United States Department of Agriculture

Major Forest Insect and Disease Conditions in the United States: 2016

Forest Service FS-1125 April 2019

Cover photos:

Emerald ash borer adult. Source: https://bit.ly/2LcTWk1.

Gypsy moth caterpillars causing defoliation. Photo by Karla Salp, Washington State Department of Agriculture. Gypsy moth landscape level defoliation. Photo by Karla Salp, Washington State Department of Agriculture.

Mountain pine beetle treatment in the Bitterroot National Forest in southwest Montana and Idaho. USDA Forest Service photo.

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Major Forest Insect and Disease Conditions in the United States: 2016

COMPILED BY HELEN CORTES AND BRUCE MOLTZAN
FOREST HEALTH PROTECTION

Forest Service FS-1125 April 2019

Preface

This report on the major insect and disease conditions of the Nation's forests represents the 66th annual report prepared by the U.S. Department of Agriculture, Forest Service. The report focuses on 10 major insects and diseases that annually impact our Nation's forests. This 2016 update provides a national summary of the major changes and status of major forest pests with updated charts, tables, and maps. Additional information on these and other pests is available at: http://www.foresthealth.fs.usda.gov/portal

The information in this report is provided by the Forest Health Protection program of the Forest Service and its State partners. This program serves all Federal lands, including 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 administered by Forest Service and State program specialists to detect and report insect and disease epidemics through annual 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.

Forest Health Protection Offices

USDA FOREST SERVICE, WASHINGTON OFFICE
Stop Code 1110
1400 Independence Avenue, SW
Washington, DC 20250–1110
703–605–5344

USDA FOREST SERVICE
NORTHERN REGION (R1)
26 Fort Missoula Road
Missoula, MT 59804
406–329–3511

USDA FOREST SERVICE
ROCKY MOUNTAIN REGION (R2)
1617 Cole Blvd., Building 17
Lakewood, CO 80401
303–275–5350

USDA FOREST SERVICE
SOUTHWESTERN REGION (R3)
333 Broadway Boulevard, SE
Albuquerque, NM 87102
505–842–3247

USDA FOREST SERVICE
INTERMOUNTAIN REGION (R4)
324 25th Street
Ogden, UT 84401
801–625–5759

USDA FOREST SERVICE
PACIFIC SOUTHWEST REGION (R5)
1323 Club Drive
Vallejo, CA 94592
707–562–8921

USDA FOREST SERVICE
PACIFIC NORTHWEST REGION (R6)
1220 SW 3rd Avenue
Portland, OR 97204
503–808–2200

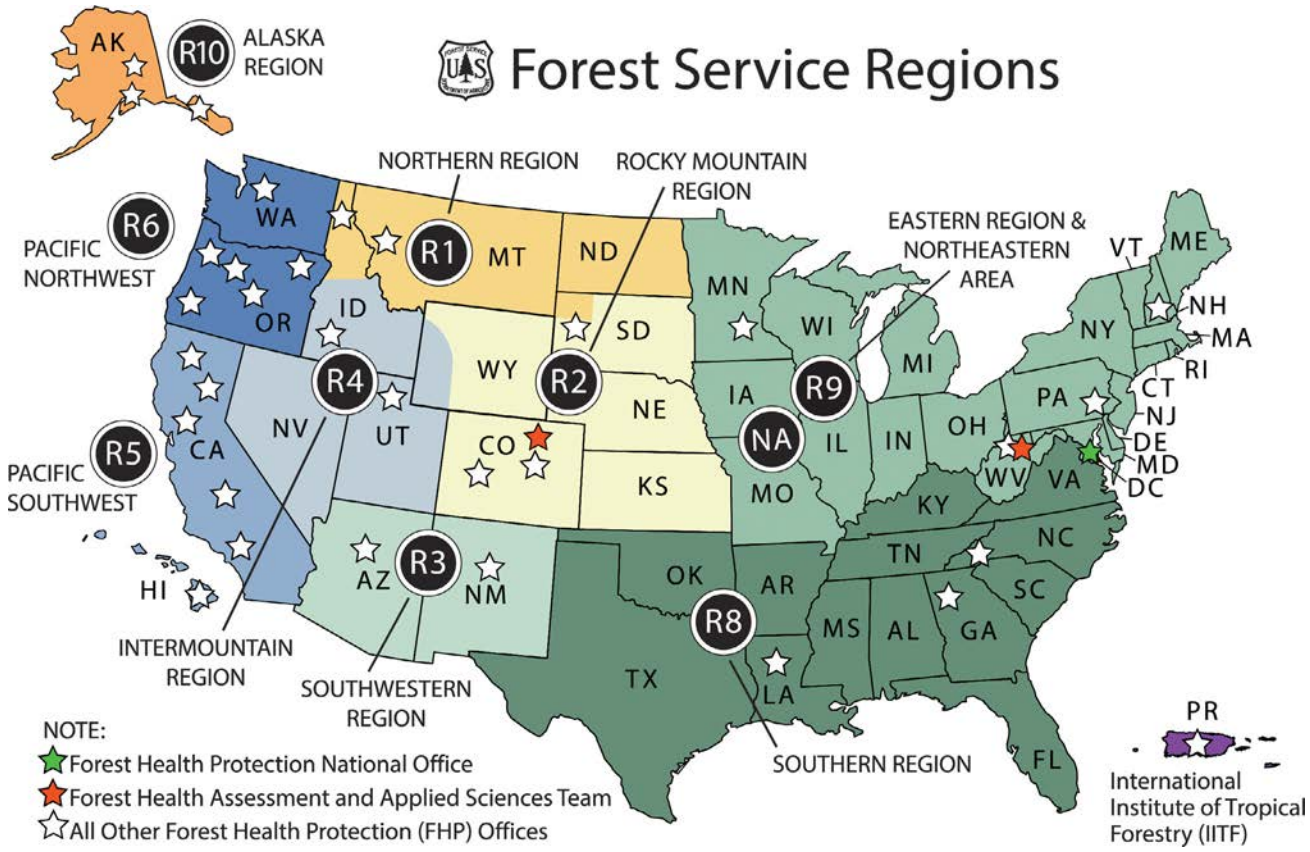
USDA FOREST SERVICE
SOUTHERN REGION (R8)
1720 Peachtree Road, NW
Atlanta, GA 30309
404–347–3540

USDA FOREST SERVICE
NORTHEASTERN AREA
626 East Wisconsin Ave
Milwaukee, WI 53202
414–297–3600

USDA FOREST SERVICE
ALASKA REGION (R10)
3301 C Street, Suite 202
Anchorage, AK 99503–3956
907–743–9455

USDA FOREST SERVICE
INTERNATIONAL INSTITUTE OF TROPICAL FORESTRY
Jardín Botánico Sur, 1201 Calle Ceiba
San Juan, PR 00926
787–766–5335

Forest Service Regions and Area



Copies of this report are available from:

Forest Service, U.S. Department of Agriculture
Attn: Forest Health Protection
1400 Independence Avenue, SW
Stop Code 1110
Washington, DC 20250–1110
Phone: 703–605–5344
Fax: 703–605–5353
E-mail: hmcortes@fs.fed.us

This report is also available on the Internet at: https://www.fs.fed.us/foresthealth/publications/ConditionsReport_2016.pdf

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Executive Summary/Introduction

Insects and diseases play critical roles in maintaining healthy, resilient ecosystems. They also can be among the most serious economic and environmental threats to the forests and urban landscapes in America. Trees respond to environmental cues and may be positively or negatively impacted by these changes, altering ecosystem services derived from forested lands, including timber, recreation, clean water, energy, wildlife habitat, and jobs. To understand how conditions are changing and to protect species, forests are surveyed for insect and disease extent and intensity so that Federal and State agencies and other stakeholders can prioritize management to ensure forests remain resilient and sustainable into the future. The overall mortality caused by insects and diseases varies by year and by pest.

TREE MORTALITY

More than **7.9 million acres of mortality** caused by insects and diseases nationally were reported in 2016, roughly 2 million acres higher than 2015, when mortality was reported on 6 million acres. Western bark beetles found in forests of the western United States caused nearly 84 percent of total mortality in 2016.

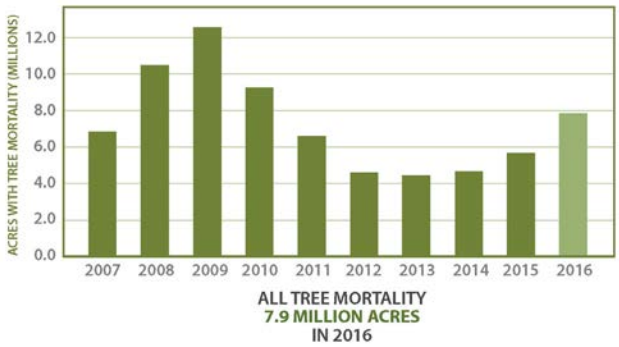


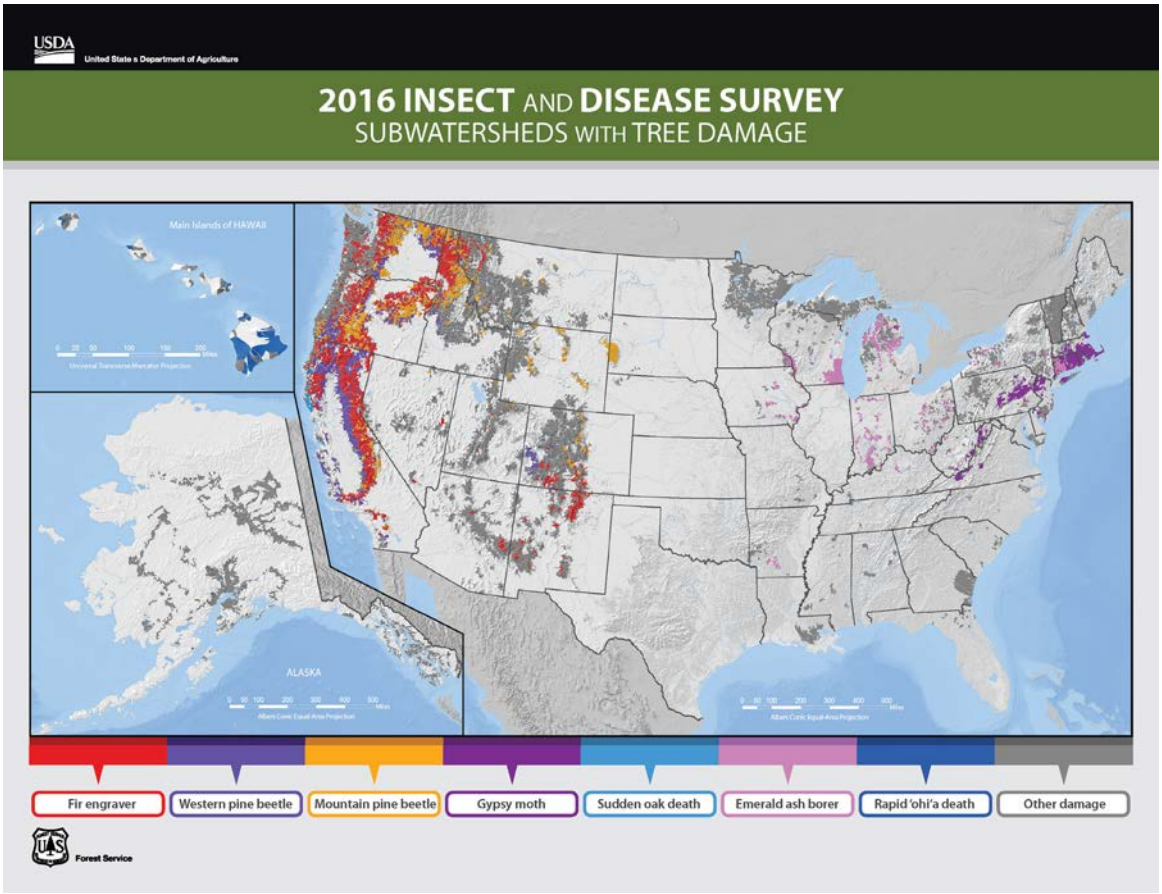
Figure 1. Surveyed acres with mortality 2007 – 2016

Every year, hundreds of native and nonnative insects and diseases damage our Nation's forests. This report provides descriptions of 10 major insects and diseases that contribute to annual forest mortality and defoliation. Additionally, our Pest Watch section describes pests that have the potential to become major threats and which the Forest Service and its partners are closely monitoring. **For more information on all the mortality and damage agents, please visit**: https://foresthealth.fs.usda.gov/portal

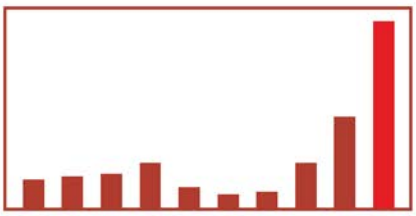
In addition to mortality, defoliating pests can damage trees by eating leaves or needles, causing significant losses of foliage and altering forest health. A single defoliation event does not usually cause tree mortality. However, with repeated attacks or severe abiotic factors, such as weather and drought, trees can succumb to these defoliating insects. There were 8.6 million acres of defoliation and other damage agents recorded nationally in 2016.

IMPORTANT: When interpreting maps throughout this document, note that data are displayed at the county scale only. For example, if damage was reported at just one location in the county, the entire county is displayed as affected. This standard convention is used because data for most pests are collected only at the county level. If the damage were reported at finer scales, many areas would not be visible at the scale used in this publication. The maps represent only what is reported as mortality or defoliation and not the total infestation of a particular pest. In any given year, some areas are not surveyed due to physical limitations, such as forest fires, weather events, or limited resources. Data collected from ground and aerial surveys used in this report represent a single snapshot in time for a given year. More frequent surveys are conducted in specific areas on a case-by-case basis. By combining these surveys over time, this report captures general trends and conditions of the 10 selected insects and diseases across multiple years.

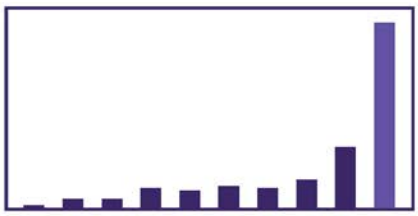
2016 INSECT AND DISEASE SURVEY



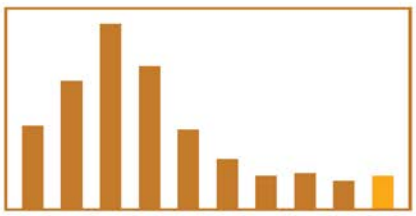
TOP MORTALITY AGENTS & TRENDS – 2007 TO 2016



FIR ENGRAVER
2.9 MILLION ACRES
IN 2016



WESTERN PINE BEETLE
2.2 MILLION ACRES
IN 2016



MOUNTAIN PINE BEETLE
1.5 MILLION ACRES
IN 2016

Gypsy **Moth**

Massachusetts, Connecticut, and Rhode Island experienced increase gypsy moth damage in 2016.

Oak forests experienced defoliation by gypsy moth, along with other earlier season defoliators including fall cankerworm, throughout the northeast in 2016. In 2016, high levels of gypsy moth defoliation could be found scattered throughout the region with more than half of the defoliation occurring in the New England States. While defoliation in much of the rest of the infested areas was spotty, overall defoliation dropped by 460,931 acres compared to 2015 for a total of 961,437 acres defoliated.

In southern New England, a series of dry springs resulted in low infection rates of the fungus *Entomophaga maimaiga*, leading to higher gypsy moth populations and heavy defoliation in many areas.

Acres of gypsy moth defoliation in 2016 increased in Rhode Island, Massachusetts, and Connecticut. The majority of the affected canopy experienced greater than 75 percent loss of foliage. In Connecticut, gypsy moth surveys found significant increases in egg masses compared to prior years. Egg mass surveys in the fall of 2015 showed an increasing population across Maryland. However, little defoliation was reported in the spring of 2016, likely due to cooler and moist conditions favoring fungal infection of the caterpillar stage. New Jersey, New York, and Pennsylvania also reported a decline in gypsy moth populations.

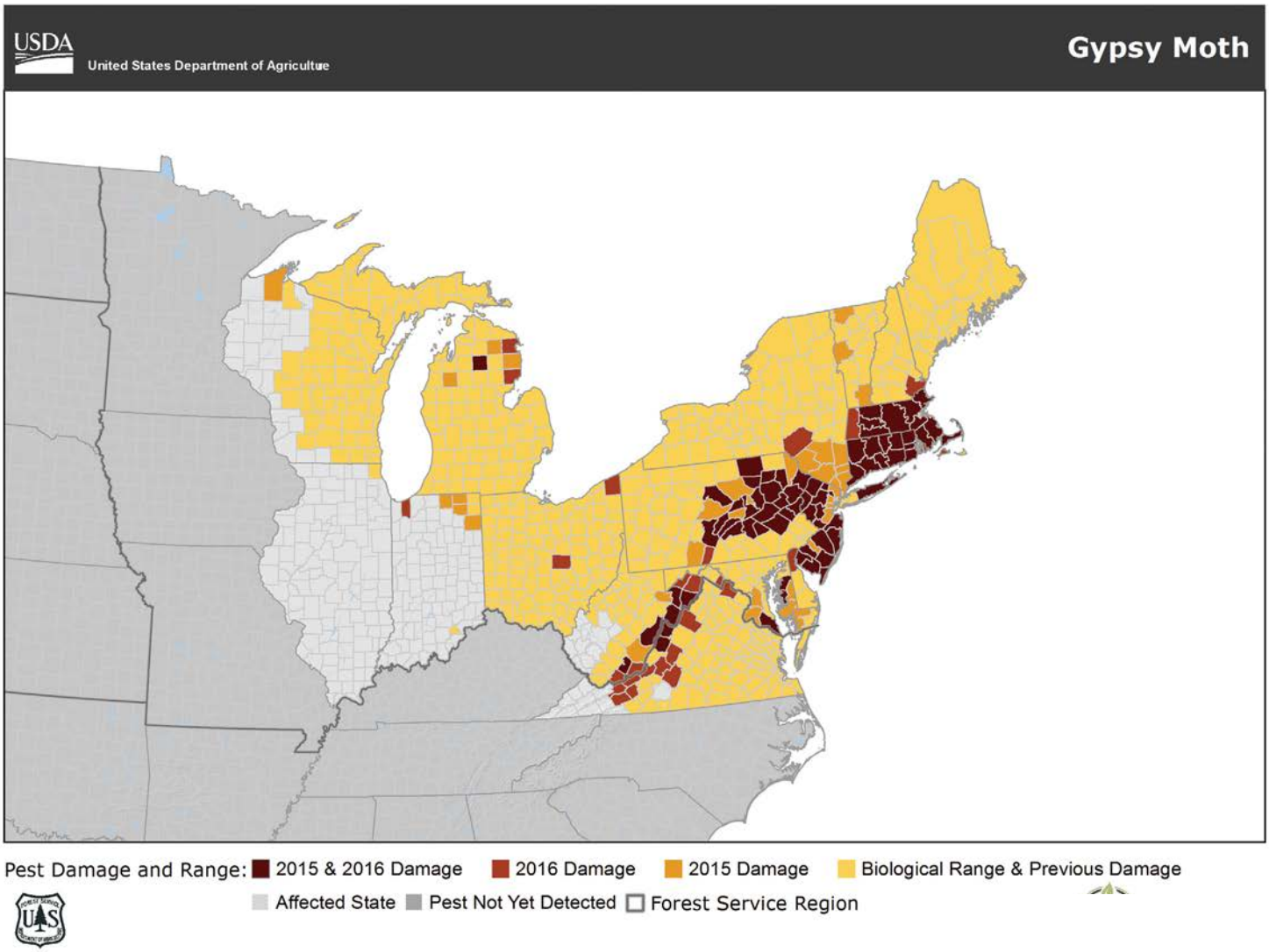
In Virginia, after more than five years of low gypsy moth activity, populations have begun to increase. Damage in 2016 was widespread across the State. Significant defoliation was detected in late May and early June. This is the most gypsy moth damage Virginia has seen since the last outbreak in 2008–2009.

West Virginia is in the second to third year of an outbreak. Population collapse has been observed in some areas, but high counts of egg masses remain.

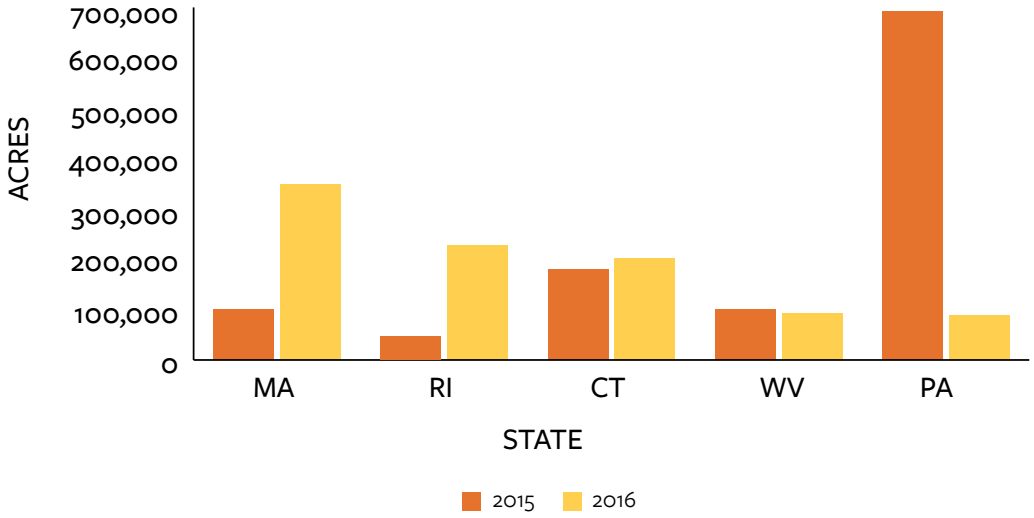
Gypsy moth caterpillars. Photo by Karla Salp, Washington State Department of Agriculture, Bugwood.org.

Gypsy moth trap. Photo by Daniel Herms, Ohio State University, Bugwood.org.

Overall defoliation dropped by
460,931 acres.



Gypsy Moth Damage 2015 – 2016



Pennsylvania had a noticeable decline in gypsy moth.

Emerald **Ash Borer**

Alabama, Delaware, Nebraska, Oklahoma, and Texas all had their first reports of emerald ash borer in 2016.

Emerald ash borer (EAB) was found for the first time in Alabama, Delaware, Nebraska, Oklahoma, and Texas in 2016. Infestations now have been detected in 31 States and the District of Columbia. Reported EAB damage increased by 663,640 acres compared to 271,927 acres in 2015.

In the Northeast, EAB occurs in every State except Maine, Rhode Island, and Vermont. Connecticut had noteworthy damage in the south central part of the State, and the New Hampshire quarantine now includes four counties in the south central and southeast with increasing damage throughout the State. New York surveys doubled the EAB quarantine area and infestations appeared to be rapidly expanding in 2016. Delaware marked its first EAB report in 2016, however no infested trees were associated with the trap catches.

In Pennsylvania, five new counties were added, with ash mortality reported in 62 out of 67 counties. Emerald ash borer is increasing in all infested areas of Maryland. West Virginia added two new counties in 2016, though they reported less mortality than 2015. Emerald ash borer is now found in all 88 counties in Ohio—adding the last 2 counties in 2016. While the EAB is no longer new to Virginia, it was found in 15 new counties in 2016, bringing the total to 46. These new counties are clustered in the southwestern part of the State. In 2016, EAB was confirmed in 6 additional North Carolina counties, bringing the State total to 24 positive counties.

In Indiana, there were 4 new county records, bringing the total confirmed EAB to 88 of the 92 counties in the State. Aerial surveys showed mortality expansion in south central Indiana and the start of mortality in the southeast along the Ohio River. Eight new county records for EAB increased the total to 38 counties in Iowa in 2016. Michigan had four new county records in 2016. The spread of EAB in Minnesota has been slower than other surrounding infested States since first reported in 2009. Mortality of ash occurred in two areas in southeastern Wisconsin where EAB has been established for the longest in the State. These areas of mortality have expanded significantly since 2015. Scattered mortality was also recorded along the Mississippi River in southwest Wisconsin.

In Missouri, EAB was found in 15 new counties in 2016, and it is now present in 31 counties. Nebraska registered its first EAB report near Omaha. In Kansas, EAB was confirmed new in Atchison County in 2016, causing mortality consistent with a well-established EAB presence of several years, suggesting that it is more embedded in the western portion of the quarantine zone than previously thought. In Colorado, Boulder County remains the only county with the confirmed presence of EAB; however, additional communities have been identified as infested.

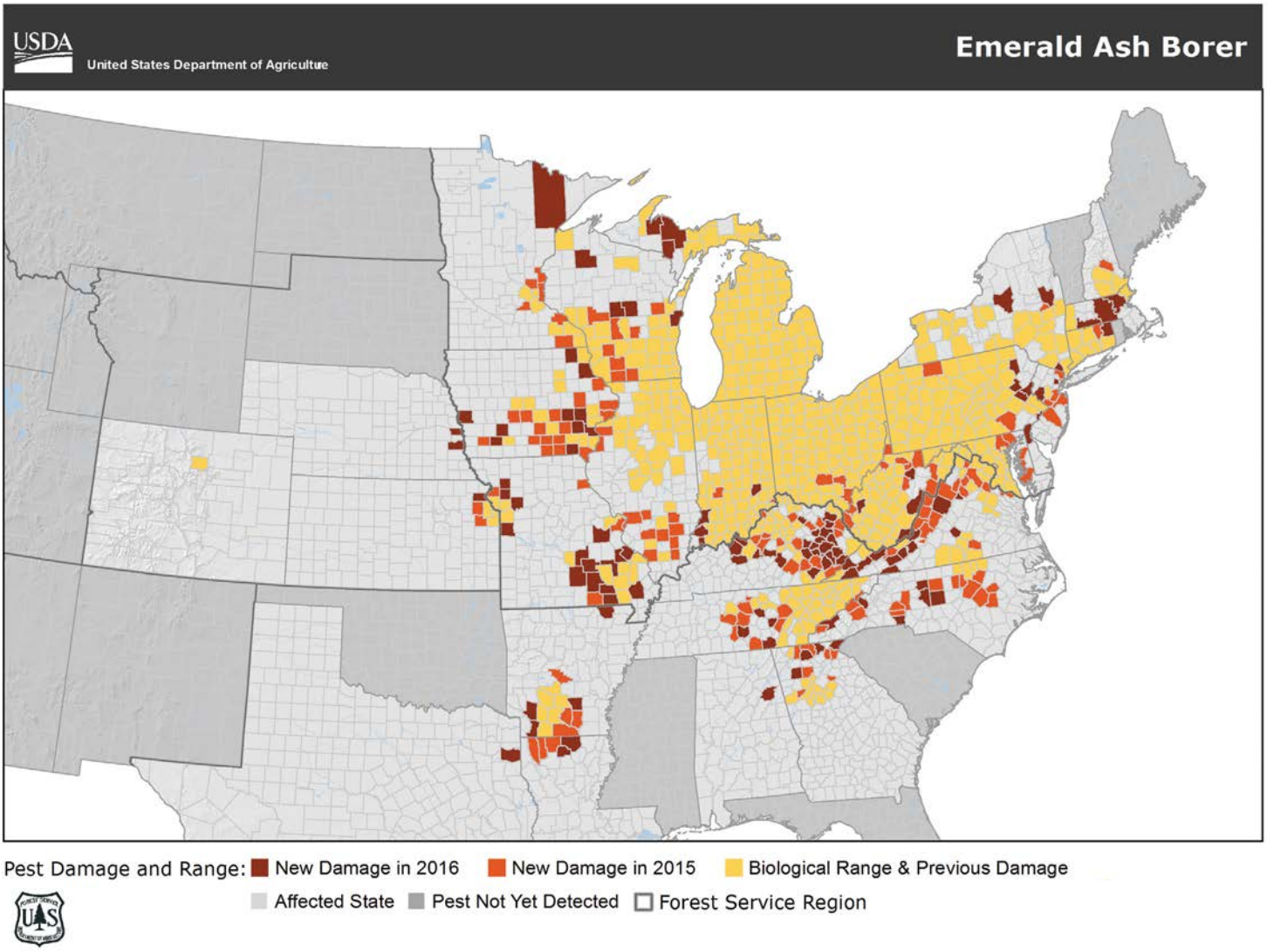
In the South, EAB was found for the first time in Alabama, Oklahoma, and Texas, and as EAB-associated ash mortality expands, damage reports via aerial survey are becoming more common along drainages and floodplain forests, where ash is abundant and mortality easily visible from the air. In Arkansas, ash mortality was found along waterways such as Ouachita River and Little Missouri River. Four new EAB counties were added in 2016.

In Kentucky, EAB has been confirmed in 80 counties, with 27 of these new infestations reported in the eastern third of the State, confirming that EAB is slowly spreading west. In 2016, Tennessee was found to have 11 newly infested counties.

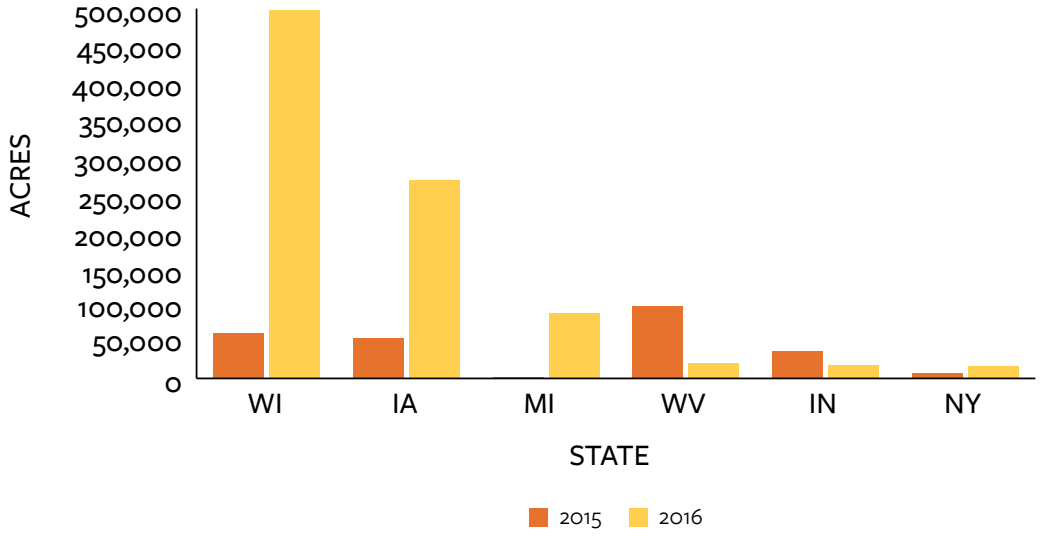
Reported emerald ash borer damage increased to

663,640 acres

compared to 271,927 acres in 2015.



Emerald Ash Borer Damage 2015 – 2016



Southern **Pine Beetle**

There were a total of 118 counties reported with southern pine beetle damage in 2016.

The Southern Pine Beetle (SPB) is the most important insect affecting pines in the Southern United States. Localized outbreaks continued in parts of Mississippi, Alabama, Georgia, and Florida, with light activity reported in Virginia and North Carolina in 2016. Overall SPB mortality declined to 31,775 acres, compared to 41,228 acres in 2015.

Southern Pine Beetle activity was minimal in Virginia, with most mortality taking place in mature dense pines on Chincoteague Island, which is subject to saltwater intrusion, and these stressed trees have become extremely susceptible to beetle attack. For the first time in several years, SPB spots were detected on State and private lands in North Carolina.

Mississippi reported SPB populations holding steady statewide, with most activity in or adjacent to the Bienville and Homochitto National Forests. Alabama reported an overall increase in SPB infestations, with numerous spots found on the Talladega National Forest and several populations found in 27 counties in 2016. In Georgia, 95 SPB spots were detected across the State in 2016.

Overall mortality declined to
31,775 acres
in 2016.

Activity in Florida was notably higher in comparison to the low activity that the State has experienced since 2003, with a majority of spots located in the northeastern part of the State. Mortality occurred within both natural and plantations of loblolly and slash pines and on private, State, and Federal lands.

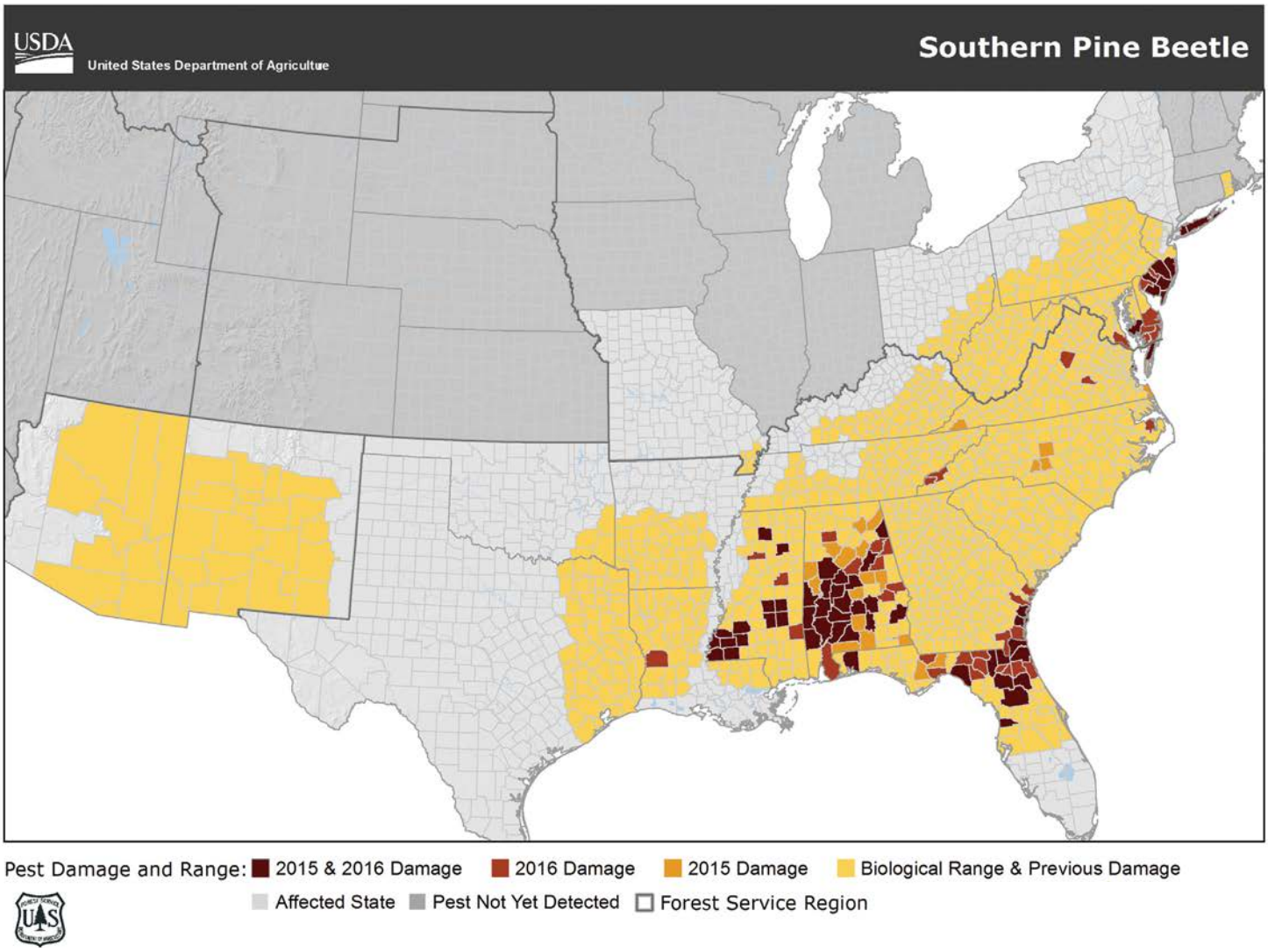
In the Northeast, Rhode Island trapped one SPB, marking the second consecutive year it was found at this location. To date, no infested trees have been found. Southern Pine Beetle was recently detected in Connecticut, on red pine, white pine, Scots pine, pitch pine, and Norway spruce in three counties.

Widespread mortality of pitch pine on Long Island, New York, continued in 2016, with much of the damage in the Central Long Island Pine Barrens, a globally rare ecosystem under threat from this beetle. For the past two years, adult SPB have been detected in multiple pheromone traps in New York's Hudson Valley. However, no infested pines have been found there to date.

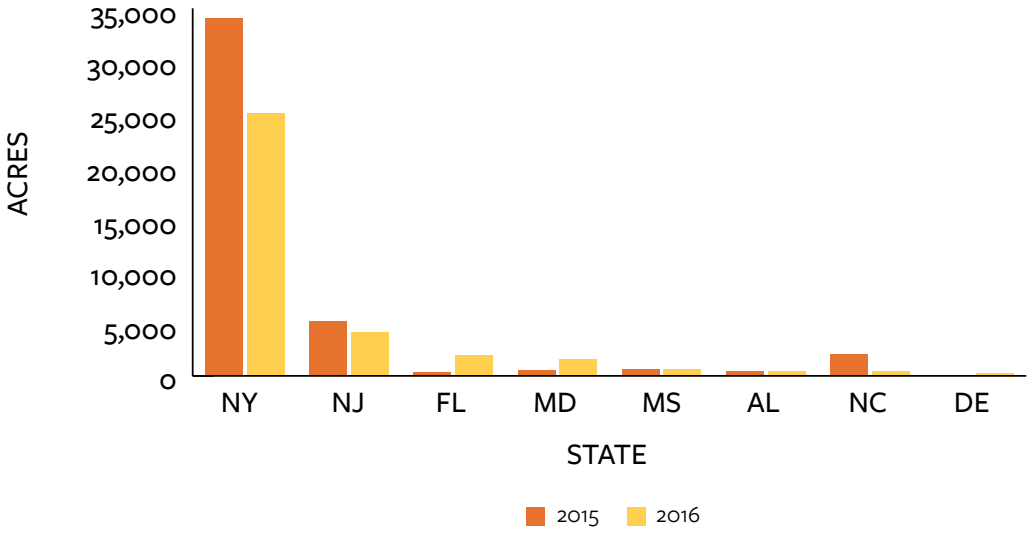
In New Jersey, SPB is mainly attacking pitch pine, shortleaf pine, and Virginia pine, but has been observed infesting Norway spruce and white pine. Southern Pine Beetle is still mainly found in the southern counties of the State. Southern pine beetle in Delaware caused high mortality in loblolly pine in 2015 and this outbreak continued to expand in 2016. These unmanaged pine stands border a salt marsh near areas of brackish water flooding, which may also be driving the infestation.

Pocket of southern pine beetle mortality. Photo by Ronald F. Billings, Texas A&M Forest Service, Bugwood.org.

In Maryland, SPB activity continued in saltwater-stressed loblolly pines in southern Maryland's Eastern Shore in 2016. Additional activity was observed in the southern part of the State on the western shore of the Chesapeake Bay.



Southern Pine Beetle Damage 2015 – 2016



Hemlock **Woolly Adelgid**

There were a total of 370 counties reported with hemlock woolly adelgid damage in 2016.

Hemlock Woolly Adelgid (HWA) continues to impact the health of eastern and Carolina hemlock trees and hemlock forests from New England through the southern Appalachians.

Hemlock Woolly Adelgid was detected near Sebago Lake in Maine in 2016. This is the farthest inland that the adelgid has been detected since its discovery in Maine. No new infestations of HWA from New Hampshire and Vermont were reported in 2016.

Hemlock woolly adelgid continues to cause patchy damage and decline among the remaining population of hemlocks in Connecticut. A buildup of HWA populations statewide was reported for Massachusetts in 2016. Areas with previous large populations continued to be infested with elongated hemlock scale, increasing levels of tree stress and mortality. Hemlock woolly adelgid infestations remained present in all five counties in Rhode Island in 2016.

In New York, HWA continued to cause damage and mortality to native forests and ornamental eastern hemlock trees throughout the State in 2016. The adelgid was found for the first time near the shore of Lake Ontario. Damage was most severe in areas infested the longest, including much of the Catskills and Finger Lakes regions.

Approximately 25,000 acres are now infested with HWA in New Jersey. Eastern hemlock is designated as a priority forest resource in the New Jersey Statewide Forest Resource Assessment and Strategies. Maryland has an estimated 42,000 acres of hemlocks, 85 percent of which are located in the two westernmost counties where HWA has been found, with an estimated 12,500 acres impacted by HWA.

In Pennsylvania, one new county was added to the infestation list in 2016, bringing the total to 60 out of 67 counties infested with HWA. Hemlock woolly adelgid was found in one new location on private land in Ohio. In Michigan, two new county records for HWA were reported. Increased survey efforts have resulted in the detection of additional HWA infestations in communities along the Lake Michigan shoreline in two counties.

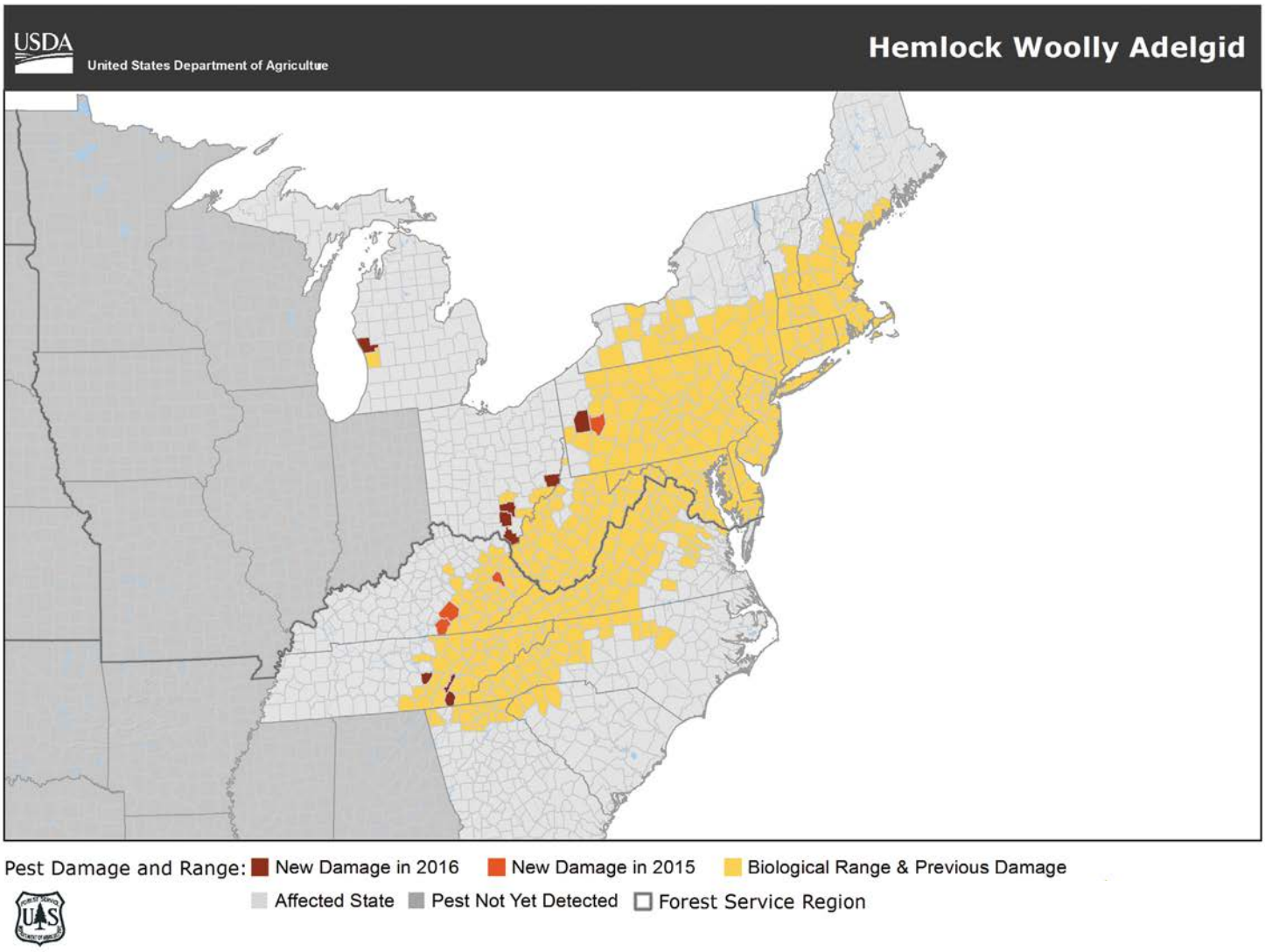
In the southern states, HWA occurs throughout most of hemlock range, including Virginia, Kentucky, Tennessee, North Carolina, South Carolina, and Georgia. Of those States, only Tennessee reported any new infested counties—three new counties in 2016.

Immature hemlock woolly adelgid crawler stage. Photo by Kelly Oten, North Carolina Forest Service, Bugwood.org.

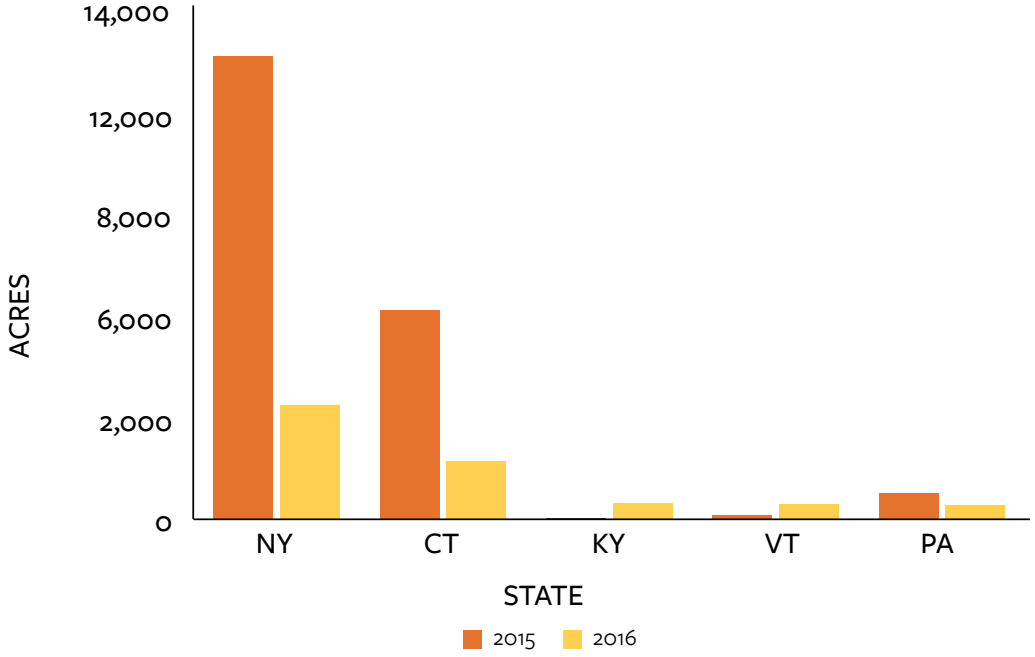
The hemlock woolly adelgid continues to spread and cause significant hemlock decline throughout the range of eastern hemlock in Virginia. Mean hemlock mortality remained at 30 percent in 2016; mean stand health was also unchanged from the previous year—the first time that both hemlock mortality and stand health did not increase from the year before. These trends indicate decreased HWA densities due to winters with below-normal temperatures.

Populations of eastern hemlock and Carolina hemlock continued to decline in South Carolina in 2016.

In Georgia, HWA has now spread throughout the entire natural range of hemlock.



Hemlock Wooly Adelgid Damage 2015 – 2016



Western **Bark Beetles**

FIR ENGRAVER

(Arizona, California, Colorado, Idaho, Montana, Nevada, Oregon, Washington, Wyoming)

Reported fir engraver damage increased to 2,932,427 acres, compared to 1,437,037 acres in 2015.

In Arizona, the number of acres with white fir mortality was the lowest reported during the past 4 years. Most of the damage was mapped on the Apache-Sitgreaves National Forests, especially on the Alpine and Springerville Ranger Districts. Substantial white fir mortality was also reported north of Flagstaff on the Coconino National Forest in 2016.

Damage increased to

2,932,427 acres

compared to 1,437,037 acres in 2015.

In New Mexico, fir engraver activity decreased across all five national forests in the State. However, high levels of fir engraver continue to damage trees on the Sandia Ranger District of the Cibola National Forest. Several years of severe drought conditions occurring from 2007 to 2012 and high stand densities are contributing to the increase in bark beetle activity.

In the Intermountain Region in 2016, fir engraver tree mortality decreased by almost half, from more than 4,000 acres in 2015. Most of the fir tree mortality occurred on national forests in Utah and Nevada. In Utah, tree mortality decreased from 3,000 acres in 2015 to just over 1,000 acres in 2016. Nevada reported most fir engraver activity on the Humboldt-Toiyabe National Forest.

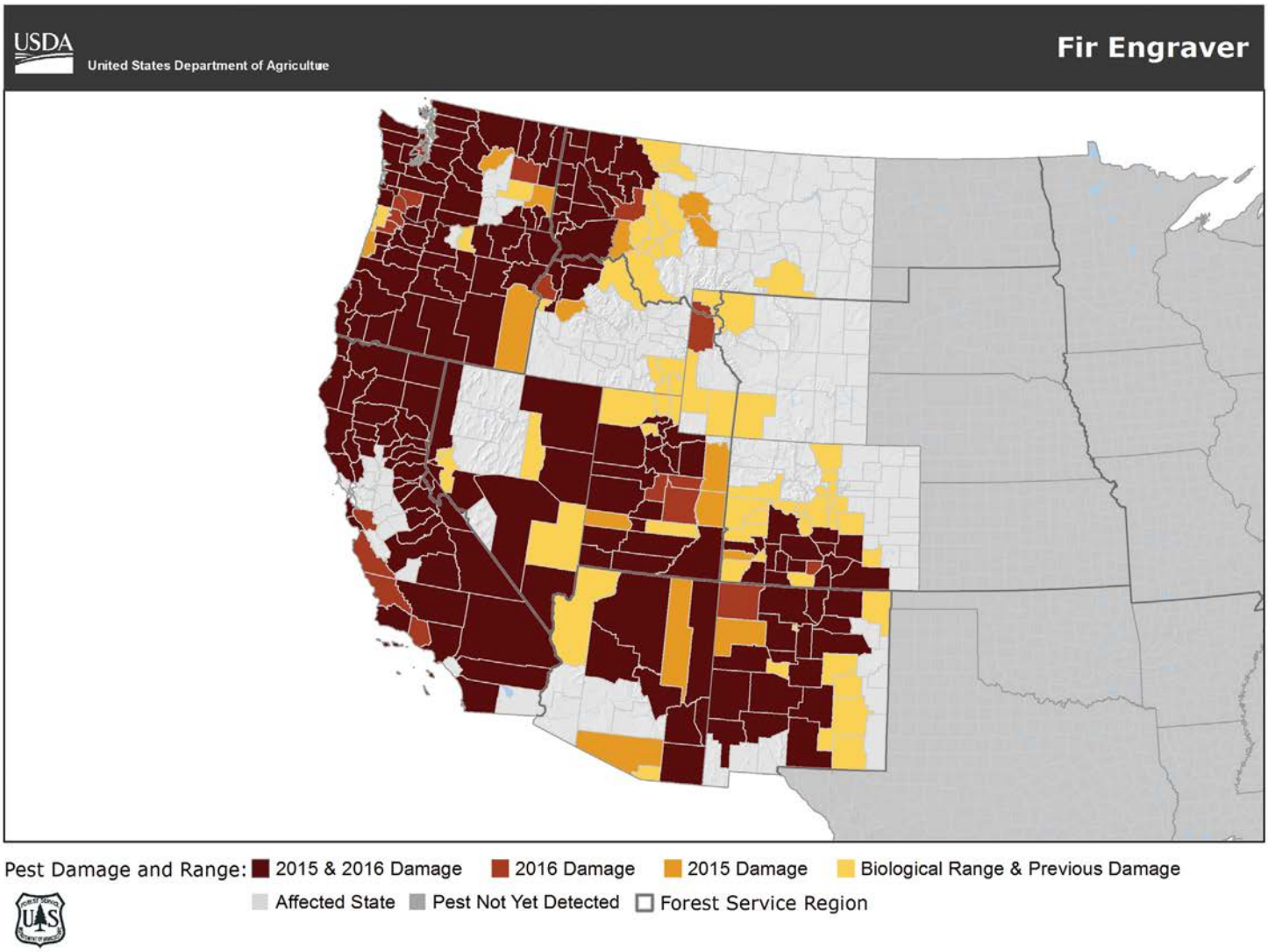
Fir engraver was once again detected in northern Idaho, with affected acreage increasing to over three times the amount from 2015. A majority of the impacts occurred on Forest Service and private lands east and south of the city of Coeur d'Alene.

In western Montana, fir engraver activity increased on Forest Service and other Federal lands. Noticeable areas of infestation in the Flathead Valley and the vicinity of Mud Lake and the Swan Lake corridor were reported in 2016. Significant decrease in fir engraver damage was found across the range of white fir in Colorado.

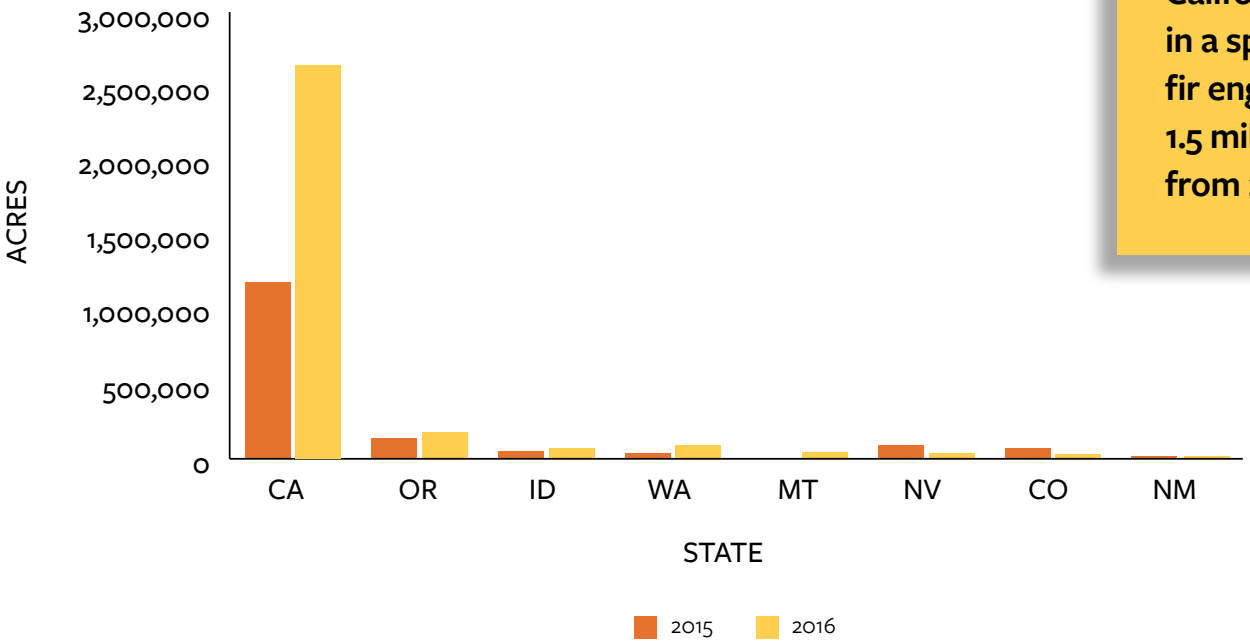
Adult fir engraver beetle. Photo by Donald Owen, California Department of Forestry and Fire Protection, Bugwood.org.

Recent drought conditions in Oregon and Washington likely increased fir engraver mortality in 2016. Damage was detected on the Fremont-Winema, Ochoco, Wallowa-Whitman, Umatilla, and Malheur National Forests in Oregon.

The highest mortality due to fir engraver (over 2.6 million acres) occurred over many of the national forests and parks in California, with the highest levels of true fir mortality reported in the Modoc, Sequoia, and Sierra National Forests, Sequoia-Kings Canyon, and Yosemite National Parks.



Fir Engraver Damage 2015 – 2016



Drought in California resulted in a spike in fir engraver up 1.5 million acres from 2015.

Western **Bark Beetles**

SPRUCE BEETLE

(Alaska, Colorado, Idaho, Montana, New Mexico, Oregon, Utah, Washington, Wyoming)

Across six States in the interior West, over 17.5 million acres have been infested by bark beetles in the last decade. Three important western bark beetles in 2016 accounted for the majority of mortality in these areas: fir engraver, spruce beetle, and mountain pine beetle. It is important to recognize many more bark beetles species are included in this complex.

Tree mortality in the spruce-fir type continued to increase in New Mexico during 2016. Increased spruce mortality was observed in the northern portion of the Carson National Forest, the Pecos Wilderness Area, and Santa Fe National Forest. In addition, other bark beetle species were found attacking smaller diameter spruce trees in the same stands.

Aerial survey in south central Colorado showed spruce beetle epidemics expanding on the San Juan, Rio Grande, Gunnison, and San Isabel National Forests. In northern Colorado, spruce beetles continued to expand and cause new tree mortality into northern Rocky Mountain National Park. Other national forests, such as San Isabel, Pike, Roosevelt, and Gunnison, experienced higher spruce beetle populations in 2016.

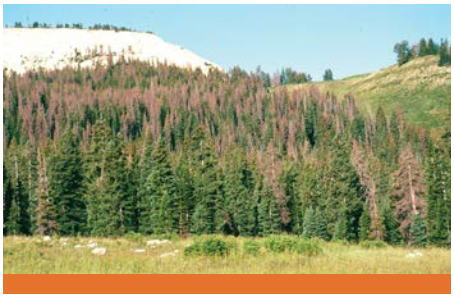
17.5 million acres

of forested lands have been infested by bark beetles in the last decade.

In the Intermountain Region, acres with spruce beetle-caused tree mortality increased from 2015. This is the sixth consecutive year of increased spruce mortality. Most of the spruce mortality was mapped in Utah, where it was detected at some level on all national forests and most other ownerships. The Uinta-Wasatch-Cache, Ashley, and Fishlake National Forests have significant outbreaks. The increase in tree mortality results from continued drought and high beetle populations in dense spruce stands.

In Wyoming, spruce beetle epidemics continue only in the western part of the State. Spruce beetle-caused mortality on the Bridger-Teton National Forest decreased from 2015. Large group mortality in Engelmann spruce stands continues in areas not already host-depleted in the Absaroka Mountains and Wind River Range.

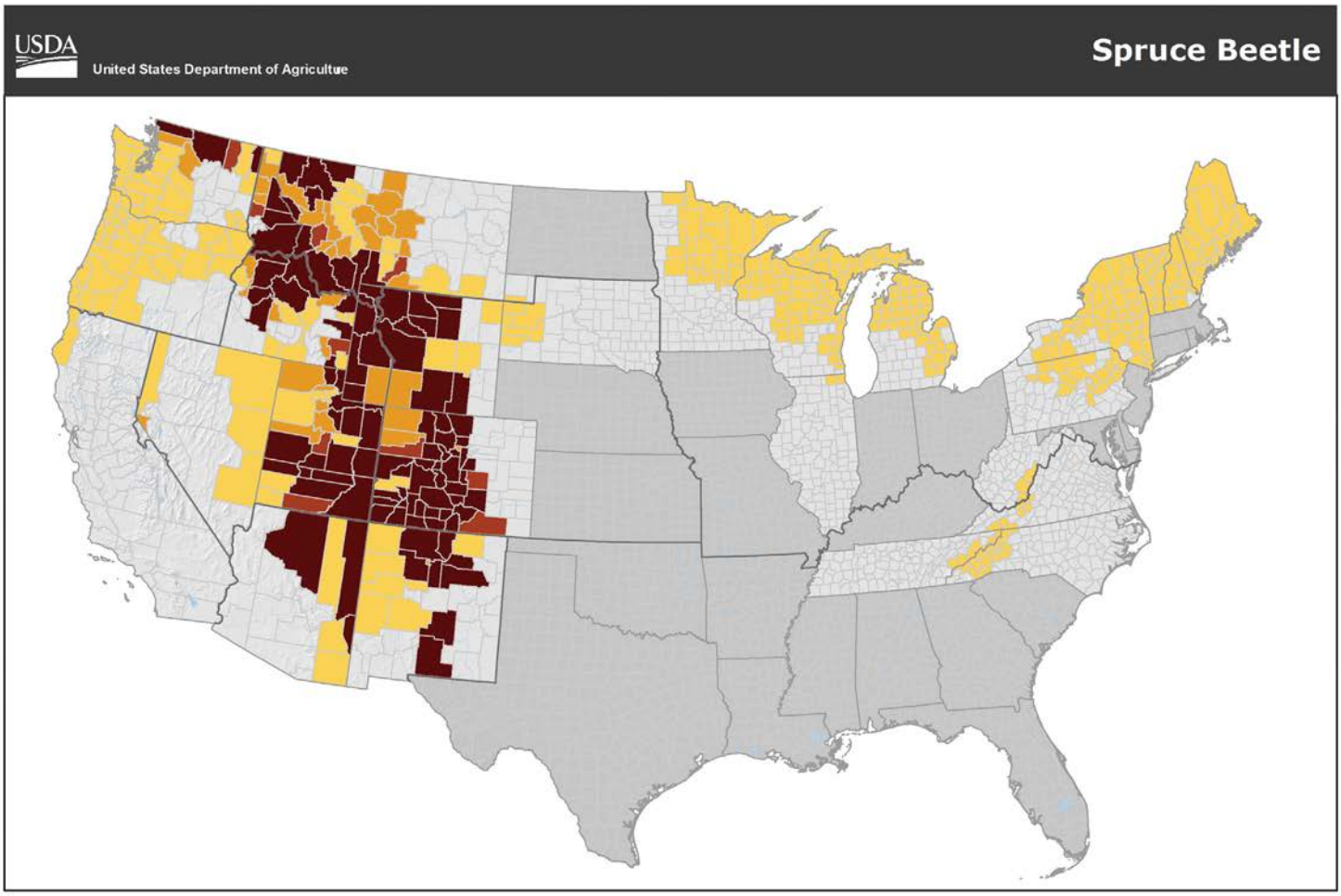
In the Northern Rockies, estimates for spruce beetle-caused mortality remained constant, causing low levels of mortality in 2016, as in 2015. Damage was limited to isolated pockets scattered throughout the region. Spruce beetle populations are not expected to erupt again within these specific locations, as the prevalence of susceptible large-diameter spruce host has been substantially depleted.



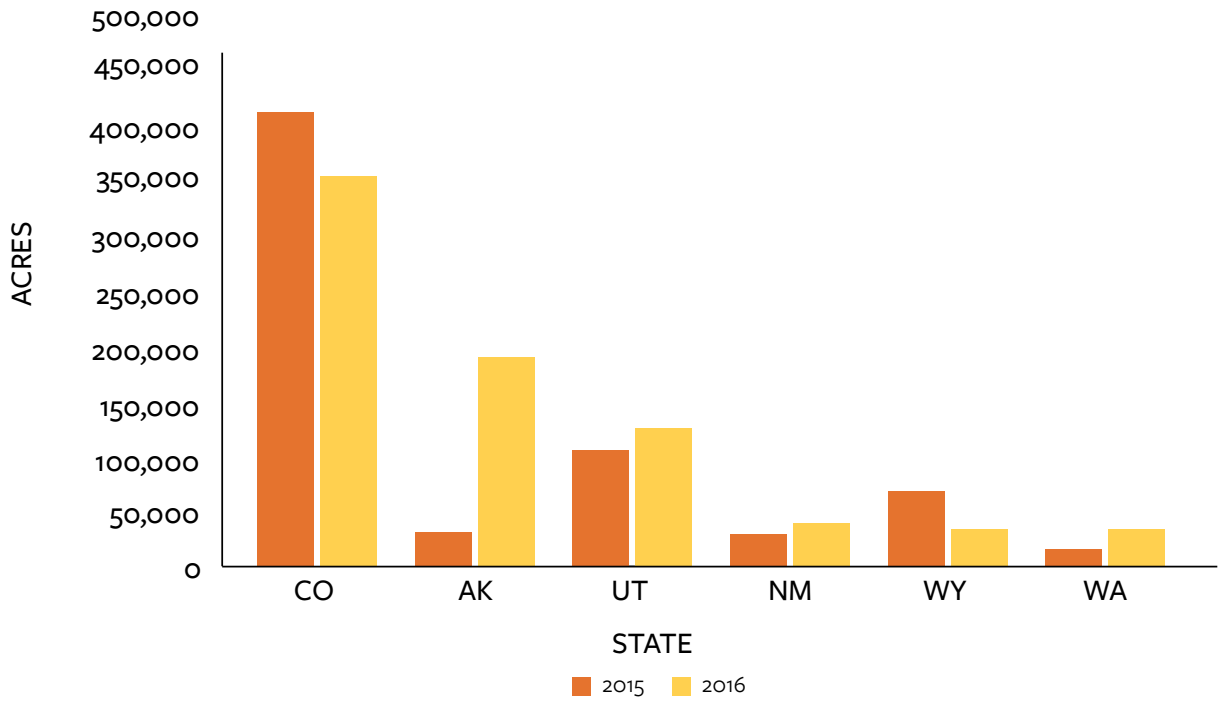
Spruce beetle activity in Engelmann spruce. Photo by Steven Munson, USDA Forest Service, Bugwood.org.

In Washington, acres affected by spruce beetle increased from 2015 to 2016. The majority of spruce beetle-caused mortality occurred near Loomis State Forest and the Pasayten Wilderness within the Okanogan-Wenatchee National Forest.

Alaska saw a fivefold increase in spruce beetle mortality compared to 2015. This marks the most spruce beetle-infested area observed in a given year since 1999. Spruce beetle remains the leading non-fire cause of spruce mortality in the State.



Spruce Beetle Damage 2015 – 2016



Western **Bark Beetles**

MOUNTAIN PINE BEETLE

(Arizona, California, Colorado, Idaho, Montana, Nevada, Oregon, Washington, Wyoming)

Across the Northern Rockies, Mountain Pine Beetle (MPB) activity declined again in 2016 to less than 100,000 total acres. The 2016 survey identified more than 88 percent of the total mortality in Idaho, and a lesser extent in Montana, Wyoming, and Washington Over 97 percent of mortality was in the lodgepole pine type, with minor amounts detected in ponderosa pine, five-needle pines, and western white pine. In Idaho, MPB activity decreased to less than 30 percent of 2015 levels, with most of the pine mortality on the Payette National Forest. In Montana, MPB activity decreased 94 percent from 2015 levels.

Mortality in the Intermountain Region decreased to

15,000 acres

compared to 60,000 acres in 2015.

In the Central Rockies, the mountain pine beetle epidemic has ended, although areas of localized new tree mortality were observed. In Colorado, affected acres did not expand in 2016. The majority of the detectable MPB-caused tree mortality was observed in high elevation limber and whitebark pines, primarily in western Wyoming. South Dakota 2016 surveys indicate MPB populations returning to low levels. Similar declines in MPB in the Black Hills region were noted by State Forestry and Resource Conservation foresters.

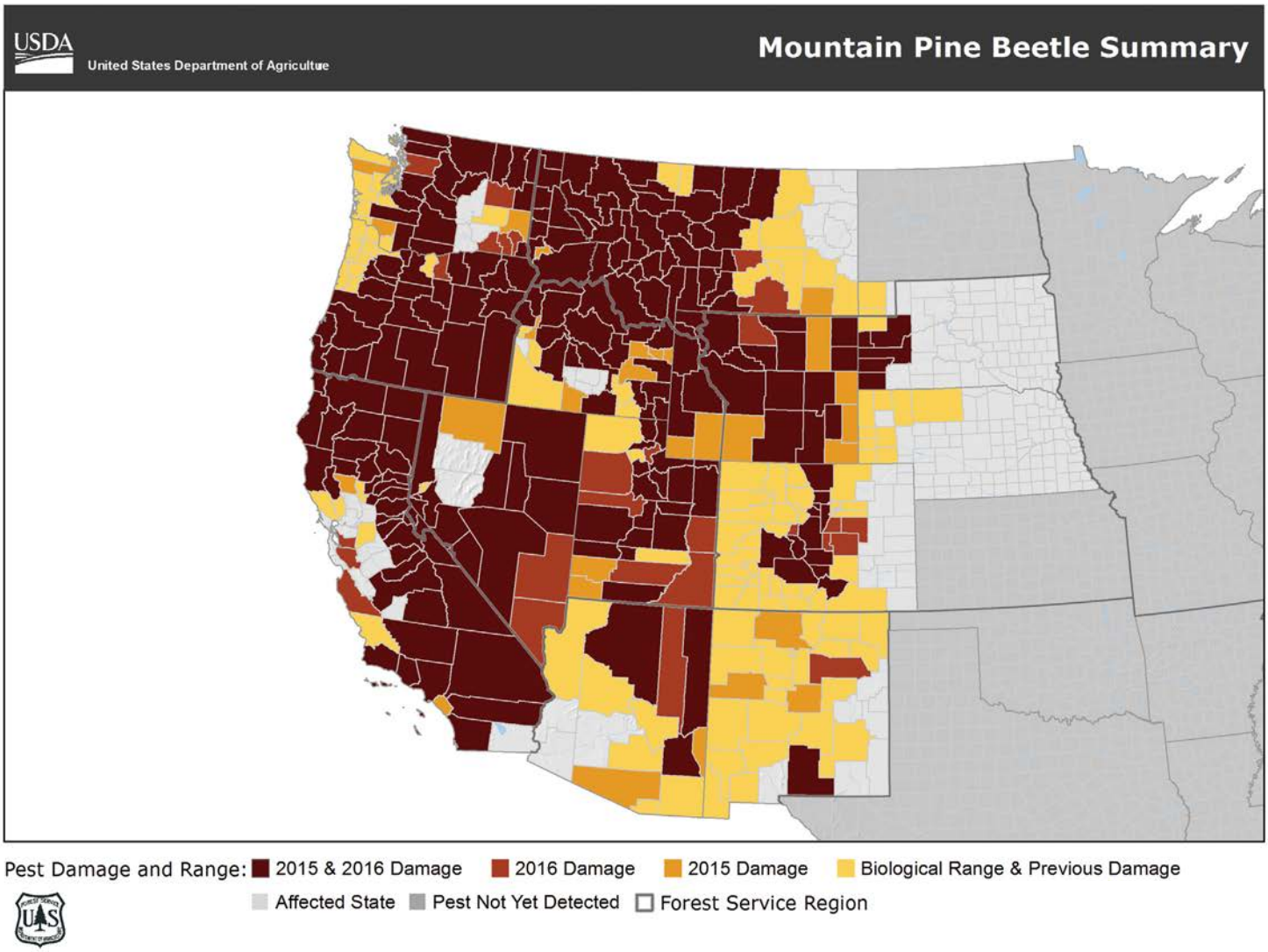
In the Intermountain Region, acres with MPB-caused mortality continue to decrease with only 15,000 acres reported, compared to 60,000 acres reported in 2015. Surveys for 2016 recorded the lowest level of acres with pine mortality in over a decade.

Mountain pine beetle activity in the Southwest typically occurs in fire-injured southwestern white pine trees in Arizona. Aerial detection reported only minor MPB activity, specifically north of Flagstaff and on the sky islands of the Coronado National Forest in southeastern Arizona. Western bark beetle activity in Southwest ponderosa pine forests tends to be a combination of Ips, western, and roundheaded pine beetles.

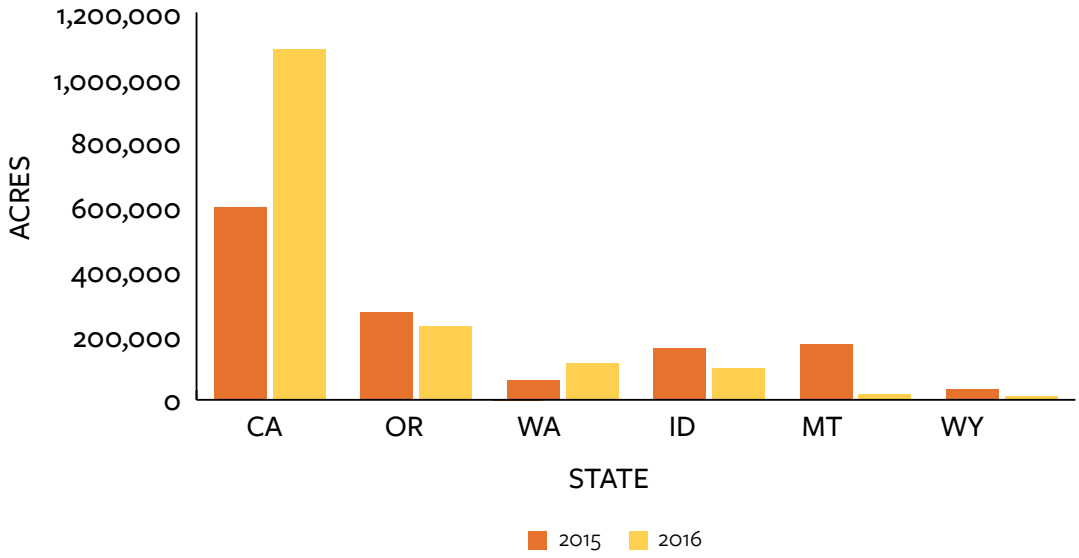
Throughout the west side of the southern Sierra Nevada range in California and Nevada, MPB continued to target large-diameter sugar pines, often in the same locations where western pine beetle was attacking ponderosa pines. The tremendous level of mortality is likely the largest loss of mature sugar pine in the past 100 years and is associated with the protracted drought.

Adult mountain pine beetle. Photo by William M. Ciesla, Forest Health Management International, Bugwood.org.

In the Pacific Northwest, MPB mortality in ponderosa, lodgepole, whitebark, western white, and sugar pine were detected during the 2016 survey. The intensity of the damage increased with whitebark and lodgepole pines. In Oregon, most of the damage occurs on the Fremont-Winema and Malheur National Forests, whereas in Washington, damage was mapped on the Okanagon-Wenatchee and Colville National Forests.



Mountain Pine Beetle Damage 2015 – 2016



Sudden **Oak Death**

The European (EU1) strain of the disease was detected again in 2016 near the first reported forest find of EU1 in 2015.

Sudden Oak Death (SOD) is a forest disease that has caused widespread dieback of several tree species in California and Oregon forests. In addition, the disease can infect commercial nursery plants, increasing the risk of spread to oaks nationwide.

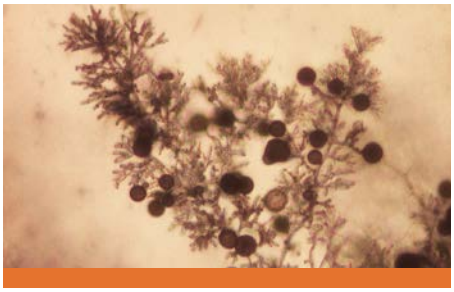
The disease was first detected by aerial survey in Curry County, Oregon, in 2001. Since then, SOD spread continues throughout the affected area and is now federally regulated in the southern part of this county. Suppression treatments are available and have been shown to significantly slow the site-to-site spread of the disease.

In 2016, there were 221 trees infected in 65 new sites. The disease appears to be intensifying in Curry County. The European (EU1) strain of the disease was detected again in 2016 near the first reported forest find of EU1 in 2015.

The California coastal wildlands experienced upswings in SOD levels compared to 2015 as a result of increased rainfall in coastal areas known to be susceptible to the pathogen. A significant SOD outbreak on bay laurel trees was identified in San Francisco's Golden Gate Park and for the first time was found in the San Francisco Botanical Garden at Strybing Arboretum. New outbreaks were identified on Mount Diablo, Contra Costa County, southern coastal Mendocino County, and in the city of Piedmont. Several areas east of the San Francisco Peninsula also had new outbreaks.

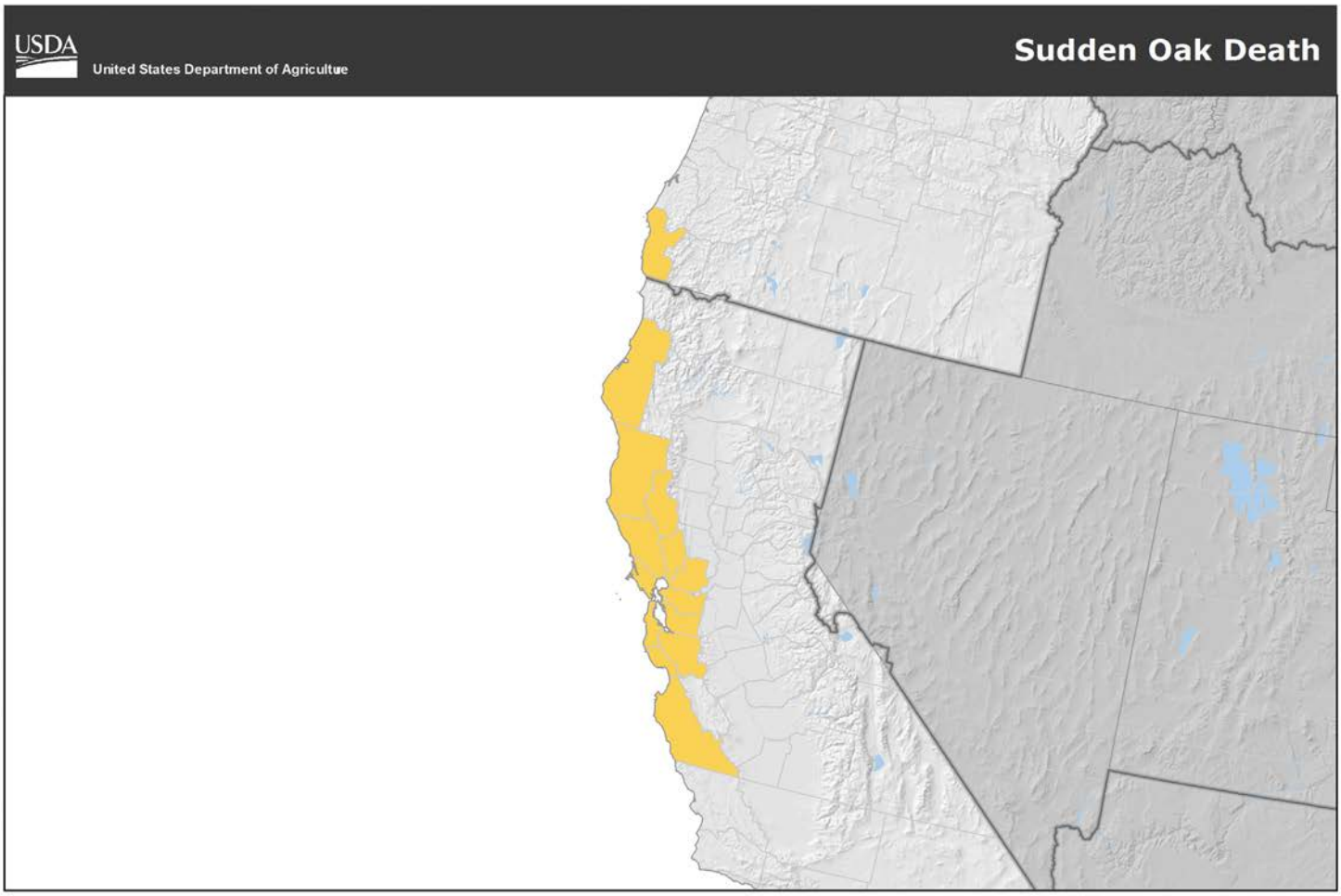
Pathogen activity increased in coastal Sonoma County along Fort Ross Road. Tanoak mortality was visible in August on both slopes along the coast up to Fort Ross State Historic Park. Branch dieback and cankers were found on small madrones along the roadside, and twig dieback could be seen throughout the crowns of numerous California black oaks.

In Mendocino and Humboldt Counties, aerial surveys detected relatively little SOD-related mortality. Jackson Demonstration State Forest had low pathogen recovery, and if present, only within the known-infested area. Infested tanoak and bay were detected in numerous areas in Redwood National Park, downstream from current SOD management areas. Active tanoak and bay slow-the-spread treatments have been underway in two infested sites in Redwood Creek and Redwood National, respectively. Surveys conducted in 2016 found an additional 43 infested acres at Bridge Creek and 45 acres at Bond/44-Creek.



Phytophthora ramorum *in laboratory culture. Photo by Sandra Jensen, Cornell University, Bugwood.org.*

In areas across the State where SOD outbreaks had decreased in 2015, the pathogen has reemerged, in Marin County and in Big Sur, Monterey County. In some areas previously affected, there have been sharp increases in infection, such as in western San Mateo and western Santa Cruz Counties.



The wildlands of coastal California experienced upswings in sudden oak death levels as a result of increased rainfall in coastal areas favoring further outbreaks of the pathogen in 2016.

Laurel **Wilt**

Florida, Georgia, and South Carolina have the highest number of laurel wilt infected counties.

Georgia reported the presence of Laurel Wilt (LW) in 52 counties in 2015. Eight new counties were added in 2016 from detections in redbay and sassafras taken from the southwestern corner of Georgia, including Cook, Tift, Ben Hill, Irwin, Telfair, Miller, Baker, and Early Counties. In Florida, this disease is causing heavy losses of swamp bay in sensitive tree islands in the Everglades, and impacting commercial avocado groves in Miami-Dade County. From November 2015 to October 2016, new county records of laurel wilt were confirmed in Escambia and Wakulla Counties, affecting redbay, swamp bay, and sassafras. No new infections were reported in 2016 in South Carolina, whereas in North Carolina, Laurel wilt was confirmed in Robeson and Onslow Counties in 2016.

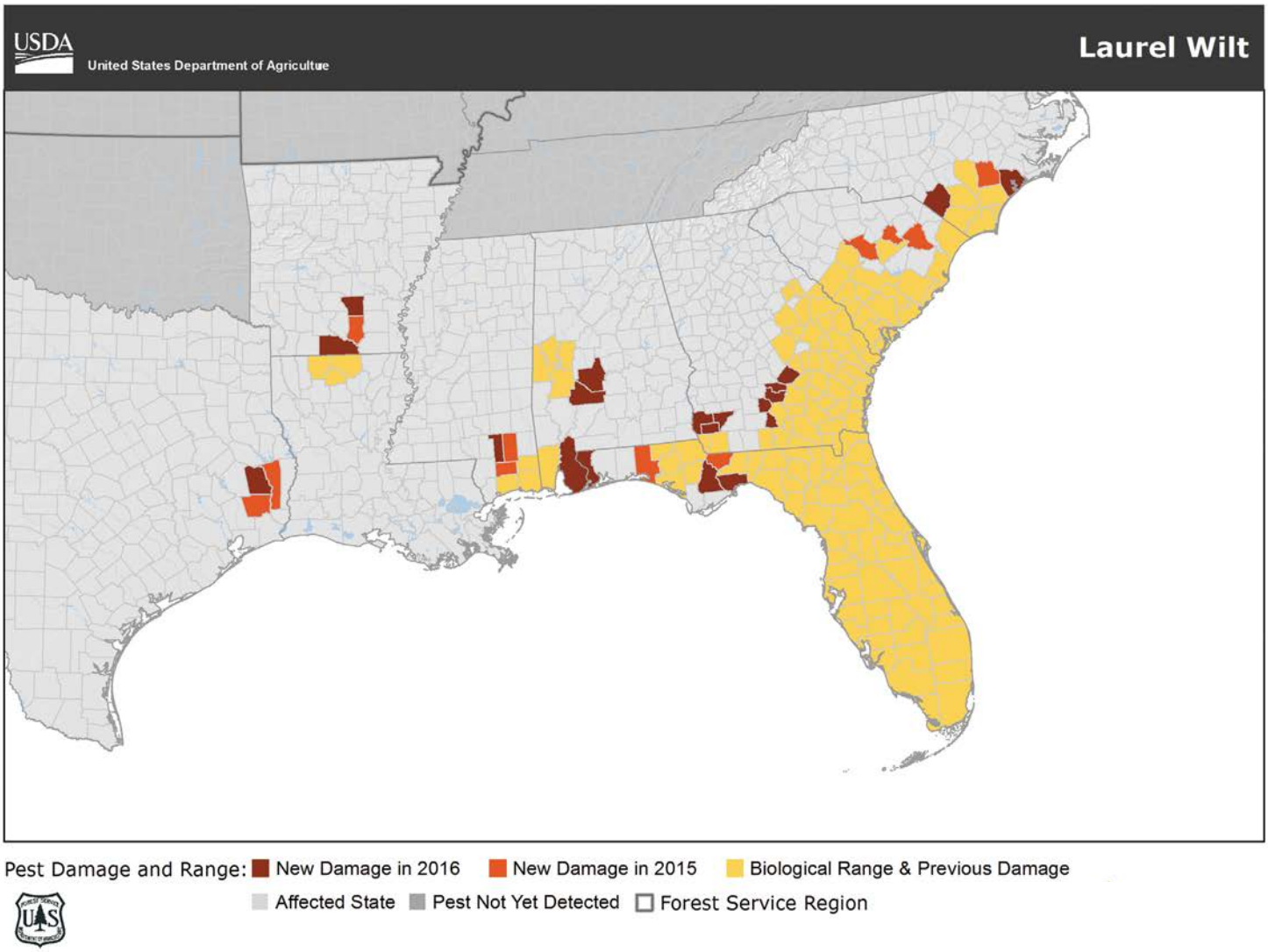
Georgia reported laurel wilt in
60 counties.

In July 2016, there were reports of LW disease in Baldwin County, Alabama, confirmed by laboratory results. Stem samples taken from symptomatic host trees in Wilcox and Dallas Counties were confirmed. Overall, three new counties in 2016 were confirmed as having LW disease. In Mississippi, mortality of redbay, swampbay, camphor, and sassafras continues in Jackson County, as the range continues to expand northward nearing the northern boundary of the coastal plain and range of redbay/swampbay. The disease was confirmed in Forrest County in 2016.

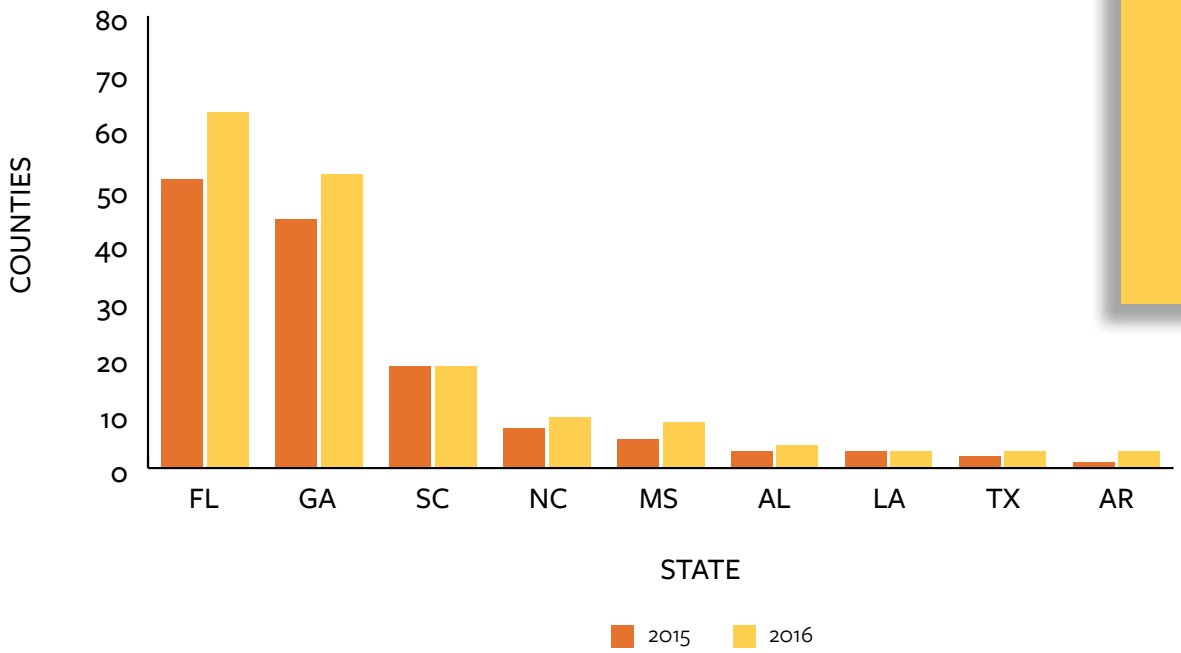
In Louisiana, no new counties were reported in 2016. However in Texas, a detection was confirmed in Tyler County in 2016, bringing to three the total number of infested counties. Laurel wilt was also detected in Union and Cleveland Counties in Arkansas in 2016 bringing the total for that State to three counties.

Xyleborus glabratus *detection trap. USDA Forest Service photo by Bud Mayfield.*

Adult redbay ambrosia beetle vectors laurel wilt fungus. Photo by Stephen Ausmus, USDA Agricultural Research Service.



Counties with Laurel Wilt 2015 – 2016



Texas confirmed laurel wilt in Tyler County bringing the total to three counties in 2016.

Oak **Wilt**

Oak wilt confirmed in multiple new locations in New York in 2016.

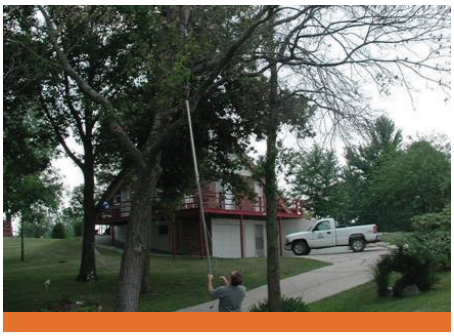
Oak wilt (OW) is a lethal pathogen of oak trees, especially those found in red oaks and Texas live oak.

In the Northeast, oak wilt was confirmed in multiple new locations in New York in 2016. Fourteen oaks on Long Island have now been confirmed, and surveys have since confirmed oak wilt in Canandaigua and another in Brooklyn. Before 2016, oak wilt had only been found in one New York location in Schenectady County. Pennsylvania reported two incidences of oak wilt in Tioga and Bedford Counties. In West Virginia, oak wilt was detected in Hancock and in Hampshire Counties in 2016.

14 oaks
with oak wilt confirmed on Long Island in 2016.

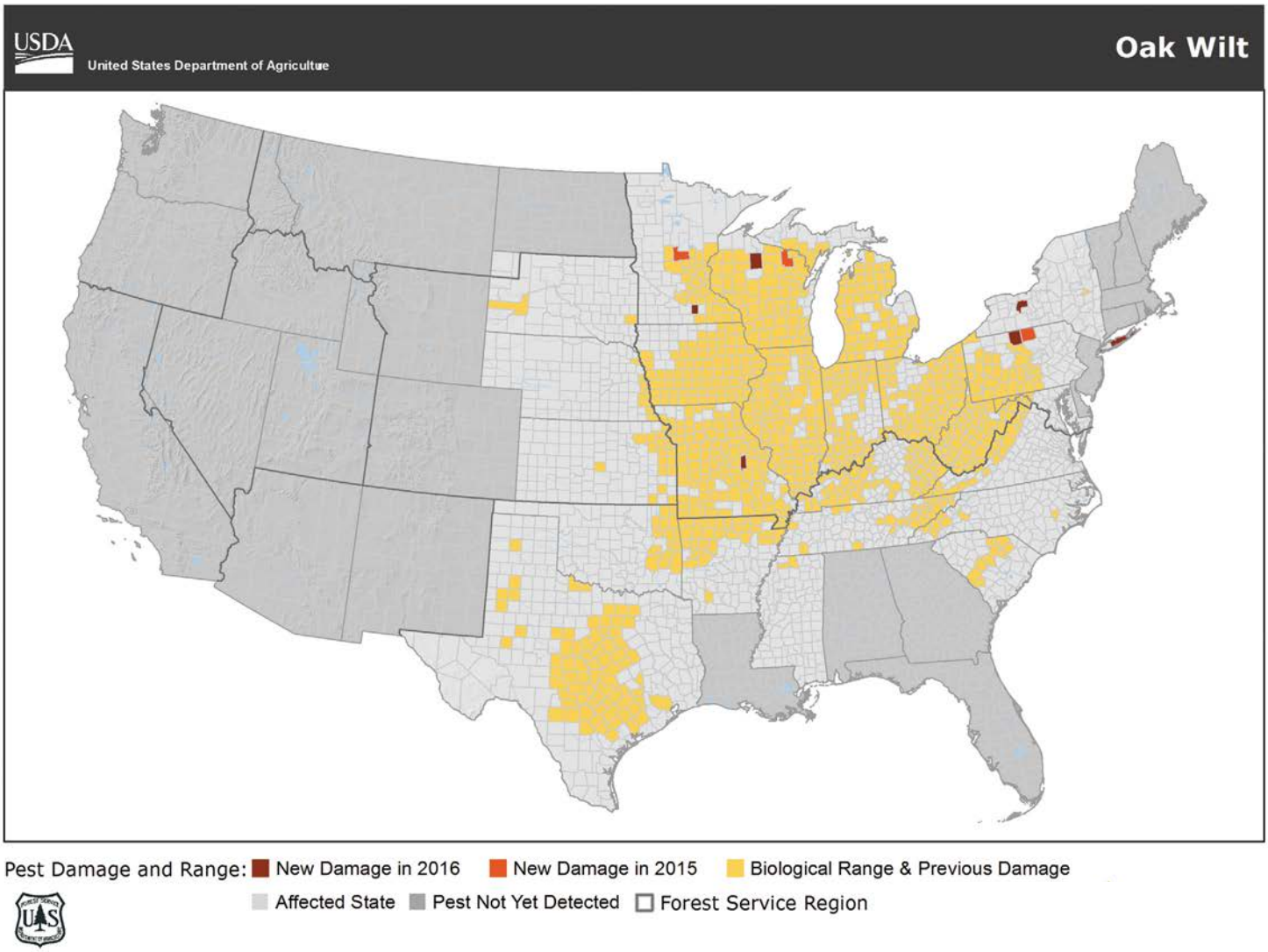
In the North Central States in 2016, OW was recorded in Waseca County, Minnesota, Price County, Wisconsin, and Gasconade County, Missouri.

Oak wilt disease conditions in the South have been static for a number of years with no new positive counties being recorded. Surveys for oak wilt are no longer done except in central Texas. An active oak wilt suppression program is in operation to slow the spread of this disease on live oak and Texas red oak.

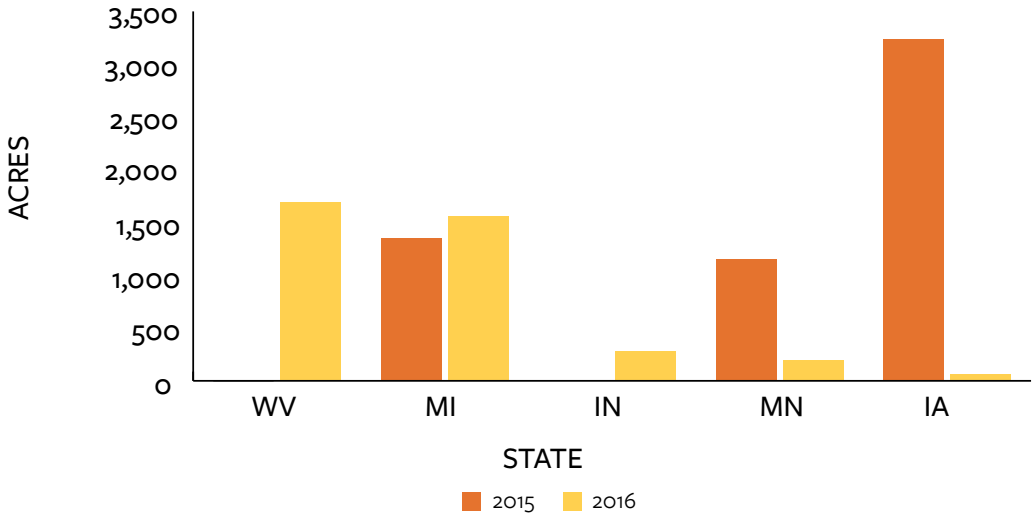


Oak wilt sampling in Missouri.
Photo by Bruce Moltzan, USDA Forest Service.

Oak wilt pad. Photo by Bruce Moltzan, USDA Forest Service.



Oak Wilt Damage 2015 – 2016



New oak wilt records were reported for Minnesota, Wisconsin, and Missouri in 2016.

Thousand **Cankers Disease**

No further spread of thousand cankers disease beyond limited action area in Cecil County in Maryland reported 2016.

Geosmithia morbida, the causal agent of Thousand Cankers Disease (TCD), is likely native to Arizona, California, New Mexico, and Mexico, where its original hosts were indigenous western walnut trees. The fungus creates small cankers that coalesce, killing branches and stems. Surveys conducted since 2012 found thousand cankers disease in numerous stands and on individual trees throughout New Mexico, Arizona, and California.

In Ohio, 35 traps for walnut twig beetles were placed at sawmills, walnut plantations, and natural walnut stands in Allen, Athens, Butler, Champaign, Clinton, Coshocton, Crawford, Delaware, Henry, Gallia, Guernsey, Hamilton, Hancock, Jackson, Jefferson, Licking, Madison, Medina, Noble, Pickaway, Portage, Preble, Ross, Union, Warren, and Washington Counties.

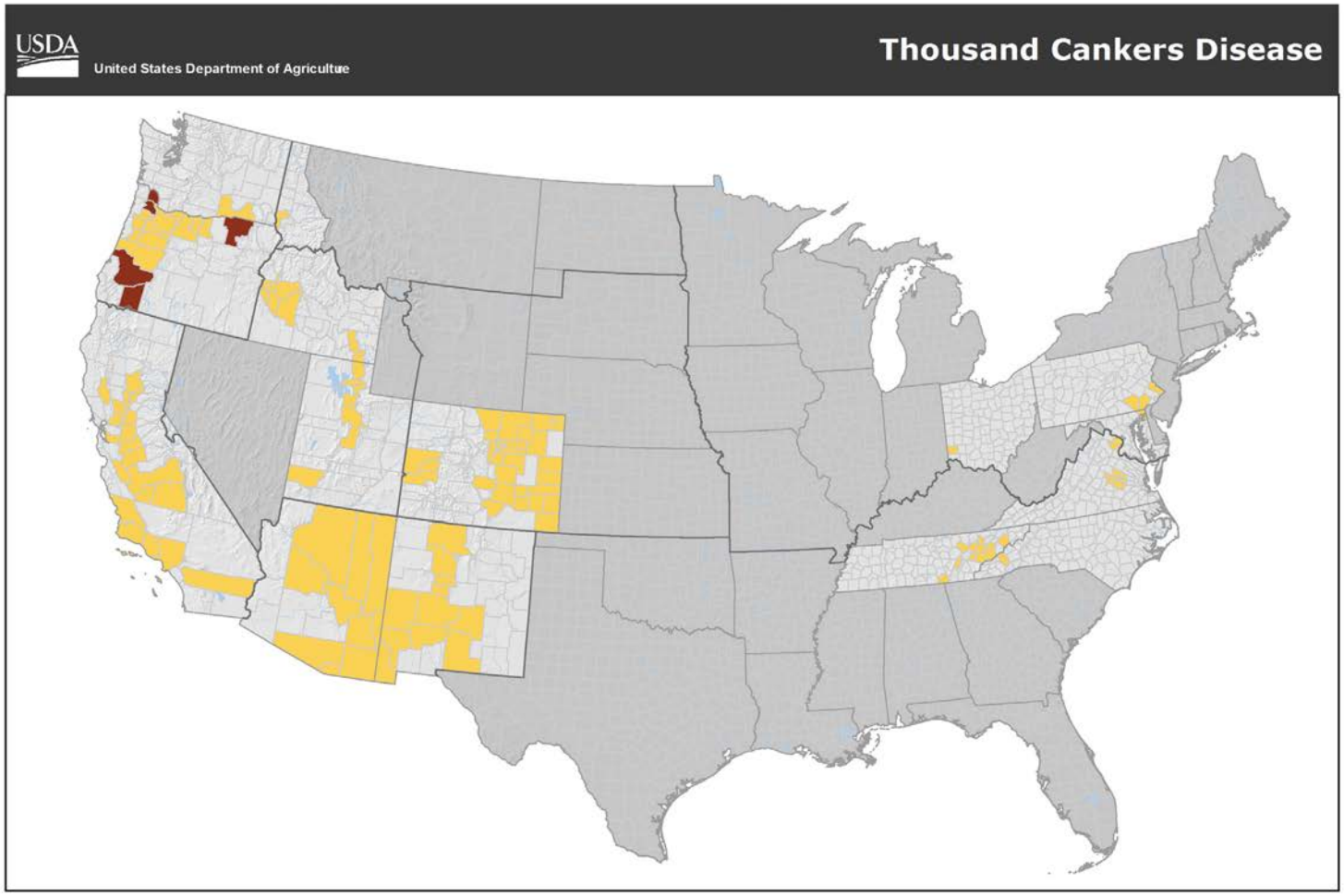
No new detections of thousand cankers disease were found in the Eastern United States in 2016.

Walnut twig beetle survey trap with pheromone. Photo by Steven Seybold, USDA Forest Service photo.

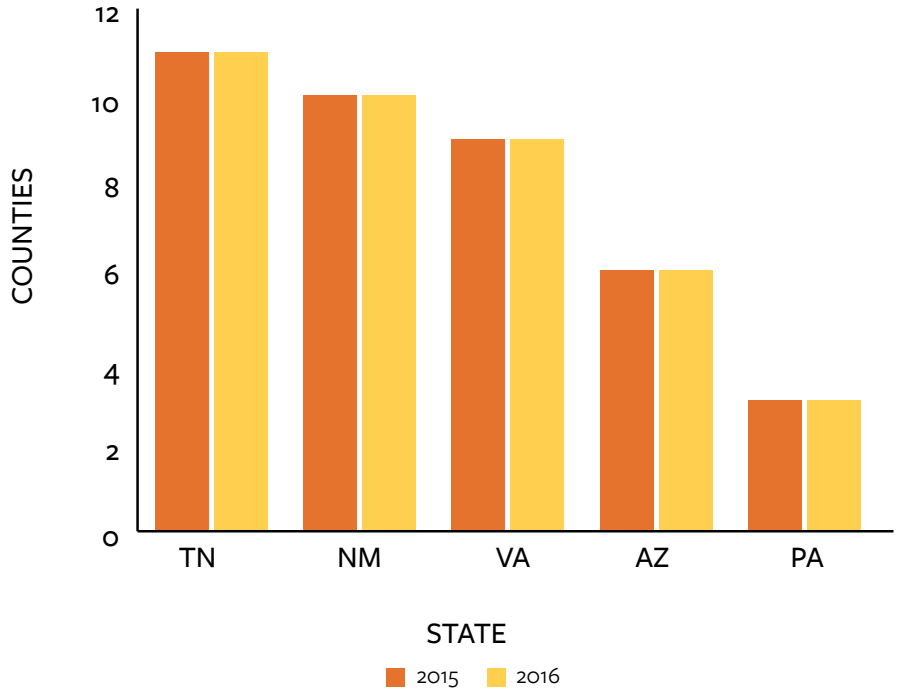
In Washington State, TCD has been confirmed in Walla Walla and Benton Counties in the southeastern portion of the State. These confirmations were determined by Purdue and Forest Service researchers setting up studies in 2016–2017.

No changes in TCD-infected counties were reported in 2016 for the three counties in Pennsylvania and one in Maryland. In Pennsylvania, TCD survey traps did not detect walnut twig beetle within the TCD-quarantine zone and throughout the Commonwealth.

Walnut twig beetle vectors the thousand cankers disease fungus. Photo by Bruce Moltzan, USDA Forest Service.



Counties Reporting TCD – 2016



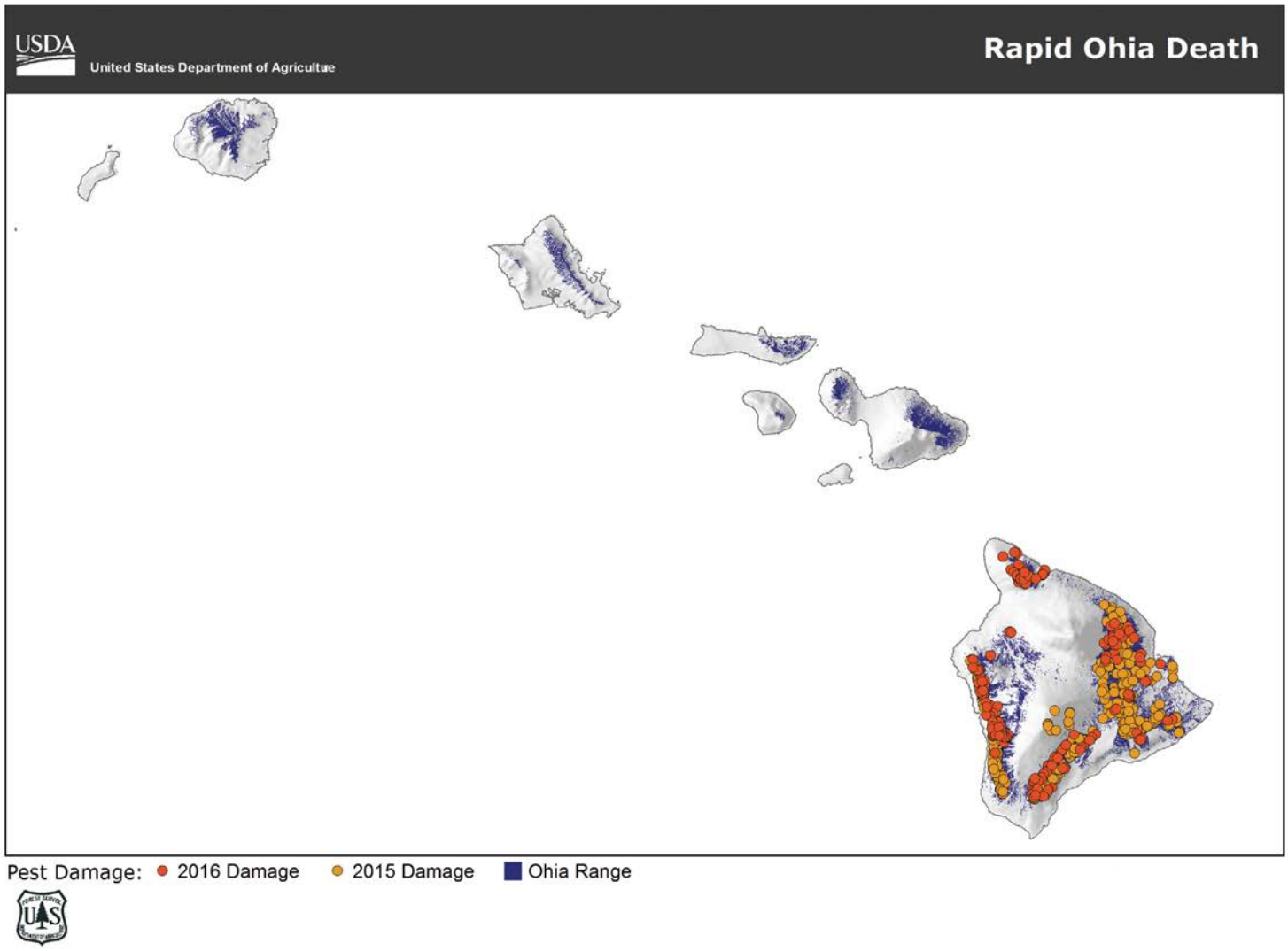
Pest **Watch**

RAPID ʻŌHIʻA DEATH

As of 2016, Rapid ʻŌhiʻa Death (ROD) now infects nearly 50,000 acres from Kalapana to Hilo on the Island of Hawaiʻi with stands showing greater than 50 percent mortality. The disease is easily transmitted, but details on how it spreads and how to control it are still being investigated. Surveys are underway on the other islands as efforts to contain ROD on the Big Island are in full swing. This disease is limited to Hawaiʻi Island and has not yet been reported on other islands, but it threatens ʻōhiʻa trees statewide. Large-scale dieback of a predominant forest species continues to adversely impact Hawaiʻi's remaining native ecosystems.

50,000 acres
reported 2016 on the Big Island in Hawaii.

Rapid ʻŌhiʻa death occurring on the Big Island in Hawaii. Photo by Ryan L. Perroy, University of Hawaii.


USDA
United States Department of Agriculture
Rapid Ohia Death
Pest Damage: 2016 Damage 2015 Damage Ohia Range

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