.

Western hemlock looper,
Lambdina fiscellaria lugubrosa

Region 6: Oregon, Washington

Host(s): Western hemlock, conifers

Acres defoliated in Washington State decreased significantly from over 35,200 acres in 2002 to 1,411 acres in 2003. Defoliation occurred mostly south of Baker Lake (965 acres). Additionally, a 283-acre area in the North Cascades National Park, and a 163-acre spot within the Northwest Washington resource area were mapped in 2003.

Western oak bark beetle,
Pseudopityophthorus pubipennis

Region 5: California

Host(s): Tanoak

Many tanoaks dying from armillaria root disease were attacked by this beetle in scattered areas of Mendocino County. The root-diseased trees were often on downhill sides of rural road where cast road berms covered the root zones.

Western pine beetle,
Dendroctonus brevicomis

Region 1: Idaho, Montana

Host(s): Ponderosa pine

Ponderosa pine mortality attributed to western pine beetle increased substantially once again. In 2002, beetle-caused mortality occurred on about 6,700 acres—up from approximately 2,500 acres in 2001. In 2003, mortality nearly doubled to almost 13,000 acres infested. Most mortality was observed on private lands within the Nez Perce Indian Reservation, Clearwater National Forest reporting area, and Idaho Panhandle National Forests, in northern Idaho; and a few isolated stands in western Montana, mainly on the Lolo National Forest. There remains the potential for western pine beetle populations to increase in 2004 if drier-than-normal conditions continue.

Region 2: Colorado

Host(s): Ponderosa pine

This beetle has been killing large ponderosa pines in several locations on the San Juan National Forest. It is most frequently found in combination with *Ips pini* (pine engraver) and *Dendroctonus adjunctus* (the round-headed pine beetle); these beetles have killed several hundred large mature ponderosa pines. These bark beetles are present at higher levels in south-central and southwest Colorado.

Region 3: Arizona, New Mexico

Host(s): Ponderosa pine

Western pine beetle-caused tree mortality in the Southwest increased over 1.5 times totaling 40,445 acres in 2002 compared to 63,315 acres in 2003. In Arizona, tree mortality attributed directly to western pine beetle was recorded on the Apache-Sitgreaves (35 acres) and Kaibab (7,835 acres) National Forests; and the Fort Apache (60 acres) and Navajo (55 acres) Indian Reservations. In New Mexico, ponderosa pine mortality attributed to the western pine beetle was mapped on the Carson (3,325 acres), Cibola (2,390 acres), Gila (27,235 acres), Lincoln (10,715) acres, and Santa Fe (3,065 acres) National Forests; Jicarilla Apache (120 acres), Mescalero Apache (6,780 acres), Picuris Pueblo (35 acres), Taos Pueblo (240 acres), Laguna Pueblo (85 acres), Santa Clara Pueblo (165 acres), and 110 acres of other Tribal lands identified by the BLM as Indian owned, but not within the boundaries of any reservation or tribal area provided by the BIA. Approximately 890 acres of western pine beetle-caused tree mortality also occurred on State and private lands in New Mexico.

Region 4: Idaho

Host(s): Ponderosa pine

In 2003, approximately 12,800 ponderosa pine trees were killed over 8,100 acres by the western pine beetle, a significant increase over the previous year when approximately 7,700 trees were killed on nearly 3,600 acres. Most of the mortality occurred in southern Idaho on the Salmon-Challis (approx. 5,100 trees on 2,100 acres), Payette (nearly 3,500 trees on 2,500 acres), and Boise (approx. 1,600 trees on 1,600 acres) National Forests. Other affected lands include State and private (nearly 1,900 trees on 1,400 acres) and BLM (nearly 600 trees on 300 acres).

Region 5: California

Host(s): Coulter pine, ponderosa pine

Although precipitation was favorable during the winter of 2002-2003, mortality caused by western pine beetle increased in several areas of northwestern California. Elsewhere in northern California, levels of mortality were about the same as 2002, low.

Attention was mostly on southern California where populations of the western pine beetle were at epidemic levels in the San Bernardino and San Jacinto Mountains, and in the mountains of San Diego County. What began as 6,000 mortality acres in the San Bernardino Mountains in 2001, is now 474,000 acres with mortality, and a good deal of it is in the 40 to 60 percent or more mortality range. Mortality of pines in some areas, such as the Coulter-ponderosa-black oak stands in and adjacent to communities on the north shore of Lake Arrowhead, exceeds 90 percent. Among the Coulter pines in Lost Valley, San Diego County, mortality exceeds 80 percent. "Dry hits" observed in May at Skyforest were a symptom of how drought-stressed the pines remained after a winter of average precipitation. Dry hits are attacks where no resin is extruded by the attacked pines.

The western pine beetle also decimated Coulter and ponderosa pines at Charlton Flat in the San Gabriel Mountains, where populations were so high in August that visitors had to brush frass (boring dust and excrement) produced by western pine beetles and pine engravers from picnic tables before and during use.

Insects: Native

Some large pines that were felled in November had thousands of exit holes of the new generation of beetles all along the bole and crown stem from the top to 5 feet above ground line. [The nearby War Memorial Plantation had been thinned a few years previously and mortality there was low.] The western pine beetle also killed Coulter pines at other locations in the San Gabriel Mountains and on Palomar, Hot Springs, and Laguna Mountains in San Diego County.

Region 6: Oregon, Washington

Host(s): Ponderosa pine

The area affected by western pine beetle activity increased from 38,999 acres (1.07 trees per acre) in 2002 to 129,877 acres (1.11 trees per acre) in 2003. Western pine beetle decreased in Oregon from 29,978 acres (0.99 trees per acre) in 2002, to 6,302 acres (0.51 trees per acre) in 2003 and increased in Washington from 9,021 acres (1.31 trees per acre) in 2002, to 123,575 acres (1.14 trees per acre) in 2003. Increases were noted in both large and pole-sized pines. These increases include the Colville reporting area, from 607 acres (1.21 trees per acre) in 2002 to 44,912 acres (0.91 trees per acre) in 2003; and the Colville Indian Reservation, from 2,661 acres (1.20 trees per acre) in 2002 to 20,228 acres (1.13 trees per acre) in 2003. Also, increases where noted in the Northeast Washington reporting area, from 780 acres (1.93 trees per acre) in 2002 to 10,944 acres (1.06 trees per acre) in 2003; and the Spokane reporting area, from 231 acres (2.28 trees per acre) in 2002 to 38,233 acres (1.45 trees per acre) in 2003. One decrease of note is the Rogue River reporting area, from 22,037 acres (1.13 trees per acre) in 2002 to 1,753 acres (0.55 trees per acre) in 2003.

Western pineshoot borer,
Eucosma sonomana

Region 5: California

Host(s): Ponderosa pine

The western pineshoot borer continues to damage plantation ponderosa pine near Pondosa in Siskiyou and Shasta Counties and north of Lookout, Modoc County. Damage in the form of stunted terminals varies widely across plantations, but exceeds 50 percent in some areas. Shoot borer damage is also beginning to appear in ponderosa regeneration at the southern edge of the Fountain Fire plantations, in the upper reaches of Montgomery Creek, Shasta County.

Western spruce budworm,
Choristoneura occidentalis

Region 1: Idaho, Montana

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

Population levels for this native insect have been gradually increasing since 1999 and are in outbreak status in some areas. A total of 141,478 acres in the region were recorded defoliated solely by budworm for 2003. Of that total, only 18,000 acres were in Idaho – most of which occurred in the Kaniksu District of the Idaho Panhandle National Forest. Monitoring plots were installed in northern Idaho where budworm was found heavily feeding on western hemlock – a rare occurrence that has not been recorded since 1939. Montana recorded nearly a quarter of a million acres damaged by spruce budworm (WSBW) for 2003. Small, previously damaged areas detected last year expanded into large landscape masses as seen from aerial survey. In the Bridger Range, on the Gallatin National Forest, WSBW defoliation increased from 15,000 acres in 2002 to 56,004 acres in 2003 – the highest activity increase in the region. Ground observations noted moderate to heavy defoliation in the overstory, with heavy to complete defoliation on

understory hosts. Nearly 30,000 acres in the Helena National Forest were defoliated, mostly concentrated at Fleicher Pass and Stemple Pass on the western side. The Beaverhead-Deerlodge National Forest and surrounding forests of Wisdom, Montana, also showed extremely high defoliation that had continued from last year. Ground surveys in various locations across the State observed WSBW activity where little to none had been detected in previous years. A significant increase in adult moths was caught in pheromone monitoring traps distributed in key locations across both States. Large groups of mature Douglas-fir trees on the National Bison Range were defoliated so severely that upper crowns were completely barren of needles. Aerial and ground surveys suggest that, where defoliation is currently moderate to high, additional damage will continue and even increase by 2004 across Montana. If dry weather conditions persist, WSBW populations will significantly rise and cause more widespread defoliation in both States.

Region 2: Colorado, Wyoming

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

Aerial survey estimates of infested acres for 2003 were 20,000 acres in Colorado and almost 6,000 acres in Wyoming's Shoshone and Medicine Bow National Forests.

The southern portion of the Uncompahgre Plateau has seen significant levels of WSBW defoliation in Engelmann spruce. In 2003, defoliation was light in the Wet and Sangre de Cristo Mountains. This area has long been subject to chronic WSBW activity, but the drought seems to have reduced activity. There was heavy defoliation in Larimer County near Cherokee Park. Acreages of Douglas-fir with light and moderate defoliation are increasing in the Front Range of El Paso and Douglas Counties. Colorado Front Range populations were at low levels in 2003. Isolated pockets of WSBW activity were detected in north-central Colorado on several different landownerships.

WSBW caused moderate to severe defoliation most notably in Douglas-fir (and some subalpine fir) on the lower elevations of the Snowy Range and Sierra Madre in southern Wyoming.

Region 3: Arizona, New Mexico

Host(s): Douglas-fir, white fir, subalpine fir, spruce

WSBW defoliation decreased slightly from 210,335 acres in 2002 to 167,330 acres in 2003. In Arizona, WSBW defoliation was recorded on the Grand Canyon National Park (1,210 acres), and the Navajo Indian Reservation (22,860 acres). WSBW defoliation in New Mexico occurred on the Carson (62,700 acres), Cibola (205 acres), Gila (1,195 acres), Lincoln (15 acres), and Santa Fe (18,675 acres) National Forests; Jicarilla Apache (5,520 acres), Mescalero Apache (20 acres), and Taos Pueblo (1,385 acres) Tribal lands; and 53,540 acres of State and private lands.

Region 4: Idaho, Utah, Wyoming

Host(s): Douglas-fir, true firs

WSBW defoliation continues to increase. In 2003, over 203,500 acres were affected, a dramatic increase over the 22,700 acres reported in 2002. While the majority of the defoliation is still concentrated on the Boise and Targhee National Forests in southern Idaho (approximately 88,300 and 69,700 acres respectively), WSBW defoliation was reported on nearly all forests in the region. In particular, defoliation was mapped on the Salmon-Challis National Forest in Idaho (over 13,600 acres) and the Dixie National Forest in Utah (nearly 9,000 acres). WSBW defoliation affected other ownerships as well. Most notably, over 8,700 acres of State and private lands in Idaho.

Insects: Native

Region 6: Oregon, Washington

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

Areas of visible defoliation increased from approximately 58,463 acres in 2002 to 143,412 acres in 2003. Small areas of light and moderate defoliation were detected on the Mount Hood (623 acres), Ochoco (476 acres), and Wallowa-Whitman (81 acres) reporting areas in Oregon; and on the North Cascades National Park (1,581 acres), the Okanogan reporting area (476 acres), and near Glenwood (1,194 acres), in Washington. A second year of defoliation was recorded on the Malheur reporting area, increasing from 1,896 to 3,435 acres. After a significant decline in 2002, acres of defoliation on the Yakama Indian Reservation increased from 1,296 acres in 2002 to 6,010 acres in 2003. The most notable increase in WSBW defoliation occurred on the Wenatchee reporting area where acres of visible defoliation increased from 51,892 acres in 2002 to 125,010 acres in 2003. Defoliation in the moderate and heavy defoliation categories increased three-fold in 2003.

The most notable decrease occurred on the Gifford-Pinchot reporting area.

Moderate intensity defoliation occurred on 955 acres in the northeast corner of Washington near the Idaho border. Due to the variety of hosts involved, it is believed the defoliation is caused by a budworm complex, which includes western spruce budworm and blackheaded budworm.

White pine weevil,
Pissodes strobi

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

Host(s): Eastern white pine

In Connecticut, more damage was observed than in previous years on white pine and especially on spruce. This perennial problem continued to limit the growth of white pine, as well as Colorado blue and Norway spruce in Maine. In New Hampshire, white pine weevil is widespread statewide. The weevil was commonly found statewide in Vermont.

Yellow poplar weevil,
Odontopus calceatus

Region 8: Tennessee

Host(s): Yellow poplar

Reduced populations were reported in 2003; leaf damage remained below 10 percent. Virginia reported light populations throughout the southwestern mountains.

Zimmerman pine tip moth,
Dioryctria ponderosae
D. zimmermani
D. tumicolella

Region 2: Kansas, Nebraska, South Dakota

Host(s): Austrian pine, Scots pine, ponderosa pine, Colorado blue spruce

Zimmerman pine tip moths continue to kill branches and entire trees in pine windbreaks, plantations, and landscape plantings in Kansas and Nebraska. In South Dakota, Zimmerman pine moth infestations are increasing. The two species most affected are Austrian and ponderosa pines, with many Austrian pine windbreaks in the southeastern part of the State showing almost 100 percent of the trees infested. In addition, there have been a number of blue spruces that have become infested with a *Dioryctria* insect.

Insects: Nonnative

Alder woolly sawfly,
Eriocampa ovata

Region 10: Alaska

Host(s): Sitka alder, red alder, thinleaf alder

Heavy defoliation of thin-leaf alder (*Alnus tenuifolia*) was observed for the seventh consecutive year in many parts of the Anchorage Bowl; especially in riparian areas. Sitka alder (*A. crispa*) was seldom defoliated. Similar to the birch leaf miner, the alder woolly sawfly appears to be a recent (less than 10 years) introduction into the State. This sawfly is a European species now established throughout the northern contiguous United States, Canada, and recently into Alaska.

Ambermarked birch leaf miner,
Profenusa thomsoni

Region 10: Alaska

Host(s): Birch

Five species of birch-leaf mining sawflies were inadvertently introduced to North America from Europe in the last century, three of which have made their way to Alaska. *Fenusa pusilla* and and *Heterarthrus nemoratus* were collected from birch in 2003. However, these two species are rare in occurrence and cause little defoliation. *P. thomsoni*, the ambermarked birch leaf miner, on the other hand, has become a widespread pest of native and introduced birch in Alaska. Birch defoliation was very noticeable in the Anchorage Bowl from late July to August. More than 32,000 acres of defoliated birch were mapped during aerial surveys. It appears that the ambermarked birch leaf miner is a recent introduction into the Anchorage Bowl and is rapidly expanding. This leaf miner has since spread into the Eagle River and Mat-Su areas and as far south as Bird Ridge; approximately 30 miles south of Anchorage. Ground surveys have indicated low levels of leaf miner defoliation as far north as Talkeetna (Parks Highway) and Pinnacle Mtn. (Glenn Highway). It has also been identified from southeast Alaska near Haines and Skagway. It was accidentally introduced into the Fairbanks area. A cooperative biological control program (USDA Forest Service and APHIS, State of Alaska/Division of Forestry, Canadian Forestry Service, and the University of Alberta) was initiated in 2002. It is anticipated that *L. luteolator* will be released in Alaska during the summer of 2004. This parasitic wasp could be a promising biological control agent for the ambermarked birch leaf miner. In the absence of an efficient biological control agent, birch leaf miner populations will continue to spread unchecked throughout many parts of south-central and interior Alaska's birch forests.

Ambrosia beetle,
Xyleborus similis
Xylosandrus mutilatus

Region 8: Tennessee

Host(s): Pines, hardwoods

A South-wide trapping effort to detect the recently discovered *Xylosandrus mutilatus* was implemented in 2003. An infestation in one black walnut plantation in western Tennessee was reported in which these beetles, in conjunction with a canker fungus, rapidly killed 5 percent of the trees.

Asian longhorned beetle,
Anoplophora glabripennis

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

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

There were several new infested locations found in New York in 2003; however, all of them were within the Federal quarantine areas around New York City and Long Island. The total number of infested trees found in New York since 1996 now exceeds 6,000. In New Jersey, during the fall and winter months, survey crews examined all of the host trees within a ½-mile radius of the 2002 initial find in Hudson County to determine the extent of the infestation from this exotic wood-boring insect. Initial surveys found 102 trees infested in Jersey City. An adult beetle was found in Chicago, the first since 1998. Tree climbers found an American elm with a beetle hole one block from where the beetle was found, and a nearby silver maple showed early signs of infestation. Both trees were removed and intensive surveys continue.

Balsam woolly adelgid,
Adelges piceae

Region 1: Idaho

Host(s): Grand fir, subalpine fir

Aerial survey data estimate 24,500 acres infested by the balsam woolly adelgid (BWA) in northern Idaho in 2003. This number is a sharp decrease from the 85,400 acres recorded in aerial surveys conducted in 2002. The decrease is likely due to a reduction in the area surveyed in 2003 over 2002 and not to a decline in the BWA population or distribution in the region. Aerial surveys reported 85,400 acres infested in 2002, 51,500 acres infested in 2001, and 56,400 acres infested in 2000. In actuality, the number of acres infested likely exceeds all of these numbers since some areas may not yet be displaying crown symptoms. Areas with the heaviest infestations occur on the Saint Joe, Clearwater, and Nez Perce National Forests and adjacent State, private, and BLM lands. Subalpine fir of all ages and size classes are killed. Extensive gouting and bole infestations occur on grand fir, but to date no grand fir over 5 inches in diameter has been documented as being killed by 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.

Insects: Nonnative

Region 6: Oregon, Washington

Host(s): True firs

BWA activity continued to increase for a fourth straight year in the region. Over 142,050 acres of BWA damage were detected in 2003, compared to a total of 82,429 acres affected in 2002, and 50,824 acres in 2001, and 6,300 acres in 2000. Increases were noted on most Oregon reporting areas where host occurs, although slightly fewer acres were detected on the Umatilla reporting area in 2003. In Washington, acres affected by BWA increased on the Gifford-Pinchot reporting area, but decreased slightly on the Olympic National Park. Favorable environmental conditions during the winters and springs of 2001 thru 2003 have supported increased levels of activity. A change in aerial survey signatures, using lichen loads as indicators of BWA, have also been responsible for the increased number of acres detected. The validity of this signature method will be evaluated over the next 2 years.

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 introduction of the BWA, approximately 64,700 acres of Fraser fir have been affected. The insect attacks all age classes, but prefers older trees. The summer of 2003 witnessed high populations in all infested areas. However, there is an abundance of uninfested or lightly infested regeneration in most areas. Many casual observers believe this portends well for the future, but in fact, these trees will almost certainly become heavily infested as they mature.

Region 9/Northeastern Area: Connecticut, Maine, New Hampshire, Vermont, West Virginia

Host(s): Balsam fir

BWA is seen on occasional landscape fir in Connecticut, but do not seem to threaten nearby Fraser fir Christmas trees. BWA populations in Maine appear to have lessened in 2003, as a result of winter mortality associated with low temperatures. New damage should be lower than in the past 7 or so years. Mortality of fir resulting from the combination of BWA damage and past drought was very striking in fir areas located south of Millinocket and is likely to continue for a few more years. In New Hampshire, the BWA is causing damage and mortality throughout the range of balsam fir, except in the extreme northern part of the State. In Vermont, there was damage and mortality observed, in combination with drought, on about 9,000 acres. In West Virginia, BWA was not surveyed for during the 2003 season; however, peripheral observations this year indicated BWA is still present and causing mortality in Randolph, Pocahontas, and Tucker Counties.

Banded elm bark beetle, *Scolytus schevyrewi*

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

Host(s): American elm, rock elm, Siberian Elm

The banded elm bark beetle was first detected in Denver in an exotic bark beetle trap and has since been discovered in Colorado, Kansas, Nebraska, South Dakota, and Wyoming. Adults are active from early spring until fall freeze and the insects can complete a generation in 4 to 6 weeks depending on weather conditions.

This beetle was first observed in Aurora, Colorado, in March 2003 and now is found throughout lower elevations of Colorado and in nine other nearby States. Of particular concern is when the beetles are found

in elms with Dutch elm disease; banded elm bark beetle might be able to vector this disease to other American elm trees.

Banded elm bark beetle was discovered in Cheyenne in September 2003 in a Siberian elm windbreak; the beetle has since been found throughout Laramie County and distribution statewide is unknown.

Birch leaf miner,
Fenusa pusilla

Region 9/Northeastern Area: New Jersey, Pennsylvania, Vermont

Host(s): Gray birch

In New Jersey, no incidence of this pest was reported this year. In Pennsylvania, this pest caused damage to foliage and shoots on approximately 50,000 acres of birch in Tioga County. Damage was reduced statewide in Vermont.

Black twig borer,
Xylosandrus compactus

Region 5: Hawaii

Host(s): Numerous, both native and exotic

First detected in Hawaii in 1961, the black twig borer and its associated pathogens continue to be a serious pest of native and nonnative shrubs and trees, affecting more than 200 species. Several species affected by this ambrosia beetle are rare and/or endangered and the black twig borer continues to hinder forestry plantings as well as native ecosystem restoration in the State.

Region 8: Florida

Host(s): Red bay, dogwood, eastern redcedar, others

Black twig borers were notably active in northern Florida in the spring of 2003, with damage reported in six counties. The primary impact was to the aesthetic quality of infested trees.

Browntail moth,
Euproctis chrysorrhoea

Region 9/Northeastern Area: Maine

Host(s): Red oak

The Casco Bay region in Maine northeast to the Penobscot River continued to support moderate to high population levels of browntail moth in 2003. Low winter temperatures slowed expansion to inland areas, but coastal lands remain heavily infested. Webs collected to assess winter mortality showed that those located 5 miles or more from the coastline exhibited 90 percent larval mortality while webs adjacent to the ocean had little if any winter losses.

Common European pine shoot beetle,
Tomicus piniperda

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

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

The Maine Forest Service and APHIS, Division of Plant Protection and Quarantine, have conducted joint trapping surveys in Maine since 1999. Beetles have been trapped in funnel traps in Franklin County and northern Oxford County since 2000 and these counties are regulated. No signs of tree damage were seen during scouting surveys of red pine plantations in areas where the beetles were trapped. Trapping in Pittsburg and Clarksville in New Hampshire caught 478 beetles. The number of New York counties where this pest has been found increased to 42 this year. The new counties are Sullivan, Greene, Albany, Schenectady, Montgomery, Saratoga, and Hamilton. In general, New York State has not experienced as high a severity of damage from this insect. In Vermont, damage was found in Orleans County where the highest trap counts have occurred. One beetle was caught in Washington County, while none were caught in Franklin, Lamoille, Chittenden, Grand Isle, Orange, or Windham Counties. Five new counties were found infested in Illinois (Caroll, Ford, Henry, Mason, and Peoria) and one new county in Indiana (Union). Delaware did not find any pine shoot beetle adults during 2003. In Maryland pine shoot beetle continues to be present in Allegany, Frederick, Garrett, and Washington Counties. In 2003, the pine shoot beetle was reported for the first time in Montgomery County. In Ohio, pine shoot beetle continues to be present in 76 counties and was observed for the first time in Gallia County in 2003. In Pennsylvania, this beetle has been found in 35 counties in the western and northern parts of the State. The West Virginia Department of Agriculture has confirmed the following 15 counties infested: Hancock, Ohio, Brooke, Tyler, Marshall, Tucker, Grant, Mineral, Preston, Pleasants, Monongalia, Taylor, Wetzel, Marion, and Harrison. In 2003, Wetzel, Marion, and Harrison Counties reported beetle occurrence for the first time. A Federal quarantine is in effect for this insect.

Elongate hemlock scale,
Fiorinia externa

Region 9/Northeastern Area: Connecticut, New York, Pennsylvania

Host(s): Eastern hemlock

Infestations are heavy throughout Connecticut, in a wider area each year (further north and east) and on both landscape *Tsuga* and plantation grown *Abies*. This insect is generally found in southeastern New York, most often in conjunction with infestation by hemlock woolly adelgid. In 2003, it was observed in Monroe County for the first time, at an abandoned nursery. No new occurrences have been found of the unidentified entomopathic fungus that was first found at Mianus River gorge a few years ago and since at two other locations. In 2003, this scale caused mortality on 5 acres of eastern hemlock in Montour County, Pennsylvania.

Emerald ash borer,
Agrilus planipennis

Region 9/Northeastern Area: Maryland, Michigan, Ohio

Host(s): Ash

This insect is now considered established in six southeast Michigan counties — Livingston, Macomb, Monroe, Oakland, Washtenaw, and Wayne. Eradication is being attempted in 10 counties in southern

Michigan, from Ottawa and Kent Counties to the west, and a ring of counties surrounding where the insect is currently established. The beetle currently infests over 2 million acres. Plans include a statewide detection survey in 2004. Trap trees will be used in high-risk areas throughout the State in an effort to detect below-damage threshold populations, and to help define the advancing front. Risk is defined using knowledge of ash resources and visitors days from people from infested counties ascertained from State Parks records. In Maryland, emerald ash borer-infested nursery stock from Michigan was found in a Prince Georges County nursery. The Maryland nursery received a total of 121 trees from Michigan in April of 2003. The trees were destroyed in September of 2003 by the Maryland Department of Agriculture. In Ohio, emerald ash borer surveys found 336 trees within survey sites to be infected by the emerald ash borer in Lucas, Defiance, Wood, Franklin, and Paulding Counties. Less than 50 percent of the trees within survey sites were infested. In an effort to prevent further spread, the Ohio Department of Agriculture imposed quarantine on ash trees, logs, lumber, bark, chips, and firewood from infested areas. In addition, the agency enacted an external quarantine on all such products from Michigan.

Gypsy moth (Asian),
Lymantria dispar

Region 5: California

Host(s): Hardwoods

The first capture of an Asian gypsy moth in California occurred in Los Angeles on July 9, 2003, at a site along South Avalon Boulevard. This area is considered a high-risk area for introduction of Asian gypsy moth and the gypsy moth trap density in the area was at 10 traps per square mile. The California Department of Food and Agriculture increased the trap density to 25 traps per square mile in a 9 square mile area around the find.

Gypsy moth (European),
Lymantria dispar

Region 1: Idaho, Montana, North Dakota, Wyoming

Host(s): Hardwoods

Cooperative detection monitoring for the gypsy moth in the region with APHIS and State Departments of Agriculture, Forestry, and Lands continued in 2003. A network of strategically located pheromone-baited traps was placed throughout all States in the region. On Federal lands in 2003, two gypsy moths were caught, one in the Madison Campground and the other in the Fishing Bridge Campground, both in Yellowstone National Park. This is the third consecutive year a moth has been caught at the Fishing Bridge site. On State lands, no moths were caught in Idaho, Wyoming, Montana, or North Dakota. The trapping program will continue as usual next year with the addition of delimitation trapping grids at the Madison and Fishing Bridge campgrounds in Yellowstone.

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

Host(s): Hardwoods

Throughout the region, several thousands of detection traps are deployed to find early arrivals of gypsy moth. Fortunately, there were no moths caught in these traps. Also, no insect larvae or pupae were found on trees in the region, nor has any defoliation been attributed to this insect.

Particular attention is given to trapping in high-use recreation areas and around nurseries importing stock from infested States. One of these traps in the Denver area caught two moths and six moths were found throughout Wyoming.

Region 3: Arizona, New Mexico

Host(s): Hardwoods

No male gypsy moths were trapped in Arizona or New Mexico during 2003.

Region 4: Idaho, Nevada, Utah

Host(s): Hardwoods

The gypsy moth was first detected in Utah in 1988. Between 1989 and 1993, almost 72,000 acres of Federal, State, and private lands were treated with *Bacillus thuringensis* (Bt). In 1995, after 2 years of intensive pheromone trapping resulted in no male moth captures, the gypsy moth was declared eradicated. In 1997, as a result of new introductions, 46 moths were captured in Salt Lake City and one moth on the adjacent Wasatch-Cache National Forest. In 1998 and 1999, the Utah Department of Agriculture, in cooperation with the USDA Forest Service, treated approximately 800 acres each year in Salt Lake County with Bt. In 2000, only one moth was captured in a 10-acre mass-trapping grid. No adult male moths were captured in the 2001 mass trapping grid. In 2002, one male gypsy moth was captured in the Utah gypsy moth detection program on Hill Air Force Base in northern Utah. The 2003 delimitation trapping on the base produced no moths. However, two male moths were captured on the north slope of the Uinta Mountains in northeastern Utah. Delimitation trapping will occur within this area in 2004.

Region 5: California

Host(s): Hardwoods

Pest Detection of the California Department of Food and Agriculture trapped six male moths in 2003 – two in Los Angeles County and one each in Riverside, San Bernardino San Mateo, and Santa Cruz Counties. No properties with egg masses or pupal cases were found in 2003.

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, 59 moths were caught in 17 areas. Fourteen were caught in Port Ludlow and three egg masses were found. In the Bellevue area, 17 moths were caught and 2 egg masses found. In the Roanoke area, still in King County, five moths were trapped, but no egg masses have been found. In Lewis County, eight moths were found in one trap, and other life stages were found. Washington Department of Agriculture is proposing three eradication sites; Port Ludlow (15-20 acres), Bellevue (10-15 acres), and near Mossy Rock.

In Oregon, 27 moths were caught in 2003. Seventeen moths were caught in the Eugene area, and all other life stages were also found, including female moths laying new egg masses. Two moths were found in the Gresham area. This is the third year that moths have been caught at this site, but intensive searches have yet to find any egg masses. Three moths were caught in the Ames area along Bull Run Road. Most of the rest of the moths were single catches scattered throughout the State. No moths were caught in the Fisher site where the State conducted an aerial eradication project this year. The only area proposed for treatment in 2004 is the Eugene site.

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

Host(s): Hardwoods, especially oak species

Virginia reported 79,927 acres of gypsy moth defoliation, a modest increase over 2002 levels. In 2003, the egg hatch was poor in some areas, and cool, wet weather combined with a late spring freeze hindered larval development. Entomophaga fungus activity killed many larvae before they were fully grown. Because of this, the potential for defoliation in 2004 appears low.

In 2003, Tennessee trapped a total of 208 moths in 18 counties, reflecting a decrease from the 1,630 moths captured in 2002. Three areas in the State are currently infested; eradication activities were conducted on 16,419 acres in Campbell County. No moths were captured in Monroe and Wilson Counties, although mass trapping is planned. The moth was eradicated from sites in Scott and Sevier Counties in 2003.

The Gypsy Moth Slow the Spread Project (STS) conducted aerial treatments in seven States. In the Southern Region, STS treatments took place in Virginia and North Carolina. More than 90 percent of the treatment acreage is treated using mating disruption, a tactic that is specific to the gypsy moth. A significant increase in male moth captures was noted in North Carolina during 2003. This is believed to have been the result of a "blow-in" of moths from infested areas to the north due to unusual weather conditions, but this can only be determined by conducting egg-mass surveys, an activity planned for the 2003-2004 winter.

Region 9/Northeastern Area: Indiana, Maryland, Michigan, New Jersey, New York, Ohio, Pennsylvania, West Virginia, Wisconsin

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

The fungus *Entomophaga maimaiga*, virus, and parasites continued to keep the gypsy moth population at low levels in many areas in the Northeast, except for Michigan and Wisconsin. There was no defoliation reported in Connecticut, Maine, Massachusetts, Rhode Island, New Hampshire, or Vermont. Only 200 acres were defoliated on Long Island in New York. Egg mass counts in New England and New York indicate that populations should remain low in 2004.

Wisconsin populations have increased steadily since 2000 with heavy defoliation occurring over 65,000 acres, up from 24,000 in 2002. Most of the defoliation was in eastern parts of the State along Lake Michigan, from Marinette County to the Illinois border. Populations in Milwaukee, Kenosha, and Racine in the south declined the past year. For the first time, oak forests in southern Dickinson County in Michigan's Upper Peninsula were defoliated enough to be included on aerial surveys. Abundance of egg masses in this area and in the adjacent Menominee County forecast a rapidly growing population. Egg mass counts in other historically gypsy moth infested States indicate that populations should remain low in 2004.

Hemlock woolly adelgid,
Adelges tsugae

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

Host(s): Eastern hemlock, Carolina hemlock

Infestations of the hemlock woolly adelgid (HWA) spread and intensified in the Carolinas and northern Georgia in 2003, and its first observed occurrence in eastern Tennessee was reported. Two new counties in South Carolina were reported to be infested. Efforts at chemical control were undertaken in the Great Smoky Mountains National Park, and the rearing and release of HWA predators was expanded. However, the expanding infestation continues to outpace control efforts and the prognosis for survival of both of the eastern hemlock species in the wild is grim.

Insects: Nonnative

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

Host(s): Eastern hemlock

HWA continues to spread throughout the generally infested area causing hemlock decline and tree mortality. The only newly infested county reported in West Virginia was Webster County. This brings the total number of infested counties to 20 within the State. Ohio reported two isolated infestations in late 2002 in Lake County as a result of importation of out-of-State infested nursery stock. Both of these Ohio infestations were subsequently eradicated. The cold winter temperatures during 2002-2003 generally reduced HWA numbers throughout the Mid-Atlantic States. By spring, HWA densities rebounded in most areas. Biological control activities to establish natural enemies of this pest continued in 2003. More than 40,000 of the lady beetle predator *Pseudoscymnus tsugae* were released in Maryland, New Jersey, Pennsylvania, and West Virginia and 1,200 of the derodontid beetle, *Laricobius nigrinus,* were released in Maryland, Pennsylvania, and West Virginia.

In Connecticut, landscape populations were down this year. Due to predator release, HWA mortality on woodland sites was generally very high. At predator release sites, hemlocks exhibited vigorous new shoot production and low levels of adelgid in the crown. The abundance of new shoots on hemlock crowns over much of the State was in stark contrast to drought stressed hemlock crowns on 2002. In Massachusetts, seven new communities were added to the list of communities with known infestations. A total of 274 acres of decline and mortality were observed during the aerial survey. The State continued to release and monitor *Pseudoscymnus tsugae*, with 11 release sites and a total number of approximately 65,000 ladybird beetles released. The severe cold experienced during February 2003 resulted in HWA mortality near 90 percent in some locations. This insect mortality, combined with the increased rainfall during the growing season, has increased the health of the hemlock substantially. During 2003 HWA, infestations were found for the first time in native Maine hemlocks at two locations in southern York County. Both infestations are less than 2 years old and still confined to few branches per tree at trace to light levels. One infestation is scattered throughout Gerrish Island, a small island connected by bridge to Kittery Point, which has 500 acres of mixed hardwood/softwood growth. The second infestation is in York and confined to a ½-acre area in a residential area. The Maine Forest Service is in the process of conducting ground surveys around the infested areas. Infestations were also found in three landscape plantings in Kennebunkport (York County), South Portland (Cumberland County), and Northeast Harbor (Hancock County). A total of 15 trees, varying in size from 6 to 16 feet, were removed and destroyed. The infestations were brought to the attention of the State by the general public as a result of Maine's media alerts and are all linked to shipments from other States. Since 1999, a total of 146 infested hemlocks have been removed from 43 sites.

In New Hampshire, currently only Rockingham County is quarantined. In 2003, three new sites were found: Chester and Atkinson in Rockingham County and Jaffrey in Cheshire County. HWA has been found in four counties: Rockingham, Hillsborough, Merrimack, and Cheshire; however, due to the small number of trees infested, eradication attempts seem successful and Hillsborough, Merrimack, and Cheshire Counties are not quarantined. The new sites are believed to have been infested through natural spread by birds. In New York, HWA continues to cause damage and mortality to native forest and ornamental eastern hemlock trees. Ground surveys indicated that the distribution of this insect did not spread as significantly as it had the previous year. HWA was found in Albany County for the first time in 2003 and several new township records were discovered as well. In Rochester, which is more than 200 miles from the nearest natural infestation, two additional infested sites associated with planted stock were found. It is still hoped that HWA can be eradicated from the Rochester area. Damage is most severe in areas that have been infested for several years. In some areas a majority of the trees are infested and many of those are in declining health or dead. Pockets of hemlock mortality can be seen from the air in infested areas. HWA continued to kill tees in Rhode Island. Many urban and suburban trees were being successfully treated with insecticide and horticultural oil. Infested forest stands are in the decline.

Larch casebearer,
Coleophora laricella

Region 6: Oregon, Washington

Host(s): Western larch

Approximately 25,200 acres were mapped in 2003 compared to only 248 acres in 2002. This marks the first increase in detected defoliation after four straight years of declines. Increases included the Mount Hood reporting area, from 241 acres in 2002 to 2,643 acres in 2003, and the Umatilla reporting area, from 7 acres in 2002 to 259 acres in 2003. New this year are the Colville reporting area (6,669 acres), the Kaniksu reporting area (4,431 acres), the Okanogan reporting area (5,023 acres), the Wallowa-Whitman reporting area (2,996 acres), the Ochoco reporting area (1,169 acres), the Malheur reporting area (806 acres), the Colville Indian Reservation (697 acres), Northeast Washington reporting area (358 acres), and Warm Springs Indian Reservation (125 acres).

Larch sawfly,
Pristiphora erichsonii

Region 10: Alaska

Host(s): Eastern larch, Siberian larch

In 2003, larch sawfly activity continued a decline that began after 1999 when sawfly populations impacted nearly 450,000 acres. Less than 600 acres of larch sawfly defoliation were recorded during aerial surveys this year. The steady decline of this infestation is due to massive mortality incurred by native larch in interior Alaska. In south-central Alaska, the larch sawfly has continued its advance southward affecting ornamental Siberian larch plantings from Sterling to Homer on the Kenai Peninsula. While larch is not native south of the Alaska Range, it is a popular landscape tree. The ornamental (Siberian) larch plantings appear to be less susceptible to stress from repeated defoliation by the sawfly and are responding better to nonchemical control measures. Larch sawfly continues to expand into the south-central Alaska urban areas.

Lobate lac scale,
Paratachardina lobata lobata

Region 8: Florida

Host(s): Melaleuca; over 100 other woody species

Numerous complaints were received by foresters and extension specialists in southern Florida from residents concerned about decline and mortality of Melaleuca (*Melaleuca quiquenervia*) urban shade trees. The decline appeared to be largely due to infestation by the lobate lac scale, an insect native to India and Sri Lanka that has become established along much of the southeast coast of Florida since its initial detection in 1999. Ironically, Melaleuca is an aggressive exotic wetland pest plant against which Federal and State agencies have released other insect biological control agents. These biological control agents sometimes occur together with lobate lac scale on urban Melaleuca trees, but the urban decline seems to be driven primarily by the scale. It is not yet known whether the scale will also attack native woody plant species.

Pear thrips,
Taeniothrips inconsequens

Region 9/Northeastern Area: Vermont

Host(s): Red maple, sugar maple

Populations in Vermont remain low with light widely scattered defoliation.

Pine cone beetle,
Chlorophorus strobilicola

Region 8: Florida

Host(s): Pine

In December 2003, live adults and larvae were found in scented pine cones contained in scented potpourri sold in Target and Wal-Mart stores in several locations in Florida, including Lake Mary, Largo, Tampa, Jacksonville, Coral Springs, and Murdock. The scented cones were imported from India and the USDA has instituted a national recall on the product, with the cooperation of the Florida Commissioner of Agriculture. It is uncertain whether or not this beetle could successfully infest cones of native southern pines.

Pink hibiscus mealybug,
Maconellicoccus hirsutus

Region 8/IITF: Puerto Rico, Virgin Islands, Florida

Host(s): Hibiscus, many other species

The pink hibiscus mealybug (PHM) is a serious pest of over 200 plant species, and is known to occur on more than 20 Caribbean Islands. It was detected in Puerto Rico in 1997, but to date no infestations have been identified on the Caribbean National Forest. Frequent monitoring surveys are conducted, assisted by the USDA Forest Service. It appears that parasitoids were introduced simultaneously with the mealybug, reducing the impacts in Puerto Rico. With support from the USDA Forest Service and APHIS, the Puerto Rico Department of Agriculture continues to rear and release two species of parasitic wasps to combat the PHM. Surveys indicate population reductions of 85-90 percent have been achieved at the parasitoid release sites.

An infestation was detected in Miramar County, Florida, in June 2002. By mid-July, it had spread to Broward and Miami-Dade counties and encompassed 22 square miles. The USDA and the Florida Division of Plant Industry initiated weekly releases of parasitoids in the infested areas, utilizing parasitoids reared in Puerto Rico. At the time the two parasitoids were released, the coccinellid *Cryptolaemus montrouzieri*, a predator, was commonly found in PHM infested areas. A total of 254,000 *A. kamali* and 295,000 *G. indica* were released in 604 sites from July 8, 2002, to August 7, 2003. As of August 7, 2003, releases have covered approximately 121 square miles. Population reductions of the PHM range from 92-97 percent, and hibiscus not killed by initial infestations are recovering. Parasitism rates near release sites have been variable, and in many cases the predators appear to be the main source of mealybug population reduction. Hyperparasites also have been discovered. The range of the PHM is expanding slowly, and the natural enemies appear to be spreading along with their hosts. Continued parasitoid releases are planned for 2004.

Red pine scale,
Matsucoccus resinosae

Region 9/Northeastern Area: Connecticut, Massachusetts, Rhode Isalnd

Host(s): Red pine

New infestations in Massachusetts, totaling 100 acres, were identified in Hampden and Hampshire Counties. Scale occurs statewide in Connecticut and Rhode Island.

Red-haired pine bark beetle,
Hylurgus ligniperda

Region 9/Northeastern Area: New York

Host(s): Pine

The State is not aware of any new trap records for this bark beetle. Previously, it had been found in Monroe, Wayne, and Ontario Counties and considered established in Monroe County. It primarily infests dead stumps, but may be a vector of *Leptographium* fungi to healthy 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. Biological control has resulted in population reduction in many areas.

Satin moth,
Leucoma salicis

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

Host(s): Aspen

As in 2002, defoliation of both quaking and bigtooth aspen by this species was very limited this year in Maine. Dieback of tree crowns from past feeding damage is quite apparent in the area between Millinocket Lake and Mt. Katahdin in central Penobscot and Piscataquis Counties that had sustained heavy damage in past years. Heavy localized defoliation occurred in New Hampshire. Widely scattered mortality has occurred in Vermont from previous defoliation.

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*. Quarantine remained in effect in several northeastern counties.

Spruce aphid, *Elatobium abietinum*

Region 3: Arizona, New Mexico

Host(s): Engelmann spruce, blue spruce

In Arizona, spruce aphid defoliation was recorded on the Apache-Sitgreaves National Forest (49,385 acres); Fort Apache (71,585 acres) and San Carlos (90 acres) Indian Reservations; and 60 acres of State and private lands. No spruce aphid activity was detected in New Mexico.

Region 5: California

Host(s): Sitka spruce

Sitka spruce continues to show thinned crowns from repeated feeding by this aphid in north coastal Humboldt County.

Region 10: Alaska

Host(s): Sitka spruce

There was a brief decline in defoliation in 2002, due to a period of very cold weather during the first week of April that killed many of the overwintering aphids. In 2003, defoliation levels significantly increased to 30,627 acres and was distributed along shore or beach fringes. Defoliation was mapped from the southern end of Dall Island in the south to Yakutat Bay in the north. The Juneau area continued to experience heavy aphid defoliation, although the aerial survey data did not accurately capture it.

Twospotted leafhopper, *Sophonia rufofascia*

Region 5: Hawaii

Host(s): Numerous, both native and exotic

Native to Asia, the twospotted leafhopper has been recorded on over 300 host plants in Hawaii. First documented in 1987 on the island of Oahu, the leafhopper has spread to all of the major islands and can be found from sea level to 4,000 feet. Of major concern are its impacts on ohia lehua (*Metrosideros polymorpha*), a dominant tree in native Hawaiian forests, and uluhe (*Dicranopteris linearis*), a common native fern that provides cover on steep slopes. The leafhopper has also been reported to be killing populations of the invasive firetree (*Morella faya*) on the island of Hawaii.

Uglynest caterpillar,
Archips cerasivoranus

Region 10: Alaska

Host(s): Cotoneaster, crabapple, mountain ash

In 2001, USDA Cooperative State Research, Education, and Extension Service and Alaska Division of Forestry entomologists found the uglynest caterpillar on cotoneaster and mountain ash hedge plantings in west Anchorage, downtown, and in south Anchorage. This introduced pest, which arrived on ornamental plantings into the Anchorage area, has continued to spread in 2002 around the Anchorage area and has been observed infesting cotoneasters, mountain ash, *Prunus* spp., spp., *Malus* spp. and spp. and *Salix* spp. This year, the pest was again observed in south Anchorage, and was newly discovered on landscape trees and shrubs at the Ted Stevens International Airport.

Unnamed bark beetle,
Hylurgops palliatus

Region 9/Northeastern Area: New York, Ohio, Pennsylvania

Host(s): Pine, larch, spruce

This European bark beetle, recovered for the first time in North America in a forest stand of Norway spruce, Scotch pine, and red pine in Erie, Pennsylvania, in 2001, was the subject of a delimiting survey in 2003. 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. In 2003, 20 sites in 9 western Pennsylvania counties, 3 sites in 2 northeastern Ohio counties, and 6 sites in 2 western New York counties were surveyed from March to May. The species was recovered at all sites in Ohio, 15 sites in Pennsylvania, and 2 sites in New York.

Winter moth,
Operophtera brumata

Region 9/Northeastern Area: Massachusetts

Host(s): Apple, northern red oak, American elm, red maple, basswood, poplar, willow

For a number of years, coastal Massachusetts has been experiencing defoliation by loopers, presumably fall cankerworm or Bruce spanworm. This past growing season concern rose about the continuing defoliation and an effort was made to confirm the identification of the defoliator. In December, Cornell University positively identified the samples as Winter Moth. A total of 24,423 acres of defoliation were documented in Plymouth, Barnstable, Norfolk, and Essex Counties.

Diseases: Native

Alder canker,
Ophiovalsa suffusa

Region 10: Alaska

Host(s): Thin-leaf alder

In 2003, substantial mortality of thin-leaf alder (*Alnus tenuifolia*) by the alder canker (*Ophiovalsa suffusa*) was observed and identified for the first time. Dead alders were observed by ground survey in riparian areas of south-central Alaska totaling hundreds, perhaps thousands, of acres. All age classes of thin-leaf alder appear to be susceptible. Although mortality of alder is not typically considered a problem, continued extensive mortality of a specific riparian alder species may have important long-term ecological consequences. Further studies of the biology, ecology, and impacts of this fungus are planned across south-central and interior Alaska. Mortality of thin-leafed alder by the alder canker is expected with continued drought conditions and heavy insect defoliation. The susceptibility of *A. crispa* and *A. rubra* is not yet known, but is under investigation.

Annosus root disease,
Heterobasidion annosum

Region 1: Idaho, Montana

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

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. Annosus root disease is widespread at low levels on Douglas-fir and true firs in mixed conifer stands throughout western Montana and northern Idaho. It is frequently found in association with other root diseases, 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 disease 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 an important factor contributing to the blowdown of white fir on the Klamath and Six Rivers National Forests. It continued to contribute to the mortality of ponderosa pine on McCloud Flats, Siskiyou County. The pathogen was responsible for thin crowns and reduced height growth of a stand of white fir west of Goose Lake in the vicinity of Black Reservoir, Modoc County.

Region 6: Oregon, Washington

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

Annosus root disease causes damage primarily in partially harvested white and grand fir stands in southern and eastern Oregon and eastern Washington. Damage from stem decay also occurs in subalpine fir, red fir, noble fir, pacific silver fir, and mountain hemlock, especially in partially harvested stands and in wounded trees. Mortality is high where annosus root disease and fir engravers occur together. Despite high infection levels in stumps cut 15 to 20 years ago, mortality of surrounding true fir regeneration is low in northeastern Oregon, but decay levels may be high. Annosus root disease in low-elevation western hemlock occurs primarily as a butt rot in wounded trees. Efforts are underway to artificially inoculate unwanted western juniper with *Heterobasidion annosum* to create mortality centers in eastern Oregon.

Region 8: Regionwide

Host(s): Southern pines

South Carolina reported slight declines in annosum root disease losses, apparently as a result of the relief from recent drought stress. Surveys indicated 50,040 acres of pine stands affected by the disease in sandy sites across the State, representing a timber value loss of $1,351,080. In Florida, this disease is an ongoing problem. Not only are serious losses suffered in scattered plantations, annosus root disease is also associated with southern pine beetle and other bark beetles and is often a precursor to their infestations. It occurs in both thinned and unthinned pine stands. In 2003, annosus losses were reported in Barbour, Macon, and Russell Counties in Alabama; Marion and Stewart Counties in Georgia; Aiken and Bardwell Counties in South Carolina. Annosus was also reported affecting white and red pine stands on the Dry River Ranger District of the George Washington-Jefferson National Forest in Virginia.

Region 9/Northeastern Area: Michigan, Wisconsin, Vermont

Host(s): Red pine

In Michigan, nine centers of infection were identified, affecting from 10-50 trees per center. In Wisconsin, annosus root rot was first reported in 1993 as a cause of mortality in a red pine plantation in Adams County. A new county, Dunn, was found to have the disease, bringing to 11 the total number of counties known to have diseased stands. In Vermont, the disease is observed occasionally causing significant butt rot in white pine sawtimber.

Anthracnose, *Gnomonia* spp.

Region 8: Kentucky

Host(s): Black walnut

Walnut anthracnose (*Gnomonia leptostyla*) was first reported in Kentucky in 2003, producing foliar damage on black walnuts in both forest and landscape settings all across the State. The appearance of this

disease is thought to be related to the significant increase in rainfall during the spring and early summer. No mortality has been reported or is expected, although a continuation of foliar injury over 2 or 3 years might produce more serious impacts.

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

Host(s): American sycamore, ash, beech, birch, maples, oaks, miscellaneous hardwoods

The wet and cool conditions in spring and summer of 2003 created conditions optimal for anthracnose development in several States. Pennsylvania ground surveys recorded numerous tree species, including American sycamores, affected by anthracnose in 16 northwestern counties. A total of 42,782 acres were found to have anthracnose-damaged foliage or shoots. In addition, Pennsylvania also recorded a total of 900 acres that were defoliated, discolored, or had significant dieback. West Virginia aerial surveys detected 18,573 acres with discolored tree canopies and another 272 acres of defoliation. The disease was present throughout Connecticut on many hardwoods including sycamore, oak, ash, beech, maple, and hickory. Sycamore was particularly hard-hit; many trees refoliated three times and anthracnose developed on newly formed leaves each time. The disease was observed in Massachusetts on 2,645 acres of maple, sycamore, and oak in Worcester and Berkshire Counties. Individual sycamore trees were completely defoliated in sections of the Connecticut Valley. Anthracnose diseases on various hardwoods were prevalent in New York. Sycamore anthracnose was visible from the air in riparian areas of southeastern New York and the maple anthracnose-forest tent caterpillar complex caused some significant tree mortality in St. Lawrence County. Anthracnose of oaks and ash were commonly observed during ground surveys. A cool, wet spring enhanced the disease on many hardwoods in Rhode Island, especially white oaks. Many mature white oaks suffered complete leaf drop, but later refoliated. Damage was scattered on maples, oaks, horse chestnut, and sycamore. The disease was occasionally heavy in Vermont, especially on ash and sycamore. Anthracnose was incidentally observed in New Jersey and Maryland. Ohio aerial surveys found 175 acres with discoloration and 11 acres that were defoliated by this fungus.

Armillaria root disease, *Armillariella* spp.

Region 1: Idaho, Montana

Host(s): Douglas-fir, other conifers

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

Region 2: Colorado, South Dakota, Wyoming

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

Armillaria root disease, the most common root disease in the region, is found in mixed conifer and spruce-fir cover types. This root disease was among the key causes of subalpine fir mortality.

A recently completed project in selected campgrounds of southern Colorado indicated that at least 10.5 percent of living trees are infected in the campgrounds and even more are infected in the forest immediately outside the campgrounds. It is a major problem in vegetation management of developed sites, and is likely important in the disturbance regime and management of spruce-fir forests at large.

Armillaria was also found in the Bighorn, Black Hills, and Medicine Bow National Forests in Wyoming. It was not a major problem in these areas, but is contributing to some tree mortality.

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 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, especially those on volcanic 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 it is functioning primarily as a weak pathogen or saprophyte causing little direct mortality. In southern Utah, it may act as a primary pathogen, killing mature and immature ponderosa pine and mature fir and spruce on cool sites at high elevation.

Region 5: California

Host(s): Conifers, some hardwoods

Scores of tanoaks were killed by *Armillariella mellea* in Sonoma, Mendocino, and Humboldt Counties. Mortality commonly occurred down slope of rural roads where berm or fill was placed over much of the root systems, or within clumps of tanoak where previously a single stem was killed by *Phytophthora ramorum* or another pathogen.

Region 6: Oregon, Washington

Host(s): Conifers

Armillaria root disease causes serious mortality losses east of the Cascade Range in mixed-conifer stands. It is the most commonly encountered root disease in Oregon and Washington. True firs sustain the most losses; however, in localized areas, Douglas-fir and ponderosa pine mortality can be significant. The world's largest known root disease clone occurs in northeastern Oregon, and several large armillaria clones exist throughout the region. Thinning of young conifers has been shown to significantly increase tree growth rates and reduce mortality caused by armillaria root disease in the Cascade Range of Oregon and Washington. Armillaria root disease has been recently shown to significantly affect stand structure, plant species diversity, and fuel loads in central Oregon. 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 reducing disease spread and tree mortality.

Black stain root disease,
Leptographium wageneri
Ophiostoma wageneri

Region 1: Idaho, Montana

Host(s): Douglas-fir

Black stain root disease is of relatively infrequent occurrence in the region. It has been identified on several hosts, including lodgepole pine, ponderosa pine, and eastern white pine, but the more common host is Douglas-fir. It is primarily found west of the Continental Divide, but in 2003 it was first identified on Douglas-fir east of the Divide near Bozeman, Montana. Two locations were found on private lands near the Gallatin National Forest. One was a single, mature Douglas-fir that had recently died and had active Douglas-fir beetle. The second location was a group of dead and dying Douglas-fir seedlings and saplings. These centers were within 15 air miles of each other.

Region 3: New Mexico

Host(s): Piñon pine, Douglas-fir

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

Region 4: Idaho, Nevada, Utah

Host(s): Pinyon pine

Aerial detection and follow-up ground surveys have discovered about two dozen root disease centers in pinyon pine stands in the region. Perennial infections caused mortality of individual pinyon pine over 50 acres of the BLM Burley District in southern Idaho. In Utah and Nevada, the host is more prevalent. The infected acreage totals 1,150 acres on the Humboldt-Toiyabe National Forest in Nevada and 1,350 acres on the Dixie and Manti-LaSal National Forests in Utah. In many cases the areas with black stain have now been infested with pinyon ips.

Region 5: California

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

This pathogen continues to kill ponderosa pine in a large area 2 miles east of Willow Creek Campground in the Modoc National Forest. The disease was first reported in the area in the early 1940s and various cultural treatments have been completed in the last two decades in an attempt to limit the mortality caused by this disease.

Most of the blow down in Tannery Campground and Fawn Group Camp (Shasta-Trinity National Forest) were Douglas-firs that were infected with black stain root disease. Pockets of ponderosa mortality in the Mudflow Research Natural Area northeast of McCloud and mature stands south of McCloud were associated with *Leptographium wageneri*.

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* spp.

Region 5: California

Host(s): Giant sequoia, Raywood ash, redwood

Many planted redwoods, mostly on drier sites, had increased incidence of this canker. Branch flagging and top-kill were found in Sonoma, Mendocino, and Shasta Counties. Raywood ash in both the Central Valley and the Bay Area had increased incidence also.

Region 9/Northeastern Area: Connecticut, Pennsylvania, Vermont

Host(s): Chestnut oak, red oak

Very prevalent on a wide assortment of drought-stressed woody plants in Connecticut, including Leyland cypress, maple, dogwood, beech, and oak. Found in Pennsylvania on approximately 5,000 acres of trees that exhibited various symptoms of foliar discoloration, twig dieback, and defoliation. The increased observation is most likely the outcome of the 1999-2002 droughts that persisted throughout most of the State. Scattered dieback occurred statewide in Vermont; the increase in damage is attributed to drought.

Brown cubical root and butt rot, *Phaeolus schweinitzii*

Region 3: Arizona, New Mexico

Host(s): Douglas-fir, other conifers

This disease is common on old Douglas-fir in many parts of the region. It causes defect and can contribute to windthrow.

Cercospora blight, *Cercospora sequoiae* var. *juniperi* *Cercospora* spp.

Region 2: Nebraska

Host(s): Rocky Mountain juniper, eastern redcedar

This disease continues to severely defoliate and kill junipers and redcedars in windbreaks in central and eastern Nebraska.

Diseases: Native

Region 8: South Carolina
Host(s): Leyland cypress

Cercospora needle blight was found in four Leyland cypress Christmas tree plantations in South Carolina. Fungicide control has been suggested for growers experiencing problems with this disease. The lack of genetic variation in this species due to asexual propagation is believed to contribute to newly discovered disease problems.

Chinkapin canker,
Cause unknown

Region 5: California
Host(s): Chinkapin

Chinkapins in Calaveras Big Tree State Park are dying from an unknown cankering pathogen. Cankers form on the branches and eventually girdle the stems, killing large numbers in sizeable groups. The affected areas have spread throughout the year. So far no fungus or other potential cause has been isolated from the affected plants.

Cytospora canker,
Cytospora spp.

Region 2: Colorado, Wyoming

Host(s): Thinleaf alder

Alder mortality and dieback were widespread and common in riparian areas of the southern Colorado mountains. Stems with dieback almost always had Cytospora canker.

Cytospora canker,
Cytospora abietis

Region 5: California

Host(s): Red fir, white fir

Branch flagging of red firs in mixed true fir stands was reported from several locations in the central Sierra Nevada Mountains. All sizes of trees were affected, and in some cases more than 50 percent of the existing crown was recently killed. A few trees up to 20 inches in diameter were dead. This pattern is consistent with branch mortality caused by the canker fungus *Cytospora abietis*, which infects branches at the site of dwarf mistletoe swellings. In general, white firs were not affected.

Cytospora canker,
Cytospora chrysosperma

Region 5: California

Host(s): Poplar, willow

First detected in both poplar and willow species at lower elevations on the eastside of the Sierra Nevada and southern Cascades in 2002, dieback became more apparent in 2003 with many willows losing all of the upper branches. Some areas have reported up to 75-percent mortality within clumps of willows.

Dermea canker,
Dermea pseudotsugae

Region 5: California

Host(s): Douglas-fir

Many pole-size and larger Douglas-firs in the interior, dry portions of Mendocino, Humboldt, and Lake Counties had branch and stem cankers caused by this pathogen. Many of these trees also had cankers attributed to *Phomopsis lokoyae* and were attacked and killed or top-killed by the Douglas-fir engraver. Drought in previous years is a likely contributing factor.

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

Region 2: Nebraska, South Dakota

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

In 2003, there were trees on about 300 acres of forest, urban, and agro-forestry land that had serious infections of Diplodia tip blight. The disease is common throughout Nebraska and South Dakota, particularly on Austrian pine; there has been an increase in the incidence of the disease in the Black Hills due to spring hailstorms. The disease continues to be a serious problem in pine windbreaks and landscape plantings in eastern Nebraska.

Region 5: California

Host(s): Gray pine, ponderosa pine

The disease is still prevalent in and around Paradise, Butte County, which is one of the areas where the current outbreak of Diplodia blight first appeared in 1996. The pathogen also continues to kill ponderosa pine branches along the North Yuba River in the Goodyears Bar and Downieville area of Sierra County. Some of the heavily infected pines have died since first reports from this area in the summer of 2000.

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 in 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 the region and causes about 18 million cubic feet of growth reduction annually. Douglas-fir dwarf mistletoe occurs on about 0.6 million acres (13 percent) of Douglas-fir, reducing growth by approximately 13 million cubic feet annually. Western larch dwarf mistletoe occurs on about 0.8 million acres (38 percent) of western larch stands, and reduces annual growth by over 15 million cubic feet. Dwarf 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, limber pine, lodgepole pine, piñon pine, ponderosa pine

With recent mild winter conditions and periods of drought, dwarf mistletoes are contributing to mortality in many areas of the region. This disease is impacting stands throughout the Colorado Front Range and in Boulder, Clear Creek, Gilpin, Douglas, Park, and El Paso Counties. Dwarf mistletoe is also a continuing problem on ponderosa pine in the Black Forest near Colorado Springs.

Lodgepole pine dwarf mistletoe *(A. americanum)* infests about 50 percent of lodgepole pine stands in Colorado and Wyoming. In Wyoming, this mistletoe is common in the Green Mountain area in Fremont County where 5,000 acres (State, Federal, and private properties) are adversely affected. This parasite is widespread and a concern throughout the Bighorn, Medicine Bow, and Shoshone National Forests.

Ponderosa pine dwarf mistletoe *(A. vaginatum subsp. cryptopodum)* is widespread throughout the host type only in Colorado. Dwarf mistletoe infests approximately 20 percent of the ponderosa pine stands in Colorado's Front Range. Infested ponderosa pines are more vulnerable to attack from tree-killing bark beetles.

Limber pine dwarf mistletoe *(A. cyanocarpum)* and piñon pine dwarf mistletoe *(A. divaricatum)* commonly occur in sites with significant amounts of the host trees. The Douglas-fir dwarf mistletoe *(A. douglasii)* occurs mostly in the southern two-thirds of Colorado.

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 region. Three species—those affecting ponderosa pine, piñon, 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 are infested, resulting in an estimated loss of 25 million cubic feet 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 region. Across the region it is estimated that 50 percent of lodgepole pine stands have some level of infestation. Twenty percent of ponderosa pine and Douglas-fir stands also have some level of the disease.

Region 5: California

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

Three species of dwarf mistletoe were reported in 2003: gray pine (*A. occidentale*), limber pine (*A. cyanocarpum*) and mountain hemlock (*A. tsugense* subsp. *mertensianae*). Heavily infested gray pines have been killed in Madera and Fresno Counties and around Lake Berryessa in Napa County. Dry conditions, poor sites, and old age are contributing factors to the mortality of large trees. Limber pine dwarf mistletoe was found infesting western white pine and whitebark pine between the Deadfall Lakes and Mount Eddy on the Shasta-Trinity National Forest. Abundant mountain hemlock dwarf mistletoe was observed on mountain hemlock growing near Shadow Lake on the east slope of Lassen Peak in Lassen Volcanic National Park.

Region 6: Oregon, Washington

Host(s): Conifers

Dwarf mistletoes are present on approximately 9.5 million acres of forested lands in the 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 9/Northeastern Area: Maine, New Hamphire, New York, Vermont

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

Severe damage as the result of infection by this parasitic plant continues to occur in stands of white spruce in coastal areas of Maine. However, less mortality than usual was observed in 2003. Favorable growing conditions, with ample precipitation, seemed to reduce mortality from the higher levels we observed in recent drought years. Scattered damage occurred on spruce in New Hampshire, upstate New York, and Vermont.

Diseases: Native

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.

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: the Jette Lake area north of Polson and the Bitterroot Valley south of Missoula. This disease has been credited with mortality in mature ponderosa pine and is a threat to the viability of ponderosa pine on several local sites in western Montana. 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 continues to be the most significant disease of loblolly and slash pine in the South. In Florida, a survey of 280 plantations was completed in 2003. Comparisons of fusiform rust levels in longleaf pine and both "improved" and "rust-resistant" slash pine sold by the Florida Division of Forestry were drawn, showing that infection levels were significantly lower in "rust-resistant" than in "improved" slash pine, while longleaf pine produced the lowest overall levels of infection. Other anecdotal reports suggest that the incidence of main stem infection is decreasing, and that the disease is becoming more confined to branches where the impact is minimized. The Resistance Screening Center in Asheville continues to screen seed lots for fusiform rust resistance. Texas reported moderate levels of fusiform rust on scattered tracts across eastern portions of the State. Over the past few years, rust infection levels have been declining for several years, in part because of reduced planting of slash pine.

Hemlock needle cast,
Fabrella tsugae

Region 9/Northeastern Area: Pennsylvania

Host(s): Eastern hemlock

In Pennsylvania, this fungus caused a total of 57 acres of damaged foliage and shoots in Franklin, Juniata, Lawrence, Luzerne, Perry, Pike, Schuylkill, and Somerset Counties.

Hypoxylon canker,
***Hypoxylon* spp.**

Region 8: Regionwide

Host(s): Oaks

Red oaks in northeastern Tennessee have shown increasing levels of *Hypoxylon* infection in response to the recent drought. White oaks have also been reported to display increasing rates of *Hypoxylon* infection in the northern Cumberland Plateau. This disease continues to be a significant component in the general epidemic of oak decline in Arkansas oak forests.

Incense-cedar rust,
Gymnosporangium libocedri

Region 5: California

Host(s): Incense-cedar

There was one report from Scott Valley in Siskiyou County.

Koa wilt,
Fusarium oxysporum f. sp. koae

Region 5: Hawaii

Host(s): Koa

Koa wilt, first reported in 1980, is a vascular wilt disease caused by a fungal root infection. Since diagnosis is often unclear, the disease has not been reported widely in natural forests. However, extended drought conditions in the State are possibly increasing susceptibility to the pathogen and a recently confirmed report of the disease in high elevation native forests on the island of Maui raises concern. Koa wilt is far more virulent in lowland sites (under 3,000 feet) where forestry plantings and restoration efforts are affected. Trees planted in former sugar cane fields have been found to be particularly susceptible. With the sugar industry in Hawaii in decline, land managers are reforesting former cane fields, and the koa wilt disease is preventing their use of koa, a high-value hardwood. Genetic resistance to the disease is being investigated.

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 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, 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. Trees are affected with heavy discolorations of the lower crowns of lodgepole pine. Areas mapped as affected by lodgepole pine needle cast in 2003 totaled 5,315 acres, down from the 7,006 acres reported in 2002. Over 50 percent of this occurred on the Wallowa-Whitman reporting area, and 20 percent occurred on the Rogue River reporting area, the bulk occurring on Federal lands.

Madrone decline,
Cause unknown

Region 5: California

Host(s): Pacific madrone

Scores of madrones in the Brooktrails Township near Willits, California, are off-color and the foliage droops from branches as if affected by a wilt. No pathogens have been isolated, and no specific environmental condition is attributed. Increased exposure from home site development and removal of the forest litter from around the trees may be contributing factors.

Oak wilt,
Ceratocystis fagacearum

Region 2: Nebraska, Kansas

Host(s): Red oak, bur oak

Oak wilt continues to be a problem in forests along the eastern edge of Kansas and Nebraska.

Region 8: North Carolina, Tennessee, Texas, Virginia

Host(s): Live oak, red oaks

Oak wilt continues to devastate more than 66 central Texas counties, mostly between Dallas and San Antonio. Urban, suburban, and rural oaks are affected. Live oak, the premier shade tree species in the region and highly valued for beauty, shade, and wildlife benefits, was severely impacted by the disease. Trenches dug between healthy and diseased trees sever interconnected root systems and help to halt the spread of the disease. The Texas Forest Service completed the 16th year of cooperative suppression of the disease. Since this project's inception, more than 3 million feet (568 miles) of barrier trenches have been installed on more than 2,100 oak wilt infection centers in 34 counties. The Texas Forest Service conducted no aerial surveys for oak wilt in 2003, but control assistance was performed for at least 5,692 landowners. In Tennessee, oak wilt aerial survey flights over Lincoln, Franklin, Moore, and Marion Counties were negative in 2003, although one oak wilt center was reported in an urban setting in Sullivan County. The North Carolina Division of Forest Resources reported 25 oak wilt infection centers in the Appalachian Mountain counties of Buncombe, Haywood, and Jackson in its 2003 survey.

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

Host(s): Northern red oak

Oak wilt continues to be the single most important disease in the Central States. In Missouri, 24 counties have been confirmed to have the disease since 2001. In 2003, 1,169 disease centers totaling 4,500 acres were detected in Minnesota. Michigan detected an additional 39 disease centers in 2003. Menominee County in Michigan's Upper Peninsula has a unique 10,000-acre oak resource threatened by oak wilt. Fourteen oak wilt areas (epicenters) were detected and treated by plowing 14,000 feet of root graft barriers in 2003. All oaks within the epicenters were removed and properly disposed of to remove the threat of overland spread. Oak wilt was first detected in West Virginia in 1951 and has been discovered in 51 of 55 counties. Oak wilt has never been detected in Brooke, Ohio, Tucker, and Webster Counties, West Virginia.

Phomopsis canker,
Phomopsis lokoyae

Region 5: California

Host(s): Douglas-fir

Douglas-fir of all sizes in the interior, dry portions of Mendocino, Humboldt, and Lake Counties had branch and stem cankers caused by this pathogen. Many of these trees also had cankers attributed to *Dermea pseudotsugae* and were attacked and killed or top-killed by the Douglas-fir engraver. Drought in previous years is a likely contributing factor.

Diseases: Native

Pine wilt,
Bursaphelenchus xylophilus

Region 2: Kansas, Nebraska, South Dakota

Host(s): Scotch pine, Austrian pine

Kansas has experienced epidemic proportions of damage due to this disease the last 3-5 years. Heavy mortality linked to this nematode was found frequently throughout Kansas, mostly affecting Scotch pine. The drought exacerbated the problem and this disease problem is now moving into Austrian pine in southeast Kansas.

Heavy mortality linked to this nematode was found frequently throughout southeastern Nebraska, mostly affecting Scotch pine.

Numerous Scotch and Austrian pines in the southern portion of South Dakota are showing symptoms of rapid needle discoloration and decline. These symptoms are often associated with pine wilt and pinewood nematode. A survey during 2002 and 2003 found that dying Scotch pines and Austrian pines in the southwestern portion of the State were infested with the nematode. In 2003, approximately 20 acres of trees in several windbreaks and communities were identified as having died from this disease.

Powdery mildew on oaks,
Microsphaera alni and *Sphaerotheca lanestris*

Region 5: California

Host(s): Blue oaks, coast live oak

Powdery mildew caused by *M. alni* was observed from the southern edge of Placerville, California, for over 6 miles south along Highway 49. Another area of infestation was seen along Highway 193 north of Placerville and a few miles past the South Fork of the American River. The primary host affected was blue oak and the mildew was confined to 2003 tissue.

Powdery mildew caused by *Sphaerotheca lanestris* was prevalent on coast live oak in southern California coast counties, with many reports from Ventura County and in Los Osos (about 500 trees), San Luis Obispo County.

Seiridium canker,
Seiridium cardinale

Region 5: California

Host(s): Incense-cedar

Seiridium canker was found throughout a stand of incense-cedar in Nevada County near the town of Nevada City. Only younger trees were affected Some seedlings were killed while saplings only lost some of the lower branches. Large trees were not affected. Potential loss of incense-cedar regeneration is a concern.

Stem decay,
***Basidiomycetes* (many)**

Region 10: Alaska

Host(s): All tree species

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

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

Swiss needle cast,
Phaeocryptopus gaumannii

Region 6: Oregon, Washington

Host(s): Douglas-fir

Swiss needle cast, a fungal-caused foliage disease of coastal Douglas-fir, has caused significant volume growth loss estimated at 25 percent throughout coastal Oregon and parts of Washington. A combination of warmer winters, increasing acreages of Douglas-fir, and the presence of two distinctive lineages of the fungus may be the cause of the severe disease symptoms over the past 15 years. In spring 2003, 268,000 of 3 million acres of Douglas-fir had obvious symptoms of Swiss needle cast in coastal Oregon. In general, symptoms decreased in 2003 as compared to 2002. The disease is also severe in localized areas in coastal Washington and in the Cascade foothills of Oregon and Washington. Thinning of young trees has been recently shown to result in improved volume growth of severely affected trees. Research on Swiss needle cast continues at Oregon State University and the Pacific Northwest Research Station concerning growth impact, infection biology, nutrient imbalances, fungicide testing, and fertilizer and vegetation control.

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 to tree mortality, especially during periods of drought.

Western gall rust, *Peridermium harknessii*

Region 5: California

Host(s): Ponderosa pine

Western gall rust has been intensifying in ponderosa pine plantations north of Camptonville in Sierra and Yuba Counties. The disease is endemic in the old pine growing in the surrounding mixed conifer stands. The rust was also severe in isolated locations in Santa Cruz, Yolo, Placer, and Nevada Counties.

Diseases: Nonnative

Beech bark disease,
Nectria coccinea var. faginata

Region 8: North Carolina, Tennessee, Virginia

Host(s): American beech

Beech bark disease (BBD) continues to intensify and spread in eastern Tennessee, western North Carolina, and extreme west-central Virginia, with seven new counties confirmed infected in 2003. BBD is now found in Sevier, Blount, and Cocke Counties in Tennessee; Swain, Haywood, Madison, Yancey, Mitchell, and Buncombe Counties in North Carolina; and Highland, Bath, and Rockbridge Counties in Virginia.

Tree mortality continues to intensify in and around the Great Smoky Mountains National Park. The disease has intensified at a faster rate than predicted, and is moving downslope into the Cherokee and Pisgah National Forests. In 2003, it was confirmed that Roan Mountain State Park (Tennessee) and Mount Mitchell State Park (North Carolina) have active infestations.

Beech is an important species for wildlife, providing both mast and den habitat.

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

The disease was endemic throughout Connecticut. In Massachusetts, Berkshire and Franklin Counties continued to experience decline and mortality caused by this disease. Damage on 6,956 acres was recorded during 2003. The disease was widespread in New Hampshire and was found readily throughout New York. In Maine, losses attributable to the disease were extensive but assessment of the damage is complicated by the effects of drought, oystershell scale, late spring frosts, and various hardwood defoliators. There was an increase in incidence of damage in Vermont statewide, with approximately 90,000 acres affected.

The beech bark disease fungus was observed for the first time this year at the Holden Arboretum in Lake County, Ohio. The beech bark disease scale has been present in the Arboretum and in other parts of Lake County for nearly 20 years. The scale, with the fungus, finally establishes the beech bark disease complex in Ohio. In Pennsylvania, aerial surveys found 47,865 acres with declining or dead beech and 6,047 acres with discolored canopies concentrated in Warren, McKean, Forest, Elk, and Cameron Counties. West Virginia surveys found an increase in the number of acres and counties with beech trees infected with scale from 2.4 million acres in 2002 to 3.3 million acres in parts of 14 counties in 2003. Within the last 5 years, beech scale has spread into 7 new counties—Greenbriar, Hampshire, Hardy, Mineral, Nicholas, Preston, and Webster. The killing front was detected over an area encompassing 1.3 million acres in portions of Barbour, Grant, Pendleton, Pocahontas, Randolph, Tucker, Upsure, and Webster Counties.

Michigan has over 7 million acres of Maple-Beech-Birch type with an estimated 138 million trees in all size classes. Over 200,000 acres were now affected by the disease. The eastern part of Alger County in the Upper Peninsula was now part of the killing front. Two thousand acres of forest land within Luce County in Michigan's Upper Peninsula were currently being salvaged. The slow spread of beech scale to new areas continued.

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

Region 1: Idaho, Montana, North Dakota

Host(s): American elm

Dutch elm disease 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 communities and naturally occurring American elms in riparian zones and wooded draws of western North Dakota. In Idaho, this disease is common in many communities along the Snake River in southern Idaho, and is slowly working its way into northern Idaho communities. In the three States, larger cities have had good success with aggressive treatment, but smaller communities do not often 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

The disease continues at moderate levels in Colorado, Kansas, and Nebraska. In 2003, the incidence of Dutch elm disease has increased in several South Dakota communities that still have American elms as a dominant street tree. Losses in 2003 were not as high an increase as the previous 2 years, but still above that experienced in the mid-1990s with some communities experiencing losses higher than 4 or 5 percent. This increase may be due to the inability of communities to conduct prompt removals of the infected trees.

Region 8: Regionwide

Host(s): American elm

Localized mortality continues to occur at low severity level in urban and wild populations of elm.

Region 9/Northeastern Area: Areawide

Host(s): American elm

Symptoms of this disease are still conspicuous throughout the mid-Atlantic States. A survey for Dutch elm disease in Washington, DC, this year showed a decrease in disease incidence from 4.5 percent in 2002 to 3.8 percent in 2003. The disease is endemic throughout the region. In Connecticut, there was a greater than usual incidence and severity, possibly associated with several years of drought stress in combination with other weather and site-related stresses. Symptoms of the disease were conspicuous throughout Maine and New York during 2003 . Many of the trees now succumbing are mature individuals in urban and suburban settings, which survived the initial wave of the disease through the region. In Vermont, mortality is statewide and wilting was more common on young trees.

European larch canker,
Lachnellula willkommii

Region 9/Northeastern Area: Maine

Host(s): Larch

The trend for this disease is static and the quarantine remains in effect; no evidence of spread from infested areas to non-infested areas was noted in 2003.

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 the age of susceptibility. Bark beetles often attack these stands once they have been weakened by 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 2: Colorado, South Dakota, Wyoming

Host(s): Limber pine, Rocky Mountain bistlecone pine, whitebark pine

White pine blister rust is found on whitebark and limber pines throughout Wyoming, in northern Colorado, and in some isolated limber pine stands of the Black Hills in South Dakota.

In 2003, isolated infestations of the disease were discovered in the Sangre de Cristo and Wet Mountains of southern Colorado on limber pine. An infected Rocky Mountain bristlecone pine was also discovered in the Sangre de Cristo Mountains in the Great Sand Dunes National Monument. This discovery is very momentous in that the disease has never been reported on bristlecone pine in nature, and the implications of rust on bristlecone pine may be very significant both ecologically and culturally.

White pine blister rust infection levels range from low to severe in whitebark and limber pine stands throughout Wyoming, however, significant rust-free areas still exist in the Sierra Madre and the Snowy Mountains in the southeast part of the State. In 2002, a study of 16 widely distributed stands across the Bighorn National Forest found white pine blister rust infection at all locations and as high as 100 percent. USDA Forest Service aerial surveys show white pine blister rust, along with other damaging agents such as mountain pine beetle, dwarf mistletoe, and needle blights damaged more than 46,000 acres of white pine in northern Wyoming.

White pine blister rust caused marked decline in limber pines in the Laramie and Pole Mountain Ranges in south-central and southeastern Wyoming. White pine blister rust was discovered for the first time in the Snowy Mountains in 2002; however, the incidence in this range is still fairly low. Limber pines throughout Johnson and Sheridan Counties in Wyoming are severely impacted by this disease on all land ownerships.

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, the adjoining White Mountains, and the nearby Capitan Mountains of southern New Mexico. This area includes two districts of the Lincoln National Forest and the Mescalero Apache Indian Reservation. An estimated 40 percent of the white pines are currently infected within this area, based on a set of representative plots. The disease has been detected more recently on Gallinas Peak, Cibola National Forest, about 80 miles north of the main outbreak area. Blister rust has not yet been detected in northern New Mexico or in Arizona.

Diseases: Nonnative

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 region in California and Nevada near the Lake Tahoe area, as well in the Ruby Mountains in eastern Nevada. No infection has been found or reported in Utah; but the disease has been identified very close to the Utah border in southern Idaho and to the west in the Jarbidge Mountains of northeastern Nevada. The new observations of white pine blister rust in eastern Nevada are cause for concern because they are close to highly sensitive bristlecone pine populations in Great Basin National Park and elsewhere. Overall, five-needled pine trees are of low occurrence and frequency in the region. Often relegated to high alpine areas, these pines grow slowly but provide important ecosystem functions such as shade and stabilization of snow retention for watershed integrity, recreation, aesthetics, and wildlife habitat and usage.

Region 5: California

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

White pine blister rust appears to be increasing in severity in the Lake Tahoe Basin. Larger trees are showing infection of upper branches more frequently than in the past. Little regeneration is surviving due to the pathogen and the overstocked conditions of the forest stands in the basin.

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 identify areas symptomatic of blister rust through aerial survey beginning in 1994. Blister rust is known to occur extensively throughout the range of susceptible host type. Observers mapped approximately 13,500 acres in 2003, down from 19,000 acres in 2002. This includes major locations on the Wallowa-Whitman (5,083 acres), the Wenatchee (4,906 acres) and the Yakama Indian Reservation (1,830 acres). 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. In Oregon, the most heavily mapped area was on the Wallowa-Whitman National Forest in whitebark pine, especially within the Eagle Cap Wilderness.

Region 8: North Carolina

Host(s): Eastern white pine

White pine blister rust continues to be a disease of concern for North Carolina landowners. The northwestern mountains are an area of particularly high hazard. The disease can be especially devastating to growers of ornamentals and Christmas trees, many of whom are centered in this area. The North Carolina Division of Forest Resources continues to review seedling applications for white pine seedlings and to screen or examine areas prior to planting.

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

Host(s): Eastern white pine

This disease occurred across New England and New York at various levels of infection in white pine stands. Blister rust is endemic in several areas in Connecticut, but not particularly active this year. In Massachusetts isolated spots in white pine regeneration continue to be observed. Most observations were in Southern Berkshire and central Worcester Counties. Maine continued limited control efforts to manage this disease in certain high value pine stands. In 2003, a total of 690 acres of pine timber was scouted for *Ribes* plants in Androscoggin and Oxford Counties and 1,440 *Ribes* plants were destroyed. White pine blister rust continues to be a problem in the landscape as well, often involving trees that were infected when purchased as nursery stock. The average incidence of the disease statewide in New Hampshire is 2.4 percent. No reports of blister rust were received from New York in 2003. New York's State quarantine law was amended in 2003 to allow planting of disease-resistant black currant cultivars, so the level of blister rust infection will be watched for any potentially significant changes in the foreseeable future. Blister rust was common statewide in Vermont. This disease remained common, but static at moderate levels in West Virginia in Mercer, Monroe, Pocahontas, and Summers Counties.

For years, managers were reluctant to manage white pine in the Lake States for fear of losses to blister rust. Observations of many disease-free and minimally affected trees prompted surveys, which confirmed an increase in the numbers of white pine throughout Lake States forests. Blister rust still has a significant impact in localized areas where conditions are favorable for infection, but management now focuses on underplanting, sanitation pruning, and planting at higher densities to successfully grow white pine within the blister rust zone. Outside the high hazard zone, blister rust is having little impact to eastern white pine.

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

The disease remains endemic through the range of butternut. No new counties have been discovered that harbor the disease and the trend is static.

Cedar heart rot

Region 8: Kentucky

Host(s): Eastern redcedar

A high incidence of heart rot has been detected in all age classes of eastern redcedar in central and southern Kentucky, adversely impacting lumber values for this species. The Kentucky Division of Forestry and pathologists with the University of Kentucky are cooperating in efforts to identify the pathogen responsible for this disease.

Dogwood anthracnose,
Discula destructiva

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

Host(s): Flowering dogwood

The disease continues to intensify within the generally infested area. North Carolina reports continuing mortality attributable to dogwood anthracnose in mountain counties. In 2003, there were no reports of additional counties being impacted. One new infected county was reported in Kentucky; the number of confirmed infected counties currently stands at 253 regionwide.

Region 9/Northeastern Area: Areawide

Host(s): Flowering dogwood

This disease has spread throughout the range of flowering dogwood in the Northeastern States and has eliminated flowering dogwood in localized areas.

Leaf tatters,
Unknown cause

Region 9/Northeastern Area: Illinois, Indiana, Wisconsin, Minnesota

Host(s): White oaks, hackberry

For about the last 14 years, this condition has appeared sporadically across the landscape. Symptoms appear in the spring when leaves develop without mid-vein tissue. The second flush of leaves develops normally. The cause is unknown but herbicide, weather, or insects may be involved.

Phytophthora canker,
Phytophthora nemorosa

Region 5: California

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

Phytophthora nemorosa caused leaf spots in California bay laurel along the Avenue of the Giants between Pepperwood and Redcrest in Mendocino County and in Hiouchi, Del Norte County.

A roadside survey by the California Department of Forestry in the Brooktrails Township northwest of Willits, California, detected 60 tanoaks with bleeding stem cankers. Only *P. nemorosa* has been isolated from the area. Of the cankered trees, 23 were dead, 16 were thinning or declining, and 21 were still green.

Phytophthora canker,
Phytophthora pseudosyringae

Region 5: California

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

Along with *P. ramorum* and *P. nemorosa*, a third *Phytophthora* species has been repeatedly isolated from trees showing similar symptoms — leaf necrosis on California bay laurel and stem cankers on coastal live oak. Colony and microscopic morphological characters of the California isolates were consistent with *P. pseudosyringae*, a recently described species recovered from rhizosphere soil of oak species and necrotic fine roots and stem necrosis on European beech and European alder in Germany and France (Jung et al. Mycological Res. 107:772-789, 2003).

P. pseudosyringae has been found in coastal California counties from San Luis Obispo to Humboldt. It has also been isolated from one location in Mariposa County in the Sierra Nevada. Disease symptoms on California bay laurel and coast live oak are similar to *P. ramorum*, although *P. pseudosyringae* does not appear to cause wide-spread mortality in oaks. This is the first report of *P. pseudosyringae* in North America. The relationship between European and California isolates is not clear at this time. It is unknown whether *P. pseudosyringae* is native to California or an introduction.

Diseases: Origin unknown

Phytophthora root rot,
Phytophthora cinnamomi

Region 5: California

Host(s): Camphor, oaks, true firs, sycamore

This pathogen has been found in various locations in California. *P. cinnamomi* is a serious problem to true fir Christmas tree production in El Dorado County. It has caused the death of various oak species in the central valley, which has experienced sporadic flooding or irrigation (Glenn, Tehama, Sacramento, Yolo Counties). The pathogen is also a problem in irrigated landscape trees and has caused death and decline of sycamores, oaks, and camphor trees in Sacramento, Yolo, and San Joaquin Counties.

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 within the Coastal Pitch Canker Zone of Infestation.

Monterey pines at three monitoring plots in Santa Cruz County continued to show little or no new infections of pitch canker. Most surviving trees in the plots previously experienced infections, some quite severe. Since 2000, one tree died and two more appear to be dying. The decline and mortality of these trees appears to be due to damage suffered many years ago, rather than recent or current infections.

Port-Orford-cedar root disease,
Phytophthora lateralis

Region 5: California

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

Port-Orford-cedar root disease continues to expand and cause tree mortality in the upper Sacramento River Canyon. This condition is expected to continue for years to come along the main stem of the Sacramento River, where the disease is well established from Dunsmuir to the mouth of Shotgun Creek. Management efforts are aimed at preventing new infestations elsewhere in the Sacramento and Trinity River drainages. Two eradication treatments were conducted in 2003 – one along Scott Camp Creek and a second in the Riverside Campground at Castle Crags State Park. Individual trees have been observed dying throughout the northern half of Del Norte County. Most have been detected from Hiouchi eastward and up to the South Fork of the Smith River.

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 *P. lateralis*. The annual aerial survey reported evidence of the disease on 8,701 acres (0.89 trees per acre) in 2003, up from 5,971 acres (1.2 trees per acre) in 2002. The vast majority of the reported mortality was mapped on private land within the Coos-Douglas reporting area

(5,060 acres with 1.03 trees per acre). Private lands within the Siskiyou reporting area had the second highest reported levels of mortality (3,173 acres with 1.03 trees per acre).

Hosts growing in riparian areas, swamps, drainage ditches, and low-lying areas downhill from roads suffer 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 USDA Forest Service, BLM, and Oregon State University to develop Port-Orford-cedar that is resistant to *P. lateralis* now has results. In fall 2002, the first operational collections of resistant seed from the Dorena containerized seed orchard occurred. Sowing will occur in winter 2002/2003 and seedlings will be available for outplanting in the spring of 2004. Approximately 26,000 resistant seedlings will be planted in 2004, many of them in the 500,000 acre area burned in the 2002 Biscuit fire.

Sudden Oak Death,
Phytophthora ramorum

Region 5: California

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

Seven new susceptible plant species were identifed in California in 2003, bringing the total of known susceptible species in California to 29. Additional species were also detected in Europe and Oregon; in all, 39 susceptible species have been identified. Newly recognized species include important horticultural plants (*Camellia* and *Pieris*), species common in wildlands, and some grown for Christmas trees.

P. ramorum was isolated from grand fir Christmas trees on a plantation in Santa Clara County. The symptoms were limited to branch tip dieback, similar to *P. ramorum* symptoms on Douglas-fir. The infected Christmas trees are growing under *P. ramorum*-infected California bay laurels. The grower reported seeing similar symptoms in this plantation for approximately 10 years.

Reports continue to come in on possible sudden oak sites in the Sierras and Central Valley. Numerous black oaks, tanoaks, bays, madrones and other species have been examined and sampled. Results have been negative. Thus far no incidence of *P. ramorum* has been confirmed outside of the affected coastal counties. Most symptoms have been related to several years of drought, development in previously forested areas, and other pathogens and insects.

P. ramorum was found approximately 10 miles north of the San Luis Obispo County line near Plaskett Creek, extending the infested area about 15 miles southward. Previously, Julia Pfeiffer Burns State Park contained the most southern infestation.

The pathogen was detected in seven California nurseries located among Alameda, Marin, Placer, Sacramento, Stanislaus, and Santa Cruz Counties. *Camellia sasanqua* cult. "Bonanza," *Camellia japonica*, and *Viburnum tinus* were important hosts. The nursery interceptions in Placer, Alameda, and Sacramento Counties were trace forwards of stock from nurseries in coastal counties.

The systemic fungicide AGRI-FOS® and Pentra-Bark surfactant were approved by the California Department of Pesticide Regulation to treat individual oaks and tanoaks at high-risk of contracting *P. ramorum*. This newly approved treatment will prevent infection of oaks and tanoaks at risk, but will not cure trees already colonized by the pathogen.

For specifics on the disease and its occurrence and research updates from the California Oak Mortality Task Force, visit the following Internet address: http://www.suddenoakdeath.org.

Diseases: Origin unknown

Region 6: Oregon

Host(s): Tanoak, evergreen huckleberry, Pacific rhododendron, Oregon myrtle, cascara buckthorn, poison oak, salmonberry, others

Phytophthora ramorum, the causal agent of Sudden Oak Death (SOD), was first discovered in Oregon by aerial survey in July 2001. As of January 2003, *P. ramorum* had been found at 21 forest sites (48 acres) near Brookings, Curry County, Oregon. During 2003, through numerous ground and aerial surveys, 12 new infested sites were discovered, and infected trees were found near the perimeter of 8 of the previously known infested sites. These new occurrences of *P. ramorum* added approximately 12 acres to the area undergoing eradication treatments. Most infected trees discovered in 2003 occurred within 200 meters of existing eradication sites. Three new infested sites were found 1.8, 0.8, and 0.25 miles from the nearest eradication site. Each year new sites tend to occur either very close to, or in a northerly direction from, previously known infestations (following the prevailing rainy season wind direction), suggesting aerial or vector spread. The infested sites occur on Federal, private industrial, and private nonindustrial forest lands.

As a result of the 2003 surveys, the Oregon Department of Agriculture will increase the area under regulation for SOD from 9 mi^2 to 11 mi^2. The Oregon Department of Agriculture and APHIS have established quarantines to protect areas within and outside of Oregon from the artificial spread of *P. ramorum*. Whole plants and some plant parts of the known affected species and associated soil are covered by these regulations.

Efforts to eradicate the pathogen from Oregon forests are continuing on approximately 60 acres of forest within this area. Infested areas were delineated based on canker, tip blight, and leaf-spot symptoms. Treatment areas include a 50- to 100-foot buffer. All host materials are cut, piled, and burned. Broadcast burns are done when feasible. On private lands, stumps are treated with herbicide to prevent sprouting. Extensive post-treatment monitoring is ongoing within the treated areas as well as in forests adjacent to treated sites.

Region 8: Not yet known

Host(s): Red and possibly some white oaks, rhododendrons, and other species

Sudden Oak Death (SOD) is a disease of concern that has been introduced to California, Oregon, and Washington, with potential to be spread into the Southeast through importation of infected nursery stock. A pilot survey for the disease was initiated in 2003 in Georgia, North Carolina, South Carolina, Tennessee, and Virginia, sampling susceptible understory forest vegetation in areas considered to be at the highest risk for potential introduction. No SOD-positive specimens were found, but the survey will be continued and expanded in 2004.

Declines and Complexes

Ash decline

Region 9/Northeastern Area: Connecticut, New Hampshire, Rhode Island, Vermont

Host(s): White ash

Noteworthy incidences of unexplained death of mature white ash occurred throughout Connecticut for the past 2 to 3 years, probably associated with ash yellows and drought stress. Ash yellows disease was confirmed in New Hampshire in Sullivan, Cheshire, and Hillsborough Counties. Decline of white ash, particularly in urban fringe areas, was scattered throughout Rhode Island, with many trees loosing over 50 percent of their foliage. Decline in Vermont was widely scattered and often associated with ash yellows.

Aspen decline

Region 5: California

Host(s): Aspen

Aspen decline, first noted in 2002 at several locations in and around the Mono Lake and Mammoth Districts, Inyo National Forest, generally remained static in 2003. Aspen affected include stands west of Conway Summit, southwest of McLaughlin Spring, Kelty Canyon, and southwest of Sawmill Meadow.

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

In Arizona, aspen defoliation was detected on the Apache-Sitgreaves (30,720 acres), Coconino (5,845 acres), Kaibab (950 acres), and Prescott (20 acres) National Forests; BLM lands (15 acres); Ft. Apache (21,000 acres) and Navajo (13,945 acres) Reservations; and State and private lands (430 acres). In New Mexico, aspen defoliation was observed on the Carson (680 acres), Cibola (1,175 acres), Gila (220 acres), Lincoln (315 acres), and Santa Fe (1,605 acres) National Forests; Mescalero Apache (60 acres) and Taos Pueblo (25 acres) Tribal lands; the Valles Caldera National Preserve (35 acres); and State and private lands (380 acres).

Bacterial leaf scorch,
Xylella fastidiosa

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

Host(s): Maple, northern red oak, scarlet oak, pin oak

In Delaware, bacterial leaf scorch is known to occur in New Castle County. In 2003, bacterial leaf scorch surveys determined the infection rate and spread of the disease within select cities in New Jersey and in Rockville, Maryland. These surveys complement the New Jersey and Maryland statewide surveys done previously that showed significant and rapid increases in disease intensity and spread throughout these States. City-based increases in disease incidence were also apparent when measured as the number of trees infected, newly infected trees, disease spread into new localities, and infection spread within individual trees.

Baldcypress mortality,
Meruliopsis taxicola (associated, not necessarily causal)

Region 8: Florida

Host(s): Baldcypress

In the fall of 2002 and continuing into 2003, large numbers of baldcypress were reported to be "failing," i.e., dying and/or falling over, in or near lake margins in Lake County, Florida. Some of the failing trees were estimated to be as old as 200 years. Field evaluations revealed that the failing trees were located almost exclusively in deep muck soils around the lake margins; trees rooted in sandy mineral soils appeared unaffected. The butts and roots of affected trees were dehydrated and decayed to near "punk" condition, and cypress knees in the affected area could be lifted from the ground with almost no effort. The southern cypress beetle (*Phloeosinus taxodii*) was found in association with many of the failed trees, but appeared to be of secondary importance. Examination of exposed and/or excavated cypress roots revealed sporophores of the decay fungus *Meruliopsis taxicola*, an organism heretofore unreported both in Florida and in association with baldcypress. It is thought that drought-related water draw-down and dehydration of the muck soils around affected lake margins created habitat and host conditions suitable for *M. taxicola* to cause significant decay of roots and butts of the trees.

Canker and dieback of Drake elm,
Botryosphaeria spp.

Region 8: Florida

Host(s): Drake elm

Cultivars of Chinese elm (*Ulmus parvifolia*) known as "Drake elms" have been popular ornamental and landscape trees in Florida for many years. In the spring and summer of 2003, numerous reports were received of cankers and dieback affecting these trees. Field and laboratory evaluations revealed *Botryodiplodia theobromae* and/or other *Botryosphaeria* anamorphs to be consistently associated with the symptoms. A superficial bloom of *Fusarium lateritium* on dead bark surfaces is also associated with the symptoms. In some cases, elongated callus ridges on upper branch surfaces are suggestive of "sunburn," a scenario previously seen on this thin-barked host. The cankers and associated dieback appear to be secondary responses to environmental stress.

Chaparral decline

Region 5: California

Host(s): Chaparral

Surveys of chapparel dieback have not revealed any associated pathogens and drought continues to be considered the activator. Early winter precipitation in 2003-04 water year is well below normal in southern California and the influence of drought continues.

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, 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 activity is strongly associated with tree stress.

During 2003, 1,209 acres of this complex were mapped, down from 2,309 acres mapped in 2002. Most of the aerially detected damage occurred within the Rogue River reporting area, from 842 acres in 2002 to 795 acres in 2003. Mapped activity on the Siskiyou National Forest fell from 1,467 acres in 2002 to only 23 acres in 2003. New spots were mapped on the Gifford-Pinchot reporting area (96 acres) and the Wenatchee reporting area (295 acres). Aerial observers sometimes mistake the color signature of cytospora with that of balsam woolly adelgid. Incidence was associated with mature noble fir stands located near ridge tops, and is probably related to drought stress.

Elm yellows

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

Host(s): American elm, slippery elm

No report of this disease was received from Maryland or Ohio in 2003. Elm yellows surveys in Pennsylvania found 96 acres damaged in Bradford, Centre, Clinton, Lycoming, Potter, and Union Counties. In West Virginia, the elm yellows disease continues to remain within the eastern panhandle.

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, increased from 261 acres reported in 2002 to approximately 1,403 acres in 2003. This includes 457 acres mapped on the Wallowa-Whitman National Forest, 693 acres on the Wenatchee National Forest, and 113 acres on the Yakama Indian Reservation. New spots were also mapped on the Colville reporting area (34 acres), the Gifford-Pinchot reporting area (73 acres), and Mount Baker-Snoqualmie reporting area (33 acres). Concentrations of infections were quite localized and mainly involved dense thickets of seedlings and saplings. These foliage diseases were most severe in stands of western larch growing in moist grand fir and moist subalpine fir plant associations as well as in riparian areas.

Larch stressors

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

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

Host(s): Eastern larch

Native eastern larch and some larch hybrids in Maine continued to be under serious stress from several pests and significantly fluctuating water levels, especially during 1995, 1999, 2001, 2002, and 2003. Approximately 5,100 acres of seriously defoliated, discolored, and dead larch were mapped. In addition to this mapped acreage, scattered individual larch and small clusters of stressed or dead trees were seen throughout eastern and northeastern Maine (a gross area of over 1.4 million acres). Nearly all stands mapped in 2003 contained examples of all the stressors listed but the most common and most visible agent in the mapped area was larch sawfly. In Vermont, approximately 4,600 acres of larch decline were observed. The severity was worsened by drought, larch casebearer, and larch beetle.

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 the mortality is strongly associated with severe defoliation from a needle disease

caused by *Dothistroma septospora.* Other factors thought to be contributing to this decline are winter damage, drought, and competition-related stress.

Live oak cankers, *Cryphonectria cubensis*

Region 8: Florida

Host(s): Live oak

Serious, debilitating cankers on mature live oaks were reported in a new residential subdivision in Polk County. The cankers were perennial, approximately 7 years old, with elongated annual "target-like" growth rings similar to those produced by *Nectria* species on certain hardwoods. No *Nectria* species were observed on or cultured from cankered tissues. Laboratory isolations did, however, yield a pycnidial fungus appearing culturally and morphologically related, if not identical, to the pycnidial (anamorph) stage of *Cryphonectria cubensis*, a canker fungus of *Eucalyptus* species occurring in southern Florida. This is the second time such a fungus has been found on live oak tissues, the other being a single isolation from the roots of a declining live oak in Dade County in 1984. The significance of these observations is unknown, but it is conceivable that stress (soil disturbance, mechanical injury, hydrological changes) associated with the development of the subdivision may have predisposed the oaks to infection.

Loblolly pine decline

Region 8: Alabama, Georgia

Host(s): Loblolly pine

Loblolly decline is a complex of interactions of biotic and abiotic stresses. Predisposing factors include site condition and host. The decline sites are predominantly upland sites with history of previous agriculture and not well suited for long-term management of loblolly pine. The inciting conditions include fine root deterioration and soil factors. Loblolly decline symptoms are similar to those of littleleaf disease of shortleaf pine; however, these upland sites are not the characteristic eroded clay soils associated with littleleaf disease. The final phase contributing to the decline includes root-feeding insects on the primary roots and the vectoring of *Leptographium* species. As loblolly stands decline with increased stresses and stand age, they also become more susceptible to attacks by southern pine beetle. The dominant forest type on these upland sites was longleaf pine prior to the initial harvesting in the early 1900s and longleaf restoration is recommended for long-term management of these sites.

Oak decline

Region 8: Regionwide

Host(s): Oaks, other hardwoods

The oak resource in the southern United States is significant. Approximately two-thirds of the hardwood forest is classified as upland hardwood, where a malady known as "oak decline" is prevalent. Oak decline has been reported in the United States for over 130 years. It is a syndrome that involves the interaction of factors such as climate, site quality, and tree age; drought and insect defoliation escalate the condition. Pests such as armillaria root disease and the two-lined chestnut borer, which are ordinarily nonaggressive pests on vigorous trees, successfully attack trees stressed by oak decline. Decline is characterized by a

gradual but progressive dieback of the crown. Mortality typically results after several years, with mature overstory trees the most heavily affected.

In South Carolina, large acreages of hardwoods suffered late season defoliation from a combination of leaf fungi and oxygen depletion due to excess precipitation and soil saturation. Aerial surveys found this defoliation on 589,120 acres in the Coastal Plain. Mortality is occurring in some areas, and ambrosia beetles and wood borers are attacking affected trees, with additional mortality expected to continue. Similar damage was reported in coastal North Carolina, but an estimate of the acreage involved was not available. In north central Arkansas and northeastern Oklahoma, widespread oak decline mortality is still prevalent, although severe drought stress has abated in 2002 and 2003. The associated red oak borer epidemic continues. Continuing problems with oak decline were noted in Tennessee in 2003.

Region 9/Northeastern Area: Connecticut, Minnesota, Missouri, Vermont

Host(s): Red oak

Considerable unexplained dying of oaks occurred in Connecticut, with many contributing factors such as drought and armillaria root rot. In Vermont, dieback and mortality of oak was widely scattered. In Minnesota, about 12,500 acres of oak mortality were detected in northern counties. About 4,300 acres were associated with the two-lined chestnut borer in areas previously affected by drought, and defoliation by the forest tent caterpillar. In Missouri, oak decline in the Ozarks is a complex phenomenon involving primarily red oaks of advanced age that are growing on soils that are shallow, rocky, and drought prone. Drought conditions of the past several years have accelerated the decline and led to attacks by secondary fungal agents and wood-boring insects. Armillaria root rot and hypoxylon canker are commonly associated with decline and mortality, as are the red oak borer, two-lined chestnut borer, carpenter worms, and a variety of other borers (*Cerambycidae, Buprestidae, and Brentidae*). It is estimated that over 100,000 acres of Mark Twain National Forest land has sustained scattered mortality due to oak decline.

Spruce decline

Region 9/Northeastern Area: Maine, Vermont

Host(s): Spruce

The declining health of Maine's coastal spruce stands continued in 2003. Maine has experienced drought conditions during 4 of the last 7 years and conditions remained dry during the first half of the 2003 growing season. Spruce stands along the central and eastern Maine coast in Hancock, Waldo, Lincoln, and Washington Counties exhibit the most significant deterioration. White spruce seemed to be most stressed. The slow growth and poor vigor has made coastal spruce increasingly susceptible to blow down and biological pests including eastern dwarf mistletoe, spruce beetle, and hemlock looper. In Vermont spruce dieback and mortality due to drought and other factors was evident on about 14,000 acres statewide.

Subalpine fir decline

Region 1: Idaho, Montana

Host(s): Subalpine fir

Subalpine fir mortality remained very high in 2003, with an estimated 224,000 trees killed on nearly 143,000 acres regionwide. This is lower than the 168,800 acres recorded in 2002. However, many portions of the Gallatin and Beaverhead National Forests, where there were high beetle populations, were not surveyed in 2003. Over one-third of the current recorded tree mortality occurred on the Idaho Panhandle National Forests in northern Idaho. Other forests with significant subalpine fir mortality include

the Gallatin, Beaverhead, and Flathead National Forests in western Montana. In many areas, populations are still increasing.

Much of the mortality occurring on these high-elevation sites results from varying combinations of root diseases, bark beetles, and possibly other climate-related factors. 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 tree mortality even when trees are only lightly attacked by the beetles.

Region 2: Colorado, Wyoming

Host(s): Subalpine fir

Subalpine fir decline, caused by the western balsam bark beetle *Dryocoetes confuses,* and root rotting fungi such as *Armillaria ostoyae,* continued at high levels in Wyoming and Colorado. In Colorado, the problems occurred on 482,000 acres; in Wyoming, east of the Continental Divide, declining subalpine firs were found in 53,600 acres.

Losses of subalpine fir have been significant throughout southern Colorado. On several ski areas, the loss of subalpine fir is a concern for managers. The widespread nature of the mortality, combined with the fact that in many cases tree death is caused by a combination of insect and fungal activity means there are few options for managerial response. Maintaining thrifty stands with a wide range of age classes is probably the most prudent course of action to reduce long-term perturbations.

Most of the stands with declining subalpine fir in Wyoming had little association with root disease and appeared to be mostly western balsam bark beetle damage.

Region 4: Idaho, Nevada, Utah, Wyoming

Host(s): Subalpine fir

Decline and die-off of subalpine fir started in the late 1980s in the region with peak mortality periods occurring during the mid-1990s when over a million trees were affected by this complex. Although there are a number of pathogens involved in this complex, the primary insect causing subalpine fir mortality is the western balsam bark beetle, *Dryocoetes confusus*. Drought, heat stress, and winter drying, compounded by overstocked and overmature stand conditions, also contribute to subalpine fir mortality. In 2003, the death of approximately 408,400 subalpine fir was recorded; an increase from approximately 334,300 trees recorded in 2002.

Sugar maple decline

Region 9/Northeastern Area: Connecticut, Pennsylvania, Vermont

Host(s): Sugar maple

Incidences of “unexplained” death of mature sugar maples occurred in Connecticut, possibly associated with drought, salt damage to roadside trees, armillaria root rot, verticillium wilt, and other factors. Over 50,000 acres of dieback and mortality occurred statewide in Vermont, a significant increase in hardwood decline and mortality attributed to drought. 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. Insect defoliation and drought are additional stressors on sugar maple trees.

White pine decline

Region 9/Northeastern Area: Connecticut, Maine, Vermont

Host(s): Eastern white pine

Incidences of declining white pine (young and mature trees) were observed in Connecticut, possibly associated with drought or salt damage. In Maine, the condition of pines affected by white pine decline stabilized in 2001 and has remained relatively stable since. Following the drought of 1995 and until 2000, white pines with symptoms of this disease declined and died on sites where rooting depth was restricted. There has been very little additional mortality in any of the stands. In Vermont, dieback and mortality was noted in drought stressed areas.

Yellow-cedar decline

Region 10: Alaska

Host(s): Yellow-cedar

Decline and mortality of yellow-cedar persists as one of the most dramatic forest problems in Alaska. Nearly 500,000 acres of decline have been mapped during aerial detection surveys. Extensive mortality occurs in a wide band from western Chichagof and Baranof Islands to the Ketchikan area. In 2003, about 9,000 acres were mapped as very active, that is, they had high concentrations of dying trees with bright yellow or red crowns. The remainder of the acreage is dominated by concentrations of dead standing trees. The active areas were found scattered throughout the distribution of dead cedars.

All research suggests that contagious organisms are not the primary cause of this extensive mortality. Some site factor, probably associated with poorly drained anaerobic soils, appears to be responsible for initiating and continuing cedar decline. Two hypotheses have been proposed to explain the primary cause of death in yellow-cedar decline: toxins are produced by decomposition in the wet, organic soils, or through cation mobilization; or the lack of snowpack at lower elevations allows solar radiation to penetrate the open-canopy forests and trigger early loss of cold tolerance in cedars, causing these trees to suffer some form of freezing injury. The high abundance of dying trees in 2003 may support the second hypothesis as the 2002-2003 winter was unusually mild with little snowpack at low elevations, but there was a severe late frost event. In fact, the coldest ambient air temperatures for the entire 2002-2003 winter measured in cedar forests in Peril Strait occurred around March 10, 2003. The primary ecological effect of yellow-cedar decline is to alter stand structure (i.e., addition of numerous snags) and composition (i.e., yellow-cedar diminishing and other tree species becoming more numerous) that leads to eventual succession favoring other conifer species. The creation of numerous snags is probably not particularly beneficial to cavity-using animals because yellow-cedar wood is less susceptible to decay. 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. Planting of yellow-cedar is encouraged in harvested, productive sites where the decline does not occur to make up for these losses in cedar populations. The large acreage of dead yellow-cedar and the high value of its wood suggest opportunities for salvage. Cooperative studies with the Wrangell Ranger District; the Forest Products Laboratory in Madison, Wisconsin; Oregon State University; and the USDA Forest Service, State and Private Forestry are investigating the mill-recovery and wood properties of snags of yellow-cedar that have been dead for varying lengths of time. This work includes wood strength properties, durability (decay resistance), and heartwood chemistry.

Seed Orchard Insects and Diseases

Black vine root weevil,
Otiorhynchus sulcatus

Region 6: Oregon

Host(s): Western larch

O. sulcatus was found to be fairly wide spread in western larch growing in large containers causing tree stress and occasional mortality. Nematodes were applied in the spring for population control with limited success. Esfenvalerate was applied while adult weevils were active above ground. An attempt was made to obtain cryolite bait (A.I. – sodium aluminofluoride, a non-organic mineral) to compare treatment efficacy, but the material was out of stock and apparently produced infrequently.

Coneworms,
***Dioryctria* spp.**

Region 6: Oregon

Host(s): Western white pine

Evidence of *Dioryctria* was evident in older western white pine rust runs, which were being used for controlled crosses for resistance breeding. One-year-old control cross conelets were treated to prevent infestation. *Dioryctria* was also found on 3-year-old white bark pine as a tip borer. Leader mortality was wide spread.

Region 8: Regionwide

Host(s): Southern pines

Surveys indicated an average 20-25 percent loss of second-year cones (2003 cone crop) in untreated trees. Damage levels in slash pine orchards were similar to those in loblolly pine seed orchards. This loss does not include first-year flowers and conelets and is, therefore, a low estimate of the total damage caused by coneworms. In eastern Texas, losses in unsprayed orchards declined in 2003 to about 30 percent from about 34 percent in 2002. Losses in treated orchards were considerably less.

Cranberry girdler moth,
Chrysoteuchia topiaria

Region 6: Oregon

Host(s): Whitebark pine

Cranberry girdler caused damage to white bark pine grown in 10-in^3 containers in a greenhouse. Container racks were located on pallets on the floor. The incidence of damage was 2-3 percent.

Gray mold,
Botrytis cinerea

Region 6: Oregon

Host(s): Port-Orford-cedar

Port-Orford-cedar seedlings growing in 10-in^3 cells in a greenhouse have shown scattered pockets of *Botrytis*. These seedlings are used for testing resistance to the root disease caused by *Phytophthora lateralis* and therefore there is minimal tolerance for the occurrence of *Botrytis*. Cultural measures were employed to minimize the occurrence of the disease. Regular monitoring of seedlings occurred and seedlings were treated to prevent further development and spread if evidence of the disease appeared.

Larch needlecast,
Meria laricis

Region 6: Oregon

Host(s): Larch

The incidence of *Meria* on western larch growing in large containers was greatly reduced through cultural means, namely protection from spring rains during and following bud break. There were scattered occurrences of the disease along the edges of containerized seed orchard trees subjected to rain drift. Because of the limited distribution and spread potential, no treatment was deemed necessary.

Needle cast,
Lophodermium spp.
Lophodermella spp.

Region 6: Oregon

Host(s): Western white pine, sugar pine

Needle cast was widespread in 3-year-old and older western white pine and sugar pine growing in rust frames. In some cases, this caused difficulty in scoring disease resistance to *Cronartium ribicola*. Due to the large buildup of inoculum on site in older trees, new grafts destined for field seed orchards and rust resistance studies were treated to prevent disease spread from older trees.

Phytophthora root rot,
Phytophthora spp.

Region 6: Oregon

Host(s): Western white pine, sugar pine

The occurrence of Phytophthora root rot was limited in 2003, occurring in only a few rust frames and causing minimal mortality.

Pitch canker,
Fusarium subglutinans f. sp. *pini*

Region 8: Regionwide

Hosts: Southern pines

Tennessee reported scattered infections of pitch canker on shortleaf pine in the eastern part of the State; no other seed orchard effects were noted in the region. About 15 percent of the pinecones harvested from State seed orchards in east Texas in 2003 were apparently damaged by pitch canker.

Seed bugs,
Leptoglossus corculus
Tetyra bipustata

Region 8: Regionwide

Host(s): Southern pines

Both species of seedbug were present in pine seed orchards throughout the South. Samples of conelet ovule damage indicated that seedbugs caused about 20-percent seed loss on loblolly in Louisiana. Large populations of *T. bipunctata* occurred in September and October in orchard trees monitored in Louisiana. These estimates probably reflect those throughout the Gulf Coast States.

Southern cone gall midge,
Cecidomyia bisitosa

Region 8: Florida

Host(s): Slash pine

This species caused localized significant loss of slash pine conelets in Florida seed orchards in 2003. Damage by this unusual insect appears to vary by clone, some clones being highly susceptible; however, little is known of the life cycle and effective management techniques are yet to be developed.

Stem canker

Region 6: Oregon

Host(s): Port-Orford-cedar

Several groups of Port-Orford-cedar growing in large containers in one shadehouse were severely damaged by stem cankers. Pathogens associated with the damage included *Seiridium cardinale* and possibly an unidentified species of *Phomopsis*. Several periods of extremely hot weather during summer combined with overhead watering may have created conditions conducive for disease. The affected plants were removed and destroyed.

Strawberry vine weevil,
Otiorhynchus ovatus

Region 6: Oregon

Host(s): Port-Orford-cedar

Root damage attributed to *O. ovatus* was found sporadically in Port-Orford-cedar seedlings grown in 10-in^3 containers in a greenhouse. No action was taken due to their limited occurrence. Some of the damage may have been caused by cranberry girdler.

Tip blight,

Region 6: Oregon

Host(s): Western white pine

Three-year-old containerized western white pine seedlings were damaged by tip blight, possibly caused by *Sphaeropsis sapinea* and *Phoma eupyrena*. The symptoms became apparent in early spring as terminal buds were opening. The diseased seedlings were scattered among healthy trees in the planting. Seedlings of other ages and species were not affected. The seedlings were treated by removing diseased shoots.

Unidentified defoliator

Region 6: Oregon

Host(s): Port-Orford-cedar

Defoliation occurred on newly germinated Port-Orford-cedar seedlings grown in the greenhouse. Significant to severe mortality occurred in several families being grown for disease resistance screening. Examination of the seedlings found only one 2-mm-long inch worm-like caterpillar, which was never identified. Due to the developing severity of the defoliation, affected and adjoining tables were treated and no further defoliation was observed.

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. Cone beetles have caused significant cone mortality at Grouse Creek Tree Improvement Area in northern Idaho for the past few years. A small test of the behavior chemical 4aa (microencapsulated 4-allylanisol) was conducted in 2003 in cooperation with Forest Insect and Disease research with promising results. A larger treatment of 4aa is planned for 2004.

Tree improvement areas in Montana are now nearing cone-producing age. Monitoring will occur as cones are produced.

Nursery Insects and Diseases

Cutworms

Region 8: Texas

Host(s): Loblolly pine

An unidentified species of cutworm destroyed over a million pine seedlings in an industrial pine seedling nursery in the spring of 2003. Successful control was obtained with an insecticide application.

Cylindrocarpon root disease, *Cylindrocarpon destructans* Fusarium root disease, *Fusarium* spp. Gray mold, *Botrytis cinerea* Pythium root disease, *Pythium spp.*

Region 1: Idaho, Montana

Host(s): Conifers

Diseases continue to seriously affect nursery production of conifer and hardwood seedlings and native plants for reforestation efforts in the Northern Region. Major damage occurs from soilborne pathogens (*Fusarium, Pythium, Cylindrocarpon*) in both bare root and container nurseries and from foliage pathogens (primarily *Botrytis*) in container nurseries. Reducing disease impacts are limited by impending restrictions and loss of methyl bromide as a pre-plant soil fumigant. Effective alternatives are currently not available for all nurseries within the region, although experimental efforts to locate satisfactory alternatives are continuing.

Damping-off, *Fusarium* spp. *Pythium* spp. *Phytophthora* spp.

Region 8: Regionwide

Host(s): Pines, hardwoods

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 and environmental conditions. Seedling losses can be severe when germination is slow due to cold, wet weather. Damping-off continued to be one of the most significant problems of nurseries in the South in 2003.

Fusarium root disease,
Fusarium spp.

Region 6: Oregon

Host(s): Conifers

Fusarium damage was evident in most conifer species late in the growing season. Damage levels appeared to be normal for our growing conditions. No reductions in net seedlings are anticipated.

Leaf spots and blight,
Alternaria spp.
Phoma eupyrena

Region 6: Oregon

Host(s): Bitterbrush, mountain mahogany

Severe leaf necrosis occurred following a period of extremely hot weather during the summer. The opportunistic pathogenic fungi *Alternaria* spp. and *Phoma eupyrena* were associated with leaf spots and large blotchy areas of dead tissue. Damage to leaf tissue caused by the heat, and possibly lack of water was believed to have created conditions that were favorable for disease. The damage was seen only in young, containerized stock growing in a shadehouse. Bare root and containerized stock growing outdoors were not affected.

Lygus bug,
Lygus hesperus

Region 6: Oregon

Host(s): Conifers

Monitoring with yellow sticky traps showed extremely high numbers of lygus in early June. We began applying asana in mid-June and made nine applications at 10- to 14-day intervals. All 1-0 conifer species were treated; as a result, Lygus damage was minimal.

Phytophthora root rot,
Phytophthora cinnamomi

Region 8: North Carolina

Host(s): Fraser fir, northern red oak

Low levels of *Phytophthora* root rot were detected in two North Carolina nurseries. Improvement of drainage, removal of infected plant, and fungicides controlled the limited occurrences of this disease.

Rhizoctonia needle blight, *Rhizoctonia* spp.

Region 8: Regionwide

Host(s): Longleaf pine

Approximately 65,000 longleaf pine seedlings were killed at the Taylor Nursery in South Carolina by *Rhizoctonia* in 2003. Although fungicide treatments were made, their efficacy was reduced by rainfall.

Root weevil, *Otiorhynchus sulcatus*

Region 6: Oregon

Host(s): Aspen, gooseberries, red osier dogwood, roses, willow

Root weevil larvae were found in containerized stock from the 2002 crop during extraction in January 2003. All had been grown in the same area in one shadehouse. The 2003 monitoring program was expanded to include the shadehouse. Monitoring was conducted weekly from April through September, but no evidence of root weevils were found in any of the stock. When the stock was extracted for shipping, there was no evidence of root weevils. Infestation may have been avoided by increased attention to cleaning in the container growing area and less holdover stock than in previous years.

Stunt nematode damage, *Tylenchorhynchus ewingi*

Region 8: North Carolina

Host(s): Loblolly pine

Stunted 1-0 loblolly pine seedlings were found in several North Carolina fields with an average of 300 stunt nematodes per 100 cc of soil. Fumigation was found to reduce populations but did not eradicate the nematode. The use of nonhost cover crops is being investigated as a strategy to help control this nematode.

Thrips, *Thysanoptera* spp. *Thripidae* spp.

Region 6: Oregon

Host(s): Ash

Thrips caused damage to leaves of containerized ash seedlings growing in a shadehouse in early summer. Growth was inhibited during the infestation but there was no mortality. The affected seedlings were treated with Safer soap. Their vigor improved significantly after treatment.

Abiotic and Other Damage

Air pollution

Region 8: Tennessee

Host(s): All species

Tennessee reported moderate ozone damage in the central part of the State and on the Cumberland Plateau.

Bear damage

Region 5: California

Host(s): Douglas-fir, redwood

Branch flagging, top-kill, and tree mortality from black bear damage is, by far, the most visible damage to second-growth conifers in Humboldt and Del Norte Counties. Redwood is the most affected, but Douglas-fir has sustained major damage also. Significant areas of damage include Smith River, Cal-Barrel (AhPah and Surpur Creeks), and the lower Bald Hills area of Tectah, Johnson, and Roach Creeks.

Region 6: Washington

Host(s): Douglas-fir, western hemlock

Loss of crop trees and reduction in value due to feeding by bears is a widespread problem in the Pacific Northwest. Bark peeling by black bear can kill trees, and result in stain, decay, breakage, and loss of value in trees that are not killed outright. Bears are attracted to thinned plantations and feed on trees from April to July. Bears tear off large patches of bark and feed on the cambium, and can damage many trees per day. Loss in merchantable volume in Douglas-fir trees that have suffered past bear damage can run 7 to 10 percent.

Acres with trees killed by bear as interpreted by aerial observers increased from 145,000 acres in 2002 to over 321,600 acres in 2003. This includes an increase in Oregon from 32,500 acres to 60,300 acres, and an increase in Washington from 112,500 acres to 261,300 acres. The vast majority of recorded damage was mapped in western Oregon and western Washington. The aerial survey only detects trees that have been recently killed by bear feeding. A ground survey on Quinault Indian Reservation lands found that at least 3.5 times as many Douglas-fir trees are damaged as killed.

Beaver damage

Region 8: South Carolina, Tennessee

Host(s): Hardwoods

The South Carolina Forestry Commission reports significant beaver damage to forest trees throughout the State. All 46 counties reported at least some losses. Most damage was to hardwoods, and the commission estimates 10,795 acres are affected, representing 194,310 cords valued at nearly $3.5 million. New mortality due to beaver impoundments doubled from 2002 levels, due in part to increased precipitation. Tennessee reported scattered beaver damage to river birch in Campbell County in the upper Cumberland Plateau.

Chemical damage

Region 2: Colorado

Host(s): All tree species

Ice and dust-control materials utilizing magnesium chloride are being increasingly applied in the mountain road systems in Colorado, with corresponding increases in tree damage throughout the State.

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

Host(s): All tree species

Widespread damage occurred from extensive road salting during the extreme winter of 2002-2003. White pine along the roadside was especially impacted.

Drought effects

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

Host(s): All tree species

Moisture conditions improved over much of Colorado with the southwest corner still having severe drought conditions. Aspen and cottonwoods along ditches and riparian waterways died in 2003 due to reduced stream flows. Gambel oaks were showing dieback in southern Colorado. Some conifer stands in the mountains are exhibiting stress cone crops due to the drought conditions.

Colorado blue spruce, cottonwood, green ash, and a number of other species were affected by drought in 2003. While some of the western portions of South Dakota began experiencing drought in 2001, this condition became statewide by 2003. In addition to agro-forestry plantings, urban forests were also impacted by the drought conditions. The increased environmental stress has resulted in tree mortality attributed in part to colonization by borers such as ash bark beetles (*Hylesinus* spp), cottonwood borer (*Plectrodera scalator*) and Zimmerman pine moth (*Dioryctria* spp).

Region 5: California

Host(s): California black oak

Recent years of drought in southern California continue to negatively affect forests in southern California and make them more susceptible to attack by bark beetles and pine and fir engravers. Understory and suppressed incense-cedar faded in many locations during the spring of 2003 in northern California. Specific locations include the Van Duzen River drainage; the Trinity and Klamath River drainages; along Highway 3 near Trinity Center, CA; and on McCloud Flats, Shasta-Trinity National Forest. Many trees had no sign of a biotic pest, but were very dry and appeared desiccated.

Region 8: Regionwide

Host(s): All species

The protracted drought of 1998-2002 was replaced by a period of abundant precipitation throughout the region. Virginia reported a record wet year, and most States reported fully recharged reservoirs and groundwater tables. South Carolina reported decline and mortality in trees of all species in low-lying areas.

Region 9/Northeastern Area: Connecticut, Massachusetts, Missouri, New York, Pennsylvania, Vermont

Host(s): Black oak, red oak, white oak, hardwoods and softwoods

Drought after-effects are evident in Connecticut in many woody species, especially hemlock, pine, maple, dogwood, and ash. In Massachusetts, the effects of previous seasons of drought continue to be observed. On some stands, this has caused an increase in borer activity, resulting in further decline and mortality. A total of 1,407 acres, mostly on the higher elevation of Berkshire County was mapped during the annual aerial survey. Although 2003 was a wetter growing season in many parts of New York, effects of drought from 2001 and 2002 were noticeable on a variety of species. Impacts ranged from slowed growth, to weakened resistance to secondary pests (such as *Ips* spp. in red pine plantations, and hickory bark beetles in hardwood stands with a hickory component), to mortality of severely stressed trees (such as American beech with beech bark disease). In Vermont, drought related mortality of stressed trees continued on shallow or disturbed sites. In Cameron County, Pennsylvania, aerial surveys revealed 144 acres of mortality caused by drought. Northwest, west-central, and north-central Missouri were hit hard by drought over the past 2 years. In the northwest, deficits are approaching 25 inches, 65 percent of normal. The lingering effects of long-term droughts resulted in continuing widespread decline of oaks throughout the southern part of the State. Above normal precipitation in the region should have some short-term benefits, but age and density of stands will result in continuing oak mortality.

Flooding

Region 9/Northeastern Area:

Host(s): Hardwoods, softwoods

In Connecticut and Vermont, wet conditions in spring and early summer of 2003 caused root damage in many areas. Aerial surveys detected 198 acres of mortality in Elk County, Pennsylvania, due to flooding.

Frost/cold

Region 5: California

Host(s): Incense-cedar

Incense-cedars throughout northern California have exhibited a range of symptoms such as top-kill, branch dieback, and whole-tree mortality over the past 2 years. In addition to the stress of drought, a sudden cold snap October 31 and November 1, 2002, resulted in some record low temperatures. Bronzed foliage suggested that many incense-cedars incurred winter damage during this cold spell and the extent of the damage was not apparent until this spring. These symptoms were reported from many ecological subsections in northern California.

Region 9/Northeastern Area: New Hampshire, Vermont

Host(s): Fir, hemlock, spruce

Extreme daytime and nighttime temperatures caused hemlock browning and mortality in New Hampshire. About 85,000 acres of spruce winter injury was observed in Vermont, the heaviest incidence of damage since 1993.

Ice/snow damage

Region 2: Colorado

Host(s): Various species

Heavy spring snowstorms throughout Colorado caused broken branches of thousands of ponderosa pines and Douglas-firs in the mountains. In the towns, junipers, piñon, Colorado blue spruces, elms, and cottonwoods suffered from many broken limbs. The broken limbs provided good habitat for several bark beetles.

Region 9/Northeastern Area: Connecticut, Maine, Maryland, New York, Ohio, Pennsylvania, West Virginia

Host(s): Hardwoods

In Connecticut, considerable breakage from ice storms in December 2002 occurred, especially in northern and central areas of the State. In Maine most trees damaged by the ice storm of 1998 now show significant recovery of affected crowns. Even in the most heavily damaged areas, trees on average now have 40-75 percent of the crowns they had prior to the ice storm. White ash and yellow birch had the highest rates of crown recovery; trembling and bigtooth aspen had the least and tree mortality was relatively low except for paper birch, bigtooth aspen, and trembling aspen. In New York, a February ice storm damaged approximately 850 acres in Tompkins, Schuyler, Cortland, and Tioga Counties, with most of the damage being on Tompkins County. Another storm in April caused light to moderate damage across a 1.2 million-acre area and moderate to heavy damage in a 440,000-acre area of Monroe, Wayne, and Cayuga Counties.

In Maryland, aerial surveys revealed over 30,000 acres of damage in Garrett and Allegany Counties due to an October 2002 ice storm. A President's Day weekend (February 16-17, 2003) ice storm swept over portions of Ohio and West Virginia causing trees to be uprooted and branches broken on thousands of acres. In southern Ohio, almost 100,000 acres of trees were damaged in Adams, Gallia, Jackson, Lawrence, and Scioto. In West Virginia, over 300,000 acres of trees were observed to be uprooted and with most having broken branches in Braxton, Calhoun, Clay, Gilmer, Jackson, Lewis, Mason, Nicholas, Putnam, Roane, Webster, Wirt, and Wood Counties. In Pennsylvania, aerial surveys detected approximately 700 acres of ice-damaged trees in Lycoming County.

Saltwater intrusion/subsidence/erosion

Region 8: Louisiana

Host(s): Cypress-tupelo

In addition to the detrimental effects of defoliating insects (see forest tent caterpillar and bald cypress leaf roller entries), erosion, subsidence, and lack of sedimentation plague the Louisiana coastal wetlands resulting in widespread mortality, particularly of cypress-tupelo stands. Thousands of acres have been lost and more are being lost annually. National attention is increasingly being focused on this issue and a number of projects are attempting to mitigate and reverse conditions leading to loss of forested wetlands and marshlands.

Wind

Region 5: California

Host(s): Blue oaks, conifers, ponderosa pine, white fir

Winter windstorms caused breakage of many species of trees in northern California. There was breakage of blue oak limbs around the northern end of the Sacramento Valley. Many trails in the Trinity Alps, Russian, and Marble Mountain Wilderness areas were blocked by blowdown of both living and dead conifers. Research plots on the Goosenest Adaptive Management Area of the Klamath National Forrest had extensive blowdown of both white fir and ponderosa pine. Several conifer stands on the Lassen National Forest, particularly on the Almanor and Eagle Lake Ranger Districts, also had substantial amounts of blowdown.

Region 8: Tennessee, Virginia

Host(s): Southern pines, hardwoods

Twenty-five tornados struck Tennessee in 2003, affecting all parts of the State, with the eastern part of the State most heavily damaged. Urban forest damage was reported from Madison, Dyer, Shelby, and Henderson Counties, while reported rural woodland loss estimates included 100 acres in Williamson County, 500 acres in Coffee County, and 300 acres in Lincoln County. Eastern North Carolina took the brunt of Hurricane Isabel on September 18, with damage spread across 26 counties. Estimates included 833,192 acres of damaged timber with a total value of $565,943,042. Virginia reported major wind damage from Hurricane Isabel and several tornados; both wind and hail damage were severe. Total timber losses from the hurricane were estimated at $176,760,303 across 20 counties.

Region 9/Northeastern Area: Missouri, Pennsylvania, Vermont

Host(s): Hardwoods, softwoods

A series of destructive storms occurred in Missouri in late April and early May. At least 40 tornadoes were spawned and 27,300 acres of forest land were damaged in western parts of the State. The largest areas were near the communities of Stockton (16,220 acres), Camdenton (4,900 acres), Pierce City (2,190 acres), and Liberty (1,850 acres). Straight-line winds and accompanying hail stripped foliage from trees in Cole County (3,410 acres) and Howard County (7,330 acres). Most hail-damaged trees had refoliated by June but the new foliage was clumped and poorly distributed in tree crowns. Over 58,500 acres of forest land were damaged by winds in Franklin, Jefferson, St. Francois, and Washington Counties. In Pennsylvania, ground surveys in Potter County detected approximately 3,000 acres of damage to maple/beech/birch. Heavy scattered branch breakage and mortality occurred in Vermont on about 3,000 acres following a July windstorm.

Region 10: Alaska

Host(s): All tree species

In 2003, less than 500 acres of blowdown were mapped statewide, with the majority of those acres in southeast Alaska. This acreage figure, however, is likely conservative as a bora wind hit south-central Alaska March 12 and 13, 2003, the strongest storm in at least 20 years. In many locations winds were measured at more than 100 mph.

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 Definition

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.