United States
Department
of Agriculture

Forest Service

Forest Health Protection

October 2006

Forest Insect and Disease Conditions in the United States 2005

Healthy Forests Make A World of Difference

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PREFACE

This is the 55th 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 2005. The first section of this report highlights emerging insect and disease issues. 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 USDA Forest Service 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.

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 Department of Defense and the Department of 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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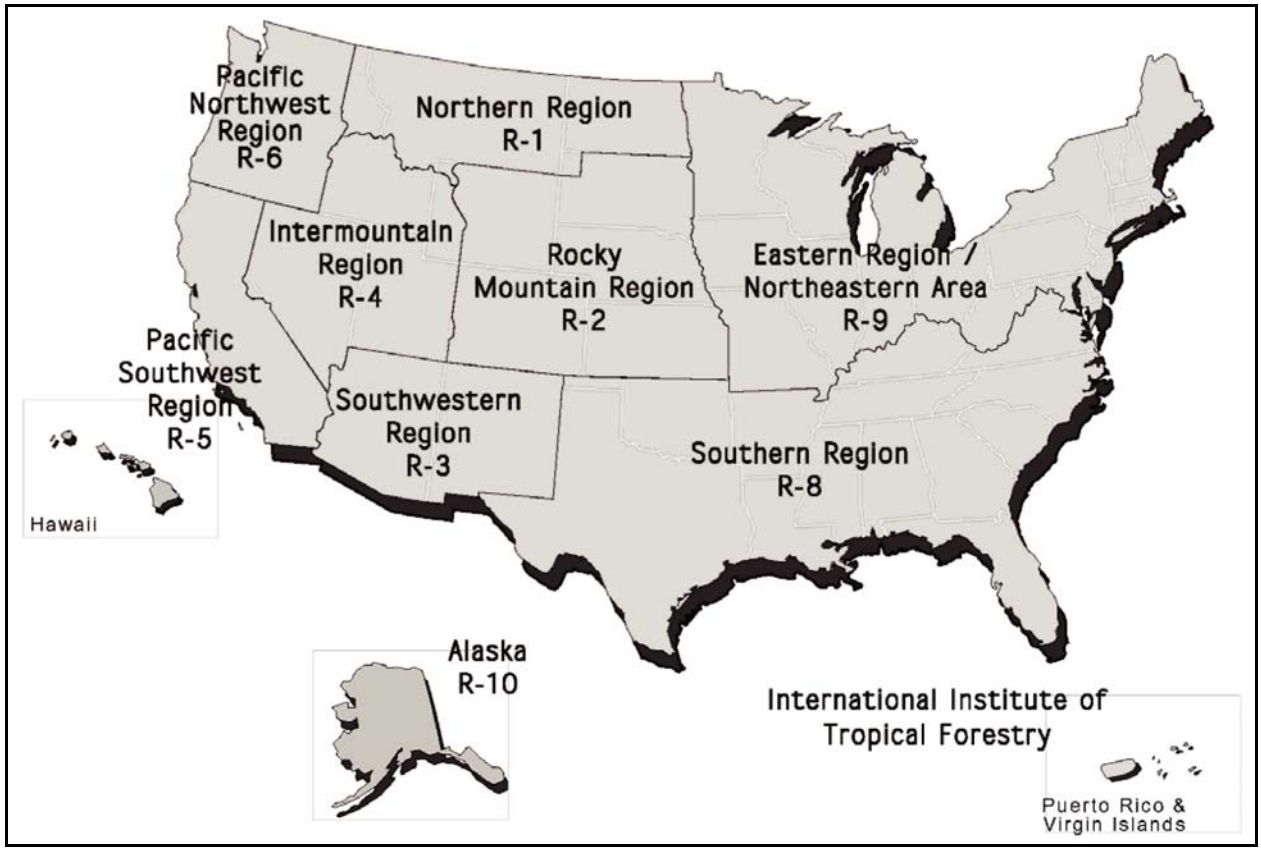
USDA Forest Service Regions and Area



Copies of this report are available from:

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This report is also available on the Internet at:

http://www.fs.fed.us/foresthealth/current_conditions.shtml

CONTENTS

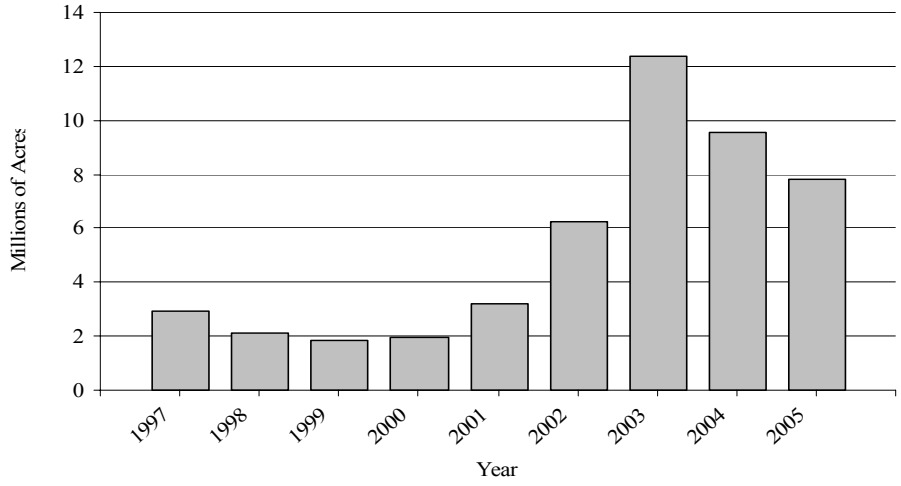
EXECUTIVE SUMMARY

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, and abiotic influences, cause significant damage that affects the health and productivity of our forests. The chart below shows the amount of insect- and disease-caused tree mortality over the past 9 years.

Acres with Insect- and Disease-Caused Tree Mortality



Highlighted below are some of the major insect pests and diseases of concern in 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 2002. About 2.8 million acres were affected in 2005, essentially equivalent to the 2.7 million acres reported in 2004. Outbreak counties were reported in Alabama and South Carolina.

Mountain pine beetle – Nationally, mountain pine beetle outbreaks increased by about 6 percent to almost 3.2 million acres in 2005, but the per-State differences varied widely, from a 75-percent decrease in California to increases of 65 percent in Montana and 70 percent in Washington.

Spruce budworm – Spruce budworm defoliation dropped 36 percent to about 139,100 acres in 2005, due in large part to a dramatic drop in observed acreage in Alaska. Nationally, budworm activity remains at a historically low level.

Western spruce budworm – Overall, defoliation by western spruce budworm increased by 64 percent, from about 734,600 acres in 2004 to 1,205,700 in 2005. Montana alone added over 275,000 acres, while Colorado, Utah, and Washington also experienced significant increases.

Spruce beetle – Outbreaks were present in all central-western Rocky Mountain States (Idaho, Montana, Wyoming, Utah, Colorado, Arizona, and New Mexico). In Alaska, spruce beetle activity decreased from almost 130,000 acres in 2004 to about 70,000 acres in 2005.

Insects: Nonnative

Asian longhorned beetle – No new infestations were found in Chicago during 2005. About 1,400 acres of newly infested trees were discovered in New Jersey during 2005, and multiagency management efforts are currently underway. In New York, low numbers of newly detected trees were found as pesticide application became more effective. A beetle was found in Sacramento, CA, prompting new eradication and monitoring actions.

Gypsy moth (European) – Overall, reported gypsy moth defoliation increased dramatically, from about 177,000 acres in 2004 to almost 670,000 acres in 2005. By far, the biggest contributing State was Pennsylvania, with over 333,000 acres, followed by Michigan, at almost 150,000 acres.

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

Hemlock woolly adelgid – This insect continued its rapid spread in 2005. Nineteen Eastern States are now affected.

***Sirex noctilio* woodwasp** – The first North American records of the woodwasp *Sirex noctilio*, native to Europe, Asia, and north Africa, were reported in 2005. The woodwasp was found in a trap in Fulton, NY, and subsequent surveys found infested trees around Oswego, NY, and woodwasps in traps in five counties in central New York State. This insect has caused significant losses of North American species of pines planted in several countries in the Southern Hemisphere, and can potentially impact native pines across North America. The U.S. Department of Agriculture (USDA) Forest Service and Animal and Plant Health Inspection Service (APHIS) will support a trapping grid in New York and parts of Vermont and Pennsylvania, regulate movement of pines in infested areas, and test the effectiveness of a parasitic nematode.

Diseases: Native

Fusiform rust – Despite some declines in infection levels, fusiform rust continues to be the most significant disease of loblolly and slash pine in the South. The Resistance Screening Center in Asheville, NC, continues to test seed lots for fusiform rust resistance and the Florida Division of Forestry has confirmed that its "rust-resistant" slash pine has significantly lower infection levels.

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 29.3 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.

White pine blister rust – Introduced around the turn of the 20th century, this disease 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 such as whitebark, limber, and bristlecone pine. New observations of infections on highly sensitive bristlecone pine populations in southern Colorado are reported.

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 causes multiple cankers under the bark that merge and kill large trees, saplings, and regeneration. This disease is a serious threat to the survival of the butternut 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 14 coastal counties north and south of San Francisco and in 1 county in southwestern Oregon. The outbreak in Oregon is under an eradication program. Dissemination of the pathogen 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 distribution maps, tables, and graphs of occurrence over time.

PART 3: CONDITIONS BY DAMAGE AGENT BY USDA FOREST SERVICE 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

Emerald ash borer

The emerald ash borer (EAB), *Agrilus planipennis* Fairmaire, is a nonnative insect originally from Japan, Korea, Taiwan, northeast China, and adjacent parts of Russia. It was unknown on the North American continent until its discovery in the Detroit, MI, area in July of 2002. Subsequent surveys showed that a large area of infestation was present, covering at least six counties surrounding Detroit. This 'core' area was put under quarantine in the fall of 2002. Infestations were also discovered across the border in Windsor, Ontario, Canada. Following further surveys in 2003, the quarantine was expanded to 13 counties, and by fall of 2004, the quarantine area included 20 counties in Michigan and Lucas County in northwest Ohio. A number of scattered isolated infestations outside of the quarantine area occur in the lower peninsula of Michigan, northern Ohio, and northeastern Indiana. By the end of 2005, there were 54 counties in Michigan, 15 counties in Ohio, and 3 counties in Indiana in which EAB spot infestations occurred or EAB-infested material had been found. It appears that many of these sites have been infested for several years and probably represent human-aided introductions, primarily through infested ash firewood, logs, or nursery material.

Emerald ash borer infests ash, walnut, and elm species 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.

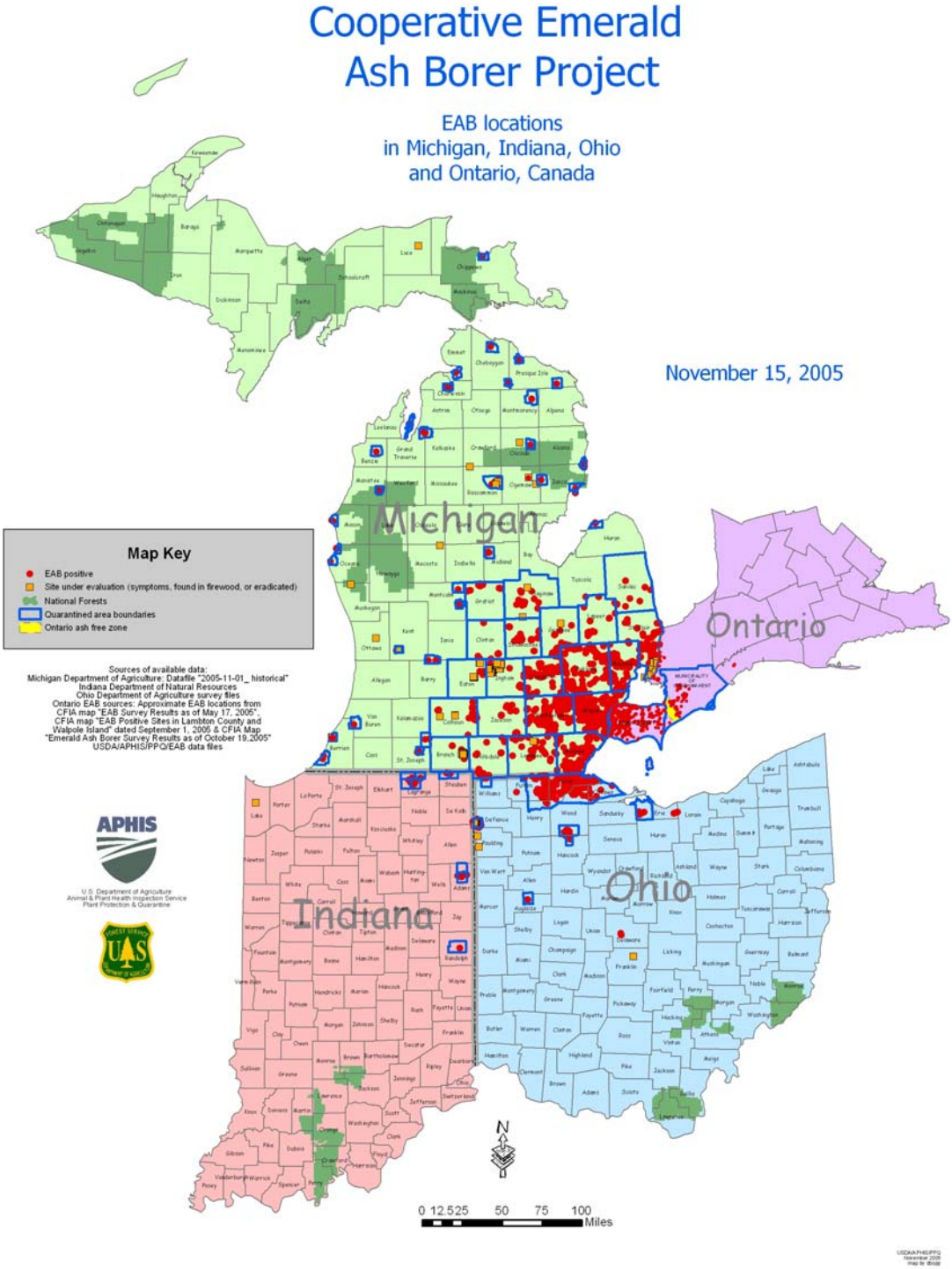
Our understanding of EAB is improving but still limited. Control options are also limited; wood boring insects are notoriously difficult to kill with insecticides once they bore under the bark or into the wood of trees.

The USDA Forest Service is a partner with the Animal and Plant Health Inspection Service (APHIS) and State authorities in the EAB containment and eradication effort, providing scientific and technical expertise, including survey, restoration, and public outreach and communications assistance. In 2004 and 2005, the USDA Forest Service implemented EAB surveys on Federal and State forest lands in Michigan and on public and private forest lands in more than 20 Eastern States. Special emphasis was placed on areas of known ash decline, around nurseries, and in areas where firewood introductions were likely. The USDA Forest Service also supports and conducts critical technology development activities with university and research cooperators to advance its understanding of EAB biology and dispersal habits, chemical control tactics, management strategies, survey techniques, and monitoring, among others.

Scientists estimate that EAB has been in the United States for perhaps 5 to 10 years prior to its detection in 2002. EAB was previously unknown outside of Asia and was neither on any exotic pest "watch list" nor the subject of any pest risk assessments.

Ash trees throughout southern Michigan had exhibited decline and dieback symptoms for years. "Ash yellows," a condition caused by a mycoplasma-like organism (MLO) was prevalent in the area and was one of the presumed causes. Ash yellows and another malady, referred to as "ash decline," were so prevalent that dying ash trees did not draw close scrutiny.

Emerald ash borer has killed millions of ash trees so far and has the potential to decimate the more than 800 million ash trees in Michigan forests. Ash species are common across the Great Lakes region and the Northeastern United States and is a common roadside, shade, and yard tree. No ash species appear to be resistant to EAB infestation and mortality. Emerald ash borer appears capable of infesting and killing ash trees across North America.


Cooperative Emerald Ash Borer Project
EAB locations in Michigan, Indiana, Ohio and Ontario, Canada
November 15, 2005
Michigan
Ontario
Indiana
Ohio
Map Key
EAB positive
Site under evaluation (symptoms, found in firewood, or eradicated)
National Forests
Quarantined area boundaries
Ontario ash free zone
Sources of available data:
Michigan Department of Agriculture: Datafile "2005-11-01_ historical"
Indiana Department of Natural Resources
Ohio Department of Agriculture survey files
Ontario EAB sources: Approximate EAB locations from CFIA map "EAB Survey Results as of May 17, 2005", CFIA map "EAB Positive Sites in Lambton County and Walpole Island" dated September 1, 2005 & CFIA Map "Emerald Ash Borer Survey Results as of October 19,2005"
USDA/APHIS/PPQ/EAB data files
APHIS
U.S. Department of Agriculture
Animal & Plant Health Inspection Service
Plant Protection & Quarantine
N
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Miles

Piñon pine mortality

Late in the summer of 2002, it became evident that a major bark beetle epidemic was taking place in piñon pine in Arizona, California, Colorado, Nevada, New Mexico, and Utah. An extensive, prolonged and severe drought stressed piñon trees and allowed piñon Ips beetles to reach epidemic levels. In 2005, precipitation across the region increased and, with it, the beetle infestations moderated; only Utah had more acres infested in 2005 than before the event began in 2002.

Acres (in thousands) of Aerially Detected Piñon Pine Mortality, 2001-2005

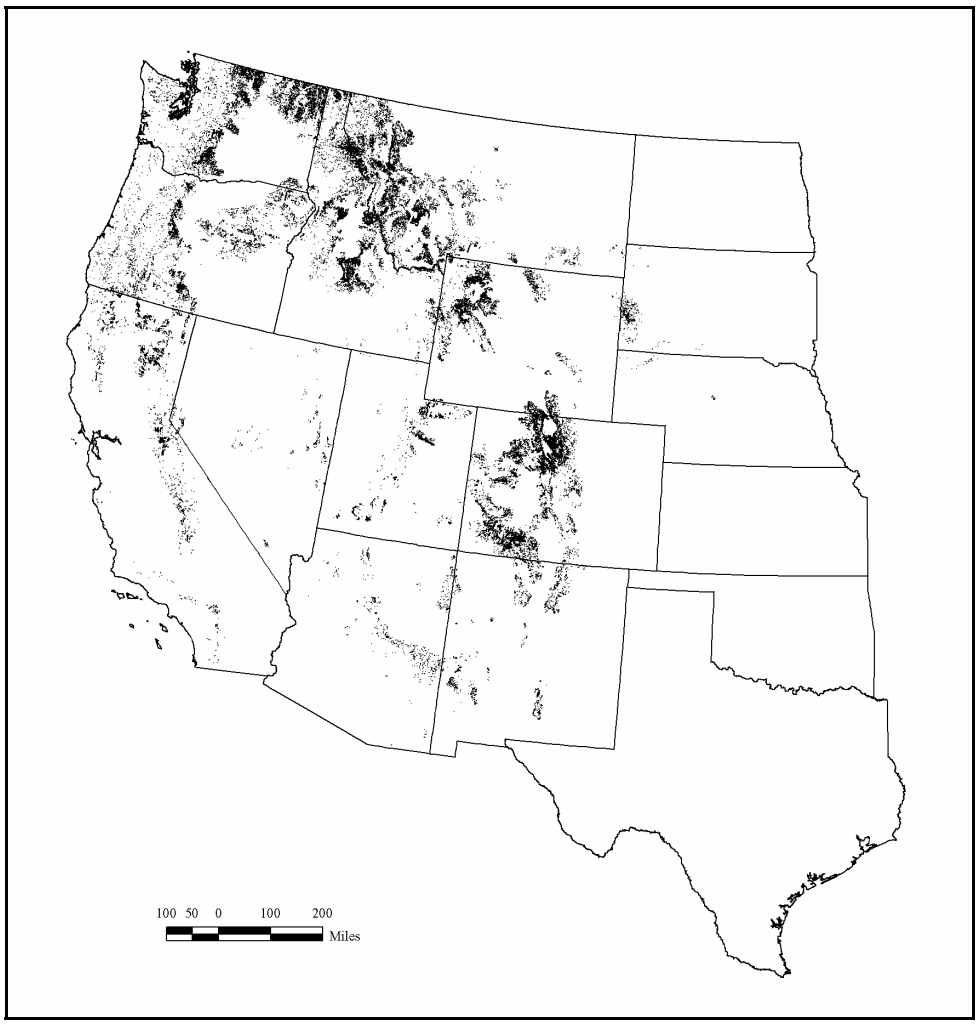
State	2001	2002	2003	2004	2005
Arizona	6.2	60.2	1,031.1	26.3	4.7
California		1.0	522.6	161.4	0.4
Colorado		63.6	814.3	582.8	37.2
Nevada	1.8	64.4	355.7	747.0	16.6
New Mexico	11.0	71.2	808.9	122.5	1.4
Utah	4.0	6.2	207.0	166.5	13.8
Total	23.0	266.6	3,739.6	1,806.5	74.1

Aerially Detected Piñon Pine Mortality, 2005

Western bark beetles

Tree mortality from bark beetles increased substantially in many parts of the West in 2003, particularly in forests severely stressed by widespread and prolonged drought and overstocking. Mortality in the piñon-juniper woodlands of the Southwest declined in 2005, in part due to a return of more normal weather patterns. Mountain pine beetle, Douglas-fir beetle, and spruce beetle were the direct cause of much of the mortality in the West in 2005, affecting over 4 million acres. However, less commonly seen insects such as fir engravers, pine engravers, western pine beetle, Jeffery pine beetle, and western balsam bark beetle caused substantial damage. In total, 6.6 million acres were affected.

Outbreak Areas of All Bark Beetles in the Western United States, 2005

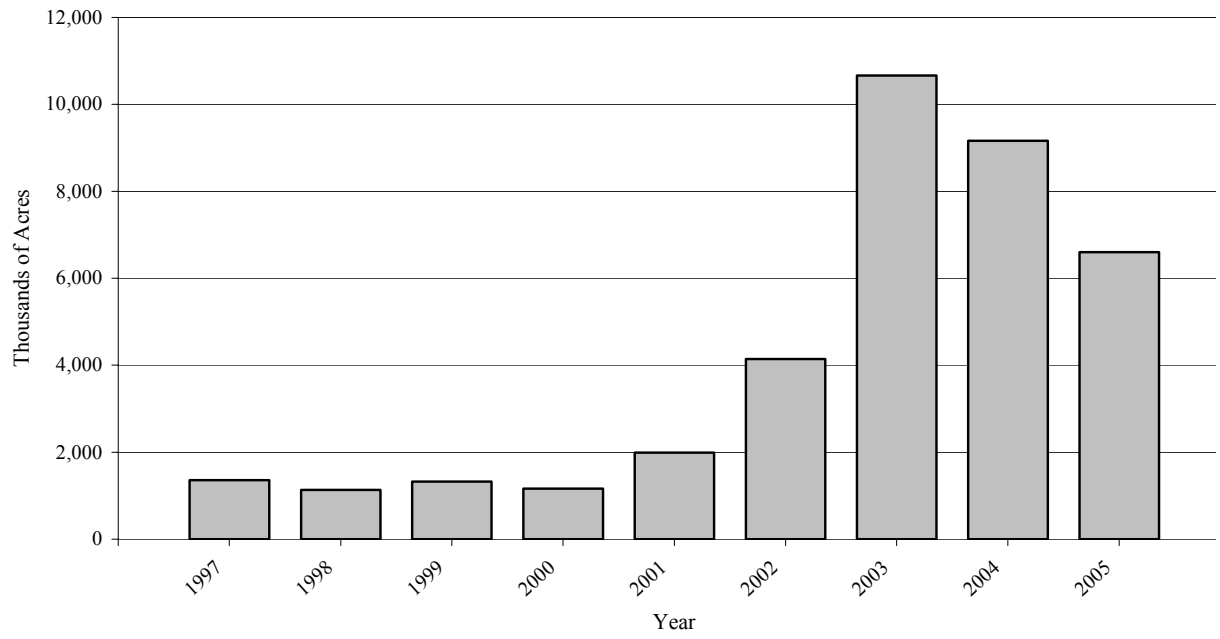


Acres (in thousands) with Aerially Detected Bark Beetle Mortality in the Western United States, 1997-2005

Region	1997[1)]	1998	1999	2000	2001	2002	2003	2004	2005
1	259.2	281.1	431.7	395.0	546.4	919.6	910.6	1,278.7	1,514.9
2	53.3	141.2	165.6	206.1	446.8	573.3	2,301.7	1,956.6	1,746.9
3	90.7	40.6	20.2	58.7	154.0	716.0	2,596.8	439.6	218.8
4	170.0	118.4	112.6	95.9	206.0	279.3	918.2	2,066.2	872.5
5		47.3	29.0	32.9	77.6	846.6	2,560.2	1,717.0	623.1
6	214.2	172.4	279.6	255.6	457.3	750.5	1,255.6	1,545.7	1,510.6
10	573.5	334.8	288.3	120.9	104.2	58.5	115.3	157.0	114.3
Total	1,360.9	1,135.8	1,327.0	1,165.1	1,992.3	4,143.8	10,658.4	9,160.8	6,601.1

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

Acres (in thousands) with Aerially Detected Bark Beetle Mortality in the Western United States, 1997-2005



Sudden Oak Death

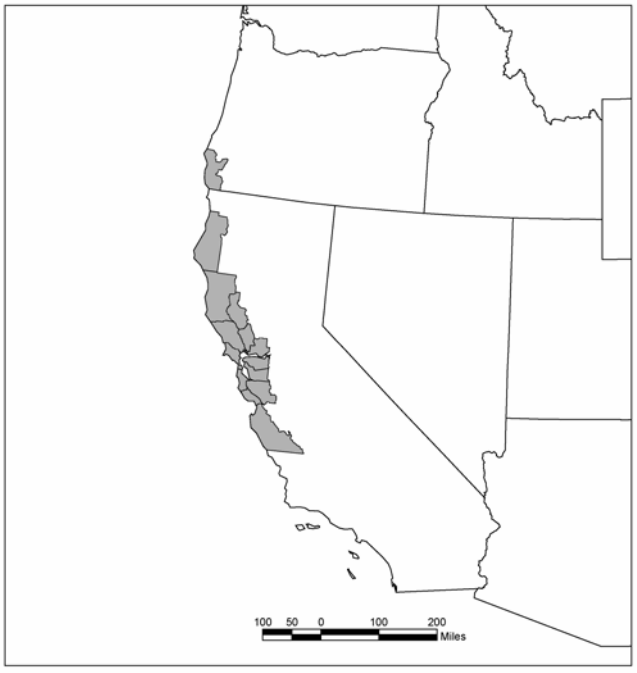
Sudden Oak Death is a recently recognized disease that is killing oaks and other plant species in California and a small portion of southwestern Oregon. First reported in 1995, the disease has been confirmed in the coastal areas north and south of San Francisco, and in southwestern Oregon. The pathogen 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 *P. ramorum* from the known infested sites in Oregon. Because 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 *http://www.na.fs.fed.us/SOD* or *http://www.suddenoakdeath.org*. The list of more than 100 regulated hosts and plants is still growing and the current list is available at *http://www.aphis.usda.gov/ppq/ispm/pramorum/*: click on the link APHIS List of Hosts and Plants Associated with Phytophthora ramorum.

Counties Where Sudden Oak Death Was Reported, 2005



Oak decline

The oak resource forms a major comonent in hardwood forests that comprise 75 percent of all forested acreage in the Eastern United States. While oak decline has been reported for over 130 years, it is a disease complex that occurs mostly in natural stands, which now predominate in much of the country. This syndrome results from interacting factors such as climate, site quality, and tree age.

Drought and insect defoliation escalate the condition by putting trees under additional stress. Pests such as Armillaria root disease and the two-lined chestnut borer, which are ordinarily nonaggressive pests on vigorous trees, severely affect stressed oaks. 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. Oak decline was abundant in eight Eastern States in 2005, mostly in the South.

Red bay ambrosia beetle

Extensive mortality of red bay (*Persea borbonia* (L.) Spreng) has been observed in the coastal plains of South Carolina and Georgia since 2003, and around Jacksonville, FL, since the spring of 2005. Dead and dying trees exhibit wilt-like symptoms, and trees often decline very rapidly with the wilt affecting the entire crown uniformly. In some cases, tree decline progresses more slowly, affecting individual branches one at a time. The sapwood of the main stem and branches of affected trees exhibits discoloration. Small beetle entrance holes and tunnels are normally found in association with discolored areas of the sapwood. An ambrosia beetle, *Xyleborus glabratus (*Eichhoff), has been routinely obtained from dead and dying trees. This nonnative beetle was first trapped in the United States in 2002 at a port facility near Savannah, GA, during the Early Detection Rapid Response Pilot Project. The recovery of the beetle from dead and dying red bay on Hilton Head Island, SC, in November 2004 was the first indication that the beetle was established in southeastern U.S. forests. The beetle is native to Asia (e.g., India, Japan) where it is associated with plant species in the family Lauraceae (e.g., *Lindera latifolia, Litsea elongata).*

A fungus has been consistently isolated from the discolored xylem of symptomatic trees throughout the range of the problem. This fungus has been identified as an *Ophiostoma* sp. based on sequences of the ribosomal DNA and its tolerance of cycloheximide. The anamorph of the fungus is similar to species of the genus of ambrosia beetle symbionts, *Raffaelea*.

During the spring and summer of 2005, sassafras mortality was also observed at several locations in coastal counties of Georgia. An examination of the trees found sapwood discoloration similar to that observed in red bay. *Xyleborus glabratus* and the *Ophiostoma* sp. were also associated with the wilted sassafras.

USDA Forest Service Research has conducted host range studies for both the beetle and fungus. Based on the results of these studies, and the association of *X. glabratus* with species in the family Lauraceae, there is reason to be concerned that the wilt associated with red bay could affect other Lauraceae species, such as endangered or threatened pondberry (*Lindera melissaefolium*) and pondspice (*Litsea aestivalis*). Various plant species in the Lauraceae are common components of forests in other regions of the United States and other countries in the Western Hemisphere.

Sirex noctilio woodwasp

A fall 2004 collection of a female woodwasp in a New York survey trap was identified in February 2005 as *Sirex noctilio*. Infested red and Scots pines were subsequently found in nearby Oswego, NY, later that spring. Delimitation trapping surveys conducted in summer and fall 2005 recovered *S. noctilio* specimens in five counties around Oswego, NY. In late fall of 2005, it was announced that *S. noctilio* was recovered from two locations in Ontario, Canada, approximately 100 miles from the New York infestation. These collections represent the first known establishment of *S. noctilio* in North America.

Sirex noctilio is native to Europe, Asia, and northern Africa and has been inadvertently introduced into a number of countries in the Southern Hemisphere, including New Zealand, Australia, Uruguay, Argentina, Brazil, Chile, and South Africa. In its native range, where it is generally considered to be a secondary pest, it attacks pines almost exclusively, e.g., Scots (*Pinus sylvestris*), Austrian (*P. nigra*), and maritime (*P. pinaster*) pines. In the Southern Hemisphere, the insect has caused upwards of 80-percent mortality in plantations of North American pines especially Monterey pine (*P. radiata*) and loblolly pine (*P. taeda*). Other known susceptible pines include slash (*P. elliottii*), shortleaf (*P. echinata*), ponderosa (*P. ponderosa*), lodgepole (*P. contorta*), and jack (*P. banksiana*).

Interceptions of *S. noctilio* have occurred in the past. The insect is the most common species of exotic woodwasp associated with solid wood packing materials detected at U.S. ports-of-entry. In November 2003, USDA APHIS added *S. noctilio to* their Regulated Plant Pest List.

Forest Health Protection conducted an economic analysis of the potential impacts if the Sirex infestation in New York is allowed to spread. The analysis assumed a conservative 25-mile/year spread from New York, no human-aided movement, current sawtimber and pulpwood prices, a 4-percent discount rate and a 10-percent mortality rate. Sirex would be expected to reach the loblolly pine growing areas of central Virginia in about 10 years, and within 20 years, as it spreads throughout most of North Carolina will have caused $275 million in losses to southern pines. By the time Sirex spreads throughout the southern pine growing region (55 years), it will have caused nearly $2 billion in losses.

USDA Forest Service and APHIS are members of a Sirex Science Advisory Panel and a Sirex Management Team. The first phase of the management plan is to delimit the infestation, implement regulatory controls and initiate biological control. The USDA Forest Service has also developed a Pest Alert to aid in detection and a series of risk maps to identify forests that are susceptible to Sirex infestation. In 2006, USDA APHIS and the Forest Service will support a trapping grid in New York and parts of Vermont and Pennsylvania, regulate movement of pines in 16 counties in New York, test the effectiveness of a parasitic nematode, and work towards securing its regulatory clearance into the infested area.

Part 2: Historical Highlights

Gypsy moth

Lymantria dispar was intentionally brought into the Boston, MA, 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 now extend from Maine to West Virginia, Indiana, and Wisconsin, although Indiana's and Wisconsin's defoliated areas are less than 100 acres, each.

Defoliation in the East has risen from 177,000 acres in 2004 to 669,000 acres in 2005. This is primarily attributable to dramatic defoliation acreage increases in Connecticut, Michigan, and Pennsylvania. Defoliation also increased to a lesser extent in New Jersey.

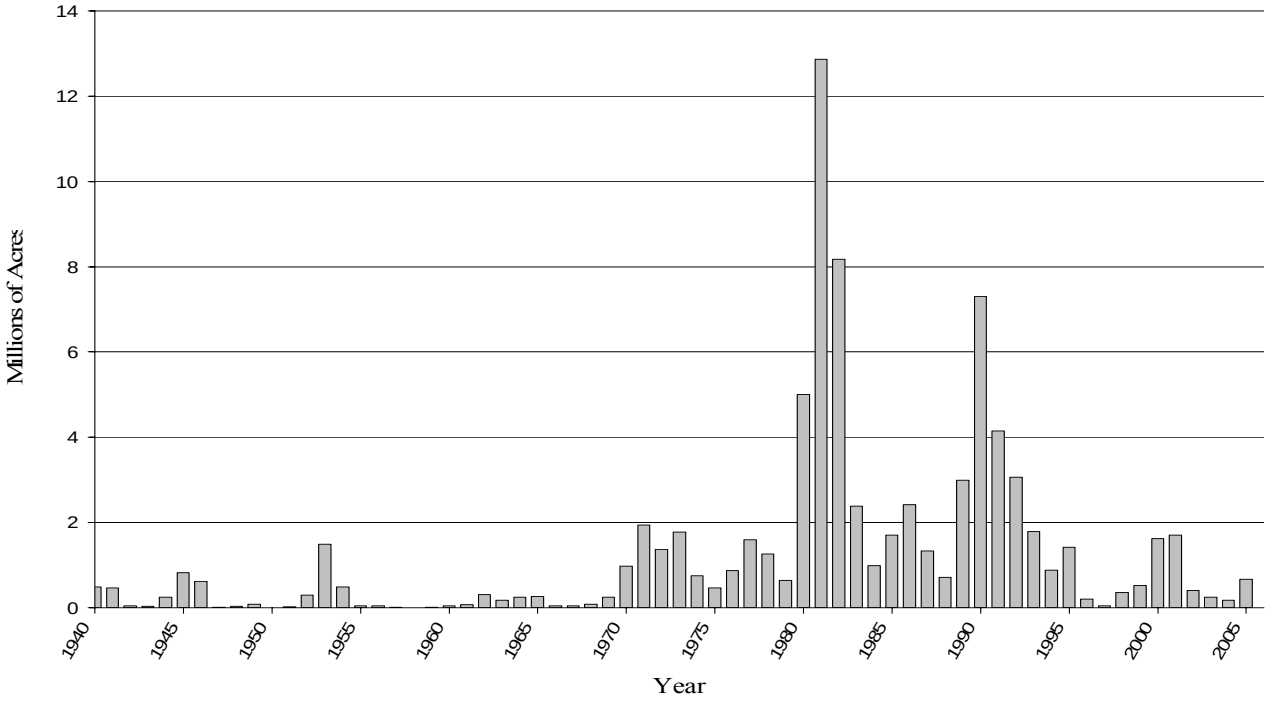
Slow-the-Spread and other suppression/eradication projects continue to show success. Six Northeastern States (Delaware, Maine, Maryland, Rhode Island, Vermont, and Washington, DC) and all 13 Southern States reported no defoliation. Gypsy moth activity continued to decline in Wisconsin, with only 20 acres reported in 2005, while in New York, defoliation declined substantially, from 60,000 acres in 2004 to 21,200 acres in 2005.

Eastern Counties Where Gypsy Moth (European) Defoliation Was Reported, 2005

Acres with Gypsy Moth (European) Defoliation, 2001-2005

State	2001	2002	2003	2004	2005
Connecticut	400	0	0	600	64,300
Delaware	0	0	0	0	0
Maine	29,500	51,500	0	0	0
Maryland	46,200	14,000	100	0	0
Massachusetts	48,000	4,700	0	34,800	36,800
Michigan	0	0	46,800	45,200	148,500
New Hampshire	8,500	11,800	0	5,000	6,400
New Jersey	140,800	41,900	5,100	8,000	45,400
New York	50,900	7,100	200	60,000	21,200
Ohio	42,500	2,500	4,100	5,900	7,700
Pennsylvania	283,700	55,800	1,800	16,800	333,300
Rhode Island	8,000	0	0	0	3,100
Vermont	100	0	0	0	0
Virginia	440,000	51,900	79,900	0	0
Washington, DC	0	0	0	0	0
West Virginia	603,800	132,100	13,900	0	2,600
Wisconsin	3,700	37,400	99,000	500	0
Total	1,706,100	410,700	250,900	176,800	669,300

Gypsy Moth (European) Defoliation, 1940-2005



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 every year. Infestations usually start in trees weakened by disease, lightning strikes, excessive age, storm damage, or other stress factors. Populations can build quickly as there are three to seven generations per year. Shortleaf, loblolly, Virginia, and pitch pines are preferred hosts.

Southern pine beetle activity remained at historic lows over much of the South in 2005, with the affected acreage increasing only slightly from 2,683,500 in 2004 to 2,845,600 acres in 2005. Beetle activity continued in South Carolina and Alabama. South Carolina reported two counties still in outbreak status, down from five in 2004. Alabama reported 18 counties in outbreak status in 2005, up slightly from 15 in 2004.

New Jersey was the only Northeastern State to report pine mortality from southern pine beetle: 634 acres in the four southern-most counties.

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

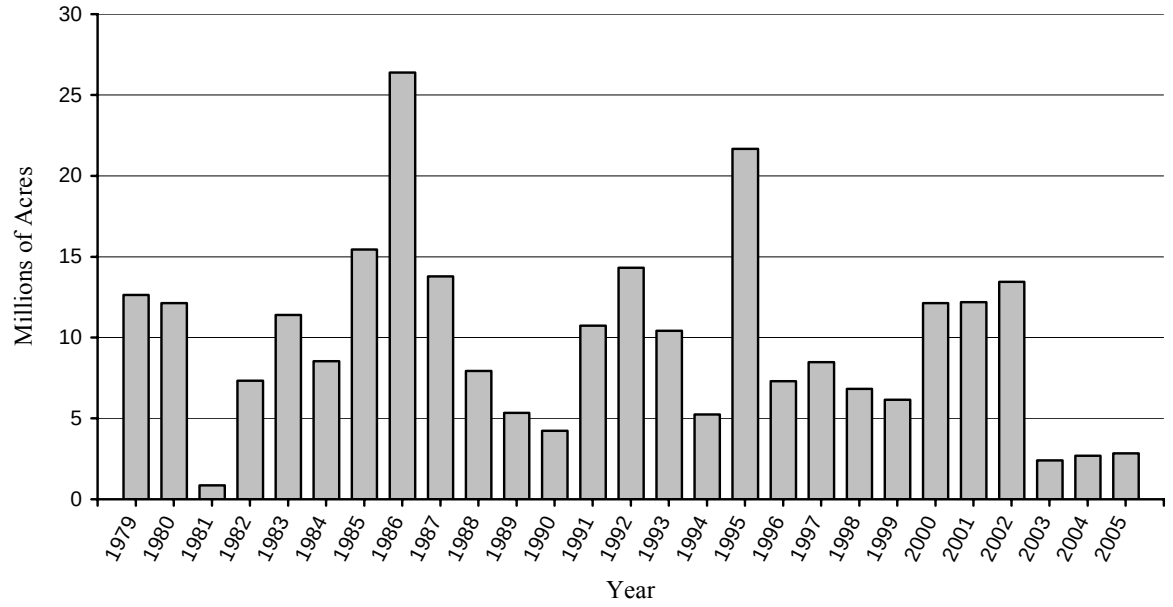
Counties Where Southern Pine Beetle Activity Was Reported, 2005

Acres (in thousands) with Southern Pine Beetle Outbreaks, 2001-2005*

State	2001	2002	2003	2004	2005
Alabama	4,876.0	5,077.0	0.0	2,182.9	2604.0
Arizona	0.0	0.0	0.0	0.0	0.0
Arkansas	0.0	0.0	0.0	0.0	0.0
Florida	916.0	916.0	0.0	0.0	0.0
Georgia	1,407.0	2,424.0	85.8	0.0	0.0
Kentucky	767.0	0.0	0.0	0.0	0.0
Louisiana	0.0	0.0	0.0	0.0	0.0
Mississippi	0.0	265.0	0.0	0.0	0.0
New Jersey	0.0	1.9	2.5	0.0	0.6
North Carolina	797.0	935.0	9.2	0.0	0.0
Oklahoma	0.0	0.0	0.0	0.0	0.0
South Carolina	1,727.0	2,574.0	1,789.0	500.6	241.0
Tennessee	1,425.0	1,197.0	516.9	0.0	0.0
Texas	0.0	0.0	0.0	0.0	0.0
Virginia	276.0	66.0	0.0	0.0	0.0
Total	12,191.0	13,455.9	2,403.4	2,683.5	2845.6

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

Southern Pine Beetle Outbreaks, 1979-2005



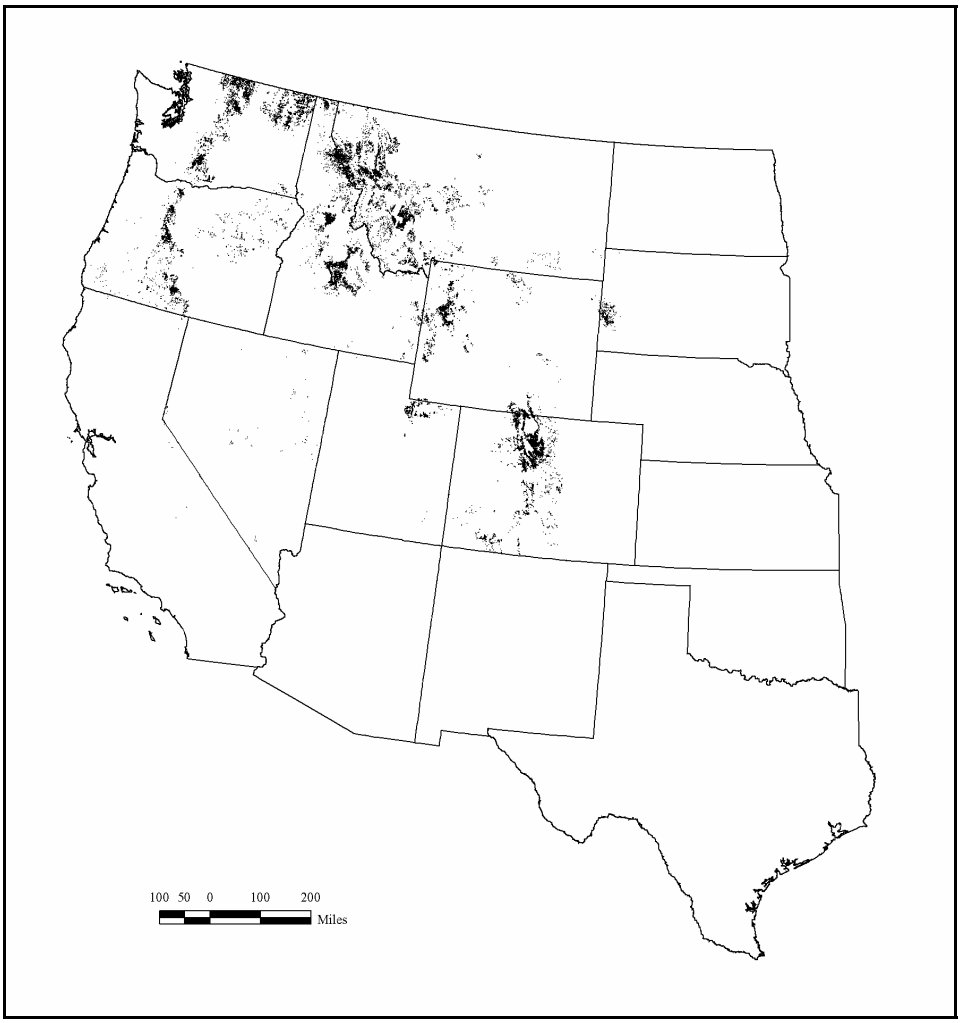
Mountain pine beetle

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 by about 6 percent over 2004. Beetles were found in all Western States, except Arizona and New Mexico, with lodgepole pine being the hardest hit tree species.

Despite the overall increase, mountain pine beetle activity decreased substantially in some States: a 75-percent decrease in California and a 66-percent decrease in South Dakota. However, these decreases were more than offset by continuing epidemics in Montana and Washington, with acreage increases of 69 percent and 70 percent, respectively. The States with highest 2005 acreage in outbreak status are Montana (749,000), Idaho (528,800), Colorado (502,700), and Washington (492,600).

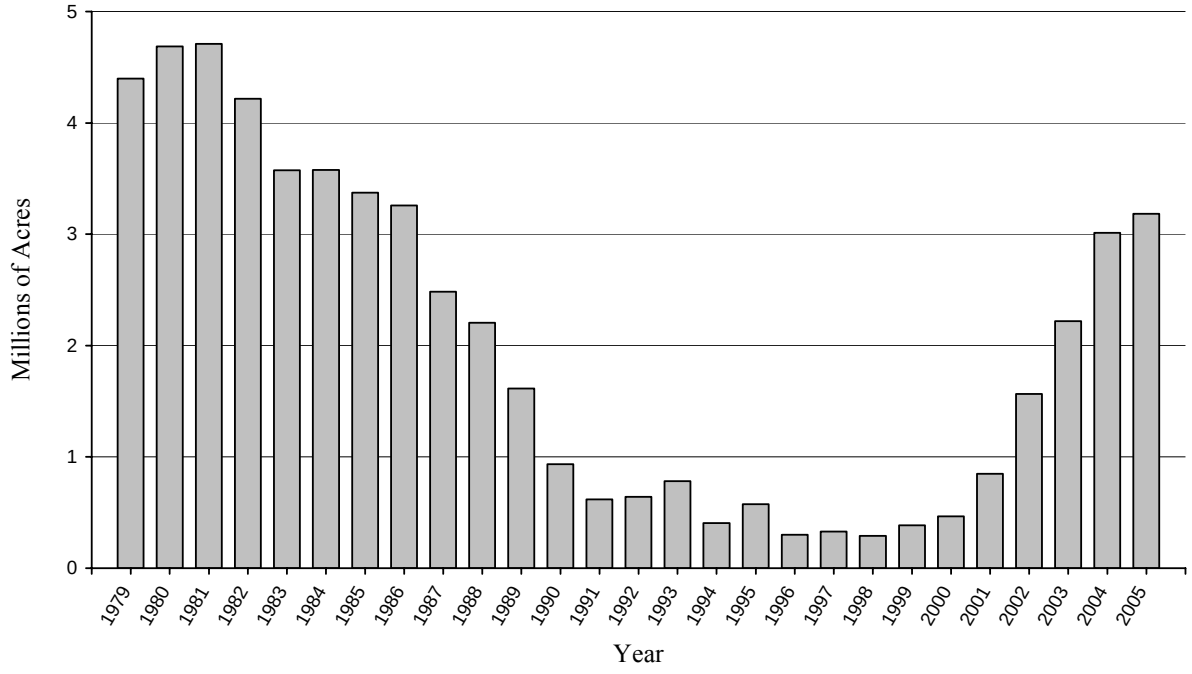
Mountain Pine Beetle Outbreak Areas, 2005



Acres (in thousands) with Aerially Detected Mountain Pine Beetle Outbreak, 2001-2005

State	2001	2002	2003	2004	2005
Arizona	0.0	0.0	0.0	0.0	0.0
California	29.6	186.8	614.8	438.4	110.2
Colorado	151.2	209.6	227.1	438.4	502.7
Idaho	170.0	339.3	341.9	553.1	528.8
Montana	111.7	249.5	291.2	453.2	749.0
Nevada	1.2	2.6	2.4	4.0	2.7
New Mexico	0.0	3.8	0.0	0.0	0.0
Oregon	76.3	182.3	186.0	244.5	265.4
South Dakota	102.2	102.9	189.6	57.6	19.5
Utah	17.3	26.7	53.4	143.9	116.2
Washington	134.8	173.1	223.8	289.9	492.6
Wyoming	55.0	88.0	88.9	389.2	395.9
Total	849.3	1,564.6	2,219.1	3,012.2	3,183.0

Mountain Pine Beetle Outbreaks, 1979-2005



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 2005 were low in the Northeastern States. Defoliation decreased slightly but was still noticeable in the Lake States. While increasing in Minnesota from 83,000 acres in 2004 to 92,600 acres in 2005, in Michigan the acres of defoliation decreased by 64 percent, from 26,000 acres to 9,500, and in Wisconsin from 26,000 acres in 2004 to 21,000 in 2005.

In Alaska, acres of defoliation decreased substantially, from the 84,000 acres observed in 2004 to 16,000 acres in 2005. However, observation problems during the 2005 survey kept reported acreage artifically low. Ground surveys indicate that populations are still expanding and the outbreak will continue.

Eastern Counties Where Spruce Budworm Defoliation Was Reported, 2005

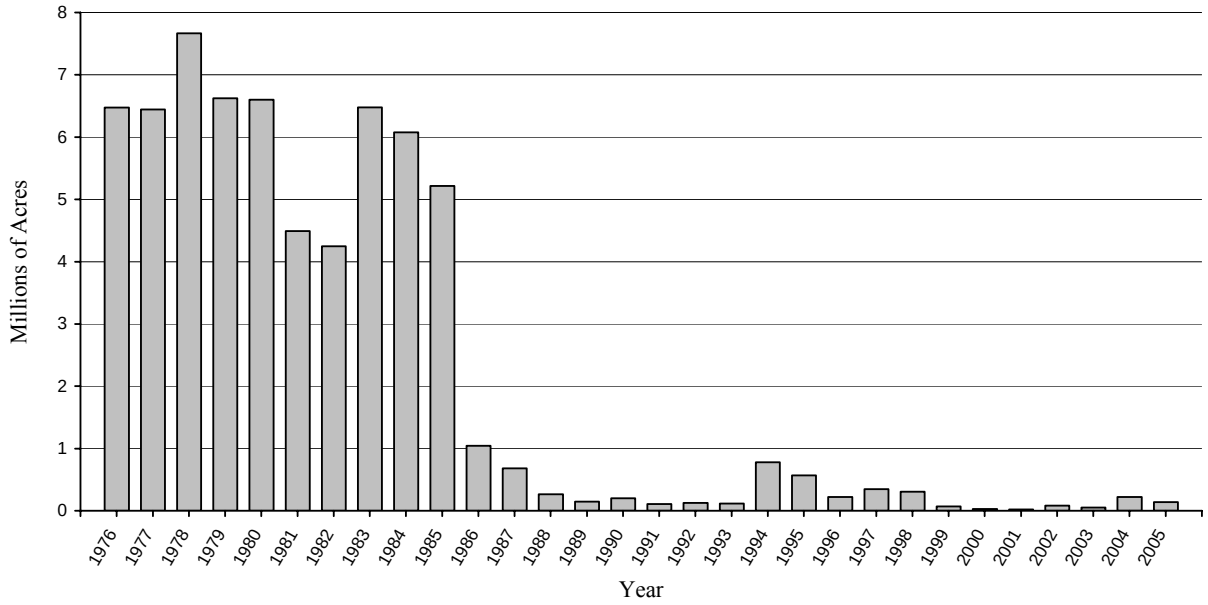
Acres (in thousands) with Spruce Budworm Defoliation in the Eastern United States, 2001-2005

State	2001	2002	2003	2004	2005
Maine	0.0	0.0	0.0	0.0	0.0
Michigan	3.3	0.5	11.8	26.0	9.5
Minnesota	18.9	80.3	34.9	83.0	92.6
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	0.8	0.4	4.0	26.0	21.0
Total	23.0	81.2	50.7	135.0	123.1

Acres (in thousands) with Spruce Budworm Defoliation in Alaska, 2001-2005

State	2001	2002	2003	2004	2005
Alaska	0.0	0.0	0.0	84.0	16.0

Acres (in thousands) with Spruce Budworm Defoliation in the Eastern United States, 1976-2005



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.

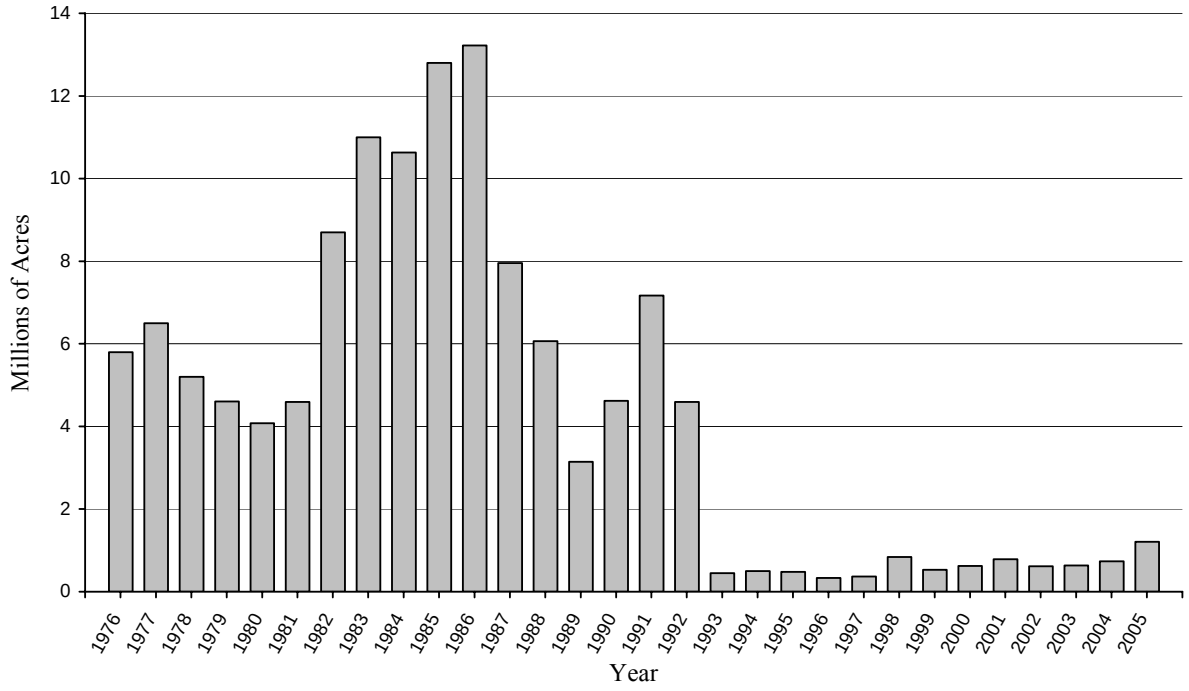
Populations of western spruce budworm remain at historic lows in many of the Western States. Despite the relatively low level of activity, acres of western spruce budworm defoliation jumped by 64 percent, from 734,600 acres in 2004 to 1,205,700 acres in 2005. Other than a 23-percent decline in New Mexico, defoliation acreage in other Western States increased dramatically with three States seeing increases greater than 100 percent between 2004 and 2005: 102 percent (20,500 acres) in Utah, 257 percent (51,400 acres) in Colorado, and 156 percent (276,400 acres) in Montana, where the budworm defoliation increased not only in extent, but also in intensity. With much of the West experiencing warmer and drier weather conditions, western spruce budworm populations are expected to continue to increase.

Western Spruce Budworm Defoliation Areas, 2005

Acres (in thousands) with Western Spruce Budworm Defoliation, 2001-2005

State	2001	2002	2003	2004	2005
Arizona	14.1	11.3	24.0	10.7	11.2
California	0.0	0.0	0.0	0.0	0.0
Colorado	35.8	131.1	20.0	20.0	71.4
Idaho	4.2	22.6	204.1	64.1	75.3
Montana	1.2	52.4	66.0	177.3	453.7
New Mexico	445.3	198.8	143.2	238.2	183.8
Oregon	0.2	1.9	5.5	6.6	0.3
Utah	10.2	7.0	14.7	20.0	40.5
Washington	271.9	57.5	139.9	193.2	363.1
Wyoming	0.8	134.6	13.3	4.5	6.4
Total	783.7	617.2	630.7	734.6	1,205.7

Aerially Detected Western Spruce Budworm Defoliation, 1976-2005



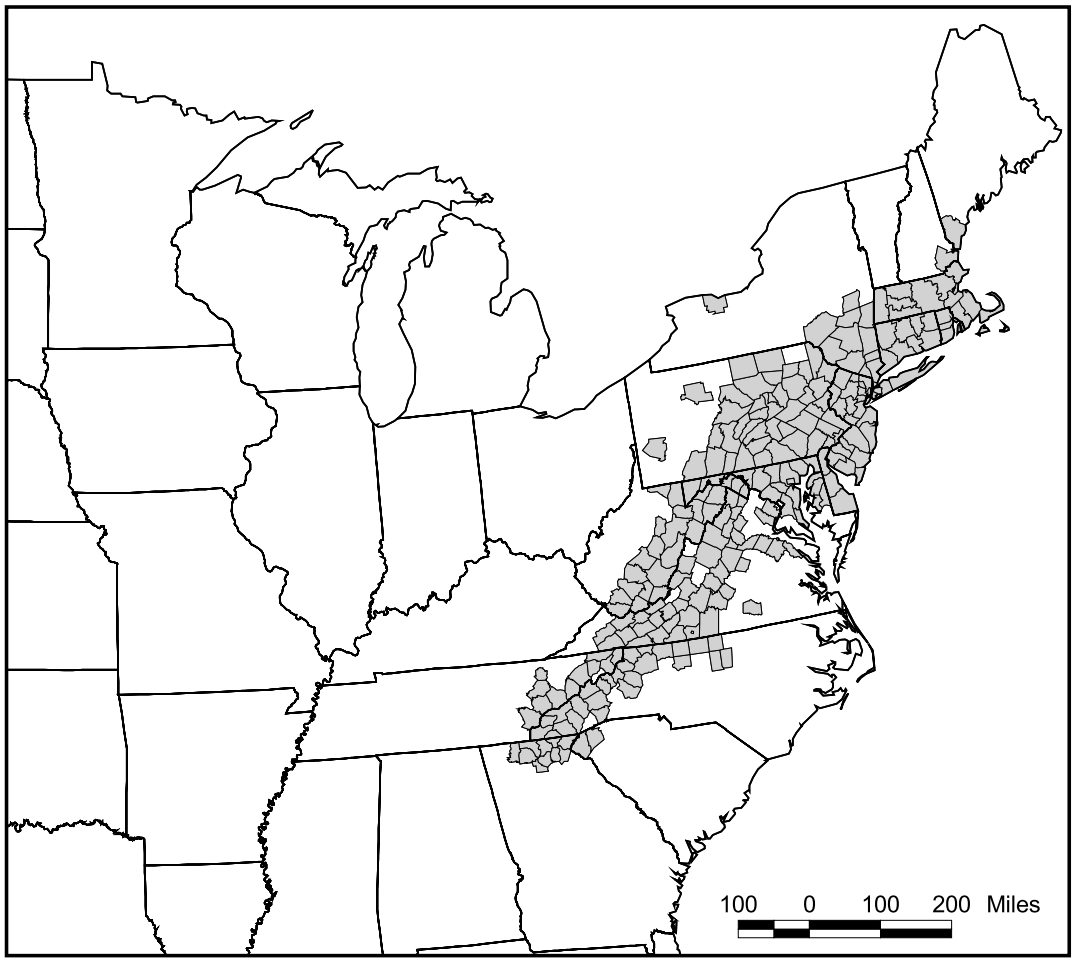
Hemlock woolly adelgid

Adelges tsugae was introduced into the east coast near Richmond, VA, 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.

In 2005, infestations of hemlock woolly adelgid intensified dramatically in the Southern Appalachians. Despite some success, the adelgid continues to outpace control efforts in many areas. The influence of 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 found on the west coast in 1924 and occurs 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, 2005

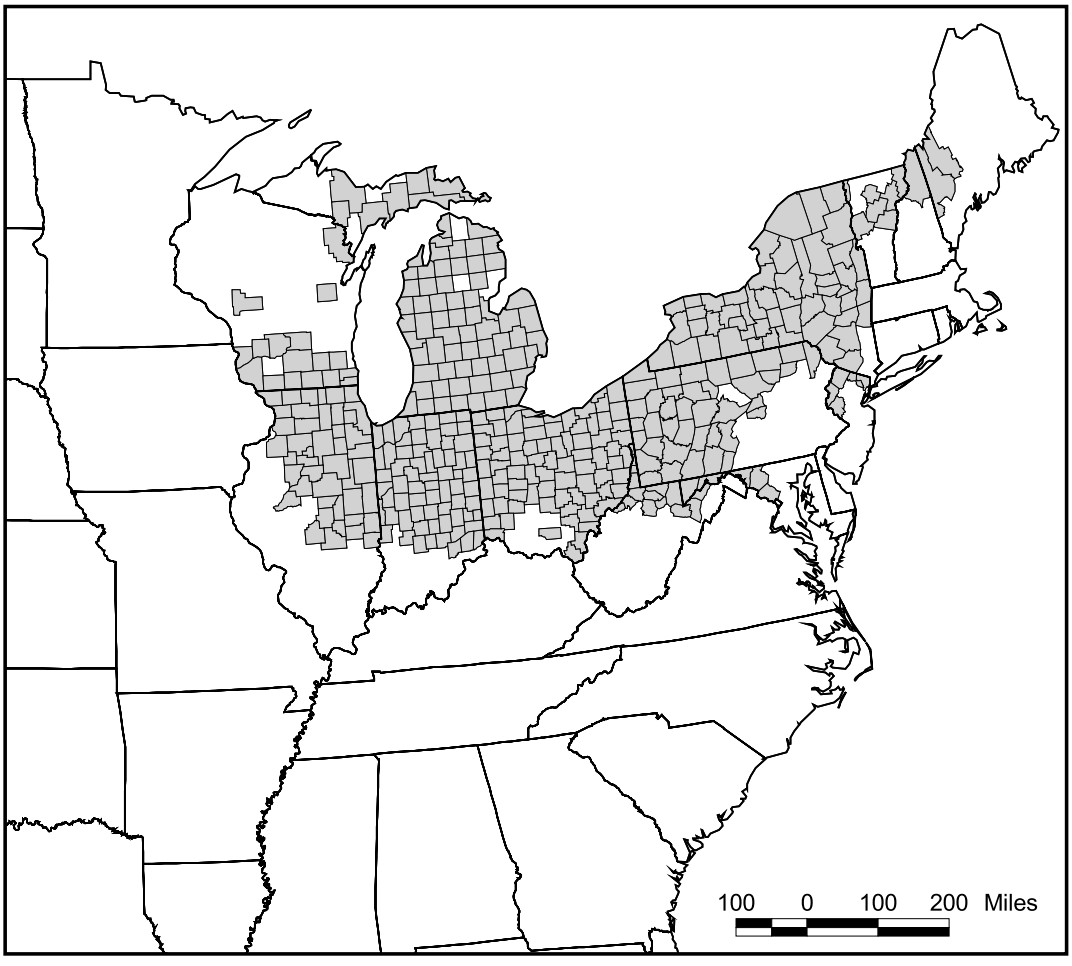


Common European pine shoot beetle

Tomicus piniperda is an introduced insect discovered in a Christmas tree plantation near Cleveland, OH, 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 for 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 15 States during 2005.

Eastern Counties Where Common European Pine Shoot Beetle Was Reported, 2005



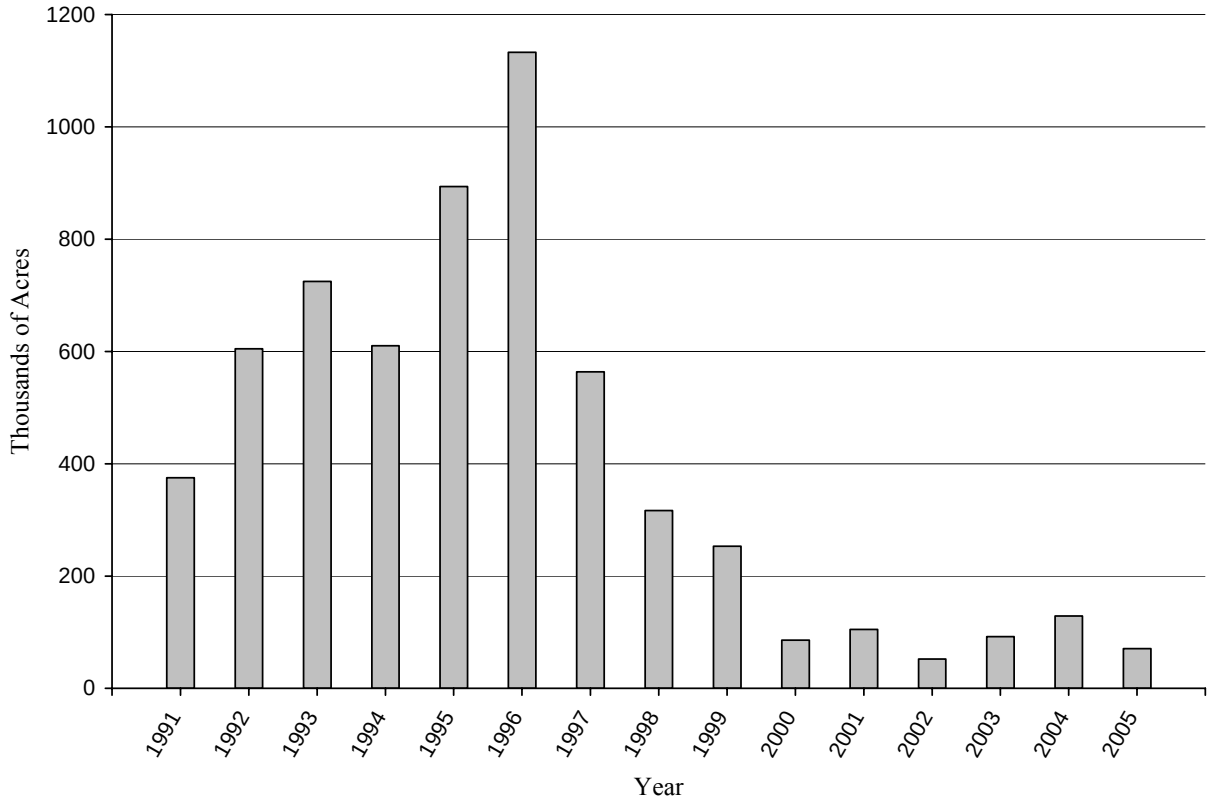
Spruce beetle

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.

Spruce beetle activity has decreased in Alaska to normal, endemic population levels, a trend reinforced by an acreage decrease of 45 percent, from 129,000 in 2004 to 71,000 in 2005. In the 1990s, 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 were conducive to increases in spruce beetle populations. Mild winters and warm dry summers have created a situation that has allowed the various populations to significantly increase.

Acres (in thousands) with Spruce Beetle Active and Newly Infested Areas in Alaska, 1991-2005



Dogwood anthracnose

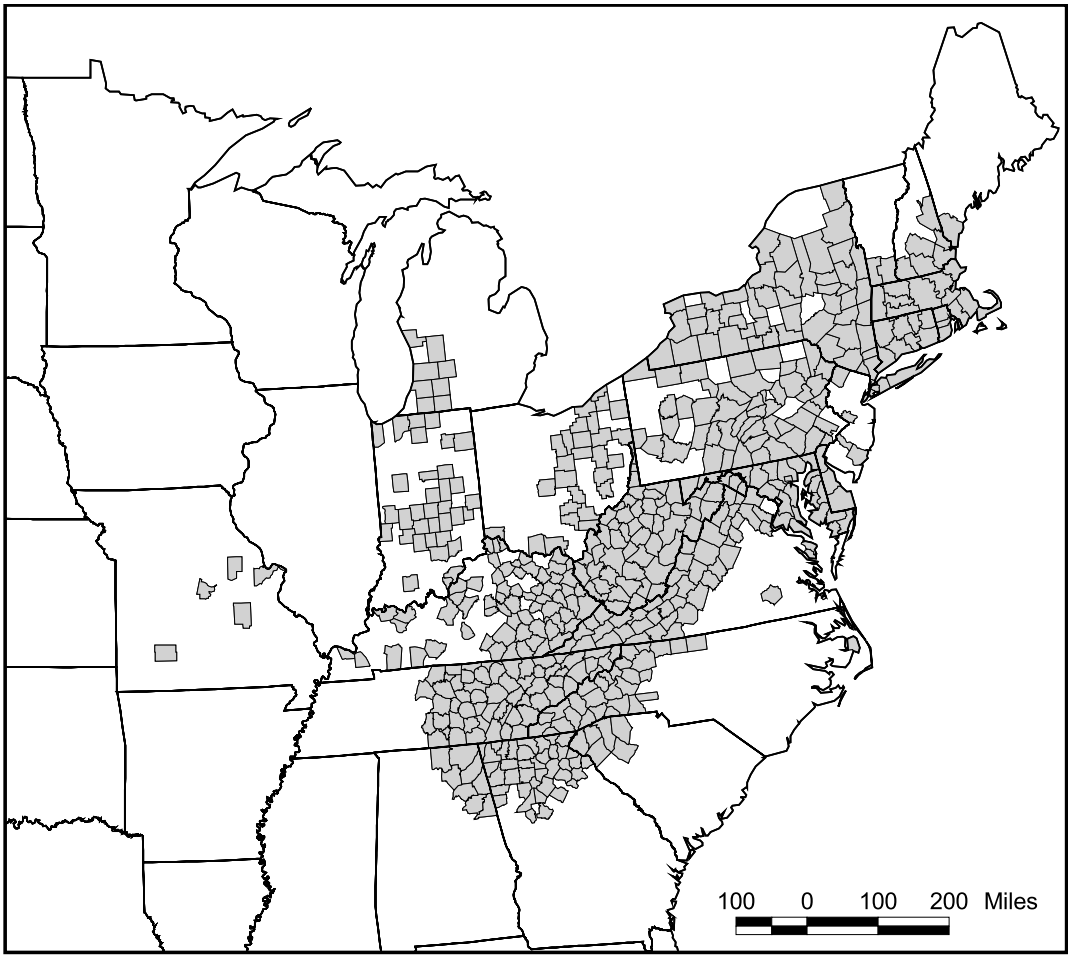
Discula destructiva, the fungus that causes dogwood anthracnose, is of unknown origin. First discovered in the Pacific Northwest in 1976, the disease is confirmed in Idaho, Oregon, and Washington. Although the Pacific dogwood is more susceptible to the fungus than the eastern dogwood, drier summers in 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 2005, 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 Delaware, Maryland, Massachusetts, Rhode Island, West Virginia, and Connecticut. No new counties were found to be infested in 2005.

Eastern Counties Where Dogwood Anthracnose Was Reported, 2005



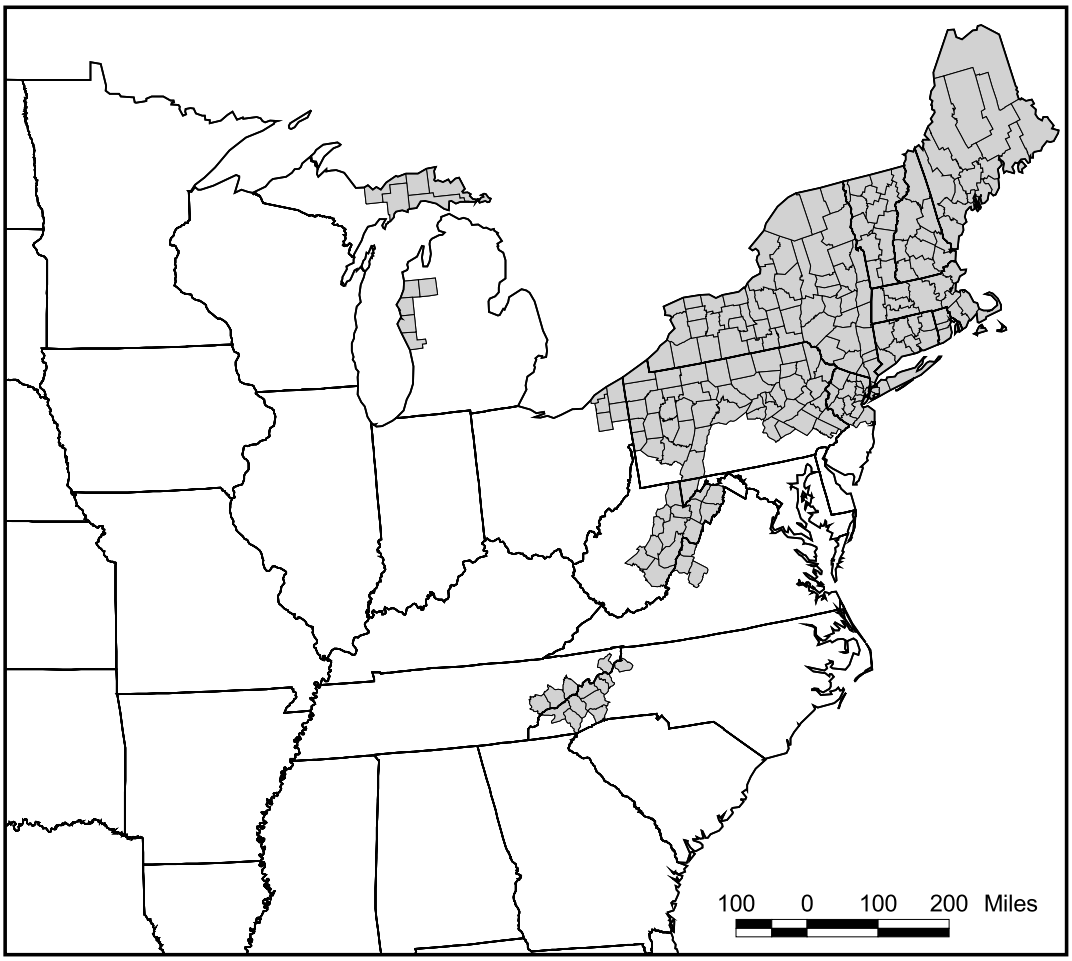
Beech bark disease

Beech bark disease is caused by the interaction of the beech scale, *Cryptococcus fagisuga*, and one or more fungi in the genus *Neonectria*. The scale insect creates wounds in the tree that are colonized by fungi, such as *Neonectria coccinea* var. *faginata*. The scale, and probably the fungus, were accidentally brought to Nova Scotia, Canada, circa 1890. Native fungi, *Neonectria galligena* and *Neonectria 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 2005, the killing front caused extensive mortality in the Allegheny National Forest.

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 predicted. Accordingly, in 2005, two new counties were added to the infected North Carolina-Tennessee border area. In 2000, the scale was found in Michigan, more than 200 miles from its nearest previously known location in northeastern Ohio. Both *Neonectria galligena* and *Neonectria coccinea* var. *faginata* have been found in Michigan, causing disease and killing an estimated 7.5 million beech trees.

Tree mortality continues within affected areas at a greater rate than predicted, although some beech trees appear to be resistant. 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, 2005



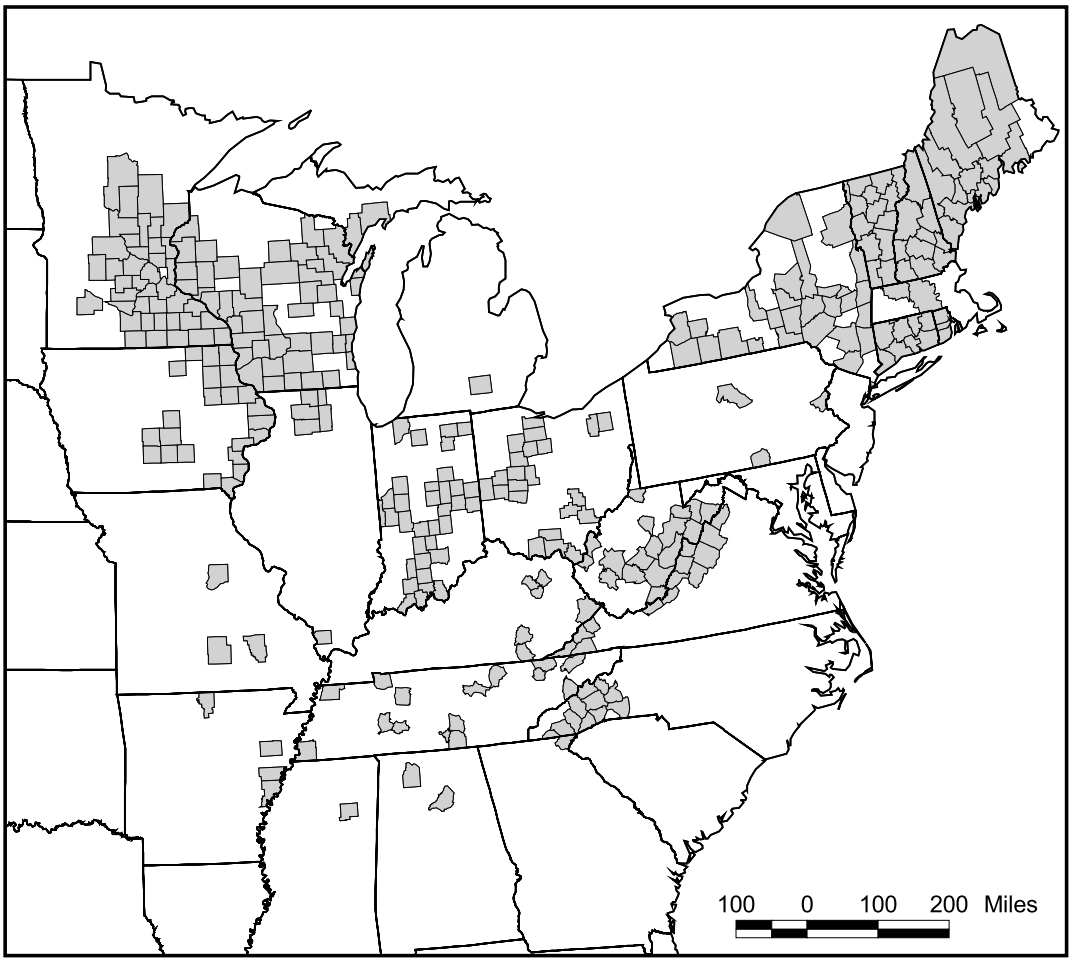
Butternut canker

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 causes multiple cankers under the bark that merge and girdle the trees, killing large trees, saplings, and regeneration. It is estimated that 77 percent of the butternut trees in North Carolina and Virginia have been killed and in 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 butternut grows. 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, but no new affected counties have been added to the map (below) in 2005.

Eastern Counties Where Butternut Canker Was Reported, 2005



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, 2005*

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 (93)	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.

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 29 million acres of western forests (including Alaska) 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, 2005

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)	1,174.0	674.0	25.0	1,873.0
Callifornia (05)	2,511.3	75.9	2,102.1	4,689.3
Colorado (06)				815.9
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)	1,144.0	348.0	581.0	2,073.0
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 (06)				637.3
Total	16,960.6	1,778.9	9,122.1	29,314.8

* 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, New Hampshire, and Vermont

Host(s): Northern white-cedar

Populations of these perennial pests of arborvitae caused varying degrees of damage across New Hampshire. No significant activity was noted in Maine, and populations in Vermont collapsed in 2005, where only light damage was observed.

Aspen leaf miner
Phyllocnistis populiella

Region 10: Alaska

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

Aspen leaf miner infestations increased for a fifth consecutive year. In 2005, 659,536 acres were mapped by aerial survey. The current outbreak continues to expand and intensify in the interior hardwoods surrounding Fairbanks. The infestation extends northeast to the Alaska/Yukon border through the Yukon River Valley, where over 200,000 acres were mapped, and southeast to the Alaska/Yukon border along the Tanana River drainage. With the exception of a few localized outbreaks in south-central Alaska and those spread sporadically across the western part of the State, the majority of the outbreak is bounded by the Alaska Range to the south and the Brooks Range to the north.

Many aspen trees, especially in the hills, were severely drought stressed in 2004 and continued to be in 2005. These trees flushed in the spring with small, thin leaves, and began losing these leaves relatively early, in late-July. In 2005, most areas of the outbreak were quite severe and some aspen top-kill was noticed. However, it is not known if the top-kill can be solely attributed to aspen leaf miner.

Ash defoliator
Palpita magniferalis

Region 9/Northeastern Area: Maine

Host(s): Ash

In Maine, ash along the mid-coast was impacted by a number of stressors, including the native pyralid moth, *Palpita magniferalis*. This insect has been reported in forest surveys for years but never at damaging levels in North America until 2003, when severe defoliation was reported in Islesboro and Owlshead, ME. In 2005, *P. magniferalis* again caused moderate to heavy defoliation in Islesboro with additional scattered reports along the mid-coast area.

Bagworm moth
Thyridopteryx ephemeraeformis

Region 9/Northeastern Area: West Virginia

Host(s): Miscellaneous conifers, black locust, and boxelder

As in 2004 in West Virginia, light populations of this moth were reported statewide.

No activity was reported in Illinois in 2005.

Baldcypress leaf roller
Archips goyerana

Region 8: Louisiana

Host(s): Baldcypress

In 2005, 66,500 acres of mixed baldcypress stands in southern and southeastern Louisiana (Ascension, Assumption, Iberia, Iberville, LaFourche, St. Charles, St. James, St. John the Baptist, St. Martin, and Terrebonne parishes) were defoliated by the baldcypress leafroller. Approximately 15,300 acres were severely defoliated (≥50 percent). The primary impact of this defoliation is loss of radial growth, producing an estimated growth loss of 0.1 MBF/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, New Hampshire, and Vermont

Host(s): Balsam fir

Population levels were very low throughout Maine in 2005. No control projects were necessary and no reports of damage in commercial Christmas tree farms or in wild balsam stands used in the wreath industry were received. Population levels of this pest are cyclic and were expected to show an increase in 2006. In New Hampshire, an increase in gall midge was seen throughout the northern region of the State. Vermont reported very little damage from this pest.

Balsam shoot boring sawfly
Pleroneura brunneicornis

Region 9/Northeastern Area: Maine

Host(s): Balsam fir and Fraser fir

In Maine, there were no reports of significant damage in Christmas tree plantations. Damage in native stands was spotty and generally light.

Balsam twig aphid
Mindarus abietinus

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

Host(s): Balsam fir

New Hampshire reported statewide populations to be rising, particularly in the northern part of the State. In Maine, statewide population levels of this insect were generally low 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 did not have a significant impact on the wreath brush harvest in 2005. Vermont reported widely scattered moderate damage.

Barklice or psocids
Archipsocus spp.

Region 8: Texas

Host(s): Hardwoods, mostly oaks

During the summer of 2005, higher than normal populations of barklice in eastern Texas caused many people to inquire about the source of webs covering the trunks and branches of their trees. No permanent harm was caused by the webs.

Basswood thrips
Thrips calcaratus

Region 9/Northeastern Area: Wisconsin

Host(s): Basswood

In Wisconsin, populations remained as low in 2005 as they were in 2004.

Beech blight aphid
Grylloprociphilus imbricator

Region 9/Northeastern Area: Ohio

Host(s): American beech

In Ohio, this aphid was again observed in Geauga County, but 2005 population levels appeared to decrease from 2004. Aphids were found feeding on twigs and smaller branches, but health impacts on trees appeared to be minimal. No significant activity was reported from Pennsylvania in 2005.

Birch skeletonizer
Bucculatrix canadensisella

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

Host(s): Birch species

Birch trees across a wide swath of eastern Maine were heavily impacted by this late season defoliator in 2005. Moderate to severe defoliation was spotty, ranging from individual trees intermingled in mixed hardwood types to 1,000-acre patches when stands were predominantly birch. Birch skeletonizer usually stays at high levels for 2-3 years at a time, and this was the first year of noticeable defoliation in eastern Maine. Continued impact was expected for the next year or two. In New Hampshire, this insect was present throughout the range of birch but at endemic levels. In Vermont, there was noticeable damage only in central and northern areas.

Black turpentine beetle
Dendroctonus terebrans

Region 8: Regionwide

Host(s): Loblolly pine, longleaf pine, slash pine, and 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. BTB are active in the lower 6 to 8 feet of the tree's bole. Although typically 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 variable in 2005. Florida reported higher than normal problems owing to damage from major hurricanes of 2004, with impacts especially harsh in wildland-urban interface areas, where homeowners incur large expenses for removal of residential shade trees. Virginia reported only scattered and moderate BTB occurrence. Georgia reported activity levels similar to 2004, generally in association with stand thinning and annosum root disease. Mississippi reported continuing BTB activity in longleaf pine stands in the southern part of the State where both prescribed burning and harvest treatments had been carried out. South Carolina reported increases in BTB activity in areas previously thinned to control SPB, scattered commercial thinnings, and areas with hot prescribed fires. North Carolina noted increased BTB activity in Sandhills longleaf stands being managed for pine straw production and in scattered areas as a result of drought stress and the impacts of urbanization. Tennessee reported scattered BTB activity in loblolly pine stands in the eastern and western ends of the State. Alabama predicted an increase in BTB activity as a result of extensive hurricane damage in 2004 and 2005, but this effect has not yet manifested itself.

Bruce spanworm
Operophtera bruceata

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

Host(s): Sugar maple and beech

No significant activity was reported in Maine. In New Hampshire, there were no reports of damage in 2005. In New York, this insect was associated with some moderate to heavy defoliation in the Adirondack region; however, its impacts were usually secondary in comparison to the forest tent caterpillar, which was often noted in the same stands. In Vermont, populations were sharply decreased from previous years.

Insects: Native

In Pennsylvania, aerial surveys for Bruce spanworm also included damage done by the fall cankerworm (*Alsophila pometaria*), and halfwing geometer (*Phigalia titea*): an estimated 5,058 acres were reported damaged in some areas. High populations of ground beetle predators (*Calosoma frigidum* and *Calosoma wilcoxi*) were observed in association with some geometrid outbreaks.

Buck moth
Hemileuca maia

Region 8: Louisiana

Host(s): Live oak and 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 began declining in 2003; the larval populations in 2005 were low, with little obvious defoliation. The effects of flooding from hurricanes in 2005 may have a profound effect on future population levels due to the stressed and weakend condition of the trees.

California budworm
Choristoneura carnana californica

Region 5: Northern California

Host(s): Douglas-fir

No defoliation was reported on the east side of Trinity Lake, Shasta County, an area where budworm populations have been highly variable over the past 20 years.

California flatheaded borer
Melanophila californica

Region 5: Southern California

Host(s): Various pines

Mortality of Jeffrey pine due to this borer increased in the Piute Mountains on the Sequoia National Forest. Borers have been active in this area for several years, but have not caused significant mortality over any one-year period. Recent drought and water competition with large shrubs appear to have contributed to tree stress, thus attracting wood-boring beetles.

The California flatheaded borer remained active in many areas of southern California in 2005, but at much reduced levels compared to previous years. This insect was most active in Jeffrey pine in the mountains of San Diego County, although attacks occurred in many other areas as well.

Common oak moth
Phoberia atomaris

Region 9/Northeastern Area: Ohio and West Virginia

Host(s): White oak

In Ohio, common oak moth and the half-winged geometer were not as evident this year in southern Ohio and populations appeared to have collapsed. Some white oak mortality was reported to be still occurring, as in 2004. In West Virginia, surveys for the common oak moth were done in conjunction with those for several miscellaneous loopers that cause damage at similar times. Defoliation reported in Braxton, Calhoun, Doddridge, Gilmer, Harrison, Jackson, Kanawha, Lewis, Lincoln, Mason, Pleasants, Putnam, Ritchie, Roane, Tyler, Wayne, Wirt, and Wood Counties totaling approximately 11,000 acres in 2004 was not apparent in 2005. This was the third season that common oak moth was recorded as a primary damaging agent in West Virginia. Populations, while widespread, appeared to be declining in 2005 compared to infestations during the 2003 or 2004 seasons.

Cypress looper
Anacamptodes pergracilis

Region 8: Florida

Host(s): Baldcypress

Cypress loopers produced heavy defoliation in several stands at the Avon Park Air Force Range and surrounding areas in Florida during the summer.

Douglas-fir beetle
Dendroctonus pseudotsugae

Region 1: Idaho and Montana

Host(s): Douglas-fir

Douglas-fir beetle populations remained at nearly static levels in most parts of northern Idaho. A notable decrease was observed on the Kaniksu National Forest, while most others showed very slight increases or levels similar to those recorded in 2004. The Nez Perce National Forest had the biggest increase, while infested acres mapped on Coeur d'Alene and Clearwater National Forests were at nearly static levels. Overall, the infested area in northern Idaho increased slightly, from 8,900 acres in 2004 to just over 9,000 acres in 2005. Few currently infested trees were observed in areas surveyed in northern Idaho.

In western Montana, most infested stands in the northwestern part of the State showed static or declining beetle populations; however, a marked increase was noted on the Flathead National Forest and in parts of Glacier National Park. In many areas, beetle-killed trees were still obvious; but seldom did we find higher numbers of new attacks in 2005. Stands surveyed in and around areas affected by fires in 2000 on parts of the Bitterroot and Helena National Forests, showed populations beginning to decline—especially so on the Helena National Forest, where the infested area recorded on aerial detection surveys declined from 18,800 acres in 2004 to slightly less than 5,560 acres in 2005. On the Bitterroot National Forest, where beetles have infested stands not affected by fire, the area infested increased from 31,000 acres in 2004 to almost 70,000 acres in 2005—still the most heavily impacted "reporting area" (see definition, Appendix B) in the region. Ground surveys showed fewer areas with high numbers of currently infested trees, so we believe the infestation has begun to decline. Surveys conducted on Deerlodge and Lolo National Forests showed significant increases in infested areas. On the Gallatin National Forest, populations remained high in some stands, and overall, more infested acres were recorded in 2004 than in 2005. Later-than-normal attacks

found there in October 2004 resulted in little tree mortality. Spring surveys indicated that few of those late-season attacks caused mortality.

Regionwide, the infested area mapped increased to more than 177,500 acres, up from 101,400 acres in 2004. In a few stands on the Bitterroot, Lolo, Deerlodge, and Gallatin National Forests, populations may be static to increasing. In some areas, increases may be more perceived than real. It is often difficult to identify the year of tree death from the air.

Region 2: Colorado and Wyoming

Host(s): Douglas-fir

Douglas-fir beetle activity continued or increased at various locations in southern Colorado, impacting both public and private lands. Some beetle activity was in direct association with prior prescribed burns and wildfires, while some had no association with fire/tree scorch. Douglas-fir beetle activity was observed on the Gunnison, Rio Grande, San Isabel, San Juan, and White River National Forests and on surrounding Bureau of Land Management and private lands. Concentrations of beetle-caused tree mortality on the Saguache Ranger District, Rio Grande National Forest, are located in stands that were previously and repeatedly defoliated by western spruce budworm. Douglas-fir beetle activity has increased immediately adjacent to the 2002 Million Fire perimeter on the Rio Grande National Forest and to a lesser degree in immediate proximity to the 2002 Missionary Ridge Fire on the San Juan National Forest. For the third consecutive year, beetle activity continued to intensify in old, dense Douglas-fir stands along Hwy. 145, above the Dolores River on the San Juan National Forest. Douglas-fir pole beetle, *Pseudohylesinus nebulosus,* was commonly observed in stands also being impacted by Douglas-fir beetle.

Douglas-fir beetle outbreaks are occurring along the west side of the Bighorns (Shell Canyon, Tensleep Canyon, BattlePark) and in parts of the Shoshone (the North Fork and most areas of Douglas-fir around the Wind River range). It is starting to increase again in the Clarks Fork area, specifically in the Upper Sunlight area. Approximately 700,000 Douglas-fir trees across 170,000 acres were killed in 2005 within these areas.

Region 3: Arizona and New Mexico

Host(s): Douglas-fir

Douglas-fir beetle-caused mortality in the Southwest decreased slightly, from 87,965 acres in 2004 to 77,255 acres in 2005. In Arizona, damage was recorded on the Apache-Sitgreaves (6,925 acres), Coconino (4,410 acres), Coronado (150 acres), Kaibab (2,510 acres), Prescott (130 acres), and Tonto (575 acres) National Forests; Grand Canyon National Park (55 acres) and Walnut Canyon National Monument (5 acres); Fort Apache (460 acres) and Navajo (5,960 acres) Indian Reservations; and 30 acres of State and private lands. In New Mexico, Douglas-fir beetle-caused tree mortality was detected on the Carson (11,885 acres), Cibola (2,860 acres), Gila (1,575), Lincoln (935 acres), and Santa Fe (14,770 acres) National Forests; Valles Caldera National Preserve (1,610 acres), Bandelier National Monument (215 acres), and 180 acres of Bureau of Land Management lands; Jicarilla Apache (2,800 acres), Isleta Pueblo (50 acres), Jemez Pueblo (100 acres), and Picuris Pueblo (125 acres), Santa Clara Pueblo (785 acres), Taos Pueblo (315 acres), and 110 acres of other tribal lands; and 17,730 acres of State and private lands.

Region 4: Idaho, Utah, and Wyoming

Host(s): Douglas-fir

Douglas-fir beetle-caused tree mortality decreased slightly across Region 4. In 2005, 140,800 acres were affected, compared to 178,100 acres in 2004. Most of the mortality for 2005 occurred in Utah on the Ashley National Forest (33,100 acres) and in Wyoming on the Bridger-Teton National Forest (19,100

acres). High levels of Douglas-fir mortality occurred on private land across the region (22,000 acres). Douglas-fir mortality on the Bureau of Land Management lands in Idaho and Utah increased slightly from 10,200 acres in 2004 to 11,100 acres in 2005. Mortality on the Salmon-Challis National Forest decreased dramatically, from 58,400 acres in 2004 to 12,300 acres in 2005.

Region 5: California

Host(s): Douglas-fir

There were about a half-dozen Douglas-fir trees attacked by the Douglas-fir beetle along Sugar Creek in the Russian Wilderness, Siskiyou County.

An increase in mortality was observed in 2005. Mapped acres increased from 59,252 (1.39 trees per acre—TPA) in 2004 to 76,968 acres (1.72 TPA) in 2005.

Region 6: Oregon and Washington

Host(s): Douglas-fir

Within the Colville Reporting Area in northeast Washington, Douglas-fir mortality was mapped on 20,812 acres at approximately 2.28 TPA. Other reporting areas with significant mortality include: Wenatchee (15,037 acres,1.42 TPA) and Gifford-Pinchot (6,253 acres,1.21 TPA), Yakama Indian Reservation (5,907 acres, 2.21 TPA), and Okanogan (5,265 acres, 2.36 TPA).

In Oregon, the most significant mortality was mapped on the Wallow-Whitman National Forest (3,558 acres with 0.88 TPA).

Douglas-fir tussock moth
Orgyia pseudotsugata

Region 1: Idaho and Montana

Host(s): Douglas-fir and true firs

Defoliation from Douglas-fir tussock moth in northern Idaho dropped from 5,400 acres in 2002 to zero in 2003-2005. In Montana, defoliation from tussock moth dropped from 5,800 acres in 2004 to 312 acres in 2005. Ground observations found only lightly defoliated trees on the Flathead National Forest. Pheromone trap catches also decreased in both Montana and Idaho with most traps catching zero moths.

Region 2: Colorado

Host(s): Douglas-fir

Defoliation in Douglas-fir due to Douglas-fir tussock moth continues to increase in Jefferson County on private forested lands west of Denver, CO. The Douglas-fir tussock moth early-warning traps located on the Rampart Range, west of Colorado Springs in Douglas and El Paso Counties, caught a total of 29 moths. This is the first time since the outbreak of 1993 to 1995 that more than just a few moths have been caught in this area, indicating Douglas-fir tussock moth populations may be on the increase again.

Douglas-fir tussock moth infestations on spruce in urban landscapes were reported in Cheyenne, WY.

Insects: Native

Region 3: Arizona and New Mexico

Host(s): Douglas-fir and true firs

In 2004, Douglas-fir tussock moth defoliation was recorded for the first time in 26 years on 295 acres of the Cibola National Forest in New Mexico. In 2005, the infestation expanded to 870 acres and resulted in significant host tree mortality along the west side of the Sandia Mountains.

Region 4: Idaho, Nevada, and Utah

Host(s): Douglas-fir, true firs

Defoliation of Douglas-fir and subalpine fir attributed to Douglas-fir tussock moth decreased in 2005. All Douglas-fir tussock moth defoliation occurred over 10,500 acres in Nevada or Idaho. Most of the defoliation occurred on the Humboldt-Toiyabe National Forest (6,600 acres) in Nevada or on Bureau of Land Management lands (2,800 acres) in Idaho.

Region 5: California

Host(s): White fir (other conifers during outbreaks)

During 2005, heavy defoliation from Douglas-fir tussock moth was detected on over 10,000 acres by aerial surveys in Yosemite National Park and on the Sierra and Stanislaus National Forests. There were also an additional 200+ acres of defoliation observed on private land in Mariposa County. Increasing moth populations were detected over a broad area in the central and southern Sierra Nevada during 2004, with light feeding injury reported from several areas. Based on life-stage monitoring in 2004, an increase in defoliation was anticipated during 2005. Ground surveys rating the level of defoliation were conducted during 2005 in Yosemite National Park and on the Sierra National Forest. Results showed that tree crowns were generally 25- to 30-percent defoliated, and up to 50-percent defoliated in small pockets within the large areas of defoliation. Defoliation was most severe in understory hosts. Larval feeding on dominate and understory trees was limited to the current year's growth. The heaviest defoliated areas were along major highways in Yosemite National Park.

The results of larval surveys conducted during 2005 in recreation areas, and around trap plots with high counts, indicated that most areas were 1 year away from reaching outbreak status. Based on larval surveys, defoliation ratings, and egg mass counts, moth populations in these areas are predicted to peak in 2006. Based on larval sampling, two areas were already at outbreak densities (Chinquapin in Yosemite National Park and one plot located on the Sierra National Forest) in 2005, and declines in populations are expected in those areas. If no suppression treatment is implemented in 2006, some tree mortality should be expected in small, localized patches where heavy defoliation occurred in 2005.

Region 6: Oregon and Washington

Host(s): Douglas fir and true firs

The primary hosts of the Douglas-fir tussock moth are Douglas fir, grand fir, subalpine fir, and white fir. Early instar larvae feed on the current year's foliage as the shoots elongate, and later instars feed on all foliage. Normally this insect occurs at very low population levels; however, it experiences cyclic population increases every 7 to 13 years, and populations can have significant impacts on resources when these eruptive outbreaks occur.

There were no areas of visible defoliation caused by tussock moth recorded in 2005.

Douglas-fir twig weevil
Cylindrocopturus furnissi

Region 5: California

Host(s): Douglas-fir

Incidence of this pest has decreased in Sonoma and Mendocino Counties from 2004 levels.

Eastern larch beetle
Dendroctonus simplex

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

Host(s): Eastern larch

In Maine, pockets of dead and dying larch have been common since the mid 1970s and continue to be a common sight throughout the range of larch. Stands of larch in southern and central portions of the State exhibited the highest mortality rates. Most tree mortality was generally in association with other stress factors, particularly extremes in water availability. In New Hampshire, populations were found throughout the range of larch. This beetle was found associated with other tree stressors causing mortality in north and central parts of the State. In Vermont, mortality was statewide, especially in the northeast.

Larch beetle continued to be active in Minnesota, where 11,593 acres of mortality occurred in 2004, up from nearly 10,000 acres mapped the previous year.

There were 25,717 acres of mortality in the eastern Upper Peninsula of Michigan. Populations were expected to decline following a return to normal moisture conditions during the 2005 growing season.

Eastern tent caterpillar
Malacosoma americanum

Region 8: Regionwide

Host(s): Cherry

Heavy infestations occurred over large areas of middle and eastern Tennessee. While defoliation in most areas was less than 50 percent and involved less than 50 percent of the trees in the stands, a few areas reported infestation and defoliation rates as high as 95 percent. Defoliation by this pest rarely causes serious or permanent damage.

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

Host(s): Black cherry and crabapple

In Massachusetts, approximately 55 acres of defoliation was documented in Berkshire County.

In New Hampshire, populations remained higher than the 10-year average but no survey work had been done. There was no significant activity reported in New York. In Maine, while not significant, damage was easily seen in 2005. There was defoliation throughout Vermont; the heaviest was in southern areas.

In Pennsylvania, the eastern tent caterpillar damaged primarily black cherry foliage on 2,993 acres scattered over most of the State. The most noticeable defoliation was concentrated on 473 acres in Tioga

County. In West Virginia, light to moderate defoliation was observed over most of the State, similar to 2004.

Populations were very high in the southern third of Illinois, completely defoliating black cherry in the region.

Fall cankerworm
Alsophila pometaria

Region 8: Regionwide

Host(s): Various oak species

Minimal, localized activity was reported in the spring in post oak forests in central Texas, but caused no serious harm. Virginia reported 2,334 of light to moderate defoliation in Page and Rappahannock Counties.

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

Host(s): Maples, oaks, and other hardwoods

In New Hampshire, there were many reports of high moth populations in the southeastern region of the State, but no defoliation was observed. In New York, this insect was associated with some moderate to heavy defoliation in the Catskills region; however, its impacts were usually secondary in comparison to forest tent caterpillars and gypsy moths, which were often noted in the same stands. In Vermont, populations collapsed, and only light defoliation was observed. No significant activity was reported in Massachusetts.

Maryland reported 1,608 acres colonized by the fall cankerworm in Anne Arundel County. Pennsylvania was surveyed for fall cankerworm and other geometrid defoliators, including the halfwing geometer (*Phigalia titea*) and the Bruce spanworm (*Operophtera bruceata*) and damage from the larvae of these moths was found on 5,058 acres in 2005. This was the third consecutive year of defoliation in some areas of Pennsylvania. Similar to Pennsylvania, West Virginia described fall cankerworm damage in terms of damage caused by several, coexisting geometrid defoliators. Looper defoliation was less severe and less widespread than in 2004. Aerial surveys mapped 1,761 acres of defoliation in Hampshire and Hardy Counties.

Fall webworm
Hyphantria cunea

Region 5: California

Host(s): Pacific madrone

Defoliation of madrone by the fall webworm occurred again this year at various locations on the Foresthill Divide, Placer County. Webs and minor defoliation of madrone were also noted in Nevada, Butte, Yuba, Fresno, Mariposa, Tulare, Merced, and Calaveras Counties on the westside of Sierra Nevada.

Region 8: Regionwide

Host(s): Hardwoods

Heavy infestations in northern Tennessee caused partial defoliation of several thousand trees. Scattered defoliation also occurred in the central part of the State.

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

Host(s): Maple, beech, birch, hickory, walnut, apple, ash, black cherry, cherry, elm, persimmon, oak, and other hardwoods

In New Hampshire, populations continued to be high throughout the State with very visible localized damage in the central region of the State. No significant activity was reported in New York. Vermont had scattered heavy damage in northern parts of the State.

Light to moderate defoliation similar to 2004 occurred over most of West Virginia in 2005.

No reports of damage in Illinois in 2005.

Fir engraver beetle
Scolytus ventralis

Region 1: Idaho and Montana

Host(s): Grand fir and, rarely, other fir species

According to 2005 aerial surveys, the number of acres with fir engraver-caused mortality in grand fir stands and the number of visible red trees remained similar to 2004 levels across western Montana and dropped significantly across northern Idaho in 2005.

Regionally, total infested area exceeded 91,000 acres, down from 606,000 acres in 2004. On the 91,000 infested acres, nearly 145,000 trees were killed in 2004 (recorded as faders in 2005). Much of the 2005 mortality occurred on the Nez Perce National Forest in north Idaho, with over 64,000 red grand fir trees mapped across 34,000 acres. In western Montana, where moisture deficits continued through 2004, many stands with a significant grand fir component experienced fir engraver beetle-caused mortality. Especially noticeable were stands on and adjacent to the Flathead National Forest.

Fir engraver populations will likely remain high in Montana until moisture conditions return to normal. We believe the reduction in the number of acres with fir engraver-caused tree mortality in northern Idaho is related to a return to near normal moisture conditions. Many grand fir stands in northern Idaho have root disease, which increases their susceptibility to fir engraver attack.

Region 2: Colorado and Wyoming

Host(s): Douglas-fir and White fir

Scolytus ventralis populations have expanded for the third consecutive year in dense white fir stands on the Pagosa Ranger District, San Juan National Forest, and on the San Carlos Ranger District, Pike-San Isabel National Forest. On the southern portions of the San Juan National Forest, corkbark fir (*Abies lasiocarpa arizonica*) has also been a preferred host of the fir engraver.

Fir engraver beetle caused tree mortality markedly diminished from 2004 in the Wet Mountains of southern Colorado. Fir engraver outbreaks, however, persist to the southwest in the Rio Grande and San Juan National Forests.

Insects: Native

Region 3: Arizona and New Mexico

Host(s): White fir and subalpine fir

Tree mortality in region due to fir engraver beetles (*Scolytus ventralis, Dryocoetes confusus*) more than doubled in 2005 to 64,915 acres vs. 25,700 acres in 2004. In Arizona, fir mortality was recorded on the Apache-Sitgreaves (455 acres), Coconino (2,270 acres), Coronado (85 acres), Kaibab (1,210 acres), and Tonto (5 acres) National Forests; Fort Apache (30 acres) and Navajo (10 acres) Indian Reservations; and 20 acres of State and private lands. In New Mexico, fir mortality was reported on the Carson (4,100 acres), Cibola (2,460 acres), Gila (22,070 acres), Lincoln (16,985 acres), and Santa Fe (2,765 acres) National Forests; BLM lands (20 acres); Jicarilla Apache (10 acres), Mescalero Apache (8,800 acres), and Taos Pueblo tribal lands (905 acres); and 2,715 acres of State and private lands.

Region 4: California, Idaho, Nevada, and Utah

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

Fir engraver beetle-caused tree mortality decreased significantly in 2005. Aerial surveyors recorded 65,800 acres with mortality in 2005, a reduction from the 199,300 acres reported in 2004. Resampling the 2004 areas with heavy tree mortality in Nevada, the Humboldt-Toiyabe National Forest decreased from 37,000 to 12,400 affected acres. Across the Utah national forests, the Dixie reduced from 34,200 to 25,300 acres, the Uinta from 18,600 to 5,000 acres, and the Manti-La Sal from 13,400 to 1,000 acres affected. In Idaho, the Boise and Payette National Forests also reduced dramatically from 18,600 acres affected in 2004 to just over 400 acres. Private lands in Utah and Idaho also saw a reduction in true fir mortality from 25,400 in 2004 to 5,800 acres in 2005.

Region 5: California

Host(s): White fir and red fir

A combination of drought, dwarf mistletoe, *Cytospora abietis* canker, fir roundheaded borer, and the fir engraver caused considerable branch killing and tree mortality in higher-elevation stands in northwest California. Specific locations include the south slope of Mt. Ashland, the Siskiyou Wilderness, Marble Mountain Wilderness, Russian Wilderness, Trinity Alps, South Fork Mountain and the Middle Eel-Yolla Bolla Wilderness.

Scattered individual trees and small groups of white and red fir killed by the fir engraver beetle were apparent again this year in Latour State Forest, Shasta County. Most mortality occurred in stands with dwarf mistletoe and Cytospora canker. Further east, fir mortality was noted in the CalPines subdivision and west of Goose Lake, Modoc County. Most beetle activity was in the pole- to intermediate-size classes. Overall, fir engraver beetle activity appears to have declined in this area compared to previous years.

Fir engraver beetle-caused mortality continued to increase in several areas of northeastern California in conjunction with overstocking, annosus root disease, and drought. Elevated mortality levels were found mostly on the Tahoe National Forest and included the InterState 80 corridor from Cisco Grove to Donner Summit, a large area between Bowman Lake and Jackson Meadow Reservoir, a large area north of French Meadows Reservoir to Royal Gorge on the American River, and a 4-mile-wide belt from Cisco Grove south to the "Placer County Grove" of giant sequoias. All of these areas averaged one to three dead trees per acre. Fir engraver activity was limited throughout the Lassen and Plumas National Forests. Two areas of elevated activity were Butt Mountain and just north of Philbrook Reservoir, Almanor Ranger District, Lassen National Forest.

Elevated mortality levels of white fir continued on the Big Valley and Warner Mountain Ranger Districts, Modoc National Forest. Some of the highest levels of fir engraver-caused mortality in northeastern California were observed in the Warner Mountains near Blue Lake and just west of Sworinger Reservoir. Fir engraver activity was also elevated along the entire western front of the Warner Mountain range. The Big Valley Ranger District, Modoc National Forest, also had several areas of fir engraver caused mortality.

The most notable areas were east of Adin, CA, near Manzanita Mountain, along Manzanita Ridge and Hunters Ridge.

True fir mortality and top-kill associated with the fir engraver remained at background levels (0.5 trees per acre) throughout much of the southern Sierra Nevada. Scattered white fir mortality and top-kill due to fir engraver activity continues in the Stanislaus National Forest—the largest polygon detected around Sherman Acres, Big Meadows, and Little Prather Meadow. Fir engraver activity around Breckenridge Mountain and the Piute Mountains on the Sequoia National Forest significantly dropped compared to 2004. Ground surveys of these areas early this summer showed a loss of about 80 percent of the old-growth white fir. Scattered mortality totalling about 10,000 acres due to fir engraver was detected on the Sierra National Forest.

In the mountains of southern California, the fir engraver beetle is most commonly found in white fir infected with true mistletoe, annosum, and/or Armillaria root diseases and the roundheaded fir borer. Individual and small groups of true firs continue to be killed in the San Bernardino Mountains. However, the mortality levels are significantly lower compared to levels observed in the recent drought period. The epidemic outbreak of the past appears to be over for the present.

Region 6: Oregon and Washington

Host(s): True firs

Fir engravers infest true firs in western forests. These beetles attack pole-size and mature trees, causing significant mortality during and following periods of drought. Trees infected with root disease are especially subject to attack. Trees defoliated by Douglas-fir tussock moth, western spruce budworm, or Modoc budworm also are likely to be attacked. These beetles commonly breed in logging slash and windthrown trees.

Acres with mortality decreased (672,387 acres in 2004 to 540,630 acres in 2005), but TPA (trees per acre) killed by fir engraver increased this year (1.4 TPA in 2004 to 1.72 TPA in 2005).

The following reporting areas are listed in order of highest levels of mortality: Colville (100,387 acres, 2.56 TPA) and Wenatchee (85,904 acres, 2.45 TPA); Yakama Indian Reservation (38,001 acres, 2.38 TPA); Malheur (30,546 acres, 0.44 TPA); Umatilla (30,098 acres, 0.34 TPA); and Okanogan (21,111 acres, 2.30 TPA).

Fir roundheaded borer
Tetropium abietis

Region 5: California

Host(s): Various fir

The fir roundheaded borer was observed causing tree mortality in association with the fir engraver beetle, dwarf mistletoe, and *Cytospora* canker in higher elevation stands in northwest California. Specific locations include the south slope of Mt. Ashland, the Siskiyou Wilderness, Marble Mountain Wilderness, Russian Wilderness, Trinity Alps, South Fork Mountain, and the Middle Eel-Yolla Bolla Wilderness.

Insects: Native

Flatheaded fir borer
Melanophila drummondi

Region 5: California

Host(s): Douglas-fir

Douglas-fir mortality in interior Mendocino County and southern Humboldt County has declined slightly in the past 2 years, but flatheaded fir borer incidence remained fairly constant. For the past 2 years, pockets of Douglas-fir mortality usually yielded both the flatheaded fir borer and the Douglas-fir engraver beetle. Attacks from the Douglas-fir engraver beetle were not as noticeable this year.

Flatheaded wood borer
Agrilus spp.

Region 2: Kansas and South Dakota

Host(s): Gambel oak, English oak, and bur oak

Many species of flatheaded borer were trapped this year in Kansas and are currently under identification study by a specialist.

Two-lined chestnut borer has been associated with dying bur oaks located in native stands in south-central South Dakota. These infestations appeared to be concentrated along the White River and Little White River and are a concern to ranchers as these stands provide winter shelter for cattle.

Forest tent caterpillar
Malacosoma disstria

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

Host(s): Aspen and cottonwood

In 2005, no forest tent caterpillar defoliation of trees was identified during aerial surveys. Forest tent caterpillar was noted sporadically on shrubs throughout the Region 4.

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

Host(s): Tupelo gum and upland hardwoods

In Louisiana, defoliation occurred on 165,000 acres of forested wetlands in Ascention, Livingston, St. James, and St. John parishes in 2005. This defoliation was severe (greater than 50 percent) on 79,500 acres, but a decrease from the previous year. Kentucky reported large populations in several counties along the Ohio River, where feeding damage coupled with drought produced significant mortality. In Texas, light, scattered defoliation was noted along the Angelina River in Angelina and Nacogdoches Counties. Mature caterpillars were found along the lower Trinity River in Liberty County, but no defoliation was visible. In North Carolina, moderate defoliation was reported from approximately 640 acres in the Roanoke River National Wildlife Refuge. South Carolina reported severe defoliation on 392,453 acres in 12 counties (Beaufort, Berkeley, Charleston, Colleton, Dillon, Dorchester, Florence, Georgetown, Horry, Jasper, Marion, and Orangeburg).

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

Host(s): Aspen, basswood, pin oak, red oak, white oak, sweetgum, sugar maple, and other hardwoods

Populations in Maine remained at endemic levels with no defoliation from the insect. Light trap catches in 2004 had shown a significant rise in forest tent moths caught and defoliation was subsequently expected to increase in 2005. However, this situation did not materialize. Those late instar larvae that were encountered had classic disease symptoms, which were most likely exacerbated by the cold, wet spring. In Massachusetts, there was severe defoliation on 204,616 acres. This widespread defoliation occurred in Plymouth, Bristol, and Norfolk, Barnstable, Middlesex, Franklin, and Berkshire Counties.

New Hampshire aerial survey detected 66,000 acres of defoliation in 2005. The acreage of damage from forest tent caterpillar doubled since 2004. The host was generally red oak with some sugar maple. Trap catches were moderate to high. Inside the traps with high numbers of forest tent caterpillar moths were also high numbers of the "friendly fly," forest tent caterpillar's major native biological control.

Forest tent caterpillar was the most significant defoliator in New York in 2005. The worst of the damage once again centered on St. Lawrence County and the western Adirondacks; however, high populations and severe defoliation were also seen in central New York and the Catskills. Egg mass surveys indicated that there may be heavy defoliation by forest tent caterpillar again in 2006 (though egg masses were often undersized in stands that had been defoliated for 2 or 3 consecutive years).

There was no significant activity reported in Rhode Island. In Vermont, defoliation occurred mostly in southern and western parts of the State on 229,702 acres.

Connecticut reported 936 acres of defoliation in Litchfield County.

The forest tent caterpillar was reported defoliating 30,759 acres in Pennsylvania during 2005, down from 35,000 acres in 2004. Most of the damage was in Lycoming County in both years. West Virginia reported no damage by the forest tent caterpillar in 2005.

The forest tent caterpillar population remained low in the Lake States in 2005. There were only 9,800 acres of defoliation in Minnesota in 2005.

In Michigan, 9,502 acres were defoliated, and populations are increasing in the aspen cover type.

In Indiana, 54,796 acres were defoliated. Mortality was estimated at 192 board feet per acre, with the total volume affected estimated to be worth $1.6 million.

Periodically, about 1,500 acres of a mixed forest stand in Union County, IL, are severely defoliated by the forest tent caterpillar. In 2005, the caterpillar infestation was extremely low, and the population in 2006 will probably be similar. In previous years, a virus infection spread rapidly through the caterpillar population, causing a collapse from which it has not recovered.

Fruittree leaf roller
Archips argyrospilus

Region 5: California

Host(s): California black oak

Fruittree leafroller activity in the San Bernardino Mountains declined from levels seen in 2004. There was significant defoliation along the Rim of the World, but far less than in recent years. An outbreak of the fruittree leafroller was reported on Palomar Mountain in San Diego County.

Insects: Native

Jack pine budworm
Choristoneura pinus

Region 9/Northeastern Area: Michigan, Minnesota, and Wisconsin

Host(s): Jack pine

About 75,600 acres were defoliated by jack pine budworm in Minnesota, up from 47,000 in 2004. Salvage of jack pine killed by 2 to 3 years of defoliation continued in Beltrami, Hubbard, and Wadena Counties. Unusual defoliation of red pine was found from Brainerd to Bemidji. Previously, such defoliation was only documented in 1957 and 1958. Red pine stands miles from any infest jack pine were being defoliated.

In northwest Wisconsin, 222,500 acres of jack pine were defoliated, up from 36,700 acres in 2004.

In Michigan, there were 201,470 acres of jack pine mortality reported in 2005. Populations were decreasing in the Northern Lower Peninsula; this was the second year of defoliating populations in the Upper Peninsula.

Jeffrey pine beetle
Dendroctonus jeffreyi

Region 4: California and Nevada

Host(s): Jeffrey pine

Jeffrey pine beetle activity returned to normal levels after the 2004 high of 11,700 trees killed across 5,600 acres. In 2005, approximately 500 trees were killed over 200 acres. Most of the mortality occurred on the Humboldt-Toiyabe National Forest, with the highest amount of mortality occurring on the Carson Ranger District, where nearly 300 trees were killed over 100 acres.

Region 5: California

Host(s): Jeffrey pine

Jeffrey pine beetle activity was extremely limited in northeastern California in 2005. Mortality was observed south of Adin, CA, near Whit Flat on the Big Valley Ranger District, Modoc National Forest. Jeffrey pine beetle mortality continued at low levels in the southern Sierra Nevada. The most significant mortality was located in the Piute Mountains of the Sequoia National Forest.

Jeffrey pine beetles continued to infest and kill their host in southern California, though populations of the beetle were much reduced from those of the previous 3 years. Recent activity was observed in the upper Santa Ana Canyon and Holcomb Valley, San Bernardino National Forest.

Jeffrey pine needleminer
Coleotechnites sp., near milleri

Region 5: California

Host(s): Jeffrey pine

The Jeffrey pine needleminer continued to infest trees in Truckee, CA. Approximately 200 acres were affected in 2005, which is about one-third of the area affected in 2004. The area has also shifted and is now entirely to the south of InterState 80. No tree mortality has been observed.

Jumping oak gall wasp
Neuroterus saltatorius

Region 8: Tennessee

Host(s): Oaks

Occurrence was reported in post oaks and white oaks from scattered locations across Tennessee, but only light damage resulted.

Region 9/Northeastern Area: Missouri

Host(s): Bur oak and white oak

Jumping oak gall damage was very minimal in Missouri in 2005. Other common gall-forming insects were quite noticeable in recent years, especially the gouty oak gall wasp and the horned oak gall wasp.

Lace bugs
Corythucha spp.

Region 9/Northeastern Area: New Jersey and West Virginia

Host(s): Black cherry, sycamore, and oaks

New Jersey reported lace bug infestations defoliating oaks on 614 acres in Atlantic, Burlington, Gloucester, Ocean, and Salem Counties in 2005. No report on lace bug infestations was received this year from West Virginia; however, moderate discoloration was observed statewide in West Virginia in 2004 on oak, black cherry, and sycamore trees.

Loblolly pine sawfly
Neodiprion taedae linearis

Region 9/Northeastern Area: Missouri

Host(s): Shortleaf pine and loblolly pine

Isolated pockets of defoliation of shortleaf pine and planted loblolly pines occurred in east-central Missouri in May.

Locust leaf miner
Odontota dorsalis

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

Host(s): Black locust

Locust leafminer activity was heavy in Virginia and northeastern Tennessee in 2005. North Carolina reported only light activity, and Kentucky reported it only as an aesthetic nuisance.

Insects: Native

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

Host(s): Black locust

In Maine, populations and the resultant defoliation were lower in 2005 than has been seen in many years. However, patches of black locust mortality from previous years of leafminer defoliation were noticeable on stressed sites around the State. In Massachusetts, approximately 200 acres of black locust, mostly along the interState highways, sustained defoliation. In New Hampshire, hundreds of acres of damage have been detected through aerial survey each year for the past decade. Mortality in these areas increased, but not significantly. This insect caused some discoloration/defoliation on black locust over portions of eastern New York, especially the lower to mid-Hudson River Valley. However, the damage was not as severe or noticeable as it had been in 2004. Scattered defoliation and defoliation was reported in Vermont, but damage was lower than reported in 2004.

For the second year in 2005, no reports of any significant locust leafminer damage were received from Ohio and Pennsylvania, although there was scattered light damage in both States in both years. In 2005, West Virginia reported moderate to severe damage across most of that State, with bronzing most obvious by late June. In 2004, damage was most noticeable on the Monongahela National Forest in Grant and Pendleton Counties.

Lodgepole pine needleminer
Coleotechnites milleri

Region 5: California

Host(s): Lodgepole pine

Lodgepole needleminer populations remained high in several areas of Yosemite National Park. A total of 31,030 acres of defoliation were detected in the park. Population density was not surveyed this year, nor were ground surveys conducted. The largest area of defoliation extended from Tuolumne Meadows down to Merced Lake. Other large areas of defoliation were detected in Matterhorn and Virginia canyons and along most of the Delany Creek watershed. Aerial detection surveys found most of the defoliation to be discontinuous, with no mortality observed.

Looper complex – Linden looper and half-winged geometer
Erannis tiliaria
Phigalia titea

Region 9/Northeastern Area: Indiana

Host(s): Various oak species

The looper complex defoliated approximately 2,606 acres in Indiana, down from 150,000 in 2004. Heavily forested Brown County sustained all the defoliation, with only 80 acres of heavy defoliation. Based on previous loss estimates, average mortality was 600 board feet per acre. Using a value of $117 per acre, losses on State forests ranged from $468,000 to $936,000.

Maple leafcutter
Paraclemensia acerifoliella

Region 9/Northeastern Area: New Hampshire and Vermont

Host(s): Sugar maple

Populations were present throughout the maple region of New Hampshire; however, there was no significant damage. Defoliation and discoloration were occasionally heavy in northern Vermont.

Maple trumpet skeletonizer
Epinotia aceriella

Region 9/Northeastern Area: Pennsylvania and Vermont

Host(s): Sugar maple, red maple

Light to moderate defoliation was reported statewide in Vermont.

Pennsylvania did not report any skeletonizer damage in 2005.

Mountain pine beetle
Dendroctonus ponderosae

Region 1: Idaho and Montana

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

The infested area mapped in 2005 increased significantly in many parts of the region. With the exception of the Kaniksu National Forest, most areas in northern Idaho reported increases. The total infested area there increased from 221,900 acres in 2004 to 236,700 acres in 2005. In western Montana, most areas also showed an increase in infested areas. The Lolo National Forest Reporting Area showed an exceptional increase; however, some of the most heavily infested areas were not flown in 2004, so direct comparisons to 2005 figures are not as meaningful. In 2005, more than 217,600 acres were infested on the Lolo National Forest alone. On the Deerlodge and Flathead National Forests, where most affected areas were flown both years, area infested increased once again. Acres on which beetle-caused mortality was recorded, in all species and on all ownerships, increased considerably throughout the region to more than 1,057,000 acres. That is the highest total recorded since 1986. Slightly more than 675,000 acres were recorded in 2004: in those infested acres, more than 3.6 million trees were killed in 2004 and subsequently recorded as faders in 2005. A little more than 80 percent of those were lodgepole pine. Although beginning to decline in some host stands, beetle populations continued to expand in most areas. As many as 90 new attacks per acre were found in one lodgepole pine stand where ground surveys were established.

A significant increase in beetle-caused mortality was noted in whitebark pine stands for the third consecutive year. Increases were especially pronounced on Gallatin, Helena, and Beaverhead National Forests and in Yellowstone National Park. Nearly 143,000 beetle-infested acres were found in whitebark pine stands in the region. An estimated 630,000 trees have been killed in those stands. Ground observations in some areas confirmed that many of those infestations are still expanding. In one stand surveyed on the Helena National Forest, ground-collected data showed nearly 220 trees per acre have been killed within the past two to three years. Many of those stands were also impacted by white pine blister rust.

Many lodgepole, whitebark, and ponderosa pine stands remain at risk to beetle depredations in the region. Unless weather patterns change to those more favorable to their host and less conducive to beetle survival and population expansion, or management activities reduce availability of susceptible hosts, mountain pine

beetle populations and resultant tree mortality will continue until few susceptible hosts remain in many stands.

Region 2: Colorado, South Dakota, and Wyoming

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

Mountain Pine Beetle again was the most damaging agent in Region 2 in 2005. Large outbreaks continue to devaState pines in the region from Colorado's San Luis Valley to the Absaroka Mountains in northwest Wyoming and over into the Black Hills in South Dakota.

Mountain pine beetle populations remain at epidemic levels in lodgepole pine stands throughout northern Colorado. The following counties have been severely impacted: Boulder, Clear-Creek, Eagle, Grand, Jackson, Routt, and Summit. Large amounts of dead and dying lodgepole pines that occur adjacent to towns have prompted efforts by Federal and State land managers and local homeowners to manage beetle impacts and fire risk in the wildland-urban interface (WUI). These areas include the communities of Breckenridge, Silverthorn, Dillon, Frisco, Grand Lake, Granby, Winter Park, and Steamboat Springs.

For the Williams Fork and Troublesome Creek watersheds in Colorado, the mountain pine beetle outbreaks have depleted lodgepole stands of almost all of their large diameter trees. The mountain pine beetle epidemics in these areas began in 1997.

During the current beetle epidemics in lodgepole pine in Colorado, mountain pine beetles have successfully completed their lifecycle in a single year at elevations in excess of 9,500 feet, where they had been expected to complete development in 2 years. As a result, these are unprecedented high levels of lodgepole pine mortality in these high elevation forests.

Mountain pine beetle populations in ponderosa pine are at epidemic levels surrounding the Woodland Park community in El Paso and Teller Counties, CO. Mountain pine beetles also are causing high levels of tree mortality in stands of ponderosa pine in the South Park area, near Fairplay, in Park County, CO.

Mountain pine beetle activity (ponderosa pine) in the Upper Arkansas River Valley was significantly lower than that observed during the previous 6 years. Several thousand acres of forest health management and fuels treatments have been implemented in the past few years in this valuable WUI setting between Buena Vista and Salida, CO. On the San Carlos Ranger District of the San Isabel National Forest, mountain pine beetle continued to spread across the landscape, moving east towards the Front Range and south towards the Wet Mountains. Beetle activity in lodgepole pine continued to intensify in proximity to Vail, CO. Beetle activity that was once concentrated along the InterState 70 corridor was evidently also impacting the Piney River drainage. Salvage, sanitation, thinning, and related fuels treatments are ongoing or being planned in proximity to Vail, including the WUI, developed recreation sites, the Vail Ski Area and the Piney River drainage. Mountain pine beetle activity was again evident, though in lesser amounts than previous years, on the Rio Grande National Forest. In the Hermosa, CO, area of the San Juan National Forest, mountain pine beetle was found in large diameter ponderosa pine in association with several other species of bark beetles, including at least two other members of *Dendroctonus,* and one or more species of *Ips.*

Mountain pine beetle increased and was at outbreak levels around much of the Black Hills, including the northern Black Hills, central Black Hills, and the Norbeck/Mt Rushmore area. Approximately 20,500 acres were infested to some degree, and the beetle has killed about 69,600 ponderosa pine trees.

The pine mortality due to mountain pine beetle was widespread in localized areas of the northern Black Hills and across the central Black Hills. Areas with high levels of beetle-caused mortality were mapped in the following general locations:

- southeast and west of Warren Peak in the Bearlodge Mountains;
- west of Highway 85 and extending west to Spearfish Canyon;
- west from Beaver Park and into the vicinity of Hanna;

- west and south of Deerfield Reservoir, on the southwest slopes of Bear Mountain, extending east and south to Highway 16; and
- around Harney Peak.

As in 2003 and 2004, of special note are the areas northwest, west, and south of Deerfield Reservoir. A multistand, landscape-level episode of mountain pine beetle-caused mortality continues across this large area. This beetle epidemic appears to have expanded and intensified significantly in the northwest, crossing Highway 85, and also to the south and east of Bear Mountain.

Although these areas have the highest concentration of beetle-caused mortality, activity again appeared to be elevated across much of the Black Hills. In some locations, what were a few, small, widely separated spots of mountain pine beetle-killed pines in 2004 appeared in 2005 to be more numerous, larger spots that were closer together—signs of potential beetle epidemics developing. It is in detecting such developing situations that the overview aerial detection survey may provide a great value.

Heavy mountain pine beetle activity occurs on the west side of the Bighorn Mountains in limber pine and, to a lesser extent, in lodgepole pine. On the east side of the Bighorn Mountains, mountain pine beetle was still at high levels in ponderosa pine.

Large acreages of mountain pine beetle are evident in lodgepole, ponderosa, and limber pine in the Bighorn Mountains. Dry Fork Ridge and southeast of Burgess Junction have extensive areas of mountain pine beetle in lodgepole pine. Roughly 150 lodgepole pines were killed north of Black Canyon in the Ferris Mountains in northwestern Carbon County. There are a few areas of ponderosa pine mortality due to mountain pine beetle in the eastern foothills of the Bighorn Mountains. There are concentrated pockets of mortality surrounding Stone Mountain, the southeastern tip of Red Canyon, and the northern edge of Tongue Canyon. Limber pine mortality was evident near Horse Creek. There are infestations of mountain pine beetle in limber pine in the Shirley Mountains in northern Carbon County: Bald Mountain and south of Grinnell Lake.

On the Shoshone National Forest, there is a big, rolling outbreak of mountain pine beetles in both whitebark/limber and lodgepole on the Wind River District.

In southern Wyoming, mountain pine beetle populations continue at epidemic levels in the Medicine Bow Mountains and the Sierra Madre Range in Albany and Carbon Counties. Severely affected stands in these areas were particularly evident along the lower and middle slopes of these mountain ranges.

Lodgepole pine beetles (*Dendroctonus murrayanae*), closely related to mountain pine beetles, were found at the base of lodgepole pine trees in the Medicine Bow Mountains, in Albany County, WY.

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

Host(s): Bristlecone, limber, lodgepole, Jeffrey, ponderosa, western white, and whitebark pines

Mountain pine beetle-caused tree mortality decreased from 3.5 million trees killed over 691,500 acres in 2004 to 2.4 million trees killed over 615,700 acres in 2005. Most of the mortality occurred in three distinct areas. In central Idaho on the Salmon-Challis National Forest and Sawtooth National Recreation Area, a total of 863,700 lodgepole and whitebark pine trees were killed over 246,000 acres in 2005, compared to 1.2 million trees killed over 289,000 acres in 2004. Mortality in this area began in 1998 and is currently the largest mountain pine beetle outbreak in Region 4. The second outbreak area is located in western Wyoming on the Bridger-Teton National Forest. Tree mortality decreased from approximately 982,700 trees across 212,000 acres in 2004 to 818,300 lodgepole and whitebark pine trees killed over 201,100 acres in 2005. The third outbreak area is in northern Utah on the Wasatch-Cache and Ashley National Forests. This outbreak, in its third consecutive year, decreased from 1.2 million trees killed over 136,700 acres in 2004 to 504,000 lodgepole pine trees killed over 101,200 acres in 2005.

Insects: Native

Region 5: California

Host(s): Various pines

Mortality caused by mountain pine beetle in most of California declined from the levels seen in previous years. The exception to this trend is on the Modoc National Forest, where mountain pine beetle-caused mortality of ponderosa pine, lodgepole pine, and whitebark pine continued to increase as very little drought relief came to this area during the 2004-2005 winter. Other areas of mountain pine beetle-caused mortality in northeastern California include lodgepole pine along the Susan River from County Road A21 to Silver Lake, lodgepole pine and ponderosa pine from Clover Butte to east of Jennie Mountain, ponderosa pine near Summit Lake (Eagle Lake Ranger District, Lassen National Forest), and ponderosa pine near Hobo Camp, Susanville, Lassen County.

Mountain pine beetle activity declined in 2005 in sugar pine that suffered various levels of fire injury during the 2001 Star Fire, American River Ranger District, Tahoe National Forest. High levels of sugar pine mortality attributed to fire injury and mountain pine beetle had been observed in the Star Fire area since 2002. Similar to previous years, lodgepole pine mortality continued along Alder Creek, north of Alder Hill and Soda Springs off of InterState 80, and in the Lower Truckee River Campground, Truckee Ranger District.

Mountain pine beetle, along with lightning strikes, low site effects, and lingering drought in northwestern California added to the mortality of five-needle pines. Sugar pine was killed by mountain pine beetle and white pine blister rust at Buck Lake in the Siskiyou Wilderness, Klamath National Forest. Mountain pine beetle and blister rust killed western white pine at French Hill and Youngs Peak on the Six Rivers National Forest. Mountain pine beetle and blister rust killed western white pine at Russian Lake and Golden Russian Lake in the Russian Wilderness, Klamath National Forest. Mountain pine beetle and blister rust killed western white pine on Mt. Eddy in the Shasta-Trinity National Forest. Lightning and mountain pine beetle killed foxtail pine and western white pine in the Trinity Alps Wilderness.

Overstocking and mountain pine beetle killed whitebark pine at Bear Camp Flat at North Emerson Lake, Squaw Peak and Patterson Lake in the South Warner Wilderness, Modoc National Forest. Western white pine on Lyons Peak near Glass Mountain Geologic Area on the Modoc National Forest were also killed.

In southern California, mountain pine beetle activity continued at low levels in the San Bernardino, San Jacinto, and San Gabriel Mountains. A small population that has been infesting and killing singleleaf piñon pine north of Big Bear Lake has persisted despite apparent poor brood survival in the suboptimal host.

Region 6: Oregon and Washington

Host(s): Lodgepole pine, ponderosa pine, sugar pine, western white pine, and whitebark pine.

Mountain pine beetles occur throughout the range of the pine type in the Pacific Northwest. Both adults and larvae feed in the phloem layer of the inner bark, producing one generation per year. Fungi introduced by the beetles clog the conductive tissues of attacked host trees and contribute to tree mortality. Some infestations have resulted in extensive mortality over large areas. Dense stand conditions continue to predispose areas to mountain pine beetle infestations.

In 2005, 757,969 acres were affected, with an average of 8.01 trees per acre (TPA) killed, compared to 543,631 acres affected, with an average of 6.44 TPA, in 2004. Overall increases in mortality were reported in all pine host types.

Lodgepole Pine

Tree mortality in lodgepole pine increased in both acres and intensity. Total reported affected acres increased from 380,306 acres (8.22 TPA) in 2004 to 606,023 acres (9.31 TPA) in 2005.

Areas mapped with the significant levels of mortality include USDA Forest Service lands on the following national forests: Okanogan (121,572 acres), Deschutes (80,369 acres), Fremont (52,932 acres), and Wenatchee (48,926 acres). Additionally, 41,970 acres (18.56 TPA) were reported on the Yakama Indian

Reservation and 28,072 acres (9.06 TPA) on the Colville Indian Reservation. Within the North Cascades National Park, 13,031 acres (14.3 TPA) of mortality were reported.

Ponderosa Pine

Fewer acres of mortality were mapped in the ponderosa type in 2005 (98,620 acres), but the intensity was slightly higher (1.58 TPA) than in 2004 (101,938 acres, .85 TPA).

Most heavily affected areas include lands administered by the USDA Forest Service on the Fremont (16,293 acres with 0.94 TPA mortality), Deschutes (9,425 acres with 1.33 TPA), and Wenatchee (10,536 acres with 2.98 TPA) National Forests. Additionally, beetle effects were reported in the Glenwood Reporting Area (10,889 acres with 1.45 TPA), and the Yakama Indian Reservation (10,501 acres averaging 1.26 TPA).

Sugar Pine

Activity in sugar pine was reported on 796 acres 2005, a decrease from acres reported in 2004 (4,106 acres), but at similar intensities. Due to the ecological importance of this rapidly disappearing species, observers attempt to record individual tree mortality to better assist land managers.

Most of the recorded sugar pine mortality was mapped within the Siskiyou Reporting Area.

Western White Pine

Activity in western white pine increased from 7,245 acres (0.88 TPA) in 2004 to 11,117 acres (0.87 TPA) in 2005. Highest levels of mortality were reported on USDA Forest Service-administered lands of the Idaho Panhandle National Forest within the State of Washington, with 3,743 acres mapped at an average mortality of 3.59 TPA. Other significant areas of mapped mortality include: Fremont Reporting Area (2,476 acres, 1.19 TPA), Yakama Indian Reservation (1,446 acres, 1.54 TPA), Wenatchee Reporting Area (774 acres, .85TPA), and Mt Hood Reporting Area (748 acres, .50 TPA).

Aerial detection of western white pine mortality is difficult because it is often found as a minor component in mixed conifer stands and has a color signature very similar to that of Douglas-fir.

Whitebark Pine

Acres affected in the whitebark pine type increased from 41,036 acres, 4.63 TPA in 2004 to 41,413 acres, 5.98 TPA in 2005. Highest levels of mortality were reported on USDA Forest Service administered lands on the Okanogan National Forest and on the Wenatchee National Forest. Most of the mortality occurred on Federally owned lands, and within the Pasyten and Chelan Sawtooth Wilderness Areas.

Nantucket pine tip moth
Rhyacionia frustrana

Region 8: Regionwide

Host(s): Loblolly pine, shortleaf pine

Texas reported a dramatic increase in tip moth activity until late summer in 2005; little mortality was noted. North Carolina reported heavier activity levels in plantations across the Coastal Plain, often in association with pitch canker. Tennessee reported only scattered, light infestations, with no significant damage.

Insects: Native

Oak leaf roller
Archips semiferana

Region 8: Texas

Host(s): Various oak species

During the spring of 2005, heavy, localized populations of oak leaf rollers occurred over much of central Texas. No significant damage occurred.

Oak leaftier
Croesia semipurpurana

Region 8: Tennessee

Host(s): Various oak species

Scattered light defoliation was reported in middle Tennessee; no other significant occurrences were reported.

Oakworms
Orange-striped oakworm
Anisota senatoria

Spiny oakworm
Anisota stigma

Pinkstriped oakworm
Anisota virginiensis

Yellownecked caterpillar
Datana ministra

Region 8: North Carolina, Tennessee, and Texas

Host(s): Various oak species

In east Texas, oakworm infestations were seen in numerous localized areas in September and October, causing a nuisance from their droppings but producing no significant impact on the trees. North Carolina reported scattered defoliation to landscape and shade trees. South Carolina reported scattered defoliation in the Piedmont. Tennessee reported moderate defoliation from parklands in the eastern part of the State. Heavy defoliation of oaks by pinkstriped oakworms was reported in south-central Florida during August and September.

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

Host(s): Black oak, red oak

In Rhode Island, 15,932 acres were defoliated—this included the same area that was affected by gypsy moth in the late spring (Providence and Kent Counties). In Connecticut, 3,841 acres in Windham County

were defoliated by orange striped oakworm, a significant increase from 2004. New York reported no significant defoliation by these insects in 2005, confirming that the outbreak from several years ago is over.

Oystershell scale
Lepidosaphes ulmi

Region 9/Northeastern Area: Vermont

Host(s): Beech

Vermont reported scattered light damage with occasional heavy populations.

Pandora moth
Coloradia pandora

Region 5: California

Host(s): Jeffrey pine and lodgepole pine

Outbreaks of the Pandora moth have occurred in California at about 20- to 30-year intervals and typically last from 6 to 8 years. Previous outbreaks have occurred in Kern, Tulare, and Mono Counties. Adults were abundant in and around the town of Mammoth Lake this year. A small population is still present in this area following an outbreak that started in 2002. Adults of the pandora moth were attracted to lights in Yreka, Siskiyou County. A survey of ponderosa pines in the area did not detect any trees with obvious signs of feeding.

Region 6: Oregon

Host(s): Ponderosa pine, Jeffrey pine, and lodgepole pine

Pandora moths occur in central and southern Oregon in the Pacific Northwest Region, preferring pumice soils. Periods of heavy defoliation during outbreaks can weaken trees, making them more susceptible to bark beetle attacks. Due to the 2-year life cycle (feeding in alternate years) and the fact that terminal buds are not eaten, trees often have an opportunity to recover. Native Americans traditionally lit ground fires to roast the pupae, which provide crunchy, nutritious protein, now primarily harvested by fat local chipmunks.

Special surveys are conducted in even years (2002, 2004, 2006) to coincide with the insect's life cycle, so there are no survey results for 2005.

Peach bark beetle
Phloetribus liminaris

Region 9/Northeastern Area: New York

Host(s): Black cherry

Populations of this bark beetle remained spotty in New York, but detectable throughout much of the range of cherry in the State. The most severe damage was associated with build-up of downed slash from storms or logging operations.

Insects: Native

Periodical cicada
Magicicada septendecim

Region 9/Northeastern Area: Pennsylvania and West Virginia

Host(s): Hardwoods

Pennsylvania reported no damage and limited populations in 2005 compared to 37,000 acres that were affected by brood X in 2004. West Virginia reported that brood XI emergence was expected in Nicholas and Fayette Counties according to historical records, however, no emergence was observed.

Pine bark adelgid
Pineus strobi

Region 8: Virginia

Host(s): White pine

This pest was reported from sites throughout the range of white pine in 2005, including Madison, Green, Albemarle, Nelson, Carroll, Grayson, and Washington Counties. It is likely that drought stress and overstocking were common outbreak factors, with the adelgid populations expanding in response to trees in a weakened condition. However, significant decline and mortality are rare.

Pine colaspis beetle
Colaspis pini

Region 8: Louisiana, North Carolina, and Virginia

Host(s): Southern pines and ornamental cypress

As in previous years, this beetle caused localized defoliation of pine plantations in eastern and central Louisiana. No significant damage occurred, but the defoliation is unsightly and causes landowner concerns: reddening of pine needles by small brown beetles is often confused with more serious bark beetle activity. Some mortality of ornamental cypress was noted in Louisiana during droughty periods. North Carolina reported scattered damage to longleaf pine in the Sandhills.

Pine engraver beetles
Ips spp.

Region 1: Idaho and Montana

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

Pine engraver beetle *(Ips pini)* populations and associated tree mortality decreased substantially in ponderosa pine stands in the region. Most of those decreases resulted in none being mapped on the Flathead Indian Reservation in western Montana, where more than 14,000 acres had been recorded in 2004. Elsewhere in the region, populations were static or increased only slightly. Notable increases were recorded on the Bitterroot National Forest in western Montana and the Custer National Forest and Northern Cheyenne Indian Reservation in eastern Montana. Those three reporting areas accounted for more than 80 percent of the infested area recorded in the region. Few other areas reported more than a few hundred acres infested.

In total, about 13,000 infested acres were recorded, compared to just over 17,000 acres in 2004. Approximately 31,000 trees were killed in 2005: almost all were ponderosa pines.

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

Host(s): Colorado blue spruce, Englemann spruce, jack pine, lodgepole pine, and ponderosa pine

Ips activity in ponderosa pine continues to be problematic in South Dakota and Nebraska as well as in jack pine at Bessey Nursery in central Nebraska. *Ips* is still very active on the Bessey Ranger District of the Nebraska National Forest and in some isolated parts of the around Chadron, NE. *Ips* declined in the Black Hills, although there were still some areas, especially in the wildland-urban interface, that are getting hit hard. One significant source of tree mortality is *Ips* attacks on pines weakened by *Sphaeropsis* blight and hail damage.

Ips spp. beetles were causing significant mortality to limber pine in the Shoshone National Forest. The six-spined engraver beetle (*Ips calligraphus*) and other *Ips* species are causing considerable mortality.

Region 3: Arizona and New Mexico

Host(s): Ponderosa pine

Ponderosa pine mortality attributed to *Ips* decreased substantially from 84,595 acres in 2004 to 6,950 acres in 2005. In Arizona, damage was reported on the Apache-Sitgreaves (860 acres), Coconino (315 acres), Kaibab (25 acres), Prescott (105 acres), and Tonto (280 acres) National Forests; Grand Canyon National Park (20 acres); Bureau of Land Management lands (150 acres); Fort Apache (4,910acres), Hualapai (5 acres), Navajo (110 acres), and San Carlos (45 acres) Indian Reservations; and 75 acres of State and private lands. No *Ips*-related ponderosa pine mortality was detected in New Mexico in 2005.

Region 4: Idaho and Utah

Host(s): Lodgepole pine and ponderosa pine

Beetles killed less than 100 trees on State, Bureau of Land Management, and national forest lands in Idaho. Mortality due to pine engraver beetle remained at endemic levels throughout the region.

Region 5: California

Host(s): Coulter, Jeffrey, knobcone, lodgepole, piñon, and ponderosa pines

Several windthrown Engelmann spruce were infested with engraver beetles in the Sugar Creek drainage in the Russian Wilderness on the Klamath National Forest. *Ips* beetles were again found this year associated with scattered mortality of shore pine and Bishop pine along the Mendocino coast from Albion northward to Cleone, CA. In the Santa Ana Canyon, San Bernardino National Forest, *Ips* species killed Coulter pine tops in overstocked plantations.

Ips emarginatus was observed attacking ponderosa pine in conjunction with mountain pine beetle in a stand near Summit Lake, Eagle Lake Ranger District, Lassen National Forest. In southern California, *I. emarginatus* was found in recently killed Jeffrey pine in the Santa Ana Canyon.

Scattered pole-sized ponderosa pines were killed by *Ips pini* following a thinning operation on the Dry Creek Rim, west of Goose Lake, Modoc County. *Ips pini* were seen in Jeffrey pine slash at Heartbar campground (San Bernardino National Forest) and in weather-broken Jeffrey pine branches a few miles west of Wrightwood (Angeles National Forest).

Insects: Native

Single leaf piñon mortality caused by *Ips confusus* has continued to decline to near background levels in areas that experienced high mortality from 2001 to 2003 on the Humboldt-Toiyabe National Forest and private lands in Douglas County, south of Minden, NV. The piñon mortality along the eastern side of the Sierra Nevada range has also subsided compared to the past few years. Aerial surveys conducted in these areas revealed none to little new mortality during 2005.

In southern California, the rate of piñon mortality was greatly reduced compared to recent years. Some *Pinus monophylla* mortality associated with *I. confusus* occurred on the north side of the San Garbriel Mountains. In the San Bernardino Mountains, mortality was associated with blackstain root disease and *I. confusus*. *I. confusus* populations were greatly reduced in the Santa Rosa Mountains, where recently dead *P. californiarum* often did not have *Ips* galleries, but rather those of much smaller scolytids. Also in the Santa Rosa Mountains, *P. quadrifolia* remain uninfested with beetles. During the height of the drought-related *Ips confusus* associated mortality in *P. californiarum* occurred, while nearby *P. quadrifolia* was unaffected. In June 2005, *P. californiarum* stands in the Little San Bernardino Mountains, western portion of Joshua Tree National Park, were examined. Mortality during the recent drought in this area reached 50 percent in some of the stands. *Ips* galleries were seen in some of the dead trees (M262B).

Several windthrown Engelmann spruce were infested with spruce engraver beetles (*Ips tridens*) in the Sugar Creek drainage in the Russian Wilderness on the Klamath National Forest.

Region 6: Oregon and Washington

Host(s): Ponderosa pine

Pine engraver beetles affect all species of pine but are most notable for their effect on ponderosa pine. Populations commonly build up in weakened trees, improperly treated logging and thinning slash, and windthrow. High populations in warm, dry years may kill large numbers of apparently healthy saplings and pole-sized trees as well as tops of mature trees.

Acres with mortality decreased from 27,601 acres (2.25 TPA—trees per acre) in 2004 to 17,812 acres (2.63 TPA) in 2005. Mortality was scattered throughout Region 6 with the following reporting areas listed in order of the highest levels of tree mortality: Glenwood (5,522 acres, 3.70 TPA), Colville Indian Reservation (3,727acres, 2.26 TPA), Wenatchee (2,362 acres, 2.21 TPA), Yakama Indian Reservation (2,216 acre, (2.67 TPA), and Colville (1,687 acres, 1.03 TPA).

Region 8: Regionwide

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

Pine engraver beetle activity was moderate across east Texas in 2005. The dry weather in 2005 resulted in increased activity compared to 2004 during the late summer and fall months, but only localized problems were reported. North Carolina reported an increase in damage scattered throughout the Piedmont and Coastal Plain in association with drought. Virginia reported only scattered activity in Coastal Plain sites affected by earlier storms. Mississippi reported little *Ips* activity, but expressed concerns over population development in hurricane-affected areas in 2006. Florida reported a heavy infestation in one Christmas tree farm in Escambia County, defoliating about 700 Virginia pines. Georgia and Tennessee reported scattered small infestations as a result of dry weather late in the growing season.

Pine needle miner
Exoteleia pinifoliella

Region 9/Northeastern Area: Massachusetts

Host(s): Pitch pine

In Massachusetts, severe damage was observed on pitchpine in Plymouth and Barnstable Counties. There were 22,624 acres of damage detected with aerial survey.

Pine needle scales
Chionaspis pinifoliae
Matsucoccus acalyptus

Region 2: Colorado

Host(s): Piñon pine and Scots pine

Some increased scattered activity was found in the vicinity of the Colorado National Monument.

Pine sawflies
Neodiprion spp.
Diprion spp.

Region 2: South Dakota

Host(s): Ponderosa pine

There were several small pockets of sawfly (*Neodiprion fulviceps*) defoliation in ponderosa pine stands across the northern Black Hills after years of almost no activity. It has been approximately 8 years since the last major outbreak of these defoliators occurred.

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

Host(s): Southern pines

Infestations of pine sawflies were lower than in previous years in Georgia in 2005. Scattered sawfly damage was reported in Louisiana in 2005. North Carolina reported scattered heavy red-headed pine sawfly infestations in the Sandhills. South Carolina also experienced scattered sawfly activity on longleaf pine in the Sandhills. Tennessee reported continuing moderate loblolly pine sawfly activity in the central part of the State, with light and scattered redheaded pine sawfly activity in central and western forests. Redheaded pine sawfly damage was reported for the first time in several years in east Texas. Virginia reported only light, scattered defoliation, while a single infestation was reported in Arkansas.

Pine tip moth
Rhyacionia spp.
Dioryctria spp.

Region 2: Nebraska and South Dakota

Host(s): Austrian pine, ponderosa pine, and Scots pine

Young pines in windbreaks and plantations are often damaged by pine tip moth. This insect appeared in several pine plantations in the southeastern part of South Dakota, though injury was light.

Pine tussock moth
Dasychira grisefacta

Region 2: Nebraska

Host(s): Ponderosa pine

An area of a few hundred acres of private land ponderosa pine near Kimball, NE, was reported in 2003 and 2004. Heavy defoliation of old needles occurred locally and control actions were contemplated by some landowners. This outbreak ended in 2005.

Piñon ips
Ips confusus

Region 2: Colorado

Host(s): Piñon pine

Ips activity in piñon pine is subsiding in southern Colorado. During a 3-year comprehensive piñon *Ips* aerial survey (2003-2005), an estimated 5.5 million piñon trees were affected across 1.5 million acres in southern Colorado.

Piñon *Ips* and piñon twig beetle activity were much reduced from the large mortality event that occurred in 2003 and 2004. However, there are still some areas of heightened mortality: notably, the area adjacent to Colorado National Monument and the southern portions of the Uncompahgre Plateau.

In virtually all affected areas, remnant populations of the causal bark beetles can be found and low moisture regimes occurring at least through the early winter of 2006 may cause these populations to rebound, resulting in increasing mortality. The close correlation between beetle activity and moisture availability make additional large mortality events possible. While many stands of piñon were virtually wiped out during the last mortality event, there are still significant areas with mature piñon, the age-class that is most susceptible to beetle activity.

Region 3: Arizona and New Mexico

Host(s): Piñon pine

Piñon ips activity decreased sharply in the Southwest in 2005, with a total of 6,080 of damage detected. In Arizona, activity was recorded on the Apache-Sitgreaves (10 acres) and Kaibab (5 acres) National Forests; Fort Apache (10 acres), Hualapai (10 acres), Hopi (30 acres), and Navajo (4,610 acres) tribal lands; and 5 acres of State and private lands. In New Mexico, piñon Ips-caused tree mortality was detected on the Santa Fe National Forest (10 acres), Zuni Pueblo (1,400 acres), and 40 acres of State and private lands.

Region 4: California, Nevada, and Utah

Host(s): Piñon pine

In 2005, approximately 83,400 trees were recently killed over 30,500 acres, a significant reduction from 2004's reported mortality of 5.8 million trees killed over 938,900 acres. Nearly all of the tree mortality occurred in Nevada (50,900 trees over 16,500 acres) or Utah (32,000 trees over 13,800 acres). In Nevada, most of the mortality occurred on private and Bureau of Land Management (BLM) lands. In Utah, most of the mortality occurred on the Manti-La Sal, Fishlake, and Dixie National Forests (21,600 trees over 9,900 acres), with the remainder observed on BLM and private lands. Historically, piñon-juniper forests have not been aerially surveyed. However, the dramatic increase in piñon mortality in 2001 and 2002 as a result of the extended drought and increased piñon ips populations necessitated documenting this widespread mortality.

Red oak borer
Enaphalodes rufulus

Region 8: Arkansas, Oklahoma, and Virginia

Host(s): Northern red oak, southern red oak, and black oak

Virginia reported widespread but locally heavy damage in 2005, evidently resulting from latent effects of past storms. Arkansas also reported continuing effects from the recent red oak borer outbreak there. (See also Oak decline under Declines/Complexes and Abiotic and Other Damage.)

Red turpentine beetle
Dendroctonus valens

Region 5: California

Host(s): Various pines

Red turpentine beetle activity was observed in sugar pine, ponderosa pine, and Jeffrey pine in nearly every prescribed burn visited in 2005 throughout northeastern California. Numbers and locations of attacks seem to coincide with the degree and location of basal fire injury. The beetle was extremely common after a prescribed burn in a fuelbreak in ponderosa pine near Tennant, CA. The fuelbreak had been entered twice in recent history to remove small diameter trees with a mechanical harvester and also to remove larger trees by chainsaw thinning. Red turpentine beetle activity was noted on ponderosa pines attacked and killed by primary beetles in Siskiyou, Modoc, and Lassen Counties.

In the southern Sierra Nevada, red turpentine beetle were present on nearly all sugar, ponderosa, and Jeffrey pine that were attacked by primary bark beetles. Notable areas include the Lake Tahoe Basin and Butte County. High numbers of red turpentine beetles attacked ponderosa pine in the Wrights Creek plantation (Stanislaus National Forest) following a prescribed fire. Ten trees were subsequently killed by western pine beetle after initial attacks by red turpentine beetles.

Red turpentine beetle populations on Laguna Mountain (Cleveland National Forest) plummeted despite the presence of fire-killed and dying trees. However, populations remained high in the San Bernardino and San Gabriel mountains.

Reproduction weevils
Hylobius pales
Pachylobius picivorus

Region 8: Regionwide

Host(s): Southern pines

Texas reported significant weevil damage from a single stand in Walker County in 2005. The feeding had been reported in December 2004 despite the site preparation and planting being carried out according to weevil-preventive recommendations; it is believed that windrows within the stand were the source of the infestation. North Carolina and Tennessee reported only scattered activity; South Carolina also reported scattered activity in the Coastal Plain.

Roundheaded pine beetle
Dendroctonus adjunctus

Region 3: Arizona and New Mexico

Host(s): Ponderosa pine

Roundheaded pine beetle-caused tree mortality in Arizona decreased for the second consecutive year from 525 acres in 2004 to 120 acres in 2005. This mortality occurred on 110 acres of the Coronado National Forest and 10 acres of the Chiricahua National Monument in Arizona. No roundheaded pine beetle-caused tree mortality was detected in New Mexico.

Scarlet oak sawfly
Caliroa quercuscoccineae

Region 9/Northeastern Area: Pennsylvania and West Virginia

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

No reports of this sawfly were received from Pennsylvania or West Virginia for 2005. Although in Pennsylvania in 2004, damage was most noticeable on 100 acres each in Perry and Tioga Counties, but less noticeable over 100,000 acres in Clinton and Lycoming Counties.

Southern pine beetle
Dendroctonus frontalis

Region 8: Regionwide

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

The highest southern pine beetle (SPB) activity within the region occurred in Alabama, where 4,444 spots were detected during the year, and 18 counties were in outbreak status. This primarily occurred in the southwestern portion of the State within the area impacted by Hurricane Ivan in 2004. This activity peaked in July and was declining by September. The other State with relatively significant activity was South Carolina, where two counties reported outbreak status early in the summer with 2,388 spots. Similar to Alabama, activity within the infestations declined, and the outbreak was declared over in September.

Florida reported only seven spots totaling 15 acres and producing an estimated 31 million cubic feet of mortality in pine timber. North Carolina reported only very low levels of SPB activity, with 23 spots in three counties. Mississippi reported 95 spots, but conditions did not appear to indicate future problems. Tennessee reported only one spot reaching a size of 10 acres; other activity was light and involved only a few mature stands with very high basal areas.

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

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

Aerial flights for southern pine beetle infestations conducted during June 2005 in Delaware found no evidence of southern pine beetle spots. Delaware continued to participate in the Southern Pine Beetle Pheromone Survey for the fifth year. Although southern pine beetle adults were detected in three of four traps used for the study, their counts indicate that southern pine beetle populations are at low or declining levels. In Maryland, southern pine beetle populations continued to remain low, but populations usually build up to damaging levels in a 7- to 8-year cycle within the State. The last outbreak in Maryland occurred in 1994. Talbot County experienced, for the first time ever, a minor southern pine beetle infestation on 99 acres within 22 isolated spots. The outbreak was significant to many of the landowners because most of the spots occurred on residential property. In New Jersey, southern pine beetle killed pines on 634 acres in 2005 in Cumberland, Atlantic, and Salem Counties. Ohio reported no southern pine beetle activity similar to 2004. A Lindgren funnel trapping survey was conducted for southern pine beetle in Mingo and Mason Counties, West Virginia, during the spring of 2005. Traps were set at sites where pine mortality indicated past southern pine beetle activity, but no southern pine beetles were collected. In 2004, southern pine beetle traps were placed in the two above mentioned counties plus Jackson and Wayne Counties. Despite capturing 373 southern pine beetles, predatory clerid beetles were numerous enough to indicate static or declining southern pine beetle populations.

Spruce beetle
Dendroctonus rufipennis

Region 1: Idaho and Montana

Host(s): Engelmann spruce

Spruce beetle populations remained at nearly endemic levels throughout northern Idaho and Montana in 2005. On the Kaniksu National Forest in northern Idaho, almost 500 acres were reported; but in no reporting area were more than 100 infested acres recorded. The outbreak recorded east of Yellowstone Lake in Yellowstone National Park has declined significantly. Mapped at more than 8,700 acres in 2003, it now covers less than 2,000 acres. While ground surveys have not been conducted there, we anticipate it will continue its decline.

Regionwide, slightly less than 2,500 acres were infested, and fewer than 2,700 Engelmann spruce were killed in the last year.

Region 2: Colorado and Wyoming

Host(s): Colorado blue spruce, Engelmann spruce, and white spruce

Spruce beetle activity intensified and spread in 2005 at scattered locations on the Grand Mesa-Uncompahgre-Gunnison, Rio Grande, San Juan, and White River National Forests. Of particular management concern are three expanding outbreaks, one on the White River National Forest in proximity to Baylor Park; another near the Colorado-New Mexico State line on the Rio Grande National Forest; and a third in proximity to Wolf Creek Pass (Rio Grande and San Juan National Forests) impacting spruce stands

in the Weminuche and San Juan wilderness areas, dispersed winter recreation and developed ski area settings. Already, over 1 million trees across 90,000 acres have been killed between roughly Wolf Creek Pass and Telluride.

Spruce beetle activity was noted in several Colorado Wilderness areas, including Eagle's Nest, La Garita, San Juan, South San Juan, Uncompahgre, and Weminuche. A spruce beetle outbreak has been expanding along the Middle and East Forks of the Cimarron River within the Uncompahgre Wilderness for at least the past 4 years. In southern Colorado, several small-scale salvage and sanitation efforts have been successful in removing wind-thrown spruce that would have contributed to additional beetle-caused tree mortality.

Spruce beetle populations in northern Colorado continue at epidemic levels in Jackson and Routt Counties in the general vicinity of Steamboat Springs. Spruce beetle populations are reaching epidemic levels adjacent to Rocky Mountain National Park and north to the Wyoming State line, in Grand, Jackson, and Larimer Counties.

In southern Wyoming, spruce beetle populations are at epidemic levels in the Medicine Bow Mountains and Sierra Madre Range in Albany and Carbon Counties. Populations are increasing rapidly in the Foxpark area of the Medicine Bow Mountains, southwest of Laramie, WY.

Spruce beetle is in epidemic status along the North Fork Corridor and Sunlight drainage on the Shoshone River. We have small outbreaks occurring in the Burgess Junction area and Powder River Pass area of the Bighorn Mountains.

Region 3: Arizona and New Mexico

Host(s): Spruce

Spruce beetle-caused tree mortality decreased slightly from 21,205 acres in 2004 to 19,935 acres in 2005. In Arizona, spruce beetle mortality occurred on the Apache-Sitgreaves (515 acres) and Coconino (340 acres) National Forests; and Fort Apache (1,140 acres) and Navajo (365 acres) Indian Reservations. In New Mexico, spruce beetle related tree mortality occurred on the Carson (6,605 acres), Cibola (315 acres), Lincoln (55 acres), and Santa Fe (3,465 acres) National Forests; Jicarilla Apache (550 acres), Mescalero Apache (55 acres), and Taos Pueblo (530 acres) tribal lands; and 6,000 acres of State and private lands.

Region 4: Idaho, Utah, and Wyoming

Host(s): Spruce

In 2005, spruce beetle-caused tree mortality lessened to 83,200 trees killed over 35,400 acres down from 2004's reported numbers of 124,400 trees killed over 38,300 acres. The majority of the mortality occurred in Utah on the Escalante Ranger District (56,900 trees over 14,800 acres) of the Dixie National Forest. Most of the Utah national forests experienced 2,000 or more acres with spruce beetle-caused mortality.

Region 6: Oregon and Washington

Host(s): Engelmann spruce

Spruce beetles infest all species of spruce and are the most significant mortality agent of mature spruce trees. Populations build up in windthrown trees. Stand susceptibility can relate to a variety of factors, including geographic location, tree diameter, basal area, and percentage of spruce in the canopy.

All reported mortality in Oregon and Washington in 2005 was in Engelmann spruce. Reported acres increased from 23,444 acres, 9.24 TPA (trees per acre) in 2004 to 39,802 acres, 18.20 TPA. The majority of mortality occurred on Forest Service lands within the Okanogan Reporting Area. On the Okanogan Reporting Area, 38,235 acres were mapped with spruce mortality averaging 18.72 TPA. The Colville

Reporting Area reported 536 acres with 4.47 TPA. Other reporting areas with reported mortality include: Wenatchee (299 acres, 3.23 TPA); North Cascades National Park (272 acres, 11.38 TPA); and Wallowa-Whitman (198 acres, 0.57 TPA).

Region 10: Alaska

Host(s): White, Lutz, Sitka, and black spruce

Total area of new spruce beetle activity across Alaska, as observed in 2005 aerial surveys, declined from 2004 levels by 45 percent to 70,913 acres. Many areas of the State have been rendered unsuitable for further large-scale beetle activity due to changes in stand structure and composition, and beetle populations have declined to endemic levels in these areas. However, monitoring continues for current beetle activity, particularly in stands weakened by recent fire and areas supporting a significant component of uninfested mature spruce. Light to moderate activity persists in some areas of south-central Alaska and the Copper and Kuskokwim river valleys. The large volume of beetle-killed spruce in past-affected areas across the interior and south-central regions continues to pose a threat to forests and forest managers as potential for catastrophic wildfires.

Spruce budworm
Choristoneura fumiferana

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

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

In Maine, monitoring of low level spruce budworm populations continued in 2005. Monitoring included field observations, a statewide light trap network, and pheromone baited traps that were highly attractive to budworm moths. Field observations were made but no larvae were found and no defoliation was detected. Light traps were operated through the budworm flight period at 25 locations statewide. Fifty-five pheromone locations were trapped this year, primarily in the north, with some in central and eastern Maine. Catches continued to average less than 3 moths per trap, with only 2 sites averaging over 10 moths per trap. Data suggested the budworm population will remain at endemic levels in 2006.

In New Hampshire, trap catches remained low and no defoliation was detected. In New York, no significant defoliation by spruce budworm was observed in 2005, and trap counts were generally low to moderate. No significant activity was reported in Vermont.

About 92,500 acres were defoliated in Minnesota in 2005, up from 83,000 acres in 2004. Spruce budworm activity had been mapped continuously in Minnesota since 1954.

About 21,000 acres were defoliated in Wisconsin, where 3,800 acres of decline and mortality occurred in areas previously defoliated. Spruce needle drop (SNEED), associated with a previously unknown fungus (*Setomelanomma holmii*), was also observed in these same areas.

Michigan had nearly 10,000 acres defoliated and budworm populations were increasing.

Texas leaf-cutting ant
Atta texana

Region 8: Louisiana and Texas

Host(s): Southern pines and 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. Production of Volcano® Leafcutter Ant Bait, which formerly provided excellent control of this insect, has been terminated.

Twig beetles
Pityophthorus spp.
Pityogenes spp.

Region 2: Colorado

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

Twig beetle activity continued to cause notable damage in piñon pine stands in southern Colorado, but at lower levels than the previous 2 years. These beetles were also found in the Sangre de Cristo Mountains attacking limber pine.

Variable oakleaf caterpillar/saddled prominent/green-striped mapleworm complex
Lochmaeus manteo/Heterocampa guttivitta/Dryocampa rubicunda

Region 9/Northeastern Area: Maine

Host(s): Oak, maple, beech, and birch

Heavy defoliation of red oak caused by variable oakleaf caterpillar was detected in western Maine, as well as in a small pocket in Westbrook and Falmouth in Cumberland County. Other intermixed hardwood species were affected to a lesser extent by the other defoliators in the complex. Heavy defoliation was noticeable from the air on approximately 1,600 acres, but ground checks detected lighter amounts of defoliation extending well beyond the mapped areas. This complex usually increases for 2 to 3 years and then subsides.

Walnut caterpillar
Datana integerrima

Region 8: Florida and Tennessee

Host(s): Walnut and hickories

A widespread outbreak over northern and central Florida produced heavy to complete defoliation of hickories; hordes of wandering caterpillars prompted calls from many concerned homeowners in the area. Light defoliation of walnut was reported scattered throughout Tennessee.

Western balsam bark beetle
Dryocoetes confuses

Region 1: Idaho and Montana

Host(s): Subalpine fir

Western balsam bark beetle mortality is a significant component of the subalpine fir mortality complex described in the Decline and Complexes portion of this report.

Aerial detection surveys (ADS) in 2005 showed an increase in acres infested and the number of red subalpine fir trees over 2004 levels. In 2004 aerial detection surveys in western Montana and northern Idaho mapped over 308,000 red trees on 179,000 acres. In 2005, ADS mapped over 392,000 red subalpine fir trees across 308,000 acres. Subalpine fir mortality is more prevalent in western Montana, specifically on the Beaverhead National Forest (194,000 red subalipe fir across 82,000 acres), Gallatin National Forest (51,000 red subalipe fir across 27,000 acres), and Flathead National Forest (35,000 red subalipe fir across 22,000 acres). In northern Idaho, the Kaniksu National Forest had the most mortality mapped in 2005 (19,000 red subalpine fir over 21,000 acres). Red trees mapped in 2005 were actually attacked by the beetles in 2004.

Western black-headed budworm
Acleris gloverana

Region 10: Alaska

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

In 2005, 1,401 affected acres were mapped, similar to the 2004 acreage (1,483 acres). However, locations of infestations are different between the 2 years: all of the acres in 2004 were found in the southern end of the Alexander Archipelago, whereas 2005 acres were mapped in the east end of Prince William Sound.

Western hemlock looper
Lambdina athasaria

Region 6: Oregon and Washington

Host(s): Western hemlock and associated conifers

The primary host of the western hemlock looper is western hemlock; however, during outbreaks other associated conifer species are also defoliated, including western redcedar, true firs, Douglas-fir, spruces, western white pine, and larch.

The larvae are wasteful feeders, chewing off needles at their bases and thus causing the stand to appear yellowish-red and brown in color. In heavy infestations, trees may be stripped in a single season. Defoliation starts in the upper crown, but as feeding progresses, more and more of the crown is affected, increasing the risk of mortality. Late in summer, larvae are very mobile, crawling over tree trunks and shrubs and by dropping by silken threads from the trees to the ground.

Western hemlock looper has caused more mortality of western hemlock than has any other defoliator. Outbreaks generally last for 2 to 3 years on any one site, and mortality seems to be greatest in old growth, although 80- to 100-year-old stands can be heavily defoliated. Outbreak collapse is usually brought about by the combined effects of pathogens, parasites, predators, and sometimes adverse weather conditions or larval starvation.

Acres defoliated in Washington State decreased from 2,189 acres in 2004 to 1,207 acres in 2005. Defoliated areas are located in the Mount Baker-Snoqualmie and North Cascades reporting areas.

Western pine beetle
Dendroctonus brevicomis

Region 1: Idaho and Montana

Host(s): Ponderosa pine

Ponderosa pine mortality attributed to western pine beetle continued to decline from about 10,300 acres in 2004 to just over 3,600 acres in 2005. Fewer than 3,600 trees were killed, a mortality rate of slightly lower than 1 tree per acre. Most mortality was observed on the Deerlodge National Forest in Montana and on the Clearwater National Forest and Coeur d'Alene Indian Reservation in northern Idaho. As moisture levels continue to attain normal or above normal conditions, western pine beetle populations are expected to continue to decrease in 2006.

Region 3: Arizona and New Mexico

Host(s): Ponderosa pine

Tree mortality attributed to this insect decreased from 58,160 acres in 2004 to 25,445 acres in 2005. In Arizona, western pine beetle mortality was detected on the Apache-Sitgreaves (80 acres), Coconino (70 acres), and Kaibab (25 acres) National Forests; Grand Canyon National Park (30 acres); Bureau of Land Management lands (115 acres); Fort Apache (110 acres), Hualapai (900 acres), Navajo (105 acres), and San Carlos Apache (30 acres) tribal lands; and 70 acres of State and private lands. In New Mexico, western pine beetle activity was detected on the Cibola (5 acres), Gila (10,530 acres), Lincoln (1,640 acres), and Santa Fe (3,545 acres) National Forests; Valles Caldera National Preserve (5 acres); BLM lands (15 acres); Mescalero Apache (50 acres) and other tribal lands (290 acres); and 7,830 acres of State and private lands.

Region 4: Idaho

Host(s): Ponderosa pine

In 2005, the number of ponderosa pine trees killed by western pine beetle was at endemic levels. Most of the mortality occurred on national forests and private lands in Idaho. Across the region in 2005, approximately 1,500 trees were killed over 600 acres. Tree mortality was reduced from 2004 levels of 6,400 trees killed over 7,200 acres.

Region 5: California

Host(s): Coulter pine and ponderosa pine

Western pine beetle-caused mortality leveled off in 2005 throughout California, with the exception of the Modoc National Forest. Beetle-caused mortality of ponderosa pine was most prevalent in the Warner Mountains, with many large group kills detected. These areas include Lassen Creek, Sugar Hill, Plum Valley Campground, South Parker Creek, and Blue Lake (Warner Mountain Ranger District). The Lonkey Hill area along Highway 139, the area surrounding Adin Pass on the Big Valley Ranger District, and a large area west of Goose Lake on the Devil's Garden Ranger District also have elevated and increasing levels of western pine beetle-caused mortality in ponderosa pine. One other location of elevated ponderosa pine mortality was observed in northeastern California on the Eagle Lake Ranger District (Lassen National

Forest) on the lower northeast side of Campbell Mountain, towards Martin Creek and the Pine Creek Valley.

Individual dead trees and small groups of dead ponderosa pine were noted at various locations in the northeastern part of the State. Inspection of dying trees on Big Valley Mountain in Lassen County and west of Goose Lake in Modoc County revealed that fewer trees were attacked and killed by western pine beetle this year than in 2004. Outbreaks at these sites appear to be declining.

Ponderosa pine mortality due to western pine beetle has decreased in most of northwestern California. Precipitation was 95 to 110 percent of normal during the winter of 2004-2005. There were conspicuous concentrations of mortality around black stain root disease centers on the McCloud Flats, Shasta-Trinity National Forest. Mortality associated with the western pine beetle was restricted to scattered individual trees and small groups of ponderosa pine. No specific western pine beetle group kills were reported from the southern part of the Sierra Nevada.

Western pine beetles killed small numbers of trees in southern California, particularly in the San Bernardino Mountains. A trapping study in the San Bernardino Mountains yielded very low catches, except in the vicinity of a log deck on Strawberry Peak. A few mature ponderosa pines were killed at Santa's Village in the Running Springs area. A few Coulter pines in overstocked plantations in the Santa Ana River Canyon were killed by western pine beetle, though most mortality was old.

Region 6: Oregon and Washington

Host(s): Ponderosa pine

Western pine beetles periodically kill large numbers of ponderosa pine in the Pacific Northwest. Normally, these beetles breed in large, old trees; in windfalls; in trees affected by root disease; or in trees weakened by drought, overstocking, or fires. Under epidemic conditions, they will attack and kill trees of all ages having bark sufficiently thick to protect the insect during development. Two generations per year of this beetle are typical in the Pacific Northwest.

Acres affected by western pine beetle activity decreased from 195,775 acres, 1.06 TPA (trees per acre) in 2004 to 70,137 acres, 1.10 TPA in 2005. Activity in large ponderosa pine was reported on 29,717 acres at 1.13 TPA and activity in pole-sized trees was reported on 40,996 acres at 1.09 TPA.

Highest levels of mortality occurred within the following reporting areas: Colville (12,147 acres, 1.02 TPA), Ochoco (9,828 acres, 1.34 TPA), Spokane Indian Reservation (7,567 acres, 1.74 TPA), Colville Indian Reservation (7,000 acres, 1.53 TPA), Yakama Indian Reservation (6,699 acres, 0.64 TPA), and Malheur (6,527 acres, 0.92 TPA).

Western pineshoot borer
Eucosma sonomana

Region 5: California

Host(s): Ponderosa pine

The western pineshoot borer continued to attack plantation ponderosa pine near Pondosa, Siskiyou, and Shasta Counties and north of Lookout, Modoc County. Injury, in the form of stunted terminals, varied widely across the plantations, exceeding 50 percent in some areas.

Western spruce budworm
Choristoneura occidentalis

Region 1: Idaho and Montana

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

In Montana, number of acres defoliated by western spruce budworm (WSB) increased more than two-fold between 2004 and 2005. In 2004, 187,000 acres were flown and mapped with defoliation, 177,000 acres of which was the result of western spruce budworm activity. (Due to the unpredictable and inclement weather conditions during the survey period, acreage figures for defoliation were considered an underestimate.) In 2005, a total of 453,739 acres were mapped as defoliated by budworm.

The most heavily impacted reporting areas were Beaverhead (60,818 acres), Gallatin (124,487 acres), Deerlodge (52,561 acres), and Helena (145,039 acres). Most other areas in Montana retain small, endemic WSB populations. We also recorded 1,332 acres of defoliation caused by WSB in Yellowstone National Park.

Number of acres defoliated by budworm in 2005 not only increased in extent, but also in intensity. In 2005, we recorded very heavy defoliation on Douglas-fir on the Helena and Gallatin National Forests. We are monitoring potential tree mortality from budworm in these areas via ground surveys. We also recorded areas of defoliation from budworm that had never been recorded via aerial survey.

In 2002, aerial detection surveys mapped over 7,000 acres of western hemlock defoliation on the Priest Lake and Sandpoint Ranger Districts of the Idaho Panhandle National Forests (IPNF). Ground surveys and subsequent taxonomic work identified a complex of *Choristoneura* species associated with the defoliated areas, the most prevalent of which was the western spruce budworm, *Choristoneura occidentalis*. In 2003, western hemlock defoliation occurred over 18,000 acres and was visible along the north fork of the Coeur d'Alene River on the Coeur d'Alene River Ranger District of the IPNF. In 2004, defoliation peaked at 51,000 acres, shrinking to 49,000 acres in 2005. However, defoliation increased dramatically on the Coeur d'Alene River Ranger District, while shrinking on the Priest Lake and Sandpoint Ranger Districts.

Region 2: Colorado and Wyoming

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

In 2005, Douglas-fir defoliation by western spruce budworm was apparent in small patches in areas of Boulder County, west of Boulder, CO, and in Jefferson County, west of Denver. This suggests that budworm populations may be on the increase along the northern portion of the Front Range. Populations of budworm have declined to inconspicuous levels along the Rampart Range, west of Colorado Springs.

Western spruce budworm damage was seen in spruce-fir stands on the southern Uncompahgre Plateau and within the area around the Cimarron Ridge. Several consecutive years of defoliation have decimated understory spruce and firs, and top-kill was readily evident in overstory and midstory trees. Budworm activity continued in another high elevation spruce-fir forest on the Rio Grande National Forest, below Wolf Creek Pass. Significant impact was evident in understory spruce and fir. Both sites are noteworthy because the western spruce budworm are attacking both spruce and subalpine fir in the affected stands. The Mosca Pass trailhead area in the Sangre de Cristo Range shows defoliation from this insect. Both Douglas-fir and white fir were affected.

Region 3: Arizona and New Mexico

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

Western spruce budworm defoliation decreased slightly to 194,970 acres in 2005, compared to 248,895 acres in 2004. In Arizona, western spruce budworm defoliation was mapped on 870 acres of the Apache-Sitgreaves National Forest and 10,335 acres of the Navajo Indian Reservation. In New Mexico, western

spruce budworm defoliation was more widespread and occurred on the Carson (80,265 acres), Cibola (255 acres), Gila (55 acres), and Santa Fe (54,790 acres) National Forests; Valles Caldera National Preserve (6,420 acres); Bureau of Land Management lands (45 acres); Mescalero Apache (125 acres), Jemez Pueblo (10 acres), Picuris Pueblo (70 acres), and Taos Pueblo (2,565 acres) tribal lands; and 39,165 acres of State and private lands.

Region 4: Idaho, Utah, and Wyoming

Host(s): Douglas-fir and true firs

Western spruce budworm-caused tree defoliation increased in 2005. In 2005, 103,600 acres were defoliated, compared to 33,100 acres in 2004. Most of the defoliation occurred on the Boise National Forest (54,900 acres) although budworm-caused defoliation was reported on all national forests in south-central Idaho. In Utah, the Dixie National Forest had high levels of budworm defoliation with 37,200 acres affected. Private land in Utah had 3,100 acres of defoliation.

Region 6: Oregon and Washington

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

Western spruce budworm is a common defoliator of conifers in the Pacific Northwest. Budworm outbreaks commonly occur in the true fir/Douglas-fir forest types east of the Cascade Mountains crest. Larvae prefer new foliage but also feed on older foliage when new foliage is in short supply. On western larch, larvae not only feed on the needles, but also sever new shoots. Repeatedly defoliated trees experience substantial radial growth reduction and, if defoliation is great enough, are predisposed to lethal infections by root pathogens or attack by various bark beetles. Increasingly effective fire prevention and suppression during this century have eliminated many major fires and nearly all surface fires; as a consequence, host trees have increased, resulting in an abundant and expanding source of the budworm's favorite food: shade-tolerant, late-successional species such as true fir.

Areas of visible defoliation increased from approximately 199,684 acres in 2004 to 352,210 acres in 2005. The most notable increase in budworm defoliation occurred within the Wenatchee Reporting Area, the fourth straight year of increase, in which acres of visible defoliation increased from 157,489 acres in 2004 to 259,725 acres in 2005. Of the acres in the Wenatchee Reporting Area, 6,431 acres were on State lands and 15,944 acres on private lands. Other reporting areas showing an increase in acres defoliated by western spruce budworm include: Okanogan (20,088 acres in 2004 to 64,133 acres in 2005); North Cascades National Park (3,594 acres in 2004 to 10,320 acres in 2005); and northeastern Washington (4,143 acres in 2004 and 5,308 acres in 2005).

The most notable decrease occurred within the Malheur Reporting Area, where 5,343 acres were reported in 2004 and 254 acres were reported in 2005. Trap intensity and ground observations suggest that observable defoliation should have been more extensive. Although not verified, observers felt that survey timing may have been such that discolored trees were not aerially visible at the time of survey.

Region 10: Alaska

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

Aerial surveys mapped 15,968 acres of spruce budworm defoliation in 2005 despite indications in 2004 that an outbreak had begun with over 83,000 mapped acres of defoliated spruce in interior Alaska. Damage was concentrated along the hills and ridges around Fairbanks (Nenana Ridge, Parks Ridge, and Chena Ridge) and west along the Tanana River, similar to 2004 infestation patterns, with a total of 7,856 acres mapped in these areas. Another large infestation, 3,641 acres, was mapped long the Chandalar River and its forks north of Fort Yukon.

Insects: Native

The decreased acreage mapped in 2005 can be attributed to several factors. Drought damage, light conditions on the day of survey, and large cone crops made it difficult to pin-point actual spruce budworm damage. Additionally, 44,081 infested acres (more than 50 percent of the area mapped in 2004) along the Yukon River in the Lower Birch Creek area were not flown during aerial surveys in 2005, as part of that acreage had burned in forest fires during 2004 and 2005. Ground surveys indicated that populations of spruce budworm are still expanding, and that the outbreak will continue to intensify along the ridges. Defoliation was observed in the top 5 to 10 feet of white spruce, resulting in some top-kill. Flight trap numbers (capturing adult moths) also increased in 2005.

Western tent caterpillar
Malacosoma californicum

Region 2: Colorado

Host(s): Aspen

Western tent caterpillar damaged aspens on 265 acres during 2005 along the northwestern rim of Colorado's San Luis Valley. A low intensity outbreak of western tent caterpillar was observed in the vicinity of Cuchara in southern Colorado. However, no tree mortality has been observed yet. The situation will continue to be monitored.

White pine weevil
Pissodes strobi

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

Host(s): White pine and spruce

Connecticut reported more problems than in previous years on white pine and especially on spruce; this has been a trend for the past 3 years. In Maine, this perennial problem continued to limit the growth of white pine as well as Colorado blue and Norway spruce. Stem deformities, resulting from the loss of the terminal leader, were very common on white pine and caused heavy economic losses to landowners annually. This insect is common throughout the pine regions of New Hampshire. This insect remains endemic to New York statewide. No significant activity was reported in Vermont.

Zimmerman pine moth
Dioryctria spp.

Region 2: Kansas, Nebraska, and South Dakota

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

Zimmerman pine moth continues to be a problem in windbreaks and ornamental plantings of Nebraska and South Dakota. Austrian pine is the primary species affected, though ponderosa pine windbreaks in drought-stricken areas were also experiencing significant branch injury.

These borers continue to kill branches and entire trees in windbreaks and plantations in much of central and western Nebraska.

INSECTS: NONNATIVE

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 *Heterarthrus nemoratus* were collected from birch in 2003; however, these two species are rare in occurrence and cause little defoliation. *Profenusa thomsoni*, the amber-marked 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, Eagle River, Mat-Su Valley, and the Haines area from late-July through August. More than 30,500 acres of defoliated birch were mapped during aerial surveys in 2005 (though a concentrated ground survey effort in 2004 was not repeated in 2005). The peak infestation of 138,000 acres in 2004 is attributed to the record warm, dry 2004 summer that favored leaf miner reproduction and dispersal. The summer of 2005 was far wetter early on, perhaps reducing or at least restraining the spread of the miner.

Large leaf miner populations are known as far south as Bird Ridge (approximately 30 miles south of Anchorage, Seward Highway) and Soldotna (Sterling Highway) on the Kenai Peninsula, north to Talkeetna (Parks Highway), and east to Pinnacle Mountain (Glenn Highway). It has been recorded in southeast Alaska near Haines and Skagway and was also accidentally introduced into the Fairbanks area, probably via nursery/landscape birch stock from the Anchorage area. Amber-marked birch leaf miner damage has been observed on and around Eielson Air Force Base (AFB), the town of North Pole, the City of Fairbanks, and Fort Wainwright Army Base. On Eielson AFB in 2004, evidence demonstrated that the amber-marked birch leaf miner could complete development within the much smaller leaves of dwarf birch (probably *Betula glandulosa*).

A cooperative biological control program (USDA Forest Service and Animal and Plant Health Inspection Service, State of Alaska Division of Forestry, Canadian Forestry Service, and the University of Alberta) was initiated in 2002. Small numbers of the host-specific ichneumonid parasitoid, *Lathrolestes luteolator*, were initially released in Anchorage during the summer of 2004, and a threefold increase in the number of parasitoids was released in 2005. Additional and increased parasitoid releases are planned for Anchorage in 2006 and 2007. After establishment in Anchorage, parasitoids will be moved to the Haines and Fairbanks areas. Until *L. luteolator* numbers increase to create 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 crassiusculus
Xylosandrus mutilatus
Xylosandrus germanus

Region 8: *Xylosandrus crassiusculus*: Regionwide; *Xylosandrus mutilatus*: Mississippi, Florida, and Texas; *Xyleborus similis*: Houston, TX

Host(s): hardwoods

Xylosandrus crassiusculus was introduced into the port of Charleston, SC, in the 1970s and has spread throughout the South. It is known to attack a wide variety of trees and shrubs, including pecan, peach, plum, cherry, persimmon, oak, elm, sweet gum, magnolia, fig, buckeye, crape myrtle, and sweet potato. It

is mainly a problem in oaks, cherries, and crape myrtles in nursery and landscape settings. It probably will attack other plants on which it has yet to be found.

Xylosandrus mutilatus was first detected in Mississippi in 2002. Subsequently, southwide detection surveys found it to be present in Texas and Florida. It is not known to attack live trees, but infests a wide variety of dead hardwood material.

Xyloborus similis was first detected in Houston, TX, in 2002. Additional surveys in Texas and other States have not found more specimens of this species; however, it is assumed to be established in Texas. Its effects are unknown, but in all likelihood it is not attacking living trees.

Region 9/Northeastern Area: Missouri

Host(s): Black walnut and possibly other hardwoods

The granulate ambrosia beetle (*Xylosandrus crassiusculus*, also known as the Asian ambrosia beetle) and the black stem borer (*Xylosandrus germanus*) are exotic species of ambrosia beetles established in the Eastern United States that attack a variety of deciduous host trees. The presence of "frass toothpicks" (stick-like accumulations of excrement and wood particles) protruding from bark is an indicator of attacks by these insects. Both of these species are rather aggressive and will attack healthy, as well as stressed trees. These insects create branched tunnels in the sapwood. Damage to hosts can be severe and sometimes fatal.

Reports of attacks by these beetles in Missouri have become more common in recent years. The granulate ambrosia beetle was identified as infesting black walnut trees in a southwest Missouri plantation in May 2005. This may be one of the first reports of this insect attacking walnut. From 2002 to 2005, "frass toothpicks" were observed in Missouri on American elm, sugar maple, red maple, Japanese maple, yellow poplar, northern red oak, goldenrain tree, and Chinese chestnut. Identities of the specific ambrosia beetles involved were not determined in these instances.

See also: Red bay ambrosia beetle

Asian cycad scale
Aulacaspis yasumatsui

Region 5: Guam

Host(s): *Cycas circinalis* and *C. micronesica*

Since its discovery on ornamental cycads in Guam in 2003, the Asian cycad scale has spread to the native cycad (*Cycas micronesica*), a dominant component of Guam's limestone and ravine forests. Without treatment, the mortality rate for native cycads is 100 percent within 1 year of infestation. Spread has been rapid and occurs by wind and human transport of infested plants and plant debris. High mortality, particularly of smaller size classes, has already been documented by the University of Guam. Chemical treatment is costly and logistically difficult. A limited biological control program is underway in Guam. Within the western Pacific, the scale appears to be limited to Guam but cycads on Rota, Yap, and Palau are at risk if the scale spreads. *Cycas micronesia* is currently proposed for "endangered status" in the next International Union for the Conservation of Nature and Natural Resources Red List of Threatened Plants.

Asian longhorned beetle
Anoplophora glabripennis

Region 5: California

Host(s): Hardwoods

The Asian longhorned beetle (ALB) was discovered on the grounds of a warehouse on McClellan Air Force Base, in Sacramento, CA, on June 16, 2005. The California Department of Food and Agriculture (CDFA) and Sacramento County Agricultural Commissioner's Office investigated the site and found a total of three Asian longhorned beetles. A live adult beetle was captured outside on the loading dock and two adults were found in the warehouse. Wooden pallets with larval galleries and adult beetle exit holes were found in the warehouse. ALB has been found in the California warehouses before; however, this is the first time that the beetle has been found outdoors. The new outdoor ALB find prompted officials to respond quickly by fumigating the warehouse and smokejumpers from Redding, CA, inspected nearby street trees for signs of the beetle. A scientific advisory panel was convened to help strategize the State's extended response to the potential beetle threat. The panel provided trapping and survey recommendations for the McClellan site and also for storage facilities in San Diego and Los Angeles Counties owned by the same company. Survey and eradication procedures will continue for the next few years at these locations to verify that the areas are beetle-free. Over 22,000 trees have been surveyed as of November 2005, none of which showed any signs of ALB.

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

Host(s): Ash, birches, black locust, elm, horse chestnut, maples, poplar, and willow

In New York, low numbers of newly detected infested trees were found in 2005. There were 6 trees found in Manhattan, 18 in Queens, 21 in Brooklyn, and 38 in Amityville. Two of the six Manhattan trees were elms adjacent to Central Park; they brought much-needed public awareness of the problem and media attention. No new infested trees were found in Islip (none since 2002), and the area was reported close to being deregulated. Soil injections and a new low-pressure stem injection system to deliver the pesticide Merit made the chemical control program much more efficient: in 2004, 11,000 trees were soil-injected and 47,000 stem-injected; in 2005, 51,000 were soil-injected and 11,000 stem-injected. With a focus on public awareness, the organization Central Park Conservancy helped to gain access to private residences in Manhattan, which has been a longstanding program barrier. A group called Trees NY provided the same service in Brooklyn and Queens.

In New Jersey, an Asian longhorn beetle quarantine remained in effect in parts of the borough of Carteret and the Avenel section of Woodbridge Township in Middlesex County and the cities of Rahway and Linden in Union County. In Union and Middlesex Counties, Asian longhorned beetle infested trees on 1,363 acres in 2005. The first discovery of Asian longhorn beetle in New Jersey was in 2002. Presently multiagency efforts to manage potential infestations are underway.

There were no new infested trees found in Chicago, IL.

Balsam woolly adelgid
Adelges piceae

Region 1: Idaho

Host(s): Grand fir, subalpine fir

Aerial detection estimated 28,000 acres infested by the balsam woolly adelgid (BWA) in northern Idaho in 2005. This is lower than the estimated 50,000 acres detected in 2004. The yearly fluctuation of acres infested by BWA is likely an artifact of aerial survey methodology and the visibility of BWA symptoms

from year to year, and not to a decline in BWA population or distribution in the region. In actuality, the number of acres infested likely exceeds the recent "high" level of 85,000 acres mapped in 2002, as some infested areas may not yet be displaying crown symptoms. Areas with the heaviest infestations occurred on the St. Joe, Clearwater, and Nez Perce National Forests, along with adjacent State, private, and Bureau of Land Management lands. Subalpine fir mortality occurred in all ages and size classes. 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 BWA and damage assessment surveys are planned in the near future.

Region 4: Idaho

Host(s): Subalpine and grand firs

This introduced aphid attacks trees of all size classes and is easily identified by the presence of masses of white "woolly" females on the stem bark and branches. Tree mortality can occur within 2 to 3 years after the initial infestation. In Idaho,north of the Salmon River, the insect is a common forest pest causing substantial mortality in subalpine fir stands. South of the Salmon River, BWA infested grand fir and subalpine fir on the Payette National Forest near Burgdorph and private property as far south as Cascade. This is the first report of this insect on national forest lands south of the Salmon River. Likely, this insect has spread to other nearby areas of the national forest that are not easily accessible.

Region 6: Oregon and Washington

Host(s): True firs

The BWA is an introduced insect that has had significant impact on grand fir, silver fir, and subalpine fir in Washington and Oregon. It can kill trees slowly by infesting the twigs or branches or quickly by infesting the bole. It also causes gouting of branch nodes. During the 1950s and 1960s, it caused extensive mortality, primarily along the Cascade Range. Since that initial mortality, BWA damage has been chronic and subtle and is not often visible from the air.

Acres affected by BWA increased from 83,325 in 2004 to 108,128 in 2005. BWA was mapped throughout Region 6 in high elevation stands dominated by subalpine fir.

In Oregon, 36,037 acres were mapped within the Wallowa-Whitman Reporting Area, 22,875 acres on the Umatilla, and 2,593 acres on the Mount Hood Reporting Area. In Washington, 8,358 acres were mapped within the Gifford-Pinchot Reporting Area, 10,069 acres on the Olympic National Park, and 3,712 within the Wenatchee Reporting Area.

Region 8: North Carolina, Tennessee, and 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 adelgid populations in all infested areas, and scattered mortality was observed in 2004 and 2005. It is expected that most wild fir populations will undergo another mortality and regeneration cycle within the next 5 to 10 years.

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

Host(s): Balsam fir

There was no significant activity reported in Connecticut. In Maine, BWA populations continued at very low levels in 2005. While mortality from past years is striking, the consistent rainfall of 2004 and 2005 coupled with low population levels of the adelgid allowed a number of the light to moderately damaged trees to recover. Mortality of heavily damaged fir continues to occur but it becomes less obvious as old stands are salvaged or fall to the ground. Patches of dead fir, 2 to 10 acres in size, will remain a common sight in eastern Maine for several more years. Firs grown for Christmas production should be watched closely for signs of this pest. In New Hampshire, this insect caused damage and mortality throughout the range of balsam fir, except in the most northern part of the State. All stands inspected below 2,000 feet were infested, but no infestation was found above that elevation. Annual mortality caused by this pest is found on approximately 5,000 acres per year. There was scattered mortality in southern Vermont.

No report was received from West Virginia for 2005, but in 2004, this insect was reported causing mortality in Randolph, Pocahontas, and Tucker Counties.

Banded elm bark beetle
Scolytus schevyrewi

Region 2: Colorado, Nebraska, and South Dakota

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

Banded elm bark beetle continued to be abundant in the Front Range communities of Colorado. Losses of Siberian elms to this beetle appear to have lessened due to improved rainfall and soil moisture conditions in these areas. This beetle also was associated with Dutch elm-diseased American elm. Bolts of American elm infected with Dutch elm disease fungus were readily attacked and infested by the banded elm bark beetle, and brood beetles emerging from these bolts were carrying spores of this pathogen.

The beetle is present in Nebraska, but the amount of damage it is causing has not been determined. Banded elm bark beetle was found infesting declining Siberian elms in communities across the State of South Dakota, however, the infestations appear to be concentrated in many of the western communities where Siberian elm is a dominant tree species and a long-term drought is occurring.

Region 5: California

Host(s): Elm

Banded elm bark beetles were collected in funnel traps in Inyo, Lassen, Los Angeles, Mono, and Nevada Counties in 2005. In addition, the banded elm bark beetle has been collected beneath the bark of *Ulmus* species in Inyo and Yolo Counties. It appears to be relatively less abundant than the European elm bark beetle in California and concurrently attacks the same host material with the European species. This Siberian species was first detected in California in 2003 and has been slowly widening its range in the United States. During 2005, this beetle was recovered in a Mediterranean pine engraver trap located in Bakersfield, Kern County, CA. This is believed to be the first record of this beetle in Kern County.

Birch leaf miner
Fenusa pusilla

Region 9/Northeastern Area: Massachusetts, New Hampshire, and Vermont

Host(s): Birch

Approximately 60 acres of moderate damage was observed in northern Worcester County, MA. In Carroll, Grafton, and Sullivan Counties, NH, defoliation was light and scattered. Damage was common in Vermont.

Black twig borer
Xylosandrus compactus

Region 5: Hawaii

Host(s): Numerous, both native and exotic

The introduced black twig borer and its associated pathogens continue to be a serious pest of native and alien shrubs and trees, affecting more than 200 species. The borer was first reported in 1961. Several species affected by this ambrosia beetle are rare and/or endangered and the black twig borer continues to hinder forestry plantings, especially koa, as well as native ecosystem restoration in the State.

Browntail moth
Euproctis chrysorrhoea

Region 9/Northeastern Area: Maine and Massachusetts

Host(s): Red oak

The browntail moth population in Maine collapsed during the summer of 2005. There was a moderate to high population going into the spring, and larvae emerged from overwintering webs and begin feeding on new foliage. However, the larvae failed to continue normal development because of the cold, wet spring. Many were found covered with fungal spores, most likely *Entomophaga aulicaie*. Larval samples brought back to the lab had a high number of Diptera parasites in them as well. Numerous properties in the Casco Bay area were treated with ground applications of pesticide before the collapse occurred. Initial results from the fall/winter overwintering web survey showed very few webs, and the webs that were present were small. In Massachusetts, defoliation continued to be limited to the Provincetown and Truro areas of Cape Cod. There were 49 acres of defoliation detected through aerial survey, approximately half of that reported in 2004.

Common European pine shoot beetle
Tomicus piniperda

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

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

The Maine Forest Service has trapped for pine shoot beetle in Maine since 1999. Oxford and Franklin Counties are both under a State and Federal quarantine for pine shoot beetle, *Tomicus piniperda*. It was collected in Oxford and Franklin Counties during trapping surveys performed between 2000 and 2003.

During 2005, trapping with 138 Lindgren funnel traps was done in 45 sites (23 pine processing sites, 2 log yards, and 20 plantations and natural stands with hard pines). No pine shoot beetle adults were trapped in Maine in 2005. Pine shoot borer is found at two small isolated locations in northern New Hampshire and the populations have not increased or moved in 4 years. In New York, pine shoot beetle was trapped in three new counties in 2005: Columbia, Orange, and Ulster. No significant damage by the insect was reported. In Vermont there was scattered shoot mortality and very light damage. Traps were placed in Windsor, Rutland, Bennington, and Windham Counties.

Delaware did not report this exotic species in 2005, but it was found in several northern counties of New Jersey. Pine shoot beetle was surveyed in 10 Maryland counties in 2005. This beetle, first found in western Maryland in 1995, is now present in all five western Maryland counties (Allegany, Frederick, Montgomery, Garrett, and Washington Counties). Significantly more beetles were trapped in 2005 than in previous years. Consequently, a Federal quarantine restricts pine material moving from these counties. No report was received form Ohio in 2005. In 2004, this beetle became established in Lawrence and Meigs Counties and became present in 80 counties statewide. No reports from Pennsylvania were received in 2005. In 2004, this beetle was detected for the first time in Sullivan, Snyder, Union, and Wayne Counties, bringing the total of infested counties to 39, statewide. No report was received from West Virginia in 2005, but the 2004 report added to the 18 counties known to harbor this beetle. A Federal quarantine was summarily initiated for this insect in West Virginia.

In Minnesota, a quarantine of all counties was established in 2005 by USDA in September after the State repealed a quarantine in August. In 2004, Anoka, Dakota, and Ramsey Counties reported the pine shoot beetle.

Infestations have been found throughout the northern half of Illinois, but populations have always been low and damage usually regarded as insignificant. Foresters and Christmas tree growers are well informed on cultural practices such as stump treatments and slash removal as a means to keep the population of beetles in check.

No significant activity was reported in Indiana.

Elongate hemlock scale
Fiorinia externa

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

Host(s): Eastern hemlock

There was no significant activity reported in Connecticut.

This insect is common in approximately the same range as hemlock woolly adelgid, and often found in the same stands. However, it was recently discovered in Rensselaer County, NY, where hemlock woolly adelgid has not yet been seen.

In Pennsylvania, the density of elongate hemlock scale in 2005 was recorded as part of a general hemlock survey for 22 eastern counties where populations ranged from low to high. In 2004, Pennsylvania reported this exotic scale causing foliar and shoot damage in isolated eastern hemlocks in Berks and Pike Counties, Pennsylvania.

Emerald ash borer
Agrilus planipennis

Region 9/Northeastern Area: Indiana, Michigan, and Ohio

Hosts(s): Ash species

In Ohio, emerald ash borer infestations have been identified in 10 northwestern counties. Trap tree and visual surveys are used by Ohio Department of Agriculture (ODA) and Animal and Plant Health Inspection Service (APHIS) to locate infested areas. Several counties have multiple infestation sites. ODA and APHIS address each spot infestation (single trees) by removing all ash trees within a ½-mile radius of each infested tree. Over 250,000 ash trees have thus far been removed, chipped, and burned in northwestern Ohio since emerald ash borer was found in 2003. New infestation spots were found in 2005 in Delaware, Auglaize, Ottawa, Hancock, Erie, and Lorain Counties. In 2004, Ohio discovered the beetle for the first time in Fulton and Henry Counties. These were added to the previously known infested counties. In Maryland, emerald ash borer-infested trees from Michigan were found at a Maryland nursery. Maryland Department of Agriculture Plant Protection personnel destroyed these nursery plants, including those that were traced forward after being sold. Additionally, ash trees within ½ mile of the infested nursery were destroyed. Maryland Department of Agriculture Forest Pest Management and Plant Protection staff continues emerald ash borer surveillance throughout the State using trap trees and visual surveys of individual trees. In 2005, no additional infested ash trees were found and no emerald ash bores were found in trap trees.

Currently, the contiguous quarantined area in southeast Michigan encompasses 21 counties. To date, Michigan has detected 31 isolated emerald ash borer infestations outside the contiguous quarantined area. The first infestation to be detected in Michigan's Upper Peninsula was identified in Brimley State Park (Chippewa County). This site was eradicated (½-mile radius of ash trees removed) and will be monitored for future infestation. As part of the eradication efforts, 25,000 infested or at-risk trees were cut in a total of four outlier sites across the State. These sites have been prioritized based on pest population, location, risk of spread, and national/international significance. The program is based upon the Science Advisory Panel's "Gateways of Exit" strategy that focuses resources to areas where emerald ash borer has the potential to spread out of the Lower Peninsula of Michigan. The Michigan Department of Agriculture designated approximately 10,500 detection trees throughout the State, except in the generally infested areas within the quarantine area of southeast Michigan. Trap trees were established in higher densities in gateways on the southern border of the State, along the St. Clair River bordering Canada, and the tip of the "mitten" and the eastern Upper Peninsula. Additional trap trees were placed throughout the State in "high risk" areas such as campgrounds and recreation areas by Michigan Tech University. In 2005, $12.8 went to Michigan for regulatory/control (49 percent), detection/survey (24 percent), sanitation/disposal (17 percent), outreach/education (7 percent), and data management (3 percent) of emerald ash borer.

Emerald ash borer is latest exotic pest in Indiana and is a very serious threat to eliminate Indiana's ash resource. The beetle originally was found in 2004 in Steuben County. Presently, there are four infestations, two of which have received eradication treatment (Jellystone and Manapogo) and two of which are undergoing eradication measures (Shipshewana and Grand View Bend). For this effort, over 118,500 ash trees has been killed or destroyed on over 12.5 square miles of Indiana. The eradication work in 2004/2005 has been supported by an estimated $2,502,341 of Federal funds from the USDA. Surveys have been and are still being conducted to detect new infestations. Approximately 1,000 trap trees are spread across the northern tier of counties to detect emerald ash borer. Presently, the movement of infested firewood and logs is the greatest risk to the introduction and spread of emerald ash borer.

Erythrina gall wasp
Quadrastichus erythrinae

Region 5: Hawaii

Host(s): Coral trees (*Erythrina* spp.), wiliwili

The Erythrina gall wasp was first detected on Oahu, HI, in April of 2005. By October 2005, it was found throughout the Hawaiian Islands in the culturally and biologically important native, dry forest tree *Erythrina sandwicensis* (or "wiliwili"), as well as in several ornamental coral trees (*Erythrina* spp.). Many wiliwili populations are severely infested, with trees showing infestation of all new growth—shoots, leaves, flowers, and fruit. The native range of the gall wasp is unknown. Since it was first described in 2004 from trees in Singapore, Mauritius, and Reunion Island, spread of this species has been swift. Spread in Hawaii closely follows the 2004 outbreak in Taiwan, where it spread rapidly throughout the island within a year of detection. Severe infestations in Taiwan have resulted in the death of trees. Its current distribution includes Mauritius, Reunion, Singapore, India, Taiwan, China, Hong Kong, and Hawaii.

In Hawaii, a network of Federal, State, and local governments and nongovernmental organizations have organized and responded to the rapid outbreak of the gall wasp in the State. A survey of the gall wasp distribution was conducted in August by the State Department of Agriculture and Animal and Plant Health Inspection Service. A more recent survey and assessment was conducted by the USDA Forest Service's Forest Health Protection group and the Hawaii Division of Forestry and Wildlife, and pesticide trials are underway. Entomologists from the Hawaii Department of Agriculture and the University of Hawaii will search Africa for enemies of the wasp starting in early 2006, and studies are underway with respect to learning more about the basic biology of the wasp. Seeds from the native wiliwili trees have been collected and stored in a certified seed bank for use in future restoration efforts.

European fruit lecanium scale
Parthenolecanium comi

Region 9/Northeastern Area: New York and Vermont

Host(s): Hardwoods

This soft-bodied scale was reported in dense populations on many hardwoods in northern New York.

Heavy populations occurred statewide in Vermont, with some dieback observed in infested stands, a sharp increase from 2004.

Gypsy moth
Lymantria dispar

Region 1: Idaho, Montana, North Dakota, and Wyoming

Host(s): Hardwoods

Cooperative detection monitoring continued for the Asian gypsy moth in Region 1 with Animal and Plant Health Inspection Service (APHIS) and State departments of agriculture, forestry, and lands in 2005. A network of strategically located pheromone-baited traps was placed throughout all Region 1 States. Two moths were captured on Federal land in Yellowstone National Park. The first was trapped at Fishing Bridge RV Park, which is the same trap site where one moth was captured each year from 2001 to 2003. A second moth was trapped at Madison Campground, also in Yellowstone National Park. Delimitation surveys near the Fishing Bridge RV Park were still in place as a result of the 2004 catch.

Insects: Nonnative

A single European gypsy moth was trapped on private land near Enaville in the Idaho panhandle. Delimitation surveys will be instituted for the area surrounding this trap catch, and will continue from last year's Asian gypsy moth catch near Hauser, ID. There have been no new gypsy moth catches following the suppression project, where 600 acres were sprayed with Btk4a48b. No moths were caught in Montana or North Dakota in 2005.

Aside from the new delimiting grid in the Idaho panhandle, the trapping program will continue as usual in Region 1 next year.

Region 4: Idaho, Nevada, and Utah

Host(s): Various deciduous species

The gypsy moth was first detected in Utah in 1988. Since then, male moths have been captured in various locations nearly every year. In 2005, one male gypsy moth was captured in Pine Brook, a residential area in Summit County, UT, in the delimiting grid established in 2005. A delimitation-trapping grid will be installed again in 2006 at the Summit County site. In Wyoming, two separate single male moth captures occurred in Yellowstone National Park. APHIS and the National Park Service will delimit trap both sites in 2006.

Region 5: California

Host(s): Hardwoods

There were two Asian gypsy moth finds in California during 2005. One moth was found in San Pedro, Los Angeles County (Asian mitotype) and the other in Santa Ana, Orange County (Siberian mitotype). These two detections and the one moth trapped on July 9, 2003, at Wilmington are considered to be three separate unrelated events. Because the San Pedro moth is Asian and the one from Santa Ana is Siberian, these moths represent separate introductions. The Wilmington find has the Asian mitotype, as does the one trapped in San Pedro. The latter find was made 2 miles from the Wilmington detection. The find area has been trapped for two seasons at 25/mi ^{2}. The probability of a viable population of 100 male moths remaining undetected during this time is approximately 1.26×10^{-4}. The California Department of Food and Agriculture will continue to set a minimum of 100+ traps in the core area and 25 traps/ mi^2 within a 5-mile radius of all three finds. No treatments are currently planned for 2006.

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

Host(s): Hardwoods, especially oak species

Suppression: There were no gypsy moth suppression projects in Virginia in 2005. Subsequently, that State reported light to moderate defoliation on approximately 6,543 acres in Frederick, Giles, Montgomery, and Floyd Counties in the western mountains of the State. Approximately half of the defoliation occurred on the George Washington-Jefferson National Forest. The small increase of gypsy moth defoliation is consistent with the general trend in defoliation throughout the Northeast.

Slow-the-Spread: In conjunction with the Slow-the-Spread program, treatments were conducted on 47,890 acres of non-Federal lands in North Carolina and on 73,464 acres of non-Federal land, 1,872 acres of National Park Service land, and 10,812 acres of national forest lands in Virginia. The majority of the treatments were specific to the gypsy moth: mating disruption accounted for 90 percent and Gypchek for another 5 percent. Since the inception of this program in the South, spread rates have been reduced from an average of 21 km per year to less than 5 km per year, a reduction of more than 75 percent.

Eradication: North Carolina conducted a 32,000-acre eradication project in Burke County in the western Piedmont region of the State. This area was treated with two applications of *Bacillus thuringiensis* var. *kurstiki* (*B.t.k.*). Post-treatment evaluation using pheromone traps showed continued gypsy moth

populations to the northwest and south of the 2005 treatment area. In addition to treatment of these areas, eradication projects are planned for Henderson and Clay Counties in 2006.

In Tennessee, the continuation of an eradication project was conducted in Claiborne County in the northeastern part of the State. Approximately 5,700 acres were treated with two applications of *B.t.k.* This project began in adjacent Campbell County in 2002, and treatments have steadily moved eastward each year. Post-treatment trapping results showed only three positive trap catches and do not indicate a need for treatment in 2006. However, 2 years of negative trapping are required before the infestation can be declared eradicated.

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

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

Connecticut reported defoliation on 64,273 acres. In Maine, no defoliation of hardwoods resulting from gypsy moth larval feeding was recorded in 2005. *Entomophaga maimaiga*, virus, and parasites continued to keep the gypsy moth population at low levels throughout southern Maine. The 2005 fall egg mass survey indicates that the population will remain at endemic levels next season. In Massachusetts, Plymouth, Bristol, and Norfolk Counties sustained heavy defoliation on about 36,771 acres. In many cases, this insect was defoliating the same areas as the forest tent caterpillar. Permanent survey sites indicated the start of a buildup statewide. In New Hampshire, approximately 6,300 acres were defoliated in Belknap and Carroll Counties. In New York, moderate to heavy defoliation occurred in scattered locations mostly in the southeastern and central parts of the State. Many of the stands defoliated were also hit in 2004, and egg mass surveys suggest that we will see a significant amount of acreage defoliated by gypsy moth in 2006. Rhode Island reported defoliation on 3,102 acres in the central part of the State. Most of the damage was located in south Scituate and central Coventry, in Providence and Kent Counties, respectively. Scattered light defoliation occurred in southwestern Vermont, and eggmass counts indicated that populations may increase in 2006.

Pennsylvania reports increased defoliation and egg mass counts. Aerial and ground surveys recorded 333,335 acres of damage occurring mostly in northeastern Pennsylvania. Suppression programs are planned for 2006. With very few gypsy moth suppression projects deployed in 2005, Ohio reported about 7,700 acres of defoliation this year. Credit was given to the various Slow-the-Spread projects occurring in 2005. New Jersey reported 45,367 acres of defoliation. Scattered areas in West Virginia experienced small increases in gypsy moth defoliation and a suppression program is planned for 2006. Aerial surveys in Delaware did not detect gypsy moth defoliation in 2005, and egg mass counts were insignificant during 2004 egg mass surveys. There were no treatments in 2005. However, egg mass counts were observed in several counties, and treatments for 2006 have been proposed.

In Minnesota, record high numbers of moths were trapped in 2005. There were 1,310 moths caught, surpassing the 1998 record of 953. Most of the moths were caught in Cook County, the far northeastern county. Treatments in the area are planned for 2006. No defoliation was detected in the State. A 640-acre block on the Superior National Forest, in the vicinity of the Boundary Waters Canoe Area, was successfully treated.

In Wisconsin, about 2,700 acres were successfully treated. There were only about 20 acres of damage reported.

Gypsy moth populations in Michigan were increasing statewide. Nearly 150,000 acres were defoliated in 2005.

Populations in 2005 continued to remain spotty in the northeastern Illinois counties with little noticeable defoliation.

Indiana reported a total of only 2 acres of gypsy moth damage in Allen and Scott Counties.

Region 10: Alaska

Host(s):

Alaska has maintained a detection monitoring system focused on the gypsy moth, a serious defoliator of hardwoods, for several years. No gypsy moths were trapped in 2005. Both the European and Asian gypsy moths are of concern to Alaska. To address this concern, annual gypsy moth trapping has and continues to be done in cooperation with the APHIS in several locations across Alaska.

Hemlock woolly adelgid
Adelges tsugae

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

Host(s): Carolina hemlock and eastern hemlock

Hemlock woolly adelgid populations continue to rapidly expand their range in the Southeast. In Virginia, the infested range was extended into Tazewell and Russell Counties, leaving only four southwestern Virginia counties uninfested. Populations spread and intensified in Georgia, North Carolina, South Carolina, and Tennessee, the latter reporting three new infested counties. North Carolina, Georgia, Tennessee, and South Carolina experienced their first adelgid-caused mortality in 2005. Efforts at chemical control continued on a limited basis on several national forests, in the Great Smoky Mountains National Park, and along the Blue Ridge Parkway. The rearing and release of various adelgid predators was expanded.

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

Host(s): Eastern hemlock

Hemlock wooly adelgid was first detected in native hemlocks in Maine 2 years ago and occurs in light spot infestations scattered over a total of 5,000 acres in five towns in the southern-most tip of the State. During 2005, new spot infestations were found scattered in an abutting area of 1,500 acres in the towns of Eliot, York, and South Berwick. Hemlock wooly adelgid was previously detected in the towns of Kittery and Wells, and in other parts of York. The Maine Forest Service is carrying out an integrated Slow-the-Spread management program to reduce the spread and impact of established adelgid populations in York County. A total of 7,500 *Sasajiscymnus tsugae* were initially released in 2004 by the Maine Forest Service on Gerrish Island to establish this predator in a forested part of the island. An additional 10,000 *S. tsugae* were released during the spring of 2005 on Gerrish Island. In October 2004, native hemlocks on nine sites in Kittery, York, and Wells were sprayed with Talstar plus oil. Treated sites were monitored throughout 2005 and all showed excellent control. In October 2005, three additional sites in Eliot, York, and Kittery were similarly treated. These sites were chosen for treatment because the use pattern by the landowner was deemed to present a high risk of artificial spread of hemlock wooly adelgid.

In Massachusetts, this insect continued to be a major concern. No new communities were found to be infested this year. The State continued to monitor predator release sites but was unable to recover *S. tsugae* beetles at 10 of the 11 release sites. The severe cold experienced during 2004 resulted in adelgid mortality in most locations; however, buildup in the adelgid population was beginning.

No new infestation sites were found in 2005 in New Hampshire. Populations decreased at the few remaining infestation sites in Rockingham County.

In New York, the hemlock woolly adelgid continued to cause damage and mortality to native forest and ornamental eastern hemlock trees. Damage was most severe in areas that have been infested for several years (the Catskills and south). In some areas, a majority of the trees are infested, and many of those trees are in declining health or dead. Pockets of hemlock mortality were seen from the air in infested areas.

However, no new county occurrences were found in 2005 (for the second consecutive year). It was also noted that some stands seem to be in a recovery phase, but there was no optimism about long-term recovery.

In Rhode Island, adelgid populations and new damage were reduced for the second year in a row. Mapping and evaluation of stands of 10 acres and larger in Kent and Washington Counties was ongoing.

Hemlock woolly adelgid continued to spread throughout the generally infested area causing hemlock decline and tree mortality. Biological control activities continued in 2005 in many Northeast States. The first effort to establish *Scymnus sinuanodulus* occurred in 2005, and more than 4,000 beetles were released in Connecticut, New Jersey, Pennsylvania, West Virginia, and Maryland. New infestations in West Virginia included Upshur and Wyoming Counties. This brought the total number of infested counties to 24 within the State. Pennsylvania reported Elk and Tioga Counties as newly infested, which brought the total number of infested counties to 44. Normal winter temperatures during the past winter resulted in growing adelgid numbers in many areas of the mid-Atlantic States.

Larch casebearer
Coleophora laricella

Region 1: Idaho and Montana

Host(s): Western larch

In 2005, for the fourth year in a row, there were no areas in western Montana or northern Idaho where visible defoliation caused by larch casebearer was recorded by aerial or ground surveys. The population that caused defoliation from 1997 to 2001 has declined to undetectable levels. Affected areas will be occasionally monitored for a resurgence of populations; but we do not anticipate any appreciable defoliation in 2006.

Region 6: Eastern Oregon and Washington

Host(s): Western larch

After years of negligible occurrence, larch casebearer-caused defoliation of western larch slowly increased in the late 1990s to 15,836 acres reported in 1999. Ideal timing for a larch casebearer survey in the Pacific Northwest is in June; however, most of the surveys in larch type occur in late July through early September.

Approximately 2,532 acres were mapped in 2005, a decrease from 7,877 acres mapped in 2004. Reporting areas with the greatest number of acres affected included Wallowa-Whitman (1,511 acres) and Mt. Hood (802 acres).

Introduced parasites released in the Pacific Northwest in the early 1960s and established years ago, along with needle diseases on larch, helped maintain low levels of casebearer for many years. As casebearer populations declined, so did the introduced parasites. Parasites are expected to respond to the increasing casebearer population, although there may be several more years of defoliation before they increase to effective levels. Refoliation of larch in late summer typically masks most of the defoliation, and because of this these trees are not as evident to observers late in the season. The ability of larch to refoliate is one of the reasons we do not expect to see tree mortality as a result of this insect.

Insects: Nonnative

Region 9/Northeastern Area: Minnesota, Michigan, Pennsylvania, Vermont, and Wisconsin,

Host(s): Eastern larch

Light defoliation in scattered locations was reported in Vermont.

In Pennsylvania, 20 acres of plantations in Tioga and Bradford Counties were reported to be damaged by the larch casebearer. This was a decrease from the 100 acres of damage reported in 2004.

Larch casebearer had been observed in the State continuously since 2000. In Minnesota, 4,600 acres of defoliation were mapped, down from 6,700 acres in 2004.

Scattered heavy defoliation was reported in Central and Northeastern Wisconsin.

There were 302 acres defoliated in Michigan.

Region 10: Alaska

Host(s): Eastern larch (tamarack) and ornamental Siberian larch

Larch sawfly defoliation increased slightly from 14,215 acres in 2004 to 16,771 acres in 2005. These years represent a significant increase from 2003, when only 600 acres were mapped. Nearly 80 percent of the infested area (13,085 acres) occurred along the Kuskokwim River between McGrath and Sleetmute and along the Holitna River south of Sleetmute. The second largest concentration of larch sawfly defoliation (2,997 acres) occurred along the Innoko River east of Anvik. Smaller infestations were also noted east of McGrath, where larch sawfly has been very active for a number of years. Typically, areas of low level activity would not be considered significant; however, the trees infested in the past 2 years represent some of the last remaining live larch in many of these areas after the large 1999 infestations, when sawfly populations impacted nearly 450,000 acres. Larch sawfly continues to be a problem on ornamental larch in urban areas of south-central Alaska.

Lobate lac scale
Paratachardina lobata lobata

Region 8: Florida

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

This pest, native to India and Sri Lanka, is being controlled biologically by the introduction of natural insect predators, even though it is not currently causing damage to native vegetation. While damaging to *Melaleuca*, itself an invasive nonnative species, concerns remain over potential spread of the scale to native species.

Mediterranean pine engraver
Orthotomicus erosus

Region 5: California

Hosts(s): Pines

In May 2004, a new exotic bark beetle for North America was discovered in baited flight traps in Fresno, CA, during an annual bark beetle and woodborer survey by the California Department of Food and Agriculture. This bark beetle was identified as *Orthotomicus erosus,* the Mediterranean pine engraver beetle. During 2004, the beetle was found in flight traps in five counties in California's southern Central Valley. Furthermore, in Fresno, Tulare, and Kern Counties, abundant overwintering populations of larvae,

pupae, and adults have been found in cut logs of Aleppo pine, Italian stone pine, and Monterey pine. This is the first and only established North American population of the Mediterranean pine engraver beetle in North America. In the Central Valley, beetles overwinter as larvae, pupae, and adults, initiate flight in late February, and establish their first broods in mid-March. Flight activity increases in June-July and remains high through September, dropping off in October-November. There appear to be two to three generations of Mediterranean pine engraver beetle in the Central Valley.

In a cooperative effort between the USDA Forest Service's Forest Health Protection group, Region 5, and the California Department of Food and Agriculture, a total of 111 Lindgren funnel traps were deployed at 39 sites during 2005 for further *Orthotomicus erosus* detection. In general, the 2004 north/south boundaries of the infestations remain the same in 2005, with some significant range extensions to the east (i.e., Porterville). Two Mediterranean pine engraver beetles were recovered from a trap deployed at Santa Margarita Recreation Area in San Luis Obispo County and one beetle from Salinas Golf and Country Club located in Salinas, Monterey County. Follow-up visual surveys need to be completed to determine if there is an infestation present or if this beetle emerged from infested firewood brought in from outside the area. An estimated 150-200 trap samples remain to be processed.

Pear thrips
Taeniothrips inconsequens

Region 9/Northeastern Area: Vermont

Host(s): Red maple and sugar maple

Populations were very low with widely scattered moderate to heavy damage in central Vermont.

Red bay ambrosia beetle
Xyleborus glabratus

Region 8: Florida, Georgia, and South Carolina

Host(s): Red bay and sassafras

Widespread mortality of red bay has been reported from coastal counties in Florida, Georgia, and South Carolina, centered on the Savannah area and involving a number of coastal barrier islands where red bay is an important vegetative component. *Xyleborus glabratus*, an Asian ambrosia beetle first detected in North American in 2002 near Savannah, has been implicated in this mortality. The beetles apparently are vectoring a blue stain fungus that threatens red bay and may also destroy sassafras and other more widely distributed species. Further study of this insect/disease complex is scheduled for 2006.

Red pine scale
Matsucoccus resinosae

Region 9/Northeastern Area: Connecticut, Massachusetts, and Rhode Island

Host(s): Red pine

The known infestations in Hampden and Hampshire Counties, MA, continued to spread slowly.

Red-haired pine bark beetle
Hylurgus ligniperda

Region 5: California

Host(s): Various pines

The red-haired pine bark beetle was detected in 2003 and has been collected in traps baited with ethanol or ethanol and α-pinene in three southern California counties (Los Angeles, Orange, and San Bernardino). The first detections in California at Bear Divide Guard Station, Angeles National Forest, and at the Frank G. Bonelli Regional County Park (both Los Angeles County) were both located near heavily urbanized areas. Later, specimens were also trapped on national forest lands in more remote locations in Los Angeles, Orange, and San Bernardino Counties. Ground checking for this species on 10 March 2005 at Bonelli Park revealed that the red-haired pine bark beetle was frequently found in large dimensional (minimum 15-20 cm diameter) cut or broken logs of Aleppo pine (*Pinus halepensis*) and Canary Island pine (*P. canariensis*). In the same logs, red-haired pine bark beetles were frequently found adjacent to more advanced galleries of the California fivespined ips (*I. paraconfusus*), but the *Ips* beetle was generally absent from the undersides of the logs. Mating pairs of red-haired bark beetle were also collected from a stump of a *P. halepensis* tree that had broken during a major storm on 27 December 2004.

Satin moth
Leucoma salicis

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

Host(s): Aspen

In Maine, there was no defoliation observed in 2005. In New Hampshire, satin moth was highly visible on several acres along the interState highway. No other known damage occurred. Scattered defoliation was reported in northern Vermont.

Sirex wood wasp
Sirex noctilio

Region 9/Northeastern Area: New York

Host(s): Pines

In New York, this new invasive pest was identified from a 2004 exotic bark beetle trap in early 2005 and has since been trapped in dozens of locations centering around Fulton and Oswego Counties and as far away as 40+ miles (not including Canadian finds near the St. Lawrence River). So far, Sirex wood wasp has been confirmed infesting Scots and red pine; however, we cannot yet rule out other pines as susceptible hosts. Much more delineation work is necessary before we can confidently or competently begin eradication and/or management of this pest.

Spruce aphid
Elatobium abietinum

Region 3: Arizona

Host(s): Engelmann spruce and blue spruce

Defoliation by spruce aphids decreased dramatically, from 28,730 acres in 2004 to 185 acres in 2005. In Arizona, spruce aphid defoliation was recorded on 50 acres of the Apache-Sitgreaves National Forest and 135 acres of the Fort Apache Indian Reservation. No spruce aphid defoliation was recorded in New Mexico.

Region 10: Alaska

Host(s): Sitka spruce and other spruce species

Overall, spruce aphid activity increased in 2005 to 14,982 acres, double 2004's acreage. About one-third of these acres (4,605 acres) were mapped in Prince William Sound, the north end of the range of spruce aphid occurrence. Surveys identified 5,869 acres in the southern part of the Alexander Archipelago south of Baranof Island, while fewer acres (4,056 acres) were mapped in the northern part, including Yakutat. Tree mortality is expected to occur in the Sitka area in 2006, as some trees have already been severely defoliated and have additional fall 2005 aphid colonies.

Twospotted leafhopper
Sophonia rufofascia

Region 5: Hawaii

Host(s): Numerous, both native and exotic

Since its first report in 1987 on Oahu, the twospotted leafhopper has been recorded on over 300 host plants on all major Hawaiian islands. 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 continues to kill the invasive firetree (*Morella faya*) on the island of Hawaii.

Uglynest caterpillar
Archips cerasivoranus

Region 10: Alaska

Host(s): Cotoneaster, crabapple, and mountain ash

Populations of this introduced pest continued to decline throughout all of Anchorage, where it was introduced on ornamental plantings. It remains a problem in west Anchorage on plantings of cotoneaster and mountain ash. It can also be found along roadsides near and around Anchorage on *Prunus*, *Malus,* and *Salix* species. This insect is especially a problem for nurseries and owners of ornamental plantings because of the unsightly appearance of the larval nests.

Winter moth
Operophtera brumata

Region 9/Northeastern Area: Massachusetts and Rhode Island

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

In Massachusetts, 20,468 acres of defoliation were documented in Plymouth, Barnstable, Norfolk, and Essex Counties. A lack of natural enemies was confirmed by surveys conducted by the University of Massachusetts and resulted in the importation and rearing of a parasitic fly, *Cyzenis albicans.* In Rhode Island, defoliation was confirmed in all east bay communities and as far west as Westerly on the Connecticut border, in Bristol, Newport, Kent, and Washington Counties.

Wooly alder sawfly
Eriocampa ovata

Region 10: Alaska

Host(s): Sitka, red, and thin-leaf alder

Defoliation and discoloration of alder was noted throughout the south-central and southwestern regions of Alaska as well as the Copper River Valley. The total acreage of alder impacted by a variety of agents, both biotic and abiotic, exceeded 26,000 acres statewide, but was especially intense in riparian areas in Anchorage and the Mat-Su Valley. This defoliation and discoloration is caused by a suite of insects, including the native striped alder sawfly (*Hemichroa crocea*), the exotic woolly alder sawfly (*Eriocampa ovata*), and several defoliating leaf beetles, as well as by abiotic factors such as drought.

Xyleborus bark beetle
Xyleborus seriatus

Region 9/Northeastern Area: Massachusetts

Host(s): Conifers

In Massachusetts, as part of the Early Detection/Rapid Response survey for exotic bark beetles, *Xyleborus seriatus* was confirmed for the first time in North America. This insect was trapped in Worcester, Middlesex, and Franklin Counties using funnel traps.

Yellow Phoracantha
Phoracantha recurva

Region 5: California

Host(s): Eucalyptus

An Austrailian insect, *Phoracantha recurva,* was first detected in southern California in 1995. The beetle, along with another closely related *Eucalyptus* borer, *P. semipunctata*, is responsible for widespread eucalypt mortality in California. *Phoracantha recurva* was discovered in Shasta County in November 2004 attacking eucalypt trees in Redding. This is the first report of the insect in the county.

DISEASES: NATIVE

Alder canker
Ophiovalsa suffusa

Region 10: Alaska

Host(s): Thin-leaf alder

For the third consecutive year, canker fungi continued to intensify and were associated with dieback and mortality of riparian thin-leaf alder (*Alnus tenuifolia*) stands across thousands of acres in south-central and interior Alaska. Isolation and culturing by Michigan State University personnel putatively identified *Valsa melanodiscus* as the canker-causing pathogen. This pathogen is considered native and has been reported in Alaska as early as the 1930s. Greenhouse inoculation studies are underway to confirm the pathogenicity of *V. melanodiscus* and test the pathogenicity of other cultured bark inhabiting fungi, including *Ophiovalsa suffusa*.

Monitoring plots were revisited in 2005; results indicate that dieback and mortality of alder is continuing.

Annosus root disease
Heterobasidion annosum

Region 1: Idaho and Montana

Host(s): Ponderosa pine, Douglas-fir, grand fir, subalpine fir, western hemlock, and Engelmann spruce

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

Region 2: Nebraska

Host(s): Jack pine, Ponderosa pine, and eastern redcedar

Annosus root disease was recently discovered on ponderosa pine and eastern redcedar in the Bessey Ranger District of the Nebraska National forest. This root disease has previously been identified there on jack pine. At present, the incidence levels are low.

Region 3: Arizona and New Mexico

Host(s): True firs and 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 Region 3. Mortality rates are typically highest in young regeneration.

Diseases: Native

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

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

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 and some hardwoods

Annosus root disease remains the major root disease problem in various parts of California. Several madrones and one knobcone pine were found dead and dying within the Bonny Doon Ecological Reserve in Santa Cruz County. Annosus conks were found at the bases of the madrones, and the pathogen was reared from the root flare of the adjacent knobcone pine. An area void of pines of approximately 2 acres is adjacent to the dying trees, and annosus root disease may have played a role in killing knobcones in this area. Not too far away are declining chinkapins, but the crowns were riddled with small branch cankers, with no evidence of *Heterobasidium annosum* near the root collar.

Annosus root disease continues to cause scattered pockets of mortality in ponderosa pine on McCloud Flats on the Shasta-Trinity National Forest.

The pathogen was found to be infecting groups of white fir trees south and west of Manzanita Mountain on the Big Valley Ranger District, Modoc National Forest. The disease appears to be interspersed throughout pure white fir stands as well as fir stands with a minor ponderosa pine component. Annosus root disease in white fir was also found near the headwaters of Thompson Creek on the Mt. Hough Ranger District, Plumas National Forest.

Region 6: Oregon and Washington

Host(s): True firs, pines, and hemlocks

Annosus root disease causes damage primarily in partially harvested white and grand fir stands in southern and eastern Oregon and eastern Washington. Damage from root and 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 true fir stumps cut 20-25 years ago, mortality of surrounding conifer regeneration is low in northeastern Oregon, but infection levels are high especially in sapling grand fir, subalpine fir, Engelmann spruce, and Douglas-fir. 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 *Heterobasidium annosum* to create mortality centers in eastern Oregon.

Region 8: Regionwide

Host(s): Southern pines

Localized, scattered annosus mortality occurred in east Texas in 2005, but did not cause significant problems. Alabama reported no significant change, but the disease remains a prevalent problem statewide, especially in Conservation Reserve Program plantations damaged by storms. North Carolina also reported scattered problems statewide. Georgia reported increasing incidence of annosus due to the large acreage of young pine plantations that have been thinned in recent years; annosus caused the greatest amount of disease-related mortality of pines in Georgia in 2005. In South Carolina, surveys indicated damage in 29 counties, with an estimated 51,820 acres affected and financial losses totaling $1,865,520.

Region 9/Northeastern Area: Michigan, Vermont, and Wisconsin

Host(s): Red and white pine

The disease was scattered throughout Vermont with no new infection centers reported.

The status of the disease remained unchanged in Michigan.

In Wisconsin, annosus root rot was found in a red pine stand in Waushara County. This brings the total number of counties with this disease to fourteen (Adams, Buffalo, Dunn, Green, Iowa, Jefferson, LaCrosse, Marquette, Richland, Sauk, Trempealeau, Walworth, Waukesha, and Waushara Counties).

Annosus root rot was found primarily on red pine, and occasionally in white pine.

Region 10: Alaska

Host(s): Western hemlock and Sitka spruce

Annosus commonly causes root and butt-rot in old-growth western hemlock and Sitka spruce forests in southeast Alaska. The form present in Alaska is the "S-type," which causes internal wood decay, but is not typically a tree killer. *Heterobasidium annosum* has not yet been documented in south-central or interior Alaska.

Anthracnose
Apiognomonia veneta
Discula fraxinosa
Gnomonia spp.

Region 8: Tennessee

Host(s): Ash

Infection levels in 2005 were reduced in middle Tennessee from 2004 levels, with less than 10 percent defoliation of infected trees.

Region 9/Northeastern Area: Regionwide

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

Anthracnose occurred throughout in the region, depending on weather. Anthracnose was present in Connecticut on many hardwoods again in 2005. Hosts included sycamore, oak, ash, beech, elm, and maple. In New Hampshire, anthracnose was identified as a serious forest damage causal agent on 5,642 acres in the southern part of the State. In southern Vermont, there was widespread heavy damage on sugar maple.

Pennsylvania reported that anthracnose along with other foliage diseases tended to be less damaging to sycamore, maple, ash, and oak in 2005 than in 2004 due to dry and warmer spring conditions in 2005. Only 6,058 acres of moderate damage was reported statewide. In 2004, above-average precipitation starting in the spring and continuing into the fall created optimal conditions for anthracnose development. Sugar maple anthracnose plots were monitored in Bedford, Blair, Potter, Susquehanna, and Tioga Counties and exhibited sparse anthracnose activity in 2005. Moderate to severe anthracnose infections were found in Pendleton County and moderate infection levels were found in Hardy County, WV, in 2005 despite prevailing dryer conditions. Stress-induced fungal infection by Hypoxylon and Armillaria were present at many investigated sites.

During 2005, moderate to heavy severity sycamore anthracnose was reported in 23 Illinois counties mostly in the northern half of the State. In the early half of the spring, the weather was cool with moderate amounts of rain, which contributed to the increase.

Armillaria root disease
Armillariella spp.

Region 1: Idaho and Montana

Host(s): Douglas-fir and other conifers

Armillaria root disease is the most damaging and widespread disease in the Northern Region. It exceeds all other insects and diseases in annual mortality volume. At least 3.3 million acres in the region have moderate to severe root disease, and up to 60 percent of this impact is due to Armillaria root disease. Annual timber volume losses are at least 81 million cubic feet. Armillaria kills conifers of all species when they are young, but is especially damaging on Douglas-fir, subalpine fir, and grand fir because these species remain highly susceptible throughout their lives. About 3 percent of forest lands in Idaho and Montana are devoid of forest cover and have become essentially permanent shrub fields as a result of severe disease. The disease carries over in stumps and snags from one generation to the next on a site, surviving forest fires and tree harvest. Unnaturally high levels of Douglas-fir and true fir composition in forests has resulted in epiphytotic levels of this pathogen.

Region 2: Colorado, South Dakota, and Wyoming

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

Armillaria root disease is the most common root disease in the region. Armillaria root rot was seen in oaks along floodplains and in grazed areas. The alternate stresses in flooding in the 1990s and drought in more recent years promoted its growth in these areas.

Armillaria spp. are found on various tree species throughout Wyoming and are quite common in the Black Hills National Forest. This disease can contribute to beetle-caused mortality.

Region 3: Arizona and New Mexico

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

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

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

Region 5: California

Host(s): Conifers, some hardwoods

Armillaria root disease has become a problem on medium pole-size incense-cedar in the central Sierra Nevada. Trees have been killed in small groups in Butte, Placer, and Fresno Counties. Most areas affected are severely overstocked.

Region 6: Oregon and Washington

Host(s): All conifer species

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. 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. Permanent plots on the Winema National Forest were examined in 2005. Ten years after commercial thinning, shelterwood harvesting, and group selection cuts, crop-tree mortality caused by Armillaria root disease is, at least, not exacerbated by harvesting and, at most, reduced by the silvicultural methods tested. 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. Infected trees are often attacked by bark beetles.

Region 9/Northeastern Area: Regionwide

Host(s): All species

Dieback and mortality occurred on many hosts throughout the Northeastern Area with various degrees of damage. A high incidence of Armillaria root disease was noted in declining stands in 2004 and 2005 in New York.

Region 10: Alaska

Host(s): Red alder and mixed hardwoods

Several species of *Armillaria* occur in the coastal forests of southeast Alaska, but in general, these species are less aggressive saprophytic decomposers that only kill trees that are under some form of stress. A few red alder trees were found apparently killed by Armillaria in 45-year old mixed hardwood-conifer forests in the Maybeso Valley of Prince of Wales Island. Many more affected red alders were found in a 100+ year-old mixed forests on Baranof Island and Chichagof Island, indicating that the disease may be important in the senescence of alder as these stands age.

Several species of *Armillaria* occur in south-central and interior Alaska where some invade conifers and others invade hardwoods. Most species appear to be weak pathogens invading trees under stress. Mature stands of paper birch and trembling aspen are particularly susceptible to attack by Armillaria.

Ash leaf and twig rust
Puccinia sparganoides

Region 9/Northeastern Area: Maine

Host(s): Ash species

In Maine, ash trees, especially white ash, along coastal sections of Maine were partially or completely defoliated by the ash leaf and twig rust organism in 2005. Trees in mid-coast Maine, especially in the Rockland–Thomaston area, were the most heavily affected, but the disease was apparent at varying intensities along the entire coast from Ellsworth to Kittery. This disease has been building for several years, and is likely to be epiphytotic at many coastal locations in 2006.

Black stain root disease
Leptographium wageneri
Ophiostoma wageneri

Region 1: Idaho and Montana

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

Black stain root disease occurs somewhat infrequently in the Northern Region. It has been identified most commonly on Douglas-fir, but has also been found on ponderosa pine and lodgepole pine. 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, MT.

Region 3: Arizona and New Mexico

Host(s): Piñon pine and Douglas-fir

Both *Leptographium wageneri* var. *wageneri* (affecting piñon) and *L. wageneri* var. *pseudotsugae* (affecting Douglas-fir) occur, but are rare, 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, and Utah

Host(s): Piñon pine

Aerial detection and follow-up ground surveys have discovered about two dozen root disease centers in piñon pine stands in the Intermountain Region. Perennial infections caused mortality of individual piñon pine over 50 acres of the Bureau of Land Management 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 Forest in Utah. In many cases, the areas with black stain have now been infested with piñon ips.

Region 5: California

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

Because precipitation levels were again near normal in most of northwestern California during the winter of 2004-2005, ponderosa pine mortality due to a combination of drought, high stocking, black stain root disease, and western pine beetle at McCloud Flats (McCloud Ranger District, Shasta-Trinity National

Forest) has decreased. However, conspicuous concentrations of mortality around black stain root disease centers were evident at the Mud Flow Research Natural Area, Elk Flat, Ash Creek Sink, Algoma, and Harris Mountain. Scattered pockets of mortality are also present in dense Douglas-fir stands in the Eel River Late Successional Reserve south of the Van Dusen River near Dinsmores (Mad River Ranger District, Six Rivers National Forest). Scattered pockets of Douglas-fir mortality due to black stain root disease were present between Soda Creek and the northwest shore of Pillsbury Lake, and several centers were present at the Pillsbury Homesite Tract near the northeastern shore of Pillsbury Lake (Upper Lake Ranger District, Mendocino National Forest).

Black stain root disease killed ponderosa pine along Forest Road 35N21 1 mile west of Schroder Lake on the Lassen National Forest, Hat Creek Ranger District. The disease was confirmed in two 0.05-acre mortality centers. Several other mortality centers were nearby.

Mature ponderosa and Jeffrey pine mortality resulting from black stain root disease continues in the Heart Rock area east of Hwy 139 in northern Lassen County. Two dead Jeffrey pine (32" dbh and 36" DBH, 110 feet tall, each) had black staining in the xylem tissue at their bases. The trees are 2.1 mile east of Hwy. 139 on Modoc National Forest Road #38N04. Black stain could not be detected in two nearby Jeffrey pine (32" dbh and 38" dbh), which apparently died due to Jeffrey pine beetle attacks.

In southern California, the only singleleaf piñon pine mortality that occurred in 2005 was in black stain root disease centers in the San Bernardino Mountains.

Region 6: Oregon and Washington

Host(s): Douglas-fir and 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 thinning, 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 9/Northeastern Area: Connecticut, Pennsylvania, and Vermont

Host(s): Beech, dogwood, chestnut oak, Leyland cypress, maple, and red oak

In Connecticut, the disease continued to be prevalent on many species including Leyland cypress, maple, dogwood, beech, peach, and oak. There was no significant activity in Vermont.

In Pennsylvania, shoot and twig damage caused by the periodical cicada in 2004 produced ideal substrate for this fungus. Extensive canker development was expected but no twig damage or defoliation was observed in 2005.

Brown cubical root and butt rot
Phaeolus schweinitzii

Region 3: Arizona and New Mexico

Host(s): Douglas-fir and other conifers

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

Region 5: California

Host(s): Douglas-fir

Brown cubical butt rot was observed affecting small groups of Douglas-fir at the Mud Flow Research Natural Area at McCloud Flats. The disease is also affecting management of the Eel River Late Successional Reserve south of the Van Dusen River near Dinsmore (Mad River Ranger District, Six Rivers National Forest).

Cankers
Botryosphaeria spp.,
Ceratocystis fimbriata,
Criptosphaeria populina,
Cytospora spp.,
Hypoxylon mammatum

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

Host(s): Thinleaf alder, English oak, Gambel oak, and aspen

A survey in 2004 showed that about one-third of the standing alder (*Alnus incana* sp. *tenuifolia*) in Region 2 is dead and another third has at least minor dieback, both associated with cankers caused by *Valsa melanodiscus* (*Cytospora umbrina*). Photographs and reports that have recently come to light suggest that unusual levels of mortality may have already begun before 1995. The cankers expand very rapidly during the growing season.

Aspen bark beetle (*Procryphalus mucronatus*) generally attacks aspen also affected by *Cytospora* canker, and the combination of the two agents often results in the death of the host tree. Areas of the southern Uncompahgre and northern San Juan National Forests have been particularly hard hit, with some stands experiencing as much as 30-percent mortality over a 2-year period.

Hypoxylon and *Botryosphaeria* cankers were observed on oaks under stress (in grazed, flooded woodlands) in eastern Kansas.

Cercospora blight
Cercospora spp.

Region 8: South Carolina

Host(s): Leyland cypress

Cercospora needle blight continued to be a problem in South Carolina in 2005. Fungicidal control has been suggested for growers experiencing problems with this disease. North Carolina also reported scattered

problems across the State. The lack of genetic variation in Leyland cypress due to asexual propagation is believed to contribute to disease problems in this species.

Chinkapin canker
Cause unknown

Region 5: California

Host(s): Chinkapin

Branch dieback and mortality of chinkapin was observed along a 2-mile segment at the summit of the Bald Hills Road between Orick and Weitchpec, near Schoolhouse Peak. The disease was widespread and affected all ages of chinkapin.

Cytospora canker
Cytospora abietis

Region 5: California

Host(s): Red fir and white fir

Branch flagging and associated injury to red fir first reported in 2003 continued to be visible in numerous areas in the central Sierra Nevada (Tuolumne, Calaveras, and Amador Counties). Cytospora canker in association with red fir dwarf mistletoe were the primary causes of branch and whole tree mortality. The continued loss of additional branches over time has resulted in more tree mortality than was observed in 2003. In affected stands, there is a mixture of recent and old mortality plus top kill. Most of the damage is occurring in areas above 6,500 feet elevation. Trees that survive will have dead branches scattered within their crowns, which may lead to hazardous conditions in recreation sites. Locations with observed damage on the Stanislaus National Forest include: Bourland Mountain, Dodge Ridge, Aspen Meadow, Crabtree Trailhead, Bear Valley, and Lake Alpine.

Significant outbreaks of Cytospora canker have been noted in Nevada, El Dorado, and Placer Counties. Injury has consisted of dieback of branch tips in affected fir trees and continues to infect red fir branches near Robinson Flat Campground on the Tahoe National Forest. Branch dieback of red fir and, to a lesser degree, white fir has been quite noticeable the past 2 years on Latour State Forest, Shasta County. Cytospora canker is commonly associated with dwarf mistletoe, and trees infected with these agents often are attacked and killed by the fir engraver beetle.

Diplodia blight
Sphaeropsis sapinea (Diplodia pinea)

Region 1: Idaho, Montana, and North Dakota

Host(s): Ponderosa pine

Diplodia shoot blight mostly occurs sporadically at low levels in North Dakota, Montana, and Idaho. However, disease incidence recently increased in North Dakota, where ponderosa pine windbreaks across the State were infected. The premier ponderosa pine producing nursery in the State is currently managing the disease in surrounding windbreaks through species conversion of windbreak trees, fungicides, alteration of irrigation schedules, and relocation of pine seedling fields. In Idaho and Montana, where the disease predominantly infects ponderosa pine, high levels of Diplodia shoot blight can be found mostly along river bottoms and major drainages. Considerable variability in infection levels is often seen between trees in a

given stand. The disease has been especially severe on ridges and dry slopes of the Southfork and Clearwater rivers between Grangeville and Orofino, ID, but poses little threat to the watershed because mortality rates have been low.

Region 2: Kansas, Nebraska, and South Dakota

Host(s): Ponderosa, Austrian, and Scotch pines

Sphaeropsis blight seems to be increasing in importance in the Great Plains and is one of the most important diseases affecting pines in this area. There were few reports of this disease in the 1900s. This shoot blight pathogen is considered a nonnative, invasive, forest pathogen in Kansas, Nebraska, and South Dakota.

Hail impact and the associated shoot blight disease were observed on many pines in localized areas at the Bessey and Pine Ridge ranger districts of the Nebraska National Forest from 2004 storms. By 2005, considerable tree mortality had occurred in these areas as a result of the disease and attack by opportunistic insects such as *Ips*.

Sphaeropsis caused higher than normal amounts of damage in 2005 because of added stress on the trees from the drought. On August 12, 2005, a storm that spawned a tornado in Wright, WY, passed across the southern Black Hills and continued over the Pine Ridge of Nebraska and South Dakota. Severe hail and *Sphaeropsis* impacts were detected on 1,700 acres, and far more acres were likely affected.

Region 5: California

Host(s): Ponderosa pine

Scattered Diplodia blight was identified in ponderosa pine at the Sheep Camp campground in Whiskeytown National Recreation Area, west of Redding, CA.

Shoot dieback caused by Diplodia blight was observed again this year on ponderosa pines in the Sacramento River Canyon, Shasta County. Repeated infections on some trees are leading to crown dieback and occasionally mortality. Diplodia blight was also reported on ponderosa pine from various locations in Nevada and Placer Counties, including Grass Valley, Nevada City, Auburn, and Meadow Vista. Shoot dieback was also observed on ponderosa pines in the foothills of the Sacramento Valley. Most of the injury was along sections of Highway 49 in Placer and Nevada Counties. The most severe injury was in the upper reaches of the South Yuba River Canyon, and infestations continue to kill ponderosa pine branches along the North Yuba River in the Goodyears Bar and Downieville area of Sierra County.

Region 9/Northeastern Area: Michigan, Minnesota, and Wisconsin

Host(s): Red pine

Diplodia shoot blight and canker was having a significant impact on survival of red pine plantings throughout the Lake States. Latent infections in nursery seedlings and infected overstory trees were the sources of infection.

Dwarf mistletoes
Arceuthobium spp.

Region 1: Idaho and Montana

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

Lodgepole pine dwarf mistletoe occurs on approximately 2 million acres (28 percent) of the lodgepole pine type in Region 1 and causes about 18 million cubic feet of growth reduction annually. Douglas-fir dwarf mistletoe occurs on about 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, ID, 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 and Wyoming

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

Although there is little change from year to year in area and severity of dwarf mistletoe infestations, and they are mostly undetected by aerial survey, there is some evidence that they have been slowly increasing. This increase is probably due to fire exclusion without compensatory management.

Dwarf mistletoe infections remain among the most important of forest health issues, substantially impacting timber productivity, fire behavior, and other forest values for more than a million acres in the region. At least 638,000 acres of National Forest System (NFS) forest land are infested in Colorado (6 percent of all NFS land in the State) and 560,100 acres in Wyoming (10 percent).

Dwarf mistletoe species are slowly, but continually building up on limber, lodgepole, and ponderosa pines in Wyoming. Nearby, epidemic mountain pine beetle populations may provide additional pressure on this isolated pine population. Green Mountain in southeastern Fremont County has noticeable levels of dwarf mistletoe in lodgepole pine.

In the increasing number of fuels reduction projects undertaken recently, both on Bureau of Land Management and NFS lands, treatments sometimes include mistletoe-infested stands. In some projects, treatments are designed after careful evaluation of the disease and its impact on future forest development, while others are planned without adequate consideration of such impacts. Failure to address these impacts could contribute to greater future severity of the disease and the fuel problems that accompany it.

Region 3: Arizona and New Mexico

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

Dwarf mistletoes continue to be the most widespread and damaging pathogens in Region 3. Three species—those affecting ponderosa pine, piñon pine, and Douglas-fir—occur throughout most of the ranges of their hosts, while five other dwarf mistletoe species have more limited distributions. Roughly 2.2 million acres of commercial ponderosa pine forest are infested, resulting in an estimated growth loss of 25 million cubic feet annually.

Diseases: Native

Region 4: Idaho, Nevada, Utah, and Wyoming

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

These plant parasites remain the most widespread and frequently observed disease within the Intermountain Region. The percent of stands having some level of infection is estimated, by major host species, as follows: lodgepole pine, 50 percent; ponderosa pine, 20 percent; and Douglas-fir, 20 percent.

Region 5: California

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

Four species of dwarf mistletoe were reported in 2005: limber pine (*Areceuthobium cyanocarpum*), red fir (A. *abietinum* f. sp. *magnificae*), western (*A. campylopodum*), and white fir (*A. abietinum* f. sp. *concoloris*).

Limber pine dwarf mistletoe was present on whitebark pine on Black Butte, which is a plug dome, between Mount Shasta and U.S. InterState 5.

Incidence and impact of red fir and white fir dwarf mistletoe continues to be heavy at South Fork Mountain on the Hayfork Ranger District, Shasta-Trinity National Forest. Western dwarf mistletoe was also widespread in ponderosa pine at Hayward Flat campground on the Trinity Unit of the Whiskeytown-Shasta-Trinity National Recreation Area, Shasta-Trinity National Forest and Sunset Campground on Pillsbury Lake, Upper Lake Ranger District, Mendocino National Forest, and is present on one side of the Sheep Camp campground in Whiskeytown National Recreation Area.

Western dwarf mistletoe is severely impacting 30-year-old ponderosa pine on approximately 10 acres of the Cottonwood plantation, which was planted after the 1974 Cottonwood Fire. Infected overstory pine that survived the fire were retained in the 150-acre plantation and provided the seed source for this current outbreak. The plantation is located 1 mile northeast of the Cottonwood Campground on the Sierraville Ranger District, Tahoe National Forest. Western dwarf mistletoe continues to infest many of the overstory ponderosa pine on the 160-acre Lassen Community College forest following a recent thinning from below. The infection in the overstory trees is generally limited to the lower 33 percent of the crowns. Scattered infected ponderosa pines were noted on the 40-acre Enterprise Rancheria near Lake Oroville in eastern Butte County.

Region 6: Oregon and Washington

Host(s): Conifers

Dwarf mistletoes are present on approximately 9.5 million acres of forested lands in the Pacific Northwest Region. Their status changes little from year to year. However, long-term impacts, including reducing 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, Michigan, Minnesota, Wisconsin, New Hampshire, New York, and Vermont

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

Severe damage as the result of infection by this parasitic plant continued to occur in stands of white spruce in coastal areas of Maine, although trends for this disease were stable. The disease remained at endemic levels in New Hampshire and in New York. Scattered damage occurred statewide in Vermont.

The disease remained at endemic levels in Michigan, Minnesota, and Wisconsin.

Region 10: Alaska

Host(s): Western hemlock

Hemlock dwarf mistletoe (*Arceuthobium tsugense*) is an important disease of western hemlock in unmanaged old-growth stands throughout southeast Alaska as far north as Haines. Although the range of western hemlock extends to the northwest along the Gulf of Alaska, dwarf mistletoe is absent from Cross Sound to Prince William Sound. Reliable estimates of the total acreage infected are not available as this disease cannot be monitored by aerial survey.

Elytroderma needle blight
Elytroderma deformans

Region 1: Idaho, Montana

Host(s): Ponderosa pine and lodgepole pine

Elytroderma needle blight has been heavy in several areas of western Montana for a number of years, such as in the Jette Lake area north of Polson and in 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. In 2005, it was found causing significant mortality on a local scale in an 80-year-old off-site plantation of ponderosa pine in northwest Montana. It is widespread, but at generally low levels throughout northern Idaho.

Region 5: California

Host(s): Ponderosa pine and Jeffrey pine

Elytroderma disease continues to be widespread on Jeffrey pines in the Laguna Mountain Area, Descanso Ranger District, Cleveland National Forest.

Fir-fern rust
Uredinopsis mirabilis

Region 9/Northeastern Area: Maine

Host(s): Balsam fir

Balsam fir in southern and central Maine was heavily infected by the fir-fern rust pathogen in 2005. The disease was especially severe in Christmas tree plantations, but woodland trees were affected as well. Long-term impacts to forest trees are negligible, but the disease can be serious again in Christmas tree plantations. Infection of the fern species which serve as alternate hosts was heavy last summer, so inoculum

potential will be high next year. If weather conditions are favorable as new needles emerge next spring, infection levels may be damaging to Christmas tree producers again in 2006.

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. Virginia reported unprecedented levels of fusiform rust in plantations statewide, apparently as a result of uncontrolled infections in nursery stock used for outplanting. Although infection rates ranged from 3 percent to 15 percent, few stands were impacted enough to require replanting. South Carolina reported scattered rust infections to be a continuing serious problem. In Florida, comparisons of fusiform rust levels in longleaf pine and both "improved" and "rust-resistant" slash pine sold by the Florida Division of Forestry showed that infection levels were significantly lower in "rust-resistant" than in "improved" slash pine, while longleaf pine showed the lowest overall levels of infection. The Resistance Screening Center in Asheville, North Caorolina, continues to screen seed lots for fusiform rust resistance. Texas reported moderate levels of rust in scattered locations, but noted that infection levels have declined in recent years.

Hemlock needle cast
Fabrella tsugae

Region 9/Northeastern Area: Pennsylvania

Host(s): Eastern hemlock

In Pennsylvania, this needle cast fungus was less noticeable in 2005 with only scattered areas of low infection found statewide. Areas previously affected in 2003 and 2004, however, exhibited extensive twig and branch dieback in the lower canopy. Previous reports list defoliation on 156 acres in Bedford, Carbon, Fulton, Huntingdon, Monroe, Pike, Potter, Schuylkill, Wayne, and Mercer Counties.

Hypoxylon canker
Hypoxylon spp.

Region 8: Regionwide

Host(s): Oaks

Higher than normal levels of hypoxylon canker were reported in eastern Virginia as declining trees impacted by earlier storms began to succumb to secondary infections. North Carolina and Tennessee also reported scattered infections associated with drought. This disease continues to be a frequent component in the general epidemic of oak decline in the oak forests of Arkansas.

Koa wilt
Fusarium oxysporum f. sp. koae

Region 5: Hawaii

Host(s): Koa

Koa wilt, first reported in 1980, has been found on all the main Hawaiian Islands but little is known of the ecology or origin of the disease. Koa wilt is far more virulent in lowland sites (under 3,000 feet) where koa are planted in former sugar cane fields for their high value wood. Evidence for genetic resistance to the wilt pathogen is being investigated.

Laminated root rot
Phellinus weirii

Region 1: Idaho and Montana

Host(s): Douglas-fir and grand fir

This disease is most severe on the region's most productive sites: those that historically supported high proportions of western white pine and western larch. Fire exclusion, the exotic pathogen white pine blister rust, and selective harvest (in response to blister rust) have all but eliminated these species from vast acreages in northern Idaho and western Montana. They largely have been replaced by highly susceptible Douglas-fir and grand fir, with consequent increases in laminated root rot. 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. It kills an estimated 20 million cubic feet of timber each year. Although laminated root rot occupies a smaller part of the region than Armillaria, it is highly significant because of the potential productivity and the hydrological sensitivity of affected sites.

Region 6: Oregon and Washington

Host(s): Highly susceptible species: Douglas-fir, mountain hemlock, white, grand, and Pacific silver fir

Laminated root rot is the most serious forest tree disease west of the Cascade Mountains in Washington and Oregon. Overall, an estimated 8 percent of the area with susceptible host species is affected in this portion of the region. Locally, 15 to 20 percent of an area may be affected. East of the Cascade crest, laminated root rot affects mixed-conifer stands north of the Crooked River in central and northeastern Oregon and throughout eastern Washington.

Besides the highly susceptible hosts listed above, the other true firs, spruce, larch, and hemlock are intermediately susceptible; lodgepole, sugar, and western white pine are tolerant; cedars, redwood, and ponderosa pine are resistant; and all hardwoods are immune. 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 trees. Hardwood trees and shrubs often increase their site capacity. Infected conifers are often attacked by bark beetles.

Lodgepole pine needle cast
Lophodermella concolor

Region 6: Eastern Oregon and 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. Lodgepole pine are affected with heavy discolorations of their lower crowns. Areas mapped as affected by lodgepole pine needle cast in 2005 totaled 3,312 acres, an increase from the 1,385 acres mapped in 2004.

Oak wilt
Ceratocystis fagacearum

Region 8: North Carolina, Tennessee, Texas, and Virginia

Host(s): Live oak and red oaks

Oak wilt continues to affect more than 60 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 severed interconnected root systems and helped to halt the spread of the disease. During 2005 (the 18th year of the cooperative suppression project), approximately 147,000 feet of trenching was installed around 109 oak wilt centers. Aerial surveys to locate new oak wilt centers were carried out on 2.3 million acres. On-site inspections were carried out by field personnel, and integral public information and assistance campaigns continued. Although this problem is also known to be widespread in the mountains of southwestern Virginia, only one report was received from that area. Oak wilt levels have remained essentially unchanged in North Carolina since 1955, with activity continuing in six counties.

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

Host(s): Red oaks

West Virginia did not report any new counties with oak wilt during 2005. An aerial survey in 2004 observed for oak wilt in Grant and Hardy Counties, where oak wilt was previously established, and in four historically oak wilt-free counties of Ohio, Brooke, Tucker, and Webster.

Oak wilt continued to be the single most important disease in the Central States of Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, and Wisconsin. Most States have only limited control programs.

Minnesota has an aggressive survey and control program. An assessment of the oak wilt suppression program revealed that incidence of disease is higher in communities that lack suppression programs, especially if soils are sandy. A significant reduction in oak wilt was noted in communities with active suppression programs. Oak wilt suppression grant recipients had oak wilt pockets averaging 1.71 infected acres per square mile, while communities without control programs exhibited infection ranging from 0 to 10.54 acres per square mile. In those areas receiving grants, there were 3,122 active centers affecting 3,616 acres, an average of 1.16 acres per pocket.

Seventeen of 40 tree samples submitted to Missouri Department of Conservation from Boone, Cass, Platte, Greene, Jasper, Pettis, St. Charles, and St. Louis Counties tested positive for oak wilt.

There were 104 oak wilt pockets identified on the Nicolet National Forest and intermingled private lands in Oconto and Marinette Counties, Wisconsin. A control program was initiated.

Together with white oak decline, 1,422 acres were mapped in Iowa. There were 205 acres of new mortality mapped in Michigan in 2005.

Pine needle cast
Hypoderma sp.
Lophioderma sp.

Region 8: Tennessee

Host(s): Loblolly pine

Increasing incidence of needlecast was reported from plantations in both eastern and western Tennessee.

Region 9/Northeastern Area: Maine

Host(s): Pines

Large stands of pitch pine in western Maine were affected by needlecast disease in 2005. Symptoms were most conspicuous in the Fryeburg, Brownfield, and Waterboro areas, with a total of 7,650 acres affected. The severity of this problem is dependent on the timely occurrence of favorable infection periods, so we are unable to predict the future trend of this disease.

Pine needle rust
Coleosporium spp.

Region 8: Texas and Tennessee

For the first time in several years, pine needle rust was reported in many areas of east Texas in the early summer of 2005. Visible symptoms of this disease cause concern to landowners, but produce little significant damage. Tennessee also reported light incidence of this rust in the eastern and western ends of the State.

Pine wilt and pinewood nematode
Bursaphelenchus xylophilus

Region 2: Kansas, Nebraska, and South Dakota

Host(s): Austrian pine, ponderosa pine, and Scotch pine

Pine wilt caused by pinewood nematode is an increasing problem in Great Plains windbreaks. Pine wilt nematode continues to spread westward in Kansas and now occupies the eastern half of the State. We do not consider a couple of reports from the western part of Kansas as indicative of pest establishment at this time but rather as single introductions. The highest level of disease activity currently in Kansas is in south-central and northeast Kansas. The spread of the disease may be slowing in the western half of the State. This primarily is due to fewer pine populations. Also, the pine species used in west Kansas plantings, their isolation from other nematode population centers, and their location within grassland ecosystems hampers natural spread of the nematode. Introduction by diseased nursery stock or some other human-facilitated pathway could change this and vector the disease into some scattered urban settings in western Kansas.

Diseases: Native

Hundreds of trees, mostly Scotch pine, were killed by pine wilt in Nebraska. Pine wilt is present mostly in southeastern Nebraska, but the area heavily affected by the disease continues to expand north and west.

Pine wilt continued to cause significant Scotch pine mortality in the southwestern South Dakota. Windbreak and ornamental trees were being killed at an alarming rate. Austrian pines, though few in number within this region, were also being affected. The nematode associated with pine wilt has not been found north of I-90 in the State.

Ploioderma needlecast
Ploioderma lethale

Region 8: Virginia

Host(s): Loblolly pine

This disease was very severe (aesthetically) and widespread throughout the Virginia Coastal Plain during April and May, particularly on loblolly pine. Although actual damage was minimal, the appearance of brown foliage during the spring produced many inquiries from landowners. Unusually cool spring weather may have triggered this outbreak.

Rhizosphaera needlecast
Rhizosphaera kalkhoffii

Region 9/Northeastern Area: Vermont

Hosts(s): White and Blue spruce

There was widespread heavy damage on Christmas trees and ornamentals in Vermont.

Seiridium canker
Seiridium cardinale

Region 5: California

Host(s): Incense-cedar

Seiridium canker was identified on a Palestine cypress (*Cupressus sempervirens pyramidalis*) near the main greenhouse at the Genetic Resource and Conservation Center in Chico (Mendocino National Forest).

Stem decay
Basidiomycetes (various)

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.

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.

Sugar pine needle cast
Lophodermella arcuata

Region 5: California

Host(s): Sugar pine and western white pine

Sugar pine needle cast was observed on several sugar pine near the intersection of Highways 32 and 36, Almanor Ranger District, Lassen National Forest.

Swiss needle cast
Phaeocryptopus gaumannii

Region 6: Western Oregon and 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. A special survey was conducted in spring 2005 for Swiss needle cast in the Coast Range and along the Cascade foothills in Oregon. The survey determined that there were 207,090 acres affected by Swiss needle cast in Oregon. The disease is also severe in localized areas in coastal Washington, with 1,377 acres reported in the general overview survey. 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 PNW 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, Sitka, and white spruce

Inonotus tomentosus causes root and butt-rot of white, Lutz, Sitka, and black spruce. The fungus may also attack lodgepole pine and tamarack, but not hardwood trees. The disease appears to be widespread across the native range of spruce in south-central and interior Alaska. Recently, tomentosus root rot was found for the first time in southeast Alaska, infecting Sitka spruce near Dyea.

Diseases: Native

Spruce trees of all ages are susceptible to infection primarily through contact with infected roots. Infected trees exhibit growth reduction or mortality, depending on age. Younger trees may be killed outright while older trees may persist in a deteriorating condition for many years. Trees with extensive root and butt decay are prone to uprooting and bole breakage. Volume loss in the butt log of older infected trees can be substantial: up to one-third of the gross volume. Individual mortality centers (groups of infected trees) are typically small; however, coalescing centers can occupy large areas.

True mistletoes
Phoradendron spp.

Region 3: Arizona and New Mexico

Host(s): Juniper and various hardwoods

True mistletoes are common in piñon-juniper woodlands throughout Region 3, and are locally abundant in riparian areas. Heavy infection contributes toward tree mortality, especially during periods of drought.

Region 5: California

Host(s): White fir

True mistletoe is severely impacting thousands of acres of white fir stands throughout portions of the central Sierra Nevada. In many locations, this infection shows up as a decline in upper crown health, making the trees susceptible to other attacking agents. In some cases, the mistletoe on individual trees may be killing the trees directly.

Western gall rust
Peridermium harknessii

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

Host(s): Lodgepole pine and ponderosa pine

This pathogen is widespread throughout the Rocky Mountain Region and usually occurs at low to moderate intensities. Occasionally, the disease severely affects trees planted "off-site."

In the Black Hills of South Dakota, the Pine Ridge Ranger District of the Nebraska National Forest, and areas in Wyoming, this disease contributes to the death of small ponderosa pines. The disease infrequently occurs on limbs of large trees or causes an occasional stem canker, but normally is not a severe problem.

Region 5: California

Host(s): Ponderosa pine and Coulter pine

Western gall rust was found infecting a large number of 27-year-old and younger ponderosa pine trees in the USDA Forest Service Meadow Valley progeny evaluation site east of the University of California-Berkley Forestry Field Camp on the Plumas National Forest. A resistance study is being conducted by the Forest Service Pacific Southwest Research Station's Institute of Forest Genetics.

DISEASES: NONNATIVE

Beech bark disease

Neonectria coccinea var. faginata

Region 8: North Carolina, Tennessee, and Virginia

Host(s): American beech

Beech bark disease continues to intensify and spread in eastern Tennessee, western North Carolina, and extreme west-central Virginia. New infections were detected in Carter County, TN, and Watauga County, NC. Tree mortality is a continuing problem in and around the Great Smoky Mountains National Park. The disease has intensified at a faster rate than predicted, and is moving down-slope into the Cherokee and Pisgah National Forests. Beech is an important species for wildlife, providing both mast and den habitat.

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

Hosts(s): American beech

In Connecticut, beech bark disease continued to be endemic throughout the State and was not particularly noteworthy, based on inquiries and samples. In Massachusetts, trees in Berkshire and Franklin Counties continued to experience decline and mortality caused by this disease. This disease, which was introduced to Maine in the early 1930's, continued to kill or reduce the quality of beech stems statewide. But beech bark disease did not threaten to eliminate beech from the Maine forest because some trees were resistant, and even susceptible trees sprouted profusely from roots when trees were damaged, killed, or harvested.

Beech stands on certain sites exhibited higher levels of infection and mortality than was apparent on other, even nearby, sites. Although assessment of the beech bark disease damage was complicated by the effects of drought, oystershell scale, late spring frosts, and various hardwood defoliators, losses were known to be extensive. Over the past 10 years in the four northern counties, beech mortality averaged approximately 5 percent per year; resulting in an annual net loss of 1 to 2 percent of the beech basal area. Trends regarding the presence of this disease were static, with about 20 percent of stems exhibiting some resistance. New Hampshire reported beech bark disease common on beech throughout the State. Beech bark disease was found readily throughout New York State. It was not reported in any new counties in 2005. The outbreak in Vermont was progressing, with widespread beech mortality and dieback occurring statewide.

Beech scale was discovered in 2003 in the southern part of Garrett County, MD. Surveys in Ohio continue to find beech scale in many northeastern counties (Lake, Geauga, Cuyahoga, Portage, and Ashtabula). Only one site, located in Geauga County at The Holden Arboretum, has been confirmed to have the disease fungus. In Pennsylvania, declining and dead beech trees due to beech bark disease occur over extensive areas of Warren, McKean, Forest, Elk, and Cameron Counties, and an isolated pocket of trees with beech bark disease was found in 2004 in Monroe County. Extensive mortality occurred on the Allegheny National Forest. In West Virginia, beech bark disease surveys were continued in 2005. Two new counties (Webster and Preston Counties) were added to 12 previously listed counties with beech bark disease, with an area totaling 1,390,298 acres. Areas where only the beech scale is present were delimited. A total of 3,279,217 acres in 14 counties now are infested with the beech scale.

Michigan has over 7 million acres of maple-beech-birch type, with an estimated 138 million trees in all size classes. There were 421,810 acres of beech bark disease reported, and an additional 612 acres had the scale but no evidence of *Nectria sp.* infection yet.

Dutch elm disease

Ophiostoma (=Ceratocystis) ulmi and Ophiostoma novo-ulmi

Region 1: Idaho, Montana, and 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 communities and in naturally occurring American elms in riparian zones and wooded draws. In southern Idaho, this disease is common in many communities along the Snake River, and it is slowly working its way into northern Idaho communities. It was positively identified in Coeur d'Alene for the first time in 2004 on a large isolated boulevard American elm also colonized by elm bark beetles. The tree was removed and the few remaining elms will be closely monitored. 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, and South Dakota

Host(s): American elm

The incidence of Dutch elm disease in the region has not increased beyond the 2004 report, though the mortality was higher than during the 1990s. Dutch elm disease annual mortality was about 2 to 5 percent of communities' elm populations in Region 2. This disease is still a concern, especially in trees that escaped the first wave of the disease and are about 5 to 6 inches in diameter and about 20 years of age. Some larger trees were succumbing as well. The disease continues to be a problem in riparian areas and cities in the region. It is unknown whether the banded elm bark beetle is responsible for vectoring this disease to elms.

Region 8: Regionwide

Host(s): American elm

Localized mortality due to Dutch elm disease continues to occur at a low level in urban and wild populations of elm throughout the region. Tennessee reported an increase in disease incidence, which is affecting saplings and larger trees.

Region 9/Northeastern Area: Regionwide and Washington, DC

Hosts(s): American elm

Connecticut reported that the disease continued to be endemic throughout the State, with greater than usual incidence and severity the past few years—possibly associated with several years of drought stress in combination with other weather and site-related stresses. Symptoms of Dutch elm disease were conspicuous throughout Maine during 2005. While most elm mortality observed was to ordinary American elms, there were observations of infection on Liberty elms as well. Symptoms of this disease were conspicuous statewide in New York. Many of the trees that were succumbing were mature individuals in urban and suburban settings, which had survived the initial wave of the disease through the region.

No major State surveys were conducted for this disease in the mid-Atlantic States in 2005. Surveys, however, continued in Washington, DC. Two independent surveys in Washington, DC. by the Casey Tree Foundation and USDA Forest Service determined disease incidence rates of 4.0 percent and 3.6 percent, respectively, within the city proper. An additional survey within the historic and governmental areas by the National Park Service determined a 1-percent disease incidence. These percentages are low and are

approaching the standards of disease acceptability levels established by the DED District Task Force. Despite the lack of major State surveys, reports of Dutch elm disease from several States are still received yearly from arborists and State tree specialist.

There were 560 acres with Dutch elm disease mapped in 2005 in Minnesota. Iowa mapped 1,362 acres of detectable mortality. In 2005, there were 45 Illinois counties that reported moderate to heavy elm tree mortality caused by Dutch elm disease. Each year there are more reports of elm tree mortality especially in the northern half of Illinois. The reason for the increase remains unclear but there is some concern that the beetle, *Scolytus schevyrewi,* might be implicated. Studies need to be conducted to see if *S. schevyrewi* might be a more aggressive vector of the Dutch elm fungus than the smaller European elm bark beetle.

European larch canker
Lachnellula willkommii

Region 9/Northeastern Area: Maine

Host(s): Larch

European larch canker is a fungal disease that originated in Europe and was first found on native larch (tamarack) in southeastern Maine in 1981. Information gathered from existing cankers indicates this disease has been present in Maine since at least the 1960s and perhaps much longer. This disease may infect any species of the genus *Larix* or *Pseudolarix*. Since larch canker has the potential for causing serious damage to both native larch stands and reforestation projects utilizing nonnative larches in Maine and elsewhere, the disease is under State and Federal quarantine. The trend for this disease is static; no evidence of spread from infested areas to noninfested areas was noted in 2005.

Littleleaf disease
Phytophthora cinnamomi

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

Host(s): Loblolly pine and shortleaf pine

Littleleaf disease continues to cause growth loss and mortality across the Piedmont areas of the affected States. Shortleaf pine is highly susceptible while loblolly pine is also affected, but at a later age. Many of the stands that were converted from shortleaf to loblolly pine 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 this root disease. 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 previously severely eroded sites will gradually reduce the impact of this disease over a period of a century or more. Alabama reported a slight increase in observations of littleleaf disease in loblolly pine stands, but it was not considered significant. In North Carolina, reports of the disease are confined to Piedmont stands of shortleaf pine.

Ohi'a rust
Puccinia psidii

Region 5: Hawaii

Host(s): Myrtaceae

In April 2005, a new rust was detected on nursery grown ohia (*Metrosideros polymorpha*) on Oahu. No rusts were known on ohi'a before this time. The rust, known locally as "ohi'a rust," was postively identified as *Puccinia psidii* by Dr. Shoabin Zhong, a pathologist with the University of Hawaii. As of December 2005, the rust has been confirmed in the wild on the islands of Oahu and Hawaii, but has not been confirmed for the other islands. Currently, hosts include a dozen tree species in the family Mrytaceae, including several that have commercial fruit and timber value (e.g., common guava and eucalypt). Spores are windborne and easily spread, making control problematic. The fate of this pathogen in Hawaii is unknown, as is the current extent of the infestation. If the strain here proves virulent on ohia, the dominant forest tree in a majority of Hawaii's forests, large-scale dieback and loss of reproduction could result in a change in forest structure and processes and increase the vulnerability of these forests to invasion by nonnative plants. Loss of essential ohi'a habitat for endangered forest birds is also a potential outcome.

Sycamore anthracnose
Discula platani

Region 8: Tennessee

Host(s): Sycamore

Infection rates of sycamore were reported as less than 25 percent in middle Tennessee and less than 50 percent in the eastern portion of the State.

White pine blister rust
Cronartium ribicola

Region 1: Idaho and Montana

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

Regions 1 and 4 are actively surveying and monitoring white pine blister rust spread and intensification on all five-needle pines in the Regions. Surveys of over 60 F2 western white pine plantations with enhanced natural resistance found infection levels varied from less than 5 percent to over 90 percent, but were always lower than infection levels in adjacent naturally regenerated trees. Special technical development projects are being conducted to look for site factors that might be related to infection levels and to determine girdling rates to help predict future loses. Additional projects are monitoring permanent plots to document changes in infection levels and growth rates of individually tagged cankers on improved stock.

As blister rust has moved into fragile, high-elevation ecosystems, the normal successional pathways of limber pine and whitebark pine have been greatly altered. The recent outbreaks of mountain pine beetle have caused additional widespread mortality in many whitebark pine stands. The combination of the beetle mortality with fire suppression and blister rust are raising concerns about the long-term viability of whitebark pine ecosystems. This has severe implications to watersheds and wildlife, such as the grizzly bear and Clark's nutcracker.

Permanent plots are being established in several areas to monitor blister rust in whitebark pine. A range-wide database is being developed to compile results of surveys in limber pine as well as whitebark pine.

Region 2: Colorado, South Dakota, and Wyoming

Host(s): Limber pine, Rocky Mountain bristlecone pine, and whitebark pine

White pine blister rust continues to spread and intensify in the Rocky Mountain Region and often promotes mountain pine beetle attack of the five-needle white pines.

In Colorado, the disease front is now approximately 12 miles north of the northern boundary of Rocky Mountain National Park, raising concerns about sustaining white pines in one of our national treasures. The disease was also discovered in isolated locations of the Sangre de Cristo and Wet Mountain Ranges of southern Colorado more than 200 miles from any other known infection zone. The closest outbreak area to the south is on Gallinas Peak in central New Mexico. The Sangre de Cristo outbreak was observed on the San Carlos Ranger District of the San Isabel National Forest, the Great Sand Dunes National Park, and other State and Federal lands nearby. In the Wet Mountains, the disease is distributed throughout the eastern side of the range, just west of Rye and Beulah, CO. Infections in southern Colorado were found primarily on limber pine, but infected Rocky Mountain bristlecone pines were also observed for the first time in their native range.

In the Black Hills of South Dakota, the only existing small population of limber pine was found to be infected with this disease.

White pine blister rust is found on whitebark and limber pines throughout Wyoming. This disease is spreading and intensifying throughout the State. The disease is causing considerable ecological impacts in some areas of Wyoming already.

White pine blister rust was discovered in several new locations in south-central Wyoming, including the Snowy Mountains and the Sierra Madre Mountains where the incidence is currently low. In the Sierra Madre Mountains, the disease was only observed on several trees on private land along Highway 70 just east of the Medicine Bow National Forest boundary.

Limber pine mortality is widespread throughout the Bighorn Mountains and Crooks, Green, Ferris, and Shirley Mountain Ranges. Virtually the all of the northern Shirley Mountains have declining limber pine due to infection by white pine blister rust. Intensities range from 4 to 15 infected trees per acre.

According to results from a 2-year limber pine aerial survey (2004-2005), white pine blister rust and mountain pine beetle affected over 1,000,000 trees across 200,000 acres. Most of the mortality was attributed to mountain pine beetle; a recent forest health survey of limber pine in the Bighorn National Forest showed that mountain pine beetle incidence positively correlates with white pine blister rust branch canker severity and stem canker incidence. Mountain pine beetle infested trees had higher incidences of branch cankers and stem cankers compared with noninfested trees.

Region 3: Arizona and 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 42 percent of the white pines are currently infected within this area, based on a set of representative plots. The disease has also been detected 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.

In 2005, blister rust was detected for the first time on the Gila National Forest (Johnson Canyon), about 200 miles west of the main outbreak area and within 3 miles of the Arizona border.

Diseases: Nonnative

Region 4: California, Idaho, Nevada, and Wyoming

Host(s): limber, whitebark, bristlecone, western white, and sugar pines

This introduced disease is common throughout its hosts' range in southern Idaho and western Wyoming. It is present in the western portion of the Intermountain Region in California and Nevada near the Lake Tahoe area. 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 whitepine 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 Intermountain Region. Often relegated to high alpine areas, these pines grow slowly but provide important ecosystem functions, such as providing shade and stabilization of snow retention for watershed integrity, recreation, aesthetics, and wildlife habitat and usage.

Region 5: California

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

White pine blister rust continues to be a significant problem of sugar pine throughout the known range of the pathogen in California. Specifically, white pine blister rust infestations were noted in Mountain Home State Forest (east of Porterville, CA) killing young and old sugar pines. Most young trees and seedlings in the forest are affected. The disease continues to spread out within the area. This population of the rust pathogen is especially virulent and appears to have overcome genetic resistance in the host population.

In 2005, USDA Forest Service Forest Health Protection Northern California Services Area personnel performed an incidence survey of 5-needle pines in many high elevation pine sites in Northern California. Rust was present in scattered locations on western white pine, whitebark pine, and foxtail pine. Occurrences of white pine blister rust in these pines are as follows:

Western White Pine

Low levels of rust were found in several locations on the Shasta-Trinity National Forest (on Black Butte), near the top of Grouse Ridge near the Dorleska mine, near Upper Deadfall Lake, and along the trail to north Yolla Bolly Summit. On the Klamath National Forest, low levels of white pine blister rust are present on western white pine along the trail to Big Duck Lake, near Buck Lake, around Eaton Lake, at Russian Lake, at Water Dog Lake, and on Russian Creek. Rust was also recorded near Statue Lake and along Sugar Creek above and below Sugar Lake. Higher levels of rust are present in western white pine on the Klamath National Forest along the Pacific Crest Trail from Carter Meadows to South Fork Lake, in the drainage around Golden Russian Lake (Russian Wilderness). On the Six Rivers National Forest, higher levels of white pine blister rust are present along the French Hill Road near Camp Six and along the Youngs Creek trail within the first two miles from the trailhead (both in the Smith River National Recreation Area).

Whitebark Pine

White pine blister rust is present in low levels in whitebark pine in the Russian Wilderness (Klamath National Forest) on the ridgeline above Big Duck Lake and near Statue Lake, in the Warner Mountains near North Emerson Lake (Modoc National Forest), at Lassen National Park, a few hundred yards north of the summit trail parking lot, and on private land near Little Crater Lake (Siskiyou County).

Foxtail Pine

White pine blister rust is present in low levels in foxtail pine at the Lake Mountain Lookout (Oak Knoll Ranger District, Klamath National Forest); and in the saddle on the west side of South Yolla Bolly Mountain (Yolla Bolly-Middle Eel Wilderness, Grindstone Ranger District, Mendocino National Forest).

Region 6: Oregon and Washington

Host(s): Western white pine, sugar pine, and 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 2,211 acres in 2005, down from 3,488 acres in 2004. 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 Washington, areas were mapped within the Wenatchee Reporting Area in northeastern Washington and in the Okanogan Reporting Area. In Oregon, the most heavily mapped area was on the Siskiyou National Forest.

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, and Wisconsin

Host(s): Eastern white pine

Connecticut reported the disease was endemic in several areas and not particularly active in 2005. This disease remained static at moderate levels, but was common throughout Maine. Isolated spots in white pine regeneration continued to be observed in Massachusetts. Most observations were in southern Berkshire and central Worcester Counties. The disease occurred statewide in Vermont.

No significant changes were reported in West Virginia.

No significant changes were reported in the Lake States.

Region 10: Alaska

Host(s): White pine

In 2004, a single ornamental white pine tree was found to be infected by white pine blister rust in Ketchikan. The rust fungus was also found sporulating on leaves of the alternate host, an ornamental black currant, at the same location in Ketchikan. This is the first report of white pine blister rust in Alaska. Later in the summer, infected ornamental gooseberry (*Ribes* sp.) bushes were found in the same area. The fungus is not native to North America and, while causing devastating mortality in native white pines in some areas of the United States and Canada, it does not pose a threat in Alaska because no native trees are susceptible. The avenue of the original introduction into Ketchikan is not certain. Introduction by infected gooseberry is one possibility, as is infection by airborne spores originating from ornamental plantings in Prince Rupert,

British Columbia, or from native whitebark pine–*Ribes* complex in the mountains of British Columbia to the east of Ketchikan. The tree has received surgical treatment, with infected shoots removed and the bole infection carved away. The health of the tree will be monitored into the future.

DISEASES: ORIGIN UNKNOWN

Bacterial leaf scorch
Xylella fastidiosa

Region 9/Northeastern Area: Maryland, New Jersey, and New York

Host(s): Maples, northern red oak, scarlet oak, and pin oak

There was no significant activity reported in New York.

New Jersey bacterial leaf scorch surveys continued. The disease increased throughout the State, particularly in urban areas. In Delaware, oak mortality occurred on numerous city streets because of this disease. These 2005 surveys complement the New Jersey and Maryland statewide surveys done previously that showed significant and rapid increases in disease intensity and spread.

Butternut canker
Sirococcus clavigignenti-juglandacearum

Region 8: Regionwide

Host(s): Butternut

This disease has been present in the South for at least 40 years and is believed to have killed more than 75 percent of the butternut across the Region. 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 (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: Regionwide

Host(s): Butternut

The disease is widespread in Connecticut. Butternut canker was first found in Maine in 1993 in Kennebec County. It was now reported in all Maine counties except Washington. The trend of this disease in Maine was presently static. In New Hampshire, 99 percent of the surveyed trees over 6 inches diameter at breast height are now infected. Our small intraspecific tree breeding program continues. We are collecting scion material from four trees still considered resistant. Two small orchards of grafted trees have been established. Butternut canker was common in New York wherever butternut was found; it was uncommon to see a symptom-free butternut. This disease was not reported from any new counties in 2005. The Department of Environmental Conservation began to archive locations of healthy butternut, but the dataset was far from complete. Dieback and mortality occur statewide in Vermont, uninfected trees are rarely observed.

The disease remains endemic through the range of butternut in the mid-Atlantic States.

The disease remains endemic throughout the Central States.

Diseases: Origin unknown

Dogwood anthracnose
Discula destructiva

Region 8: Alabama, Georgia, Kentucky, North Carolina, South Carolina, Tennessee, and 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 2005, there were no reports of additional counties being impacted. The number of confirmed infected counties in Region 8 is as follows:

State	Counties
GA	38
KY	64
NC	30
SC	6
TN	59
VA	48
Total	**245**

Region 9/Northeastern Area: Regionwide

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.

In Connecticut, despite the dry season, there were enough periods of free moisture to allow infections from dogwood anthracnose. It seemed worse than usual on a tree-by-tree basis; this was especially problematic for heat and drought-stressed trees. Dogwood anthracnose was present in all counties in Connecticut.

Dogwood anthracnose continued to affect understory and ornamental flowering dogwood across New York. This disease was not reported from any new counties in 2005. In Vermont, it was present throughout the host range of dogwood in the State.

There was no significant change in the mid-Atlantic States.

There was no significant change in the Central States.

Phytophthora canker
Phytophthora pseudosyringae

Region 5: California

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

Phytophthora pseudosyringae was collected from symptomatic California bay laurel leaves near Pulga, Butte County.

Phytophthora root disease
Phytophthora cinnamomi, P. cryptogea, and unidentified Phytophthora sp.

Region 6: Oregon

Host(s): Sugar pine, western white pine, and Port-Orford-cedar

In one orchard, *Phytophthora cinnamomi* caused mortality in 3-year-old containerized whitebark pine seedlings used for testing resistance to white pine blister rust. The affected seedlings and soil were removed and destroyed, and the containers were sanitized. A new water treatment system and improvements in preventive measures, early detection, and sanitation will be used to reduce damage from this disease in the future. At another orchard, root disease caused by *P. cryptogea* resulted in the death of about 275 sugar pine trees. An unidentified *Phytophthora* species was suspected as the cause of death of 40 young sugar pines at a third orchard. The orchards are taking steps to reduce additional losses and prevent further spread of infection. An unidentified *Phytophthora* species was associated with mortality in a containerized Port-Orford-cedar orchard. Sanitation and management practices designed to prevent spread of inoculum from infected to healthy trees will be used to prevent further losses.

Phytophthora root rot
Phytophthora cinnamomi

Region 5: California

Host(s): Douglas-fir and true firs

Phytophthora root rot was problematic in Amador County, where it is wiping out the endangered ione manzanita and killing many white manzanita. It was also widespread on coast live oak in San Diego County, where it causes mortality in concert with drought.

Region 8: North Carolina

Host(s): Fraser fir

Phytophthora root rot affected the end of a field. Infected seedlings were destroyed and fungicides were used to protect healthy seedlings remaining in the beds.

Pitch canker
Fusarium circinatum

Region 5: California

Host(s): Bishop pine, Douglas-fir, Monterey pine, and Torrey pine

New infections of pitch canker were found in large, planted Monterey pines in a private campground in Olema in northwestern Marin County. Most symptoms (flagged branch tips) were in the upper crowns. Pitch canker was also found in a mature Monterey pine plantation and adjacent native Bishop pines in the Drakes Estero portion of Point Reyes National Seashore. These infections mark the most northern coastal sites in Marin County where symptoms have been reported and sampled.

Diseases: Origin unknown

In San Diego County, a large infestation by pitch canker is occurring at the Legoland parking lot. Aleppo pines are infected in the roots, and the pathogen girdles the entire tree at the root collar without any above-ground symptoms.

On November 5, 2003, the New Zealand Ministry of Agriculture and Forestry reported the presence of the pitch canker fungus in one yellowed graft from a consignment of Douglas-fir cuttings imported from the Badger Hill Orchard on the Eldorado National Forest. The confirmed record of pitch canker from Badger Hill is the first report of the pathogen in the Sierra Nevada. Ongoing surveys were conducted in 2005 for pitch canker in El Dorado and surrounding counties (Amador, Placer, and Nevada Counties): no *F. circinatum* was found. Surveys have emphasized Christmas tree plantations, urban plantings, and other sites at landowner requests.

Region 8: Regionwide

Host(s): Southern pines

Pitch canker was reported in several counties in east Texas in the spring of 2005, with the heaviest damage in Shelby County. Infections were also reported in loblolly pine stands in Polk County. Problems with the disease also continued in Louisiana and Mississippi, with large areas experiencing both top-kill and mortality. North Carolina reported scattered infections of pitch canker on shortleaf pine in the Piedmont, possibly as a consequence of storm damage. Tennessee reported increasing infection rates from plantations in the eastern part of the State. Scattered infections were also reported from South Carolina and Virginia. Georgia reported a significant increase in pitch canker in six southern counties that were heavily impacted by hurricanes in 2004. While mortality was generally less than 5 percent, many stands had significant dieback on one-third or more of the trees.

Damage to second-year cones (2005 crop) was reported throughout the South. Crops from susceptible clones were severely damaged, with some orchards reporting losses as high as 90 percent. Extensive damage was reported from a few orchards in Alabama, Louisiana, and North Carolina.

Port-Orford-cedar root disease
Phytophthora lateralis

Region 5: California

Host(s): Port-Orford-cedar

Port-Orford-cedar root disease continues to spread and intensify along the main stem of the Sacramento River from Dunsmuir to Shotgun Creek. Monitoring Port-Orford-cedar eradication treatments at Scott Camp Creek in the upper part of the Sacramento River drainage revealed no new infestations of *Phytophthora lateralis*.

A new group of infected Port-Orford-cedar (three to four trees) was noted in the Mill Creek Addition of Redwood National Park and near the west end of the Hiouchi Bridge along U.S. Highway 199.

On the Smith River National Recreation Area, Six Rivers National Forest, three active infestation areas were noted along the French Hill Road. One was near Allen's Gulch and two were near Dry Lake. Three more were noted near the Low Divide Road: two along Myrtle Creek and one on private land adjacent to the Low Divide Road (Del Norte County). Two additional infestations were found along Monkey Creek near U.S. Highway 199.

Ornamental Port-Orford-cedars were killed in Arcata, near the Humboldt State University campus. No other cedars were observed adjacent to the infected trees, and imported, infested soil is reportedly the likely source of pathogen introduction.

Region 6: Oregon

Host(s): Port-Orford-cedar

Port-Orford-cedar root disease continues to cause mortality of Port-Orford-cedar on sites with conditions favorable for spread and establishment of the causal pathogen. The annual aerial survey reported evidence of the disease on 9,336 acres (1.16 TPA) in 2005, down from 9,910 acres (0.54 TPA) in 2004. The vast majority of the reported mortality was mapped on private lands within the Coos-Douglas (5,393 acres) and Siskiyou (3,213 acres) Reporting Areas.

Hosts growing in riparian areas, swamps, drainage ditches, and low-lying areas downhill from roads suffer by far the greatest impacts. Trees on about 9 percent of the area within the limited range of Port-Orford-cedar are affected. Management activities, such as road gating during the wet season, washing vehicles before they enter uninfested areas, and roadside sanitation treatments help slow the spread of the pathogen.

Sudden Oak Death
Phytophthora ramorum

Region 5: California

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

The distribution of *Phytophthora ramorum* in California did not change significantly in 2005 (there were no new counties), but a new find in Willow Creek (Monterey County) extended the infestation south to just north of the San Luis Obispo County line. Infestations intensified in Southern Humboldt County around Redway, extending north into the Salmon Creek watershed. Thousands of trees (mostly tanoak) were killed in western Sonoma and western Marin Counties and the Big Sur area of Monterey County.

Twenty-five species were added as associated species or moved to the regulated host list in 2005. The total number of known susceptible species stands at more than 80, across more than 40 genera. For a complete list, see *http://www.suddenoakdeath.org.* Of note are more native Californian species, including *Abies concolor* (white fir), *Adiantum jordanii* (California maidenhair fern), *Torreya californica* (California nutmeg), and *Vancouveria planipetala* (redwood ivy). The first canker infection on a conifer, *Taxus brevifolia* (pacific yew), was also seen this year.

The USDA Animal and Plant Health Inspection Service (APHIS) issued an emergency Federal order for all California, Oregon, and Washington nurseries to regulate the interState movement of all host and associated host plants. Nurseries must be inspected and certified as *P. ramorum*-free before transporting plants across State lines, with inspections repeated annually.

In 2004, there were 177 USDA APHIS confirmed-positive *P. ramorum* sites in 22 States from trace-forward, national, and other surveys. So far in 2005, 95 sites in 7 States (California, Oregon, Washington, Georgia, Louisiana, South Carolina, and Tennessee) have had *P. ramorum* detections. As of August 2005, the California Department of Food and Agriculture (CDFA) has identified 53 *P. ramorum*-positive nurseries in California.

In addition to wholesale nurseries, the pathogen was recovered from a retail nursery in Sacramento County. Genetic analysis of the Sacramento retail nursery isolate determined that it represents a new lineage of the pathogen. In addition, the pathogen was isolated from roots of infected rhododendron plants for the first time.

The pathogen was also detected in a residential landscape in El Dorado County. Following USDA APHIS protocols, the infestation was eradicated.

Diseases: Origin unknown

Region 6: Oregon and Washington

Host(s): Oaks

Phytophthora ramorum, the causal agent of sudden oak death (SOD), was first discovered in Oregon by aerial survey in July 2001. Since fall of 2001, State and Federal agencies have been attempting to eradicate *P. ramorum* from infested sites by cutting and burning all infected host plants and adjacent apparently uninfected plants, and treating stumps to prevent sprouting. At of the end of 2005, the area under Federal and State quarantine remained at 11 square miles near Brookings, Curry County, OR. The number of new infected trees discovered each year since the pathogen was first discovered in Oregon decreased until 2005. In 2005, the number of newly infected plants increased. In addition, three streams outside the quarantine area were found positive for *P. ramorum*. The infested sites occur on Federal, private industrial and private nonindustrial forest-lands.

In Oregon and Washington, nurseries, forest environs adjacent to nurseries, and general forest areas were surveyed using the national survey protocol. Oregon had four confirmed *P. ramorum*-positive nurseries and six positive landscape plantings. In all cases, eradication activities were carried out using the appropriate protocol for the site.

Region 8: Regionwide

Host(s): Red and possibly some white oaks, rhododendrons, and numerous 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 to locate the disease if present in the South was initiated in 2003 and was continued in 2004 and 2005. No SOD-positive specimens have yet been found in native forest vegetation in the South.

DECLINES AND COMPLEXES

Ash decline

Region 9/Northeastern Area: Connecticut, Illinois, and New York

Host(s): White ash

In Connecticut, there were reported deaths of mature white ash from unknown causes throughout the State, possibly associated with ash yellows and drought.

In New York, there were many stands with various symptoms of "decline" mapped.

There has been a general decline in the vigor of ash trees for many years in Illinois. In 2005, there were eight counties that reported moderate to severe ash decline. Surveys conducted in Illinois in previous years showed that ash yellows is common throughout the State and is probably a major factor in the general decline.

Aspen decline

Region 3: Arizona and New Mexico

Host(s): Aspen

Aspen dieback and defoliation due to western tent caterpillar (*Malacosoma californicum*), Cytospora canker (*Cytospora chrysosperma),* and weather-related damages was detected on 83,225 acres in 2005, an increase from 66,725 acres reported in 2004. In Arizona, most affected trees continued to die back due to the severe drought of 2002, although an increase in tent caterpillar defoliation also occurred. In New Mexico, most damage was attributed to western tent caterpillar, and trees are expected to recover.

In Arizona, defoliation from this complex was recorded on the Apache-Stitgreaves (3,035 acres), Coconino (6,850 acres), Coronado (45 acres), Kaibab (22,665 acres), Prescott (15 acres), and Tonto (10 acres) National Forests; Grand Canyon National Park (12,635 acres); Fort Apache (1,190 acres) and Navajo (590 acres) Indian Reservations; and 390 acres of State and private lands. In New Mexico, aspen defoliation was observed on the Carson (8,525 acres), Cibola (1,435 acres), Gila (2,210 acres), Lincoln (505 acres), and Santa Fe (3,285 acres) National Forests; Valles Caldera National Preserve (290 acres) and Bandelier National Monument (150 acres); Jicarilla Apache (10 acres), Mescalero Apache (20) acres), and Taos Pueblo (1,275 acres) tribal lands; and 18,095 acres of State and private lands.

Bacterial leaf scorch
Xylella fastidiosa

Region 8: Tennessee

Host(s): Sycamore and pin oak

Incidence of this leaf scorch was reported to be increasing in middle and eastern Tennessee, with symptoms becoming apparent in late summer.

Birch decline

Region 9/Northeastern Area: New Hampshire and Vermont

Host(s): White birch

In New Hampshire, 3,288 acres of dieback and mortality were mapped by aerial survey on State and private lands in the northern part of the State. There was also considerable damage reported at the higher elevations on the White Mountain National Forest. Dieback and mortality of white birch were reported statewide in Vermont at higher elevations.

Black ash/brown ash decline

Region 9/Northeastern Area: Maine and Minnesota

Host(s): Black ash (brown ash)

There was no significant activity reported in Maine.

The area of black ash decline continued to expand in Minnesota: 4,322 affected acres in 58 stands were detected across the northern two-thirds of the State. This is in addition to the 27,000 acres detected in 2004. No insects or pathogens appeared to be associated with the decline, although occasionally secondary root disease and bark beetles were present. Site and weather conditions were thought to be primary predisposing factors. Research was underway to determine more fully the causes of the widespread phenomenon.

Elm yellows

Region 9/Northeastern Area: Pennsylvania and West Virginia

Host(s): American elm and slippery elm

Pennsylvania recorded elm yellows widely distributed in northeastern areas of the State, mostly in riparian habitats, fence rows, and along roadways. Elm yellows appeared to affect individual elms and not large groups of elms known as disease "flare-ups." As in 2004, Pennsylvania reported that this elm disease continues to persist in Bradford, Centre, Clinton, Lycoming, Potter, and Union Counties. West Virginia reported static levels of elm yellows within the eastern panhandle in 2005. No significant activity was reported in Ohio and Maryland.

Hickory decline

Region 9/Northeastern Area: New York and Wisconsin

Host(s): Bitternut and shagbark hickory

In New York, many declining hickory stands were found in the Finger Lakes region in 2004, but after further investigation in 2005, the relationship of causal factors remained undetermined. Shagbark hickories were unaffected, leading to speculation that drought was a major factor (the shagbarks being somewhat deeper-rooted than our other hickories). Armillaria root disease was another common causal factor within stands, but it is not certain that this is the primary pathogen.

Severe decline and mortality of hickory has been observed from southern to northeastern Wisconsin. Most of the mortality was of bitternut hickory, but there was some mortality of shagbark hickory as well. The symptoms progress from thinning crowns to branch mortality to complete tree mortality. Epicormic

branches often sprout from the main stem only to wilt and die later. Some of the pests that have been associated with dying hickory trees include a bark beetle, a flatheaded borer, and possibly fungi that cause canker and wilt diseases. The hickory bark beetle (*Scolytus quadrispinosus*) is believed to introduce a canker fungus (*Ceratocystis smalleyii*), which creates oblong sunken cankers with discoloration under the bark. A flatheaded woodborer (*Agrilus otiosus*) was also observed attacking these declining and dying trees, although it is not clear if this flatheaded woodborer is a primary or secondary cause of decline. Additionally, there may be a fungal disease associated with dying trees that causes wilt (*Ceratocystis caryae*), in which the affected trees have dead crowns with wilted epicormic branches. Armillaria root disease was also found in the roots of dead hickory trees in some sites, but in other sites, there was no Armillaria. Armillaria was not found in the northeast part of the State where hickory in Calumet, Shawano, and Oconto Counties were most affected.

Incense-cedar decline

Region 5: California

Host(s): Incense-cedar

A new disease concern has developed of young incense-cedars. A canker disease of unknown origin is killing young trees and branches. Cankers form in the smooth bark and spread until the tree or branch is girdled. The infection does not penetrate the wood of the host. Affected cankers tend to ooze slightly. Most of the disease is found in understory trees growing in extremely dense thickets beneath the overstory vegetation. Surrounding mature incense cedars are also often infected, but have yet to show dieback or death. Affected trees have been found from approximately 2,000 to 4,000 feet in elevation. The area extends from El Dorado County just south of Route 50 in the north to the community of Shaver Lake in Fresno County in the south. The area was affected by years of drought followed by an average rainfall year, but with rain extending into late June. The winter was on average very mild, but there were severe late spring frosts that may have contributed to disease susceptibility.

Larch needle cast, larch needle blight
Meria laricis , Hypodermella laricis

Region 6: Eastern Washington and Oregon

Host(s): Western larch

Larch needle blight and larch needle cast, reported as a complex because of similar signatures when viewed from the air, increased from 2,117 acres in 2004 to 4,011 acres in 2005. Infections were quite localized and mainly involved dense thickets of seedlings and saplings. These foliar 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.

Loblolly pine decline

Region 8: Alabama, Georgia, and South Carolina

Host(s): Loblolly pine

Premature decline of loblolly pines is occurring on many predominantly upland sites with a history of previous agriculture, which are not well-suited for long-term management of loblolly pine.

Oak decline

Region 2: Kansas

Host(s): Oaks

Oak decline is a long-term problem and appears to be incited by a combination of weather and man-made stresses that gradually exhaust tree energy resources, allowing opportunistic diseases to attack a stand. Weather extremes of flooding and drought have negative impacts on oak health, as do animal husbandry practices such as locating cattle lots in oak stands, which causes soil compaction and erosion. *Hypoxylon* and *Botryosphaeria* cankers have been noted in decline situations. Both canker diseases have occurred at moderate to high levels in specific sites. Each decline site situation is different, but the combination of these factors is common to all situations and absent when undisturbed native stands were observed. A 2005 sudden oak death detection survey of forest stands near nurseries receiving planting stock from California did not detect *Phytophthora remorum*.

Region 8: Regionwide

Host(s): Oaks and 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 by putting trees under additional stress. Pests such as Armillaria root disease and the two-lined chestnut borer, which are ordinarily nonaggressive pests on vigorous trees, severely affect stressed oaks. 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.

Virginia reported widespread oak decline due to drought and unusually high temperatures; the problem was most notable in coastal plain sites impacted by storms and flooding in recent years. Mortality was highest in trees with the greatest exposure, including yard and landscape trees, and is expected to continue for the foreseeable future. In South Carolina, oak decline continues to affect substantial acreage of red oak stands, especially those subject to water table fluctuations. Similar damage was reported from scattered sites in North Carolina and Kentucky. In north-central Arkansas and northeastern Oklahoma, widespread oak decline-caused mortality is still prevalent. Although the severe drought stress that incited its occurrence there has abated, mortality and dieback have continued to increase, with 40 percent of the red oak basal area now dead in severely affected stands. Tennessee reported increasing incidence of oak decline in northeastern counties.

Region 9/ Northeastern Area: Connecticut, Iowa, Minnesota, and Missouri

Host(s): Red oaks

In Connecticut, there was considerable, unexplained dying of oaks. There were many contributing factors, such as drought and Armillaria root rot. Oak decline decreased in Vermont due to a recovery from drought conditions.

In Minnesota, about 768 acres of oak mortality associated with the two-lined chestnut borer in areas previously affected by drought and defoliation by the forest tent caterpillar were detected in northern counties in 2005.

No large increases in wood borer activity were observed in northwest Missouri, where prolonged drought conditions existed from 2002 to 2004. Oak decline was an ongoing phenomenon in red oak stands across much of the State. Decline was observed occurring in white oak stands in a few locations.

Iowa continued to report scattered decline of white oak. Together with oak wilt, 1,422 acres were detected.

Red pine decline

Region 9/Northeastern Area: Minnesota and Wisconsin

Host(s): Red pine

Red pine pocket mortality was discovered for the first time in Sherburne County, MN.

In Wisconsin, pockets of dying red pine are expanding. Mortality is associated with turpentine beetles and a fungus, *Leptographium* sp. About 123 pockets in over 50 stands in southern Wisconsin have been mapped. Isolating pockets by severing roots between diseased and healthy trees was attempted. On 13 sites, 2,800 total trees were isolated, 106 died, and only one tree was outside the plow line.

Subalpine fir decline

Region 1: Idaho and Montana

Host(s): Subalpine fir

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.

Subalpine fir mortality continued to increase in 2005 with an estimated 419,000 trees killed on about 250,300 acres regionwide. This is much higher than the 371,000 trees killed on over 175,000 acres in 2004. However, many areas were not flown in 2004. Most of the current recorded tree mortality occurred on Beaverhead National Forest in western Montana. Other forests with high levels of mortality include the Bitterrroot, Flathead, Gallatin, and Kootenai National Forests in Montana; Yellowstone National Park; and the Kaniksu and Nez Perce National Forests in northern Idaho. In many areas, populations may still be increasing. Increases are expected to slow, however, due to increased levels of precipitation.

Region 2: Colorado and Wyoming

Host(s): Subalpine fir

Subalpine fir decline is again the most damaging agent in Region 2, affecting over 1.5 million trees across 500,000 acres. This decline is present everywhere throughout the range of subalpine fir in Region 2 and is most often caused by western balsam bark beetle. In southern Colorado, mortality levels are lower than those seen during recent years. This mortality may be closely associated with low moisture availability. The high elevations of the northern Bighorn Mountains of Wyoming have extensive areas of subalpine fir dying.

Region 4: Idaho, Nevada, Wyoming, and Utah

Host(s): Subalpine fir

Decline and die-off of subalpine fir started in the late 1980s in the Intermountain Region, with peak mortality period occurring during mid-1990, 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, compounded by overstocked and overmature stand conditions, also contribute to subalpine fir mortality. In 2005, approximately 284,200 subalpine fir trees died over 161,300 acres across the region. This is a substantial

decrease from the 2004 regionally reported numbers of 840,500 trees over 308,200 acres. The Bridger-Teton National Forest in Wyoming accounted for the majority of subalpine fir mortality for the second consecutive year, with 90,200 trees killed over 47,900 acres. The Humboldt-Toiyabe National Forest in Nevada lost 19,500 trees over 13,500 acres. The Dixie National Forest in Utah lost 31,100 trees over 14,000 acres.

Sugar maple decline

Region 9/Northeastern Area: Connecticut, New York, and Vermont

Host(s): Sugar maple

There were incidences of "unexplained" death of mature sugar maples in Connecticut, possibly associated with drought, salt (in roadside trees), Armillaria, Verticillium, and other factors. In New York, the rate of mortality among declining sugar maple seems to have increased over the previous few years. In Vermont, dieback and mortality increased due to impact of forest tent caterpillar; in some cases associated with lecanium scale.

True fir decline

Cytospora canker of true firs
Cytospora abietis,

Dwarf mistletoe
Arceuthobium spp.,

Sawfly (unknown species)
Neodiprion sp.

Fir engraver beetle complex
Scolytus ventralis

Region 6: Oregon and 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 weakly pathogenic, canker-inducing fungus that attacks stressed trees. It commonly infects branches already infected by dwarf mistletoe and causes 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.

Aerially detected damage decreased from 5,551 acres in 2004 to 2,916 acres in 2005. Most of the aerially detected damage occurred within the Willamette and the Siskiyou Reporting Areas.

Aerial observers sometimes mistake the color signature of cytospora with that of balsam woolly adelgid. Incidence was associated with mature noble fir and silver fir stands located near ridgetops and is probably related to drought stress.

White pine decline

Region 8: Virginia

Scattered isolated landscape trees and small clusters of planted Christmas trees were reported to display mortality caused by white pine decline in 2005. The decline is often difficult to diagnose, but in some cases pathogens can be isolated from diseased trees. Feeding by weevils around the root collars of infected trees has also been observed, but it is not known whether the weevils vector the disease.

Region 9/Northeastern Area: Connecticut and New York

Host(s): White pine

There were reports of declining white pine (young and mature trees) in Connecticut. In New York, declining white pine were again mapped and investigated in eastern parts of the Hudson River Valley, but the relationship of causal factors remained undetermined. Root disease, root weevils, and drought have all impacted the site in previous years. One of the major sites was a former industrial site on the Hudson River, and it was speculated that pollutants in the soil played a role in the decline.

Yellow-cedar decline

Region 10: Alaska

Host(s): Yellow-cedar

Decline and mortality of yellow-cedar persists as one of the most spectacular forest problems in Alaska. Approximately 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 2004, we discovered that yellow-cedar decline extended approximately 100 miles south into British Columbia. The entire distribution hints at climate as a trigger for initiating the forest decline. In 2005, approximately 30,000 acres scattered throughout the distribution of decline were mapped as very active; that is, they had high concentrations of dying or recently killed trees with bright yellow or red crowns. The remainder of the acreage is dominated by concentrations of dead standing trees, where most of the mature yellow-cedar is already dead.

SEED ORCHARD INSECTS AND DISEASES

Coneworms
Dioryctria spp.

Region 6: Oregon

Host(s): Western white pine and sugar pine

Damage was evident in older western white pine used for controlled crosses for resistance breeding at one orchard. Year-old conelets were treated to prevent infestation. At another orchard sugar pine cones were damaged by mining. Developing cones were re-covered with cloth bags during the second growing season and unharvested cones were removed.

Region 8: Regionwide

Host(s): Southern pines

Surveys indicated an average 30 percent loss of second-year cones (2005 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 that fall off or disintegrate during the season and is, therefore, a low estimate of the total damage caused by coneworms. Moderate and unexpected damage to treated orchards occurred throughout the South, including orchards in east Texas, central Alabama, and southern Georgia, indicating higher than average populations. Virginia reported only minimal (<5 percent) cone losses in orchards with routine spray programs.

Cypress canker
Seiridium cardinale

Region 6: Oregon

Host(s): Port-Orford-cedar

Cypress canker continues to affect a small number of trees in a containerized orchard. Diseased trees are removed and destroyed.

Douglas-fir cone gall midge
Contarinia oregonensis

Region 6: Oregon

Host(s): Douglas-fir

Minor *Contarinia* damage of the 2005 cone crop was noted during longitudinal cut-face counts in early August at one orchard. The cone crop was extremely small and scattered, and was not operationally collected. An aerial application of esfenvalerate was applied to 58 orchard acres in early spring 2005 for the primary purpose of reducing Douglas-fir gall midge damage. Duff vacuuming was conducted on three acres in fall 2005 as a means of removing overwintering pest habitat, thereby reducing damage to the 2006 cone crop. At another orchard, damage was observed but no treatments were made.

Douglas-fir cone moth
Barbara colfaxiana

Region 6: Oregon

Host(s): Douglas-fir

Cone moths were in found in one of the Douglas-fir seed orchards. Since the cone crop was not large enough to harvest, there was no insect damage to the crop. However, the insects were observed in the few cones that were present and sanitized.

Douglas-fir seed chalcid
Megastigmus spermotrophus

Region 6: Oregon

Host(s): Douglas-fir

Megastigmus was noted during longitudinal cut-face counts in early August at one of the orchards. Damage was considered minimal. No chemical control measures were used to limit damage in 2005.

False chinch bug
Nysius spp.

Region 6: Oregon

Host(s): Port-Orford-cedar

Damage contributed to a reduction in the percentage of filled seed in controlled crosses of containerized stock. The orchard experimented with control treatments and the staff is assessing the results.

Fir coneworms
Dioryctria abietivorella

Region 6: Oregon

Host(s): Douglas-fir

In two seed orchards, coneworms (*Dioryctria abietivorella*) were evident in mature Douglas-fir that were girdled for stimulation of a seed crop; however, damage was considered to be minor. Higher than normal insect damage was noted in mature cones during longitudinal cut-face counts in August (the cone crop was extremely small and scattered. The coneworms appeared to be concentrated on what few cones were available). No chemical control measures were used to limit damage in 2005.

Pitch canker
Fusarium subglutinans f. sp. pini

Region 8: Tennessee and Florida

Host(s): Virginia, white, and slash pines

Low levels of infection were reported at nurseries in the late summer and fall.

Seed bugs
Leptoglossus corculus
Tetyra bipunctata

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, primarily *Leptoglossus corculus*, caused about 25-percent seed loss on untreated loblolly in Louisiana. Large populations of *Tetrya bipunctata* occurred in September and October in orchard trees monitored in Louisiana. In Texas, unsprayed pine seed orchards sustained about 23-percent damage. These estimates probably reflect those throughout the Gulf Coast States.

Seed damage
Western conifer seed bug
Leptoglossus occidentalis

Coneworm
Dioryctria abietivorella

Cone beetle
Conophthorus ponderosae

Region 1: Idaho and Montana

Host(s): Douglas-fir, western white pine, and 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. To assist in timing of insecticide treatments, cone beetles are monitored with pheromone traps. Sanitation of infested cones is routinely done in the orchards. However, their proximity to wild stands makes immigration of pests a continual problem.

Cone beetle populations were high at white pine seed orchards at the Coeur d'Alene nursery and at Grouse Creek in northern Idaho. Plans are to treat these seed orchards with insecticides in 2006.

At Grouse Creek seed orchard, coneworms continue to infest a young larch seed orchard that is just starting to produce cones.

Tree improvement areas in Montana will be monitored as cones are produced.

Region 6: Oregon

Host(s): Ponderosa pine and western white pine

Cone beetles destroyed a pickable ponderosa pine cone crop at one orchard. Populations levels of the beetle have been increasing. The orchard will consider bagging the cones next year to prevent damage.

Southern cone gall midge
Cedidomyia bisitosa

Region 8: Florida

Host(s): Slash pine

This species caused significant localized loss of conelets in northern Florida slash pine seed orchards in 2005.

Unidentified cone midge

Region 6: Oregon

Host(s): Port-Orford-cedar

Damage contributed to a reduction in the percentage of filled seed in controlled crosses of containerized stock. The orchard experimented with control treatments and is assessing the results.

Unidentified adelgids and scales

Region 6: Oregon

Host(s): Port-Orford-cedar

Unidentified species of adelgids and scales infested containerized Port-Orford-cedar seedlings in a greenhouse at one of the seed orchards. They were treated with horticultural oil. The orchard also took steps to reduce seedling density and improve air circulation.

Western conifer seed bug
Leptoglossus occidentalis

Region 6: Oregon

Host(s): Douglas-fir

Seed bugs were in observed in one of the Douglas-fir seed orchards. Since the cone crop was not large enough to harvest, there was no insect damage to the crop. However, there were insects in the few cones that were present and sanitized. *Leptoglossus* were also observed in small numbers in sugar pine cones at an orchard during installation of the cotton cone bags. When the seeds were extracted, it turned out that about 25 percent of the potential yield had been lost. Populations of the insect have also increased in a western white pine orchard, and treatment may be needed next year.

NURSERY INSECTS AND DISEASES

Black vine weevil
Otiorhynchus sulcatus

Region 6: Oregon

Host(s): Containerized hardwoods, shrubs, and conifers

Monitoring was conducted weekly from April through August. Root weevil activity was observed in mid-June. Two treatments of chlorpyrifos were made. Damage was minimal.

Corky root syndrome
Cylindrocarpon destructans and Fusarium spp.

Region 6: Oregon

Host(s): Western white pines and sugar pines

Mortality attributed to root disease caused by *C. destructans* and *Fusarium* spp. was observed in bareroot western white and sugar pines during the growing season. However, the number of seedlings culled during grading because of corky roots continues to decline. A batch of sugar pines from an infected seedlot that were transplanted into one-gallon containers suffered severe mortality after they were fertilized. To protect the remaining seedlings, growing conditions were monitored to minimize stress and symptomatic seedlings were removed and destroyed.

Cranberry girdler
Chrysoteuchia topiaria

Region 6: Oregon

Host(s): Conifers

Monitoring for the girdler was done with the standard pheromone trap system. Inspection of seedlings in the seedbeds did not reveal any damage on the plants at the end of the growing season. No chemical treatments were used.

Cylindrocarpon root disease
Cylindrocarpon destructans

Region 1: Idaho and Montana

Host(s): Western white pine and whitebark pine

Cylindrocarpon destructans caused root disease of container-grown five-needle pines (western white pine, whitebark pine) at several container nurseries in Region 1. The pathogen caused varying levels of root decay, often without eliciting above-ground disease symptoms on affected seedlings. The disease was best controlled by container sterilization with hot water treatments, seed treatments, and periodic fungicide applications. *Cylindrocarpon destructans* also causes root disease on other conifer hosts grown in both bare root and container nurseries, although damage is usually minor.

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

Region 1: Idaho and Montana

Host(s): Conifers

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

Region 8: Regionwide

Host(s): Pines and hardwoods

Damping-off continued to be one of the most common disease problems of nurseries in the South.

Fungus gnats
Family: Sciaridae

Region 6: Oregon

Host(s): Containerized conifers and aspen

The fungus gnat population built up in conifers growing in Q-plugs, and in aspen rootstock in a greenhouse at one nursery. Inspection revealed a small amount feeding damage on young roots. Three applications of Gnatrol (*Bacillus thuringensis)* prevented further damage. At another nursery, fungus gnats built up in a small group of maples in a greenhouse. Removal of empty containers, algae, and weeds, and placement of yellow sticky tape reduced the population to acceptable levels.

Fusarium root disease
Fusarium spp.

Region 1: Idaho and Montana

Host(s): Conifers

Fusarium-associated diseases were the most important and damaging diseases of conifer seedling production in both bareroot and container nurseries in Region 1. These fungi caused several different types of diseases throughout the seedling production cycle. The most damaging *Fusarium* species in bareroot nurseries was *F. oxysporum*, while *F. proliferatum* was the most important pathogen in container operations. Other *Fusarium* spp. were commonly isolated from both diseased and healthy seedlings; some of these were capable of eliciting diseases, whereas others were more commonly saprophytes, endophytes or secondary colonizers of seedling root tissues. *Fusarium* diseases were most commonly controlled by pre-plant soil fumigation in bareroot nurseries and seed, container sterilization, and fungicide treatments in container nurseries.

Region 6: Oregon

Host(s): Sugar pine

Fusarium proliferatum caused scattered mortality in small plugs in styroblock containers in one greenhouse. Symptomatic seedlings were removed to prevent buildup of inoculum and the grower minimized stress on the seedlings as much as possible to discourage disease development.

Gray mold
Botrytis cinerea

Region 1: Idaho and Montana

Host(s): Western larch, Engelmann spruce, western redcedar, and western white pine

Botrytis cinerea was an important pathogen of container-grown western larch, Engelmann spruce, western redcedar, and western white pine seedlings in container nurseries in Region 1. This disease was best prevented by careful monitoring and sanitation procedures. Fungicide applications, alternating several different chemicals, were implemented to reduce losses. *Botrytis* also caused important damage to cold-stored seedlings after lifting and prior to outplanting. Pathogen development may be restricted by storing seedlings at below-freezing temperatures and rapidly thawing them prior to outplanting.

Region 6: Oregon

Host(s): Port-Orford-cedar, incense cedar, western redcedar, and Douglas-fir

One nursery experienced a minor amount of gray mold. The disease was controlled by spacing seedlings to increase air flow, knocking water off foliage after watering in the fall, continuous checks for and removal of infected foliage, and spot treatments with Zerotol. At another nursery, an outbreak of gray mold was resolved by reducing moisture and opening the green house to increase air movement.

Leaf spots
Marssonina populi

Region 6: Oregon

Host(s): Black cottonwood

Young containerized black cottonwood cuttings were damaged by leaf spots during a long period of unusually wet weather in late spring. Diseased leaves were removed and the seedlings were monitored until the weather improved. No chemical treatment was needed.

Lygus
Tropidostepes spp.

Region 6: Oregon

Host(s): Conifers

Monitoring for the lygus was done with the yellow sticky trap system. Insect levels were low for most of the season and then increased rapidly toward the end of July. Seven treatments with Asana were made after

high insect levels were noted. Inspection of seedlings in the seedbeds at the end of the growing season did not reveal any damage on the plants.

Nematodes
Tylenchorhunchus claytoni and ewingi
Paratrichodorus minor

Region 8: Several nurseries regionwide

Host(s): Pines

Patches of stunted seedlings occurred in some fields the second year after fumigation.

Pythium root disease
Pythium spp.

Region 1: Idaho and Montana

Host(s): Conifers

Root diseases caused by *Pythium* spp. were fairly common in poorly-drained portions of bareroot seedling beds. Spot fungicide treatments were sometimes required to reduce disease spread and impact

Phytophthora root rot
Seiridium cardinale

Region 6: Oregon

Host(s): Conifers

The nursery continued to irrigate bareroot crops with untreated water. The water was sampled periodically for *Phytophthora* species during the growing season. No *Phytophthora* species were found in water in the nursery system. No evidence of Phytophthora root disease was observed. Monitoring of water and crops will be continued.

Rhizoctonia needle blight
Rhizoctonia spp.

Region 8: Regionwide

Host(s): Longleaf pine seedlings

Little *Rhizoctonia* damage was noted in 2005 due to less bare root longleaf pine production in Region 8 and fungicide spray programs.

Sirococcus tip blight
Sirococcus conigenus

Region 1: Idaho

Host(s): Conifers, particularly Douglas-fir

Tip blight of bare root Douglas-fir was common during 2005; this disease was primarily caused by *Sirococcus conigenus*. Disease severity was related to high levels of prolonged moisture during the spring and early summer. Losses were reduced by applications of foliar fungicides between periods of rain.

Unidentified powdery mildew

Region 6: Oregon

Host(s): bigleaf maple

Foliage of large containerized bigleaf maple were damaged by an outbreak of an unidentified powdery mildew in late spring. The first emerging leaves were most severely affected. The foliage was treated with Safers Garden Fungicide to prevent the fungus from spreading as new leaves emerged.

Unidentified shoot blight

Region 6: Oregon

Host(s): Black cottonwood

Large containerized black cottonwood were damaged by shoot blight during a long period of unusually wet weather in late spring. Severely affected plants, fallen leaves, and debris were removed and destroyed. The remaining plants were placed in clean racks at wider spacing.

ABIOTIC AND OTHER DAMAGE

Air pollution

Region 5: California

Host(s): Jeffrey pine, ponderosa pine, and hardwoods

Ozone damage has been observed on both conifers and hardwoods in the San Bernardino Mountains. Ozone levels as well as general pollution problems appear to be increasing in the greater Los Angeles area. The USDA Forest Service's Forest Inventory and Analysis (FIA) uses biomonitoring to monitor the potential impact of tropospheric ozone on forests. FIA visited 65 plots in 2005; ozone injury was present on 31 plots. Indicator species with validated injury were ponderosa pine, Jeffrey pine, blue elderberry, and skunkbush. Additional analysis of ozone injury detected by the FIA program will be reported in the upcoming FIA 5-Year Report for California as well as a Pacific Northwest General Technical Report.

Region 8: Tennessee

Host(s): All species

Tennessee experienced moderate ozone damage on the Cumberland Plateau.

Bear damage

Ursus americanus

Region 5: California

Host(s): Douglas fir and redwood

Black bear damage continues to be the most common plight of conifers on industrial and small private lands from the Klamath River northward to the Smith River. Twenty- to 40-year-old Douglas-fir is commonly damaged, but where redwood also exists, it is equally damaged or killed.

Region 6: Oregon and Washington

Host(s): Douglas fir, western hemlock, and Port-Orford-cedar

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 they 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 178, 709 acres (1.66 TPA (trees per acre)) in 2004 to 271,976 acres (2.52 TPA) in 2005. 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 lands found that at least 3.5 times as many Douglas-fir trees are damaged as killed.

Noteworthy reporting areas include: southwestern Washington (36,170 acres, 2.24 TPA); Gifford-Pinchot (62,698 acres, 2.53 TPA), Mount Baker-Snoqualmie (50,662 acres, 3.12 TPA), and Olympic (59,984 acres,

3.00 TPA) National Forests; northwestern Oregon (19211 acres, 0.80 TPA); and Quinault Indian Reservation (12,300 acres, 3.31 TPA).

Host(s): Western white pine

Ten percent of the pine trees at one orchard in Oregon have been damaged by bears over the last 5 years. Fencing is planned but has not yet been funded.

Beaver
Castor canadensis

Region 8: South Carolina

Host(s): Primarily lowland hardwoods

All but three South Carolina counties experienced some forest loss to beavers in 2005. The majority of this damage was in hardwood stands. The South Carolina Forestry Commission estimated that 13,950 acres were affected, representing 279,000 cords valued at $5.02 million. New mortality due to beaver impoundments continued to increase, due in large part to increased spring precipitation.

Canada geese
Branta canadensis

Region 6: Oregon

Host(s): Grasses

Canada geese destroyed a large portion of *Danthonia* spp. In one nursery, and the crop had to be replaced. Control may be needed in the future.

Drought effects

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

Host(s): All tree species

In Region 2, moisture conditions improved somewhat in 2005, but drought is still stressing trees in each State and causing many conifers and broadleaf trees to die from secondary and stress-related insect pests and diseases, such as bark beetles, *Sphaeropsis* blight, and root diseases. Reduced growth and poor color were seen in many tree species, especially conifers. Windbreak trees are particularly stressed with drought conditions in Kansas, Nebraska, and South Dakota.

Region 3: Arizona and New Mexico

Host(s): Ponderosa pine

Discoloration of ponderosa pine attributed to drought decreased over two-fold from 37,830 acres in 2004 to 18,290 acres in 2005. In Arizona, drought-related damages to ponderosa pine occurred on the Coconino (11,960 acres), Kaibab (2,990 acres), Prescott (220 acres), and Tonto (1,275 acres) National Forests.

Drought-related ponderosa pine discoloration on State and private lands totaled 1,845 acres. No discoloration of ponderosa pine due to drought was recorded in New Mexico in 2005.

Region 5: California

Host(s): Oaks and other hardwoods

California came out of 4 years of drought conditions with above average springtime precipitation in 2005. statewide snowpack conditions in April were 135 percent above average. Conditions remained slightly to extremely wet throughout the year. The moist, cool spring contributed to increased tree vigor and was a factor in the continued decrease in overall pest activity seen in 2004. However, drought-induced bark and engraver beetle activity still occurred on the Warner Ranger District of the Modoc National Forest where precipitation was 13 percent below the 30-year average.

Region 8: Georgia, North Carolina, Oklahoma, South Carolina, Texas, and Virginia

Host(s): Oaks, hickories, and other hardwoods

Drought conditions prevailed across eastern Texas and Oklahoma through the summer and fall, with only slight and localized relief from Hurricane Rita in Texas. By November, Lufkin, TX, was 12 inches below long-term precipitation averages. Much of the Southeast experienced at least moderate and localized drought, with little rain outside of the areas influenced by hurricanes and episodic severe thunderstorms. The central Piedmont of North Carolina was impacted, forcing the State to implement water use restrictions in Durham, Orange, and Wake Counties. South Carolina was reporting extensive drought-induced hardwood foliar die-back by mid-summer. In Virginia, drought and unusually high temperatures from June through September produced defoliation and mortality in oaks and hickories in several counties, particularly along ridge lines. Tennessee reported late summer brown-up and premature leaf drop on hardwoods in central and eastern stands with shallow soils. Georgia reported widespread stress-induced forest injury from the combination of flooding spring rains followed by extreme summer drought.

Region 9/Northeastern Area: Connecticut, Massachusetts, Pennsylvania, Vermont, and West Virginia

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

In Connecticut, drought was a major factor contributing to tree stress this year. Periods of prolonged unusually high temperatures exacerbated the drought situation. Symptoms were evident on many woody species, especially hemlock, pine, maple, dogwood, and ash. In Massachusetts, the effects of the 2004 drought continued to be observed. A total of 107 acres, mostly on the higher elevation of Berkshire County, was mapped during the annual aerial survey. In Vermont, various hardwoods were affected statewide. Mortality of stressed trees continued, but the impact was lessened following three years of adequate water availability.

Pennsylvania reported fluctuating moisture conditions in 2005. Winter precipitation was well above average statewide and averages decreased to normal during the spring months and then reached levels below average in May. West Virginia reported that from January through September conditions were much drier and warmer than normal. Dieback and mortality was reported.

Fire

Region 5: California

Host(s): True firs and other conifers

Fire damaged and scorched trees are found throughout fire areas of California. Individual trees continue to die from the injury to their crowns, roots, and cambium. Scorched trees may be more susceptible to attack by bark beetles.

Region 8: Regionwide

Host(s): All species

In Texas, the fall fire season was one of the most serious in many years, and major flare-ups occurred during the final week of the year and continued into 2006, with effects that will not be tabulated for some time. Oklahoma also experienced a disastrous end-of-year fire season, with widespread losses to forests and grasslands as well as major destruction of homes and property and loss of life. No figures on these losses are currently available because of the continuing involvement of all available Forestry Division personnel in the on-going crisis. In contrast, Alabama reported a continuing decrease in wildfire incidence statewide.

Region 9/Northeastern Area: Vermont

Host(s): Hardwoods and softwoods

Occasional light damage on balsam fir Christmas trees occurred in northern Vermont.

Region 10: Alaska

The summer of 2005 was the third-largest fire season on record, with about 4.61 million acres burned. There were a total of 628 fires of at least 0.1 acres; the largest fire burned 244,600 acres. Large fires were more evenly distributed across interior Alaska compared to the distribution of fires in 2004.

The combination of the 2004 fire season (the largest on record: 6.59 million acres burned) and 2005 fire season also set a new record. During the last 2 years, about 11.20 million acres burned. According to the Alaska Interagency Coordination Center, this was the first time since such records have been kept that more than 2 million acres burned in 2 consecutive years.

Flooding

Region 9/Northeastern Area: Connecticut, Iowa, Minnesota, and Vermont

Host(s): Hardwoods and softwoods

Heavy rain in Connecticut in October 2005 resulted in flooding and standing water in many areas. It was thought that root damage from these conditions would be evident next season. In Vermont, flooding occurred statewide, with 11,078 acres mapped.

About 3,700 acres in Minnesota sustained damage from floods.

In Iowa, Boone, Tama, Marshall, Polk, Louisa, and Linn Counties had 2,910 acres with a high incidence of chlorotic silver maple and cottonwood trees and 776 acres of mortality.

Frost/cold

Region 2: Colorado and South Dakota

Host(s): All Tree Species

Heavy snowstorms caused extensive damage in Colorado. Three hundred acres of Englemann spruce and subalpine fir were destroyed by avalanches in the San Juan Mountains of southwestern Colorado during heavy snows the winter of 2004-2005.

A heavy May snowstorm in western South Dakota resulted in death or decline of thousands of trees within South Dakota. Many deciduous trees already had produced their first flush of leaves and the cold temperature killed the tender foliage. In addition, the heavy snow and ice resulted in branch breakage.

Region 8: Tennessee

Host(s): Hardwoods

Widespread frost damage was reported from two spring episodes in upper east Tennessee in 2005, affecting sycamore in drains and oak/hickory stands above 2,400 feet in elevation. The frosts also delayed insect emergence by about 1 week in this area.

Herbicide leaf tatters

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

Host(s): White oaks and hackberry

For about the last 15 years, this condition has appeared sporadically across the landscape in Illinois, Wisconsin, and Minnesota. Symptoms appear in the spring when leaves develop without midvein tissue. The second flush of leaves develops normally. Experiments were initiated at the University of Illinois in 2004 and then repeated in 2005 in which small potted white and red oak trees were exposed briefly to various herbicides inside a spray chamber. Trees were treated in the tight bud stage, when the leaflets were unfolding, and when the leaves were fully expanded. Leaf tatters developed in the group of trees that were exposed to the chloroacetanilide herbicides acetochlor + atrazine (Harness Xtra) and metolachlor (Dual Magnum) when they were in the unfolding leaf stage. The same herbicides, applied when the trees where in the tight bud stage or when the foliage was fully developed, did not produce leaf tatters. The leaf symptoms that were produced in the experiments were similar to the leaf symptoms seen on trees in forests near agricultural fields.

What long-term affects leaf tatters may have on trees remained unclear. The stage of leaf development, the kind of herbicide applied, wind currents, and temperature are all variables that will influence whether leaf tatters injury is produced. Trees with leaf tatters 1 year do not necessarily have leaf tatters the following year. Foresters, nurserymen, and homeowners need to communicate with the herbicide applicators to find ways of reducing herbicide drift. During 2005, there were 22 Illinois counties that reported severe to moderate leaf tatters injury.

No significant activity was reported in Minnesota or Wisconsin.

Ice/snow damage

Region 8: Regionwide

Host(s): Southern pines and hardwoods

South Carolina experienced an ice storm in late December 2004, generating an estimated $1,082,000 worth of damage to pine pulpwood stands in six counties that could not be assessed until 2005. On March 31, a hail storm damaged about 2,000 acres in Panola County, TX. By late summer, considerable mortality was visible on pines of all sized classes in this area.

Region 9/Northeastern Area: Vermont

Host(s): Hardwoods

In Vermont, there was widespread breakage and mortality of beech, birch, oak, and aspen following heavy wet snow in October.

Jackrabbits
Lepus spp.

Region 6: Oregon

Host(s): Conifers and hardwoods

Jackrabbits at one nursery are starting to annoy the grower. They caused a noticeable amount of damage by biting the tops off seedlings to create runs. Control may be needed in the future.

Nutria
Myocaster coypus

Region 8: Louisiana

Host(s): Baldcypress and other species

Nutria continue to frustrate reforestation efforts on wetland sites, especially those in which baldcypress is planted to restore environmental damage. Several plantings in southeastern Louisiana were decimated in 2005, requiring replanting or abandonment of the sites.

Porcupine
Erethizon dorsatum

Region 5: California

Host(s): White pine

Feeding by porcupines was noticed on sugar pines infested with white pine blister rust in Fresno County on the west side of the Sierras.

Saltwater intrusion/subsidence/erosion

Region 8: Alabama, Louisiana, Mississippi, and Texas

Host(s): Cypress-tupelo

In addition to the detrimental effects of defoliating insects (see forest tent caterpillar and bald cypress leafroller entries), erosion, subsidence, and lack of sedimentation affect 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.

The extensive storm surges produced by Hurricanes Katrina and Rita flooded much of the coastal lowlands from Mobile to Galveston, often extending inland for several miles. Because hurricane winds defoliated much of this area, the full extent of forest damage and mortality will not be apparent until the spring of 2006, but effects are expected to be widespread and severe. The maritime forest in this area is important as a haven for neotropical migrant birds as well as for its scenic and recreational values, and the impact on nontimber resources is expected to be both extensive and long-lasting.

Voles
Microtus spp.

Region 8: South Carolina, Tennessee, and Virginia

Host(s): Loblolly pine and cherrybark oak

Virginia reported that voles had caused considerable amounts of damage in 1- to 5-year-old loblolly pine stands throughout the State, with the greatest impacts in the southwestern part of the State. Almost 1,400 acres of damage was reported from 20 tracts; some entire plantations were destroyed. Alabama reported some vole damage in pine plantations, but there was no significant change from previous years. Tennessee reported approximately 1,500 acres of vole damage to pine and oak seedlings.

Wind

Region 2: Colorado

Host(s): Englemann spruce and subalpine fir

A strong wind event in September, and another in October, toppled and snapped approximately 100 acres of spruce and fir on Colorado's Grand Mesa. The downed trees were significant because of impacts to at least four different developed recreation sites and because of spruce beetle populations that will respond to the downed spruce, their ideal habitat. Efforts have been initiated to clean up the recreation sites and to address the downed spruce in the forest at large.

Region 8: Alabama, Louisiana, Mississippi, Texas, North Carolina, and Florida

Host(s): Southern pines and hardwoods

In 2005, Hurricanes Katrina and Rita, striking in rapid succession, caused extensive damage to property, forests, and living conditions, as well as significant loss of life. In Louisiana, Hurricane Katrina produced severe forest damage in portions of Washington, St. Tammany, and Tangipahoa Parishes, with lesser damage in St. Bernard, Plaquemines, St. Charles, St. Helena, Livingston, Jefferson, and St. James Parishes.

Abiotic and Other Damage

Aerial sketch-mapping indicated more than 200,000 acres of blown-down timber, exclusive of urban and suburban trees. Estimates of commercial timber losses are incomplete, but are currently set at approximate 3.0 billion board feet. Much of this timber will decay on-site before salvage can be affected. Effects were generally less severe to baldcypress than to other species. Future fire and insect problems can be expected to be exacerbated in areas with significant uprooting and breakage; effects from salinity due to storm surge flooding are also expected to become more apparent in 2006. Damage to nontimber values, including recreation and wildlife habitat, have yet to be evaluated.

In Louisiana, Hurricane Rita caused extensive wind damage in Cameron and Vermillion Parishes, but because of land use patterns, this produced little commercial timber damage. There was extensive moderate to light timber blow down in Calcasieu, Beauregard, Allen, and Vernon Parishes. Acreage estimates are not yet available, but estimates based on Forest Inventory and Analysis data indicate losses of approximately 1.4 billion board feet. In Texas, Orange, Jasper, and Newton Counties were hardest hit, but damage was seen as far inland as Angelina County. An estimated 771,000 acres of forest land were impacted, with anticipated losses of 967 million cubic feet of timber valued at $833 million. Mississippi reported damage both from hurricanes and from numerous associated tornados. Damage was most widespread in the southern third of the State. Alabama reported minor flooding and scattered wind damage from tornados and thunderstorms spun off by Hurricane Katrina. North Carolina reported limited forest damage along the coast from Hurricane Ophelia.

Damage to southern pine seed orchards occurred in 2005 as a result of Hurricanes Katrina and Rita. Hurricane Katrina was catastrophic to some orchards. The Erambert Seed Orchard (De Soto National Forest, Wiggins, MS) was extensively damaged, as was a commercial seed orchard in Louisiana. Many of the first-generation trees were lost, either to uprooting or to crown breakage. New orchard blocks with younger trees (generally less than 8 inches, diameter at breast height) were much less severely impacted. Rita caused moderate damage to seed orchards in east Texas and southwestern Louisiana.

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

Host(s): Hardwoods and softwoods

Sporadic hail damage occurred in Connecticut, but was not widespread. There was considerable breakage from ice storms, especially in northern areas. In Vermont, there was scattered breakage and mortality of various tree species following tropical storms, with increased windthrow due to wet soil conditions.

About 3,400 acres were damaged by winds in Minnesota.

Other

Region 9/Northeastern Area: Minnesota

Hosts(s): Aspen

There were 587 pockets of aspen with thin foliage throughout northern Minnesota this summer; the area totaled 410,500 acres. The trees had leaves but they were small, approximately the size of a nickel to a quarter. These trees often were the largest and oldest on the sites. This situation was not examined until late in the summer, making it somewhat difficult to make a positive determination of the cause. There appeared to be a number of different causes of this across the State. In most locations, insects did not appear to have been involved. In some places, spring frosts at the time of aspen leaf break killed portions of the tender new leaves and caused other trees to drop all their new leaves. In northeastern Minnesota, another common cause appeared to be stress from past years of forest tent caterpillar attack and drought. The affected trees were putting on little or no growth, and the shoot growth was abnormally short.

Appendices

Appendix A

Forested Areas*

About one-third of the Nation's land area, 748.9 million acres, is forested—384.3 million acres (51 percent) in the East, 237.8 million acres (32 percent) in the continental West, and 126.9 million acres (17 percent) in Alaska. By ownership nationwide, 43 percent of the acreage is in public ownership and 57 percent is in private ownership. Of the public ownership, 20 percent is in the East, 50 percent in the continental West, and 29 percent in Alaska. In contrast, 74 percent of the private ownership is in the East, 18 percent in the continental West, and 8 percent in Alaska.

Eastern hardwood forests make up 75 percent of all the forested acreage in the East. The largest component of the eastern hardwood forest type is oak-hickory, which occupies 133 million acres, or 35 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 55 million acres, or 14 percent, of the eastern forests and are located in the North.

The oak-pine forests occupy 34 million acres, or 9 percent, of the eastern forested acreage and are located in the South, as are the oak-gum-cypress forests, which occur on 31 million acres, or 8 percent, of the eastern forested acreage.

The aspen-birch forests occupy 18 million acres, or 5 percent, of the eastern forested acreage and are located in the North. The elm-ash-cottonwood forests on 14 million acres, or 4 percent, of the forested acreage are bottom land forests in both the North and South. Other forest types occupy 3 million acres, or 1 percent, of the forested acreage in the East.

Eastern softwood forests make up the remaining 25 percent of the eastern forested acreage. The loblolly-shortleaf pine forests occupy 54 million acres, or 14 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 17 million acres, or 5 percent, of the forested lands and the white-red-jack pine forest on 12 million acres, or 3 percent, of the forest lands; both are in the North.

Western hardwood forests occupy 50 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 40 million acres, or 11 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 19 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 19 million acres, or 5 percent, of the forested lands. The fir-spruce forests occupy 73 million acres, or 20 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 73 million acres, or 20 percent, of the forested land in the West.

The piñon juniper type occupies 52 million acres, or 14 percent, of the forested acreage.

Other western types (western white pine, larch, redwood, chaparral, and nonstocked areas) occupy 8 million acres, or 2 percent, of the western forested acreage.

* Data may not add to totals because of rounding

From: Smith, W. Brad; Miles, Patrick D.; Vissage, John S.; Pugh, Scott A. 2003. Forest resources of the United States, 2002. General Technical Report NC-241. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Research Station. 137 p.

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.