



Forest Health *Notes*

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NORTH CAROLINA FOREST SERVICE

2021 Forest Health Highlights

(An update on the health of state and private forests in North Carolina)

Our Forests

Forestry is one of North Carolina's most important industries, providing more than 148,000 jobs and contributing \$34.6 billion to the state's annual economy. The state's forestland covers nearly 18.8 million acres, or approximately 61% of the state's land area. Most of this forestland, approximately 11.3 million acres, is owned by individuals, families and non-corporate entities. Roughly 2.9 million acres is owned by private corporations not involved in forest product manufacturing, and about 1.3 million acres is owned by forest industry. Federal, state, and local public lands total 2.6 million acres. The forestry industry ranks first in manufacturing sector jobs and second in overall statewide employment.

North Carolina forests are prized for their scenic beauty, supporting tourism, outdoor recreation, and providing wildlife habitat from the Appalachian Mountains to the lowlands of the Atlantic Coastal Plain. The beauty and productivity of North Carolina's forests have historically been challenged by a variety of threats, both native and nonnative. Over the last 10 years, three nonnative invasive species have been detected for the first time in the state: laurel wilt in 2011; thousand cankers disease of walnuts in 2012; and emerald ash borer in 2013. Pests such as hemlock woolly adelgid and gypsy moth have impacted forests in the state for more than 20 years. Others, such as spotted lanternfly and Asian longhorned beetle, have been found in adjacent states and are being monitored closely in North Carolina.

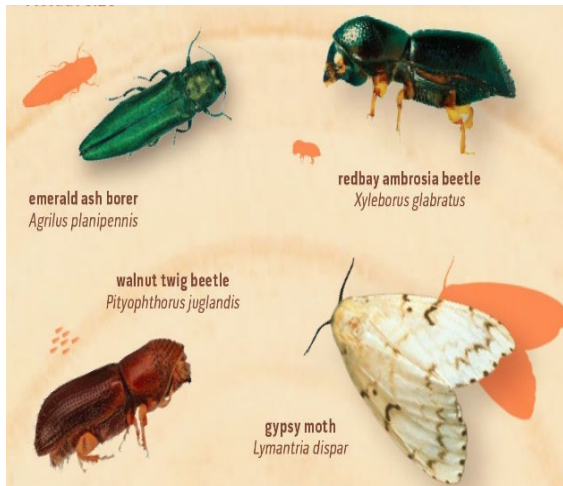
COVID-19 Impacts

North Carolina Forest Service (NCFS) programs and services were greatly impacted by the Coronavirus pandemic. Aerial surveying to detect and document southern pine beetle mortality, forest tent caterpillar defoliation and damage caused by other pests was grounded until late summer. Alternative technologies, such as satellite remote sensing, were utilized to attempt detection of forest health threats. Forest health meetings, training, and education and outreach events were delivered via online formats. Field services were provided with social distancing, while some field visits were prioritized or eliminated through diagnostic use of photographs from landowners, homeowners, and forestry professionals. Click [here](#) for information on how to properly photograph tree pests and disorders.



Cell phone pictures can be useful aids for diagnosis of insect, disease, and other forest health issues. This image shows emerald ash borer larvae as well as the damage they cause beneath the bark.

Invasive Pests



Like Trojan soldiers, these nonnative invasive pests hide on or in the trees they kill and can be transmitted from one location to another through movement of untreated firewood. Graphic credit: www.dontmovefirewood.org

Laurel Wilt Detected in Two Additional Counties in 2021

The devastating laurel wilt disease was first confirmed in North Carolina in 2011. This year, it was detected in Johnston and Jones counties, bringing the total number of positive counties in the southeastern part of the state to 14. Laurel wilt was previously detected in Bladen, Brunswick, Columbus, Cumberland, Duplin, Lenoir, New Hanover, Onslow, Pender, Robeson, Sampson and Wayne counties. Laurel wilt, which is vectored by the Redbay ambrosia beetle, is known to kill Redbay, Swampbay and Sassafras trees. A map illustrating the known distribution of laurel wilt in North Carolina can be found [here](#). As the beetles move across the northern and western regions of the state, they will encounter fewer bay trees and more sassafras. So, be on the lookout for wilting sassafras especially if you live in the piedmont or mountain regions of the state.



Wilting redbay tree. Note the characteristic reddish-purple color of the foliage. Redbay and swampbay will cling to these wilted leaves for a long time, even through the winter months. Sassafras will cling to their wilted leaves through the summer but drop them in the fall. Image credit: Jim Moeller, NCFS.

Thousand Cankers Disease Remains Only in Haywood County

Since 2012, when thousand cankers disease was first detected in Haywood County, neither the fungus nor the walnut twig beetle that carries it, have been found in other counties in the state. In Jan. 2013, a quarantine was enacted prohibiting the movement of regulated materials from Haywood County to unaffected areas of North Carolina.

The NCFS works alongside the United States Department of Agriculture Forest Service (USFS) to trap, and survey for newly affected areas in the state. In 2021, 46 traps were set in high priority areas statewide and the walnut twig beetle was not detected in any additional areas. A map illustrating the known distribution of thousand cankers disease of walnuts in North Carolina can be found [here](#).

Emerald Ash Borer not detected in any Additional Counties in North Carolina

Since its initial 2013 detection in North Carolina, Emerald Ash Borer (EAB) has been found in 62 counties across the state, but there were no new county detections in 2021. The NCFS continues to monitor the spread of EAB across our state, even though the federal quarantine prohibiting movement of EAB regulated materials has been lifted. By documenting the spread in North Carolina, we can provide information to our citizens about the proximity of the pest to their lands and forests. A map illustrating the known distribution of EAB in North Carolina can be found [here](#).

This year, the NCFS continued the Ash Protection Program, a reimbursement program to assist communities in protecting ash trees in urban settings. In 2021, six communities signed up for the program and 202 ash trees were treated, totaling 3,337 diameter inches. Since 2018, 990 urban ash trees have been protected with appropriate insecticides.

Hemlock Woolly Adelgid

The Hemlock Woolly Adelgid (HWA) was first detected in North Carolina in 1995 and has since spread to all regions where hemlocks naturally occur in the state. Nearly all untreated hemlock stands in the western portion of the state are either dead or in sharp decline due to HWA.

In 2015, a cooperative effort between the NCDA&CS, WNC Communities, USFS, and NCFS formed the Hemlock Restoration Initiative (HRI). Part of this effort included protecting hemlocks with chemicals and working to establish biological control agents throughout the region. Since 2018 more than 41,000 hemlocks have been treated and are still under protection from that treatment. A total of 2,276 hemlocks were treated in hemlock conservation areas, or other sites working in collaboration with the Hemlock Restoration Initiative. Meanwhile, the HRI continues to release and monitor biocontrol agents that prey on the adelgids. Three new sites were identified for potential biocontrol releases in 2021.

Lymantria dispar

Since 1982, North Carolina has been under statewide surveillance for *Lymantria dispar* (formerly known as Gypsy Moth), by the NCDA&CS-Plant Industry Division *Lymantria Dispar* Program, and the USFS Slow the Spread Program. With the 2021 trapping season now complete, 2,096 males were captured in 725 of the 17,455 traps set statewide. This is slightly more than double the number of captures compared to 2020, when 1,037 moths were captured in 371 of the 16,577 traps set statewide. Male moth captures do not necessarily indicate a population of *Lymantria dispar* is developing in an area, but it warrants further investigation to determine if females are present and if control methods are necessary.

Based on this year's trap captures, 11 treatments totaling 17,096 acres have been proposed for 2022. All treatments are scheduled to employ a mating disruption pheromone.

A map of proposed 2022 *Lymantria dispar* treatments can be found [here](#).

In 2021, four mating disruption treatments were conducted on 7,655 acres and one biological control treatment using *Bacillus thuringiensis* (strain: kurstaki) was conducted on 450 acres.

Historically, *Lymantria dispar* has been contained in North Carolina with only two counties, Currituck and parts of Dare, being quarantined for the pest since 1988. These two counties remain the only two in the state with a *Lymantria dispar* quarantine in place.

Note: Beginning July 1, 2021, the Entomological Society of America no longer recognizes gypsy moth as the common name for *Lymantria dispar*. Future reports, publications, and outreach materials will include the new common name once it has been selected.

On the lookout

Two pests of concern not yet found in North Carolina have been detected in adjacent states. The Spotted Lanternfly has been found in 11 Northeastern, and Midwestern states as of Nov. 2021. The pest has occupied northern Virginia since January 2018. However, in late Oct., a small population was discovered in Hillsville, VA, just 15 miles from the North Carolina border in Surry County. While mostly a pest of fruit trees and grapes, it is also known to attack a variety of hardwood trees found in North



Left: Adult Spotted lanternfly, Credit: Richard Gardner, Bugwood.org. Right: Adult Asian longhorned beetle, Credit: Kenneth R. Law, USDA-APHIS, Bugwood.org.

Carolina forests and ornamental landscapes. Likewise, Asian Longhorned beetles have been reported in the Northeast and Midwest over the past decade, impacting a variety of hardwood species. In May 2020, the Asian Longhorned Beetle was detected for the first time in the Southeast near Charleston, South Carolina. Efforts are underway to control the pest before it spreads further. Multiple federal (USDA-APHIS and USFS) and state (NCDA&CS-Plant Industries Division, and NCFS) agencies are surveying and monitoring for these insect pests to detect and respond to early infestations.

Native Pests

Bark Beetles

Historically, the southern pine beetle (SPB) has been North Carolina's most significant forest insect pest. Between 1999 and 2002, the SPB destroyed at least \$84 million of timber in the state. Beetle activity has fluctuated since then as we saw a steep decline until 2017. Activity once again increased activity throughout 2017 and 2018 until subsiding again in 2019. In 2020, only one small spot of SPB activity was reported on private lands in the western part of the state, and none were reported in 2021. In spring 2020, the NCFS deployed 39 SPB prediction traps across the state. These traps, along with an additional 18 traps deployed by the USFS on national forestlands, correctly predicted low SPB activity across state this year.

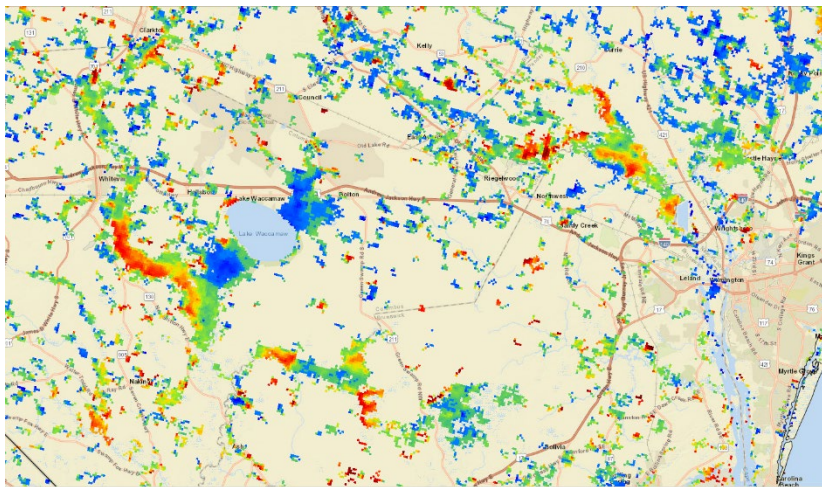
The Southern Pine Beetle Prevention Program, funded through a grant from the USDA Forest Service, partially reimburses nonindustrial private forest landowners in North Carolina for the cost of completing forest management practices to improve pine forest health and to reduce the likelihood of SPB infestations. Precommercial thinning has been the most utilized practice under this program in North Carolina. The practice reduces the number of trees in a young stand that would otherwise compete for available sunlight, nutrients and water, ultimately improving growing conditions for remaining trees. In 2020, additional practices such as understory prescribed burns and understory vegetation control, were added to the program to further encourage healthy growing conditions. Since 2005, there have been more than 2,550 cost-shared projects exceeding 82,000 acres in North Carolina aimed at the prevention of SPB. There are 64 more projects still pending on 4,505 acres.

While southern pine beetle activity was low, *Ips* engraver beetle continued to cause statewide pine mortality. *Ips* are secondary pests, meaning they attack trees that are stressed or weakened by other factors such as overstocking, drought, flooding, wind damage, and poor soil or growing conditions. While *Ips* was identified in many locations, there were just 45 reports of severe damage across 245 acres in the state.

Defoliators

Native foliage-consuming pests cause unsightly damage, but usually have little impact on healthy trees in the long run.

The forest tent caterpillar is the most frequent defoliator for bottomland hardwoods in our state. In 2021, North Carolina experienced its seventh consecutive year of forest tent caterpillar outbreak. Through the use of satellite-assisted remote sensing (USDA Forest Service, FORWARN II) and ground observations, widespread defoliation was observed in Northeastern North Carolina, primarily along the Roanoke River and Southeastern North Carolina along the Lumber River, Cape Fear River and southwest of Lake Waccamaw. Due to Covid restrictions, aerial observation was grounded during the period in which forest tent caterpillar defoliation occurred. Using remotely sensed data, we estimate the extent of defoliation to be between 90,000 and 100,000 acres. By the summer, the trees had recovered with no mortality was observed. In 2020, this pest had defoliated 158,700 acres of bottomland hardwoods.



Signatures like the red, yellow, and light green pixels on this satellite remote-sensing product from US Forest Service [FORWARN](#) alerted forest health staff of a large disturbance in the forest along the Cape Fear River and Lake Waccamaw in southeaster NC. Forest tent caterpillar was quickly verified as the culprit and ground observations by local field staff documented the extent and severity of the outbreak.

Stem and Needle Diseases

Pitch canker, Needle cast, and Needle rusts are diseases that typically have a minor impact among native pines in North Carolina. The state saw a notable reduction in the frequency of occurrence for all three of these diseases during 2021.

After consecutive years of increased pitch canker activity, 2021 saw few reports of the disease. There was one notable report of an eight-acre loblolly stand where nearly 100% of trees exhibited pitch canker symptoms, with some trees having succumbed. Most other reports of pitch canker were scattered throughout the state and mortality was infrequent. Usually, pitch canker coincided with exposure to wind and hail events causing wounds that acted as access points for infection. Although the effects of pitch canker are highly visible, mortality was infrequent in 2021.



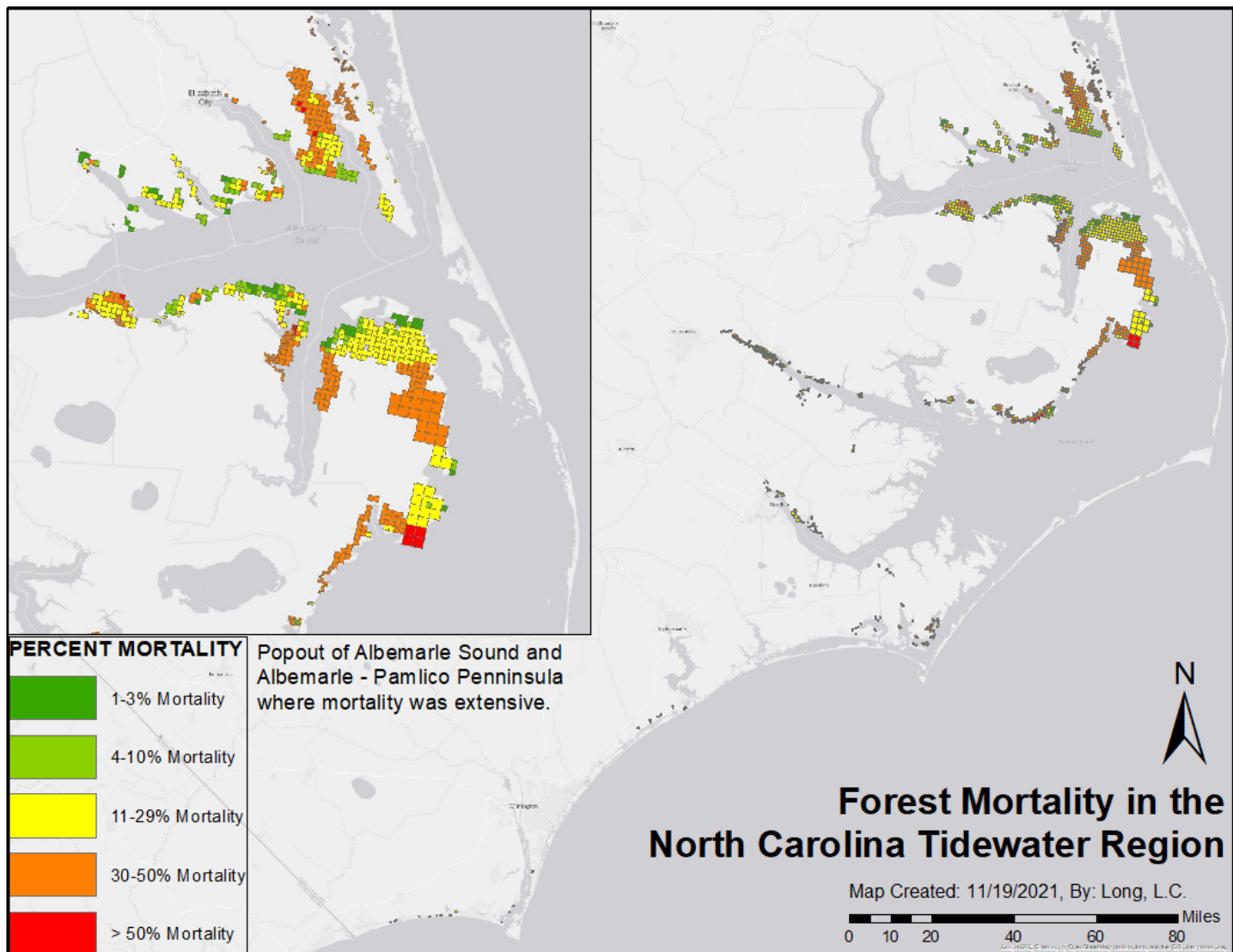
Left: Pitch canker foliar symptoms (discoloration and branch dieback). Image Credit: Jim Moeller, NCFS.

Right: Pitch Canker stem symptoms (oozing pitch). Image Credit: Mark Bost, NCFS.

Abiotic Stressors

Saltwater Intrusion

Once Covid restrictions began to ease and aerial survey was permitted, the NCFS conducted flights to estimate the extent of tree mortality along most of the tidally influenced regions of the North Carolina coast. North Carolina and four other Atlantic coast states, in collaboration with the USDA Forest Service, have undertaken an effort to estimate and map “ghost forest”. Ghost forest is a term used to describe tree mortality in coastal and estuary forests, as well as forests near tidally influenced rivers. As seawater advances and overtakes freshwater, it slowly kills most tree species and leaves behind standing decaying timber. By mapping these dead and dying trees, the NCFS and collaborators can determine the extent of damage to forest trees caused by saltwater intrusion into ground water, as well as via hurricane storm surge. An added benefit of these surveys was the ability to obtain an estimate of forest mortality before the next landfall hurricane in the state. The NCFS surveyed approximately 1,876,451 acres and mapped 202,369 acres with probable salt mortality. Mortality ranged from about 1% to more than 50% in the areas with damage.



Above: Map depicting areas of coastal forest mortality. Hotter colors represent high tree mortality and cooler colors represent low mortality.

Forest Health Assistance in North Carolina

With assistance and support from the USDA Forest Service, the NCFS is responsible for helping forest landowners in the state with the detection and control of destructive forest insects and diseases. Forest health specialists in the Forest Protection Division direct this responsibility. Services are provided to forest landowners by district and county personnel, with forest health section staff providing appropriate training along with professional and technical expertise in the diagnosis and control of destructive insects and diseases.

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Where are they now?

Monitoring Firewood-Vectored Invasive Forest Pests in North Carolina



Emerald Ash Borer

http://www.ncforestservice.gov/forest_health/fh_eabfaq.htm



Gypsy Moth Quarantine

<http://www.ncagr.gov/plantindustry/plant/entomology/gm.htm>



Laurel Wilt Disease

http://www.ncforestservice.gov/forest_health/forest_health_laurelwiltfaq.htm



Thousand Cankers Disease

http://ncforestservice.gov/forest_health/forest_health_thousandcankers.htm



Spotted Lanternfly

https://www.ncforestservice.gov/forest_health/pdf/FHN/FHN201802-SLF.pdf



Asian Longhorned Beetle

These devastating pests can easily be moved in or on firewood. The use of local or treated firewood is important to reduce the spread of invasive species in our state's forests.

The N.C. Forest Service asks that you use local firewood to prevent the further spread of forest pests.



Map Created 11/18/2021 by: Long, L.C. - FHM Coordinator

The N.C. Forest Service is a division of the N.C. Department of Agriculture and Consumer Services; Steve Troxler, Commissioner.