



North Carolina Forest Health Highlights



2014

Our Forests

North Carolina's forests cover 18.6 million acres, or about 60 percent of the state's land area. Ninety-seven percent of the forested area (17.9 million acres) is considered available for timber production and classified as timberland.

Most of the state's forested land, (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. Public lands (federal, state and local) total 2.6 million acres.

Recent forest inventory data reveal that the state's forests are growing more wood volume each year than is being harvested or lost due to mortality or conversion to non-forest uses. This is true for both hardwoods and softwoods and is a positive reflection on the ability of the state's forests to sustainably supply goods and services for all North Carolinians. The forest products industry is important to the state, providing nearly 180,000 jobs.

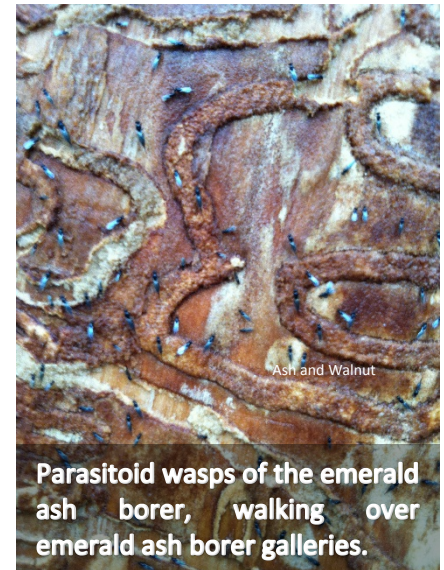
North Carolina's forests are also prized for their scenic beauty, supporting tourism and outdoor recreation, and providing wildlife habitat from the Appalachian Mountains to the lowlands of the Atlantic Coastal Plain. Major forest types in the state include oak-hickory, loblolly-shortleaf pine, oak-pine, and oak-gum-cypress.

2014 Influences on Health of Forests in North Carolina

The beauty and productivity of North Carolina's forests have historically been challenged by a variety of threats. Healthy forests are generally accustomed to pests and conditions that are common to the area where they grow. Outbreaks of common pests may occur periodically and cause a great deal of damage; but, for the most part, forests are resilient and outbreaks eventually subside. Newly introduced pests, on the other hand, can have devastating impacts on the forests of our state as trees may be lacking defense responses necessary to repel attacks from these new threats.

In the past several years, three non-native invasive threats were detected for the first time in the state: **laurel wilt** (2011), **thousand cankers disease** of walnuts (2012), and **emerald ash borer** (2013). In 2014, none of these were detected in new counties, although their range within already infested counties did expand. All three of these threats can be accelerated by the movement of firewood. A map showing where these pests were found at the end of 2014 can be found at the end of this publication.

In addition to these new threats, common pests such as **bark beetles** (especially engraver beetles), insect **defoliators**, and leaf infections by **anthracnose** pathogens were present throughout the state.



Found in Firewood

The movement of infested plants and wood products can spread invasive pests from one area of the state (or country) to another. One common but often overlooked way that these invasive species make it into the state's parks, forests, and private campgrounds is through the movement of firewood.



Some invasive insects, such as the **gypsy moth**, can lay eggs on pieces of firewood. Others, such as **walnut twig beetle** (which carries the fungal pathogen that causes **thousand cankers disease**), **emerald ash borer**, and **redbay ambrosia beetle** (which carries the fungal pathogen that causes **laurel wilt**), spend parts of their lifecycle within wood and can emerge from firewood as adults ready to infest new trees.

One way to help prevent the spread of these dangerous invasive species is by using local firewood. A good rule of thumb is to burn wood within a 50 mile radius of its origin. Additionally, one should not bring firewood into North Carolina from another state unless it has been treated to kill pests, and/or inspected or certified as pest free. If firewood has inadvertently been brought into the state, or has been moved long distances within the state, it should be burned as soon as possible. A nationwide campaign (dontmovefirewood.org) encourages citizens to limit the movement of firewood due to the potential for transporting pests, primarily non-native invasive insects and diseases, from one geographic area to another. Through educational efforts, the state of North Carolina encourages residents and visitors to use local, treated, or inspected firewood to reduce the risk of moving these pests.



Because the transportation of insects and diseases in firewood could have devastating effects on Great Smoky Mountains National Park, park officials have proposed only allowing firewood into the park (in both North Carolina and Tennessee) that has been heat treated. North Carolina's state parks are also encouraging campers to use treated or local firewood during their stays.

Thousand Cankers Disease has not spread, remains only in Haywood County

Late in 2012, **thousand cankers disease (TCD)** was first detected in North Carolina in Haywood County near Cataloochee in Great Smoky Mountains National Park. In North Carolina, black walnut and butternut trees are at risk of infection leading to eventual mortality from the disease. The fungus that causes TCD is carried by the tiny **walnut twig beetle**. Both the fungus and the insect vector were found in walnut trees for the first time in the eastern U.S. in Knoxville, TN in July 2010. Both are native to the southwestern U.S. and Mexico and are thought to have been brought east in infested walnut wood.



In North Carolina, a quarantine was enacted in January 2013 to prohibit the movement of infected materials from Haywood County to unaffected areas of the state. Regulated materials in Haywood County include unprocessed wood from walnut trees, the insect itself, and hardwood firewood. Previously, an external quarantine was implemented against importation of firewood and walnut wood products from states where the disease is known to be present. The North Carolina Forest Service has been actively working with the United States Department of Agriculture Forest Service (USFS), North Carolina Department of Agriculture and Consumer Services (NCDA&CS) Plant Industry Division and the University of Tennessee in trapping and surveying for newly affected areas in the state.

In 2014, no new affected sites were detected (based on 50 walnut twig beetle traps in addition to ground surveys). Being new to eastern forests, there are many unknowns about the insect and disease, including management options available, but research is ongoing.

Emerald Ash Borer not found in any new North Carolina Counties

The first evidence of **emerald ash borer (EAB)** in North Carolina was found during a standard check of emerald ash borer traps in Granville County in 2013 (note: the initial detection was not found in a trap, but in symptomatic trees at several trapping locations). Additional surveying found emerald ash borer activity in the nearby counties of Person, Vance, and Warren Counties. In 2014, EAB was not found in any additional counties, although new sites within these infested counties were detected.



These counties (Granville, Person, Vance, and Warren) are under state and federal **quarantines** to prevent the spread of this pest throughout the state. The movement of ash wood products, the insect itself, and hardwood firewood outside the quarantine area is not permitted without a compliance agreement issued by the NCDA&CS Plant Industry Division. Plant Industry and the N.C. Forest Service are working in cooperation with the U.S. Department of Agriculture (USDA) Animal and Plant Health Inspection Service (APHIS) and USDA Forest Service to monitor and slow the spread of this pest.

The emerald ash borer, which is native to Asia, causes mortality to all species of ash in the U.S. In North Carolina, four species of ash are threatened: green, white, Carolina and pumpkin ash. The first detection of EAB in the U.S. occurred in Michigan in the summer of 2002. This wood-boring insect most likely arrived in the U.S. in wood packing materials originating from Asia, where it is native. It quickly began to spread and in 2013, North Carolina became the 20th state in the country to confirm the presence of the destructive pest. Currently, there is no reliable management option to stop this insect from spreading but individual trees may be protected or saved using insecticides. Localized extinction of ash in North Carolina forests is likely, but the long term effects of such a dramatic change in forest species composition is poorly understood.

Management of EAB is possible with insecticides in urban areas (e.g., ash street trees, park/yard trees), but there is currently no option in forest settings. Research related to long-term management strategies is ongoing and includes biological control (i.e., the release of several parasitoid wasps native to Asia). N.C. Forest Service Forest Health staff became a part of this research in 2013 by releasing parasitic wasps to study the establishment, dispersal, and impact these natural enemies have on suppressing EAB populations and the recovery of ash trees. Continual releases in Granville and Vance Counties total almost 45,000 wasps (September 2013 – November 2014). The wasps, which do not sting humans, are reared in a USDA - APHIS laboratory in Brighton, Michigan and releases are conducted under specific USDA guidelines.



Laurel Wilt Now continues to spread in North Carolina



The devastating **laurel wilt** disease was first confirmed in North Carolina in 2011. The pathogen that causes laurel wilt is from Asia and was first discovered in the U.S. in Georgia in 2003. Since then, it has spread into seven states in the southeast, including North Carolina. In South Carolina, Georgia, and Florida, this disease has killed more than 95 percent of susceptible redbay trees in infected stands and has gained the attention of forest pathologists for its ability to kill healthy, mature trees in only a few weeks. The pathogen that causes laurel wilt is carried from tree to tree by the **redbay ambrosia beetle**.



In North Carolina, this disease is currently found in portions of Bladen, Brunswick, Columbus, New Hanover, Pender, and Sampson counties. Though the disease has been

spreading within previously confirmed counties, it was not been detected in any new counties in 2014.

Only plants in the Laurel family are susceptible to laurel wilt. The most severely affected species are redbay and swampbay, which are medium sized trees commonly found throughout the eastern part of the state, particularly in coastal forests. Other susceptible trees and shrubs in the Laurel family include sassafras, spicebush, pondspice, and pondberry. Due to the possible localized extinction of redbay trees, the Palamedes swallowtail may also potentially suffer the same fate, as it feeds almost exclusively on redbay as a larvae. To assess the impact of the disease on this charismatic butterfly, N.C. Forest Service Forest Health staff is cooperating with Mississippi State University to assess population levels of the butterfly in areas affected and unaffected by laurel wilt. This research began in 2013 and is ongoing.

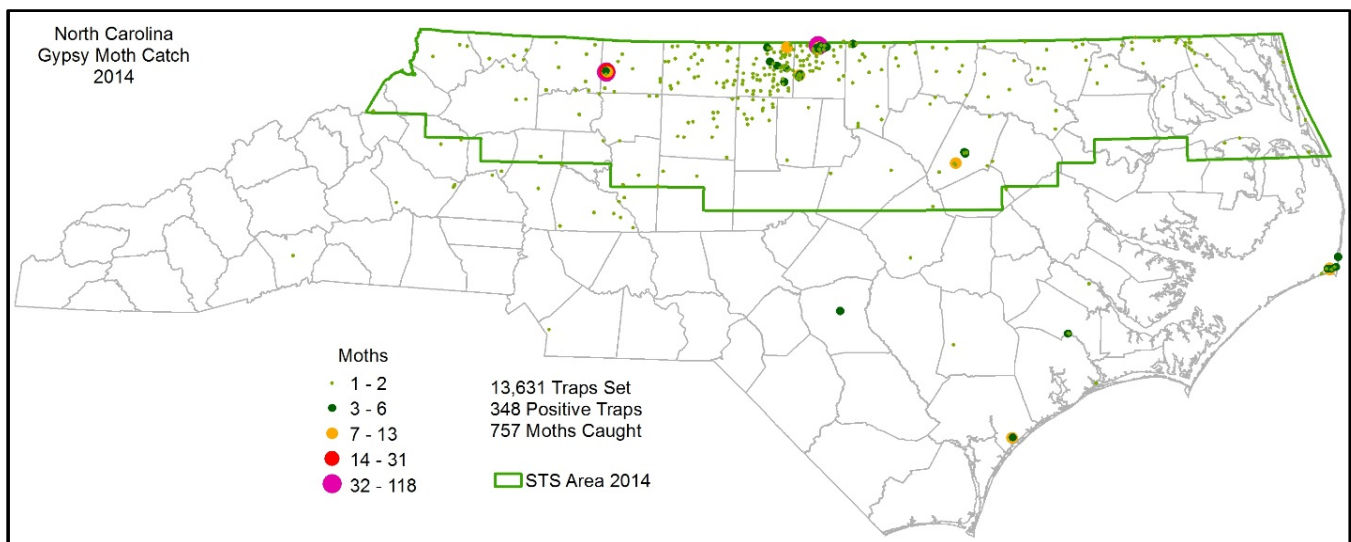
Bark Beetles

The **southern pine beetle (SPB)** has historically been North Carolina's most significant forest insect pest. From 1999 through 2002, the beetle killed at least \$84 million worth of timber in North Carolina. Most of the mortality during that outbreak was in the mountains and western piedmont areas. Since then, beetle activity has been relatively low and there were no reports of southern pine beetle activity on state or private forest lands in 2014. While this pest is currently having a minimal impact on North Carolina's pine trees, prevention efforts remain important because the insect periodically increases to epidemic proportions. Statewide in 2014, **Ips engraver beetles** were a major concern, with higher activity than was seen in recent years. This sudden spike in activity could be due to the high number of trees damaged in two ice storms in early 2014. Damaged trees are more susceptible to attack by secondary bark beetles, especially engraver beetles. **Black turpentine beetle** activity continued to be of concern, but were relatively low and constant from previous years.

Southern pine beetle prevention efforts remain important during periods of low beetle activity. **The Southern Pine Beetle Prevention Program**, funded through a grant from the USDA Forest Service, will reimburse non-industrial private forest landowners in North Carolina for some of the cost of pre-commercial thinning of pine stands. During a pre-commercial thinning, trees with no commercial value are removed in order to allow remaining trees to grow with less competition for food and sunlight. Such thinning improves the health of the remaining trees and reduces the stand's susceptibility to the southern pine beetle. Since the program began, over 65,000 acres have been thinned through this program to encourage proper management conditions for pine stand health and to reduce the likelihood of southern pine beetle infestations.

Gypsy Moth

The entire state of North Carolina has been monitored for **gypsy moth** since 1982 through an effort of the N.C. Department of Agriculture and Consumer Services (NCDA&CS) with assistance from the N.C. Forest Service. The 2014 trapping season is complete and 757 moths were captured in 348 traps. This is higher than last year (2013), when positive trap captures totaled 431 moths within 247 traps.



These trap captures, along with egg mass surveys to be conducted this winter, will play a role in the determination of treatments that will be done in 2015. Treated areas in 2014 (based on 2013 trap catches) included 1,804 acres in northwest Warren County, 174 acres in western Rockingham County, and 517 acres in northern Rockingham County.

The gypsy moth has historically been held at bay from becoming established in North Carolina, with only two counties being quarantined for the pest since 1988 (Currituck County and parts of Dare County). These two counties remain the only two with a gypsy moth quarantine in place.

Insect Defoliators

Several insects that defoliate hardwood trees had greater than normal activity in the state. The native defoliators listed below cause damage that is mainly unsightly, but they usually have little impact on healthy trees in the long-run.

Fall and spring cankerworms were active throughout the piedmont region, primarily in urban areas with Durham experiencing enough activity that citizens were encouraged to install tree bands (sticky bands) around their oak trees in the winter to minimize outbreaks next spring. Defoliation also was reported in Wake County and Charlotte/Mecklenburg County.

Fall webworm populations were also active throughout the eastern half of the state. In addition to munching on the leaves of a variety of hardwoods, the webworm caterpillars create gaudy webs at the ends of branches that cause concern from landowners.

Although **redheaded pine sawflies** were found in large numbers in 2013, 2014 reports of this pine seedling pest were low. This wasp larva attacks young pines trees and is normally naturally managed by native natural enemies.



Storm Damage

In early 2014, two ice storms and a series of tornados affected N.C.'s forested lands. Based on post-storm aerial surveys, the long-term impact on forest health is likely minimal, but landowners may experience localized severe damage. In many cases, young trees leaning under the weight of ice returned to their upright position. The most significant damage is likely the increase in secondary pests following storm events of this nature. In accordance and as previously mentioned, reports of *Ips* engraver beetles were abnormally high in 2014.

Forest Health Assistance in North Carolina

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

North Carolina Department of Agriculture and Consumer Services N.C. Forest Service Forest Health Section 1616 Mail Service Center Raleigh, North Carolina 27699-1616 919-857-4858 http://ncforestservice.gov	United States Department of Agriculture Forest Service Southern Region, State & Private Forestry Forest Health Protection 200 W.T. Weaver Road Asheville, North Carolina 28804 828-257-4320 http://www.fs.fed.us/r8/foresthealth/
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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.agr.state.nc.us/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

The devastating pests above are likely to be brought into or moved around North Carolina in or on firewood. The use of local firewood is an important factor in preventing the spread of potentially devastating invasive species in our state's forests. Please keep this in mind as you prepare for your outdoor recreation activities.

**The N.C.
Forest Service
asks that you
please use
local firewood.**



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The data used to create this map were compiled from a variety of publicly available sources and are correct to the best of our knowledge.

Map Created 11/6/2014
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