



NORTH CAROLINA FOREST SERVICE 2022 Forest Health Highlights

Our Forests

North Carolina's forests cover nearly 18.8 million acres or about 61% of the state's land area. Most of this forestland, about 11.3 million acres, is owned by individuals, families, and non-corporate entities. About 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. Forestry is an important industry in the state, providing more than 150,400 jobs and contributing \$33.6 billion to the North Carolina economy annually. The forestry industry ranks first in manufacturing sector jobs and second in statewide employment overall.

Forests in North Carolina are also prized for their scenic beauty, supporting tourism and 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. In the past 11 years, at least 5 nonnative invasive species were 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 *Lymantria dispar* have impacted forests in the state for more than 20 years. **Asian longhorned beetle** has been found in an adjacent state. Forest Health personnel have visited this site to familiarize themselves with identification and control of this insect and North Carolina is being monitored closely for this pest.

Most notably, **spotted lanternfly** and **elm zigzag sawfly** were discovered for the first time this year in the piedmont area. Populations of this insect have existed in neighboring Virginia since 2018 with a population discovered within 15 miles of our state line in 2021. Forest Health personnel have been actively monitoring for this insect. However, this discovery was reported by an observant citizen. Forest Health resources cooperated with our North Carolina Department of Agriculture and Consumer Services (NCDA) Plant Industry Division and were used widely in the treatment and surveying efforts for this occurrence. Treatment is ongoing at the time of this writing.

COVID-19 Impacts

Although N.C. Forest Service (NCFS) programs and services were greatly impacted by the Coronavirus pandemic in 2021, most activities were resumed by this year. Aerial surveying of the entire state was accomplished to detect and document **southern pine beetle** mortality, **forest tent caterpillar** and **fall cankerworm** defoliation was mapped, and damage caused by other

pests was surveyed with no major issues. Forest health meetings, training, and education and outreach events were delivered in person in most instances. No major hindrance of field services was observed.

Invasive Pests

Spotted Lanternfly

As mentioned in the opening, North Carolina had its first established population of spotted lanternfly detected early this summer as the result of a report from a citizen. This occurrence was in Forsyth and Guilford Counties. It appears that the insect has been here for a short period of time, but long enough to become established. NCDA Plant Industry Division took the lead on control efforts with support from NCFS and others. NCFS staff were heavily involved in delimiting surveys and treatment operations throughout the summer. This effort is ongoing. A second population was detected in Surry County and appeared to be a new population. This population was suppressed. While this insect feeds on the invasive tree of heaven and other tree species it is of major concern to the agricultural industry in the state, including the viticulture industry.



Figure 1. Spotted Lanternfly nymphs (left) and adult (right).

Laurel Wilt Detected in Three Additional Counties in 2022:

The devastating **laurel wilt disease** was first confirmed in North Carolina in 2011. This year, it was detected in Carteret, Craven, and Scotland Counties, bringing the total to 17 positive counties in the southeastern part of the state. Laurel wilt was previously detected in Bladen, Brunswick, Columbus, Cumberland, Duplin, Lenoir, New Hanover, Jones, Johnston, Onslow, Pender, Robeson, Sampson, and Wayne counties. Historically, detections of laurel wilt and its insect vector, **redbay ambrosia beetle**, were confined to redbay and swampbay trees. More recent detections have also been recorded in sassafras. A map of the current known distribution of laurel wilt in North Carolina can be found here:

https://www.ncforestservice.gov/forest_health/pdf/Map_LW_NCTracking.pdf



Figure 2: Vascular streaking due to laurel wilt fungus (left) and red bay mortality due to laurel wilt (right).

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 additional counties within the state. In January 2013, a quarantine was enacted that prohibits the movement of regulated materials from Haywood County to unaffected areas of North Carolina.

The NCFS works with the United States Department of Agriculture Forest Service (USFS) to trap and survey high risk areas in the state. In 2022, 50 traps were set statewide, and **walnut twig beetle** was not detected in any new areas. A map of the distribution of Thousand Cankers Disease of Walnuts may be found at: https://www.ncforestservice.gov/forest_health/pdf/Map_TCD_NCTracking.pdf

Emerald Ash Borer Detected in Two Additional Counties in 2022

Since its initial 2013 detection in North Carolina, **emerald ash borer (EAB)** has been found in 65 counties across the state, with three of those being new county detections in Bladen, Pitt, and Stanly Counties in 2022. NCFS continues to monitor the spread of EAB across our state even though the federal quarantine which prohibited the 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. The link to a map of the current known distribution of EAB in North Carolina can be found below: https://www.ncforestservice.gov/forest_health/pdf/Map_EAB_NCTracking.pdf



Figure 3: Dead Carolina ash due to emerald ash borer infestation.

Hemlock Woolly Adelgid and the Hemlock Restoration Initiative

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 dead or in sharp decline due to HWA.

Six years ago, a cooperative effort between the NCDA&CS, WNC Communities, USFS, and NCFS formed the Hemlock Restoration Initiative (HRI). Part of this effort includes protecting hemlocks with chemicals and working to establish biological control agents throughout the region. Since the NCFS became involved in treating hemlocks more than 100,000 hemlocks have been treated and are either still under protection from said treatment, are being treated a second time, or are part of biocontrol releases. Meanwhile, HRI and the NC Department of Agriculture and Consumer Services (NCDA) Plant Industry Biocontrol Program continue to release and monitor biocontrol agents that prey on the adelgids. 1629 *Laricobius* beetles were released as biocontrol in 2022.



Figure 4. Hemlock woolly adelgid on branch.

Lymantria dispar Program

Since 1982, the entire state of North Carolina has been monitored for *Lymantria dispar* by the NCDA&CS-Plant Industry Division *Lymantria dispar* Program and the USFS Slow the Spread Program. The 2022 trapping season is complete, and 1433 male *L. dispar* were captured in 826 traps, with 17,248 traps set statewide. This is approximately one third fewer captures compared with last year (2021) when 2096 moths were captured in 726 traps, with 17,455 traps set statewide. Male moth captures do not necessarily indicate a population of *L. dispar* is developing in an area but triggers further investigation to determine if females are present and if control is warranted.

Based on this year's trap captures, 7 treatments totaling 19,133 acres have been proposed for 2023. All treatments are scheduled to employ a mating disruption pheromone.

In 2022, 11 mating disruption treatments were conducted on 16,909 acres with no larvicides being applied. For a map of the 2022 *Lymantria dispar* treatments see:

<https://ncagr.maps.arcgis.com/apps/Minimalist/index.html?appid=3df6f80cc8354f61899c5a8056137350%20>

Lymantria dispar has historically been held at bay from becoming established 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. North Carolina has been using the term spongy moth in lieu of a new name.

Elm Zigzag Sawfly

2022 saw the emergence of a new invasive insect pest in North Carolina. The **elm zigzag sawfly** was reported in Canada in 2020, Virginia in 2021, and in our state this year. Stokes and Surry Counties were affected. It was recorded from multiple sites in two counties and, although a non-regulated invasive pest, was the subject of a news release through our agency. This insect was discovered following a call to one of our county offices and was identified by county personnel. NCFS Forest Health Staff were notified, observed the insect, and subsequently identified the insect at other sites in the same counties. This insect is causing defoliation of elm trees and known sites will be monitored this coming year to determine if defoliation of the same trees will occur again and if any mortality will be evident.



Figure 5. L to R: Elm zigzag sawfly defoliation of American elm, larvae entering the ground to pupate, and typical feeding pattern on leaf.

On the Lookout

Asian longhorned beetles have been previously reported in the Northeast and Midwest over the past decade impacting a variety of hardwood species. In May 2020, it was detected for the first time in the Southeast near Charleston, South Carolina. Efforts are underway to control the pest before it spreads further. This species is not wanted in North Carolina. Multiple federal (USDA-APHIS and USFS) and state (NCDA&CS-Plant Industries Division and NCFS) agencies are surveying and monitoring for this insect to detect and respond early to any infestation.

Native Pests

Bark Beetles:

The **southern pine beetle (SPB)** has historically been North Carolina's most significant forest insect pest. From 1999 through 2002, SPB killed at least \$84 million worth of timber in North Carolina. Since then, beetle activity has been relatively low. In 2017 and 2018, however, activity

picked up on federal, state, and private lands, then began to subside in 2019. In 2021, no southern pine beetle spots were reported. In the spring, the NCFCS deployed 39 SPB prediction traps in 39 separate counties across the state. These traps, plus additional traps deployed by the USFS on national forestlands, correctly predicted low SPB activity across state this year. One, approximately two-acre, southern pine beetle spot was reported in the eastern portion of the state.



Figure 6. Southern pine beetle pitch tubes (left) and damage (right) in eastern North Carolina.

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, including 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 on more than 82,000 acres in North Carolina aimed at the prevention of SPB. There are 67 more projects still pending on 4,434 acres.

While southern pine beetle activity was low, ***Ips engraver beetle*** continued to cause pine mortality statewide. *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 and growing conditions. While *Ips* was seen in many locations, there were 40 reports, from 22 counties, reporting damage on a total of 424 acres.

Defoliators:

Native foliage-consuming pests cause damage that is mainly unsightly, but usually have little impact on healthy trees in the long run. The **forest tent caterpillar** most frequently defoliates bottomland hardwoods in our state. In 2022, North Carolina experienced its eighth consecutive

year of forest tent caterpillar defoliation. Through monitoring and communication with local agency personnel, NCFCS Forest Health Staff determined that defoliation was occurring and conducted flights to determine the extent of the damage. Damage was found over portions of 10 counties throughout the outer coastal plain of the state. Most damage occurred in water tupelo stands and associated bottomland hardwoods. An estimated 47,700 acres were impacted during this occurrence with damage spilling over state lines into adjacent states. Impacted river drainages included the Chowan, Roanoke, Lumber, and Waccamaw Rivers. Damage was also documented in the Great Dismal Swamp. Trees recovered by summer and no mortality was observed. It is believed that at some level this is an annual occurrence within water tupelo swamps and associated forest types. It coincides with the emergence of leaves on that species.



Figure 7: Defoliation by fall cankerworm (left) and forest tent caterpillar (right).

Fall cankerworm made a significant appearance in North Carolina this year. Named for the emergence time of the adult moths, this pest defoliated approximately 1500 acres in the northwestern mountains. This defoliation was in high elevation hardwood forest cover and has resulted in some mortality. Monitoring of this site will continue into this coming year for signs of reemergence and additional mortality.

Stem, Needle, and Root Diseases

Needle cast, and Needle Rusts are diseases that typically have a minor impact among native pines in North Carolina. However, they were prevalent over the early part of this year throughout the state. Some stands had heavy occurrence while adjacent stands did not.

Heterobasidion Root Disease has also been observed persisting in Western North Carolina for two consecutive years with most occurrences being in eastern white pine. A new report in the northwestern piedmont/foothills area of the state had a occurred this year. Forest Health staff continue to monitor these infections and mortality observed in white pine elsewhere (see below).

Declines

Staff fielded numerous calls related to white pine health this year. This has been observed sporadically since at least 2016 but is on the increase this year. NCFS forest health specialists noted a heavy occurrence in two northwestern counties with other areas of what appears to be the same situation across the western end of the state. As mentioned above, heterobasidion root disease has been observed in some areas but this does not explain all the cases seen. **White pine bast scale** and **caliciopsis canker** have also been documented on some sites. This problem appears to be continuing and ongoing monitoring and research will occur going forward.



Figure 8: White pine mortality, various causes

Abiotic Stressors

Saltwater Intrusion

As reported in 2021, flights were conducted over the North Carolina Coast to determine the extent of tree mortality in tidally influenced areas due to saltwater intrusion into groundwater and other factors. The dead trees resulting from this phenomenon have become known as ghost

forests. The NCFS Forest Health Program continues to be involved in documenting this damage and monitoring its occurrence over time. This past year monitoring plots were established in areas affected by this situation. These plots included vegetation surveys of the overstory and understory as well as establishment of photo points. More of these plots will be established into the coming year.



Figure 9: “Ghost Forest” site in the outer coastal plain.

Forest Health Assistance in North Carolina

With assistance and support from the USDA Forest Service, the NCFS is responsible for helping forest landowners of the state in 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 staff providing appropriate training along with professional and technical expertise in the diagnosis and control of destructive insects and diseases.

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