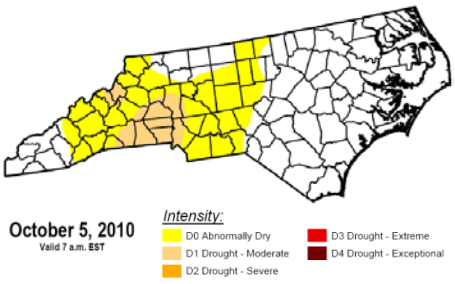
North Carolina Forest Health Highlights 2010

Our Forests

North Carolina's forests cover 18.6 million acres, or about 60 percent of the state's land area. The majority of the state's forested land, some 12 million acres, is in non-industrial private ownership, while approximately 1.1 million acres are in national forests. Forestry is the state's second most important industry, providing 83,000 jobs and producing $6 billion in annual revenue. 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. Longleaf-slash pine forests, historically much more widespread, now comprise only 2 percent of the state's forests.

2010 Forest Influences

Drought Conditions Continue to Have Lingering Effects on Trees



Though drought intensity in North Carolina has been relatively low for most of the year, lingering drought conditions continue to have both direct and indirect effects on forest health in North Carolina. Scattered pine mortality associated with **bark beetles** remained common across the entire state and was the result of increased susceptibility brought on by drought conditions in previous years. Oak mortality associated with drought and **oak decline** was also commonly observed. While much of North Carolina is around average annual precipitation levels, large precipitation events have also been followed by long periods of dry weather creating intermittent periods of drought that are a significant stress on trees, and why we continue (and will continue) to see stress related issues.

Cost-Share Available For Thinning To Prevent SPB

Southern pine beetle prevention efforts remain important during periods of low beetle activity. The N.C. Division of Forest Resources manages an ongoing Southern Pine Beetle Prevention Cost-Share Program with a grant from the U.S. Forest Service to assist landowners in timber stand improvement work (particularly pre-commercial thinning). In the past five years, nearly 50,000 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.

Bark Beetles—Ips Beetles Having a Larger Impact than SPB

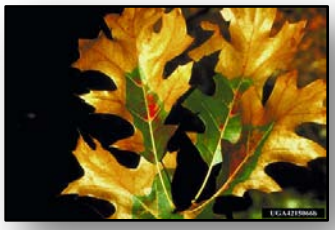
The **southern pine beetle** (SPB) is North Carolina's most significant forest insect pest. Southern pine beetle

populations remained low throughout North Carolina this year; only five reported spots totaling 70 affected trees. No significant spread of spots was observed. None of the spots were on national forest or other federal lands. Reports show ***Ips* engraver beetles** had moderate to heavy activity statewide due to lingering drought conditions. Although *Ips* infestations tend to be relatively small and scattered, and usually cannot be effectively controlled or efficiently salvaged, their economic impact may approach that caused by southern pine beetles.

Oak Decline Still a Concern After Years of Drought Conditions

The incidence of oak decline in North Carolina has remained high for the past several years. **Oak decline** is not caused by a single insect or disease but is instead the product of the interaction between environmental conditions and a variety of forest pests. This decline complex can cause mortality in both urban areas and forests. All species of oak can be affected and the decline complex is now common in all areas of the state. Years of drought conditions have led to an increase in oak decline incidence and severity, especially in older hardwood forests and in areas with shallow, or compacted or disturbed soils.

Presence of Oak Wilt Confirmed in Seven Mountain County Locations



Oak wilt is a vascular disease caused by a fungus that kills oaks. In North Carolina, **oak wilt** has historically been found in seven counties, with the majority of disease centers confined in a five county area near the North Carolina-Tennessee state line. This year's annual survey confirmed oak wilt in seven locations, six of which were new sites. These confirmed sites were found in Buncombe (2), Haywood (4), and Madison (1) Counties.

Hemlock Woolly Now Found Throughout the Entire Range of Hemlocks in the State

The **hemlock woolly adelgid** continues to wreak havoc in North Carolina. These tiny insects, introduced from Asia, attach themselves to the base of hemlock needles and feed on their sap. In large numbers, adelgids can kill a tree by depleting its energy reserves. While the hemlock woolly adelgid has been present throughout most of western North Carolina for more than a decade, this year it was discovered for the first time in Iredell and Wake counties, meaning the adelgid now officially infests the entire natural range of hemlocks in the state. The infestation in Wake County threatens an isolated population of hemlocks in the Hemlock Bluffs Nature Preserve located far from the normal range of hemlocks. Range-wide, many hemlocks have already succumbed to the hemlock woolly adelgid, and many continue to die. The use of systemic insecticides has been the primary control method used on state and private forests, with periodic releases of predatory beetles occurring on state and national forests. Most chemical control measures are confined to urban landscape trees, and forest trees of high aesthetic, historic, or sentimental value on private lands. Hemlock mortality caused by the adelgid continues to outpace efforts to control this pest.

State and Federal Programs Continue to be Effective in Minimizing Gypsy Moth Spread into the State

Originating from Europe, the **gypsy moth** was initially introduced into the United States near Boston in 1869. Since then, it has spread to and defoliated mainly hardwood trees in Northeastern, Mid-Atlantic, and Midwestern states. Repeated

defoliations can lead to tree mortality. In North Carolina, Currituck County and a portion of Dare County are the only areas considered "generally infested" and are quarantined to regulate the movement of forest products and other items that could carry the insect to non-quarantined areas. Periodically, gypsy moths enter other areas of the state (primarily on firewood and recreation vehicles/equipment) from the north. The N.C. Department of Agriculture and Consumer Services (NCDA&CS), with assistance from the Gypsy Moth Slow the Spread Program, the U.S. Department of Agriculture, and N.C. Division of Forest Resources, traps and monitors for the presence of gypsy moth populations in the state and takes action to eradicate these populations before they become well established. In 2010, NCDA&CS trapped all 100 counties and treated nearly 7,800 infested acres of forestland in five counties (Caswell, Currituck, Onslow, Warren and Wayne) to control this pest.

Charlotte's Program Keeps Fall Cankerworm Under Control

Since the City of Charlotte conducted an aerial spray program on 65,000 acres of the city in 2008, **fall cankerworm** populations have decreased significantly. Since the tree defoliating pest was not completely eradicated, the city is continuing to trap and monitor for fall cankerworm on street trees and is encouraging citizens to install traps on trees located on private property as well.

Non-Native Invasive Plants Impact Forests and Provide Challenges to Effective Forest Management

North Carolina foresters, landowners, and homeowners have been increasingly encountering and attempting to control a large variety of non-native invasive plant species on properties they own and manage. These weedy plants create problems for forests and forest management by: outcompeting/displacing native vegetation; impacting species composition; reducing biodiversity in stands; damaging wildlife habitat; providing challenges to management, site preparation and reforestation; and, increasing the risk and intensity of wildfires.

The North Carolina Division of Forest Resources' staff was polled to develop a list of species that most affect forests and forest management in the state. The top 20 most problematic weeds (starting with the worst) are listed to the right. These plants, and other nonnative invasive plant species, are receiving increasing attention in forest management and fire management throughout the state.

1. *Privets (Chinese, Japanese)*
2. *Kudzu*
3. *Stiltgrass/Microstegia*
4. *Wisteria*
5. *Honeysuckle (Japanese, Bush)*
6. *Tree of Heaven*
7. *Multiflora Rose*
8. *Lespedeza, (All Nonnative)*
9. *Fescue*
10. *Phragmites/Common Reed*
11. *Mimosa*
12. *Oriental Bittersweet*
13. *Johnsongrass*
14. *Bamboo*
15. *Princess Tree/Paulownia*
16. *Bradford/Callery Pear*
17. *Chinaberry*
18. *Chinese Silvergrass*
19. *Olives (Russian, Autumn)*
20. *English Ivy*

Early Detection and Rapid Response

Emerging Threats Can Greatly Impact a Variety of Forest Tree Species in the Future

In addition to the 'forest influences' already occurring within the state's borders, there are a number of non-native invasive insect, disease, and plant species that threaten to move into the state and affect our forests in the future. These species are constantly being monitored and plans are being updated to deal with these threats as they make their way into North Carolina. The following pests are not known to be present in North Carolina but are found in adjacent states or have the capability to move large distances, either naturally or through introduction. These species have potential to cause immeasurable damage to a variety of tree species and forest ecosystems in the state, especially since most are recent introductions to the United States and control practices have not yet been developed. Through information and education efforts to limit spread, surveys to detect introductions early, and rapid responses to threats, the North Carolina Division of Forest Resources personnel,

along with other state and federal agencies will enact control efforts, where feasible, to delay or minimize the threats caused by these pests.

Thousand Cankers Disease Cankers

Laurel Wilt Mortality

Emerald Ash Borer Galleries

Sudden Oak Death Mortality

Cogongrass Invading Woodlands

Thousand Cankers Disease Causes Threat of Walnut Tree Decline and Mortality

Black walnut trees in North Carolina are at risk of infection leading to eventual mortality from a disease that was previously known to be active only in western states. The fungus that causes **thousand cankers disease** is carried by the **walnut twig beetle**, a tiny bark beetle. Both the fungus and the insect vector were found in walnut trees for the first time in the east in Knoxville, TN in July 2010, and more recently were revealed to be affecting hundreds of trees in at least four surrounding counties. Some experts suspect that the disease could have been present in Tennessee for 15-20 years. In North Carolina, an external quarantine was implemented against importation of firewood and other walnut products from areas where the disease is known to be present. An early detection survey in seven North Carolina mountain counties was conducted by the Division of Forest Resources with state and federal partners and found no evidence to date that the beetle or the pathogen are present in this state.

Destructive Laurel Wilt Disease Close to North Carolina State Line

Redbay ambrosia beetles serve as vectors for the fungus that causes **laurel wilt**, a destructive disease of redbay and other species of the laurel family (including swampbay, sassafras, spicebush, and pondspice) found in the state. Various species of wildlife and rare butterflies depend on laurel species and may be impacted by mortality of host species. First detected in the United States near Savannah, Georgia, in 2002, the beetle is believed to have been introduced in wooden crating materials used in shipping of goods from its native range in Southeast Asia. The non-native, highly virulent invasive wilt-inducing fungus is believed to have arrived in the U.S. along with the beetle. Spreading at an average rate of 20 miles per year, laurel wilt has caused high levels of redbay mortality in coastal plain areas of South Carolina, Georgia, and Florida. In 2009, laurel wilt was observed in Horry County, near Myrtle Beach, South Carolina. Neither the insect, nor the disease has been detected in North Carolina, but their arrival in our state is imminent. At this time, there are no reliable controls for this disease, although movement of wood debris and firewood from affected trees is being discouraged to minimize spread of both the insect and the fungus.

New Discoveries of Emerald Ash Borer Reveal Ash Tree Killer Closer to North Carolina

First discovered in Michigan in the summer of 2002, this tiny wood boring insect most likely arrived in the United States in solid wood packing material from Asia. Since its discovery, **emerald ash borer** has killed tens of millions of ash trees in Michigan, Ohio, Illinois, Indiana, Pennsylvania, West Virginia, Maryland, Virginia, Missouri, Wisconsin, Minnesota, Kentucky, and Ontario and Quebec, Canada. More recently, emerald ash borer was detected in Knoxville, TN, making its entrance into North Carolina seem more imminent. Quarantines have been placed around areas of known infestations to limit movement of firewood and ash wood products into non-infested areas. All species of ash found in North Carolina can be attacked and killed by this insect. Currently, there is no reliable control method to stop this insect from spreading. The inevitable arrival of this insect in North Carolina poses a serious threat to ash species; localized extinction of ash is likely, but the long term effects of such a dramatic change in forest species composition is poorly understood. One of the major contributors to dispersal of this insect is the movement of firewood. Movement of wood materials,

including non-heat treated firewood, from all but local sources is discouraged to slow the spread of this destructive insect into the state.

Nursery Plant Disease Threatens Oaks

Tens of thousands of oak and tanoak trees in the coastal areas of California and Oregon have been killed by this recently discovered plant disease caused by a fungus-like microorganism. Many of North Carolina's native oak species are also known to be susceptible to this pathogen. While the list of host plants that can be infected is very large, oaks are the most seriously affected and can be killed in just a few years. Other plant species, such as our native rhododendron and mountain laurel, along with a wide variety of ornamentals commonly used for landscaping, may only suffer from leaf and shoot blight symptoms but can spread the disease to nearby oaks. Suitable hosts and cool, moist weather conditions make forests in the mountains and foothills especially at risk, though all of North Carolina is threatened. The pathogen causing **sudden oak death** and **ramorum leaf blight** was first introduced into North Carolina in 2004 in plant nursery shipments of mostly camellias and rhododendrons from California and affected plants were quickly eradicated. Since then, NCDA&CS, Plant Industry Division has inspected plant nurseries on a regular basis and has put a high priority on detecting and eradicating any new introductions of infected nursery stock. As a part of a cooperative national project coordinated and funded by the USDA Forest Service, the N.C. Division of Forest Resources conducts annual surveys of areas outside of suspected nurseries to determine if the pathogen may have escaped into the environment. The pathogen that causes sudden oak death (***Phytophthora ramorum***) was confirmed in a stream sample outside of an infected nursery in the summer of 2010. Surveys are ongoing to determine if the pathogen is present in the surrounding plant communities. To date, surveys in North Carolina have not detected the presence of the pathogen in forest or landscape vegetation outside of nurseries receiving infected plants.

Aggressive Cogongrass Spreading Throughout the Southeast

This weed has been ranked as one of the ten worst weeds in the world. The perennial grass was introduced from Southeast Asia as packing material and as potential forage and erosion control vegetation and is now found in Alabama, Florida, Georgia, Mississippi, South Carolina and Tennessee. Disturbed roadsides, forests, and open fields can be invaded and overtaken by **cogongrass**. It forms dense thatch and leaf mats that make it virtually impossible for other plants to compete or coexist. In addition, cogongrass is cold hardy, and tolerant of shade, high soil salinity and drought. Large infestations of cogongrass can alter the normal fire regime of a fire-driven ecosystem by causing more frequent and intense fires that injure or destroy native plants. Cogongrass displaces a large variety of native plant species used by animals (e.g., insects, mammals, and birds) as forage, host plants and shelter. Some ground-nesting species have also been known to be displaced due to the dense cover that cogongrass creates.

Forest Health Threats Related to the Movement of Firewood

Firewood Movement Traced To Unintentional Introductions of Hitchhiking Pests

Insects and diseases that are transported by way of commercial, residential, or recreational firewood affect many species of forest trees. The following table illustrates the various non-native invasive forest pests capable of damaging North Carolina's forest trees that are directly traceable to interstate and intrastate movement of firewood. Natural movement of invasive pests may be limited to a few hundred feet or up to 20 miles per year. However, movement of pests in firewood can be 300 to 600 miles per day. A national campaign is underway 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. The state of North Carolina has started an educational effort to encourage residents and visitors to use local firewood or firewood that has been treated and thoroughly inspected for hitchhiking pests.

Forest threat organisms potentially transported in firewood

Presently Found in North Carolina		Not Present in North Carolina, But Can be Introduced Through Firewood Movement	
Insects	**Diseases/Pathogens**	**Insects**	**Diseases/Pathogens**
Balsam woolly adelgid *	Beech bark disease	Asian longhorn beetle	Laurel wilt
Gypsy moth	Butternut canker*	Emerald ash borer	
Hemlock woolly adelgid *	Dogwood anthracnose	Redbay ambrosia beetle	
Pine bark adelgid *	Oak wilt	Sirex woodwasp	

* Movement of this pest in firewood is not likely, but possible

Forest Health Assistance in North Carolina

With assistance and support from the USDA Forest Service, the N.C. Division of Forest Resources is responsible for providing assistance to the forest landowners of the state in the detection and control of destructive forest insects and diseases. A staff of pest control foresters and technicians in the Forest Protection Section directs this responsibility. Services are provided to forest landowners by district and county personnel with the pest control staff providing appropriate training along with professional and technical expertise in the diagnosis and control of destructive insects and diseases.

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Division of Forest Resources
Pest Control Branch
1616 Mail Service Center
Raleigh, NC 27699-1616
919-857-4858
http://www.dfr.state.nc.us/forest_health/forest_health.htm

USDA Forest Service
Southern Region, State & Private Forestry
Forest Health Protection
200 W.T. Weaver Road
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http://www.fs.fed.us/r8/foresthealth/

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