NORTH CAROLINA FOREST SERVICE
2022 Forest Health Highlights

Our Forests

North Carolina's forests cover nearly 18.8 million acres, roughly 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. Approximately 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 **spongy moth** have impacted forests in the state for more than 20 years. **Asian longhorned beetl**e has been found in an adjacent state. Forest Health personnel visited the site to familiarize themselves with identification and control of the 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&CS) Plant Industry Division and were widely involved 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 had resumed by 2022. Aerial surveying of the entire state was accomplished to detect and document **southern pine beetle** mortality, **forest tent caterpillar and fall cankerworm** defoliation were 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

Adult spotted lanternfly. Photo by NCFS staff

As mentioned in the opening, North Carolina had its first established population of spotted lanternfly detected early this summer, first reported by a citizen. This insect was found in Forsyth and Guilford counties and appeared to have been there long enough to become established. The Plant Industry Division lead control efforts with support from the NCFS and others. Staff with the NCFS 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 but suppressed population. 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.

Spotted lanternfly late instar nymphs. Photo by NCFS staff

Laurel wilt detected in three additional counties in 2022:

Left Photo: Red bay mortality due to laurel wilt. Right Photo: Vascular streaking due to the laurel wilt fungus. Photos by NCFS staff

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

Thousand cankers disease remains only in Haywood County

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

The NCFS works with the U.S. 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 TCD 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

Dead Carolina ash due to EAB infestation. Photo by NCFS staff

Since its initial detection in 2013, **emerald ash borer (EAB)** has been found in 65 counties across the state. Three of those being new detections in Bladen, Pitt and Stanly counties in 2022. The 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 is located below:

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

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.

In 2016, a cooperative effort between the NCDA&CS, WNC Communities, the USFS and the 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 with treating hemlocks, more than 100,000 hemlocks have been treated and are either still under protection from treatment, being treated a second time or are part of biocontrol releases. Meanwhile, HRI and the Plant Industries Biocontrol Program continue to release and monitor biocontrol agents that prey on the adelgids. In 2022, 1,629 Laricobius beetles were released for the purpose of biocontrol.

Hemlock wooly adelgid. Photo by NCFS staff

Spongy Month Program

Since 1982, Plant Industry's Spongy Month Program and the USFS Slow the Spread Program has been monitoring the state for **spongy moth**. At the conclusion of the 2022 trapping season, 826 traps captured 1,433 male spongy moths, having 17,248 traps set statewide. This is approximately one-third fewer captures compared to the 2021 season when 726 traps captured 2,096 moths, having 17,455 traps set statewide. Male moth captures don't necessarily indicate that a population of spongy moth is developing, but it does trigger further investigation to determine if females are present and if control is warranted.

Based on 2022 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 applied. For a map of the 2022 spongy moth treatments see:
https://ncagr.maps.arcgis.com/apps/Minimalist/index.html?appid=3df6f80cc8354f61899c5a8056137350%20

Spongy moth 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 spongy moth quarantine in place.

Note: Beginning July 1, 2021, the Entomological Society of America no longer recognized gypsy moth as the common name for lymantria dispar. Spongy moth is the new accepted name.

Elm zigzag sawfly

In 2022, we saw the emergence of a new invasive insect pest in North Carolina. The **elm zigzag sawfly** was first reported in Canada in 2020, then Virginia in 2021 and now in Stokes and Surry counties. It was recorded from multiple sites in both counties and, although a non-regulated invasive species, was the subject of a news release through our agency. The insect was reported to one of our county offices and later identified by county personnel. Forest Health staff with the NCFS were notified, observed the insect and subsequently identified the insect at other sites in the same counties. This pest is causing defoliation to elm trees and known sites will be monitored throughout 2023 to determine if defoliation of the same trees will occur again and if any mortality will be evident.

Left to Right: Elm zigzag sawfly typical feeding pattern, larvae entering the ground to pupate, and defoliation on American elm. Photos by NCFS staff

On the Lookout

Asian longhorned beetles were previously reported in the northeast and midwest over the previous decade, impacting a variety of hardwood species. In May 2020, it was detected for the first time in the near Charleston, S.C. Efforts are underway to control the pest before it spreads further and this species is not wanted in North Carolina. Multiple federal (USDA-APHIS and USFS) and state (Plant Industries Division and the NCFS) agencies are surveying and monitoring for this insect to detect and respond early to any infestation.

Asian longhorned beetle, Credit: Kenneth R. Law, USDA-APHIS, Bugwood.org

Native Pests

Bark Beetles:

Southern pine beetle damage in Eastern N.C. Photo by NCFS staff

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 the state. Since then, beetle activity has been relatively low. However, activity increased during 2017 and 2018 before subsiding again in 2019. In 2021, no southern pine beetle spots were reported. In the spring, the NCFS deployed 39 SPB prediction traps in 39 separate counties across the state. These traps, along with additional traps deployed by the USFS on national forestlands, correctly predicted low SPB activity across the state in 2022. A single, two-acre southern pine beetle spot was reported in the eastern portion of the state.

Southern pine beetle pitch tubes. Photo by NCFS staff

The **Southern Pine Beetle Prevention Program**, funded through a grant from the USFS, partially reimburses nonindustrial, private landowners in North Carolina for the cost of completing forest management practices to improve pine forest health and 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 share projects covering more

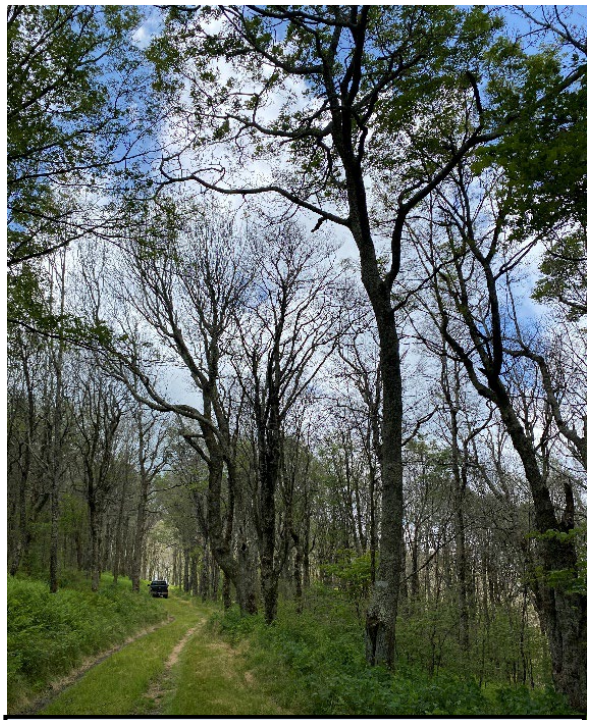
than 82,000 acres in North Carolina aimed at the prevention of SPB. There are 67 additional projects still pending on 4,434 acres.

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 were 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, NCFS 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. Impacted trees recovered in time for 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.

Forest tent caterpillar defoliation. Photo by NCFS staff



Fall cankerworm defoliation. Photo by NCFS Staff

Fall cankerworm made a significant appearance in North Carolina this year. Named for the time of year adult moths emerge, this pest defoliated approximately 1,500 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 2022. Some stands had heavy occurrence while adjacent stands did not.

Heterobasidion root disease has also been observed persisting in Western North Carolina in consecutive years, with most occurrences being in eastern white pine. A new report in the northwestern Piedmont/foothills area of

the state 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 appearing to be in 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 cases seen. **White pine bast scale** and **caliciopsis canker** have also been documented on some sites. This problem appears to be ongoing, and research will continue going forward.

Cause for white pine mortality remains unknown. Photo by NCFS staff

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 from saltwater intrusion into groundwater and other factors. The dead trees resulting from this phenomenon have become known as ghost forests. The Forest Health Program with the NCFS 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 these events. These plots included vegetation surveys of the overstory and understory as well as establishment of photo points. More of these plots will be established in 2023.

"Ghost Forest" site in the outer coastal plain. Photo by NCFS staff

Forest Health Assistance in North Carolina

With assistance and support from the USFS, the NCFS is responsible for helping forest landowners detect and control destructive forest insects and diseases. Forest health specialists direct this responsibility and services are provided to landowners by district and county personnel. Forest Health staff also provide appropriate training along with professional and technical expertise in the diagnosis and control of destructive insects and diseases.

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