United States
Department of
Agriculture

Forest Service

FS-1000

June 2012

Major Forest Insect and Disease Conditions in the United States: 2011

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Compiled by Gary Man
Forest Health Protection

Disclaimer

Cover photo: *Spruce beetle mortality on the Wasatch Plateau overlooking Duck Fork Reservoir in Utah. USDA Forest Service photo.*

Preface

This report represents the 61st annual report on the major insect and disease conditions of the Nation's forests prepared by the Forest Service, an agency of the U.S. Department of Agriculture. The report focuses on the 20 major insects and diseases that annually cause defoliation and mortality in forests of the United States. The 2007 report, *Major Forest Insect and Disease Conditions in the United States 2007* (http://www.fs.fed.us/foresthealth/publications.shtml#reports) provides background information on the 20 insects and diseases described in this report and should be referenced if more detailed information is desired. This 2011 update provides a national summary of the major changes and status of these 20 forest pests with updated charts, tables, and maps. Additional information on these and other pests is available at http://foresthealth.info/.

The information in this report is provided by the Forest Health Protection program of the Forest Service and its State partners. This program serves all Federal lands, including the National Forest System, the lands administered by the U.S. Departments of Defense and the Interior, and tribal lands. The program also provides assistance to private landowners through the State foresters and other State agencies. Detecting and reporting insect and disease epidemics are key elements of the program. State and Forest Service program specialists regularly conduct detection and monitoring surveys.

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

United States Department of Agriculture

Forest Service
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Denver, CO 80225
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Albuquerque, NM 87102
505–842–3286

Forest Service
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1323 Club Drive
Vallejo, CA 94592
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Portland, OR 97208–3623
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Atlanta, GA 30309
404–347–3540

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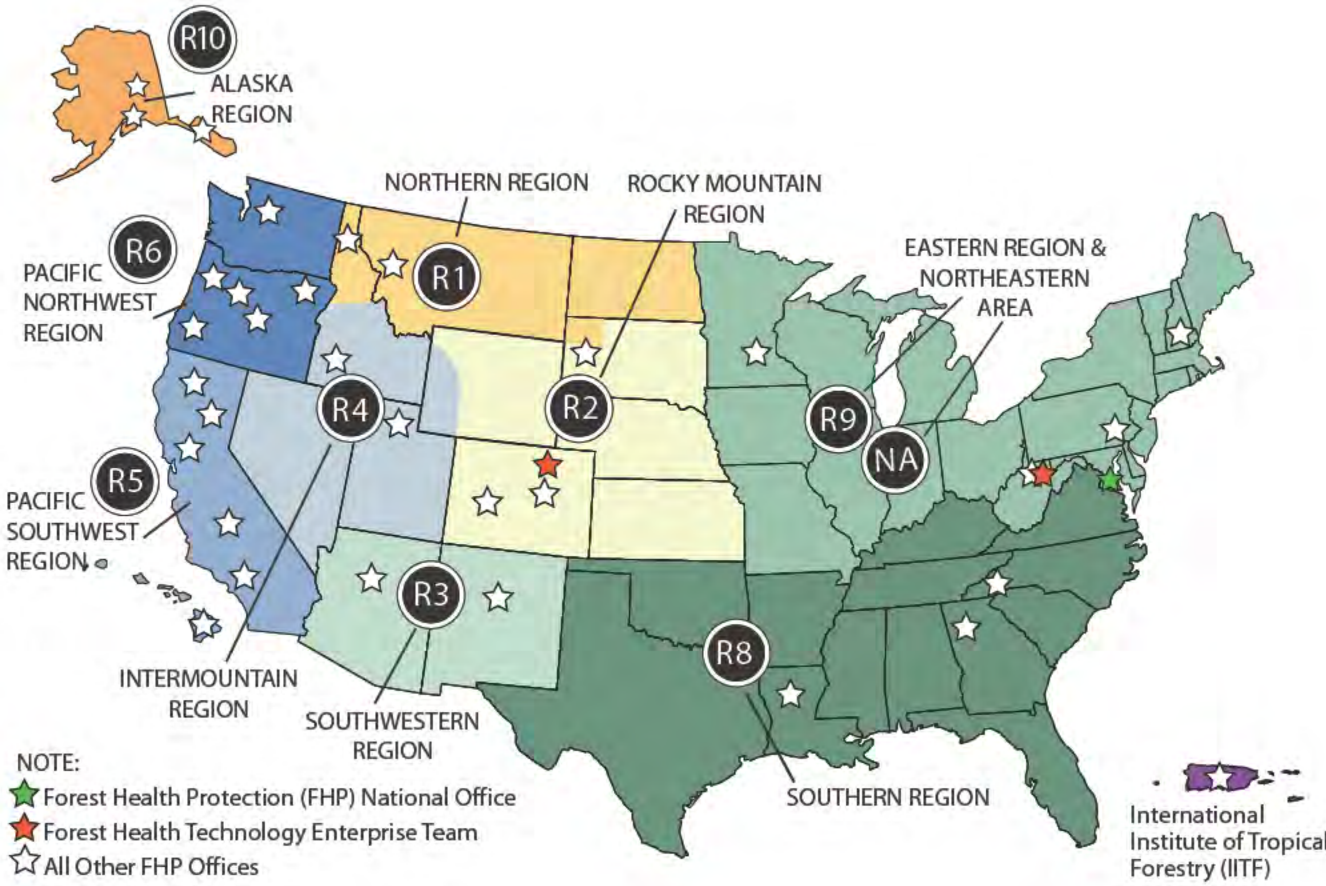
787–766–5335

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 and at http://www.fs.fed.us/foresthealth/publications.shtml#reports.

Contents

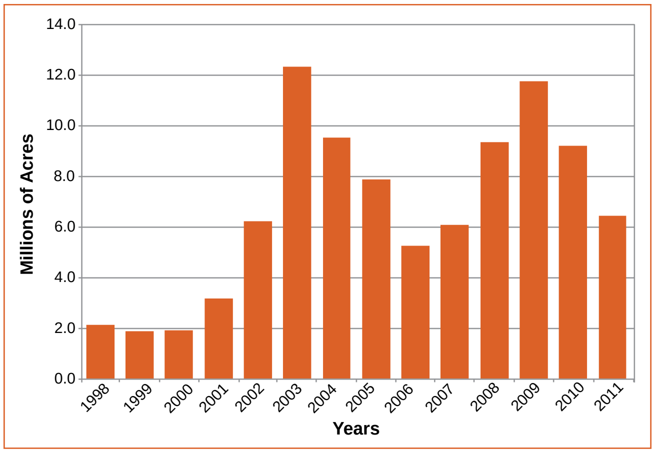
Executive Summary/Introduction

Insects and diseases play critical roles in both maintaining balance in healthy, functioning forests and causing catastrophic outbreaks and forest loss. These critical roles affect the more than 750 million acres classified as forest land and millions more acres with trees in urban areas that provide a wide array of services and commodities, such as timber and other forest products, recreation, wildlife, clean water, energy, and jobs. Determining the extent and intensity of insects and diseases through surveys is an important tool to help prioritize actions to be taken by Federal agencies, States, and other stakeholders so that forests are healthy and sustained for generations. As occurs with most biological systems, the overall mortality that insects and diseases cause varies from year to year and pest to pest. Figure 1 illustrates how mortality has varied over the past 14 years.

Acres of Tree Mortality Caused by Insects and Diseases

In 2011, more than 6.4 million acres with mortality caused by insects and diseases were reported nationally, a 2.8-million-acre decrease from 2010, when 9.2 million acres with mortality were reported. During the past 2 years, progressively fewer acres with mortality have been reported, perhaps indicating a downward trend as compared with 2009, when 11.8 million acres with mortality were reported. Slightly more than 59 percent of the mortality was caused by one pest, the mountain pine beetle, a native insect found in Western U.S. forests. Although mortality is represented in the chart, defoliation can have significant effects on our forests. The western spruce budworm caused more than 4.5 million acres of defoliation damage in 2011, nearly twice the reported damage in 2010. Reports of European gypsy moth defoliation decreased more than 99 percent from the previous year, when gypsy moth caterpillars defoliated only 4,822 acres. A single defoliation event does not usually cause tree mortality; however, taken together with continued attacks or severe abiotic factors, such as weather and drought, trees can succumb to these defoliating insects.

Figure 1.—*Surveyed acres of mortality from 1998 to 2011.*



Readers should use caution in interpreting the maps in this document because they are displayed at the county scale. If damage was reported at just one location in the county, the whole county is noted as affected. The reason for this protocol is that, for some pests, data are collected only at the county level. Also, if damage was reported at a finer pixel level, many areas would not show up at the scale used in this publication. For instance, numerous counties reported southern pine beetle mortality in 2011, but most individual infestations are small and, when added together, affect a little more than 7,004 acres of mortality. In addition, the maps represent only what is reported as mortality or defoliation and not necessarily the total infestation of a pest. In any given year, some areas are not surveyed because of physical limitations, such as forest fires, weather events, or limited resources.

Every year, hundreds of native and nonnative insects and diseases damage our Nation's forests. In the following pages, we describe 20 of the major insects and diseases that contribute to annual mortality and defoliation. In addition, we have included a Pests To Watch section for pests that have the potential to become major threats and that we are monitoring.

Mountain Pine Beetle

Dendroctonus ponderosae Hopkins

In 2011, surveys detected more than 3.8 million acres with mountain pine beetle (MPB) mortality, a decrease of 3.0 million acres from the number of acres detected in 2010 (fig. 1). Colorado, Idaho, Montana, and Wyoming continue to report high mortality levels (figs. 2 and 3).

Region 1—Idaho and Montana

In the Northern Region, during 2011, aerial surveys detected fewer acres with MPB mortality and fewer trees killed to levels approximately one-third of the levels in 2010, although some localized areas are experiencing continued or increased activity. Increases have been most notable in eastern Montana and northern Idaho in ponderosa pine and western white pine forests.

Figure 1.—*Mountain pine beetle activity decreased significantly in 2011 in much of the Western United States.*

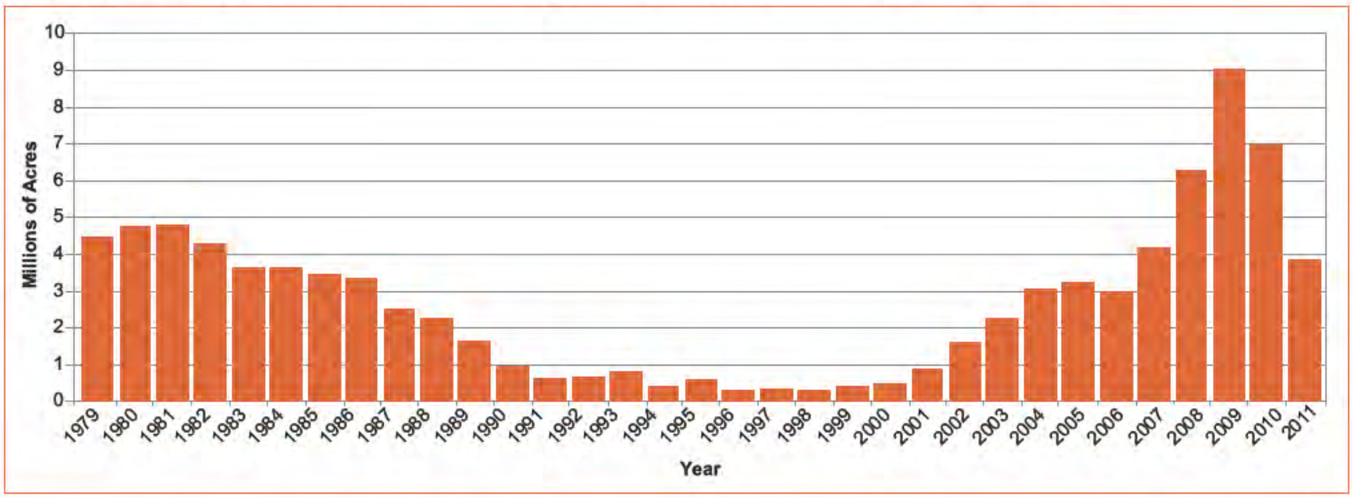


Figure 2.—*Mountain pine beetle mortality in 2011 by State.*

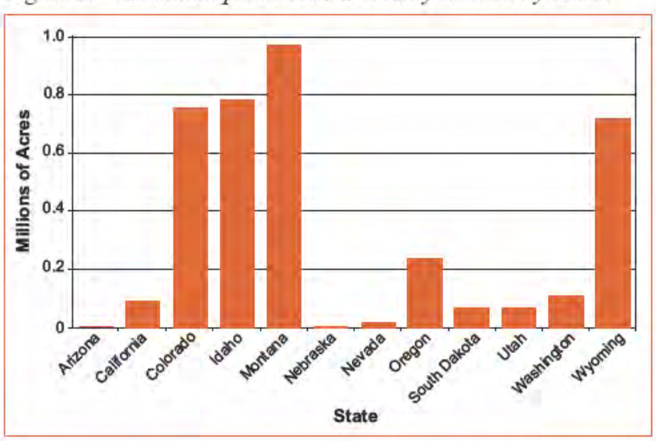
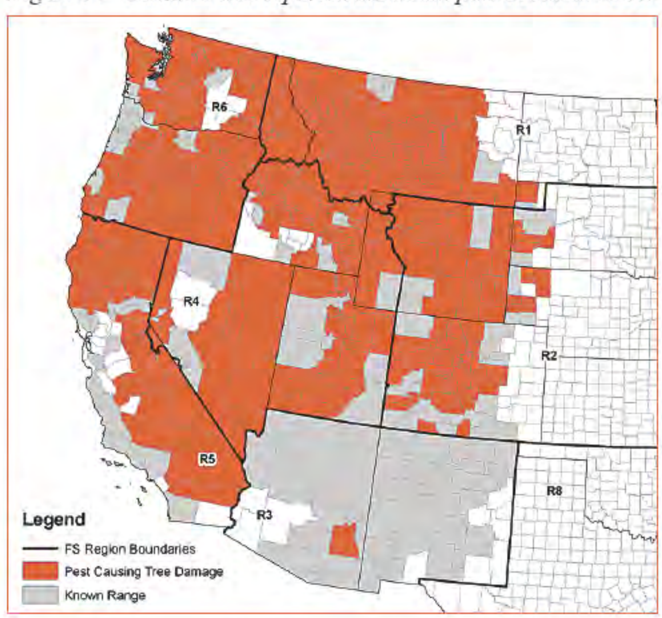


Figure 3.—*Counties that reported mountain pine beetle in 2011.*



Most MPB-caused mortality is recorded on Forest Service-managed lands, although 58 percent of the ponderosa pine mortality (mostly in Montana) was noted on other ownership types, principally private lands (38 percent of total). Aerial surveys on National Forest System lands showed greatest increases in MPB-caused mortality of ponderosa pine on the Lewis and Clark National Forest (~ 16.6 percent of all acres), the Bitterroot National Forest (> 13 percent of all acres), and the Lolo National Forest (> 6 percent of all acres). Mortality continues to be recorded on the Helena National Forest (~ 6 percent of all acres). Mortality in whitebark pine was most notable on the Beaverhead, Custer, and Gallatin National Forests. Mortality in lodgepole pine continues where this species is present with significant activity on the Beaverhead-Deerlodge, Bitterroot, Gallatin, Lewis and Clark, and Lolo National Forests.

Northern Idaho exhibited a decrease in the acreage of infested areas, down nearly 80 percent from the 2010 survey. Activity continues on and around the Clearwater, Nez Perce, and St. Joe National Forests but at decreased levels; activity continued on the Coeur d'Alene and Kaniksu National Forests. Although the 2011 survey recorded more than 83 percent fewer acres with mortality, the estimate of numbers of trees killed was down about 60 percent from 2010.

In western Montana, fewer infested acres were recorded in 2011, down about 50 percent from 2010. The total recorded number of trees killed decreased by about 65 percent from 2010 and by 80 percent from the 2009 survey. The most heavily infested areas remained the Beaverhead-Deerlodge, Bitterroot, Helena, and Lewis and Clark National Forests, and surrounding areas, with significant increases on the Lolo National Forest.

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

The MPB epidemic in northern Colorado and southeastern Wyoming continues, although the populations rapidly decline west of the Continental Divide (Grand, Jackson, Routt, and Summit Counties) in 2011. East of the Continental Divide, Front Range counties experienced a variety of epidemic MPB conditions; populations declined in several Front Range areas, including Gilpin and Park Counties, and, along the northern Front Range, epidemic levels of MPB populations remained about the same in Boulder and Jefferson Counties but continued to increase in Larimer County. MPB mortality occurred in four host tree species, including lodgepole pine (fig. 4), ponderosa pine, limber pine, and Rocky Mountain bristlecone pine. The spread of MPB from high-elevation lodgepole pine forests into low-elevation ponderosa pine forests occurred readily in Larimer and northern Boulder Counties, affecting more densely populated wildland-urban interface communities on the Front Range. Ornamental pine plantings are being lost to MPB near Colorado's State capital, Denver. MPB is killing lodgepole pine in large numbers, particularly in the vicinities of Aspen and Vail, CO. Although a number of sites are experiencing MPB activity within the southern part of the State, these outbreaks do not approach the levels seen in the northern portions of the State.

In southeastern Wyoming, the MPB populations continue to rapidly decline in Albany, Carbon, and Laramie Counties because of host-tree depletion. Ornamental pine trees are being lost to MPB in Wyoming's State capital, Cheyenne. Fremont, Park, and

Figure 4.—*Mountain pine beetle mortality on lodgepole pine. USDA Forest Service photo.*

Sublette Counties are experiencing stand-replacing mortality of whitebark pine because of MPB. The Absaroka and Wind River mountains on the Shoshone National Forest continue to have localized areas with heavy mortality caused by MPB.

Crook and Weston Counties in the Black Hills of South Dakota continue to report mortality that MPB caused. The MPB epidemic in the Black Hills, which originally was concentrated on Federal land, now occurs on private lands, primarily in the central Black Hills area, although infestations are now becoming more common in the northern Black Hills as well.

In Nebraska, MPB continues to cause scattered mortality in the Wildcat Hills and the Pine Ridge in both rural and urban areas of Scotts Bluff and Dawes Counties.

Region 3—Arizona and New Mexico

In contrast to Colorado and other Rocky Mountain States, Arizona and New Mexico have little MPB activity. Occasional individual ponderosa pine trees have been observed with MPB in prior years, but no major recent outbreaks have occurred. Bark beetle activity in ponderosa pine forests in New Mexico tends to be a combination of *Ips*, western, and roundheaded pine beetles.

Region 4—Idaho, Nevada, Utah, and Wyoming

In the Intermountain Region, MPB-caused tree mortality decreased by 67 percent in 2011 as compared with 2010. The reduction in tree mortality is because of exhaustion of large-diameter and suitable host trees. Most of the tree mortality occurred in south-central Idaho where it increased on the Payette National Forest but decreased on the Boise, Caribou-Targhee, Salmon-Challis, and Sawtooth National Forests (fig. 5). In Utah, MPB-caused tree mortality decreased by 75 percent in 2011, which is the first decrease in tree mortality since 2003. In western Wyoming, tree mortality decreased by 78 percent on the Bridger-Teton National Forest. In Nevada, MPB-caused tree mortality decreased 40 percent. Although MPB-caused tree mortality has decreased, the MPB population is still at outbreak levels in many areas.

Region 5—California

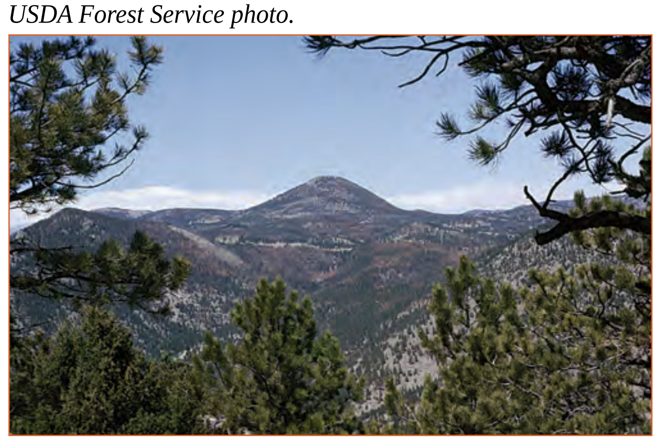
MPB continued to cause high levels of mortality of pine species in 2011. The most significant mortality areas were in whitebark and lodgepole pine stands on Mt. Shasta, the Warner Mountain range, and the areas surrounding June Mountain on the Inyo National Forest. MPB-caused mortality of whitebark pine continues to be a concern in California.

Region 6—Oregon and Washington

MPB historically has caused the largest amount of tree mortality for any bark beetle found throughout Oregon and Washington. The acres affected by MPB in all host types in the Pacific Northwest continued a 9-year downward trend in affected acres as determined by aerial surveys. MPB continued to cause mortality in lodgepole, western white, whitebark, and ponderosa pine. The vast majority of mortality was on National Forest System lands. Most heavily affected areas of MPB mortality include the Colville, Deschutes, Fremont, Ochoco, Okanogan-Wenatchee, Wallow-Whitman, and Winema National Forests. Mortality caused by MPB was also recorded in Crater Lake National Park, Yakama Indian Reservation, and Colville Indian Reservation.

MPB mapped in the sugar pine type had the largest number of reported acres since 1992. Most heavily affected areas were on Forest Service lands on the Winema National Forest within Klamath County, OR.

Figure 5.—*Mountain pine beetle mortality on ponderosa pine. USDA Forest Service photo.*

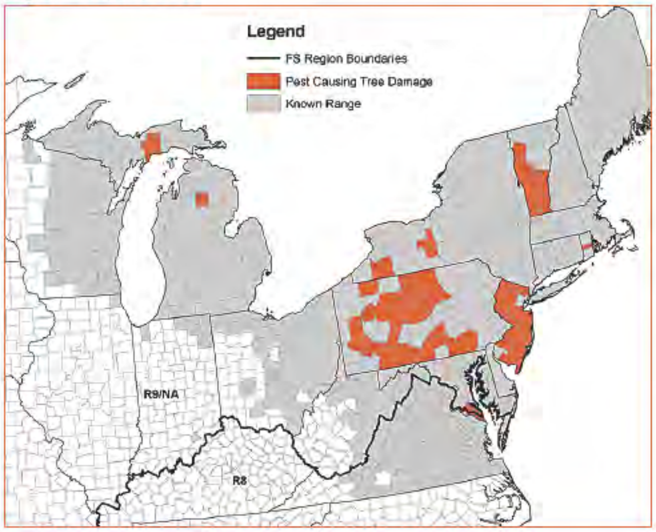


Gypsy Moth

Lymantria dispar Linnaeus

Gypsy moth (GM) is permanently established in all or parts of 18 States and the District of Columbia (fig. 1 and table 1). Periodic outbreak episodes across the generally infested area and defoliation can be widespread and severe enough to cause tree mortality. The insect is usually active somewhere in the generally infested area each year. In 2011, 4,827 acres with defoliation were reported as compared with 1,207,305 acres reported in 2010 (fig. 2).

Figure 1.—*Counties that reported gypsy moth mortality and defoliation in 2011.*

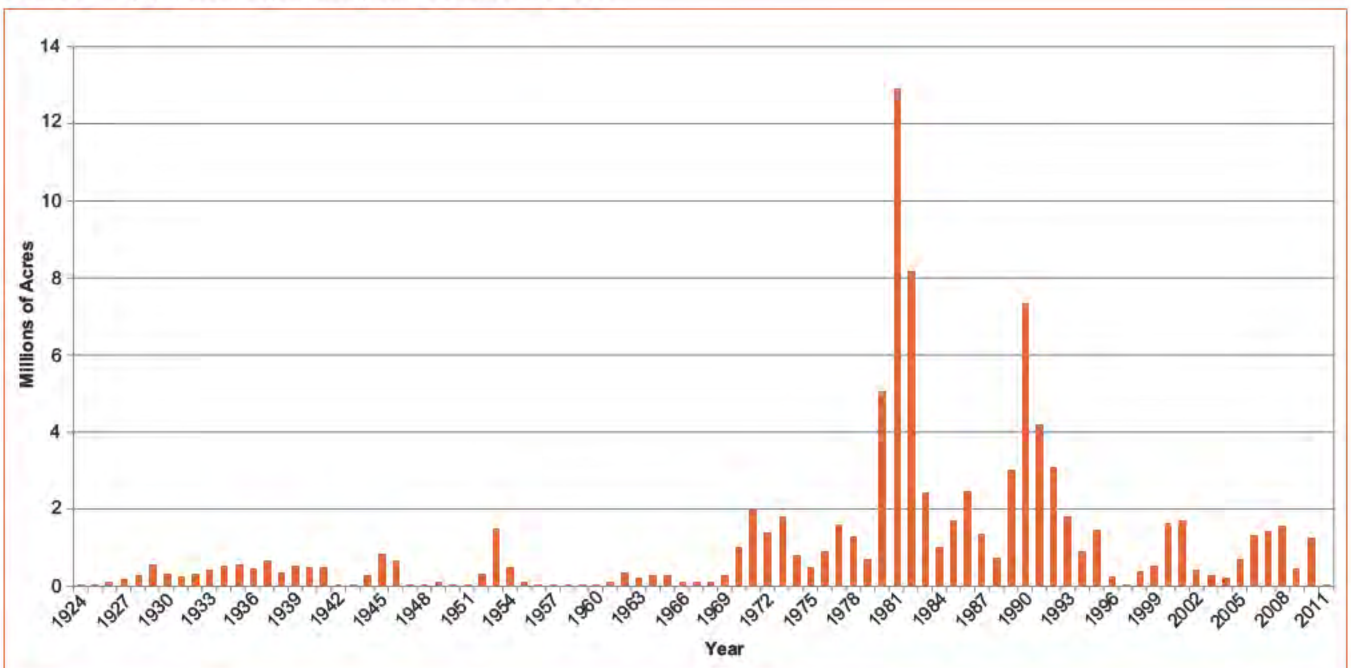


The wet spring of 2009 and the resultant effect of the pathogenic fungus *Entomophaga maimaiga* decimated GM populations throughout the South and Northeast where GM is present. Successive wet springs in 2010 and 2011 did not allow populations to recover sufficiently to cause any detectable defoliation in many areas.

Table 1.—*Gypsy moth defoliation (only) by State in 2011.*

State	Acres Defoliated
Maryland	38
Michigan	1,047
New Jersey	1,314
New York	2,423
Pennsylvania	5
Total	4,827

Figure 2.—*Gypsy moth defoliation from 1924 through 2011.*



Defoliation caused by GM in Michigan was reported at very low levels in 2011 (1,047 acres) as compared with 2010, when 941,981 acres with defoliation were reported.

In 2011, GM defoliation was detected and reported in New York. Vermont reported light defoliation in Addison, Bennington, Chittenden, Rutland, Windham, and Windsor Counties (fig. 3). Minimal defoliation was recorded in Massachusetts, although plots in the central part of the State showed increases in egg mass counts. In Maryland, GM defoliation was reported especially in St. Mary's County. In New Jersey, defoliation was reported at low levels and appears to be declining. In Pennsylvania, the GM population continued to remain low across the State after the 2009 epizootic of fungal pathogen *Entomophaga maimaiga* and Nuclear Polyhedral Virus (NPV). No defoliation was reported in Connecticut, Illinois, Indiana, Iowa, Maine, Minnesota, Ohio, Rhode Island, Virginia, West Virginia, and Wisconsin.

Figure 3.—*General defoliation by larvae. Photo by Chris Asaro, Virginia Department of Forestry.*

Southern Pine Beetle

Dendroctonus frontalis Zimmermann

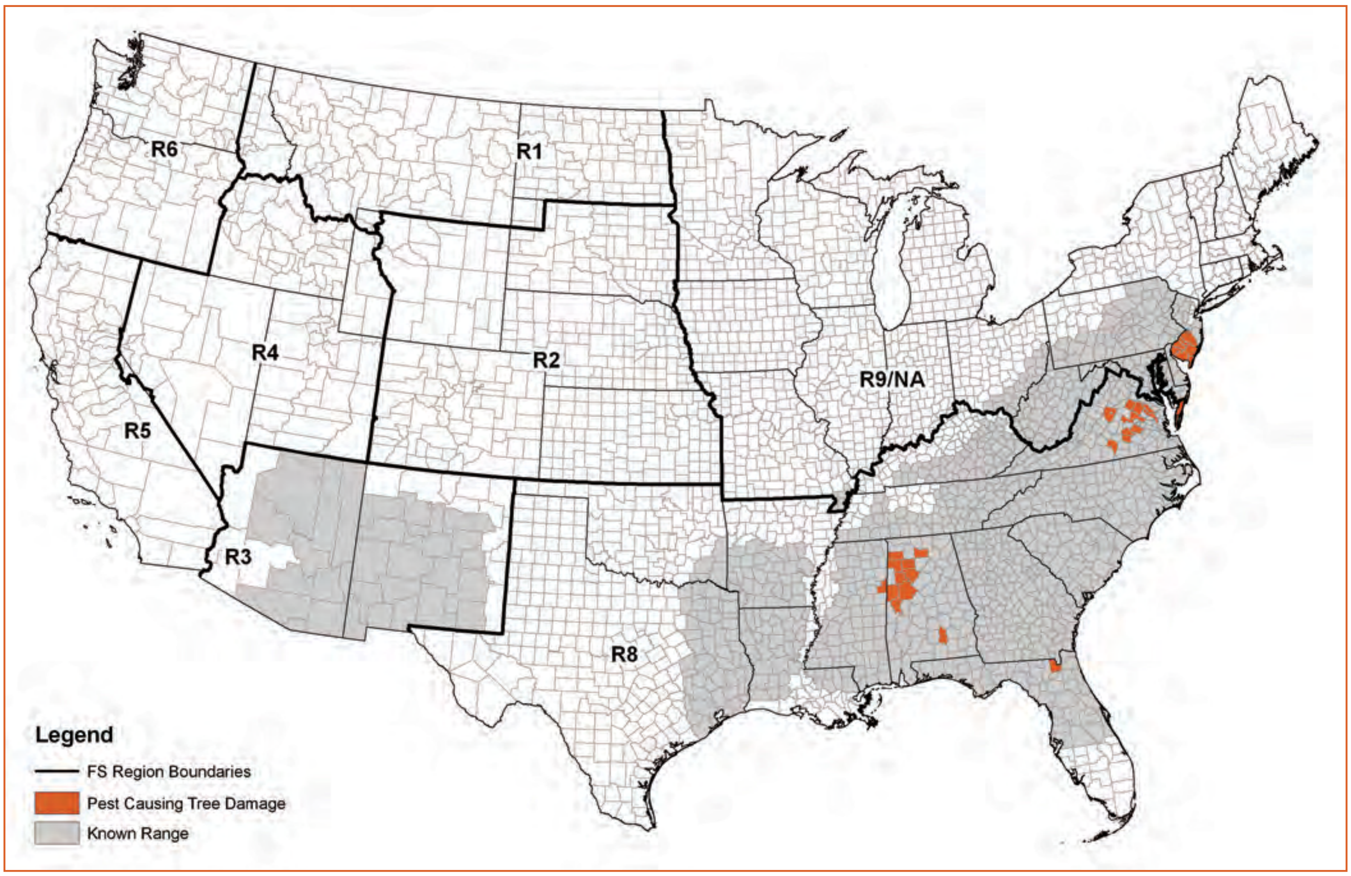
Southern pine beetle (SPB) populations remained at historically low levels across the South in 2011 and populations in New Jersey declined (figs. 1 and 2). A total of 7,004 acres with SPB mortality was reported in 2011.

A total of 62 SPB infestation spots was detected and mapped during 2011 in the Southeastern United States. Only 4 States reported SPB activity, with 31 spots in Virginia, 28 in Alabama, 2 in Mississippi, and 1 in Florida (table 1). All but two infestations were located on nonindustrial, private forest lands. Most infestations were less than 0.5 acres, with the exception of several large spots in Virginia (figs. 3 and 4). SPB activity and damage have remained at very low levels across the South since the mid-2000s. Expanding infestations have not been detected west of the Mississippi River since 1999.

No SPB infestations were observed in 2011 in Delaware or Maryland.

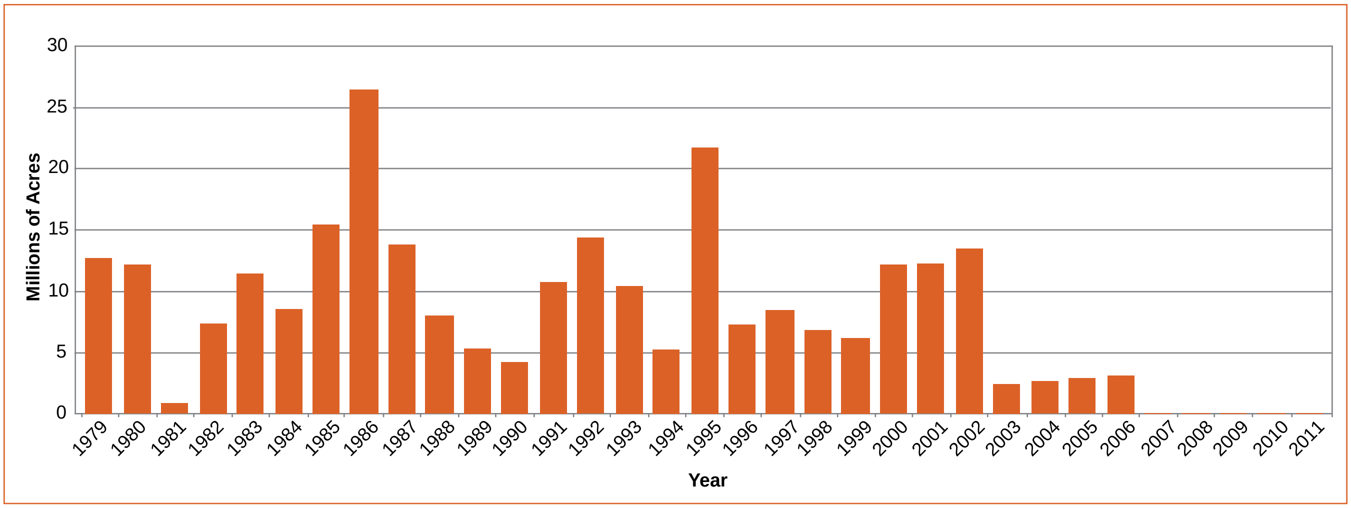
In New Jersey, surveys are done through trapping, aerial detection, and select ground verification. SPB damage appears to be less than one-half of what was detected in 2010. Less than one-half of infestations were located on State lands, and the remaining infestations were located on other ownership lands, including private, municipal, county, and Federal properties.

Figure 1.—*Counties that reported southern pine beetle infestations in 2011.*



NA = Northeastern Area.

Figure 2.—*Southern pine beetle (SPB) outbreaks, 1979 to 2011.*



Note: The surveys after 2007 counted outbreak acres differently than in previous years. Previously, all acres in the county were counted if a single spot was positive for SPBs. The surveys after 2007 reflect only the estimated actual areas affected by SPBs.

Table 1.—*Southern pine beetle activity by State in 2011.*

State	Acres Infested	Number of Spots[1]
Alabama	5	28
Florida	2	1
Mississippi	2	2
New Jersey[2]	6,786	0
Virginia	209	48
Total	**7,004**	**79**

[1] Spot size and density vary, so the number of spots does not directly correlate to the number of acres infested.

[2] Acres infested include mostly lightly scattered mortality. No spot information is available for New Jersey.

Figure 3.—*Southern pine beetle mortality in Virginia. Photo by Chris Asaro, Virginia Department of Forestry.*

Figure 4.—*Scattered southern pine beetle mortality in Virginia. Photo by Chris Asaro, Virginia Department of Forestry.*

Emerald Ash Borer

Agrilus planipennis Fairmaire

As of 2011, the emerald ash borer (EAB) was found in 15 States (fig. 1).

In Kentucky, six new counties (Anderson, Boyle, Bracken, Garrard, Hardin, and Scott) confirmed EAB infestation in 2011. A 20-county quarantine remains in place where damage is variable.

No new counties were determined to be infested in Virginia. The number of infested counties remains at four. Seven counties are under Federal quarantine.

In Tennessee, four new counties (Blount, Claiborne, Grainger, and Sevier) confirmed EAB infestation during 2011.

In Maryland, ground surveys indicate increasing levels of damage from EAB. Three new counties (Allegany, Howard, and Washington) were added to the Federal quarantine in 2011 (fig. 2). The estimated size of the current known infestations in Maryland is approximately 476.3 square miles.

Ohio reported four new counties with positive finds: Geauga, Lake, Shelby, and Trumbell. EAB is now reported in 57 of 88 counties in Ohio.

West Virginia, through ground surveys and trapping, reported 17 counties with EAB infestations. Counties infested with EAB include Berkeley, Brooke, Calhoun, Clay, Fayette, Gilmer, Greenbrier, Hancock, Kanawha, Mingo, Morgan, Nicholas, Raleigh, Roane, Summers, Webster, and Wirt.

Sizeable infestations were reported in Pennsylvania with three new counties (Albany, Erie, and Orange) confirmed positive for EAB.

Minnesota reported one new infested county: Winona. Wisconsin reported two newly infested counties: La Cross and Racine. Illinois reported two new counties—Effingham and Marion—in southern Illinois. This expanded infestation represents a 70- to 100-mile advance from the previous 2010 find in Champaign County in east-central Illinois.

New York confirmed three new counties (Albany, Erie, and Orange) were infested with EAB. Detection of EAB in Albany and Orange Counties was by purple trap catches and in Erie County was by citizens and tree-care professionals.

Figure 1.— *Counties quarantined as a result of the emerald ash borer infestation as of 2011.*

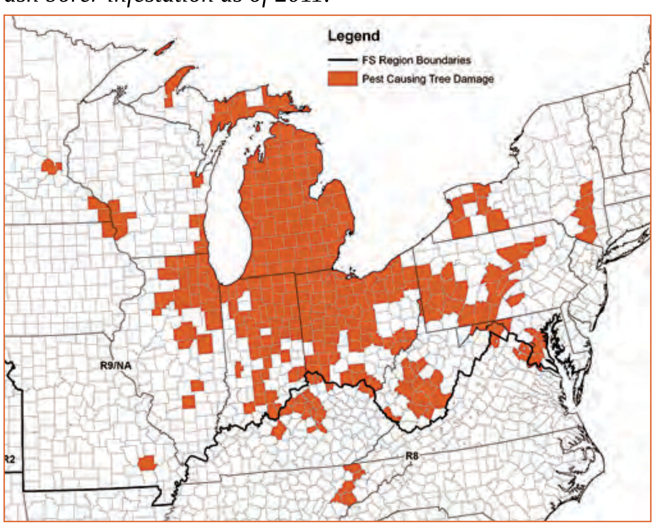


Figure 2.—*Exit holes from emerald ash borer. Photo by Joseph O'Brien, USDA Forest Service.*

In Indiana, an aerial survey was conducted to map new locations and the expansion of EAB-caused mortality. Most of the mortality is in Huntington and Wabash Counties, followed by Orange, Lawrence, and Washington Counties. Mortality increased significantly from 2010 in Carmel, Fishers, Indianapolis, and Winchester Counties.

The Lower Peninsula of Michigan is mostly EAB infested. In the Upper Peninsula, EAB is found in several counties throughout the peninsula and is expected to continue spreading through the rest of the ash resource (fig. 3).

Figure 3.—*Ash trees killed by emerald ash borer in a woodlot on the Michigan State University campus. Photo by Leah Bauer, USDA Forest Service.*

Sudden Oak Death

Phytophthora ramorum Werres et al.

Sudden Oak Death continues to cause mortality in Curry County, OR; the pathogen was first detected in 2001 by aerial survey. Tanoak continues to be the primary inoculum source and the main host affected by this disease.

Following two successive springs with adequate rainfall in California, many new symptomatic tanoaks have been reported in 2011, but no new counties reported mortality (fig. 1). A total of 13 counties to date have reported mortality (fig. 2). Aerial surveys detected an increase in coast live oak and tanoak mortality in Sonoma and southern Humboldt Counties (fig. 3).

Figure 1.—*Coast live oak mortality at China Camp State Park in California. Photo by Joseph O'Brien, USDA Forest Service.*

Figure 2.—*Counties that reported Sudden Oak Death in 2011.*

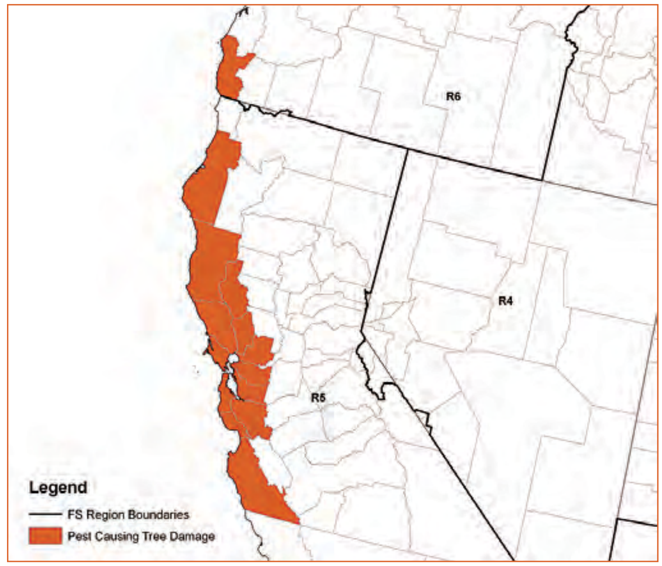


Figure 3.—*Bleeding on bark surface of coast live oak, caused by* Phytophthora ramorum. *Photo by Joseph O'Brien, USDA Forest Service.*

Spruce Beetle

Dendroctonus rufipennis Kirby

Spruce beetle (SB) continued to cause significant mortality in northern Colorado and southeastern Wyoming. The total number of acres reported nationally with mortality in 2011 was more than 428,300 acres, similar to the number of acres reported in 2010 (fig. 1).

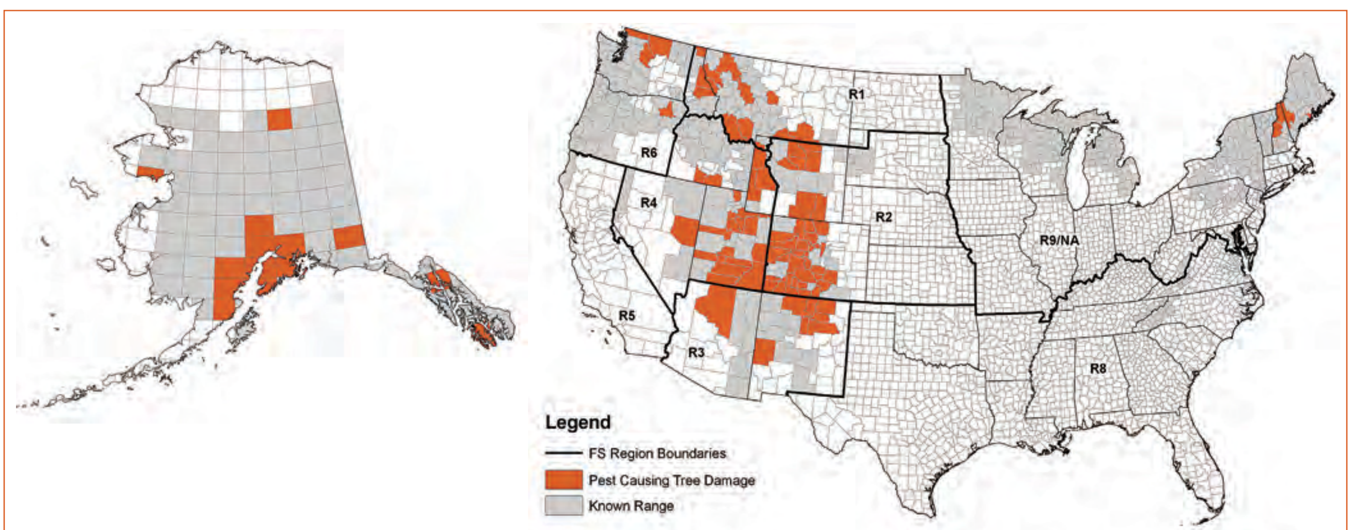
The acreage in Alaska infested by SBs in 2011 declined from 2010 levels, resulting in the lowest acreage recorded in more than 35 years. Most of the current activity (91 percent) is in southwestern and south-central Alaska. The most heavily affected areas are within Katmai and Lake Clark National Parks and the Kenai National Wildlife Refuge. Other smaller, yet significant, areas of activity exist outside those national interest lands. What these infestations lack in size relative to the outbreaks of the 1980s and 1990s is more than made up for by their intensity.

Acres with mortality in Oregon and Washington attributed to SB in Engelmann spruce were down slightly in 2011 from 2010 levels, to their lowest level since 2000. Some of this downward trend could be attributed to an aggressive, multiple year outbreak in Washington State that has been depleting the susceptible host type. Nearly 82 percent of the area affected occurred within the Pasayten Wilderness in Okanogan County. Estimated tree mortality per acre in 2011 was relatively heavy.

The SB epidemic in northern Colorado and southeastern Wyoming continued in high-elevation Engelmann spruce forests. Mortality in Colorado was most conspicuous along the Medicine Bow Mountains in Grand, Jackson, and Larimer Counties, with scattered pockets of spruce mortality along various mountain ranges in Clear Creek, Jefferson, Routt, and Summit Counties.

Activity of SB is currently at epidemic levels throughout the south-central Rocky Mountains. Drought-induced stress occurring nearly a decade ago, in conjunction with wind-throw events, appears to be responsible for the initiation of the current outbreaks. SB populations are rapidly expanding in some areas, causing entire drainages to be infested in the course of 1 year. Outbreaks in southern Colorado are ongoing on the Grand Mesa, incipient in the Wet Mountains, declining in the Weiminuche Wilderness because of host depletion, and expanding into new areas in the eastern San Juan Rio Grande National Forests. The latter outbreak, first detected in 2004 in the San Juan Mountains and Weiminuche Wilderness Area, has killed most of the mature spruce in the eastern San Juan

Figure 1.—*Spruce beetle-caused tree mortality detected in 2011 by aerial detection surveys.*



NA = Northeastern Area.

Mountains, has continued into the headwaters of the Rio Grande drainage, and now is moving north and starting to impinge on the southern portions of the Gunnison National Forest. This outbreak has been particularly striking in the intensity of the beetle activity. In some cases, every mature spruce above pole size has been killed in multiple drainages, from the creek bottoms all the way to the high-elevation krummholz.

In Wyoming, the SB continued at epidemic levels on the Sierra Madre, Snowy Range, and Medicine Bow Mountains in Albany and Carbon Counties. In northwestern Wyoming, in and adjacent to the Shoshone National Forest, the SB attack continues in areas not already host-depleted in the Absaroka Mountains and is slightly increasing in portions of the Wind River Range. In north-central Wyoming, SB-caused mortality continues in localized areas in the northern Big Horn Mountains in Big Horn, Sheridan, and Johnson Counties.

Estimates for SB-caused mortality for the Northern Region (Idaho and Montana) decreased in 2011 relative to 2010. Beetle populations remained endemic throughout most of northern Idaho and Montana, except for two locations in south-central Montana. Outbreak populations of SB continued on federally managed lands in the Gravelly Mountains, in the Beaverhead-Deerlodge National Forest, and within the Rock Creek drainage, Custer National Forest. Ground surveys identified that groups of beetle-caused mortality typically ranged from two to five trees and were spatially adjacent to 2010 infected Engelmann spruce.

In the Intermountain Region, SB-caused mortality decreased slightly overall (fig. 2). Outbreak populations of the insect are still occurring in some locations, however. Most of the SB mortality was mapped in Utah on national forests (fig. 3). The most abundant tree mortality was mapped on the Uinta-Wasatch Cache and Fishlake National Forests. Spruce mortality also occurred on private lands in Utah. In western Wyoming, spruce mortality was mapped on the northern portion of the Bridger-Teton National Forest. Scattered and isolated spruce mortality was mapped in southern Idaho. No spruce mortality was reported in Nevada.

In New Mexico, some areas of suspected SB activity on the Carson and Santa Fe National Forests were mapped during aerial detection surveys during 2011. Ground visits to the northern part of the Carson National Forest adjacent to the Rio Grande National Forest in Colorado, where a large SB outbreak is occurring, found no evidence of SB activity along the New Mexico side of the State border.

Figure 2.—*Spruce beetle mortality at a dispersed recreation site on the Manti-La Sal National Forest in Utah. Photo by Steve Munson, USDA Forest Service.*

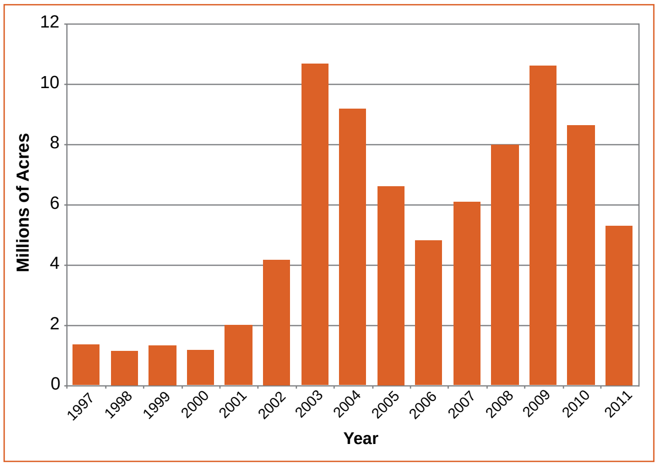
Figure 3.—*Fading spruce caused by spruce beetle on the Manti-La Sal National Forest in Utah. Photo by Steve Munson, USDA Forest Service*

Western Bark Beetles

Numerous Species

Mortality caused by the western bark beetle (WBB) in 2011 declined significantly compared with mortality in 2010, primarily because of the decreases in mountain pine beetle mortality. In 2011, nearly 5.3 million acres of WBB-induced mortality were reported (fig. 1). The following section describes the conditions of selected WBB reported for 2011 (table 1).

Figure 1.—*Western bark beetle outbreaks from 1997 to 2011.*



Douglas-Fir Beetle

Acres mapped with mortality attributed to Douglas-fir beetle (DFB) were at their lowest level since 1997 in Oregon and Washington. Some of the most heavily affected areas include

Table 1.—*Trends for selected western bark beetles and infested acres detected in aerial surveys during 2011.*

Bark Beetle(s)	Host(s)	Acres Detected With Bark Beetle Activity in 2011*	Trend
Mountain pine beetle, *Dendroctonus ponderosae* Hopkins	Ponderosa pine (*Pinus ponderosa* C. Lawson), lodgepole pine (*P. contorta* Douglas ex Louden), white pines, and others (*Pinus spp.*)	3,724,964	Decreasing across much of the West. The cause for the decline is probably a combination of weather, lack of host material, and some areas not surveyed.
Spruce beetle, *Dendroctonus rufipennis* (Kirby)	Engelmann spruce (*Picea engelmannii* Parry ex Engelm.), white spruce (*P. glauca* [Moench] Voss), Sitka spruce (*P. sitchensis* [Bong.] Carr.)	428,169	Southern Colorado reports large active spruce beetle outbreaks. Spruce beetle activity is high throughout much of Wyoming.
Douglas-fir beetle, *Dendroctonus pseudotsugae* Hopkins	Douglas-fir (*Pseudotsuga menziesii*)	159,691	Overall, the trend is decreasing to their lowest levels since 1997. Southern Idaho and New Mexico reported an increase in mortality.
Jeffrey pine beetle, *Dendroctonus jeffreyi* Hopkins	Jeffrey pine (*Pinus jeffreyi* Balf.)	8,509	Populations remain low across the range, with some local areas increasing.
Western pine beetle, *Dendroctonus brevicomis* LeConte	Ponderosa pine, Coulter pine (*Pinus coulteri* D. Don)	204,232	Total acres with mortality are slightly decreasing from 2010, but still increasing in some areas of New Mexico and Arizona.
Western balsam bark beetle, *Dryocoetes confusus* Swaine	Subalpine fir (*Abies lasiocarpa* [Hook. Nutt].)	22,562	Significantly declining in most areas.
Fir engraver beetle, *Scolytus ventralis* LeConte	True firs (*Abies* spp.)	323,334	Significant decrease in mortality, with some localized outbreaks in northern California and New Mexico.
Pine engraver beetle, *Ips pini* (Say), Arizona five spined ips, *Ips lecontei* Swaine	Ponderosa pine	8,766	Acres affected increased in 2011, but still not to the levels of 2003.
Pinyon ips, *Ips confusus* (LeConte)	Pinyon pine (*Pinus edulis* Engelm.), singleleaf pinyon (*P. monophylla* Torr. & Fen.)	4,526	Acres affected have declined dramatically since the 2003 peak with improved moisture.

** The number of dead trees per acre varies.*

the Columbia River Gorge National Scenic Area, Hells Canyon National Recreation Area, and the Okanogan and Umatilla National Forests (fig. 2).

Douglas-fir tree mortality from DFB was observed throughout New Mexico during the 2011 aerial detection surveys. Most activity was in the northern part of the State on the Carson and Santa Fe National Forests. Some activity was also observed in the Sacramento Mountains. Beetles were found in mature Douglas-fir trees on the Mescalero Apache Indian Reservation. This collection is the first from this area. Limited DFB-caused tree mortality was observed across Arizona in 2011.

Numerous small infestations of DFB were identified in stands of Douglas-fir throughout northern Colorado. The most affected counties included Douglas, El Paso, Jackson, Jefferson, and Routt. DFB activity is currently higher than usual throughout the south-central Rocky Mountains.

The recorded number of acres of DFB-caused mortality decreased in Idaho and Montana from 2010 to 2011. Tree mortality was primarily detected in isolated pockets that were scattered throughout the region. Most DFB-caused mortality (82 percent) was detected on federally managed lands in Montana and northern Idaho. DFB-caused mortality was observed in association with prior western spruce budworm defoliation through ground surveys in Montana within the Bitterroot, Gallatin, and Helena National Forests.

In the Intermountain Region of southern Idaho, Nevada, and Utah, DFB-caused tree mortality more than doubled in 2011. Increased mortality of Douglas-fir trees to DFB may be because of stress caused by several years of defoliation by western spruce budworm and increased DFB populations from the 2007 fire-damaged trees. Most of the 2011 Douglas-fir mortality was mapped in southern Idaho. Tree mortality increased on the Boise, Payette, Salmon-Challis, and Sawtooth National Forest.

Figure 2.—*Spot infestation caused by Douglas-fir beetle. Photo by Daniel Miller, USDA Forest Service.*

In Utah, Douglas-fir mortality increased on the Ashley National Forest and private lands but decreased on all other ownership lands. DFB activity decreased in all areas except within Clearwater National Forest, where DFB activity continued at levels similar to those in 2010.

In California, DFB was associated with dead and downed trees in Humboldt and Mendocino Counties. The beetle was also associated with the mortality of bear-damaged Douglas-fir near Orick in Humboldt County.

Jeffrey Pine Beetle

Jeffrey pine mortality caused by Jeffrey pine beetle (JPB) was very limited throughout California in 2011. Areas within the Lake Tahoe Basin and locations within Lassen Volcanic National Park had continued or increasing levels of tree mortality with limited total numbers of trees and acres affected. The southern Sierras experienced only scattered mortality, and southern California reported no activity.

In Nevada, JPB-caused mortality remains low. In 2011, the number of acres affected by JPB increased slightly after 2 consecutive years of slight decreases. Most of the Jeffrey pine mortality occurred on the Bridgeport and Carson Ranger Districts of the Humboldt-Toiyabe National Forest.

Fir Engraver Beetle

In Oregon and Washington, acres with mortality attributed to the fir engraver beetle (FEB) were at their lowest level since 2001, decreasing by nearly one-half from the 2010 level. The most heavily affected areas in Washington were Mt. Baker-Snoqualmie, Okanogan, and Wenatchee National Forests and the Olympic National Park. In Oregon, the most heavily affected area was on the Rogue-Siskiyou National Forest and on State and Federal lands in the vicinity of the Fremont National Forest.

The amount of tree mortality caused by FEBs observed during aerial detection surveys increased substantially from 2010 in New Mexico. Activity was observed throughout the State, but typically only in scattered amounts. Most of the activity observed in 2011 was on the Lincoln National Forest and Mescalero Indian Reservation in or adjacent to areas also affected by ponderosa pine mortality (fig. 3).

The 2011 aerial detection surveys show a continued decrease in the number of acres and trees killed by FEBs in grand fir stands from 2010 levels across Idaho, Montana, and eastern Washington. Across the region, surveyors reported the FEB-infested area decreased fourfold from 2010.

In Colorado, FEBs are currently at a reduced level after a number of years of high activity. The FEBs are active primarily in stands that have reached mature to overmature status. Currently, only one area has significant FEB activity, southwest of Pueblo in the Wet Mountains.

Figure 3.—*Top-kill and tree mortality by fir engraver beetle. Photo by Ken Gibson, USDA Forest Service.*

In 2011, in the Intermountain Region, FEB-caused fir mortality remained at a low level. Most of the damage occurred on national forests and private lands in Utah. Fir mortality increased slightly in Nevada, occurring primarily on the Humboldt-Toiyabe National Forest.

Northern California continued with elevated levels of FEB activity as reported in previous years, but other areas, including northeastern California and the south Sierra, reported a sharp decline in most locations. FEB activity in southern California was associated only with the recent Douglas-fir tussock moth outbreak in white fir.

Pine Engraver Beetle

In 2011, losses to the pine engraver beetle (PEB) increased in El Paso County, CO. PEB-caused mortality was observed in low-elevation ponderosa pine forests along the Front Range, south of Colorado Springs. Southern Front Range ponderosa pine forests continue to experience elevated losses from the PEB because drought conditions persist.

In the Black Hills of South Dakota, PEB populations, which were very low during the past several years, are beginning to increase, causing some ponderosa pine mortality.

In the Intermountain Region of Idaho, Nevada, and Utah, PEB-caused tree mortality increased slightly (less than 1,000 acres) across the region. Most of the aerially observed mortality was reported on the Boise National Forest in Idaho.

In 2011, PEB populations and associated tree mortality more than doubled in northern Idaho and Montana. The increase occurred in ponderosa pine scattered across several large areas in northern Idaho.

Western Pine Beetle

In 2011, affected acres with western pine beetle (WPB) were the lowest since 2007 in Oregon and Washington. Approximately 65 percent of the mortality was mapped on the Ochoco National Forest.

In 2011, ponderosa pine mortality caused by the WPB was extremely low across Arizona.

Mortality caused by WPB has been increasing during 2011 in the Sacramento Mountains, both on the Lincoln National Forest and Mescalero Apache Indian Reservation, and on the Gila National Forest in New Mexico.

In the Intermountain Region, ponderosa pine mortality attributed to WPB decreased by 71 percent from 2010 levels. Most of the mortality was mapped in Idaho on the Boise and Payette National Forests following wildfire activity in 2007. In Utah, ponderosa pine mortality attributed to this insect is at endemic levels. No damage was reported in Nevada. WPB was stable to increasing in most locations despite above-average precipitation in California.

In the northern Rocky Mountains, ponderosa pine mortality attributed to WPB decreased by about 85 percent from 2010 to 2011. Most of the mortality occurred in northern Idaho and was generally scattered.

Although WPB activity is currently at a low level throughout Colorado, activity is very scattered but widespread.

Western Spruce Budworm

Choristoneura occidentalis Freeman

Western spruce budworm (WSBW) defoliation was reported on more than 4.5 million acres in 2011, nearly double the defoliation reported in 2010 (fig. 1). Idaho and Montana continued to report significant areas of defoliation (fig. 2 and table 1).

The area with defoliation by WSBW mapped during aerial surveys increased substantially in the Southwestern Region. WSBW activity occurs primarily in New Mexico. The activity in New Mexico, which is widespread throughout the northern part of the State, is a chronic situation in this area. Defoliation from the WSBW outbreak in the Sacramento Mountains in southern New Mexico continued in 2011, affecting portions of the Sacramento Ranger District of the Lincoln National Forest and the Mescalero Apache Indian Reservation.

Figure 1.—*Acres of western spruce budworm defoliation in 2011.*

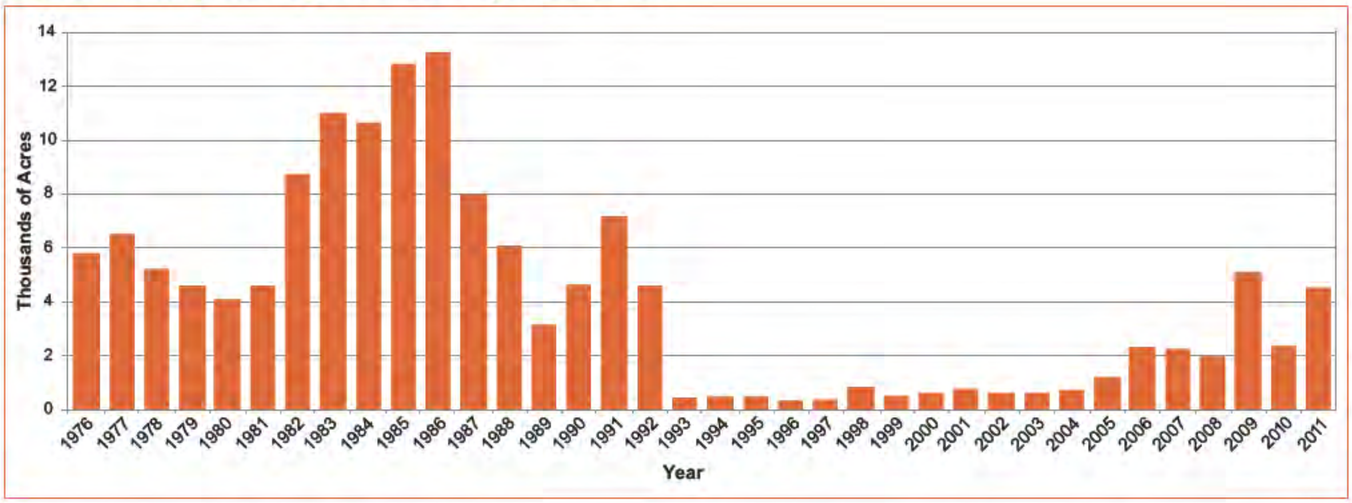
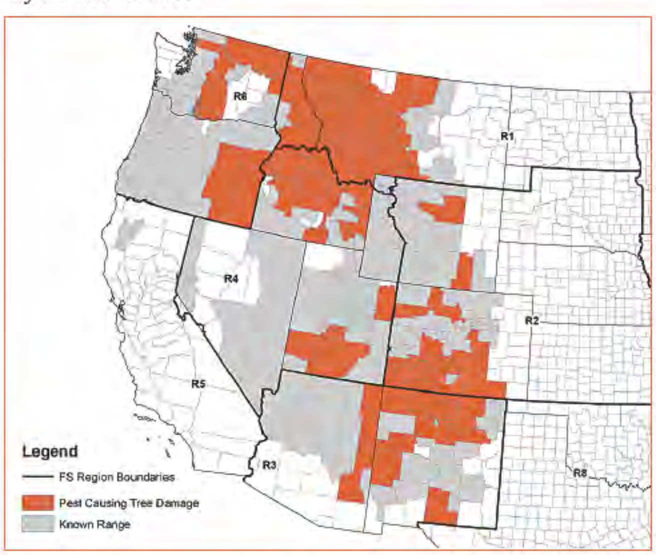


Figure 2.—*Counties that reported western spruce budworm defoliation in 2011.*



In Arizona, defoliation from WSBW in 2011 increased in acres compared with the number of acres reported in 2010. Most WSBW defoliation occurred on tribal lands, including the Navajo Tribal Lands, White Mountain Apache Tribal Lands, Chuska Mountains, in the Canyon De Chelly National Monument, and on the White Mountain Apache Tribal Lands around Mount Baldy. On Forest Service lands, defoliation occurred east of Springerville on the Apache-Sitgreaves National Forest.

Small patches of defoliation of Douglas-fir were noted in Douglas and El Paso Counties, CO, in 2011 (fig. 3). These areas occur along the southern Front Range, between Denver and Colorado Springs, which has sustained defoliation for the past 10 years. A small amount of defoliation was noted in Grand County, CO. Heavier defoliation in Douglas-fir and

Table 1.—*Acres (in thousands) with western spruce budworm defoliation by State, 2002 to 2011.*

State	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Arizona	11.30	24.00	10.70	11.20	2.50	4.80	1.70	1.27	393.00	3,504.00
California	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Colorado	131.10	20.00	20.00	71.40	93.70	390.20	153.40	382.37	212,834.00	90,267.00
Idaho	22.60	204.10	64.10	75.30	254.30	360.50	366.20	1,030.56	865,991.00	1,887,469.00
Montana	52.40	66.00	177.30	453.70	1,142.20	497.20	577.80	2,576.15	326,340.00	1,200,780.00
Nevada	0.00	0.00	0.00	0.00	0.00	0.70	0.00	0.00	0.00	0.00
New Mexico	198.80	143.20	238.20	183.80	142.50	452.20	360.40	559.29	317,424.00	500,537.00
Oregon	1.90	5.50	6.60	0.30	38.00	98.10	10.00	40.80	108,135.00	256,084.00
Utah	7.00	14.70	20.00	40.50	88.60	51.40	7.70	69.71	142,044.00	28,044.00
Washington	57.50	139.90	193.20	363.10	555.70	355.80	455.10	414.50	373,081.00	538,473.00
Wyoming	134.60	13.30	4.50	6.40	4.40	29.00	34.90	30.32	20,851.00	34,767.00
Total	**617.20**	**630.70**	**734.60**	**1,205.70**	**2,321.90**	**2,239.90**	**1,967.20**	**5,104.97**	**2,367,093.00**	**4,539,925.00**

Figure 3.—*Western spruce budworm defoliation. USDA Forest Service photo.*

white fir, corkbark and subalpine fir, and Engelmann spruce forests by WSBW continued throughout the south-central Rocky Mountains. WSBW continues to be detected in portions of the Wet Mountains, the Sangre de Cristo and Culebra Ranges, the Spanish Peaks, and the San Juan Mountains, although at lower levels than in the recent years.

The number of acres defoliated by WSBW increased fivefold from 2010 to 2011 in Montana and northern Idaho. Most of WSBW-caused defoliation in Idaho and Montana was on Forest Service lands. Defoliation from WSBW in Wyoming was recorded in Yellowstone National Park. Also, a significant amount of defoliation from WSBW was observed on State and private lands in Montana and Idaho. Defoliation from WSBW was recorded in most counties in Montana in 2011. An aerial survey recorded the highest number of acres defoliated by WSBW in the northwestern part of the State (Flathead National Forest). Other areas with significant WSBW defoliation were the Gallatin, Helena, and Lewis and Clark National Forests, in Montana and Coeur d'Alene and Kaniksu National Forests in Idaho.

In the Intermountain Region, WSBW-caused tree defoliation increased in area by nearly 43 percent in 2011 compared with defoliation in 2010. Populations of WSBW remain at outbreak levels in most of south-central Idaho. The increase occurred across various land ownerships in southern Idaho, with the largest affected acreage occurring on the Boise National Forest, where moderate to heavy defoliation occurred for the 7th consecutive year. Additional areas in southern Idaho with extensive acres of defoliation include the Salmon-Challis and Caribou-Targhee National Forests. Douglas-fir beetle outbreaks are occurring in some of these heavily defoliated stands, often on the driest, south-facing sites. In Utah, defoliation in WSBW-affected acres decreased by 80 percent in 2011 from the number of reported acres in 2010. In western Wyoming, defoliation occurred in small, widely scattered pockets in 2011. Nevada reported no WSBW activity.

In 2011, 794,557 acres with WSBW defoliation were reported throughout Oregon and Washington; however, most outbreaks occurred east of the Cascade Mountains crest (fig. 4).

Figure 4.—*Two trees side by side in the Starkey Experimental Forest, Wallowa-Whitman National Forest in Oregon, one dead, one alive. Both trees were exposed to intense feeding by western spruce budworm. Photo by Dave Powell, USDA Forest Service.*

Hemlock Woolly Adelgid

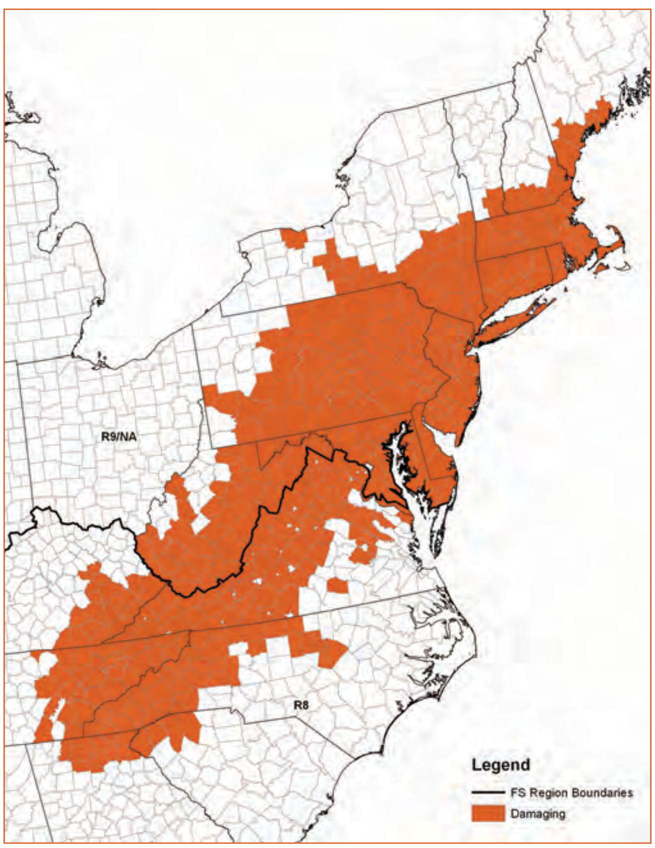
Adelges tsugae Annand

Through 2011, hemlock woolly adelgid (HWA) occurred in 17 States from southern Maine through Georgia, Kentucky, and Tennessee (fig. 1). In the South, most of the areas with HWA were in southern Appalachian States, where small areas of mortality can be observed on the edges of old mortality.

In Kentucky, 5 new counties (Knott, Knox, Lee, Menifee, and Perry) were determined infested with HWA in 2011, bringing the total number of infested counties to 19. Mortality of hemlocks is now reported in Bell and Harlan Counties.

In Tennessee, HWA continues to cause damage to hemlocks in the State's mountainous eastern counties. Fentress County was determined to be positive, bringing the total number of infested counties in Tennessee to 30 in 2011.

Figure 1.—*Counties that reported hemlock woolly adelgid damage in 2011.*



NA = Northeastern Area.

Decline and mortality of eastern and Carolina hemlock continue in HWA-infested areas of northeastern Georgia. HWA is now on both sides of the Appalachian Mountains. Surveys conducted in 2011 for the 8th year show the adelgid continues to spread, but no new infested counties were detected. The total number of infested counties in Georgia remains at 12.

In North Carolina, Durham County was confirmed as infested in 2011. Infestations of the HWA continued to spread within infested counties and to intensify in the southern Appalachian Mountains. The adelgid now infests all of the native range of both eastern and Carolina hemlocks in the State. Mortality is very apparent in infested counties, primarily in forested stands where control is difficult and cost prohibitive.

Decline and mortality of eastern and Carolina hemlocks from HWA continue in four affected counties in northern South Carolina.

HWA continues to spread and intensify in infested areas in Virginia, causing decline and mortality of host trees, although no new infested counties were identified in 2011 (fig. 2). Almost the entire range of hemlock in Virginia is now generally infested. Estimates of current mortality levels for southwestern counties are at 19 percent.

Most hemlocks affected with HWA in Maryland are located in isolated stands in northern tier counties of the State. Populations are increasing throughout Maryland, especially in Garrett County, where 19,000 acres were reported infested by HWA.

In New Jersey in 2011, the HWA populations continued to decrease or remain static.

To date, no infestations of native hemlock have been found in Ohio. In 2011, several landscape trees at Muirfield Golf Course in Franklin County were discovered to have HWA.

In West Virginia, a general increase of HWA over the previous year was observed in many affected counties, including Mercer, Raleigh, Summers, and Tucker.

Pennsylvania reported no new HWA-infested counties in 2011. A significant increase in damage was observed in Lycoming and Potter Counties; more than 6,000 acres of infestation were reported in Lycoming County alone.

In New Hampshire, surveys were conducted in 62 towns in 2011. New infestations of HWA were found in 12 of those towns: Brookline, Danville, Derry, Greenland, Greenville, Hampton, New Ipswich, Rollinsford, Sandown, Swanzey, Temple, and Wilton. Other new infestations were found after the survey in Dublin and Exeter.

New York reported Schoharie County as newly infested in 2011. The HWA continues to cause damage and mortality in the counties previously reported. Damage is most severe in areas that have been infested for several years (the Catskills and south). In some areas, most of the trees are infested, and many of those trees are in decline or dying.

In Connecticut, HWA continued to cause patchy damage and decline on hemlock trees. Some recovery and new growth were reported in some areas, especially in the northwestern part of the State.

In Maine, surveys of high-risk sites in more than 80 towns outside the area known to have infestations of HWA found one new infested area in the city of Cape Elizabeth (Cumberland County).

Cold winter temperatures caused a decline in HWA populations statewide in Massachusetts. No new communities reported infestation.

The HWA remained present in all five counties in Rhode Island.

Vermont reported no new damage in 2011 and observed heavy over-wintering mortality of the insect.

Figure 2.—*Hemlock woolly adelgid egg masses on underside of hemlock branch. Photo by Chris Asaro, Virginia Department of Forestry.*

Laurel Wilt Disease/Redbay Ambrosia Beetle

Raffaelea lauricola T.C. Harr., Fraedrich and Aghayeva • *Xyleborus glabratus* Eichhoff

Laurel wilt (LW) disease is present and spreading in a number of counties in Florida, Georgia, and South Carolina. More recently, the disease and its insect vector, the redbay ambrosia beetle, have been found in Alabama, Mississippi, and North Carolina (fig. 1).

In 2011, Georgia detected 1 new positive county (Atkinson), bringing the total number of affected counties in southeast Georgia to 30 (fig. 2). As LW disease moves farther inland, sassafras becomes the predominant host.

In 2011, Florida confirmed that 3 new counties (Miami-Dade, Pinellas, and Sumter) had LW disease, bringing the total affected counties to 31. Of particular interest is the 2010 detection in Bay County (Panama City), which is more than 150 miles west of the nearest known infested area, and the 2011 detection in Miami-Dade County on swamp bay, just a few miles from major commercial avocado-growing areas.

In Mississippi, LW disease is confined to Jackson County. Mortality is particularly severe for redbay, swamp bay, camphor tree, and sassafras in and around the Pascagoula River Basin, extending northward near George County. The beetle has been trapped in neighboring Harrison County, MS, and Mobile County, AL, but, to date, LW disease has not been confirmed.

In 2011, Alabama reported that LW disease was diagnosed on sassafras for the first time in Marengo County. The redbay ambrosia beetle and the LW fungus both are present.

The redbay ambrosia beetle and LW disease were confirmed in North Carolina for the first time in 2011. Through the spring, LW disease had only been found in a limited area, where Bladen, Columbus, Pender, and Sampson Counties merge. The LW disease has also been confirmed at Lake Waccamaw State Park. The damage does not appear to be as heavy as in infested areas in States farther south, where 30 percent of the redbay in the infested areas show mortality.

In South Carolina, during 2011, no new counties were determined to be infested. Mortality of redbay and sassafras continues in scattered locations in 12 counties in South Carolina. Dieback and mortality are locally severe.

Figure 1.—*Counties that had detected laurel wilt disease as of 2011.*

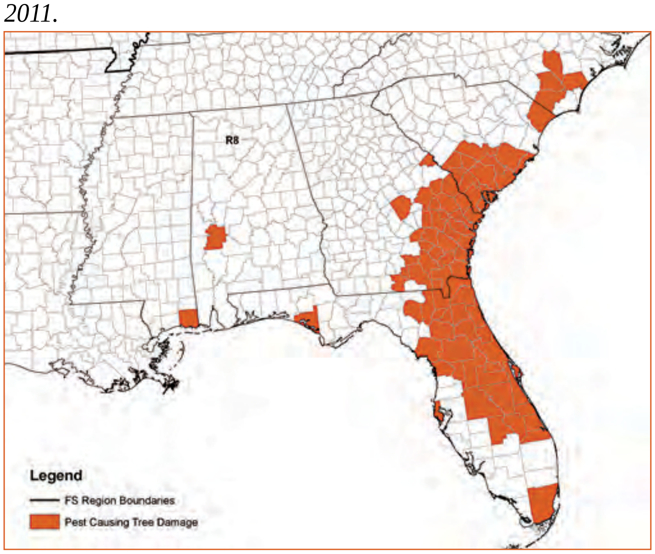


Figure 2.—*Redbay mortality on Jekyll Island, GA, caused by laurel wilt disease. Photo by Ronald F. Billings, Texas Forest Service.*

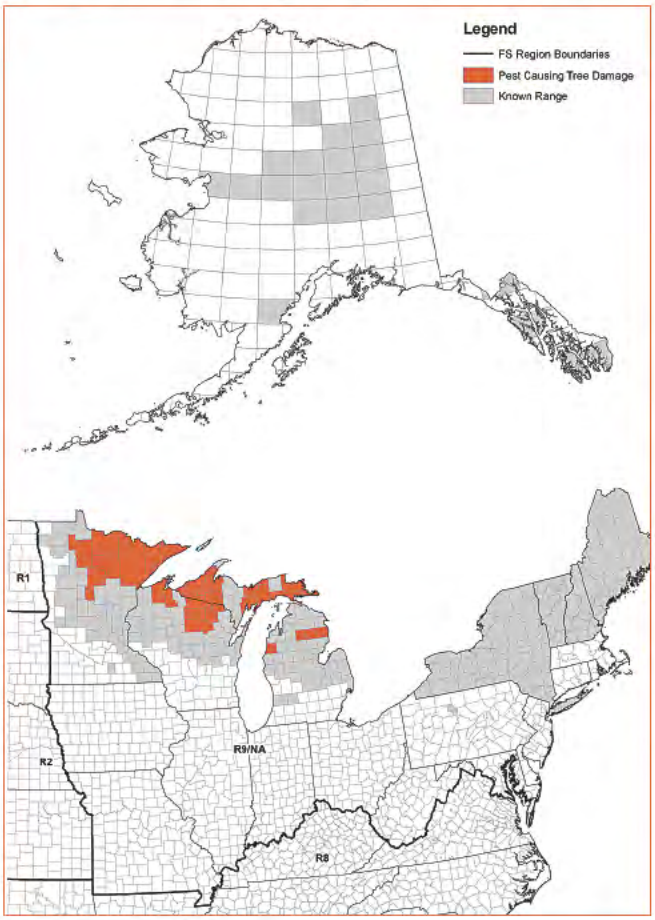
Spruce Budworm

Choristoneura fumiferana Clemens

Spruce budworm populations have increased gradually during the past few years in the Upper Peninsula of Michigan (fig. 1), with defoliating populations largely located on National Forest System lands. Historically, populations can remain high for several years before collapsing. In the Lower Peninsula, the scattered nature of the spruce cover type does not allow for large spruce budworm populations to build, which prevents large outbreaks of this insect.

For the past few years in Minnesota, spruce budworm populations have been found causing defoliation in southern Lake and St. Louis Counties. The last time spruce budworm caused significant defoliation in these areas was the 1970s. The tree mortality mapped in St. Louis County likely represents the cumulative effect of the past 3 to 4 years of defoliation (fig. 2).

Figure 1.—*Counties that reported spruce budworm in 2011.*



NA = Northeastern Area.

Figure 2.—*Dead and declining white spruce in northern Minnesota following a spruce budworm outbreak. Photo by Steven Katovich, USDA Forest Service.*

In Wisconsin, widespread spruce budworm damage occurred for at least the 2nd consecutive year in northern Forest County and several parts of Florence County. In northwest Wisconsin, spruce budworm damage was not detected in extreme northeast Sawyer County (between Ghost and Clam Lakes), where it had caused problems in previous years (fig. 3).

Although pheromone trap catches increased significantly in 2011, no reports of larval feeding were made and no adults were caught in light traps in Maine.

In Alaska, no reports were made of significant defoliation by spruce budworm (fig. 1).

Figure 3.—*Closeup of spruce budworm defoliation. Photo by Joseph O'Brien, USDA Forest Service.*

Sirex Woodwasp

Sirex noctilio Fabricius

Pennsylvania reported 3 new counties (Forest, Lycoming, and Warren) with sirex found through trapping in 2011, bringing the total to 11 infested counties.

No new infested counties were detected in New York in 2011. Within the known infested area, much of the worst damage is found on State-owned pine plantations, many of which are overstocked and/or in declining health. Michigan detected no new counties in 2011 (fig. 1).

Figure 1.—*Sirex woodwasp in New York. Photo by Dave Lance, USDA Animal and Plant Health Inspection Service.*

Dwarf Mistletoes

Arceuthobium spp.

Like decay diseases, dwarf mistletoes are rarely detected in aerial survey and do not change rapidly from year to year. Yet, they chronically affect trees and stands, slowly increasing over time, reducing growth, reducing tree longevity, increasing susceptibility to drought, and generally leading to deteriorating stand conditions. The following section summarizes the extent of dwarf mistletoe.

Idaho and Montana have three major dwarf mistletoes that are causing significant growth loss and mortality. Lodgepole pine dwarf mistletoe occurs on approximately 2 million acres (28 percent) of the lodgepole pine, causing about 18 million cubic feet (ft^3) 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 ft^3 annually. Western larch dwarf mistletoe occurs on about 0.8 million acres (38 percent) of western larch stands, reducing annual growth by more than 15 million ft^3. 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. Western larch and Douglas-fir are heavily infected by dwarf mistletoes across much of their range west of the Continental Divide.

Distinct species of dwarf mistletoes occur in lodgepole pine, ponderosa pine, Douglas-fir, limber pine, and piñon pine. The first three host species are the most heavily affected. More than 50 percent of lodgepole pine stands in the region are infected by dwarf mistletoe.

Douglas-fir dwarf mistletoe is common in Douglas-fir in the Southwest. Based on limited ground surveys, more than 50 percent of mixed conifer stands with Douglas-fir are estimated to be infected. Southwestern dwarf mistletoe infests more than one-third of the ponderosa pine in the Southwest. Although the biggest impact of this disease is on tree growth, Douglas-fir dwarf mistletoe causes some direct mortality and contributes to mortality by bark beetles and other agents.

Dwarf mistletoes remain the most widespread and frequently observed disease within the Intermountain Region. Currently, dwarf mistletoe incidence information is updated using data gathered by the Forest Service, Forest Inventory and Analysis (FIA) group. The 2008 FIA data indicate that one or more dwarf mistletoe species were present at various levels of intensity on 15 percent of all plots surveyed. Incidence of the major dwarf mistletoe species by percent of host type infected within the Intermountain Region is lodgepole pine, at 26 percent; piñon pine, at 20 percent; Douglas-fir, at 14 percent (fig. 1); ponderosa and Jeffrey pine, at a combined 7 percent (fig. 2); limber pine,

Figure 1.—*Dwarf mistletoe on Douglas-fir at Panguitch Lake, Dixie National Forest in Utah. Photo by Steve Munson, USDA Forest Service.*

at 12 percent; and whitebark pine, at 6 percent. No FIA plots were located in infected Great Basin bristlecone pine stands.

Years of observation indicate the widespread occurrence of most of the dwarf mistletoe species throughout the Blue Mountains of eastern Oregon and Washington.

In California, dwarf mistletoe in western hemlock was observed to be widespread in stands of mature hemlocks along Redwood Creek in Humboldt County. Whitebark pine heavily infected with limber pine dwarf mistletoe continued to experience mortality on the northern flank of Mount Shasta on the Shasta-Trinity National Forest.

FIA plot data from southeast Alaska have been used to estimate the occurrence and distribution of hemlock dwarf mistletoe on the landscape. In southeast Alaska, hemlock dwarf mistletoe infests approximately 12 percent of the forested land area and causes growth loss, top-kill, and mortality on an estimated 1 million acres. The occurrence of dwarf mistletoe is apparently limited by climate, becoming uncommon or absent at an elevation of more than 500 ft and 59° N latitude (Haines, AK), despite the continued distribution of western hemlock. Dwarf mistletoe is conspicuously absent from the Cross Sound to the Prince William Sound.

Figure 2.—*Arceuthobium campylopodum (western dwarf mistletoe) on Jeffrey pine in western Nevada. Photo by Gail Durham, Nevada Division of Forestry, Department of Conservation and Natural Resources.*

Asian Longhorned Beetle

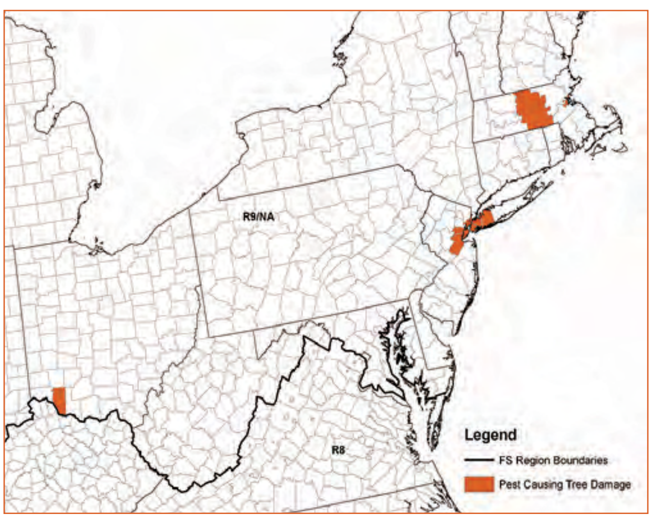
Anoplophora glabripennis Motschulsky

Asian longhorned beetle (ALB) was discovered in Bethel, OH, in June 2011. The USDA Animal and Plant Health Inspection Service quarantined 56 square miles around the town and put eradication efforts into full effect (fig. 1).

ALB was first detected in August 2008 in Worcester, MA, where more than 30,000 trees that were identified as infested or at high risk have been removed to date (fig. 2). Recent finds of ALB-infested trees in southwest Worcester and the central part of Shrewsbury have pushed the quarantine boundary out to 110 square miles. Infested trees in forested areas in the towns of Holden, West Boylston (adjacent to the Wachusett Reservoir), and Boylston are of great concern. On July 3, 2010, an infestation of ALB was discovered in the Jamaica Plain suburb of Boston at the Faulkner Hospital. Six infested trees were located on the grounds of the hospital. A 10-square-mile regulated area was formed, including parts of the Town of Brookline and suburbs of Boston (Jamaica Plain and West Roxbury). As of December 2011, nearly 42,000 trees have been surveyed for ALB infestation, and no other infested trees have been found or reported in the Boston area. Counties reporting ALB infestations include Worcester and Suffolk (fig. 3).

No new ALB infestations were detected in New York in 2011. The Islip infestation (Suffolk County) has been declared eradicated as of August 23, 2011.

Figure 1.—*Counties that reported Asian longhorned beetle in 2011.*



NA = Northeastern Area.

Figure 2.—*Boring dust from Asian longhorned beetle. Photo by Robert Haack, USDA Forest Service.*

Figure 3.—*Adult Asian longhorned beetle. Photo by Kenneth Law, USDA Animal and Plant Health Inspection Service.*

White Pine Blister Rust

Cronartium ribicola J.C. Fisch. ex Rabenh

White pine blister rust (WPBR) continues to spread throughout the range of western white and whitebark pine in the inland Northwest, including northern Idaho, Montana, and northeastern Washington. This infestation affects more than 5 million acres that were once dominated by western white pine. Although western white pine can still be found at low densities on much of its original range, the acreage where western white pine dominates has shrunk dramatically (fig. 1).

WPBR continues to slowly spread and intensify in southeastern Colorado, South Dakota, and Wyoming (fig. 2). Decline and mortality are occurring in limber pine populations on the Arapaho-Roosevelt, Medicine Bow, and Pike-San Isabel National Forests and within the Great Sand Dunes National Park and Preserve. The combined effects of WPBR and mountain pine beetles remain a threat to limber pine populations in some locations, especially in northern Colorado and southern Wyoming.

WPBR has spread throughout the range of five-needled pines in Oregon and Washington. In 2011, ground surveys were conducted in eastern Oregon and Washington for WPBR in the Elkhorn Mountains and the Seven Devil Mountains, where

Figure 1.—*Stand infested with white pine blister rust. USDA Forest Service photo.*

Figure 2.—*Rust sporulating on the bole of an infected tree. Photo by John W. Schwandt, USDA Forest Service.*

WPBR was previously found to be present. Elsewhere, WPBR infestations on whitebark pine are variable, with some level of rust present in most stands.

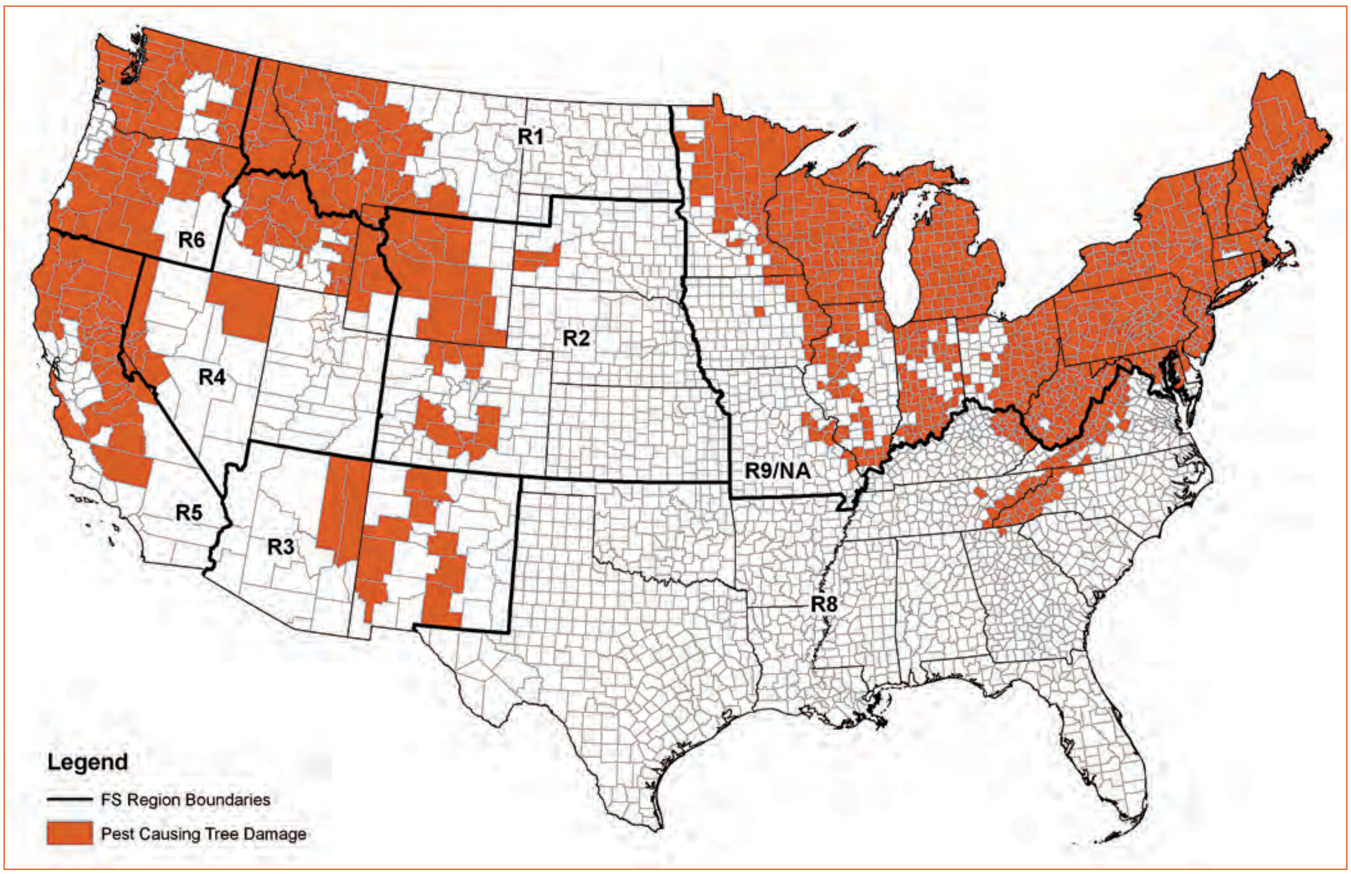
WPBR can be found throughout the host range in California.

Since its introduction into North America more than a century ago, WPBR has spread throughout the range of most western five-needle pines in the Intermountain West, including Idaho, Nevada, and Utah (fig. 3). There are two notable exceptions. First, in Utah, the pathogenic fungus has yet to be detected on pine hosts. Second, WPBR has not been detected on Great Basin bristlecone pine, despite the high susceptibility of the host to the disease in greenhouse tests. WPBR is most frequently found on whitebark and limber pines. In the Intermountain Region, plots have been established to survey and monitor the spread of WPBR and its intensification on limber, whitebark, Great Basin bristlecone, and western white pines.

WPBR was first detected in New Mexico in 1990 in the Sacramento and White Mountains. WPBR was later found on the Gila National Forest and on the Zuni and Jemez Mountains. WPBR was found in Arizona in 2009, where it is currently limited to the White Mountains of eastern Arizona. Southwestern white pine is the primary host in both States. The infestation in the Sacramento and White Mountains has advanced enough to cause widespread crown dieback and mortality.

In Maine, WPBR continues to threaten natural and plantation stands of white pines, as well as white pines used in ornamental plantings throughout the State. A State quarantine remains in place to help control this disease. Vermont reported occasional dieback and mortality of white pine. New Hampshire reported no significant WPBR activity.

Figure 3.—*Counties that reported white pine blister rust in 2011.*



NA = Northeastern Area.

Oak Wilt

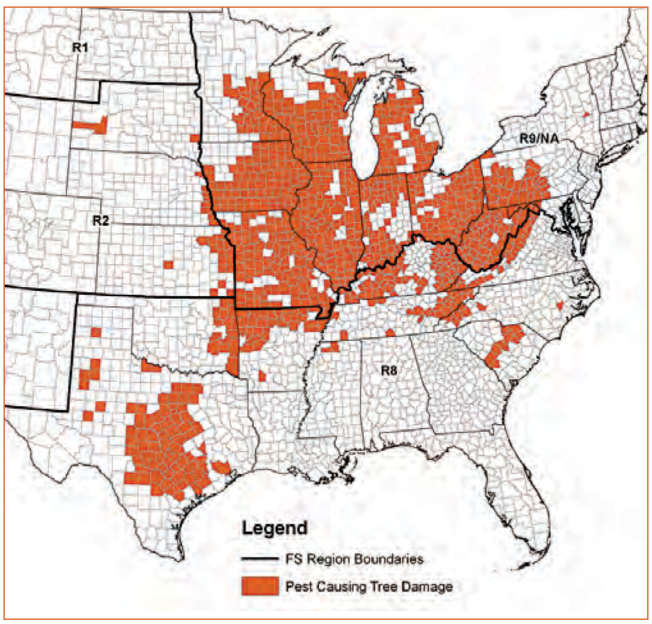
Ceratocystis fagacearum Bretz

Oak wilt disease conditions in almost all Southern Region States have been static for a number of years, with no new positive counties being recorded in 2011 (fig. 1). Surveys for oak wilt are no longer routinely performed in most States, and serious or widespread damage is generally unknown, except in Texas, where 73 counties are currently affected.

In 2011, aerial and ground surveys conducted for oak wilt yielded no new infested trees in New York. The disease was first detected in 2008 in Schenectady County.

New infestations were reported in Warren County, MO, and in Cheboygan and Montcalm Counties, MI. The number of affected acres in Minnesota in 2011 was down by a little more than 50 percent, because fewer acres surveyed as compared with 2010 (fig. 2). In Iowa, large oak wilt pockets were found in Hardin County after a severe hailstorm. Large pockets of infestation were also observed in Allamakee and Louisa Counties. An oak wilt detection flight was flown in Wisconsin over portions of Florence, Forest, Langlade, Oneida, and Vilas Counties. The only new oak wilt pockets were in Florence County, which was already heavily infected.

Figure 1.—*Counties that reported oak wilt in 2011.*



NA = Northeastern Area.

Figure 2.—*In Minnesota, shedding leaves on red oak indicate oak wilt. The tree is marked for removal. Photo by Joseph O'Brien, USDA Forest Service.*

Fusiform Rust

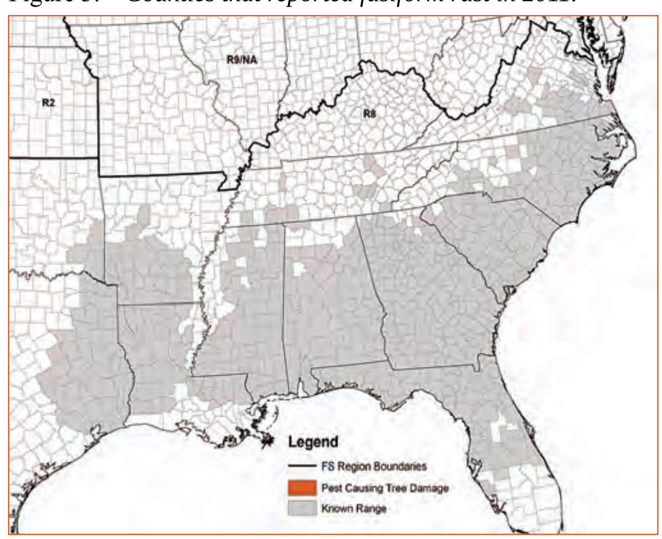
Cronartium quercuum f. sp. *fusiforme* Hedg. and Hunt ex Cumm.

Fusiform rust (fig. 1) is sometimes a significant disease problem in loblolly and slash pine plantings throughout the South (fig. 2), primarily in stands that are less than 5 to 7 years old. Rust infection varies in severity from year to year, depending on weather patterns and local site conditions and also on the susceptibility of host genetic sources. No new significant reports of fusiform infections were reported in 2011 (fig. 3).

Figure 1.—*Fusiform rust in Bainbridge, GA. USDA Forest Service photo.*

Figure 2.—*Fusiform rust; fruiting aecial stage. USDA Forest Service photo.*

Figure 3.—*Counties that reported fusiform rust in 2011.*



NA = Northeastern Area.

Dogwood Anthracnose

Discula destructiva Redlin

Dogwood anthracnose disease has now spread to most of the cool, moist, high-elevation areas with dogwood host in the seven Southeastern States (Alabama, Georgia, Kentucky, North Carolina, South Carolina, Tennessee, and Virginia) with vulnerable habitat (fig. 1). Widespread dieback and mortality have resulted (fig. 2). Over the last 20 years, in some areas, the dogwood population has been reduced by as much as 90 percent. No newly affected areas have been reported in recent years.

No new counties were detected in the Northeast in 2011.

Figure 1.—*Twig dieback from dogwood anthracnose. Photo by Robert L. Anderson, USDA Forest Service.*

Figure 2.—*Dogwood anthracnose symptoms on leaves in Bent Creek, NC. Photo by Robert L. Anderson, USDA Forest Service.*

Beech Bark Disease

Cryptococcus fagisuga Lindinger • *Neonectria ditissima* Tul. & C. Tul. Samuels & Rossman • *N. faginata* Lohman

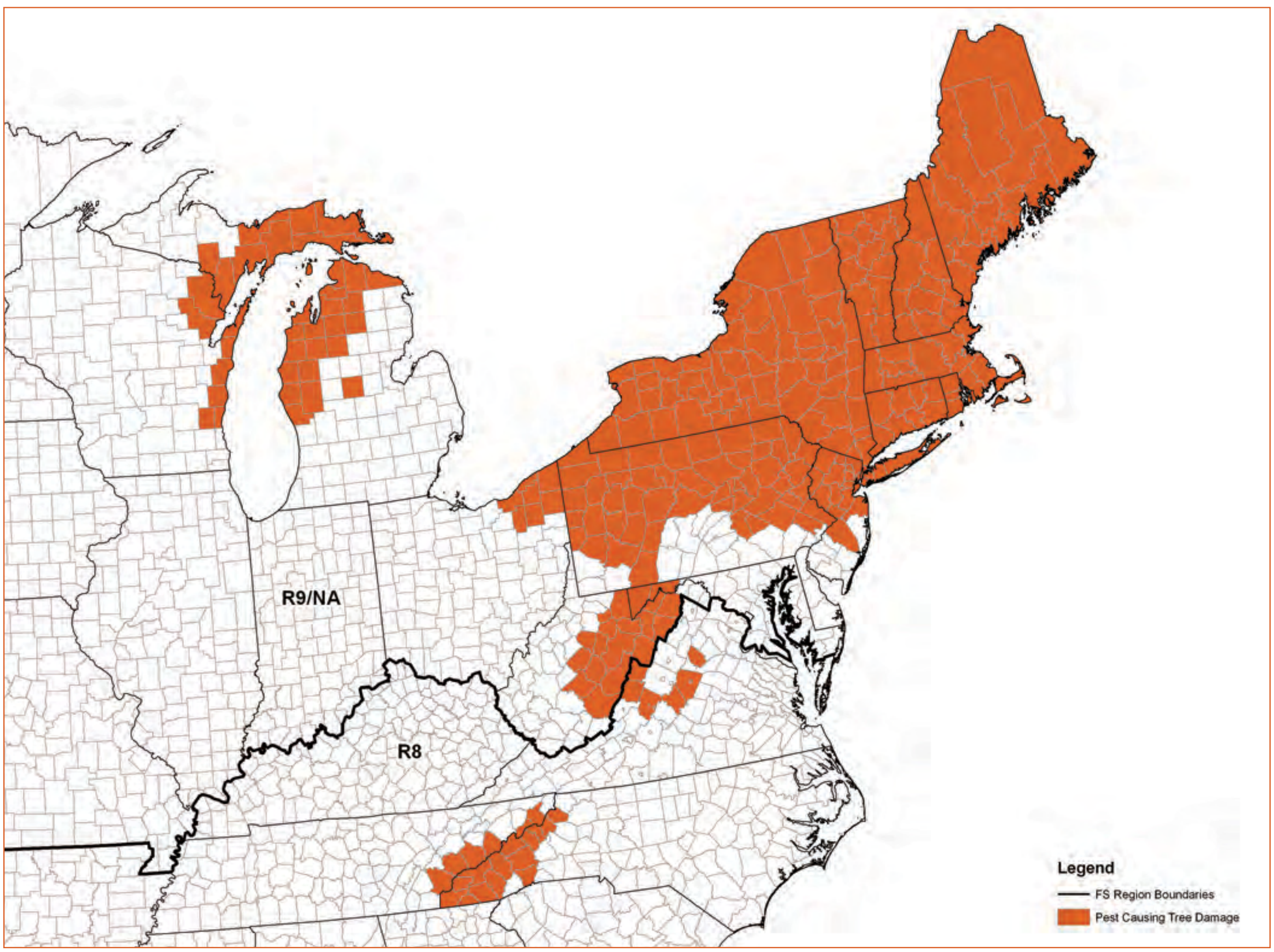
Since Beech Bark Disease (BBD) was introduced from Europe to Nova Scotia in 1920, the disease has spread slowly throughout the St. Lawrence Valley and the Appalachian region and now extends as far west as Michigan and as far south as Tennessee and North Carolina (fig. 1). In heavily affected stands, the disease can kill up to 98 percent of overstory beech, which significantly alters species composition in these forests.

BBD is scattered and widespread in 14 counties of western North Carolina. Decline and mortality occur in affected stands. The disease is particularly significant in and around the Great Smoky Mountains National Park (fig. 2).

BBD is known to occur in five eastern Tennessee counties and six counties in western Virginia. No formal surveys have been conducted recently.

In the North-Central and Northeastern United States, mortality and dieback from BBD were recorded by aerial survey in Massachusetts, New York, and Vermont. In New Jersey, no BBD-damaged acres were reported in 2011. Based on field observations, however, it appears that many stands of beech in the northern counties, which include Sussex, Warren, Passaic, and Hunterdon Counties, have been infested and infected with both the scale and fungus, respectively. Burlington County (southern

Figure 1.—*Counties that reported beech bark disease in 2011.*



NA = Northeastern Area.

New Jersey) is of particular interest because, in 2010, American beech trees showed signs of scale infestation, but no signs of fungal infection were observed.

Maryland ground surveys recorded 203 acres of damage in Garrett County, where BBD is increasing throughout the area. BBD was reported for the first time in Hampshire County, WV, in 2011.

In Wisconsin, no new counties were reported for 2011, although BBD was detected in seven new counties in 2010. In Michigan, the advancing front of BBD continues to move across Michigan's beech resource. Fragmentation of the beech forests in the Lower Peninsula has slowed the spread eastward from the initial infestations in Oceana and Mason Counties. No new counties were added in 2011. The killing front continues to expand toward the western extent of beech in the central Upper Peninsula in Michigan (fig. 3).

Ohio reported no new damage in 2011.

Figure 2.—*Beech bark disease symptoms. USDA Forest Service photo.*

Figure 3.—*Beech bark disease on American beech, with tarry spots, in Michigan. Photo by Joseph O'Brien, USDA Forest Service.*

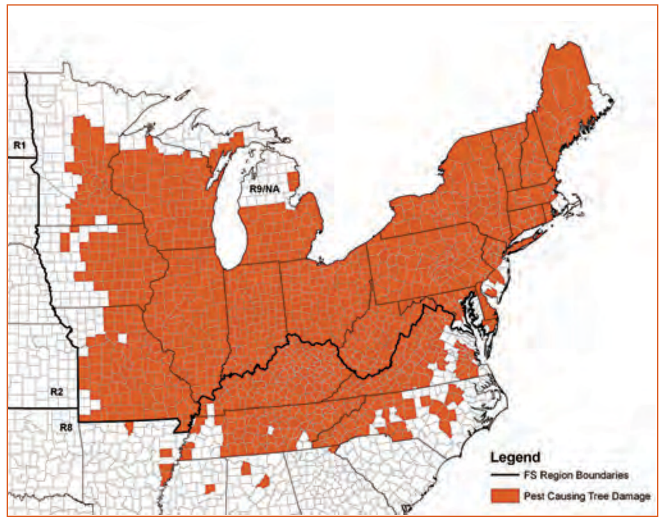
Butternut Canker

Sirococcus clavigignenti-juglandacearum Nair, V.M.G: Chuck Kostichka and J.E. Kuntz

Butternut canker continues to have a damaging effect throughout the entire range of butternut (fig. 1). In the Northeastern region, butternut canker continued to cause scattered dieback and mortality on butternut forests, especially throughout New England (fig. 2).

Figure 1.—*Butternut canker bole damage. Photo by Joseph O'Brien, USDA Forest Service.*

Figure 2.—*Counties that reported butternut canker in 2011.*



NA = Northeastern Area.

Armillaria Root Disease
Armillaria spp.

Armillaria root disease is not new on the landscape, but it is a significant agent of disturbance and change. This disease is caused by several native fungi in the genus *Armillaria* that, together, are responsible for the most widely distributed root diseases in America. Armillaria root diseases occur in numerous conifer and hardwood species of all ages from the east coast to the west coast, causing mortality and growth loss in infected stands. *Armillaria* spp. decay cellulose and lignin in the roots and butts of trees, which compromises the uptake of water and nutrients, leading to direct mortality or to greater susceptibility of stem failure and attack by insects and other pathogens. In the Northeast and Midwest, damage from *Armillaria* spp. is most severe in oaks, maples, beeches, birches, aspens, balsam fir, spruces, and pines. In the North-Central United States, subalpine and white firs, spruces, lodgepole pine, cottonwoods, green ash, bur oak, and white birch are frequent hosts. Interior Douglas-fir (var. *glauca*) and true firs (*Abies* spp.) are the most susceptible tree species in the Northwest and northern Rocky Mountain areas, and in the Southwest, interior Douglas-fir and Engelmann spruce are the main hosts. In the Interior West, *Armillaria* spp. affects high-elevation spruce and fir forests. In Alaska and the Southeast, *Armillaria* spp. is not usually the primary cause of tree mortality but is an opportunist on many tree species affected by other factors.

Armillaria spp. persists on a site for many years in the coarse roots of infected trees. In Oregon, one *Armillaria* spp. clone has been estimated to be 2,400 acres in size and 2,200 years old. Spread occurs when the fungus moves from an infected root system to neighboring trees by root-to-root contact, or by limited growth of rhizomorphs through the soil. Rhizomorphs are shoestring-like structures produced by *Armillaria* spp. that are able to grow through the upper soil layers for several meters and directly infect tree roots. The reproductive structures of *Armillaria* spp. are mushrooms (fig. 1) that appear in late summer or early fall and do not always appear on infected sites. Spores of these fruiting structures appear to play a limited role in spreading the disease.

Figure 1.—*Armillaria mushrooms near infected interior Douglas-firs. Note the presence of both mushrooms and white mycelial mats under the bark in the photo on the right. Photo by Blakey Lockman, USDA Forest Service.*

Seedlings and saplings often turn red and die quickly without displaying other aboveground symptoms. Larger, older trees develop aboveground symptoms over many years. Symptoms include thinning crown, yellowing foliage (figs. 2 and 3), reduced shoot and foliar growth, and copious production of resin at the base of some infected conifers. White mycelial mats, growing in fanlike striations, are present under the bark of infected hosts (fig. 1).

Mortality from Armillaria root disease may occur in patches of up to tens of acres in size or as scattered individual tree mortality (figs. 2, 3, and 4). In the West, changes in species composition to those more susceptible to Armillaria root disease, such as interior Douglas-fir, subalpine fir, and grand fir, have led to an increase in root disease. In the East, past mortality from Armillaria root disease most commonly occurred as scattered individual trees. More recently, effects from *Armillaria* spp. appear to be increasing because of synergistic effects of exotic insects and diseases and from extreme weather events, including ice storms and severe drought. In the Southwest, *Armillaria* spp. is contributing to dieback and mortality in old-growth spruce and fir forests, but with only minor losses in younger forests. In addition to causing tree mortality, *Armillaria* spp. significantly affects tree growth and site productivity. Recent research shows that many infected trees have greatly reduced growth with no aboveground symptoms.

In Montana and northern Idaho, permanent plots and long-term analyses indicate that Armillaria root disease infects more than 12 million acres, and nearly 2.5 million of those acres will experience more than 25 percent mortality of mature stems that are more than 15 years old. Damage is most severe on the best growing sites, and severely affected stands often convert to brush fields in the absence of tree species tolerant to Armillaria root disease (fig. 2). In forest plantations in the Northeastern United States, *Armillaria* spp. causes 3 to 50 percent mortality over a rotation. In Colorado, annual volume losses by *Armillaria* spp. in subalpine fir are estimated to be 10,500 m^3 (370,800 ft^3).

Figure 2.—*Armillaria root disease mortality center in northwest Montana. The site is dominated by brush species in the absence of tree species tolerant to* Armillaria *spp. Symptomatic and dead trees are Douglas-fir, which is the most susceptible species on this site. Photo by Blakey Lockman, USDA Forest Service.*

Figure 3.—*Armillaria root disease crown symptoms in an aspen stand on the Big Horn National Forest in Wyoming. Photo by James T. Blodgett, USDA Forest Service.*

Armillaria root disease also has a large, but unmeasured, effect on recreation sites by greatly contributing to tree failure. Data on the effects from *Armillaria* spp. are not easily measured because of difficulties with identifying root disease and the predisposition to other agents. These agents are more readily identified and often mask the effects from Armillaria root disease. Monitoring Armillaria root disease, as well as other root diseases, requires long-term studies to effectively evaluate effects on the ecosystem.

Figure 4.—*Armillaria root disease mortality center in south-central Oregon. Dead trees are white fir, which is the most susceptible species on this site. Photo by Greg Filip, USDA Forest Service.*