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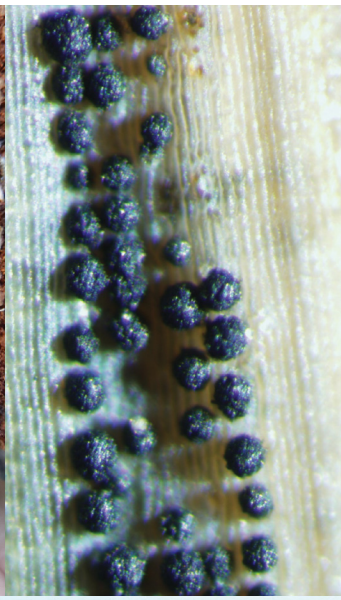
Major Forest Insect and Disease Conditions in the United States: 2018



Forest Service FS-1155 May 2020

Cover photos (From top left clockwise):

The head of an adult emerald ash borer collected in Maryland. Photo by Zerene Stacker, USGS Bee Inventory and Monitoring.

Spruce beetle galleries with larvae (bottom) and pupae (top). Photo by Elizabeth Graham, USDA Forest Service.

Pseudothecia emerging from needle. Photo by Bruce Watt, University of Maine, Bugwood, org.

Southern pine beetle pocket detected in Chester County, PA. Photo courtesy of Pennsylvania Department of Conservation and Natural Resources Bureau of Forestry.

Armillaria mellea fruiting bodies often associated with oak decline. Photo by Dave Powell, USDA Forest Service (retired), Bugwood, org.

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Major Forest Insect and Disease Conditions in the United States: 2018

COMPILED BY HELEN CORTÉS AND BRUCE MOLTZAN

FOREST HEALTH PROTECTION

Forest Service FS-1155 May 2020

Preface

This report on the major insect and disease conditions of the Nation's forests represents the 68th annual report prepared by the U.S. Department of Agriculture, Forest Service. The report focuses on major insects and diseases that annually impact our Nation's forests. This 2018 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: https://www.fs.fed.us/foresthealth/

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)
Federal Building
200 East Broadway
P.O. Box 7669
Missoula, MT 59807–7669
406–329–3308

USDA FOREST SERVICE
ROCKY MOUNTAIN REGION (R2)
1617 Cole Boulevard, 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 Ave.
Portland, OR 97204–3440
503–808–2913

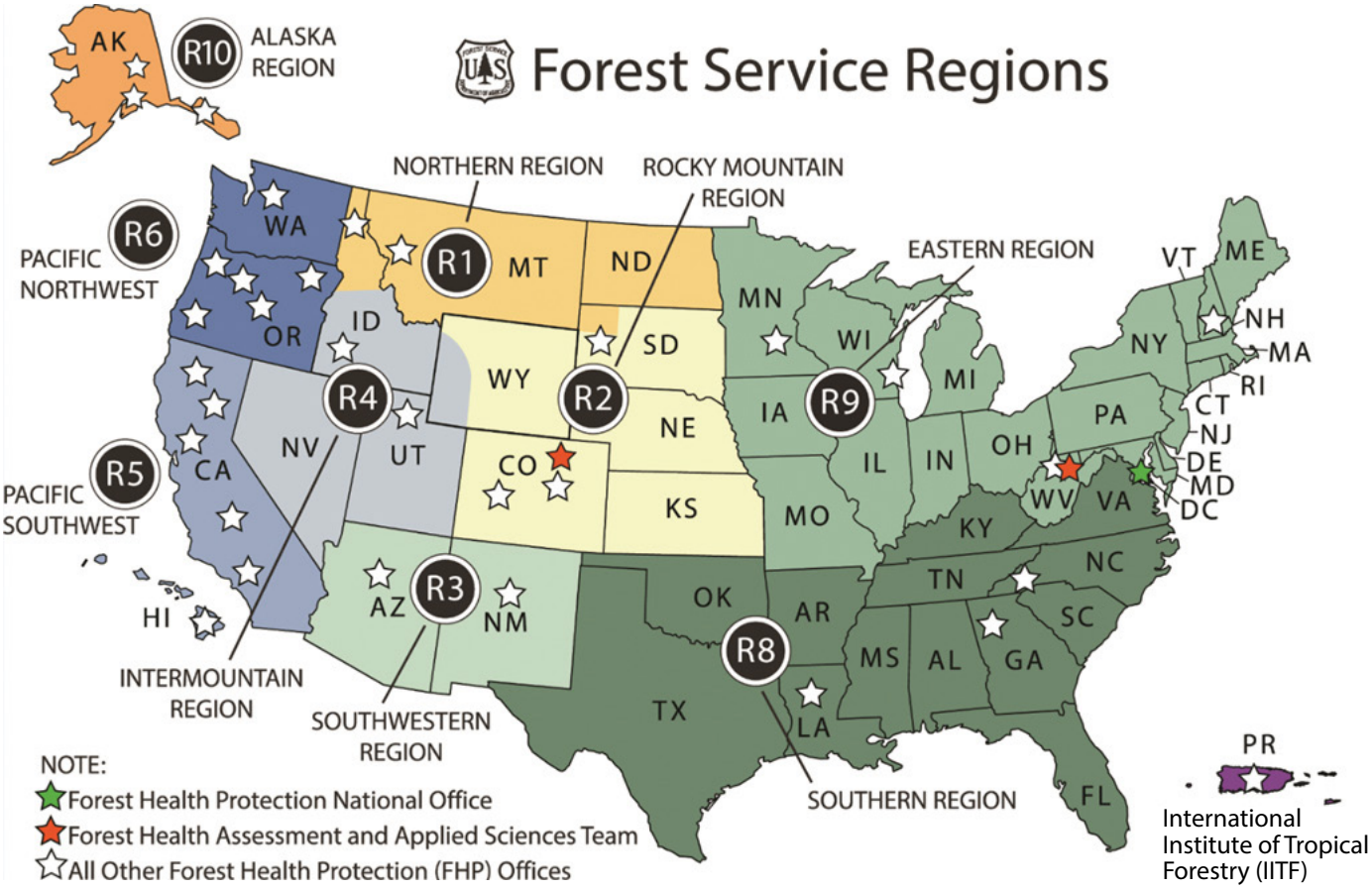
USDA FOREST SERVICE
SOUTHERN REGION (R8)
1720 Peachtree Road, NW
Atlanta, GA 30309
404–347–3540

USDA FOREST SERVICE
EASTERN REGION (R9)
626 East Wisconsin Avenue
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, Puerto Rico 00926
787–766–5335

Forest Service Regions



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: 703–605–5336
Fax: 703–605–5353
E-mail: bmoltzan@usda.gov

This report is also available on the Internet at:
https://www.fs.fed.us/foresthealth/publications/ConditionsReport_2018.pdf

Contents

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 on an annual basis. Federal and State agencies and other stakeholders work together to use this information for management to ensure resilient forests are sustainable into the future. The overall mortality caused by insects and diseases varies by year and by pest.

TREE MORTALITY

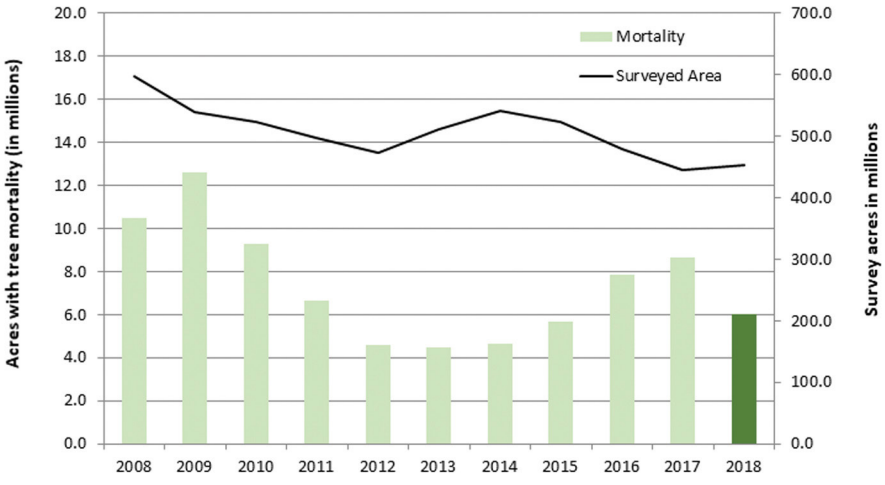
In 2018, more than **6 million acres** of tree mortality was caused by insects and diseases in the United States, which is approximately 2.6 million acres less than reported in 2017. In forests across the western United States, tree mortality by fir engraver accounted for 33 percent of total mortality observed in 2018, causing approximately 1.9 million acres of mortality to white, red, and grand fir. Spruce beetle, emerald ash borer, and sudden oak death were also important sources of tree mortality throughout our Nation's forests in 2018.

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

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; taken together with repeated attacks or severe abiotic factors, such as weather and drought, trees can succumb to these defoliating insects. In 2018, surveys recorded 6.3 million acres of defoliation and other damage agents.

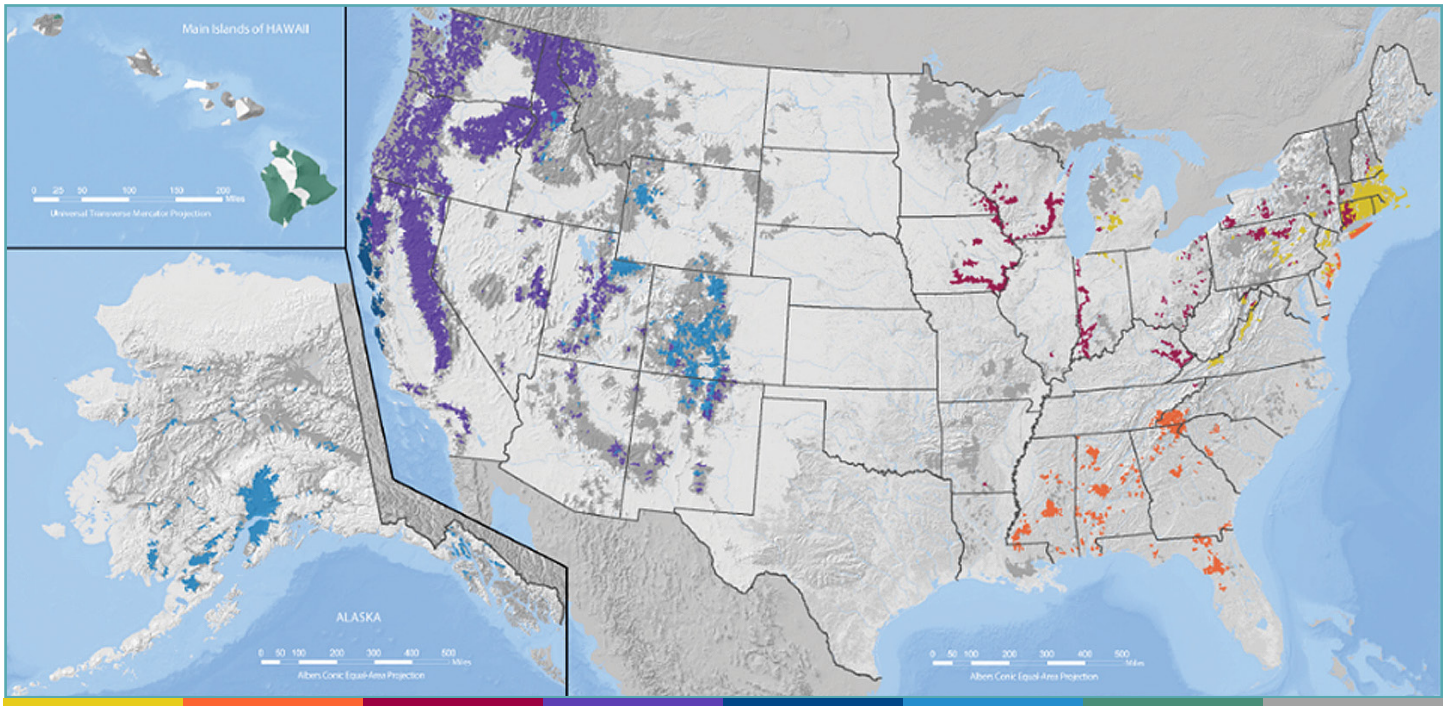
IMPORTANT when interpreting maps throughout this document, note that data are displayed at the county scale only. For example, if damage was reported at just one location in the county, the entire county is displayed as affected. This standard convention is used because data for most pests are collected 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 selected insects and diseases across multiple years.

Figure 1. Surveyed acres with mortality 2008 – 2018



Executive Summary/Introduction

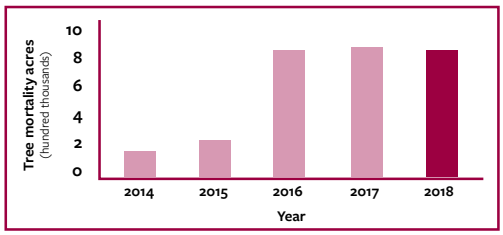
Subwatersheds with Tree Damage



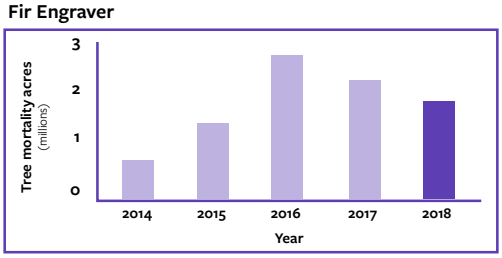
*Includes damage from forest tent caterpillar, western pine beetle, mountain pine beetle, Swiss needle cast, spruce budworm, and many other less significant pests.

Top Mortality Agents & Trends – 2014 To 2018

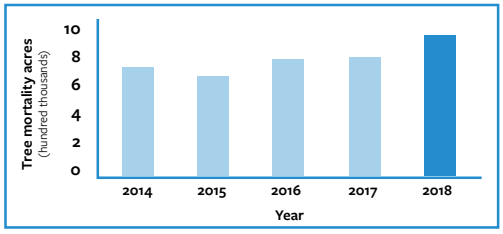
Emerald Ash Borer



Fir Engraver



Spruce Beetle



Fir Engraver - *Scolytus ventralis*

Acres with mortality from fir engraver increased substantially in Oregon and Washington in 2018. This beetle is active in overstocked stands of fir on drought-prone sites causing top kill and tree mortality. In Oregon, increased damage was detected on the Fremont-Winema, Ochoco, Wallowa-Whitman, Umatilla and Malheur National Forests.

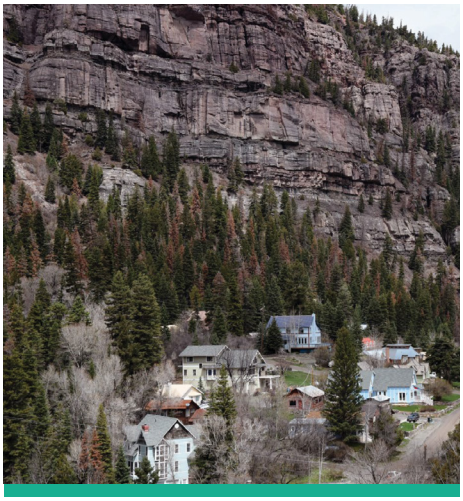
Across the Northern Rockies, there was a six-fold increase in fir engraver-caused mortality. Persistent dry weather patterns combined with root disease in northern Idaho and western Montana have escalated fir engraver attacks. Forest Service lands sustained most of the overall mortality. Fir engraver-caused mortality in western Montana was higher than 2017, whereas southwestern Idaho mortality remained at low levels. Increased fir engraver-caused mortality was found on the Boise and Payette National Forests. This increase followed 10 years of western spruce budworm defoliation combined with drought.

Fir engraver dead patches of cambium illustrating patch attack. Photo by Ladd Livingston, Idaho Department of Lands.

California fir mortality comprised over 75 percent of the total tree mortality observed across the State in 2018. Mortality was prevalent in mid- to high-elevation white fir in northwest California, especially in stands that were historically pine dominated. Shasta-Trinity and Klamath National Forests had increased mortality in all age classes compared to 2017. Fir engraver-caused mortality doubled in the central and southern Sierra Nevada range, particularly on fir in the Sierra, Stanislaus, and Eldorado National Forests in all tree size classes.

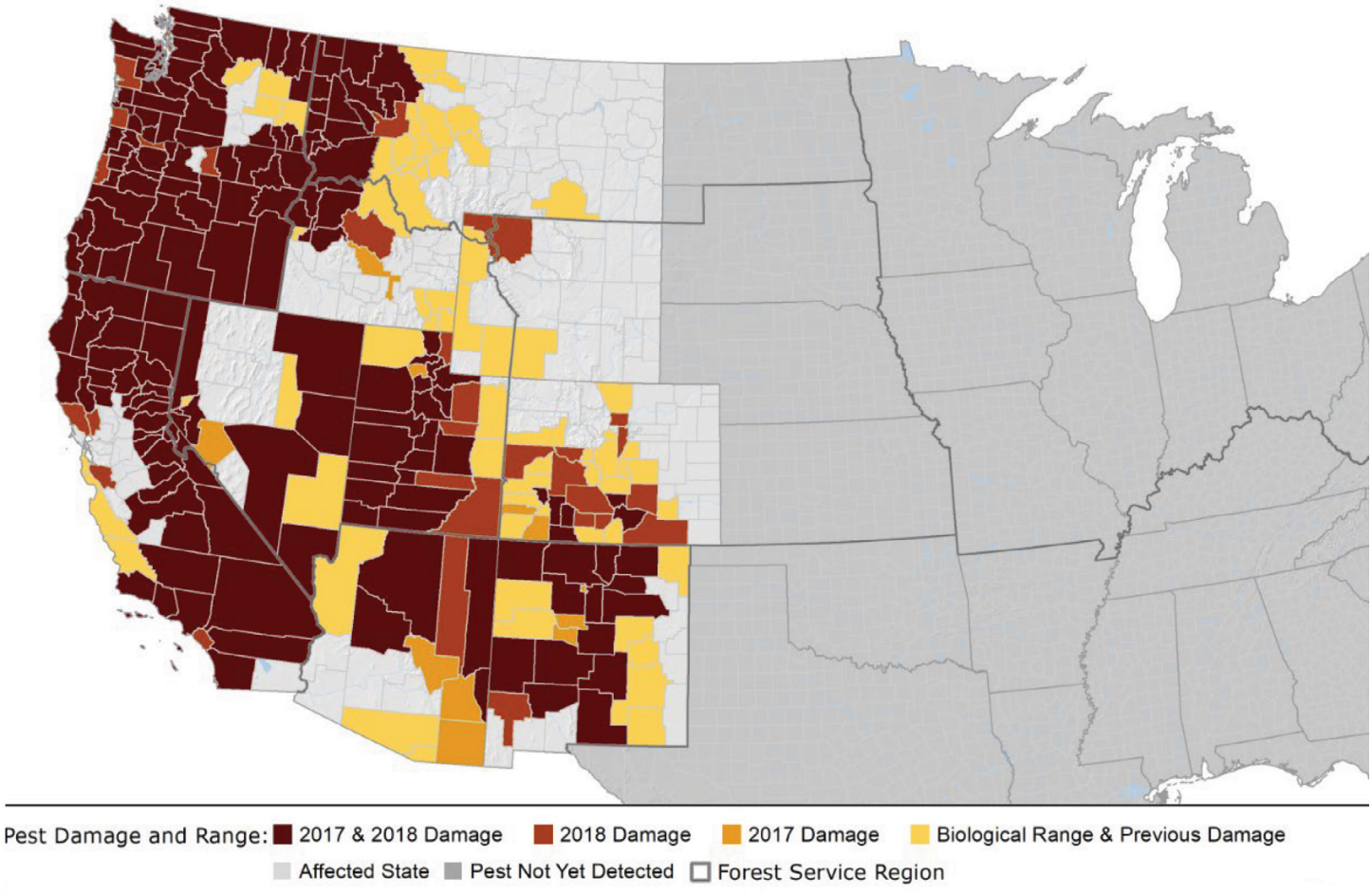
In Nevada, fir engraver activity was on the Humboldt-Toiyabe National Forest. Most of the fir engraver-caused mortality mapped during the survey in Utah was found throughout the range of the beetle's white fir hosts. Fir engraver mortality also occurred within the range of white fir in southern Colorado. Drought conditions have been improving in southwest Colorado where fir engraver beetle has killed large-diameter white fir in increasing numbers for several years.

For Arizona, activity in 2018 was recorded only on the White Mountains on the Apache-Sitgreaves National Forests. In New Mexico, the majority of the mortality was impacting the Carson and Santa Fe National Forests. Fir engraver populations in the Cibola National Forest, where activity had been prevalent in prior years, declined substantially to background levels in 2018.

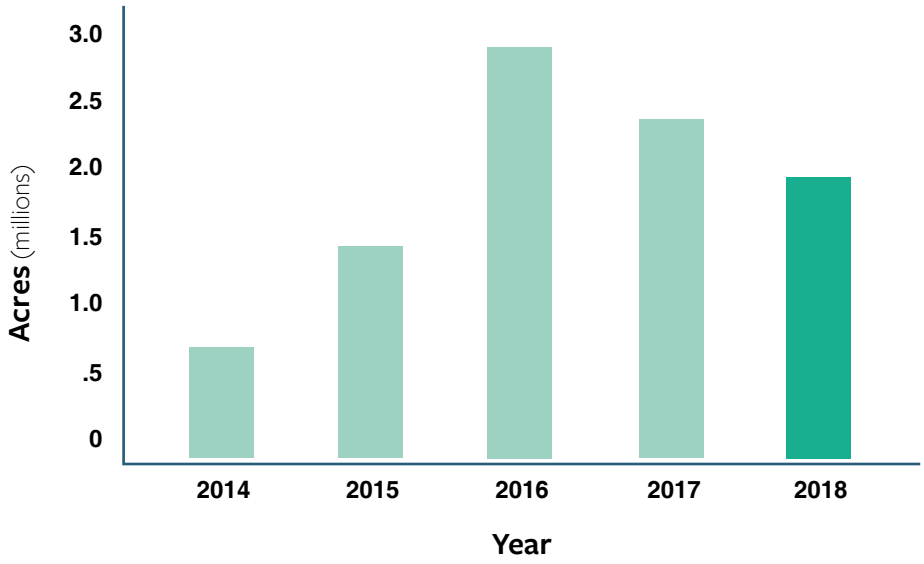


Trees killed by the fir engraver beetle near Ouray, CO. Photo by Dan West, Colorado Forest Service.

Acres of fir engraver increased substantially in Oregon and Washington in 2018.



Fir Engraver Mortality Acres



Spruce Beetle - *Dendroctonus rufipennis*

In Alaska, spruce beetle activity was observed on roughly 593,000 acres statewide. Southcentral portions of the State are experiencing the third year of a spruce beetle outbreak, with 94 percent of the statewide spruce beetle-caused mortality occurring in this area. Many large-diameter ornamental spruce are being attacked and killed. In addition to white, Lutz, and ornamental spruces, spruce beetle attacks have been confirmed on black spruce, Scots pine, and Siberian larch. At present, the spruce beetle does not appear to be impacting the Sitka spruce of southcentral or southeast Alaska.

For over a decade, spruce beetle outbreaks have had significant impacts to high elevation stream bottom stands of Engelmann spruce in western Washington. Beetle populations remained endemic throughout the majority of northern Idaho and Montana. However, an outbreak that erupted in 2017 expanded in 2018 on Federal lands managed by the Nez Perce-Clearwater National Forest in northern Idaho. There were 29,000 mortality acres detected by aerial survey confined to western Wyoming in 2018. Spruce beetle mortality on the Bridger-Teton National Forest in western Wyoming continues, with nearly 17,000 acres reported in 2018.

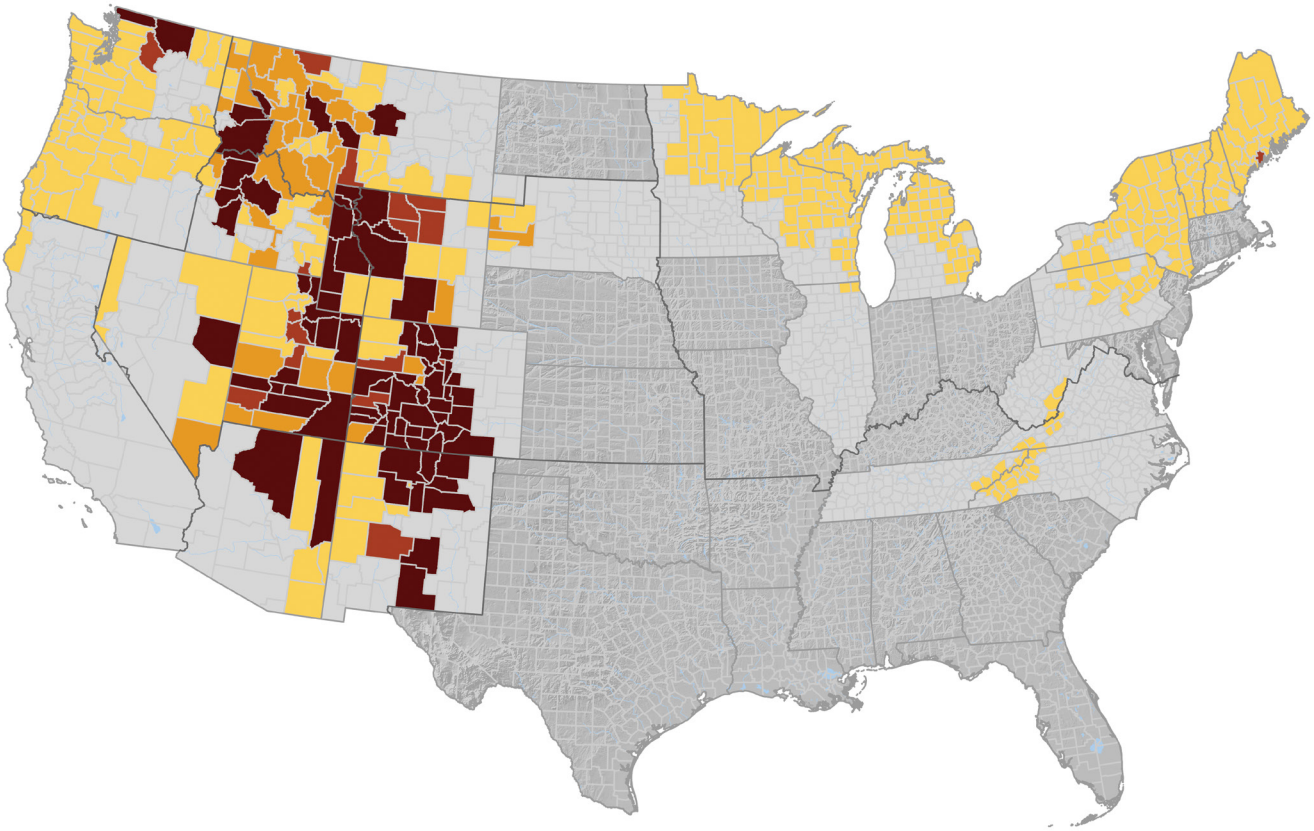
Spruce beetle galleries with larvae (bottom) and pupae (top). Photo by Elizabeth Graham, USDA Forest Service.

The 2018 surveys in Utah indicated spruce beetle mortality remained active, where 110,000 acres were reported. In Utah, the Uinta-Wasatch-Cache and Ashley National Forests continue to have significant outbreaks. In Colorado, severe outbreaks continued in and around Rocky Mountain National Park. Spruce beetle has affected 1.84 million cumulative acres in Colorado from 1996 through 2018. Mortality of Engelmann spruce slightly declined from 206,000 acres in 2017 to 178,000 acres in 2018.

In Arizona, the majority of spruce beetle activity was reported in small pockets on White Mountain Apache Tribal lands in east central portion of the State. A small number of trees were mapped north of the Grand Canyon on the Kaibab National Forest and on the Coconino National Forest north of Flagstaff. In New Mexico, spruce beetle activity continued to kill spruce-fir forests in the northern part of the State, primarily on the Carson and Santa Fe National Forests. Scattered patches of spruce beetle mortality continue in the southern part of the State, affecting the Ski Apache ski area and nearby Mescalero Apache Tribal lands.

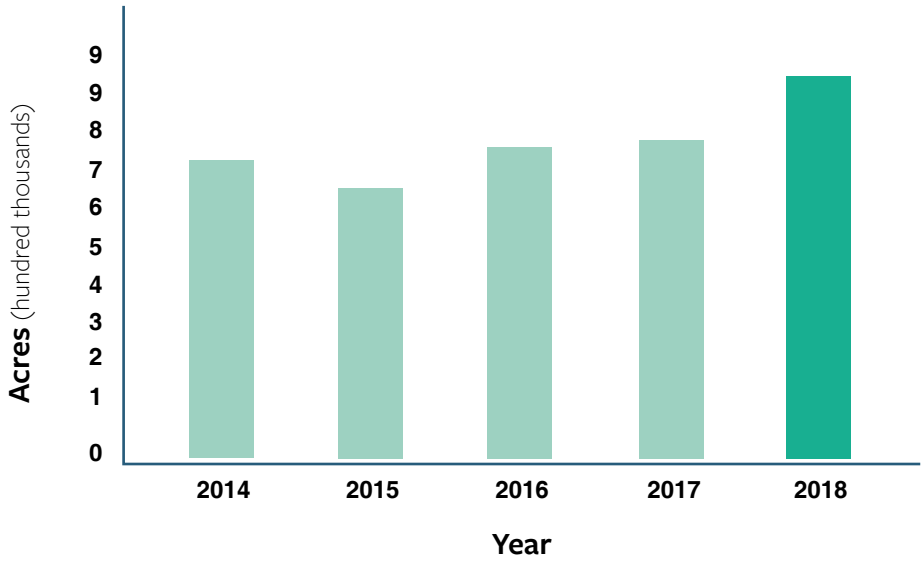
Trees killed by the fir engraver beetle near Ouray, CO. Photo by Dan West, Colorado Forest Service.

Spruce beetle activity continued to impact spruce-fir forests in northern New Mexico.



Pest Damage and Range: 2017 & 2018 Damage | 2018 Damage | 2017 Damage | Biological Range & Previous Damage | Affected State | Pest Not Yet Established | Forest Service Region

Spruce Beetle Mortality Acres



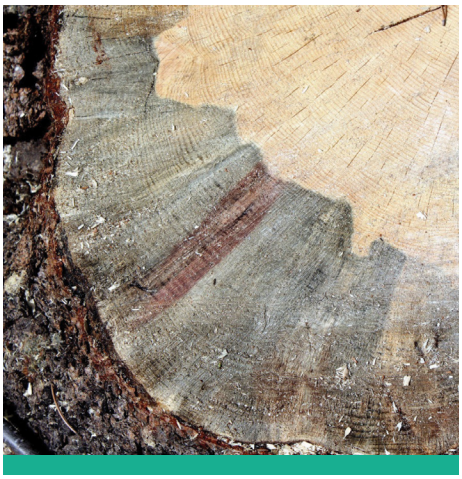
Mountain Pine Beetle - *Dendroctonus ponderosae*

In Washington, pine mortality due to mountain pine beetle showed a decrease from 2017 and was below the 10-year average. Even though overall mortality attributed to mountain pine beetle decreased, local outbreaks continue to be active. Areas of concentrated mortality on lodgepole and ponderosa pine occurred in the Colville National Forest. Mortality was also elevated within the Okanogan-Wenatchee National Forest and on the Yakama Indian Reservation. In Oregon, mountain pine beetle may be found in combination with western pine beetle on larger-diameter ponderosa. Damage from both of these beetles was most concentrated in the Fremont-Winema and Wallowa-Whitman National Forests.

There was notable increase in tree mortality by mountain pine beetle in the Pacific Northwest United States in 2018. The majority of mortality (greater than 90 percent) continued to be in lodgepole pine, with limited amounts in ponderosa pine, five-needle pines, and western white pine. The majority of affected areas were on National Forest lands, with limited amounts found on other Federal, State, and private ownerships. Mountain pine beetle mortality continued in most of the same counties that it had in the past and is especially increasing in northern Idaho and in Montana west of the Continental Divide. Counties with significant mountain pine beetle mortality were reported in the Idaho Panhandle and the Nez-Clearwater National Forests.

Mortality of sugar pine attributed to mountain pine beetle was lower than previous years in northeastern California. Mountain pine beetle mortality increased on the Lassen National Forest. Sugar and lodgepole pine mortality was lower than previous years in the southern Sierra Nevada range. Significant mortality occurred in limber and whitebark pines on the Humboldt-Toiyabe and Klamath National Forest. Other areas with scattered mountain pine beetle mortality in lodgepole pine include the Payette National Forest and the Uintah-Wasatch-Cache National Forest.

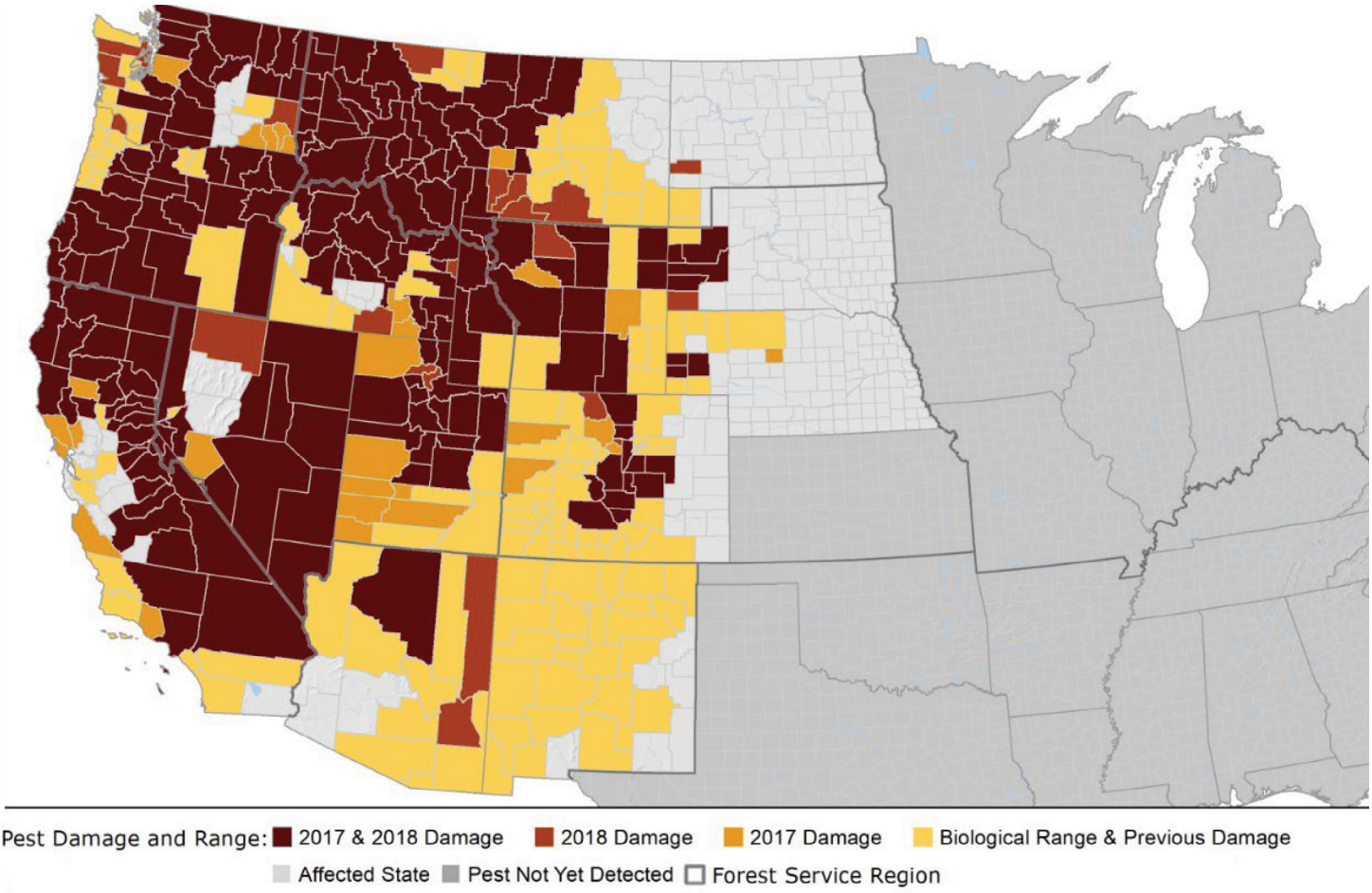
On the Coronado National Forest in Arizona, ground surveys did note some southwestern white pines being attacked and killed by beetles. Although most of the trees had some mountain pine beetle, the mortality seemed to be driven by *Ips bonanseai*.



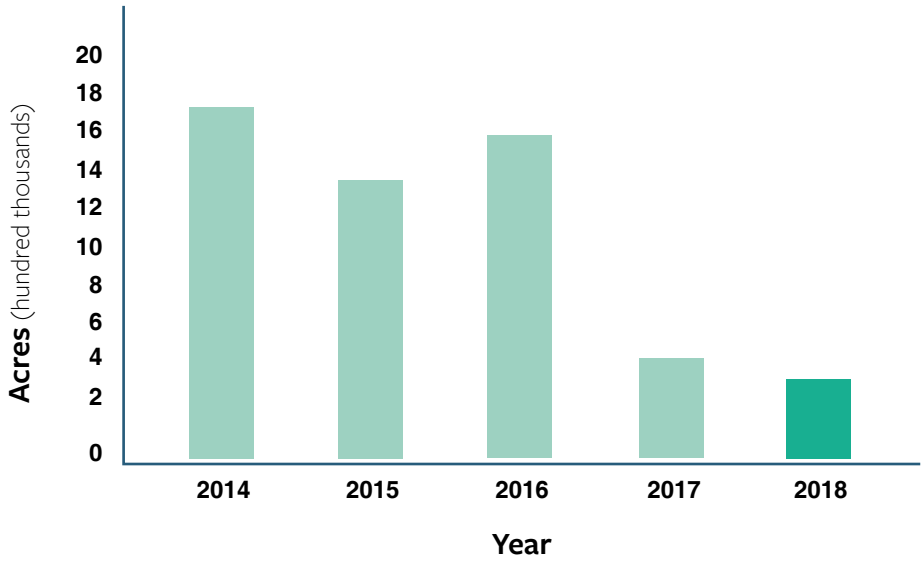
Blue stain associated with mountain pine beetle. Photo by Whitney Cranshaw, Colorado State University.

Mountain pine beetle damage on the Medicine Bow National Forest in Wyoming. Photo courtesy of U.S. Fish and Wildlife Service.

Mortality attributed to mountain pine beetle continues to decrease even though localized outbreaks still occurred in 2018.



Mountain Pine Beetle Mortality Acres

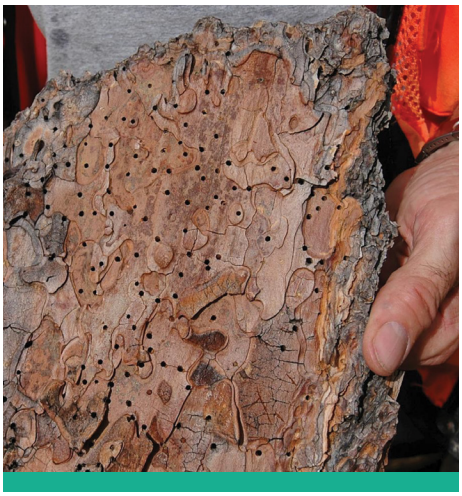


Western Pine Beetle - *Dendroctonus brevicomis*

In the Pacific Northwest, overall western pine beetle-caused mortality decreased slightly from the levels recorded in 2017. In Oregon, mortality was most extensive on the Malheur, Ochoco, Umatilla, and Wallowa-Whitman National Forests, as well as the Warms Springs Reservation. Significant mortality occurred on the southern part of the Malheur National Forest. Washington experienced highest levels of western pine beetle-caused mortality since 2006. Recent drought conditions and large fires are important drivers for this increase.

In northern Idaho, all counties recorded western pine beetle damage across a mix of land ownerships, with the highest amount found on Forest Service lands. Nine counties in western Montana were shown to have western pine beetle damage. This is the first year western pine beetle has been reported in Cascade County. Acres impacted by western pine beetle remained scattered and low, with an estimated 2,000 acres affected across the Intermountain Region in 2018.

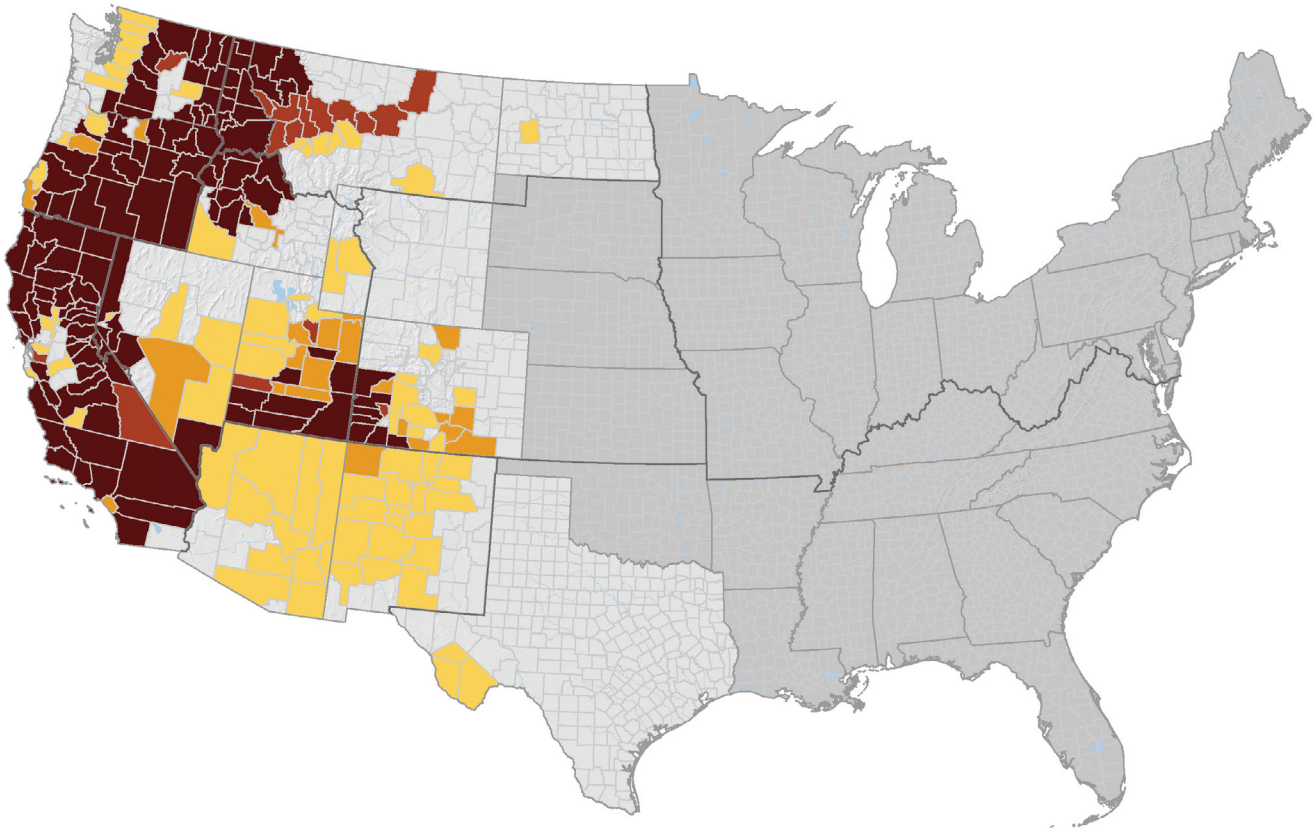
In Colorado, western pine beetle is limited to the southwestern part of the State and is currently causing damage on the Uncompahgre and San Juan National Forests. Western pine beetle is acting in conjunction with "mixed broods" of other bark beetles, further contributing to mortality across the area. Western pine beetle mortality is also associated with a large outbreak of roundheaded pine beetle in the San Juan National Forest.



Western pine beetle dead patches of cambium illustrating patch attack. Photo by Ladd Livingston, Idaho Department of Lands.

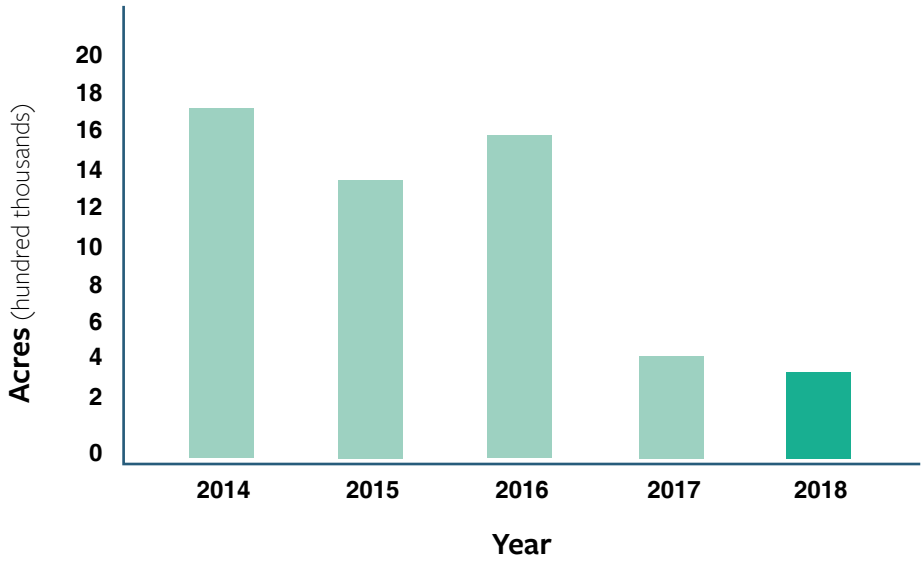
Dead ponderosa pines killed by western pine beetles in the Davis Mountains of west Texas. Photo by James Everitt, Texas A&M Forest Service, Bugwood.org.

Western pine beetle is acting with "mixed broods" of other bark beetles, further contributing to mortality across Colorado.

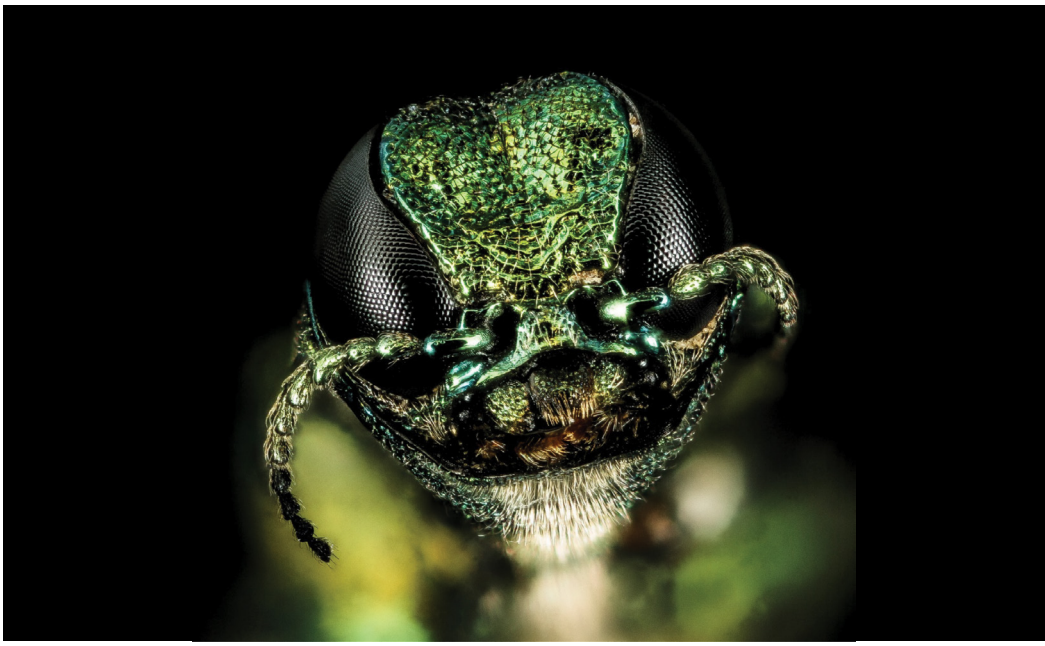


Pest Damage and Range: 2017 & 2018 Damage | 2018 Damage | 2017 Damage | Biological Range & Previous Damage | Affected State | Pest Not Yet Detected | Forest Service Region

Western Pine Beetle Mortality Acres



EMERALD ASH BORER



As of October 2018, emerald ash borer (EAB) is now found in 35 States, and the Canadian provinces of Ontario, Quebec, New Brunswick, Nova Scotia, and Manitoba. First reports for Maine, Rhode Island, South Dakota, and Vermont were added in 2018.

Surveys confirmed EAB near Madawaska, ME, and a single beetle was also reported in southern Maine in September 2018. New Hampshire reported mortality in three counties in the State. Vermont reported small pockets of ash mortality and the presence of EAB in five counties. Rhode Island had its first confirmation of the EAB in 2018. EAB was confirmed in nine counties in Massachusetts, with a first detection of the beetle in Bristol County. This beetle has been detected in all eight counties of Connecticut and severe mortality was reported in New Haven County in 2018. Madison County, NY, and Camden County, NJ, were confirmed for EAB in 2018.

All counties in Maryland with the exception of four eastern counties have EAB. In Delaware, a 1-acre infestation was discovered by aerial survey in New Castle County in 2018. In Washington, DC, EAB is known in all eight wards in high ash density areas, such as Kenilworth Aquatic Gardens and Theodore Roosevelt Island. EAB continues to spread through Virginia and was confirmed in 16 new counties, bringing the total number of confirmed counties in Virginia to 71. EAB was confirmed in 17 counties in Indiana in 2018. In the Upper Peninsula of Michigan, the beetle is in all but the very western part of the peninsula. Wright County was added to the list, bringing the total counties with EAB to 17 in Minnesota. For Wisconsin, the beetle was found in three new counties. No new finds for the insect were found in Iowa in 2018. EAB continues to advance and was detected in 12 new counties in Missouri. In Nebraska in 2018, the invasive pest was trapped in Mahoney State Park, in the city of Lincoln, and near Fremont.

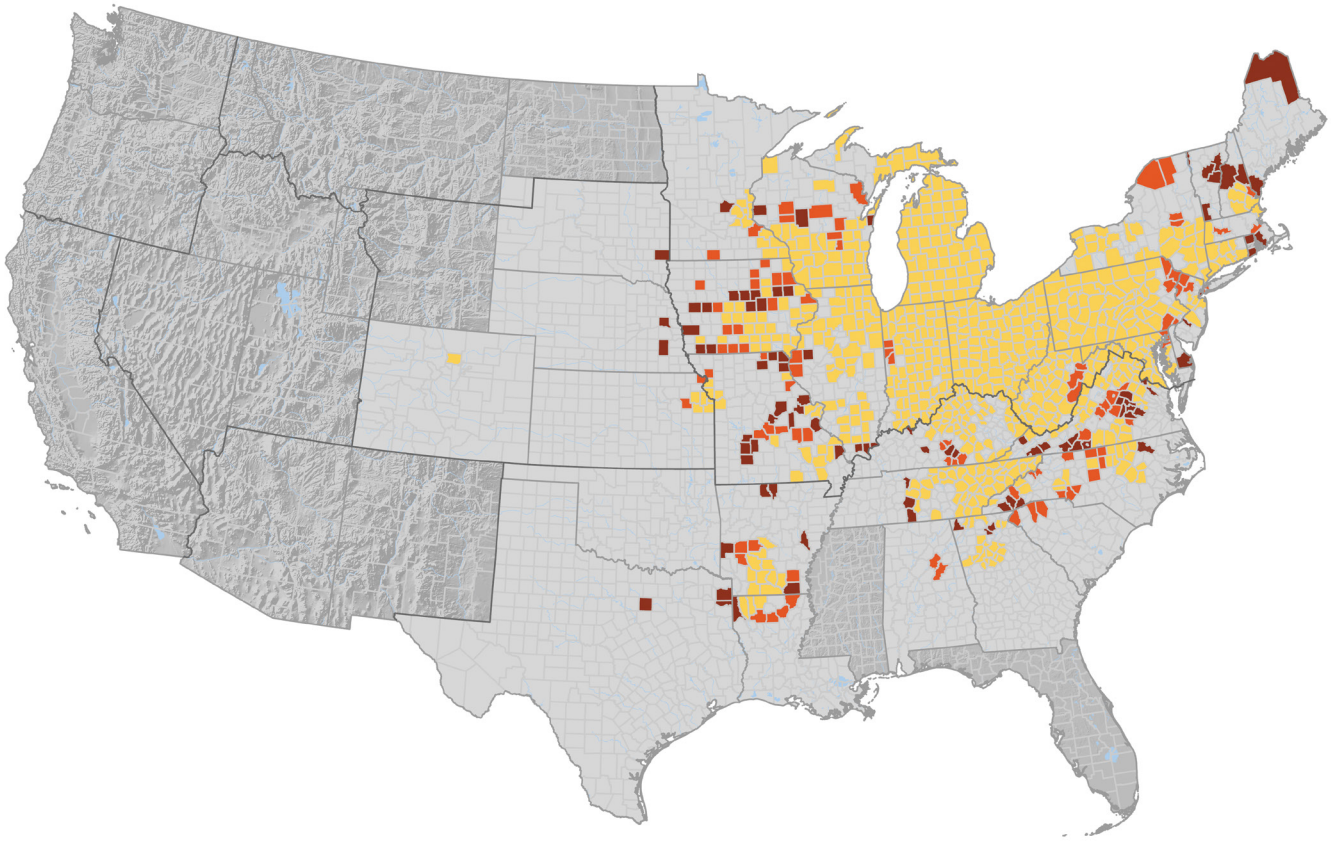
The Atlanta metro area and north Georgia are now positive for EAB. All counties in Georgia are now under a statewide quarantine. The beetle was confirmed in four counties in North Carolina, bringing its statewide total to 37 known counties. Three additional counties were confirmed positive for EAB in Alabama, and Louisiana added Caddo Parish in 2018. Four new county infestations in Kentucky and five new counties in Arkansas were confirmed in 2018. Mortality was observed along waterways where ash is common, such as Ouachita River and Little Missouri River. In Texas, the beetle was spreading across Harrison County.

In South Dakota, EAB was newly confirmed in Sioux Falls in spring 2018. Roughly 250 infested trees within a mile area surrounding the initial find were found. Most were in the north side of Sioux Falls. The infestation appears to be recent—perhaps 3 or 4 years old—and concentrated within about a 1 square mile area. Most were concentrated within the core, but there were two satellite areas within ¼ mile of the core. New detections in 2018 occurred in the towns of Lyons and Superior, CO, still within an established quarantine that primarily encompasses the generally infested county of Boulder. No additional detections in Colorado were reported outside of the quarantine county.

Emerald ash borer galleries in Frederick County, VA. Photo by Chris Asaro, USDA Forest Service.

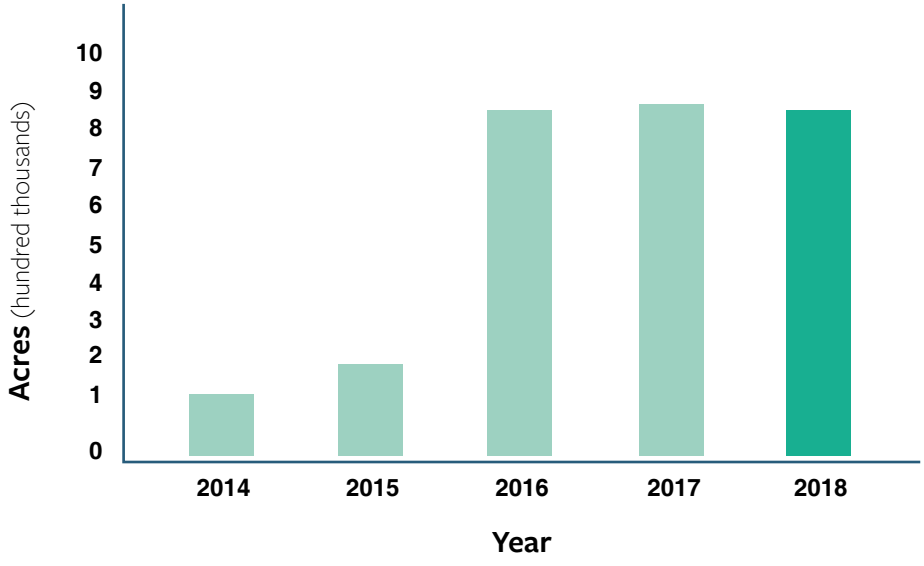
Emerald ash borer stand level mortality. Photo by Troy Kimoto, Canadian Food Inspection Agency, Bugwood.org.

First reports for Maine, Rhode Island, South Dakota, and Vermont were added in 2018.



Pest Damage and Range: New Damage in 2018 | New Damage in 2017 | Biological Range & Previous Damage | Affected State | Pest Not Yet Established | Forest Service Region

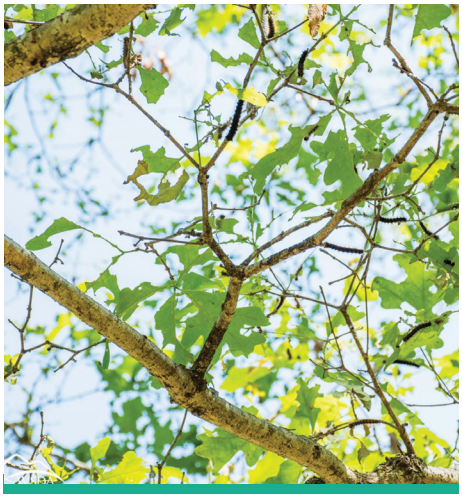
Emerald Ash Borer Mortality Acres



GYPSY MOTH - *Lymantria dispar*

In 2018, except for southern New England, gypsy moth defoliation and populations across much of the United States were lower than in 2017. A wet spring and early summer across much of the infested area resulted in favorable conditions for *Entomophaga maimaiga*, a fungus reducing gypsy moth populations. In the Northeast and Midwest, defoliation by gypsy moth was reported in Maine, New Hampshire, Vermont, Southern New England, New York, New Jersey, Pennsylvania, West Virginia, and portions of Michigan, Indiana, and Wisconsin.

Damage from gypsy moth continued to rise in New Hampshire in 2018. Gypsy moth feeding caused heavy defoliation across the eastern two-thirds of the Massachusetts. In Rhode Island, defoliation and tree mortality were reported throughout the State. In New York, defoliation was down 50 percent, likely due to wet spring conditions favorable to fungal infection among caterpillars. Defoliation by gypsy moth in New Jersey declined compared to 2017, with the majority of the damage seen in the northern half of the State. Gypsy moth declined dramatically in areas throughout Pennsylvania. No areas of defoliation were found in Maryland, Delaware, or Washington, DC, in 2018 and gypsy moth populations in the eastern counties of West Virginia collapsed during the summer of 2018.



Gypsy moth defoliation on white oak. Photo by Karla Salp, Washington Department of Agriculture.

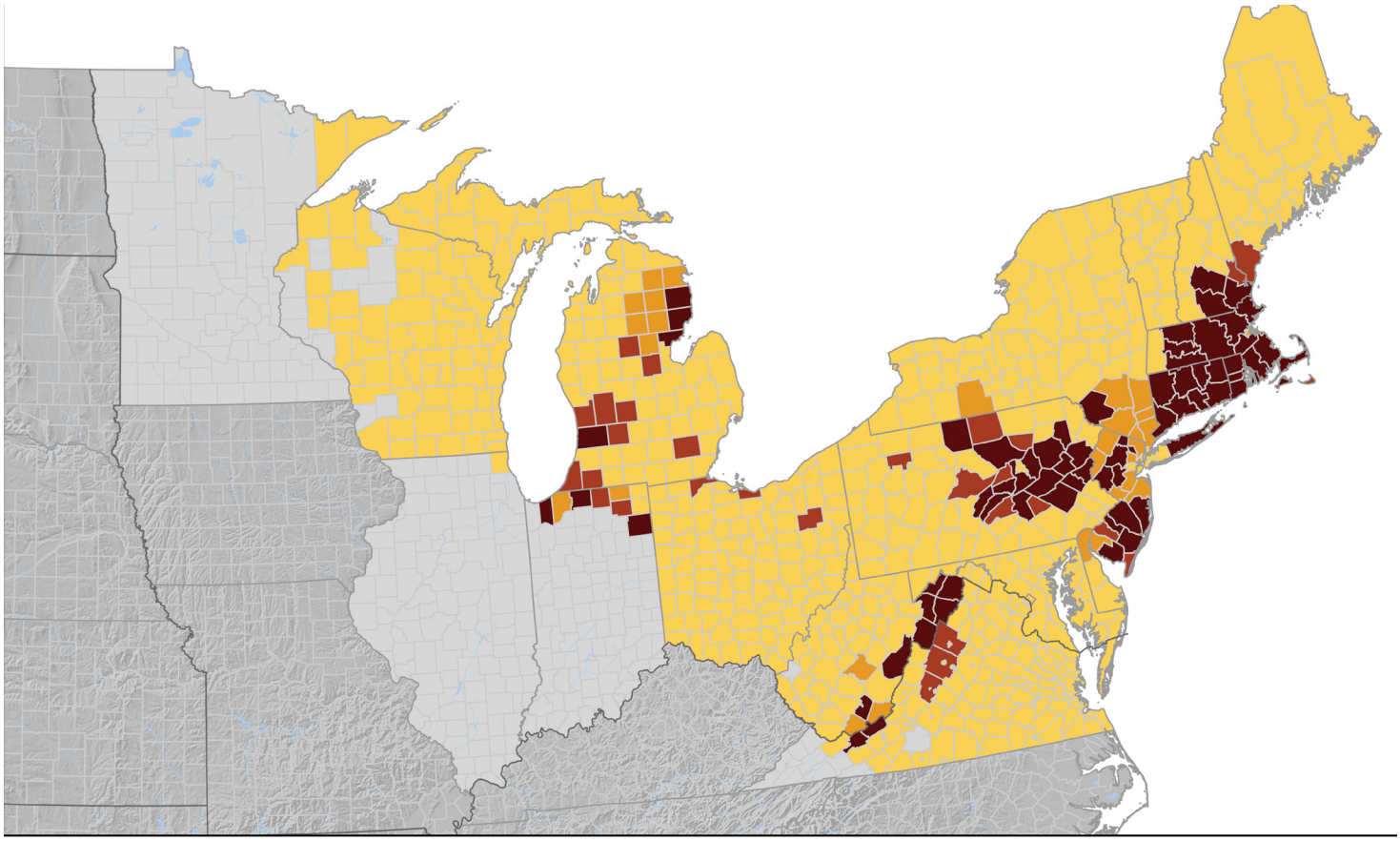
In the South, Virginia was the only State reporting defoliation by gypsy moth, where it has been observed for the past 3 years. Moderate to heavy defoliation was mapped along ridgetops in the Shenandoah Mountains in 2018. In Kentucky, gypsy moth is not yet established, even though adult moths have been detected every year since 2005. North Carolina continued to monitor populations and treat isolated infestations ahead of the generally infested area, with fewer trap catches than 2017.

In the Midwest, gypsy moth defoliation was reported in Ohio. Gypsy moth populations increased significantly in the southern Lower Peninsula of Michigan. Gypsy moth is known to occur in 50 of Wisconsin's 72 counties, but populations were low in 2018, with no damage recorded. Indiana saw adult gypsy moth trap detections across 52 counties, increasing the total number in 2018 compared to 2017.

No gypsy moths were trapped in northern Idaho, Montana, or northwestern portion of South Dakota in 2018. In Washington, 51 European gypsy moths and 1 Asian gypsy moth were trapped. Eradication efforts are ongoing.

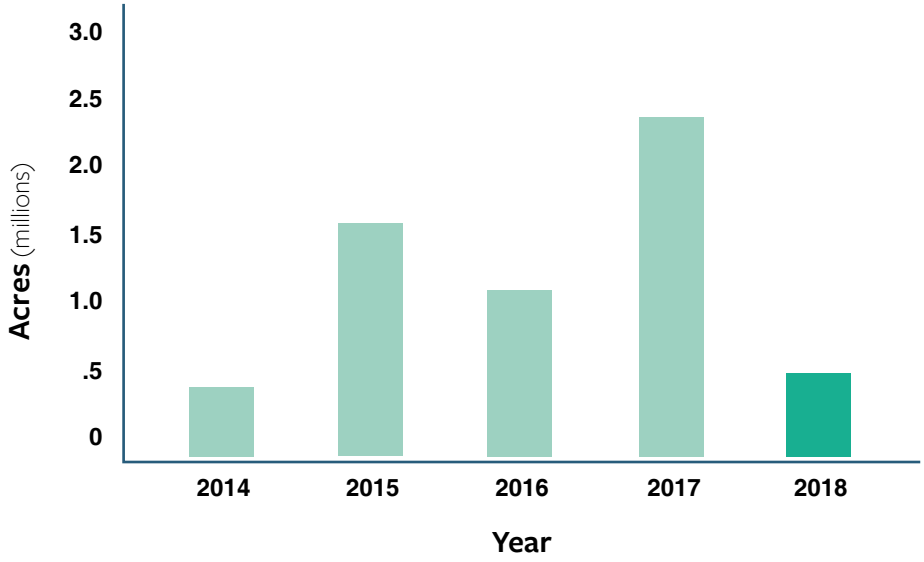
Illinois gypsy moth suppression treatments in 2019. Photo by Nancy C. John, Plant and Pesticide Specialist II, Illinois Department of Agriculture.

Damage from gypsy moth continued to rise in New Hampshire in 2018.



Pest Damage and Range: 2017 & 2018 Damage | 2018 Damage | 2017 Damage | Biological Range & Previous Damage | Affected State | Pest Not Yet Established | Forest Service Region

Gypsy Moth Damage Acres



SOUTHERN PINE BEETLE - *Dendroctonus frontalis*

Many areas in the Northeast and South saw declining or stable populations of southern pine beetle (SPB) in 2018, but in a few States reports of activity increased. Mississippi continued to be the State with the most damage from SPB, especially on national forests. While the beetle continues to be trapped in New England and areas of New York, infestations in the Northeast are on the decline.

In the Northeast United States, SPB infestations were found in New York and New Jersey. Trap catches in pheromone-baited monitoring traps continued to be reported in these States, as well as in Connecticut, Delaware, Maryland, Massachusetts, Pennsylvania, and Rhode Island. As of 2018, no new beetle-infested trees have been detected in Massachusetts. Trapping in Rhode Island found increasing numbers of beetles, indicating a growing endemic population in some areas that have yet to reach outbreak status. SPB continued to cause mortality of pitch pine on Long Island, NY, mostly on the eastern and western fronts of the Central Long Island Pine Barrens, and in East Hampton. Adult beetles were confirmed in traps in the Albany Pine Bush Preserve from last year and were again detected in a pheromone trap in Bear Mountain in the Hudson Valley, but no infested pines have been found in this region to date.

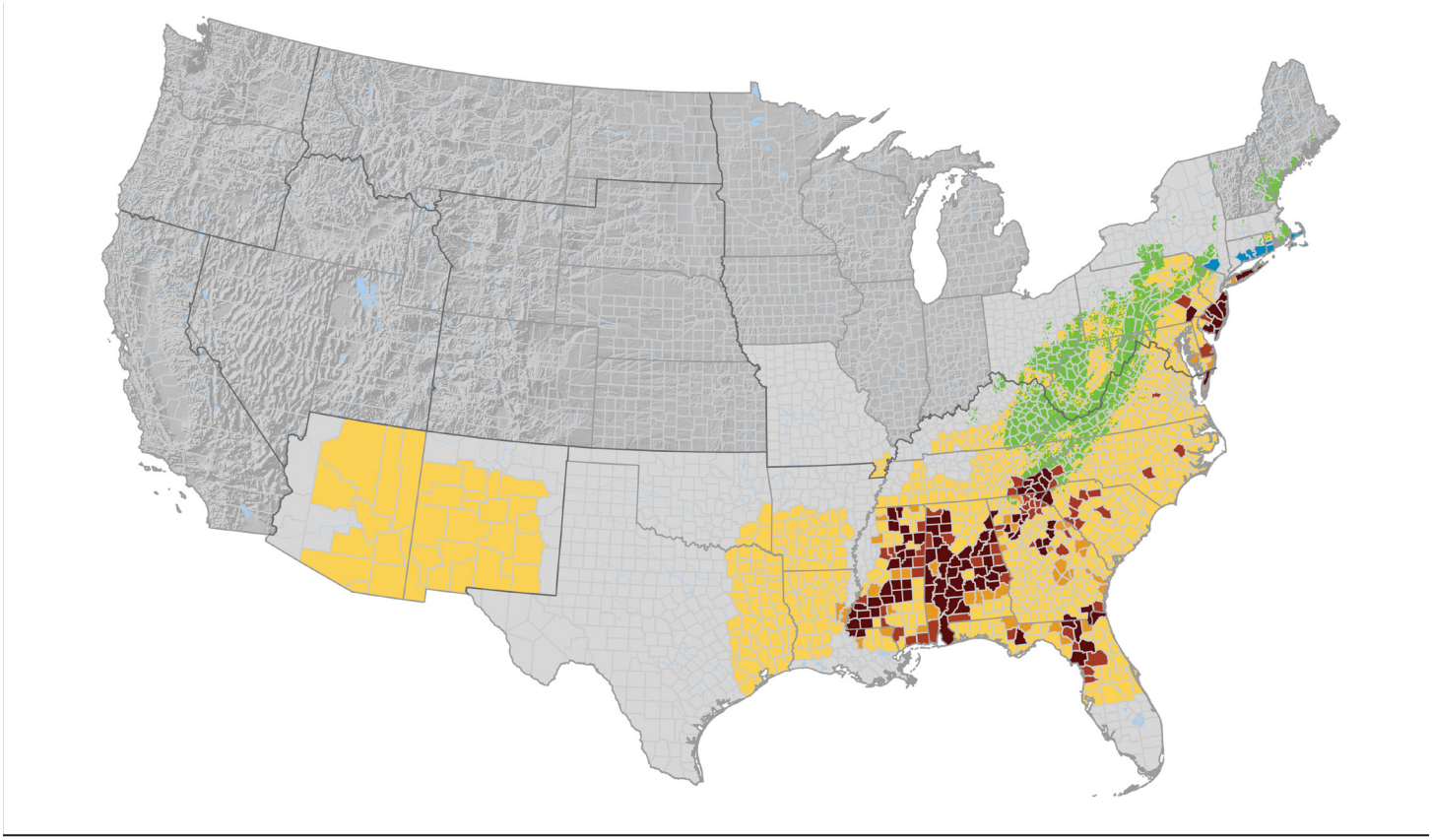
In 2018, more than 5,300 SPB spots were reported across the South. The extent of significant activity in 2018 was similar to 2017, with 18 counties in outbreak status. However, except for Mississippi, most States saw sharp declines in activity overall. North Carolina and northern Georgia showed significant increase in activity since 2017. Most activity in western North Carolina and adjacent parts of northern Georgia ramped up in late 2017 but was not documented until the 2018 field season. SPB populations in North Carolina were declining during most of 2018. In Mississippi, activity continued to be severe and was heavily concentrated on National Forest System lands, most notably the Homochitto and Bienville National Forests. Areas with some beetle activity in 2017, such as northern Florida and southern Alabama, saw declines to insignificant levels in 2018. In general, private land holdings were minimally affected by the beetle in 2018. SPB has been at historic lows for more than a decade in South Carolina, but spring trapping and aerial surveys reveal populations are increasing.

Southern pine beetle damage on pitch pine. Photo courtesy of Pennsylvania Department of Conservation and Natural Resources Bureau of Forestry.

Southern pine beetle damage. Photo courtesy of Pennsylvania Department of Conservation and Natural Resources Bureau of Forestry.

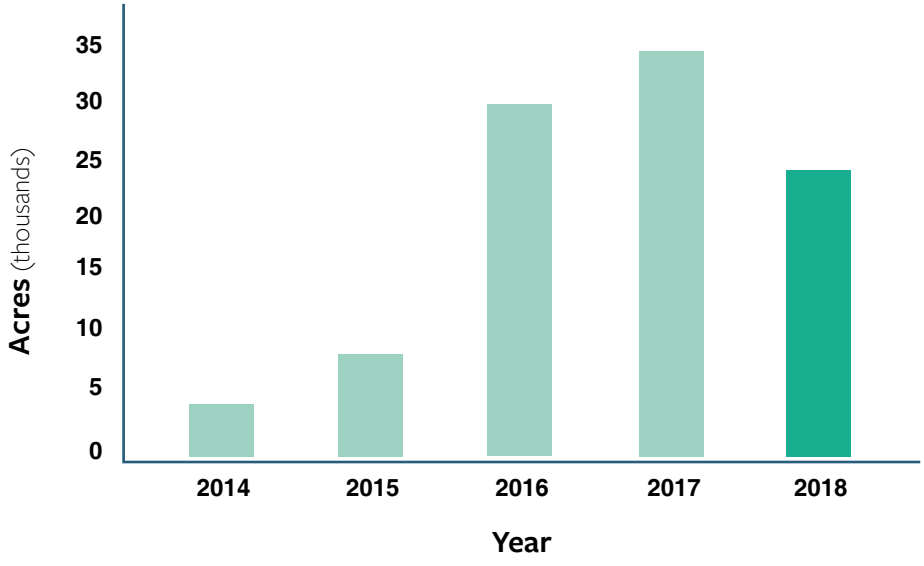
In Georgia, 76 SPB spots were detected on approximately 190 acres. Activity on the Oconee National Forest continued but declined significantly since 2017. Alabama detected 299 beetle spots, infesting 8,013 pines. More than half of these infestations were located on national forests, with concentration of beetle spots found in the Bankhead and Talladega National Forests. Scattered infestations of the beetle were detected in Florida. Most infestations were small (1 acre or less), and the largest was 40 acres. The majority of infestations occurred in overstocked loblolly pine plantations on nonindustrial private land. Mississippi reported 275 SPB spots on non-Forest Service lands, a slight reduction from 2017. Spots were detected throughout the State but were especially elevated adjacent to Bienville and Homochitto National Forests. Trapping data indicate low beetle populations across Louisiana, with the exception of the Feliciana Parrish. Louisiana reports 23 SPB spots statewide. In Virginia, very few SPBs were caught in pheromone-baited traps, indicating that populations will remain at low, static levels. Pine mortality was mapped on 475 acres on Chincoteague Island and Chincoteague National Wildlife Refuge, but no active spots were detected.

Mississippi reported the most damage from southern pine beetle in 2018.

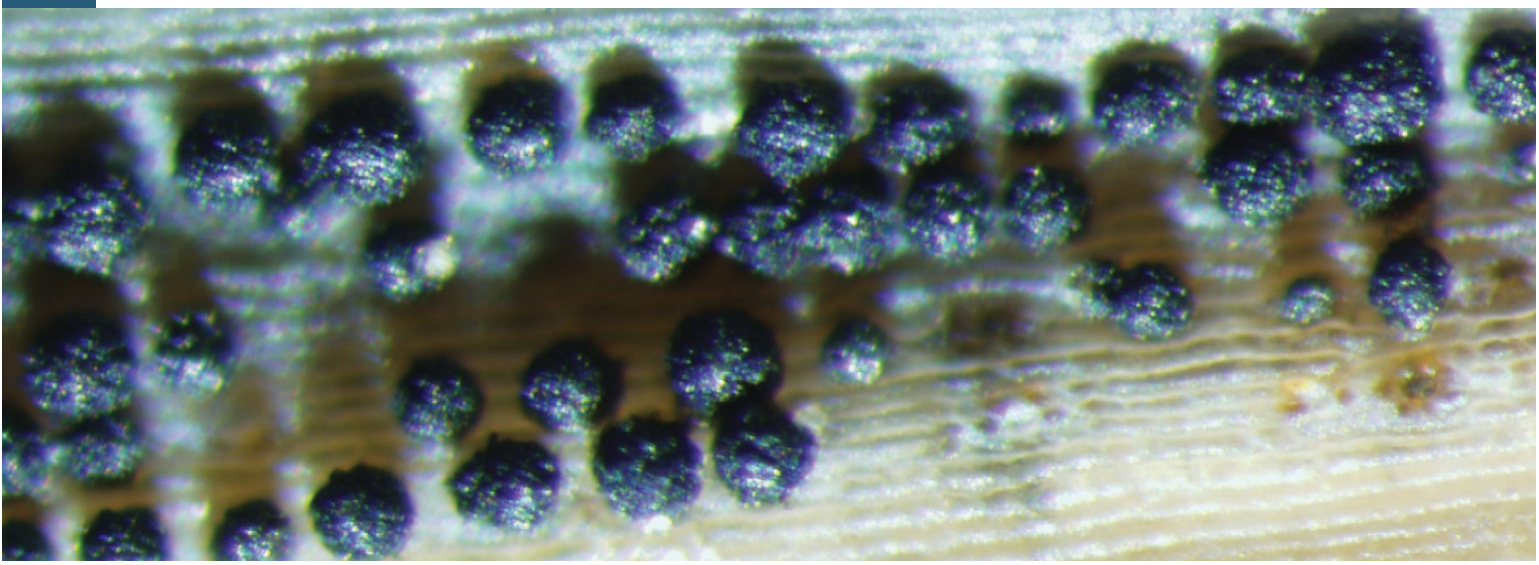


Pest Damage and Range: 2017 & 2018 Damage | 2018 Damage | 2017 Damage | Biological Range & Previous Damage | Pitch Pine Range | Trap Catch | Affected State | Pest Not Yet Established

Southern Pine Beetle Mortality Acres

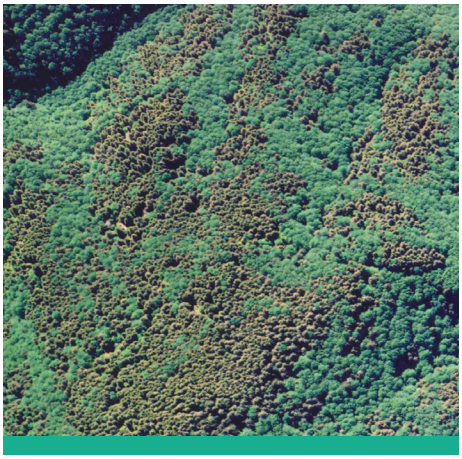


Swiss Needle Cast - *Phaeocryptopus gaeumannii*



Swiss needle cast (SNC) can be found in Douglas-fir throughout Oregon and Washington, but it is particularly damaging within 30 miles of the Pacific Ocean. The fungus that causes SNC is native to the Pacific Northwest and can be found throughout Oregon and Washington. Fungal fruiting bodies block the stomata of infected needles, reducing gas exchange and causing carbon starvation within the needle. Growth loss occurs on severely infected trees. SNC is of local concern and is very damaging along the northwest Oregon and southwest Washington coasts, where conditions are especially favorable and extensive plantations of Douglas-fir have been established.

Green spruce and hemlock in the background, contrasting with the yellow Douglas-fir with Swiss needle cast. Photo by Dave Shaw, Oregon State University.



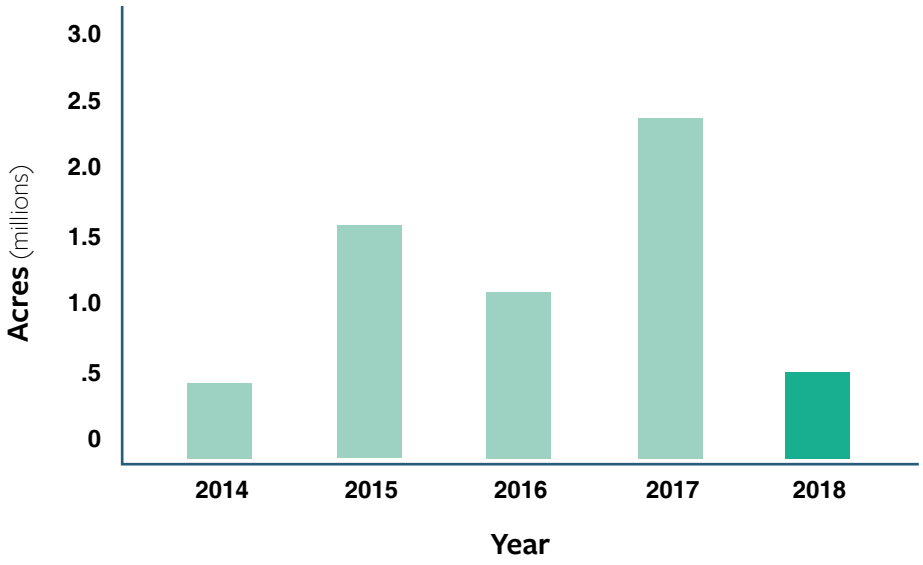
Mixed species stand with Swiss needle cast. Photo by Dave Shaw, Oregon State University.

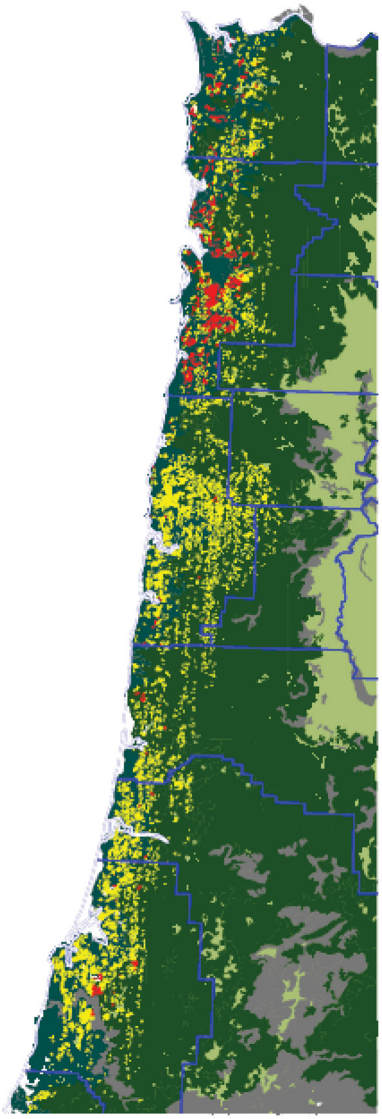
Douglas-fir with SNC symptoms were mapped on 79,000 acres in 2018. Twenty-six ground plots, across the range of the aerial survey, were assessed for incidence and severity on the needles and foliage on the branches. The amount of disease-causing fungus in the foliage and the amount of foliage retained on sample trees has remained relatively stable across the years of the survey.

In Oregon, the 2018 aerial survey recorded 413,081 acres of Douglas-fir forest with observable symptoms of SNC. Most damage occurred along the coast and in Curry County, where 1,860 acres had observable symptoms, a slight increase from the 2016 aerial survey. Overall acres of observable damage decreased slightly from 2016 to 2018 throughout the range of SNC.

Douglas-fir with Swiss needle cast symptoms were mapped on 79,000 acres in 2018 in Oregon and Washington.

Swiss Needle Mortality Acres

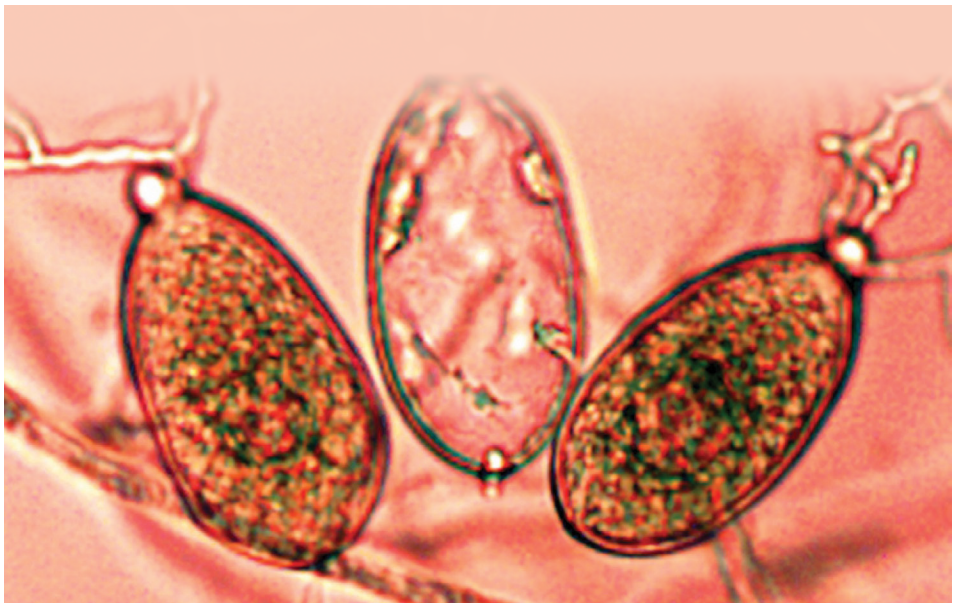




Areas of Douglas-fir forest with symptoms of Swiss needle cast detected in 2018 aerial surveys, Coastal Range. Adapted from Oregon Department of Forestry.

Sudden Oak Death - *Phytophthora ramorum*

In Oregon, eradication treatments for EU1 (European form) infestations of sudden oak death (SOD) totaled 203 acres for 2018. Treatments are underway and planned for the remaining 455 acres of EU1 infestations found in 2018. In Washington, the pathogen has only been detected in locations that are either at or near plant nurseries, and not in general forests. However, this pathogen was detected in a single privately owned botanical garden. In 2018, a single water bait sample was confirmed positive on Bainbridge Island in Washington. The water bait was from a pond below a previous positive area at the reserve, representing a unique wildland interface outside of normal nurseries or stream samples.



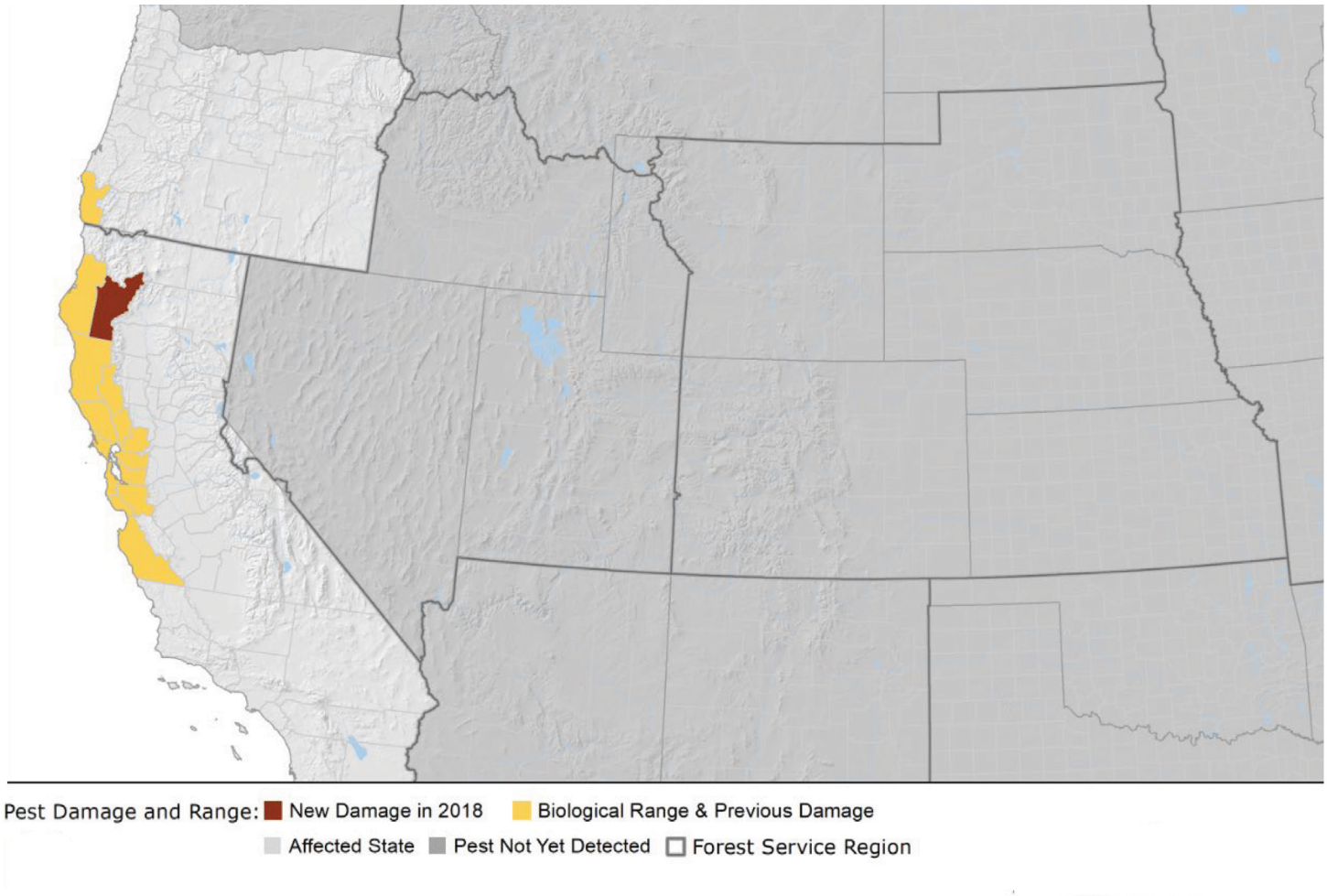
Aerial detection surveys documented a large increase in SOD tanoak mortality from Big Sur through Humboldt County in California. Most of the wildland mortality was the result of pathogen spread during the 2016–2017 winter, which had above-average precipitation in many coastal areas. Infected bay trees were found positive for the first time in the Salmon Creek watershed in southern Monterey County. Extensive tanoak mortality up to 3,000 feet in elevation on ridgetops was observed in Big Sur, as were extensive areas of symptomatic coast live oak. Tanoak mortality was observed throughout the Santa Cruz Mountains, beginning with smaller trees early and progressing to larger trees as water deficits increased throughout summer in 2018.

North of the San Francisco Bay, tanoak and manzanita mortality was widespread on Mount Tamalpais, even in areas with no bay trees. In the Timber Cove/Fort Ross area, SOD was causing extensive mortality on tanoaks. Likewise, southern Humboldt County had widespread SOD mortality, and the pathogen was causing new, discrete mortality centers near Piercy and within Jackson Demonstration State Forest. In northern Humboldt County, aerial survey detected extensive spread upriver along Redwood Creek within Redwood National Park.

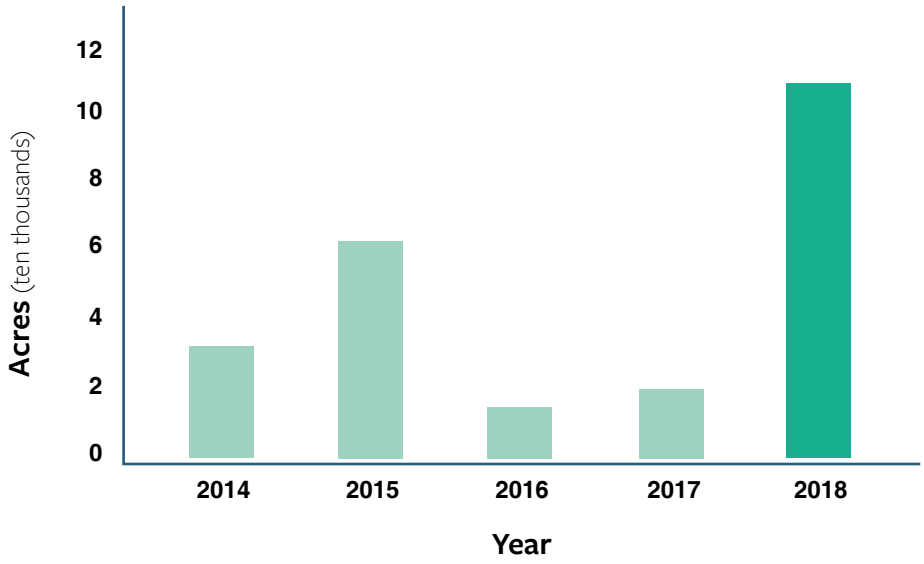
Countless trees have been killed by sudden oak death in California. Photo by Dave Rizzo, University of California, Davis, CA.

Dead tanoak (Lithocarpus densiflorus) *killed by Phytophthora ramorum in Muir Woods, CA. Photo by Joe O'Brien, USDA Forest Service (retired), Budwood, org.*

In California, there was an increase in tanoak sudden oak death mortality from Big Sur to Humboldt counties in 2018.



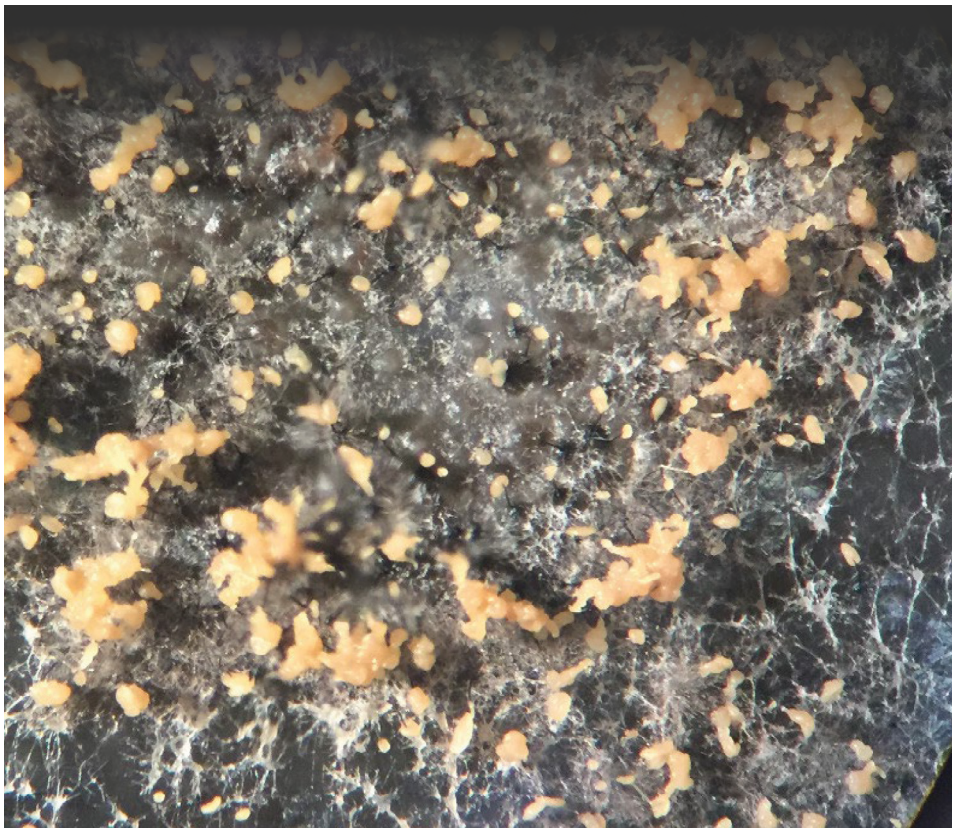
Sudden Oak Death Mortality Acres



Rapid ʻŌhiʻa Death - *Ceratocystis lukuohia and C. huliohia*

Both fungal forms of *Ceratocystis lukuohia* and *C. huliohia* were detected on the island of Kaua'i in 2018. *Ceratocystis huliohia* was found via follow-up surveys by the Hawai'i Division of Forestry and Wildlife and its partners on 15 trees spreading among four remote areas, while *C. lukuohia* was detected in a single location with only a few positive results. Intensified monitoring and management for containment have been planned for Kaua'i.

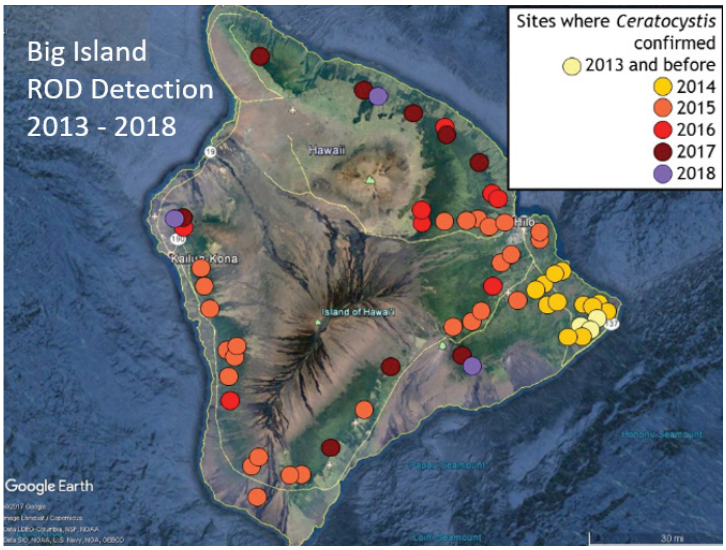
Rapid ʻōhi'a death continued its spread on the Hawai'i Island, mostly filling in areas where only scattered mortality occurred. ʻŌhi'a is the most common tree species in Hawaii's native forests, growing from sea level to nearly 8,000 feet on dry, mesic, and wet forests. ʻŌhi'a forests covers 864,869 acres statewide, with 617,763 acres occurring on Hawai'i Island alone, and accounting for 50 percent of all forest trees in the State. No rapid ʻōhi'a death has been detected on O'ahu, Maui, Moloka'i, and Lana'i where ʻōhi'a also occurs. Surveys on all islands are ongoing.

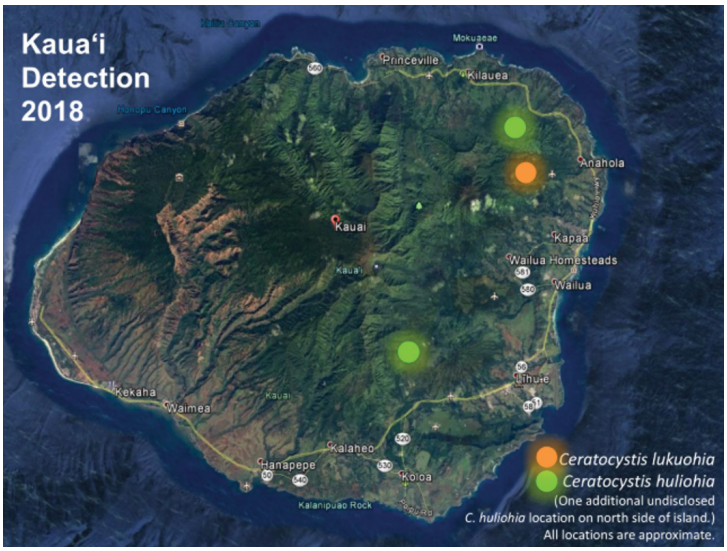


Rapid ʻōhiʻa death seen from above, image from video courtesy the University of Hawaii. Photo by J.B. Friday, University of Hawaii.

Establishing best temperatures to kill rapid ʻohi'a fungus on logs by installing thermocouples as part of steam/vacuum treatment. Photo by J.B. Friday, University of Hawaii.

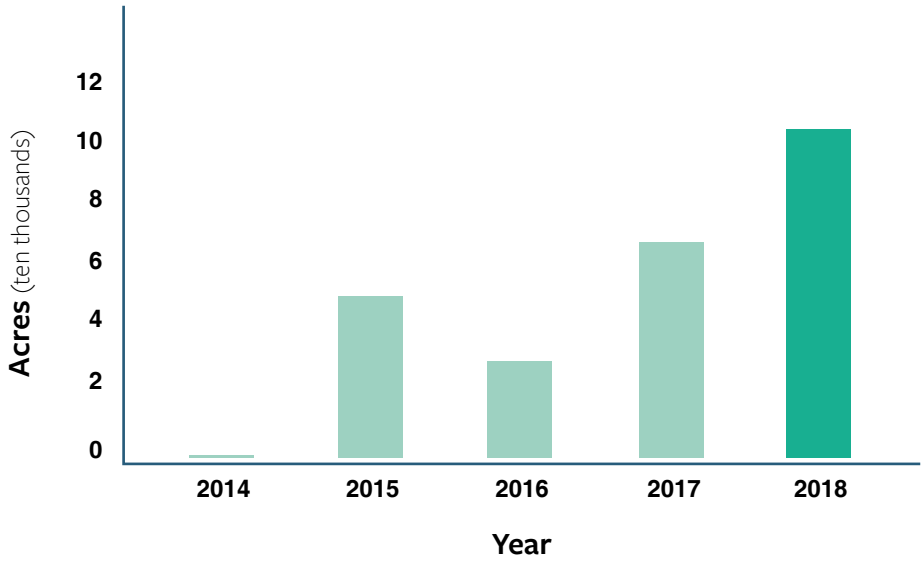
Both fungal forms of* Ceratocystis lukuohia *and* C. huliohia *were detected on the island of Kaua'i in 2018.





Adapted from https://cms.ctahr.hawaii.edu/rod/THE-DISEASE/DISTRIBUTION

Rapid ʻOhiʻa Death Mortality Acres



Oak Decline - *Multiple causal agents*

Periods of prolonged drought weaken oaks and allow for opportunistic insects and fungi to cause further damage. Defoliation events also weaken trees and may lead to tree death in oaks that were already approaching the end of their natural lifespan. In the North Central States, oak decline has continued to cause mortality on north-facing slopes as a result of many biotic stressors. Oak decline was mapped in five counties in southern Illinois in 2018 during aerial surveys over the Shawnee National Forest. Oak decline was mapped in 11 counties in southcentral Indiana and found for the first time on chestnut oak in 2018. As declines take time to manifest themselves, the problem appears to occur on trees that died 3 to 4 years ago, which is likely tied to the 2012 drought. In Michigan, oak decline was mapped in seven counties in the central portion of the Lower Peninsula in 2018.

In the South, widespread oak decline was reported from Virginia, Alabama, Tennessee, and Oklahoma. Virginia continues to see decline of mature oaks statewide. Giles and Bland counties in southwest Virginia were heavily defoliated by gypsy moth in the springs of 2016, 2017, and 2018. Red oaks in southwest Virginia (Buchanan County) experienced defoliation by the oak sawfly from 2016 to 2018 and white oaks in central Virginia were damaged by the oak button gall in 2018. In combination with other stress factors, these defoliation events lead to oak mortality. As Virginia's cohort of oaks continue to age and are weakened by factors such as drought and defoliating insects, oak decline will continue to be a problem throughout the State.

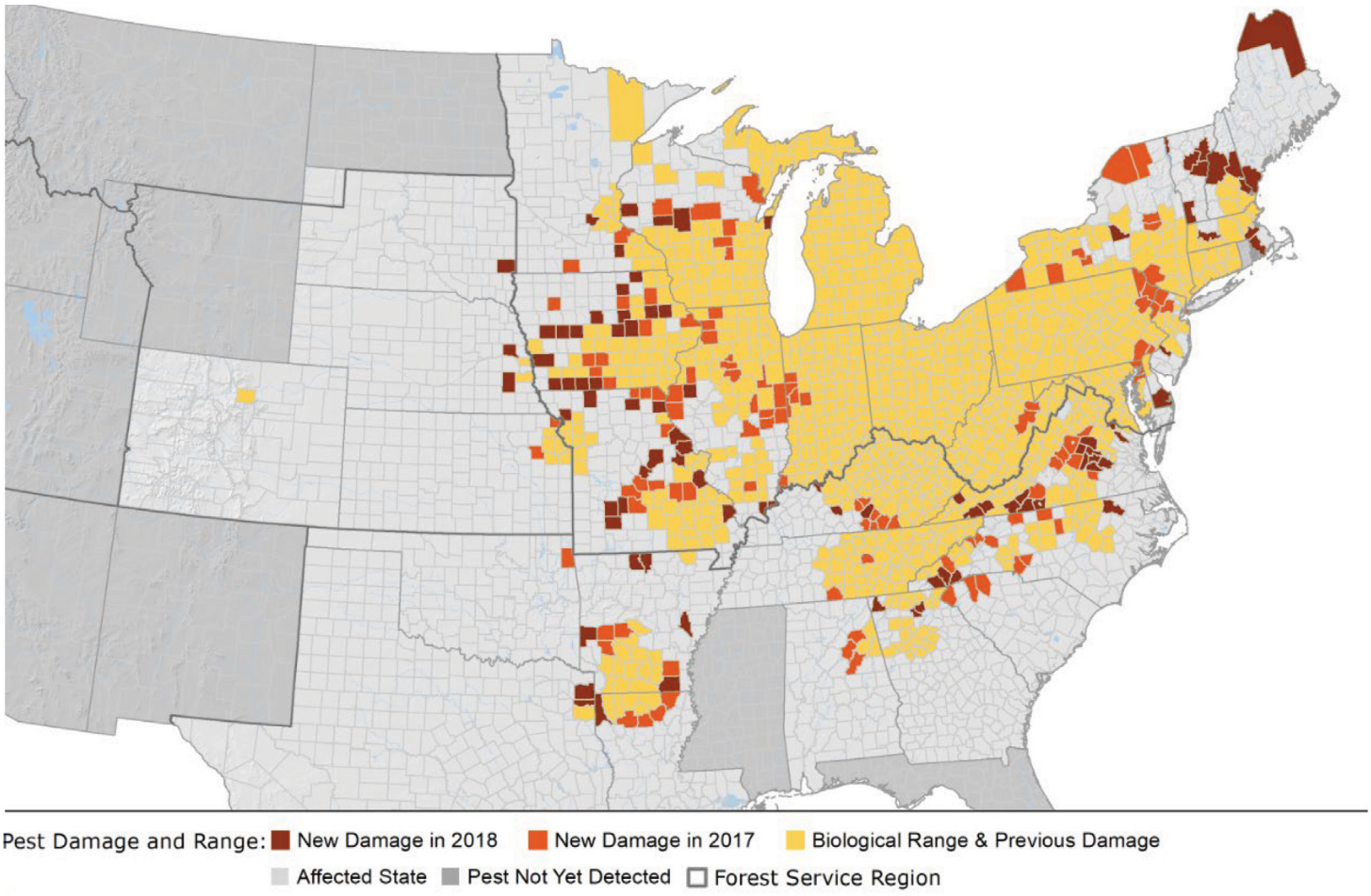
Branch dieback on pin oak in severe cases of oak decline. Photo by Joe O'Brien, USDA Forest Service (retired), Bugwood, org.

Red oaks in northern and central Alabama, where the drought was most severe, started showing signs of decline by late summer of 2016. By late winter, some of the drought-affected hardwoods were succumbing to hypoxylon canker. Certain species of hardwoods were becoming infected with hypoxylon canker, but the disease was more prevalent on red oaks. This fungal disease is a weak pathogen and can only successfully attack hardwoods if they are stressed or declining from other biotic or abiotic pests. Oak decline was widespread throughout the State in 2018. Throughout Oklahoma, both rural and urban forests had reports of oaks showing signs of hypoxylon canker, a common indicator and stress agent on oak. Severity ranges from a few trees to many in a stand. This canker affects all of Oklahoma's oaks, especially within the Cross Timbers ecosystem, with increased rates of mortality occurring in the red oak group. Hypoxylon is prevalent as a result of overstocked forests, as well as stress created from the droughts over the past few years, the most severe beginning in 2011.

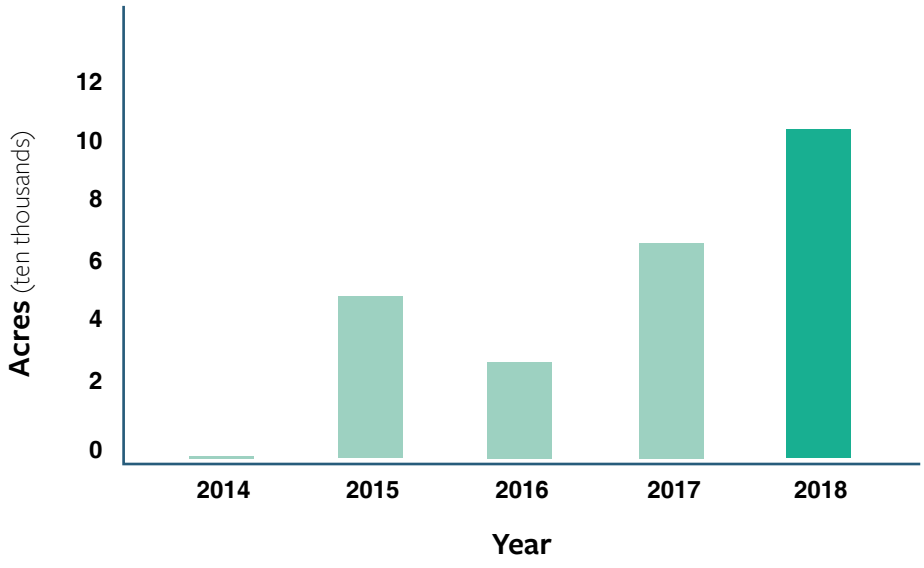
South Carolina had a high incidence of calls regarding dying oaks throughout the State in summer 2018. Isolated dead trees were common between Hampton County and Lexington County, particularly on sites with well-drained soils that have been under prolonged drought conditions. Mortality is largely attributed to a combination of primarily abiotic factors, including soil compaction, age, drought in previous years, and temperatures over 100 degrees F for longer than a week. Tennessee also had a high incidence of oak decline in 2018 with widespread reports of hypoxylon canker on red and white oaks.

Hypoxylon cankers often associated with oak decline. Photo by Edward L. Barnard, Florida Department of Agriculture and Consumer Services, Bugwood.org.

Tennessee had a high incidence of oak decline with hypoxylon canker on red and white oaks in 2018.


Pest Damage and Range:
New Damage in 2018
New Damage in 2017
Biological Range & Previous Damage
Affected State
Pest Not Yet Detected
Forest Service Region

Oak Decline


Acres (ten thousands)
12
10
8
6
4
2
0
2014
2015
2016
2017
2018
Year

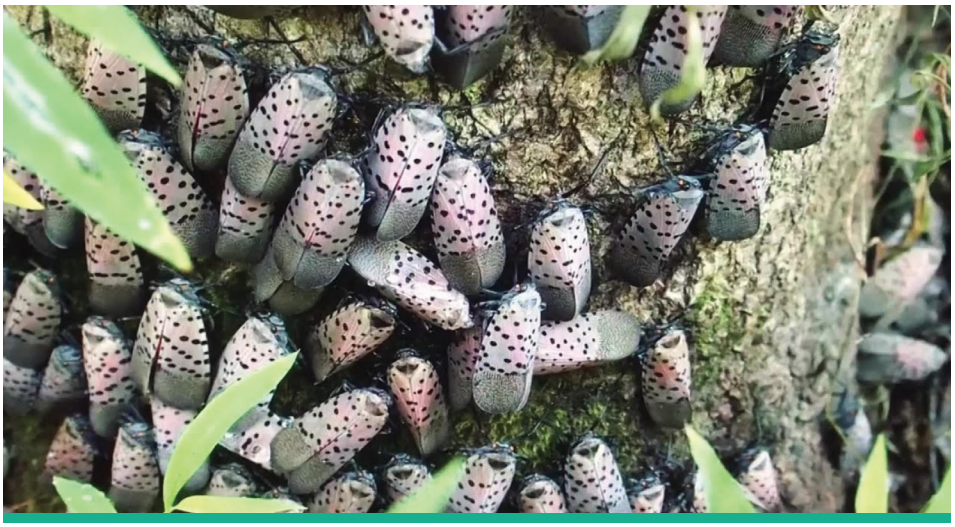
EMERGING PEST TO WATCH

Spotted Lanternfly - *Lycorma delicatula*

The spotted lanternfly is a new exotic insect that has spread throughout southeastern Pennsylvania since its discovery in Berks County in 2014. This insect is an invasive planthopper and is native to certain parts of Southeast Asia. By January 2018, the Pennsylvania quarantine included portions of 13 counties in the southeastern part of the State. By late 2018, the spotted lanternfly had been detected in six additional Mid-Atlantic States: Delaware, Maryland, Massachusetts, New Jersey, New York, and Virginia. Based on the host preferences indicated in the literature, the most at-risk commodity in the United States is grape production.

The spotted lanternfly utilizes 67 plant species, including many important agricultural crops, such as wild and cultivated grapes, plums, cherries, peaches, nectarines, apricots, almonds. Also included are forest hosts such as oak, elm, poplar, birch, walnut, and pine. It remains unclear as to whether actual feeding on these hosts has been observed. The plants are damaged by both the loss of sap from stems and leaves, which reduces photosynthesis and deposition of large amounts of fluid (honeydew), which promotes mold growth.

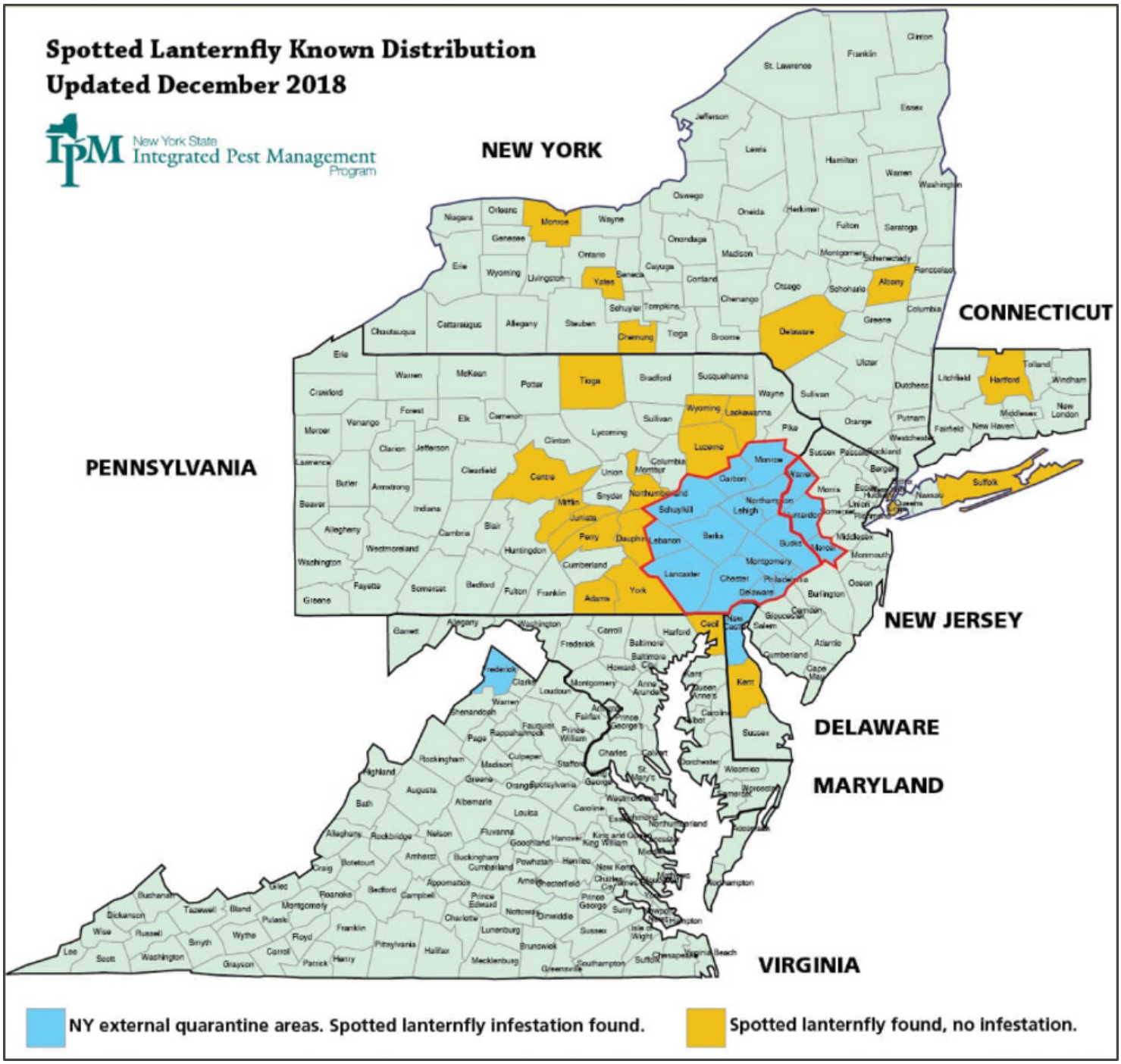
In response to the rapid growth of the infested area, in 2018 the USDA announced that it had allocated $17.5 million in emergency funds to slow the spread of the spotted lanternfly. The goal of these funds will be to expand surveillance and control programs containing the leading edge of the infestation while at the same time reducing the density of spotted lanternfly populations in the core infested area.



The spotted lanternfly causes serious damage in trees including oozing sap, wilting, leaf curling, and tree dieback. Photo courtesy of Pennsylvania Department of Conservation and Natural Resources Bureau of Forestry.

Spotted lanternfly egg masses on tree-of heaven. Photo courtesy of Pennsylvania Department of Agriculture, Bugwood.org.

In 2018, the USDA announced that it had allocated $17.5 million in emergency funds to slow the spread of the spotted lanternfly.



Adapted from https://nysipm.cornell.edu/environment/invasive-species-exotic-pests/spotted-lanternfly/

Photos

PAGE 3 – MALE FIR ENGRAVER BEETLE. PHOTO BY THE DEPARTMENT OF ENTOMOLOGY, THE NATIONAL MUSEUM OF NATURAL HISTORY, DEPARTMENT OF ENTOMOLOGY, WASHINGTON, DC.

PAGE 5 – *DENDROCTONUS RUFIPENNES* RED FORM DORSAL VIEW. PHOTO BY STEVE VALLEY, OREGON DEPARTMENT OF AGRICULTURE.

PAGE 7 – MOUNTAIN PINE BEETLE ADULT. PHOTO BY KLAUS BOLTE, AGRICULTURE AND AGRI-FOOD CANADA (RETIRED).

PAGE 9 – *DENDROCTONUS BREVICOMIS* ADULT FEMALE. PHOTO BY THE DEPARTMENT OF ENTOMOLOGY, THE NATIONAL MUSEUM OF NATURAL HISTORY, DEPARTMENT OF ENTOMOLOGY, WASHINGTON, DC.

PAGE 11 – THE HEAD OF AN ADULT EMERALD ASH BORER COLLECTED IN MARYLAND. PHOTO BY ZERENE STACKER, U.S. GEOLOGICAL SURVEY, BEE INVENTORY AND MONITORING.

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PAGE 15 – SOUTHERN PINE BEETLE ADULT. PHOTO BY MATT BERTONE, EXTENSION ASSOCIATE, N.C. STATE UNIVERSITY.

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PAGE 19 – INFECTIOUS SPORES OF *PHYTOPHTHORA RAMORUM* ARE RELEASED INTO THE ENVIRONMENT AND DISPERSED BY RAIN AND WIND. PHOTO BY MATTEO GARBELOTTO LAB, UNIVERSITY OF CALIFORNIA, BERKELEY.

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PAGE 23 – *ARMILLARIA MELLEA* FRUITING BODIES OFTEN ASSOCIATED WITH OAK DECLINE. PHOTO BY DAVE POWELL, USDA FOREST SERVICE (RETIRED), BUGWOOD, ORG.

PAGE 25 – ADULT SPOTTED LANTERNFLY. PHOTO BY LAWRENCE BARRINGER, PENNSYLVANIA DEPARTMENT OF AGRICULTURE.

See a forest through the trees. Photo by Bruce Moltzan, USDA Forest Service.