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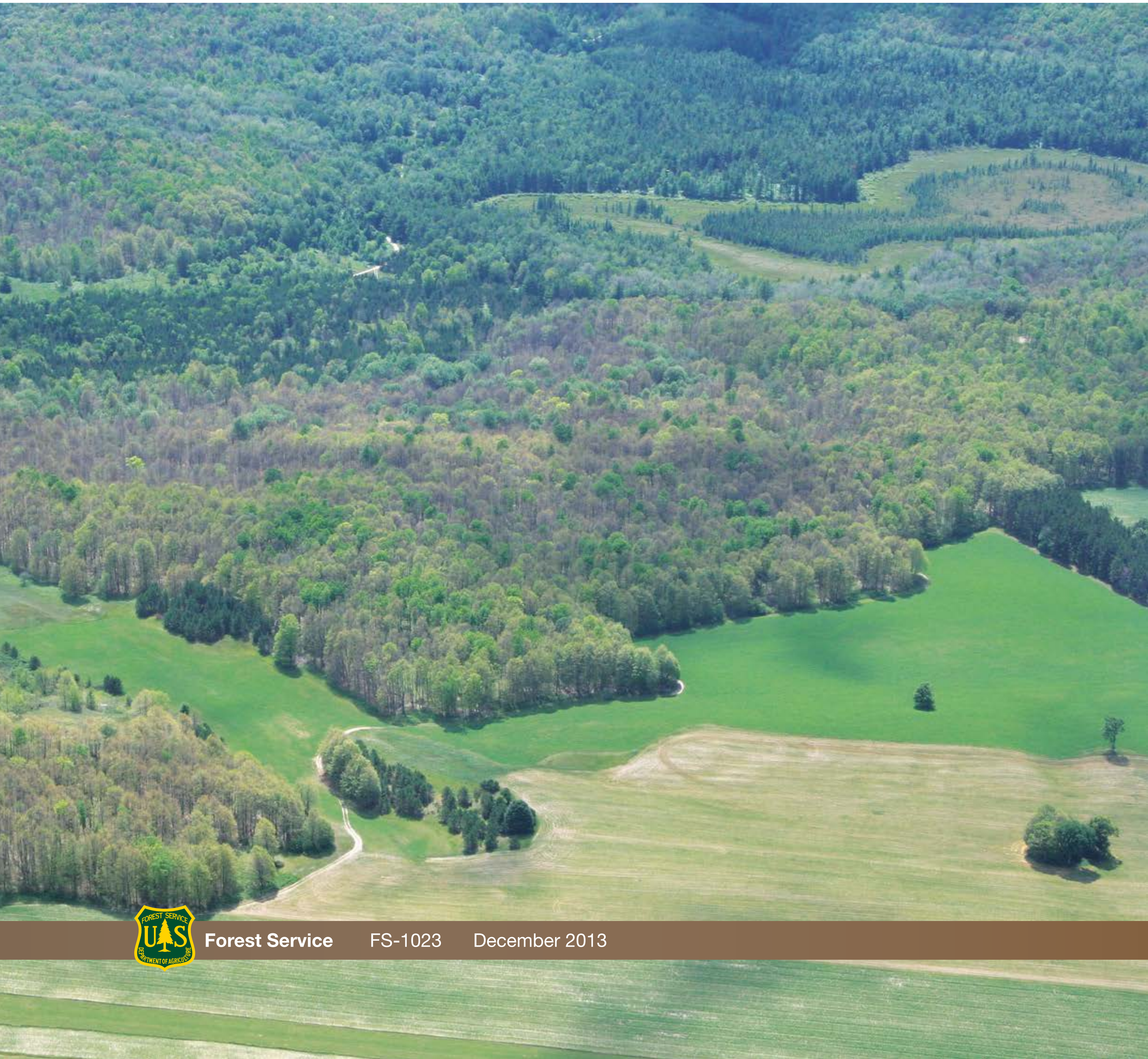
Major Forest Insect and Disease Conditions in the United States: 2012



Forest Service FS-1023 December 2013

United States
Department of
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Forest Service

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Major Forest Insect and Disease Conditions in the United States: 2012

Compiled by Gary Man
Forest Health Protection

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Cover photo: *Hardwood defoliation caused by forest tent caterpillars and gypsy moths, Antrim County, Lower Peninsula of Michigan. Photo by Marc Roberts, USDA Forest Service.*

Preface

This report on the major insect and disease conditions of the Nation's forests represents the 62nd annual report prepared by the Forest Service, an agency of the U.S. Department of Agriculture (USDA). 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 2012 update, with updated charts, tables, and maps, provides a national summary of the major changes and status of these 20 forest pests. Additional information on these and other pests is available at https://www.fs.fed.us/foresthealth/applied-sciences/mapping-reporting/detection-surveys.shtml.

The Forest Health Protection program of the Forest Service and its State partners provide the information in this report. This program serves all Federal lands, including National Forest System lands, lands administered by the U.S. Departments of Defense and the Interior, and tribal lands. The program also provides assistance to private landowners through State foresters and other State agencies. Key elements of the program are detecting and reporting insect and disease epidemics. State and USDA 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.

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Albuquerque, NM 87102
505–842–3247

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Intermountain Region (R4)
324 25th Street
Ogden, UT 84401
801–625–5759

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Vallejo, CA 94592
707–562–8921

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Pacific Northwest Region (R6)
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Portland, OR 97208–3623
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Atlanta, GA 30309
404–347–3540

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11 Campus Boulevard, Suite 200
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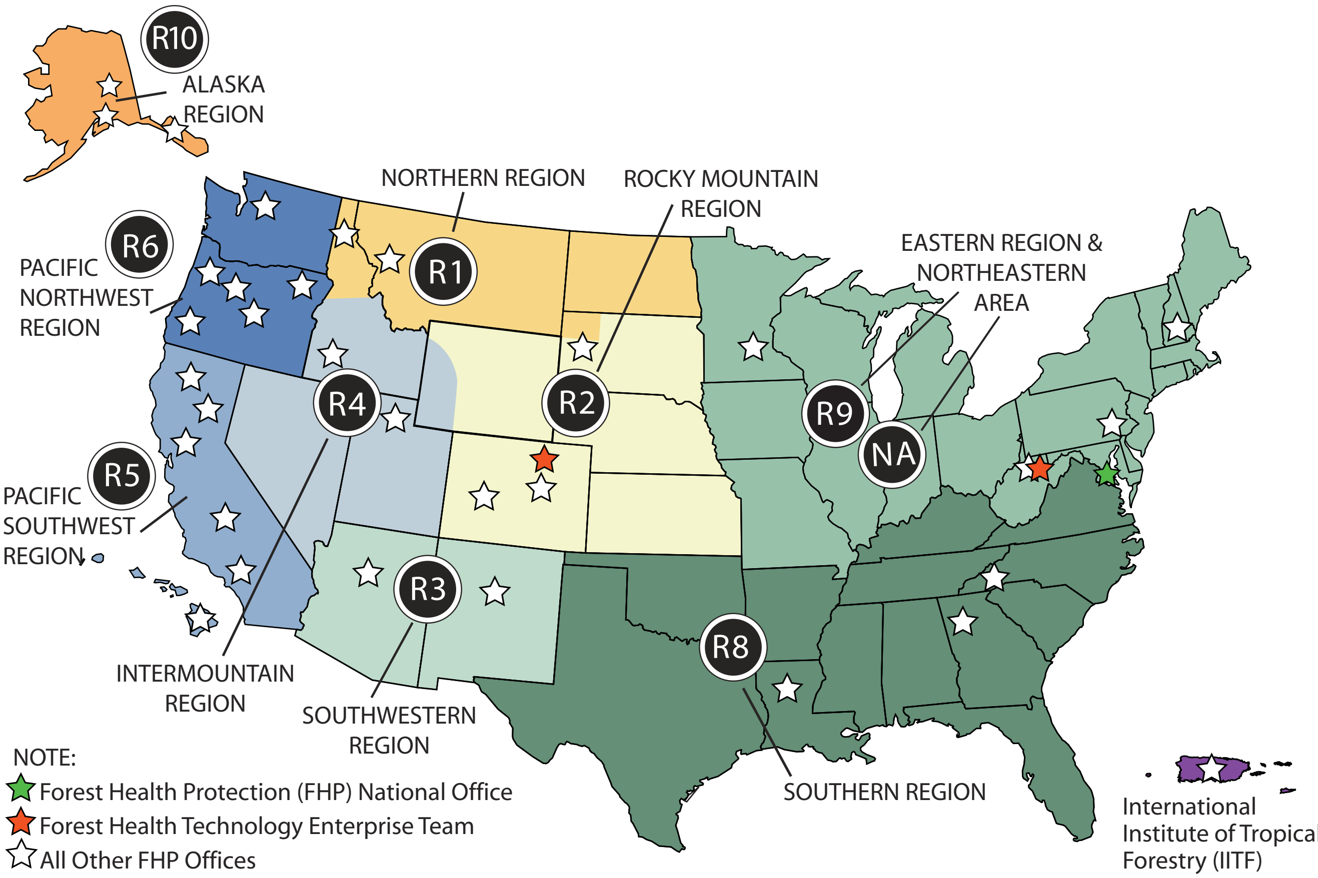
Forest Service Regions and Area



Copies of this report are available from—

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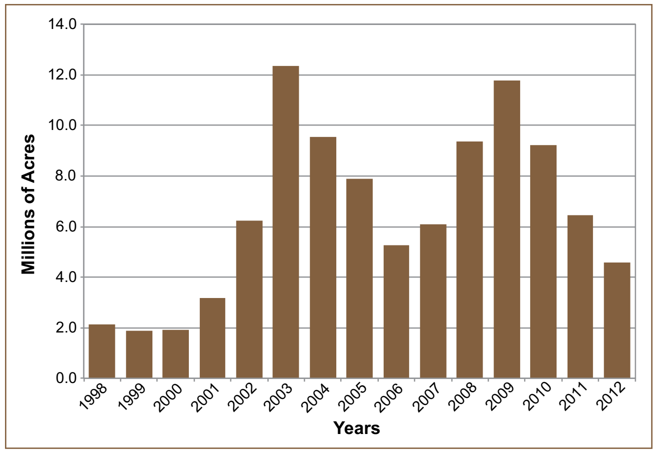
This report is also available on the Internet at http://www.fs.fed.us/foresthealth/current_conditions.shtml and at http://www.fs.fed.us/foresthealth/publications.shtml#reports.

Contents

Executive Summary/Introduction

Forest insects and diseases are crucial to contributing to forest resilience but also cause catastrophic outbreaks and forest loss. They can affect the more than 750 million acres of forest land and millions more acres of urban treed areas. Trees provide a wide array of services and commodities, such as timber and other forest products, recreation, climate mitigation, wildlife, clean water, energy, and jobs. Surveys help to determine the extent and intensity of insects and diseases and are an important tool to help prioritize future actions to be taken by Federal and State agencies and other stakeholders to ensure forests remain resilient and sustainable for generations. The overall mortality that insects and diseases cause varies by year and by pest. The chart in figure 1 illustrates mortality variations during the past 14 years.

Figure 1.—*Surveyed acres of mortality from 1998 through 2012.*



Acres of Tree Mortality Caused by Insects and Diseases

In 2012, mortality caused by insects and diseases was reported on nearly 4.6 million acres nationally, a 1.8-million-acre decrease from 2011, when mortality was reported on 6.4 million acres. During the past 3 years, mortality has been reported on a declining number of acres, indicating a downward trend since 2009, when mortality was reported on 11.8 million acres. One pest caused slightly more than 52 percent of the mortality—the mountain pine beetle, a native insect found in forests of the Western United States.

Although mortality is represented in the chart, defoliation can also significantly affect our forests. The western spruce budworm caused more than 3.5 million acres of defoliation damage in 2012, a 1.0-million-acre decrease from 2011. European gypsy moth defoliation was reported at more than 39,000 acres in 2012, an increase from the 4,882 acres reported in 2011. 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.

Readers are advised to use caution when interpreting the maps in this document because data are displayed at the county scale. If damage was reported at just one location in the county, the whole county is displayed as affected. This protocol is used because data for some pests are collected only at the county level. In addition, if the damage was reported at a finer pixel size, many areas would not be visible at the scale used in this publication. For example, numerous counties reported southern pine beetle mortality in 2012, but most individual infestations were small. When added together, the total area affected was only about 8.346 acres of mortality. The maps in this publication represent only what is reported as mortality or defoliation and not 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. This report provides descriptions of 20 major insects and diseases that contribute to annual forest mortality and defoliation. An additional section, Pests To Watch, describes pests that have the potential to become major threats and that the Forest Service and its partners are monitoring.

Mountain Pine Beetle

Dendroctonus ponderosae Hopkins

In 2012, surveys detected mountain pine beetle (MPB) mortality on approximately 2.4 million acres, a decrease of 1.4 million acres from 2011 (fig. 1). Colorado, Idaho, Montana, and Oregon continue to report high mortality levels (figs. 2 and 3).

Region 1—Northern Idaho and Montana

In the northern Rockies, surveys identified lower levels of MPB activity, a continued decrease from 2011; more than 80 percent fewer acres with mortality and 58 percent fewer dead trees were reported. Most MPB mortality (85 percent) was recorded on Forest Service-managed lands, with approximately 10 percent mortality recorded on private lands, 3 percent on other Federal lands, and 2 percent on State lands. For the ponderosa pine type, more than one-third of the mortality detected was on private lands, nearly all of which was in Montana.

In northern Idaho, most MPB activity was delineated in and around the Clearwater and Nez Perce National Forests. In Montana, areas that continue to have significant mortality included

Figure 1.—*Mountain pine beetle activity decreased significantly since 2009 in much of the Western United States.*

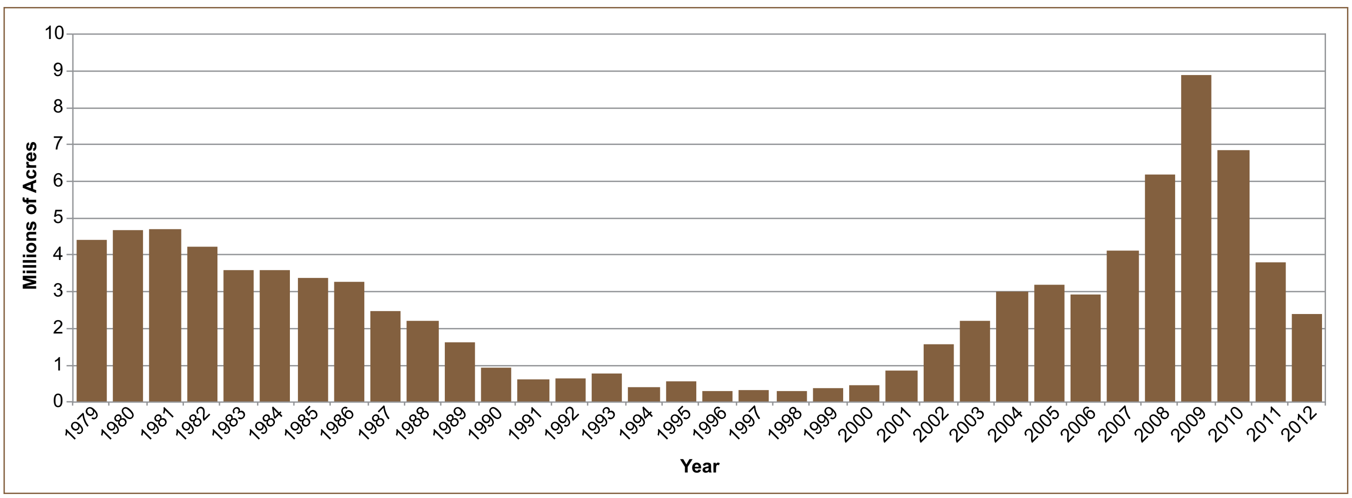


Figure 2.—*Mountain pine beetle mortality in 2012 by State.*

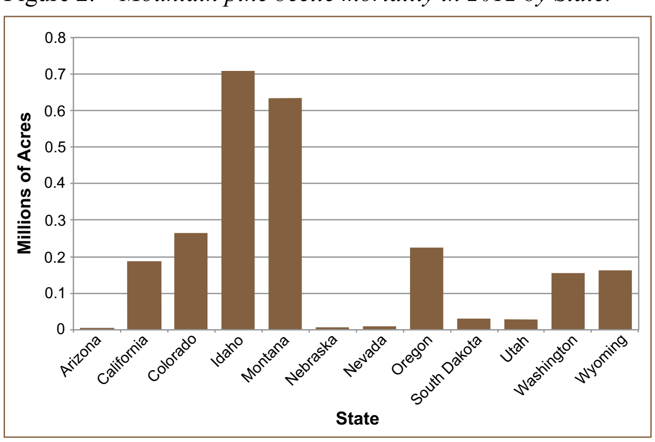
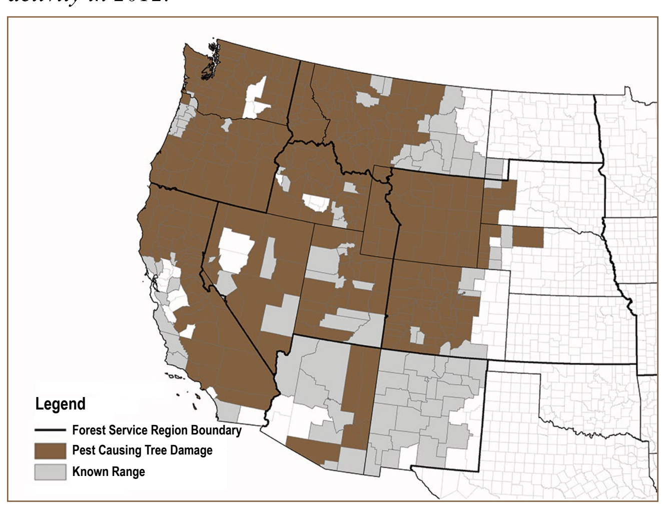


Figure 3.—*Counties that reported mountain pine beetle activity in 2012.*



the Big Hole area of the Beaverhead National Forest, Bitterroot National Forest, Deerlodge National Forest, and the Lewis and Clark National Forest. Most of the high-elevation five-needle pine mortality was detected in the Beaverhead, Gallatin, and Lewis and Clark National Forest areas.

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

On the Medicine Bow National Forest and adjacent lands in Albany, Carbon, Converse, Laramie, Natrona, and Platte Counties in south-central Wyoming, MPB populations remained active but declined in many areas. Populations in all identified counties, except Natrona, had far fewer acres in 2012 than in 2011. New MPB activity was observed on Casper Mountain, portions of the Laramie Mountain Range, and the Shirley and Ferris Mountains. On the Shoshone National Forest and adjacent lands in northwest Wyoming, MPB continued to kill lodgepole (fig. 4) and five-needle pines, although activity declined in many areas largely because of susceptible host depletion. The Bighorn National Forest and adjacent lands in Bighorn, Johnson, Sheridan, and Washakie Counties in north-central Wyoming had relatively little MPB activity in recent years. Large areas of forest remain unaffected by MPB in this area. Crook and Weston Counties in eastern Wyoming, along the Wyoming and South Dakota State line, primarily in the Black Hills National Forest, MPB continue to have elevated levels of activity.

In South Dakota, on the Black Hills National Forest and adjacent lands, MPB continued to kill ponderosa pines in 2012. All land ownership types were affected. The Black Elk Wilderness Area bordering Custer State Park experienced high mortality of ponderosa pine because of MPB. The adjacent land in Custer State Park had much lower pine mortality. Relic stands of limber pine in the Cathedral Spires of Custer State Park are highly valued. Foresters are concerned that the expanding MPB

Figure 4.—*Lodgepole mortality. Photo by Brian Howell, USDA Forest Service.*

population from the adjacent Black Elk Wilderness Area may spread to these relic stands. The trees are already stressed by white pine blister rust and white spruce encroachment; the additional stress of beetle attacks, even when unsuccessful, can result in significant tree mortality.

In northern Colorado, the MPB epidemic continues but showed signs of decline in many of the affected counties. The epidemic has nearly ended west of the Continental Divide in Grand, Jackson, Routt, and Summit Counties. East of the Continental Divide, MPB populations in Clear Creek, Gilpin, and Park Counties also have declined. Populations in the southern portion of Boulder County declined but stayed static in the northern portion of the county. In Larimer County, MPB remained very active, although populations have begun to decline as well. Along the southern edge of the epidemic in Lake, Park, and Pitkin Counties, a few new areas of infestation were reported, but beetle activity has generally decreased or stopped in these counties.

Region 3—Arizona and New Mexico

In contrast to Colorado and other Rocky Mountain States, Arizona and New Mexico had little MPB activity. In Arizona, MPB and *Ips lecontei* were found attacking southwestern white pine scattered throughout the Wallow Fire. MPB were also active in and adjacent to recreation sites within the Piñalenos. In New Mexico, occasional individual ponderosa pine trees were observed with MPB, but no major recent outbreaks have occurred. In 2012, individual ponderosa pine trees infested with MPB were observed on the Santa Fe National Forest. Widespread bark beetle activity in ponderosa pine forests in New Mexico tended to be a combination of *Ips*, western, and roundheaded pine beetles.

Region 4—Southern Idaho, Nevada, Utah, and Western Wyoming

In the Intermountain Region, MPB-caused mortality decreased, but populations remained at outbreak levels in many areas, including several areas affected by the 2012 wildfires. This continuing outbreak is the largest recorded in the region. Increased mortality in ponderosa pine and the expansion of lodgepole pine mortality in areas recently infested with MPB account for current mortality. Some areas that experienced years of heavy mortality, however, have no mortality mapped in 2012. In older outbreak areas, most of the preferred, susceptible host type for MPB has been killed.

Most of the mapped mortality occurred in south-central Idaho, where large increases in lodgepole and ponderosa pine mortality occurred on the Payette and Salmon-Challis National Forests. A decrease in mortality occurred on the Boise, Caribou-Targhee, and Sawtooth National Forests. Five-needle pine mortality decreased on all forests in southern Idaho in 2012.

In Utah, MPB-caused tree mortality decreased for the second consecutive year. The Ashley and Uinta-Wasatch-Cache National Forests saw the largest decrease in lodgepole and ponderosa pine mortality. Most forested land ownership types in northern Utah, however, experienced an increase in five-needle pine mortality.

In western Wyoming, on the Bridger-Teton National Forest, lodgepole pine mortality decreased nearly 40 percent, because 2012 wildfires affected a large portion of infested lodgepole on the Big Piney and Kemmerer Ranger Districts. Tree mortality related to this insect still occurred on the Pinedale Ranger District. Five-needle pine mortality increased five-fold throughout the Bridger-Teton National Forest. In Nevada, MPB-caused tree mortality decreased 54 percent.

Region 5—California

MPB continued to cause high levels of mortality of pine species in several areas of California during 2012. The most significant mortality areas were whitebark and western white pine stands in the Warner Mountain Range, lodgepole stands on the Klamath and Modoc National Forests (fig. 5), and lodgepole and whitebark pine on the Inyo National Forest. MPB activity also increased in sugar pine throughout northwestern California and the Sierra Nevada Mountains.

Region 6—Oregon and Washington

The number of acres affected by MPB in all host types in the Pacific Northwest was unchanged from 2011 levels but was still at its lowest reported level since 2002. MPB in whitebark

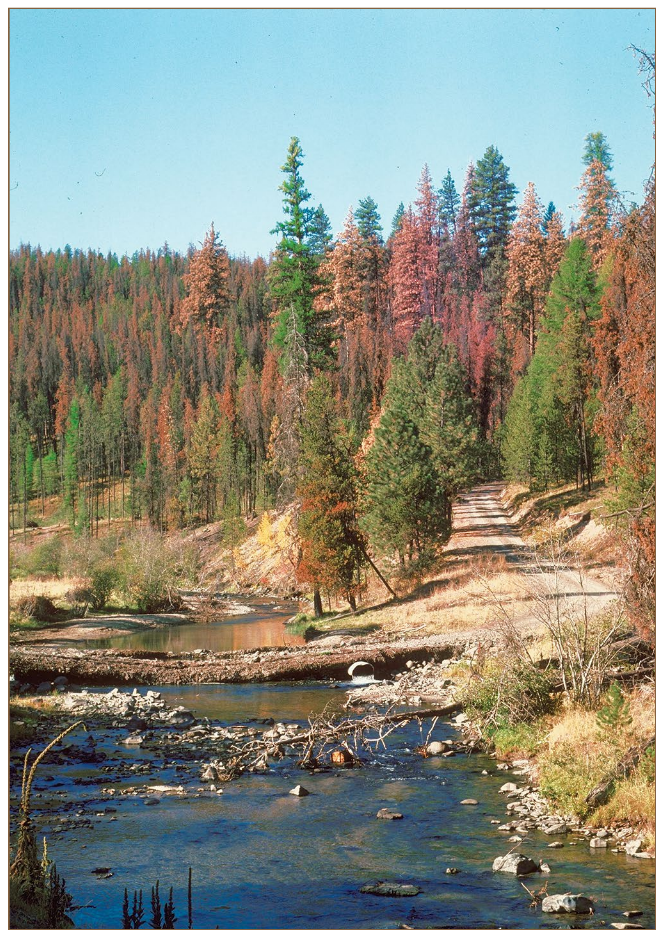
Figure 5.—*Lodgepole mortality on the Klamath National Forest in California. Photo by Zachary Heath, USDA Forest Service.*

pine was recorded at the lowest number of affected acres in 12 years. Past mortality in this host type was, in part, responsible for the lower number of acres mapped with mortality in 2012. The most affected host type was on National Forest System lands in Chelan and Okanogan Counties, along the crest of the Cascade Mountain Range. Some damage was mapped in the vicinity of Mt. Adams. MPB in lodgepole pine had a higher number of recorded affected acres the past year and nearly twice as many estimated trees killed per acre.

In Oregon, the most heavily affected areas of lodgepole pine were similar to those affected by MPB in 2011 (fig. 6) and include the Malheur and Winema-Fremont National Forests located southeast of Prairie City. In Washington, a significant increase occurred in the number of acres mapped with damage to lodgepole pine. Most of this damage occurred in Chelan, Ferry, Okanogan, and Yakima Counties. The Shady Pass outbreak in Chelan County expanded in size and intensity. Most of damage on the Colville National Forest was mapped on the Kettle Falls and Republic Ranger Districts.

MPB in ponderosa pine had the lowest recorded number of acres with mortality in the past 10 years. In Oregon, Forest Service lands on the Fremont-Winema and Ochoco National Forests were the most heavily affected areas. In Washington, mapped damage in 2012 increased over 2011 levels in ponderosa pine, with most of the damage on tribal lands in Ferry, Okanogan, Pend Oreille, Stevens, and Yakima Counties. Significant mortality occurred on the Okanogan-Wenatchee National Forest in the vicinity of Fox Peak and the south fork of Gold Creek.

Figure 6.—*Lodgepole pine stand killed by mountain pine beetle on the Wallowa-Whitman National Forest in Oregon. Photo by Dave Powell, USDA Forest Service.*

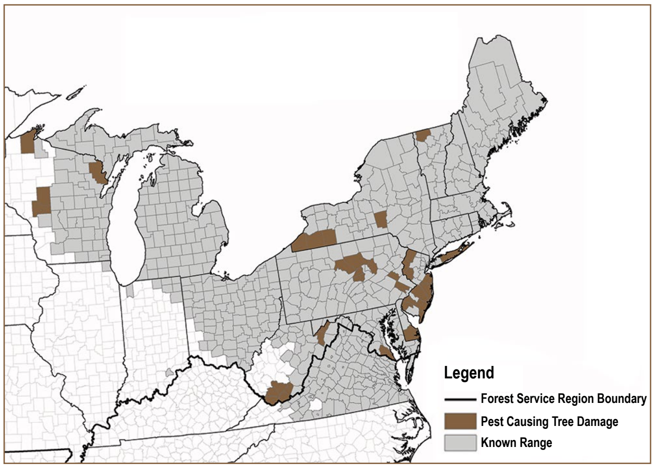


Gypsy Moth

Lymantria dispar Linnaeus

Across the Northeast in 2012, defoliation remained at low levels, but egg mass surveys in the fall indicate gypsy moth (GM) populations may be rebounding (figs. 1 and 2).

Figure 1.—*Counties that reported gypsy moth damage in 2012.*

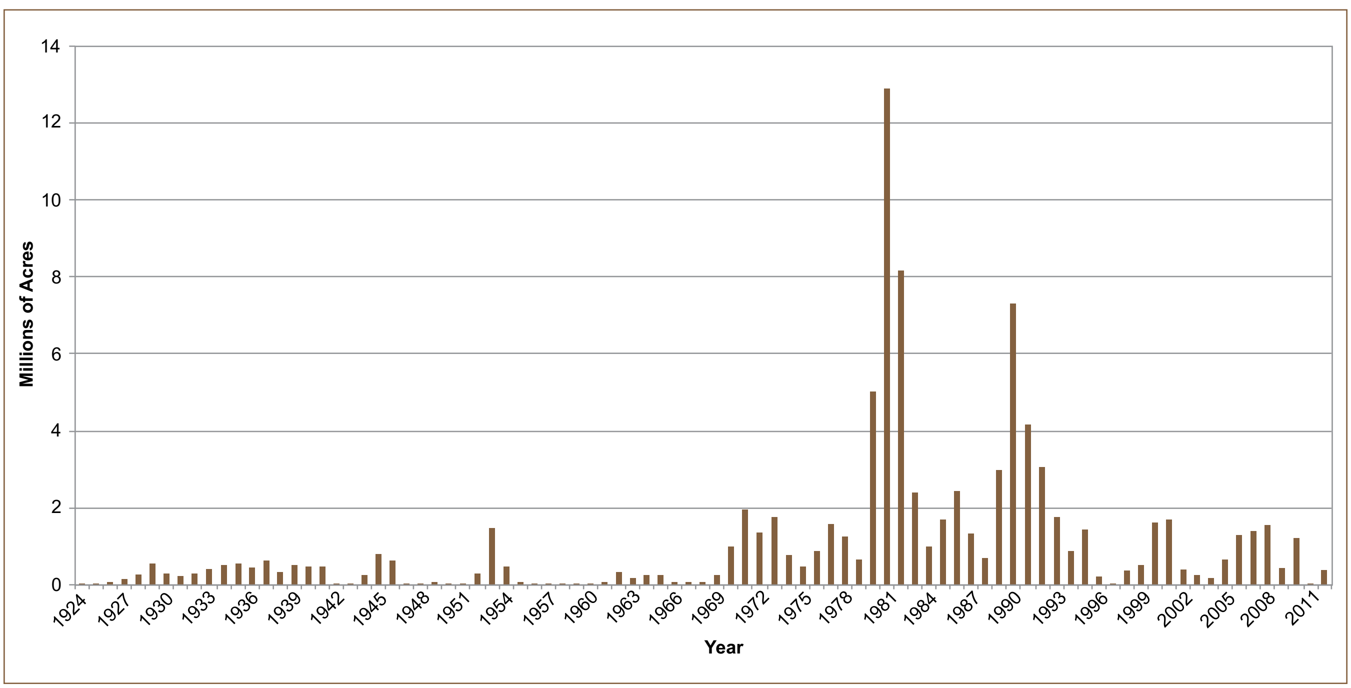


No defoliation was reported in 2012 in Rhode Island, and caterpillar populations remained at low levels. Vermont reported moderate defoliation detected by ground survey in Franklin County.

Noticeable GM defoliation was seen in parts of western New York, and subsequent egg mass surveys indicated that some outbreak-level populations are likely in 2013. Damage was mapped by aerial survey in five New York counties.

In Pennsylvania, low populations of GM continue across the State. No visible foliage damage was detected from the air, and only minimal (5 acres) foliage damage was observed from the ground in Columbia, Leigh, Lycoming, and Montgomery Counties. The density of viable GM egg masses has increased considerably from last year, however, in the Northern Tier of Pennsylvania.

Figure 2.—*Gypsy moth defoliation from 1924 through 2012.*



Several very isolated but heavy infestations of landscape trees at private residences were reported in Sussex County, DE, in 2012. Maryland reported defoliation in St. Mary's County (table 1). The New Jersey Department of Agriculture reported less GM defoliation than in 2011. Ohio reported no areas of defoliation in 2012, and no new counties were added to the quarantine area.

West Virginia added five new counties to the GM quarantine in 2012: McDowell, Mercer, Raleigh, Summers, and Wyoming. Most populations were static through 2012, although signs of building populations were evident in parts of Grant and Preston Counties. The counties in the southwestern part of the State indicated a building population as well.

Moderate to heavy defoliation was detected on aspen and birch in Bayfield County, WI. In Marinette County, a few large roadside oaks were heavily defoliated and caterpillar counts predict a larger outbreak in 2013.

In North Carolina, expansion of GM populations from the north continued. The 2012 trapping season had higher trap catches than in 2011, which was a notably low year. In 2012, 1,457 moths (fig. 3) were caught in 419 positive traps (11,565 total traps set). Trapping was conducted in most North Carolina counties and positive trap counts were found statewide.

In Virginia, no defoliated acres from GM were detected during aerial survey for the third year in a row, although 4 acres of light to moderate defoliation were reported from ground observations.

Table 1.—*Gypsy moth defoliation by State in 2012.*

State	Acres Defoliated
Maryland	0.4
West Virginia	191.0
New Jersey	1,065.0
New York	16,295.0
Wisconson	21,642.0

Figure 3.—*Emerging gypsy moth. Photo by Justin Williams, USDA Forest Service.*

Southern Pine Beetle

Dendroctonus frontalis Zimmermann

Southern pine beetle (SPB) activity increased during 2012; approximately 8,346 acres with SPB-caused mortality were reported compared with 7,004 acres in 2011 (figs. 1 and 2). A total of 2,091 acres (1,164 SPB spots with infestations) of SPB-caused mortality were detected and mapped during 2012 (table 1) in the Southeastern United States. Most of the activity was in Mississippi, which reported 1,471 affected acres. Of these acres, 1,068 spots had infestations and 914 of these spots were on National Forest System lands, primarily the Homochitto National Forest (fig. 3). SPB activity was reported in four other States: Alabama, Florida, South Carolina, and Virginia. Both infestations in South Carolina were on Federal lands, while most of the spots in the other States, except Mississippi, were on nonindustrial and private forest lands. The activity in Mississippi was the first SPB outbreak in the Southeastern United States since around 2005. Expanding infestations have not been detected west of the Mississippi River since 1999 (fig. 4).

In New Jersey, SPB activity was concentrated in the southern portion of the State, south of the Mullica River. Although small areas with SPB were reported just north of the Mullica River, heavy populations had not yet established in those areas. In New Jersey, SPB mainly affected pitch pine, shortleaf pine, and Virginia pine, but it has been observed infesting Norway spruce and white pine. In 2012, approximately 500 fewer acres of damage were reported than in 2011. SPB was still mainly found in the southern counties of New Jersey, including Atlantic, Cape May, Cumberland, Gloucester, and Salem. SPB was not detected in Monmouth County in 2012.

Low levels of mortality in Chihuahua pine, in which SPB brood galleries were found, were observed in the Chiricahua Mountains in southeastern Arizona. Low levels of ponderosa pine mortality caused by SPB were also observed in 2012 in the Santa Catalina Mountains north of Tucson (Pima County), AZ.

Figure 1.—*Counties that reported southern pine beetle infestations in 2012.*

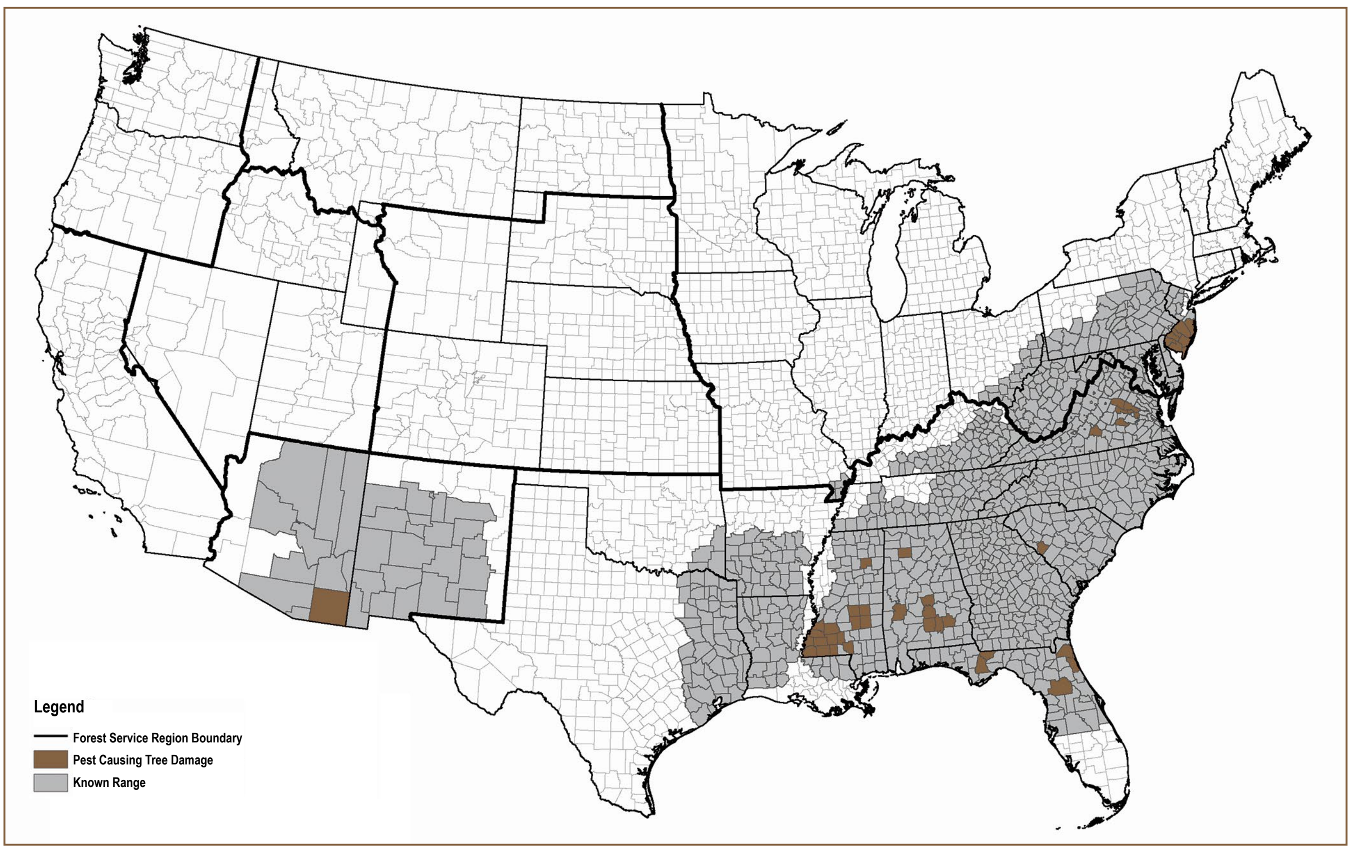
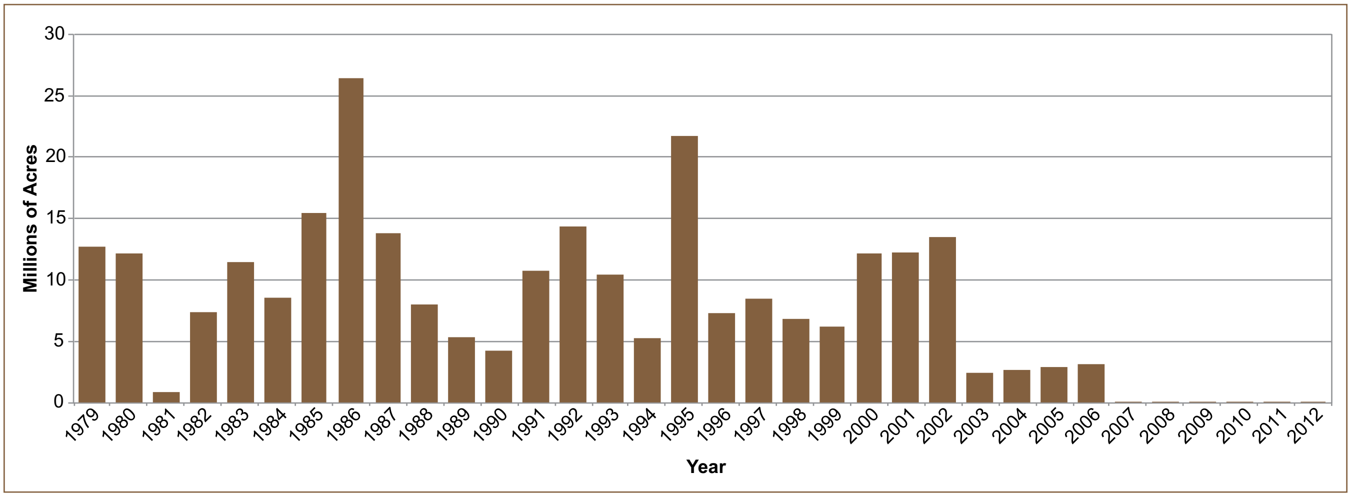


Figure 2.—*Southern pine beetle outbreaks, 1979 to 2012.*



Note: The surveys after 2007 counted the number of outbreak acres differently than in previous years. All acres in the county previously were counted if a single spot was positive for southern pine beetles (SPBs). The surveys after 2007 reflect the estimated number of areas affected by SPBs.

Table 1.—*Southern pine beetle activity by State in 2012.*

State	Acres Infested	Number of Spots[1]
Alabama	4	57
Arizona	1	3
Florida	310	10
Mississippi	1,470	1,059
New Jersey	6,255	966
South Carolina	12	2
Virginia	294	25
Total	8,346	2,122

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

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

Figure 3.—*Loblolly pines killed by southern pine beetle. Photo by Erich G. Vallery, USDA Forest Service.*

Figure 4.—*Southern pine beetle damage in slash stand. Photo by Erich G. Vallery, USDA Forest Service.*

Emerald Ash Borer

Agrilus planipennis Fairmaire

By the end of 2012, 18 States reported emerald ash borer (EAB). EAB was found for the first time in Connecticut, Kansas, and Massachusetts in 2012 (fig. 1).

The first EAB was detected in Connecticut in the town of Prospect at a Cerceris wasp surveillance colony in Canfield Park on July 16, 2012. Additional discoveries were made at other colonies, which lead to detections in four towns in New Haven County: Beacon Falls, Bethany, Naugatuck, and Prospect.

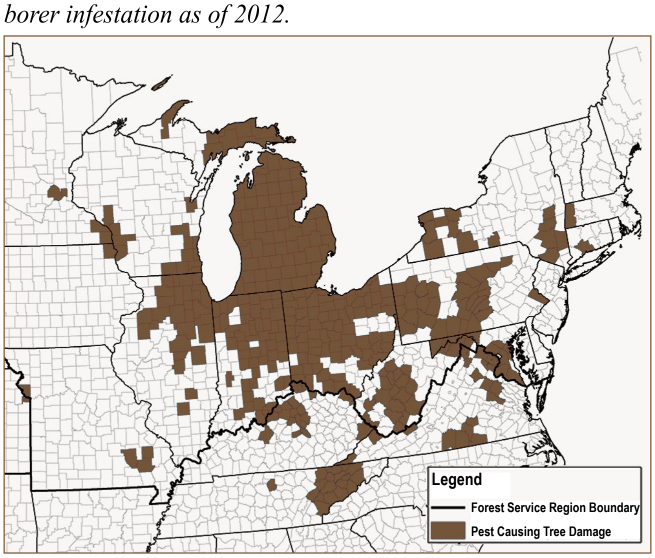
In Kansas, a State emergency quarantine was enacted by the Kansas Department of Agriculture following the detection of EAB at the south end of the dam on Wyandotte County Lake on August 26, 2012.

The first EAB in Massachusetts was detected in the western town of Dalton in August 2012.

EAB was positively confirmed in three new counties (Dutchess, Niagara, and Tioga) in New York in 2012. EAB was collected in purple prism traps in all infested counties. Mortality from EAB was mapped by aerial survey in Albany County, NY.

In Illinois, EAB was found for the first time in Henry, Knox, Lee, and Macon Counties. EAB continued to spread throughout the northern two-thirds of the State, particularly in the Chicago metropolitan areas. Henry, Knox, and Lee Counties are the farthest points west where EAB has been found in Illinois.

Figure 1.—*Quarantined counties as a result of the emerald ash borer infestation as of 2012.*



Indiana reported new county records for Henry, Newton, and Wayne Counties, which were already under quarantine. EAB was present in 54 Indiana counties, with noticeable mortality occurring in the rural, urban, and riparian forests in 28 counties. Aerial surveys were conducted to map new locations and expansion of the mortality across and around the areas that have obvious and extensive ash mortality. By order of severity and damage, the infestations were in (1) Huntington and Wabash Counties; (2) Orange, Lawrence, and Washington Counties; (3) Marion and Hamilton Counties; (4) Allen, Wills, and Adams Counties; (5) Randolph County; and (6) Pigeon River County. Developing mortality found in Lake and Porter Counties includes the Dunes National Lake Shore area.

No new county records were reported in Minnesota for 2012; however, two additional sites were identified in Winona County within Great River Bluffs State Park. These sites were moderately infested, along with a number of individual ash trees scattered across and adjacent to the park.

In Wisconsin, a new county record was reported for Trempealeau County. Mortality from EAB was still confined to the local areas where it had been detected. Even within quarantined counties, damage was scattered and localized.

Missouri reported new county records for Madison, Platte, and Reynolds Counties. In 2012, an arborist detected the first EAB in an urban area in Platte County, MO, near Kansas City.

The Lower Peninsula of Michigan was generally infested. In the Upper Peninsula, EAB was found in several counties throughout the peninsula and is expected to continue spreading through the ash resource (fig. 2).

In 2012, seven Ohio counties reported new EAB infestations: Belmont, Crawford, Columbiana, Guernsey, Knox, Madison, and Muskingum. EAB continued to spread throughout the State, with increasing populations in new counties.

Figure 2.—*Emerald ash borer infested ash trees in Novi, MI. Photo by Steven Katovich, USDA Forest Service.*

In 2012, Pennsylvania added seven counties to the infestation list: Bucks, Clinton, Franklin, Jefferson, Perry, Snyder, and Venango. EAB was found in 29 of 67 counties in Pennsylvania.

EAB continues to spread in West Virginia. Seven counties in West Virginia reported new activity in 2012: Braxton, Hampshire, Lewis, Lincoln, Mercer, Mineral, and Ritchie.

In 2012, Maryland added three new counties to the EAB-infested list: Garrett, Montgomery, and St. Mary's, for a total of nine counties.

Surveys in Delaware and New Jersey did not detect any EAB infestations.

In Kentucky, Pike County was the only new county infested by EAB in 2012. Damage was variable in the 21 counties where the beetle previously had been confirmed. Positive EAB detections have been found in adjacent or nearby counties of neighboring States on all sides of Kentucky.

In Tennessee, 13 counties were added to the infested list, bringing the total number of EAB-infested counties to 18. The insect was much more widespread than previously known, and survey activities documented its presence in many new areas.

In Virginia, 2012 was a "breakout" year for EAB. Since 2008, EAB had been found only within the northern counties of Arlington, Fairfax, Frederick, and Prince William. Random discovery of new infestations and the results of the summer trapping effort produced finds in 13 additional counties, including Loudoun and Warren in the north; Caroline, Hanover, and in Spotsylvania the northeast; Charlotte, Halifax, Mecklenburg, Pittsylvania, and Prince Edward in the south central; and Buchanan, Giles, and Lee in southwest. A Federal quarantine for the entire State is now in place. One area of new infestation spanned approximately 7,000 acres in far northern Frederick County, bordering the West Virginia panhandle. The other large area was along the Roanoke (Staunton) River, which represents the border of Charlotte and Halifax Counties.

Sudden Oak Death

Phytophthora ramorum Werres et al.

Sudden Oak Death (SOD) continued to be a persistent problem in 2012 along coastal California and Oregon (fig. 1). In California, an increase in infection levels and subsequent mortality was a direct result of the mild, wet springs experienced in the 14 infested counties in 2010 and 2011 (fig. 2). A wave of new SOD-related oak and tanoak mortality was observed in 2012 throughout California's coastal infested forests. Aerial surveys for 2012 reported a dramatic increase in the number of infested acres and number of recently dead trees compared with 2011 levels. Aerial surveys were also conducted to target ground surveys in the uninfested counties of Del Norte and San Luis Obispo. No *Phytophthora ramorum* was recovered as a result of these surveys, suggesting the disease has not spread into the counties at the northern or southern extent of SOD (fig. 3).

In Curry County, OR, the pathogen was detected in 2001 by aerial survey. Tanoak was the main affected host. SOD spread continues throughout the affected area.

Figure 1.—*Counties that reported Sudden Oak Death in 2012.*

Figure 2.—*Sudden Oak Death near Carmel Valley, CA. Photo by Tom Coleman, USDA Forest Service.*

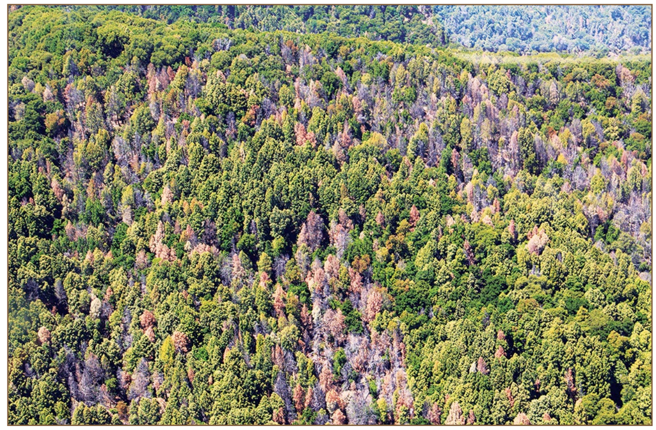


Figure 3.—*Bark cracks and bleeding on coast live oak caused by Sudden Oak Death. Photo by Joseph O'Brien, USDA Forest Service.*

Spruce Beetle

Dendroctonus rufipennis Kirby

Spruce beetle (SB) epidemics continued in Colorado and Wyoming within the Rocky Mountain Region in 2012, leaving many areas of large, dead standing trees. The number of acres reported with SB mortality totaled more than 443,300 acres nationally, similar to the 428,300 acres reported in 2011 (fig. 1).

In northwestern Wyoming, on the Shoshone National Forest, much of the spruce has been killed in the Absaroka Mountains, but epidemic activity continued north to the Montana border and south in the Wind River Mountain Range. SB activity increased in the northern Big Horn Mountains in north-central Wyoming, where much suitable green spruce remained. In southeastern Wyoming, SB continued at epidemic levels on the Medicine Bow, Sierra Madre, and Snowy Range Mountain Ranges, and many areas have been depleted of suitable hosts.

In Colorado, moderate to severe epidemics were ongoing in the La Garita and San Juan Mountains in southern Colorado; Grand Mesa, the Wet Mountains, and portions of the Arapaho-Roosevelt and Routt National Forests; and Rocky Mountain National Park in northern Colorado. Localized infestations also were detected on the eastern slopes of the Sangre de Cristo Mountain Range. The massive SB outbreak, which began in the Weminuche Wilderness of the Rio Grande and San Juan National Forests in the early 2000s, continued to expand farther north and east in 2012 (fig. 2). In a number of cases, increased tree mortality was from the migration of beetles rather than the expansion of local populations. Large numbers of beetles were transported with prevailing winds, infesting new areas and quickly expanding the scope of the outbreak. Outbreak intensity was so great that in some locations nonhost lodgepole pine and immature spruce down to 1-inch diameter at breast height were attacked. Small groups of dead and dying spruce were detected along the Continental Divide as far north as Monarch Pass. Heavy infestations occurred in the Cochetopa Hills from Cochetopa Pass south to the La Garita Mountain Range and at Spring Creek Pass in Ramboullet Park. New areas of infestation also were detected south of Lake San Cristobal near Lake City.

In the Intermountain Region, SB-caused tree mortality nearly doubled. Most of the spruce mortality was mapped in Utah, where it was detected at some level on all its national forests. Most of the SB-caused tree mortality was mapped on the Ashley, Fishlake, and Uinta-Wasatch-Cache National Forests. Spruce mortality also doubled on private lands in Utah. In western Wyoming, spruce mortality was scattered throughout the Bridger-Teton National Forest, with most of the mortality mapped in the Teton Wilderness. No spruce mortality was reported in southern Idaho or Nevada.

Figure 1.—*Spruce beetle-caused tree mortality detected in 2012 by aerial detection surveys.*

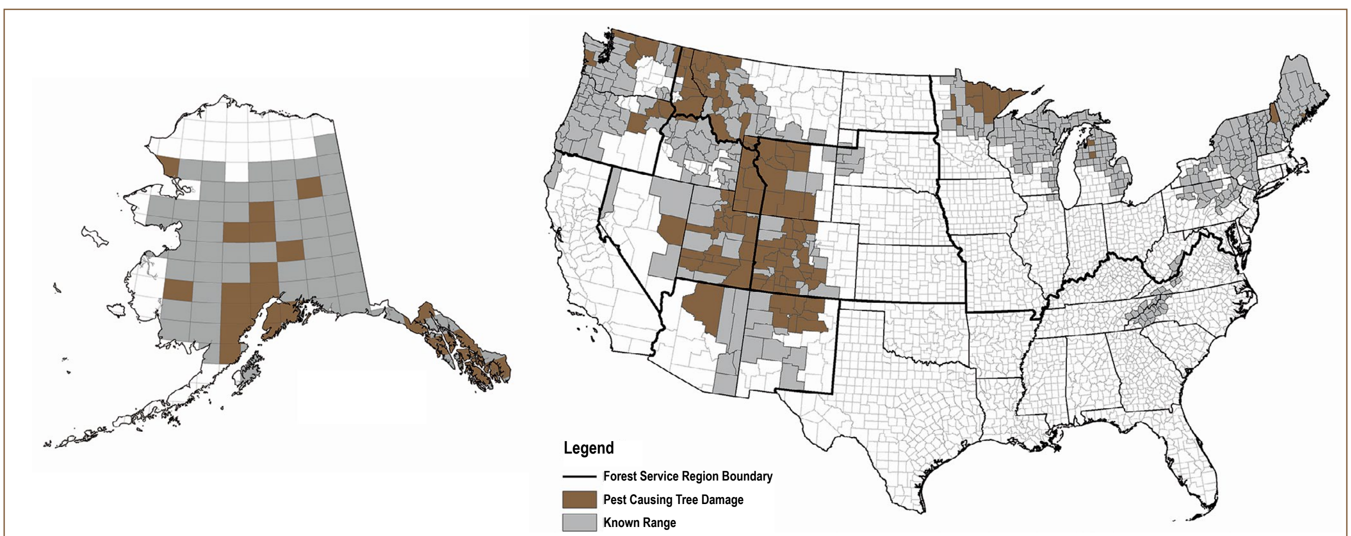


Figure 2.—*Spruce beetle damage on Engelmann spruce on the San Juan National Forest in Colorado. Photo by Justin Backsen, USDA Forest Service.*

In the northern Rockies, estimates for the number of acres affected by SB decreased in 2012 relative to 2011. SB populations remained endemic throughout most of northern Idaho and Montana, except for two locations in south-central Montana. Outbreak of SB populations continued to cause tree mortality, although the numbers appear to be declining in both locations. These outbreaks were located on federally managed lands on Beaverhead-Deerlodge National Forest, in the Gravelly Mountains, and within the Rock Creek drainage on the Custer National Forest. Ground surveys identified that groups of SB-caused mortality typically ranged from two to eight trees and were spatially adjacent to Engelmann spruce infested in 2011.

In the southwest, SB activity remained a concern among entomologists, especially with the outbreak occurring adjacent to the New Mexico border along the Rio Grande National Forest in Colorado. Only relatively minor activity, however, was observed in the Southwest in 2012.

In Arizona, SB activity was observed during aerial detection surveys on the Apache-Sitgreaves and Kaibab National Forests; however, only 1 acre of SB-caused mortality was mapped on the Kaibab National Forest. Many acres on Mt. Baldy had new and older spruce mortality. SB-caused tree mortality also occurred in fire-injured trees within areas impacted by the Wallow Fire (mostly in Alpine and Springerville Ranger Districts of the Apache-Sitgreaves National Forests). SB later attacked some trees that were initially attacked by the blue spruce engraver beetle.

In New Mexico, areas with SB activity were mapped from aerial detection surveys on the Carson and Santa Fe National Forests. The largest concentration of activity was in the Pecos Wilderness on the Santa Fe National Forest, likely the result of a large area of forest blowdown that occurred just over the ridge in 2007.

In Oregon and Washington, the number of Engelmann spruce acres with SB-attributed mortality in 2012 increased significantly from 2011 levels. Some of this downward trend in tree killing could be attributed to a multiyear aggressive outbreak in Washington that has been depleting the susceptible host type. In Washington, most of the mortality occurred within the Pasayten Wilderness in Okanogan County. Estimated tree mortality per acre in 2012 was relatively low compared with mortality rates in 2011. New outbreaks were detected near the Canadian border in the vicinity of Castle Creek, west of Mt. Winthrop.

The number of acres of spruce that was actively infested by SB in Alaska declined again in 2012, continuing a trend that began following its peak in the mid-1990s. In 2012, a relatively small amount of SB activity was identified during aerial surveys, which represents a decline from 2011 levels, and was the lowest recorded figure since systematic, statewide aerial surveys began in the 1970s. Despite the relatively low number of infested acres, SB remained the leading cause of conifer mortality in south-central and southwestern Alaska, while southeast Alaska accounted for nearly 25 percent of the SB-caused mortality in 2012. All the areas of significant recent SB activity in south-central and southwestern Alaska continued to decline in intensity, although all exhibit some signs of persistent, residual activity. These areas include Katmai National Park, Lake Clark National Park, and Lake Iliamna in southwest Alaska and Chickaloon Bay and Kwentna/Puntilla Lake in south-central Alaska. The west side of Cook Inlet in south-central Alaska showed the largest amount of activity, but it was spread out across a large area and, in general, was light in intensity. In southeast Alaska, slightly more than one-half of all the observed SB activity occurred on Kupreanof Island (fig. 3).

SB also occurs in the Eastern United States and occasional population increases lead to isolated outbreaks and tree mortality. Maine recorded a small amount of mortality in Knox County. In the Lake States, low levels of mortality were found in Minnesota State parks and campgrounds along the shores of Lake Superior. Significant mortality was found in a few white spruce plantations in Koochiching County. Small pockets of mortality were reported in several north-central counties. In Michigan, damage was detected in white spruce plantations that were managed by row thinning during or followed by a period of drought stress.

Figure 3.—*Spruce beetle damage and woodpecker activity. Photo by Edward H. Holsten, USDA Forest Service.*

Western Bark Beetles

Numerous Species

Western bark beetle (WBB) mortality in 2012 continued its downward trend that began 3 years ago. As in previous years, the primary reason for the decrease was a fewer number of acres recorded with mountain pine beetle mortality. In 2012, nearly 3.7 million acres of WBB-induced mortality were reported (fig. 1). The following section describes the conditions of selected WBB reported for 2012 (table 1).

Douglas-Fir Beetle

The number of recorded acres of Douglas-fir beetle (DFB)-caused mortality slightly increased from 2011 to 2012, from 159,000 to 162,000 acres.

In Montana and northern Idaho, tree mortality was primarily detected in spatially isolated pockets primarily on federally managed lands. DFB-caused mortality was observed in association with previous western spruce budworm defoliation in Montana, especially within the Bitterroot and Gallatin National Forests through ground surveys. Overall, DFB populations were at near-normal levels in most Douglas-fir and mixed-species stands, except for a few isolated areas where higher populations continued to cause low to moderate levels of Douglas-fir mortality in 2012.

Figure 1.—*Western bark beetle outbreaks from 1997 through 2012.*

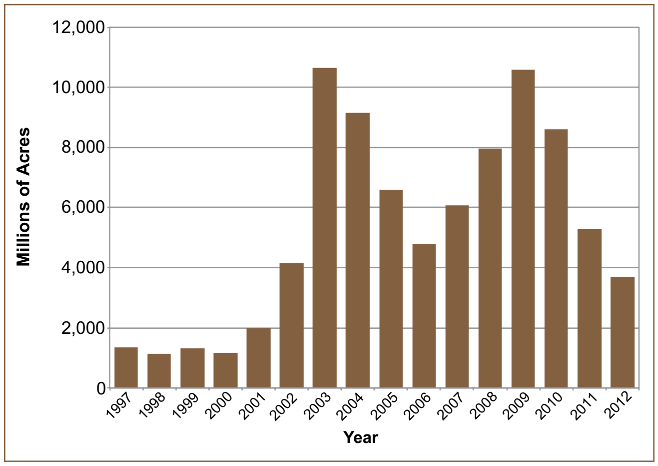


Table 1.—*Trends for selected western bark beetles and infested acres detected in aerial surveys during 2012.*

Bark Beetle(s)	Host(s)	Acres Detected With Bark Beetle Activity in 2012*
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.)	2,394,544
Spruce beetle, *Dendroctonus rufipennis* (Kirby)	Engelmann spruce (*Picea engelmannii* Parry ex Engelm.), white spruce (*P. glauca* [Moench] Voss), Sitka spruce (*P. sitchensis* [Bong.] Carr.)	443,364
Douglas-fir beetle, *Dendroctonus pseudotsugae* Hopkins	Douglas-fir (*Pseudotsuga menziesii*)	161,953
Jeffrey pine beetle, *Dendroctonus jeffreyi* Hopkins	Jeffrey pine (*Pinus jeffreyi Balf.*)	12,576
Western pine beetle, *Dendroctonus brevicomis* LeConte	Ponderosa pine, Coulter pine (*Pinus coulteri* D. Don)	252,045
Western balsam bark beetle, *Dryocoetes confusus*, Swaine	Subalpine fir (*Abies lasiocarpa* [Hook.] Nutt.)	14,668
Fir engraver beetle, *Scolytus ventralis* LeConte	True firs (*Abies* spp.)	211,431
Pine engraver, *Ips pini* (Say), Arizona five spined *Ips*, *Ips lecontei* Swaine	Ponderosa pine	3,657
Pinyon *Ips*, *Ips confusus* (LeConte)	Pinyon pine (*Pinus edulis* Engelm.) Singleleaf pinyon (*Pinus monophylla* Torr. & Fen.)	22,866

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

DFB continued to impact forests in several areas south of Denver and on Colorado's Western Slope. These beetle populations occurred on more forest land than in 2011. Many of the identified infestations have been ongoing for several years, and trees with gray crowns from previous years' attacks are adjacent to more recent mortality. Infestations continued in Douglas-fir forests in the northern Rampart Mountain Range and in drainages north of Florence and Cañon City. Mortality also continued on steep mountain slopes from Manitou Springs, south along the eastern slopes of Cheyenne Mountain, and south to Turkey Creek. Surveyors commonly observed groups of between 1 and 20 trees killed by DFB at the lower elevation limits of Douglas-fir growth in drainages on the western slopes of the Culebra and Sangre de Cristo Mountain Ranges, including several large groups in the lower Medano Creek Basin of Great Sand Dunes National Park and Preserve.

On the Western Slope of Colorado, infestations continued to expand in and around Paonia, on the rimrocks of the Black Canyon of the Gunnison, and in low-elevation forests from Gunnison south to Lake City. Infestations were detected in several tributaries of the Crystal River, from Marble north and east to the slopes of Mount Sopris. Infestations also were observed in multiple locations along the base of the San Juan Mountains in the vicinity of Pagosa Springs.

DFB-caused mortality was mapped on few acres in Arizona this year, mostly in canyons and drainages. Most activity occurred on the Coconino, Coronado, and Kaibab National Forests and on the Fort Apache tribal lands. Most activity in the State was associated with fires.

Douglas-fir tree mortality from DFB was observed throughout New Mexico during the 2012 aerial detection surveys. The affected area mapped in 2012 was four times the amount mapped in 2011. Activity was reported on the Carson and Santa Fe National Forests in the northern part of the State and also on the Lincoln National Forest in the southern part of the State. Mortality was also reported in the Sacramento Mountains.

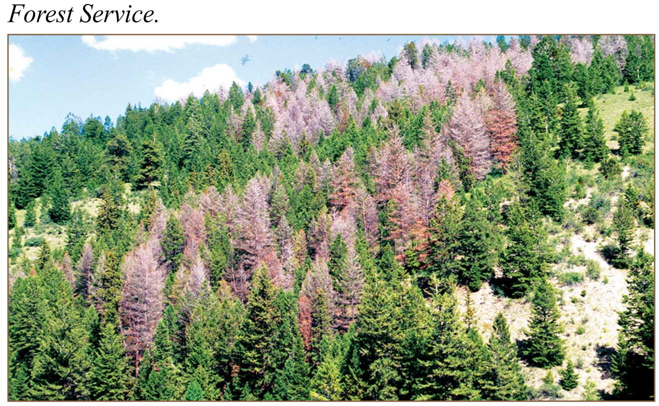
In the Intermountain Region of Utah, Nevada, and southern Idaho, DFB-caused tree mortality decreased by 40 percent in 2012 (fig. 2). Although southern Idaho had the most Douglas-fir mortality, the affected area decreased from 2011. Tree mortality increased slightly in Utah and western Wyoming national forests.

DFB caused the mortality of several groups of Douglas-fir within the southeastern portion of the Lassen National Forest and the northeastern portion of the Plumas National Forest in California. This report of DFB activity was the first in these areas in many years.

In Oregon and Washington, the number of acres that were mapped with mortality attributed to DFB increased nearly 1.5 times from 2011 levels. Expanding areas of defoliation caused by western spruce budworm often mask the aerially observable signature of DFB-caused mortality. DFB annually causes scattered mortality across northwest Oregon, often in association with blowdown from winter storms. Recent outbreaks have been most severe on the west slopes of the Cascade Mountain Range. Tree mortality was most apparent this year in the vicinity of the Middle Fork of the Willamette National Forest near Diamond Lake and in the Rogue Umpqua Divide Wilderness on the Umpqua National Forest, where recent fires have occurred.

Some of the mortality was related to past fires on the Umpqua National Forest, where other agents such as woodborers were present. An increase of mortality was also observed in the Hells Canyon National Recreational Area of the Wallowa-Whitman National Forest. The number of acres mapped with DFB increased slightly from 2011 in Washington State. Areas with

Figure 2.—*Douglas-fir beetle infestation, Manti-La Sal National Forest, Utah. Photo by A. Steven Munson, USDA Forest Service.*



significant mortality include Federal lands administered by the Gifford Pinchot National Forest and Columbia River Gorge National Scenic Area in southern Skamania County, Okanogan-Wenatchee National Forest in Okanogan County, and Umatilla National Forest in southeast Washington.

Jeffrey Pine Beetle

Aerial surveys detected relatively low levels of Jeffrey pine beetle activity throughout its range in California.

In Nevada, Jeffrey pine beetle-caused mortality increased five-fold in 2012 after 3 consecutive years with little change. Most of the Jeffrey pine mortality occurred on the Bridgeport and Carson Ranger Districts of the Humboldt-Toiyabe National Forest.

Fir Engraver Beetle

Overall, reported fir engraver beetle (FEB) mortality saw a significant decrease from 2011 to 2012, from 323,000 to 211,000 acres. FEB activity subsided throughout much of California in 2012, perhaps from increased precipitation levels in 2010 and 2011. Areas of notable FEB fir mortality were often observed in conjunction with other stressors, such as Douglas-fir tussock moth, fire injury, and root diseases.

In the Intermountain Region, FEB-caused fir mortality increased in 2012. Most of the damage occurred on national forest lands in Nevada and Utah. Fir mortality increased nearly seven-fold in Nevada, primarily on the Carson and Ely Districts of the Humboldt-Toiyabe National Forest. In Utah, the increase was three-fold, with mortality occurring on all land ownership types, but primarily on the Fishlake National Forest.

In Oregon and Washington, the number of acres with FEB-attributed mortality was 68 percent of the area reported in 2011—the lowest level since 2001 (fig. 3). As with Douglas-fir beetle, the increased area affected by defoliation caused by western spruce budworm may obscure mortality signatures when viewed from the air. In Washington, the number of mapped acres increased slightly with FEB-attributed mortality. The most heavily affected areas were in the vicinity of Cle Elum Ranger District on the Okanogan-Wenatchee National Forest. Areas with heavy western spruce budworm defoliation north and south of the Interstate 90 corridor were hotspots of FEB-caused mortality. In Oregon, 2012 damage from FEB decreased to 33 percent of 2011 levels. Overall damage continued at endemic levels because of normal to above-average annual precipitation.

Figure 3.—*Fir engraver damage on grand fir—red foliage stage. Malheur National Forest, Oregon. Photo by Dave Powell, USDA Forest Service.*

Acreage estimates for FEB damage in northern Idaho decreased in 2012 compared with 2011. This decrease may be attributable, in part, to recent increases in moisture. Private, State, and Forest Service lands in Benewah, Clearwater, and Kootenai Counties made up 80 percent of the total detected land area of FEB damage. Montana remained relatively static with low amounts of affected land area in 2012 compared with 2011.

About one-half of this year's damage occurred on Forest Service and private lands in Lincoln County. The remaining counties had small amounts of infestation on a mix of National Park Service, National Forest System, and State lands, as well as adjoining private lands.

Acres of FEB decreased slightly in Arizona in 2012 compared with 2011. The amount of tree mortality caused by FEB observed during aerial detection surveys increased in New Mexico in 2012 compared with 2011. White fir mortality caused by FEB was observed on all New Mexico national forests, particularly on the Lincoln National Forest.

Pine Engraver Beetle

Overall, reported mortality caused by pine engraver beetle (PEB) in 2012 was more than 58 percent less than in 2011. Specifically in Colorado, PEB-caused losses increased in El Paso County in 2012. Increased losses were observed in low-elevation ponderosa pine forests along the Front Mountain Range, south of Colorado Springs. The Intermountain Region (southern Idaho, Nevada, and Utah) reported endemic levels of PEB-caused mortality. All of the mortality was reported in south-central Idaho on the Boise National Forest and was associated with the 2012 drought conditions.

On the Uinta-Wasatch-Cache National Forest in Utah and portions of the Bridger-Teton National Forest in Wyoming, entomologists observed a high incidence of top-kill and mortality associated with *Ips* following the mountain pine beetle epidemic. PEB populations and associated tree mortality continued at low, endemic levels in 2012 throughout Idaho, Montana, and Wyoming. Most mortality was in ponderosa pine, with very little mortality of lodgepole pine detected. Private lands continued to be more impacted than other land ownership types, sustaining more than one-half the total recorded mortality.

Western Pine Beetle

Western pine beetle (WPB) activity continued its upward trend in most locations with the return to below normal precipitation in many areas in 2012. In 2012, 252,000 acres with mortality were reported compared with 204,000 acres in 2011. Areas with black stain root disease saw sharp increases in western pine beetle activity. Pockets of ponderosa pine mortality were frequently observed in aerial surveys in northern California and the Sierra Nevada Mountain Range. Areas of elevated activity in southern California were mostly restricted to ponderosa and Coulter pine within previously burned areas.

In southern Idaho, Nevada, and Utah, ponderosa pine mortality attributed to WPB decreased nearly 40 percent from 2011 levels. In Utah, ponderosa pine mortality attributed to WPB increased slightly. Endemic levels of activity were reported in Nevada. In southern Idaho, most of the mortality was mapped on the Payette National Forest and on private land.

In 2012, the reported number of WPB-mortality affected acres was the lowest number since 2007 in Oregon and Washington. In Oregon, some of the more apparent damage was on the Malheur and Ochoco National Forests. In Washington, heavier concentrations of damage occurred on the Yakama Indian Reservation and areas south in Klickitat County.

An increased level of ponderosa pine mortality continued in 2012 throughout southern New Mexico, especially on the Cibola, Gila, and Lincoln National Forests and adjacent lands such as the Mescalero Apache Indian Reservation lands in the Sacramento Mountains. WPB was one causal factor contributing to the ponderosa pine mortality. Other agents and bark beetles, including *Ips* engraver beetles, also contributed to the ponderosa pine mortality. Bark beetle activity in ponderosa pine in New Mexico was often a combination of *Ips* engraver beetles and WPB. WPB pine beetle individuals and *Ips* were found in ponderosa pine trees during ground visits to the Gila National Forest in 2012.

WPB mortality in Idaho decreased slightly in 2012. Almost all the mortality occurred in northern Idaho on private land. The mortality was generally scattered on the Nez Perce Indian Reservation and the Clearwater, Coeur d'Alene, and Nez Perce reporting areas.

Much of the WPB activity was associated with tornado-damaged and fire-impacted areas in Arizona. A large increase in WPB activity occurred statewide in 2012 compared with 2011. In general, a complex of *Ips* and *Dendroctonus* bark beetles are attacking ponderosa pine.

Western Spruce Budworm

Choristoneura occidentalis Freeman

Western spruce budworm (WSBW) defoliation was reported on more than 3.5 million acres (figs.1 and 2) in 2012, a decline of more than 1 million acres from 2011 (table 1).

Most of the WSBW activity in the Southwest was in New Mexico, which had a greater amount of susceptible host types. Defoliation continued to be widespread throughout northern New Mexico, but the number of acres with defoliation mapped from aerial detection surveys decreased slightly from the amount observed in 2011. The outbreak in the Sacramento Mountains in southern New Mexico seemed to have subsided and only a minor amount of defoliation was mapped this year on the Lincoln National Forest and Mescalero Apache Indian Reservation.

In Arizona, most WSBW-caused defoliation was mapped in the Chuska Mountains on Navajo Nation lands. Some defoliation was mapped on Fort Apache tribal lands, but this damage was a combination of frost, minimal defoliation from budworm, and background spruce beetle mortality. Climax spruce-fir forests on the North Kaibab Ranger District have had chronic budworm activity for years. Top-kill of blue and Engelmann spruce was prevalent in the area.

In the Intermountain Region, WSBW-caused tree defoliation decreased in area by nearly 43 percent in 2012 compared with 2011. Although in most of south-central Idaho, populations of this insect remain at outbreak levels for the 8th consecutive year. The largest decreases in affected acreage occurred on the Boise and Salmon-Challis National Forests. Douglas-fir beetle outbreaks occurred in some of these heavily defoliated areas, often on the dry, south-facing sites. In Utah, the number of acres affected by WSBW defoliation decreased 52 percent

Figure 1.—*Acres of western spruce budworm defoliation in 2012.*

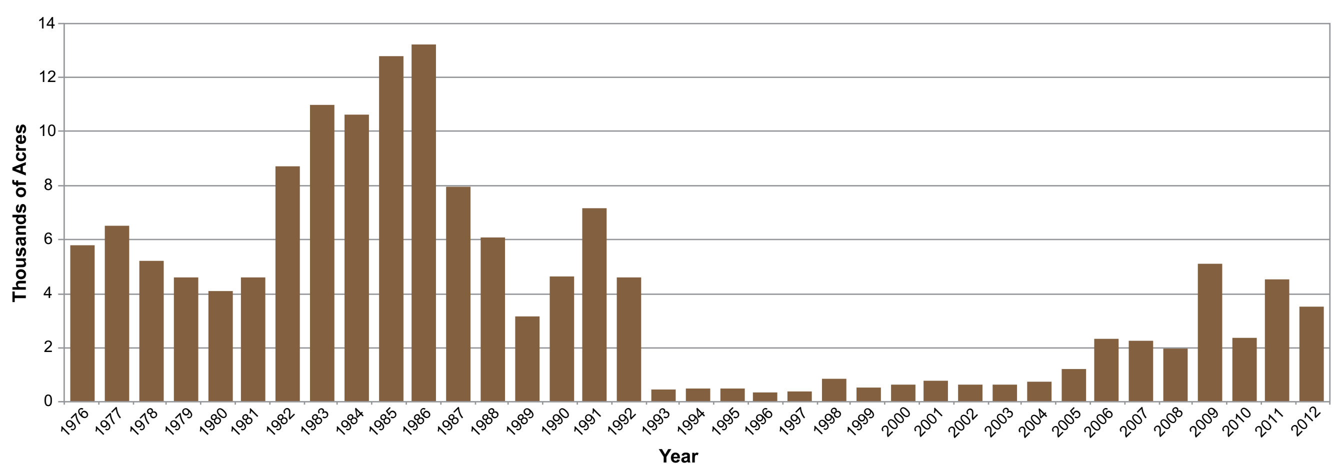


Figure 2.—*Counties that reported western spruce budworm in 2012.*

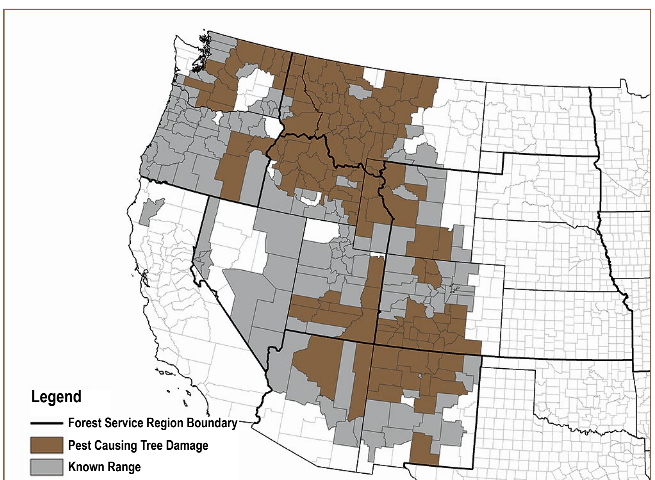


Table 1.—*Acres (in thousands) with western spruce budworm defoliation by State, 2002 through 2012.*

State	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Arizona	11	24	11	11	3	5	2	1	4	4	2
California	0	0	0	0	0	0	0	0	0	0	0
Colorado	131	20	20	71	94	390	153	382	213	90	217
Idaho	23	204	64	75	254	361	366	1,031	866	1,887	717
Montana	52	66	177	454	1,142	497	578	2,576	326	1,201	1,491
Nevada	0	0	0	0	0	1	0	0	0	0	0
New Mexico	199	143	238	184	143	452	360	559	317	501	477
Oregon	2	6	7	0	38	98	10	41	108	256	79
Utah	7	15	20	41	89	51	8	70	142	28	14
Washington	58	140	193	363	556	356	455	414	373	538	511
Wyoming	135	13	5	6	4	29	35	30	21	35	21
Total	**617**	**631**	**735**	**1,206**	**2,322**	**2,240**	**1,967**	**5,105**	**2,370**	**4,540**	**3,529**

from acreage mapped in 2011. In western Wyoming, defoliation increased, with the largest concentration found along the Interstate 89 corridor. No WSBW was mapped in Nevada.

The number of acres defoliated by WSBW in Montana in 2012 remained high and similar to 2011 levels, especially east of the Continental Divide. Defoliation from budworm was recorded in almost every county. In 2012, defoliation intensity also increased on some forests, especially east of the Continental Divide, where budworm has been recorded for several years. Areas with significant budworm defoliation were the Flathead, Gallatin, Helena, and Lewis and Clark National Forests.

Defoliation from budworm in northern Idaho greatly decreased in 2012. Very little defoliation from budworm was found even via ground surveys. Significant defoliation from budworm was again recorded in Glacier National Park in Montana. In 2011 and 2012, Douglas-fir beetle-caused tree mortality was recorded in areas that experienced consecutive, heavy budworm defoliation during the past few years.

WSBW was found throughout Oregon and Washington; however, most outbreaks occurred east of the Cascade Mountains. Defoliation attributed to WSBW in the Pacific Northwest region decreased slightly in Washington and was only 30 percent of 2011 levels in Oregon. Most affected areas were located within the Malheur and Ochoco National Forests of northeast Oregon in the vicinity of Snow Mountain, the Strawberry Mountains, and north and west of the Silvies Valley and Seneca. In Washington, WSBW was still very active in the eastern part of the State. Ferry and Okanogan Counties experienced an expanding population of budworm. Most of the damage occurred on Forest Service lands, but new occurrences were reported on the Colville Reservation. In some areas that experienced several years of defoliation, mortality was evident from bark beetles. The area between Cle Elum and Ellensburg, WA, still experienced heavy landscape-level defoliation.

Defoliation by WSBW was notable in southern Colorado and on the North Zone Ranger District of the Shoshone National Forest in Wyoming. In southern Colorado, localized areas of defoliation occurred in mixed white fir/Douglas-fir forests on both sides of the Culebra Mountain Range, from La Veta Pass south to Cucharas Pass and the Trincheras Creek Basin. Defoliation was more extensive from Cucharas Pass and Ojitos south to the New Mexico border and on the south-facing slopes of the Spanish Peaks. Heavy defoliation also was noted in North La Veta Pass, on the north slopes of Mount Maestas, and in all susceptible host tree types on the eastern slopes of Iron Mountain and on Sheep and Little Sheep Mountains. Conspicuous defoliation of white fir and Douglas-fir occurred again on the eastern slopes of the Sangre de Cristo Mountain Range (fig. 3) from Methodist Mountain south to Medano Pass. WSBW outbreaks also continued for the 3rd successive year in the Wet Mountains. Susceptible host trees from Ophir Pass south to the southern terminus of the mountain range were defoliated on the eastern and western slopes. Damage also was prevalent in Douglas-fir forests on the western side of the San Luis Valley, from Poncha Pass south to Bonanza and Saguache and along the southern slopes of the San Juan Mountains, especially in the Animas and Dolores River basins. Two small areas of suspected WSBW defoliation also were mapped in Fremont County near Mullock Gulch. Small patches of defoliation of Douglas-fir were also noted in El Paso, Grand, and Jackson Counties in Colorado in 2012. In southeastern Wyoming, patches of defoliation were observed in Douglas-fir in Albany and Carbon Counties. Large areas of heavy defoliation were noted on the northern section of the Shoshone National Forest from ground and aerial observations in 2012.

Figure 3.—*Western spruce budworm on white fir and Douglas-fir on the San Isabel National Forest, Colorado. Photo by Justin Backsen, USDA Forest Service.*

Hemlock Woolly Adelgid

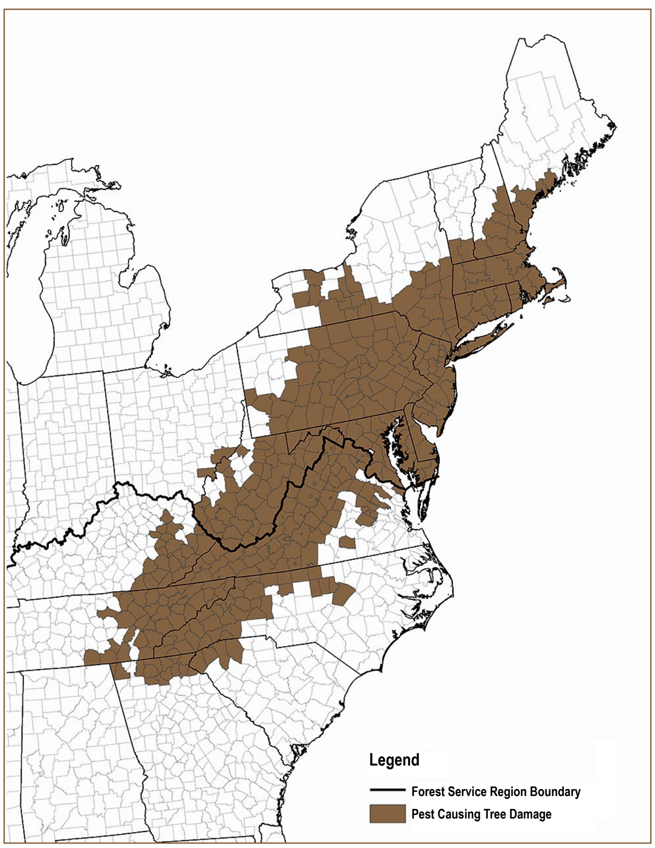
Adelges tsugae Annand

Hemlock woolly adelgid (HWA) continued to expand its range and affect an increasing number of its host trees—eastern and Carolina hemlock (figs. 1 and 2).

In Georgia, decline and mortality of eastern and Carolina hemlock continued in infested areas in the northern counties on both sides of the Appalachian Mountains. Surveys conducted for the 9th year in 2012 revealed the adelgid continued to spread. In the far northwest corner of the State, an isolated area of hemlocks in Dade and Walker Counties were positive for the insect in 2012. In total, Georgia had 14 infested counties, and HWA has affected the State's entire hemlock forest range.

In Tennessee, HWA continued to cause damage to hemlocks in the mountainous eastern counties where Fentress, Franklin, Marion, Punam, and Sequatchie Counties were determined to be positive in 2012. The total number of infested counties in Tennessee increased to 35 of the 38 counties with hemlock populations. HWA continued to spread in infested counties.

Figure 1.—*Counties that reported hemlock woolly adelgid damage in 2012.*



In Kentucky, HWA infested 22 counties, with 3 counties added in 2012: Martin, Morgan, and Rowan. Infestations occurred on private nonindustrial, State, and Federal lands. Scattered hemlock declined in some areas. Infestation levels quickly increased in 2012.

In North Carolina, all 35 counties within the native range of hemlock were affected by HWA. Infestations continued to spread within infested counties and intensified in the southern Appalachian Mountains. Mortality was apparent in infested counties, primarily in forested stands where control was difficult and cost prohibitive.

In South Carolina, decline and mortality of eastern and Carolina hemlock continued in four affected counties in the westernmost part of the State.

In Virginia, significant decline continued in many areas, although in some areas, trees that had supported HWA infestations for many years were still alive. HWA continued to spread and had permeated the entire range of hemlock within Virginia. Hemlock mortality levels averaged about 20 percent in the southwest portion of the Commonwealth from Bath and Rockbridge Counties, southwest to Lee County.

Figure 2.—*Hemlock woolly adelgid infestation. USDA Forest Service photo.*

In Connecticut, discoloration from HWA was mapped by aerial survey throughout the State. This pest has been present in Connecticut for many years and continued to cause patchy damage and decline among the remaining population of hemlocks. In 2012, damage from HWA was mapped in Fairfield, Hartford, Litchfield, Middlesex, New Haven, and New London Counties. Some areas of hemlock were healthy, especially in the northwest corner of the State. In many areas, hemlocks were recovering from wet summers and reduction in HWA populations, particularly where biological control was implemented.

HWA was reported in seven new communities in Massachusetts; Athol, Gardner, Monroe, Orange, Otis, Phillipston, and Shelburne Falls.

In Maine, populations of HWA appeared to be up in 2012, as expected, following a very mild winter. Overwintering mortality averaged 17 percent across five forested sites in coastal Maine, most of which are infested areas very close to the coast or other significant bodies of water.

New Hampshire reported HWA infestations in three new counties: Belknap, Carroll, and Merrimack.

HWA infestations were present in all five Rhode Island counties in 2012. Warm winter temperatures caused an increase in HWA populations statewide.

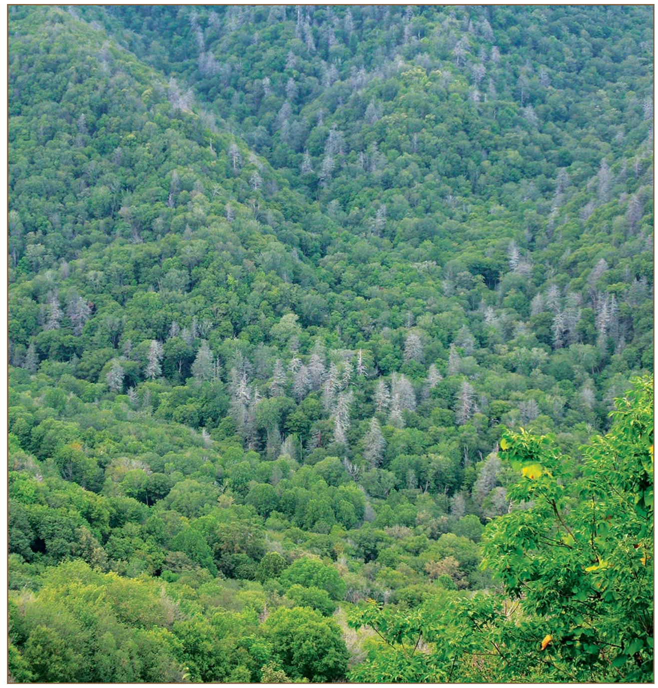
In Vermont, Bennington County was reported as newly infested in 2012. Little overwintering mortality of the insect occurred, and dieback and mortality of hemlock increased in the southernmost counties of the State.

Hemlock is not a significant component of Delaware's rural or urban forests; nevertheless, HWA was confirmed in all three counties within the State.

In Maryland, HWA was present in the entire State in 2012, but most hemlocks affected were located in isolated stands in northern tier counties of the State. Populations of HWA increased, especially in Garrett County. Maryland reported 42,000 acres affected by HWA through ground surveys in 2012 (fig. 3).

Nearly all hemlocks in New Jersey were infested with HWA to some extent.

Figure 3.—*Hemlock mortality caused by hemlock woolly adelgid. USDA Forest Service photo.*



Mortality, discoloration, dieback, and defoliation were mapped by aerial survey in several counties in New York. HWA continued to cause damage and mortality to native forest and ornamental eastern hemlock trees. Five new counties (Cayuga, Livingston, Schenectady, Steuben, and Wyoming) were found to be HWA infested in 2012. Damage was most severe in areas that were infested for several years in the Catskills and southern part of the State. In some areas, most of the trees were infested and many of those were in declining health or dead.

HWA was discovered for the first time in a natural stand of hemlocks in Ohio in January 2012. Eight trees were found to be infested in Shade River State Forest, Meigs County.

In Pennsylvania, no new counties were added to the infestation list in 2012. In general, HWA started to recover after 2009 winter's population crash but remained static in most areas compared with 2011.

In West Virginia, new HWA detections were in Harrison and Tyler Counties in 2012. Both finds were in urban settings. During the past year, HWA increased in many previously affected counties.

Laurel Wilt Disease/Redbay Ambrosia Beetle

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

Laurel wilt (LW) disease has devastated populations of mature redbay trees since it was first found in 2003 on Hilton Head Island, SC. Laurel wilt fungus is carried by the redbay ambrosia beetle. In forest stands where the disease has been established for several years, nearly all of the mature redbay trees have been killed (fig. 1).

LW was diagnosed from wilting redbay trees in Mobile County, AL, bringing a total of two counties in Alabama with the disease. Mobile County is adjacent to Jackson County, MS, where the disease had been detected earlier.

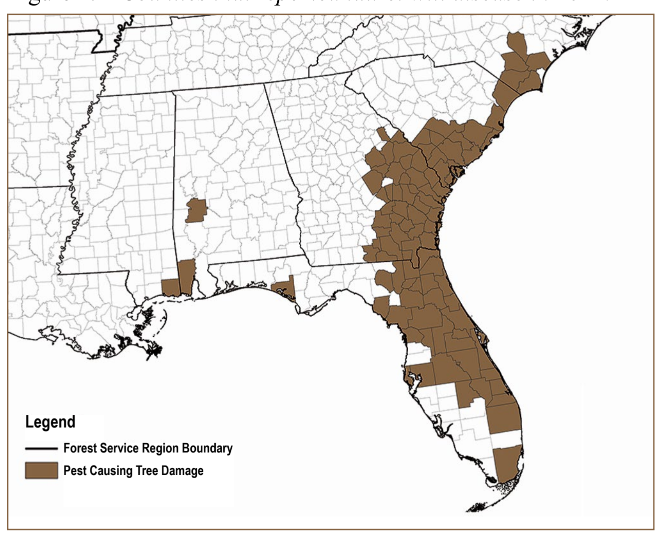
LW continues to spread locally into new areas of the Southeast, causing heavy mortality in redbay and related species in Florida. Three new counties (Dixie, Hillsborough, and Palm Beach) were confirmed to harbor LW in Florida during 2012, bringing the total affected counties to 34. In 2012, the first cases of LW affecting avocado trees in commercial groves in Miami-Dade County were confirmed, and many more cases followed.

In Georgia, nine new LW-positive counties were detected in 2012: Burke, Coffee, Echols, Jefferson, Johnson, McDuffie, Montgomery, Washington, and Wheeler. These additions bring the total number of affected counties in southeast Georgia to 39. As the disease moves farther inland, hosts such as sassafras become predominant; thus, the spread and severity of the disease may change. Five of the nine new LW-positive counties were identified from detections on sassafras, where redbay is rare or absent. The rate of spread inland from the initial coastal introduction has varied—from more than 17 miles per year in the southern coastal plain, where redbay trees are the primary host and abundant, to less than 9 miles per year farther inland, where redbay becomes less abundant and sassafras more abundant (fig. 2).

In Mississippi, LW was still confined to Jackson County. No new discoveries of LW were made in 2012. Mortality of redbay, swamp bay, camphor tree, and sassafras were particularly severe in and around the Pascagoula River basin extending northward, nearly into George County.

Figure 1.—*Redbay mortality caused by redbay ambrosia beetle and its associated fungus. Photo by Albert (Bud) Mayfield, USDA Forest Service.*

Figure 2.—*Counties that reported laurel wilt disease in 2012.*



In North Carolina, LW was confirmed for the first time in 2012 in Brunswick County and was found in additional areas within Bladen, Columbus, Pender, and Sampson Counties. The mortality rate throughout the affected area did not appear to be as heavy as in States farther south, suggesting the infestation was still relatively new.

In South Carolina, mortality of redbay (fig. 3) and sassafras was known to occur in scattered locations in 13 counties; Georgetown County was added in 2012 making 14, but LW mortality was found only on sassafras in Beaufort County.

Figure 3.—*Wilted redbay foliage. Photo by Albert (Bud) Mayfield, USDA Forest Service.*

Spruce Budworm

Choristoneura fumiferana Clemens

Maine reported that spruce budworm (SBW) catches in pheromone traps in 2012 were, in general, the same as in 2011. Larval feeding was still not reported (fig.1). Vermont reported that moth catches from pheromone traps in 2012 decreased from 2011 and remained low.

A continuous outbreak of SBW has occurred primarily in the northeast quarter of the State of Minnesota since 1954 (fig. 2). In the past few years, budworm populations have remained in northern Lake and St. Louis Counties. In the past 2 years, new infestations have been observed in in Cook County and southern Lake County, along Lake Superior. Scattered pockets of defoliation were also detected in 2012 in Aitkin, Becker, Beltrami, Carlton, Cass, Crow Wing, and Pine Counties.

Overall, the damaged acreage trend decreased. SBW populations continued to increase in the Upper Peninsula of Michigan, with defoliating populations located on National Forest System lands (fig. 3). In the Lower Peninsula, the scattered nature of the spruce cover type prevented large outbreaks of this insect. Heavy defoliation was detected in central Ashland, eastern Florence, northern Forest, and northern Marinette Counties in Wisconsin. Defoliation also occurred in Iron, Langlade, and Oneida Counties.

In Alaska, a moderate outbreak of spruce budworm was recorded near Ninemile Slough, approximately 10 miles upriver from the town of Ruby on the Yukon River. Overall observations of the spruce budworm were low.

Figure 1.—*Counties that reported spruce budworm in 2012.*

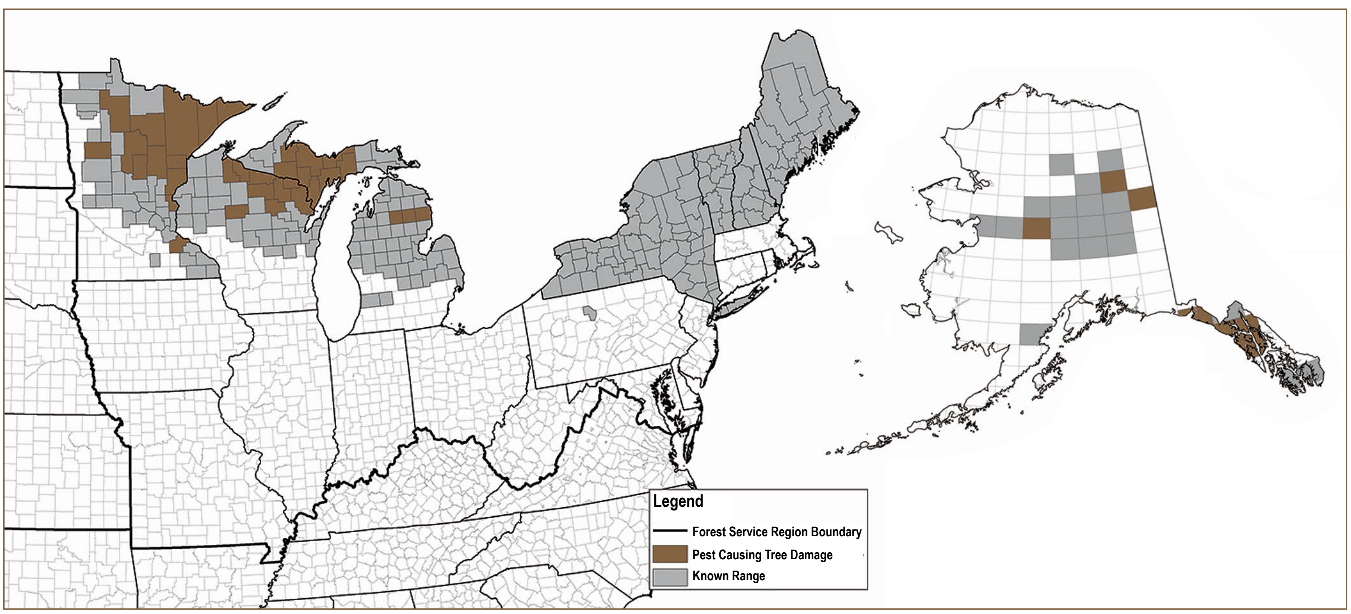


Figure 2.—*Balsam fir and white spruce defoliation and mortality caused by spruce budworm on the Superior National Forest, Minnesota. Photo by Marc Roberts, USDA Forest Service.*

Figure 3.—*Spruce budworm defoliation and mortality on the Hiawatha National Forest, Michigan. Photo by Marc Roberts, USDA Forest Service.*

Sirex Woodwasp

Sirex noctilio Fabricius

Scotch pine mortality was mapped by aerial survey in Delaware County, NY, but no new affected counties were detected in 2012 (fig. 1). Trapping surveys conducted in Delaware, Maryland, New Jersey, Ohio, Pennsylvania, and West Virginia did not detect any sirex woodwasp in 2012 (fig. 2).

Figure 1.—*Resin beads, characteristic of sirex woodwasp attack, New York. Photo by Kevin Dodds, USDA Forest Service.*

Figure 2.—*Adult sirex woodwasp on Scots pine. Photo by Kevin Dodds, USDA Forest Service.*

Dwarf Mistletoes

Arceuthobium spp.

Like decay diseases, dwarf mistletoe (DM) species 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 contributing to deterioration of stand conditions (fig. 1). The following section summarizes the extent of DM in selected areas.

Douglas-fir DM was common in Douglas-fir in the Southwest. It was even present in remote canyons in the Navajo National Monument. Ground surveys indicated that more than 50 percent of mixed conifer stands with Douglas-fir were thought to be infected. Southwestern DM infested more than one-third of the ponderosa pine forest type in the Southwest. Pinyon DM was widespread across the Southwest, but it occurred at fairly low levels. Widespread distribution of DM infection was found in two-needle pinyon (*P. edulis*), but only one known population of infected border pinyon was found in the Mule Mountains of southern New Mexico. Infested California single-leaf pinyon trees were found in central Arizona.

Figure 1.—*Dwarf mistletoe damage on pine, Western United States. Photo by Pete Angwin, USDA Forest Service.*

Forest Inventory and Analysis (FIA) plot data from southeast Alaska has been scaled-up to estimate the occurrence and distribution of mistletoe on the landscape. In southeast Alaska, hemlock DM infested approximately 12 percent of the forested land area and caused growth loss, top-kill, and mortality on an estimated 1 million acres.

Lodgepole pine DM occurred on approximately 2 million acres (28 percent) of the lodgepole pine type in Northern Region (northern section of Idaho, Montana, and North Dakota). Douglas-fir DM occurred on about 13 percent of Douglas-fir in the region. Western larch DM occurred on about 38 percent of western larch stands. DM species were 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 were heavily infected in localized areas of Montana, with higher infection levels east of the Continental Divide (fig. 2). Western larch and Douglas-fir were heavily infected by DM across much of their range west of the Continental Divide.

Dwarf mistletoe species remain the most widespread and frequently observed disease within the Intermountain Region (southern Idaho, Nevada, and Utah). DM incidence was updated using data gathered by the FIA group. The 2008 FIA data indicated that one or more DM species were present at various levels of disease intensity on 15 percent of all plots surveyed. Incidence of the more significant DM species by percent of host type infected within the Intermountain Region was lodgepole pine at 26 percent, piñon pine at 20 percent, Douglas-fir at 14 percent, limber pine at 12 percent, ponderosa/Jeffrey pine at 7 percent, and whitebark pine at 6 percent. No FIA plots were located in infected Great Basin bristlecone pine stands, but the disease was observed in this host in several Intermountain Region locations.

Figure 2.—*Infection to whitebark pine from limber pine dwarf mistletoe, Mount Shasta, CA. Photo by Robert L. Anderson, USDA Forest Service.*

Asian Longhorned Beetle

Anoplophora glabripennis Motschulsky

Cooperative efforts to eradicate the Asian longhorned beetle (ALB) from the quarantined areas in New York City and Long Island, NY, continued and no new infestations were found in the area in 2012. The last infested tree was found and removed on Staten Island in 2009 (fig. 1).

In 2012, surveys continued in New Jersey. No infested trees have been found in the 25-square mile quarantine area in Middlesex and Union Counties since 2006.

In Worcester, MA, 22,253 trees were identified as infested; 31,919 infested or high-risk trees were removed, and a quarantine area of 110 square miles was established in 2012. No infested trees were found in the Jamaica Plain suburb of Boston in 2012.

In Ohio, ALB surveys and removal efforts continued in Clermont County. The current USDA Animal and Plant Health Inspection Service, or APHIS, quarantine area covers 61 square miles. By the end of 2012, 9,276 infested trees had been detected out of the nearly 252,000 trees surveyed since the beginning of the program in 2011.

In 2012, surveys for ALB (fig. 2) were conducted in Delaware, Maryland, New Jersey, and Pennsylvania, but no detections were reported.

Figure 1.—*Counties that reported Asian longhorned beetle in 2012.*

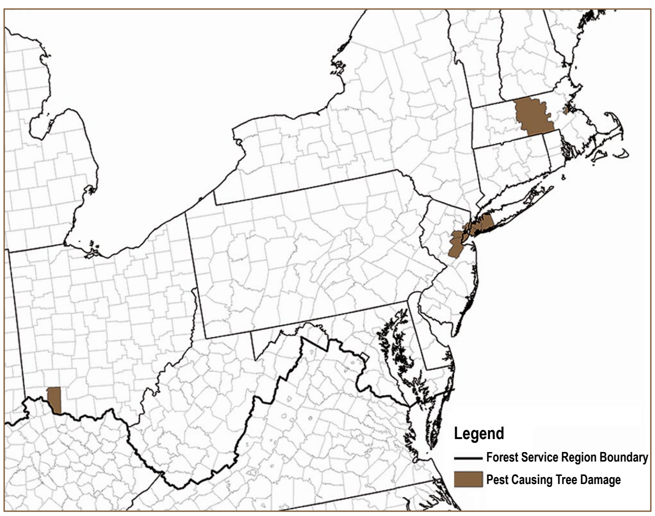
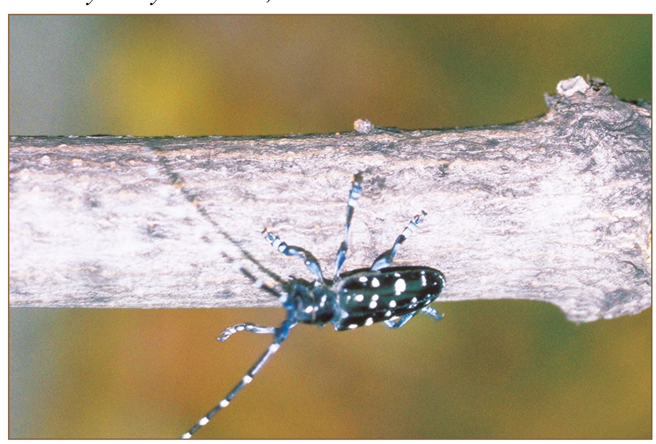


Figure 2.—*Adult Asian longhorned beetle, United States. Photo by Larry R. Barber, USDA Forest Service.*



White Pine Blister Rust

Cronartium ribicola J.C. Fisch. ex Rabenh

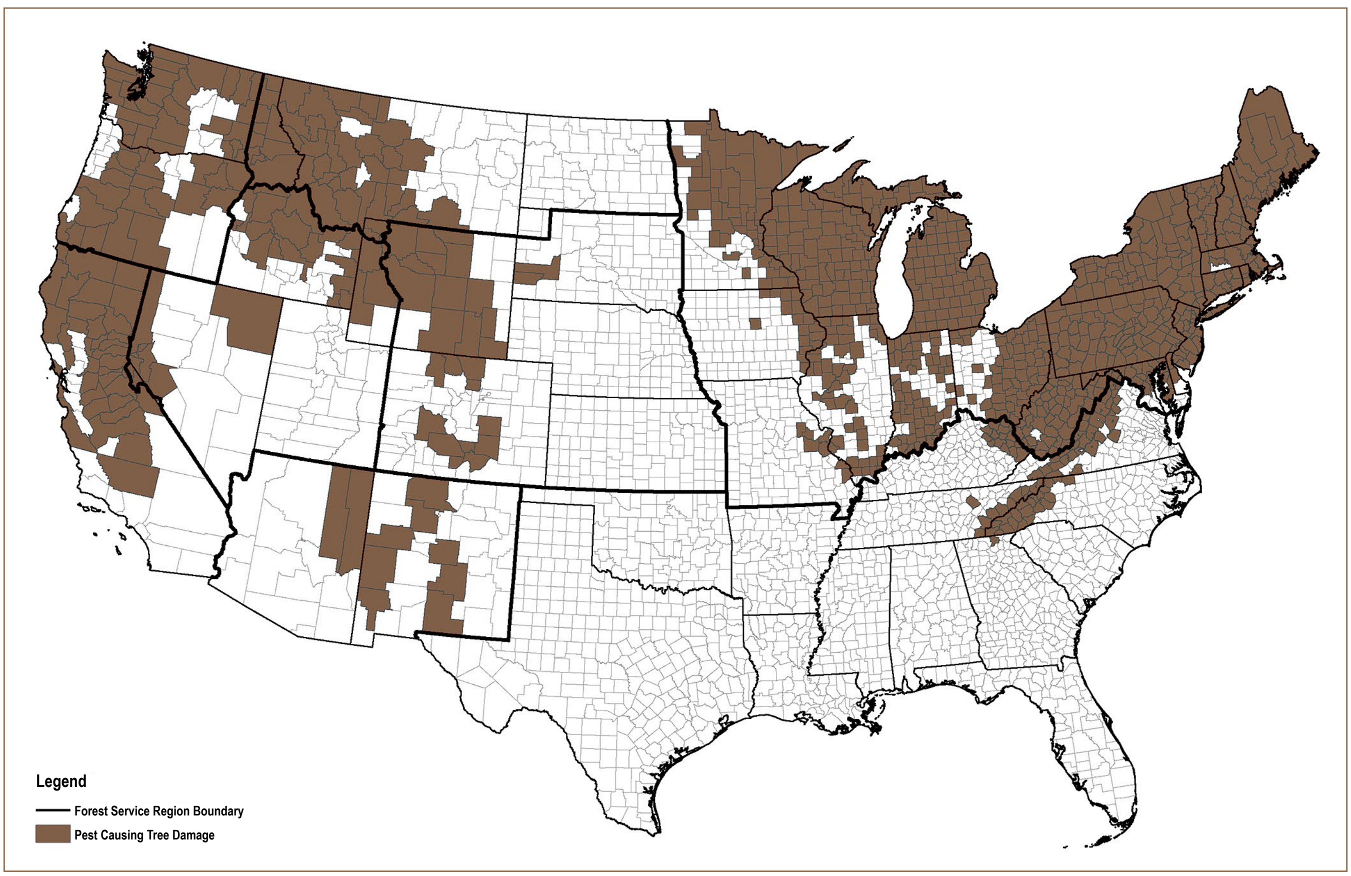
In 2012, Maine reported white pine blister rust (WPBR) observed in Aroostook, Handcock, Lincoln, Penobscot, Somerset, and Washington Counties (fig. 1). Vermont reported an increase in dieback and mortality of white pine in 2012. Scattered damage was mapped by aerial survey throughout most of the State. In West Virginia, two sites in Pocahontas County reported WPBR. One site was 2 acres and the other site had nearly 3 acres.

WPBR has spread throughout the range of western white pine in the inland northwest. Although western white pine can still be found at low densities on much of its original range, the acreage where it dominates has been dramatically reduced to around 5 percent of its historical range.

WPBR continues to spread throughout the range of whitebark pine in the Rocky Mountain Region. A recent study in northern Idaho found whitebark pine, once the dominant species, comprised only 2 percent of its original habitat. In addition, WPBR has spread throughout the range of limber pine, which dominates several hundred thousand acres in the more arid portions of the area.

The Northern Region continued to survey and monitor WPBR spread and intensification on limber pine, western white pine, and whitebark pine. WPBR continued to spread and intensify in the Rocky Mountain Region. Decline and mortality continued to occur in limber and whitebark pine populations on the Arapaho-Roosevelt, Bighorn, Medicine Bow, Pike-San Isabel (fig. 2), Rio Grande, and Shoshone National Forests; on Bureau of Land Management lands in central Wyoming (on Green, Ferris, and Shirley Mountains and on Rattlesnake Hills); and within the Great Sand Dunes National Park and Preserve. Infected bristlecone pines have also been observed within the park.

Figure 1.—*Counties that reported white pine blister rust in 2012.*



In Wyoming, WPBR-caused mortality occurred on limber and whitebark pine trees statewide, and the disease continued to intensify. The incidence of WPBR was lowest in the Medicine Bow and Sierra Madres Mountain Ranges. Whitebark pines in the Shoshone National Forest were predisposed by this rust disease and are succumbing to MPB attacks.

In the Southwest, WPBR caused widespread mortality on five-needled pines. In 2012, infected white pines and gooseberry (fig. 3) were observed in more moderate hazard sites in the White Mountains of Arizona. Since its introduction, WPBR has spread throughout the range of most western five-needle pines in the Intermountain West.

In the Intermountain Region, WPBR was most frequently found on whitebark and limber pines. Western white pine and sugar pine, some of which are infected, are found only on the Humboldt-Toiyabe National Forest along the California/Nevada border.

In the Pacific Northwest, in Oregon and Washington, WPBR has spread throughout the range of five-needled pines.

In California, a survey was conducted in the southern Sierra Nevada Mountain Range and the Tehachapi Mountains to determine whether WPBR had expanded its range south in the past decade. No incidences of rust were found in the Tehachapi Mountains, and the only positive incidence was found south of its former known range in the Sierra Nevada Mountain Range within a couple of miles of the former southernmost known location.

Figure 2.—*White pine blister rust on limber pine on the San Isabel National Forest, Colorado. Photo by Justin Backsen, USDA Forest Service.*

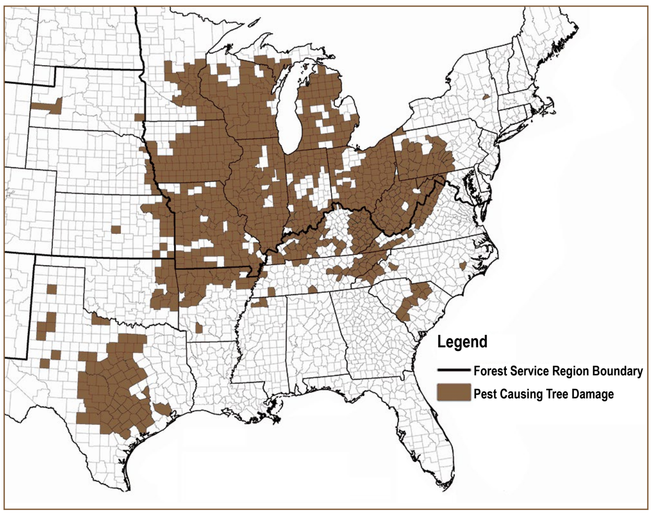
Figure 3.—*Symptoms of white pine blister rust showing on white pine blister rust-resistant ribes plant. Photo by Isabell Munck, USDA Forest Service.*

Oak Wilt

Ceratocystis fagacearum Bretz

Oak wilt (OW) continued to cause mortality across the Northeastern United States and the South (fig. 1). In the North-Central United States, Iowa reported the disease throughout most of the State. In 2012, the incidence of OW increased, most notably on white oak in the southeast quadrant of the State. It appears that white oak has been infected for more than 10 years, and the drought in 2012 may have intensified the development this disease.

Figure 1.—*Counties that reported oak wilt in 2012.*



In 2012, no formal OW survey was conducted in Missouri or Illinois, and no new county records were reported. OW was present in 90 percent of the counties in Illinois and was common wherever oaks, especially those in the red oak group, grow. Indiana reported OW in 63 counties and reported that the disease common in the woodlots of northwestern Indiana in the Kankakee River basin. OW on white oak has not been detected in Indiana.

Michigan reported OW spread across its oak resource (fig. 2). New county records in Arenac, Charlevoix, Clare, Jackson, Lake, Osceola, Otsego, and St. Clair Counties were confirmed (fig. 3). In Wisconsin, new county records for OW were reported in Lincoln, Sawyer, and Vilas Counties. In 2011, a windstorm damaged oak trees along the Mississippi River, and, in 2012, the incidence of OW in Burnett County significantly increased in this same area. In Minnesota, OW was newly reported in Pine and Stearns Counties. Oak wilt was also confirmed at the St. Croix State Park.

Figure 2.—*Oak wilt pocket on private land near Cadillac, MI. Photo by Marc Roberts, USDA Forest Service.*

In the Northeastern States in 2012, OW has not yet been reported in the State of Delaware. In 2012, Maryland reported two trees having OW in Rocky Gap State Park in Allegany County. New Jersey did not report OW. In Ohio, Mahoning County had a report of OW. In Pennsylvania in 2012, Allegheny County reported 5 acres of damage. In addition, four positive samples were reported for Beaver, Butler, and Cameron Counties.

OW disease conditions in nearly all Southern Region States have been static for a number of years, with no new positive counties recorded. Surveys for OW are no longer routinely performed in most States, except in Texas locations where serious or widespread damage is generally unknown. In Texas, widespread mortality of live oak and Texas red oak continues and a survey, and suppression program is in full operation.

Figure 3.—*Oak wilt in Mio, MI, on the Huron Manistee National Forest. Photo by Marc Roberts, USDA Forest Service.*

Fusiform Rust

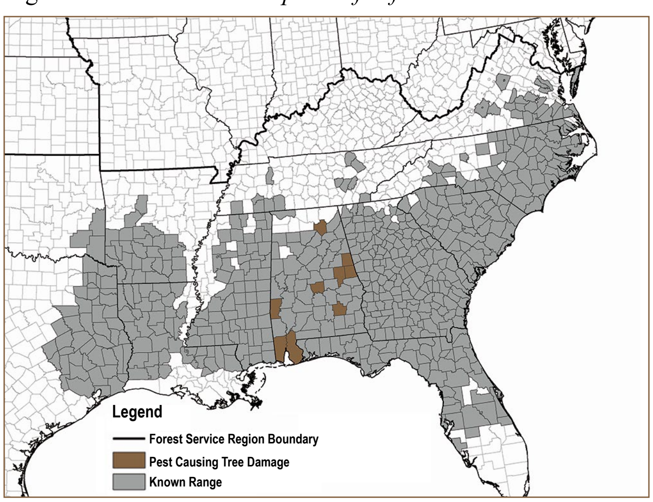
Cronartium quercuum f. sp. *fusiforme* Hedg. and Hunt ex Cumm.

In the South, fusiform rust causes deformation and mortality regionwide on loblolly and slash pine hosts (fig. 1), particularly in young plantations, in 12 States with susceptible host pines (Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, and Virginia). Severity of damage is highly variable depending on location and annual weather-mediated pressure (fig. 2). No recent estimates of the number of affected acres are available, but past estimates from forest inventory data (circa 1987 to 1993) indicate 13.4 million acres of planted and natural loblolly and slash pine stands were affected with infection levels of 10 percent of the pines or greater (fig. 3). In Alabama, a number of cases were reported and inspected in nine counties; however, the disease was reported statewide.

Figure 1.—*Slash pine near Miley, SC, with various symptoms caused by fusiform rust, including stem and branch galls, basal whorls of galls, mortality, and wind breakage (stems weakened by the disease). Photo by E.G. Kuhlman, USDA Forest Service, http://www.bugwood.org.*

Figure 2.—*Multiple branch galls on pine caused by fusiform rust. Photo by Robert L. Anderson, USDA Forest Service, http://www.bugwood.org.*

Figure 3.—*Counties that reported fusiform rust in 2012.*



Dogwood Anthracnose

Discula destructiva Redlin

In the Northeastern Area, a new county in Missouri was positively identified with dogwood anthracnose disease. In response, the Missouri Department of Agriculture conducted a followup survey of residential sites in St. Louis, including the cities of Ballwin, Florissant, and Ladue. Dogwood anthracnose continues to occur across its historic range statewide in Delaware, Maryland, New Jersey, Ohio, Pennsylvania, and West Virginia, but no new counties or damaged acres were reported in 2012 (fig. 1).

In the Southern Region, dogwood anthracnose disease has now spread to most of the cool, moist, high-elevation areas with dogwood host in Alabama, Georgia, Kentucky, North Carolina, South Carolina, Tennessee, and Virginia. Widespread dieback and mortality have resulted. In the hardest hit areas, the dogwood population has been reduced by as much as 90 percent (fig. 2).

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

Figure 2.—*Tree defoliation caused by dogwood anthracnose infestation. Photo by Robert L. Anderson, USDA Forest Service.*

Beech Bark Disease

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

Beech Bark Disease (BBD) has spread continuously into the Northeastern United States, and several discontinuous jumps have transported it as far as west as Michigan, as far south as central Virginia, and to isolated locations in eastern Tennessee and western North Carolina (fig. 1).

In North Carolina, no new counties were detected with BBD. Intensification in some areas and spread to stands at elevations lower than 4,000 feet, however, were observed for the first time in 2012. BBD was scattered and widespread in 14 counties of western North Carolina. The disease has manifested itself in and around the Great Smoky Mountains National Park and has been particularly damaging to "beech gaps" throughout the park and nearby mountains. In Tennessee, BBD has occurred in five eastern Tennessee counties. In Virginia, BBD has been known to occur in six counties in the western part of the State. The disease was generally restricted to the border area in West Virginia and along the Shenandoah National Park. Additional survey work in South Carolina resulted in no reports of BBD in 2012.

In the Northeast in 2012, mortality, dieback, and discoloration attributed to BBD were recorded by aerial survey in New York. Vermont aerial surveys mapped dieback in most counties throughout the State, with a noted increase from 2011 levels. No significant increases in BBD were detected in Rhode Island, and most beech surveyed showed no signs or symptoms.

In Delaware, more than 100 trees at 4 sites in New Castle County were revisited and inspected for scale and dieback. No scales were found, indicating that BBD was not well established in the State. Only two trees were positively identified with BBD in Delaware. Maryland reported increases of BBD in Garrett County. Field observations in New Jersey indicated that many stands of beech in the northern counties, including Hunterdon, Passaic, Sussex, and Warren, were infested with the scale and infected with the fungus.

BBD remains static in Pennsylvania. In West Virginia in 2012, however, major damage was reported across the State, and Mineral County was added to the infected county list.

In the North-Central States, including Wisconsin, new beech scale was detected in 2012 in three new counties: Dodge, Forest, and Menominee. High populations of the beech scale and disease were found only in Door County, WI (fig. 2). In Michigan, no new counties were reported. The advancing front of BBD continued to move across the beech resource.

Figure 1.—*Counties that reported beech bark disease in 2012.*

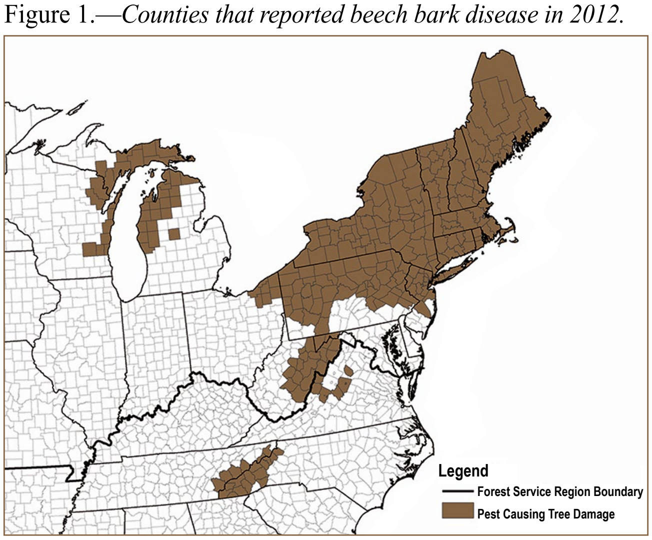


Figure 2.—*Beech scale on beech trees on the Huron Manistee National Forest, Michigan. Photo by Marc Roberts, USDA Forest Service.*

Fragmentation of beech forests in the Lower Peninsula of Michigan slowed the spread eastward from the initial infestations in Mason and Oceana Counties. The killing front continued to expand toward the western extent of beech in the central part of the Upper Peninsula (fig.3). Local killing fronts were beginning to appear in the extreme northern Lower Peninsula.

Figure 3.—*Mortality and decline/discoloration caused by beech bark disease at Pictured Rocks National Lakeshore, Upper Peninsula of Michigan. Photo by Marc Roberts, USDA Forest Service.*

Butternut Canker

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

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

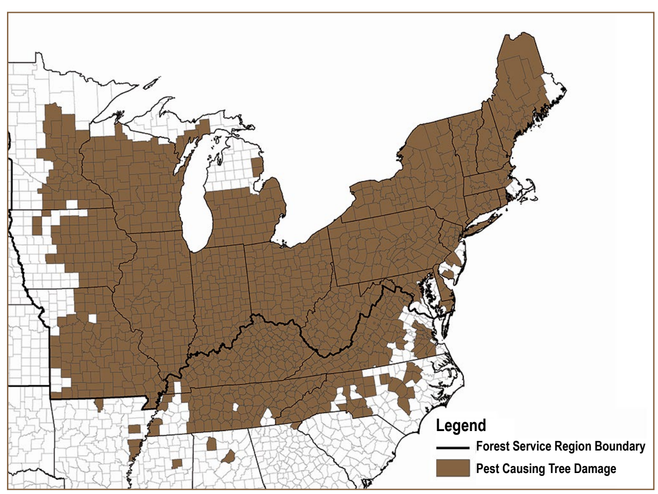
In the South, butternut canker severely affected butternut trees in seven States (Alabama, Arkansas, Kentucky, Mississippi, North Carolina, Tennessee, and Virginia) and spread into most areas where butternut was present (fig. 3).

No formal surveys have been conducted recently.

Figure 1.—*Butternut canker symptoms. Photo by Manfred Mielke, USDA Forest Service.*

Figure 2.—*Butternut canker symptoms, Wisconsin. USDA Forest Service photo.*

Figure 3.—*Counties that reported butternut canker in 2012.*



Pests To Watch

Polyphagous shot hole borer, Euwallacea *sp., and Fusarium Dieback,* Fusarium *sp.*

The polyphagous shot hole borer, *Euwallacea* sp., and Fusarium dieback, *Fusarium* sp., are a new insect-disease complex threatening public and private lands in southern California. In the spring of 2012, the insect-disease complex was discovered on a backyard avocado tree near Los Angeles, CA. In 2003, the exotic ambrosia beetle was first detected in the region, but it was not initially linked to tree injury and mortality. The current distribution of the insect-disease complex is primarily located in the urban areas of southern California, extending across Orange, Los Angeles, and San Bernardino Counties (fig. 1). In August 2012, the ambrosia beetle and new *Fusarium* fungus were found on the Angeles National Forest.

Figure 1.—*The 2012 distribution of the polyphagous shot hole borer,* Euwallacea *sp. spans three counties in southern California.*

In southern California, the polyphagous shot hole borer was originally identified as the tea shot hole borer, *Euwallacea fornicatus*, another exotic Asian ambrosia beetle. The two ambrosia species are morphologically similar; however, recent genetic analyses by the University of California, Riverside, suggest they are different species. The new invasive *Euwallacea* sp. has not yet been described taxonomically, but the common name of polyphagous shot hole borer was proposed because of its wide host range. The polyphagous shot hole borer species was previously introduced into Israel, where it attacks avocado and ornamental hardwood trees. The native distribution of the polyphagous shot hole borer is not currently known. The tea shot hole borer is a native pest to tea plantations in Sri Lanka and has been introduced several times throughout the South Asia and the Pacific. In the United States it has been reported from Hawaii and Florida.

The adult polyphagous shot hole borer females are black and measure approximately 0.07 to 0.10 inches (fig. 2), whereas the adult males are brown, are flightless, and measure 0.050 to 0.065 inches. The sex ratio is skewed toward the females, and males are not commonly observed. Sib-mating occurs in the egg galleries. Studies are currently investigating the polyphagous shot hole borer's life cycle in southern California, but it is hypothesized the beetle can complete several generations a year.

The polyphagous shot hole borer, an ambrosia beetle, causes mechanical injury to the xylem while the female constructs branching egg galleries (fig. 3). Attack densities can be quite alarming along the main stem and branches. The new *Fusarium* sp., which is carried by the female shot hole borer into the galleries, destroys the phloem and xylem tissue of host trees. Studies at the University of California, Riverside are assessing the pathogenicity of this new fungus. The insect-disease complex has caused crown dieback and tree mortality of several hardwood species in the urban and forested areas of southern California. The ambrosia beetle currently is known to complete development in 22 native and ornamental hardwood species. A current host list can be viewed at http://www.eskalenlab.ucr.edu/avocado.html. Injury from the insect-disease complex is common on box elder (*Acer negundo)*, castor bean (*Ricinus communis)*, avocado (*Persea americana)*, willow (*Salix* spp.),

Figure 2.—*Adult female of the polyphagous shot hole borer,* Euwallacea *sp. Photo by G. Arakelian, Los Angeles County Agricultural Commissioner/Weights & Measures Department.*

Figure 3.—*Branching egg galleries of the polyphagous shot hole borer,* Euwallacea *sp., observed in a branch of castor bean. Photo by Tom Coleman, USDA Forest Service.*

coast live oak (*Quercus agrifolia)*, and California sycamore (*Platanus racemosa)*. Reminiscent of other ambrosia beetles, tree injury symptoms include adult beetle entry and emergence holes, white boring dust, crown thinning and dieback, and host wound responses (e.g., wet discoloration, gumming, and a sugar response). The polyphagous shot hole borer attacks all size classes of hosts.

On the Los Angeles Ranger District of the Angeles National Forest, red willow (*Salix laevigata)*, castor bean, and white alder (*Alnus rhombifolia)* trees were severely injured by the insect-disease complex. Extensive beetle attacks have led to stem failure of red willow on the national forest (fig. 4). Eleven species of hardwoods are common across the four national forests in southern California, and the susceptibility of all these native tree species to the new insect-disease complex is not yet known. The Forest Service will continue to collaborate with the University of California, Riverside, to expand the detection efforts and assess the impact from the new insect-disease complex on public and private land in southern California.

Figure 4.—*White boring dust along the main stem of a red willow, a common injury symptom from polyphagous shot hole borer attacks, on the Angeles National Forest. Photo by Tom Coleman, USDA Forest Service.*