

# 2012 Forest Health Highlights



Michigan Department of Natural Resources

# Acknowledgments

Forest Health Highlights is a summary of the condition of Michigan's forests during 2012 and the work done to preserve and protect them by Forest Resources Division, Department of Natural Resources, [www.michigan.gov/foresthealth](http://www.michigan.gov/foresthealth).

**Written by:**

Michigan Department of Natural Resources  
Forest Resources Division staff

**Photographs and design by:**

Michigan Department of Natural Resources  
Marketing and Outreach Division staff  
Forest Resources Division staff  
United States Department of Agriculture  
Forest Service  
Michigan Department of Agriculture and Rural Development  
Michigan State University  
Michigan Technological University

**Maps and other information provided by:**

Michigan Department of Agriculture and Rural Development  
United States Department of Agriculture  
Forest Service  
Animal and Plant Health Inspection Service  
Michigan State University Extension

The Michigan Department of Natural Resources is committed to the conservation, protection, management, use and enjoyment of the state's natural and cultural resources for current and future generations.

For more information, visit [www.michigan.gov/dnr](http://www.michigan.gov/dnr).

# Table of Contents

- Forest Resource Overview ..... 4
- Michigan Department of Natural Resources Forest Health Program ..... 5
- Feature: Harvesting Ash and American Beech Ahead of EAB and BBD Impacts...** 6
- Insects & Diseases..... 8
  - Heterobasidion* Root Disease..... 9
  - Asian Longhorned Beetle..... 10
  - Beech Bark Disease ..... 12
    - BBD Research Update..... 13
  - Resistant American Beech Project ..... 14
  - Emerald Ash Borer ..... 15
  - Spring Defoliators..... 17
  - Eastern Larch Beetle..... 17
  - Hemlock Woolly Adelgid ..... 18
  - Oak Wilt ..... 19
    - Upper Peninsula Oak Wilt Control Project ..... 21
  - Spruce Budworm ..... 22
  - Thousand Cankers Disease and Walnut Twig Beetle ..... 23
  - Jack Pine Budworm ..... 25
  - Balsam Woolly Adelgid ..... 26
  - Firewood Movement..... 27
- Forest Decline ..... 29
  - Maple Decline ..... 30
  - Drought and Forest Health ..... 32
  - White Pine Dieback ..... 33
- Invasive Plant Control..... 34
- Other Forest Health Highlights ..... 37
  - Locust Leafminer ..... 38
  - March Snowstorm ..... 39
  - Duck Lake Fire..... 40
  - Miscellaneous Pests..... 42

# Forest Resource Overview

Michigan is a state like no other in the nation, with its two peninsulas surrounded by the largest system of fresh surface water on Earth. From the warmer agriculture and urban areas in the south to the colder wooded lands in the north, the state offers unique ecosystems and land uses and one of the most diverse forests in the United States.



Nearly all of the forest land in Michigan was cut or burned during European settlement. The bulk of the lumber boom and most of the fires occurred in the late 1800s and early 1900s. By 1920, the lumber boom had ended and secondary succession was in full swing with the recovery of the forests. Since then, these forests have been maturing.

Today, Michigan has more forest land than any other state in the Northeast or Midwest. The rich diversity of our urban and rural forests is being threatened, however, by exotic insects, plants and diseases finding their way into the state from around the world.

Invasive organisms like emerald ash borer, beech bark disease and oak wilt are affecting thousands of acres in Michigan and killing millions of trees. Without a plan of action, entire species of native trees are at risk of disappearing from our forests.

The solution to this growing crisis lies largely in public awareness. Understanding the role humans play in the accidental introduction of exotic pests into our forests is a vital first step in halting the problem.

The 2012 Michigan Forest Health Highlights publication is dedicated to getting the word out about the work the Department of Natural Resources and collaborative organizations are doing to protect our state's exceptional forest resource.

- Among the 50 states, Michigan ranks 22nd in land area and 10th in forest land area.
- Forest land accounts for 20.1 million acres or 54 percent of land in Michigan; 97 percent or 19.4 million acres is timberland.
- Sugar maple dominated forest types (sugar maple-beech-yellow birch and hard maple-basswood) are the predominate forest types (26 percent of timberland/forest land). Northern white-cedar (7 percent) and red pine (4 percent) are the most abundant softwood forest types.
- Of Michigan's forest land, 62 percent (12.4 million acres) is owned by families, individuals, private corporations and other private groups. The remaining 38 percent (7.6 million acres) is managed by federal, state and local government agencies.
- Sixty-five percent of Forest Inventory and Analysis plots sampled for nonnative species had at least one identifiable nonnative species. Higher ratios of nonnative to total species were evident in the Lower Peninsula.

# Michigan Department of Natural Resources Forest Health Program

The Michigan Department of Natural Resources Forest Health Program grew out of a 1970s collaboration between Michigan State University, the U.S. Department of Agriculture (USDA) Forest Service's Northeastern Area State & Private Forestry Unit, and the DNR's then-Forest Management Division.

This interagency cooperation still drives the Forest Health Program today. Our services are coordinated with all three Michigan forestry schools, the MSU Extension, the Michigan Department of Agriculture and Rural Development, the North Central Forest Experiment Station and the USDA Animal & Plant Health Inspection Service. Additionally, it includes strong cooperative ventures with other state forest health programs. The Northeastern Area State & Private Forestry program plays a strong coordinating role regionally and nationally.

Beginning in the early 1990s, Michigan's Forest Health Program became increasingly involved in multistate and national forest health issues. These efforts were, in part, a response to a new era of exotic forest pest challenges and ever-increasing demands and needs for quantifiable, high-quality information about the health of our forests.

In a 1997 effort to improve program utility and efficiency, a team structure was adopted to better serve the demands of national and statewide initiatives and of local programs across all forest ownerships in Michigan. Forest health activities were divided between two new programs: Forest Health Monitoring and Forest Health

Management, coordinated statewide by two forest health specialists. These programs are supervised statewide by the Forest Health Unit manager.

In 2012, a forest health technician was added to the team to assist with field activities statewide. The technician's responsibilities include conducting a variety of ground and aerial surveys, collecting and processing survey data and assisting with forest health outreach activities.



*Anna River Valley in Munising, Mich.*

# Harvesting Ash and American Beech Ahead of EAB and BBD Impacts

Foresters from the Department of Natural Resources and Michigan Technological University are examining thousands of acres of state forest land with American beech and ash species doomed by the continuing spread of beech bark disease (BBD) and the emerald ash borer (EAB).

As this forest resource is assessed and mapped, efforts are being mounted to salvage at-risk timber values before they are lost due to impacts of these two exotic forest pests.



*Beech snap caused by beech bark disease.*

This effort is funded in part by federal grants from the Great Lakes Restoration Initiative and the Pest and Disease Revolving Loan Fund, which are administered by the U.S. Department of Agriculture Forest Service's State and Private Forestry, Forest Health Program.

Since the discovery of BBD in 2000, and EAB in 2002, millions of beech and ash trees have been killed. In addition to timber values, beech is an important mast, or nut, producer for

wildlife, and a tree with great aesthetic appeal due to its smooth gray bark and large spreading canopies. It is also known as the "initials tree" as the smooth bark often hosts the names or initials of people wishing to leave a sign of their visit to a state park or other forested areas.



*Impact of beech bark disease in Michigan's Luce County.*

Ash samaras (winged seeds) are important forage for many species of birds and small mammals. Cavities in both beech and ash trees are used by nesting birds and gray squirrels.

Forest inventory of state-managed forest land reports 448,000 acres with a few, to many, ash and/or American beech of all sizes. Of this area, 166,000 acres have ash and/or beech with an 8-inch or greater diameter, and comprise at least 10 percent of the stand. It is within these 166,000 acres that ash/beech salvage efforts will take place.

Deciding which areas to harvest in the next few years, and in what order to harvest the targeted areas are the next challenges. Surveys to date have detected areas where ash and beech forests in the Upper Peninsula and northern Lower Peninsula have not yet been affected by EAB or BBD.

Criteria used to make harvest decisions include:

- Whether the resource is infested;

# EAB and BBD Impacts *continued*

- Proximity of uninfested resources to the nearest infested site;
- Value and volume of the at-risk resource; and
- Ease of access.

A primary goal of this effort is to promote healthy forests through harvest prescriptions which remove most of the beech and ash, and replaces them with a desired mix of productive species. Desirable tree species have value in terms of forest products, as well as benefits to certain wildlife species. It is not the goal to remove all beech or ash, but to remove and replace many of these trees so that the impacts of anticipated mortality will not significantly impair the quality or productivity of the remaining forest.

In addition to the harvests, a portion of the federal funds for this project are being used to support the writing of forest management plans on private lands that have a significant ash or American beech component.



*Ash tree mortality as a result of emerald ash borer.*

# Insects & Diseases

*Healthy and productive forests are comprised of a diversity of native tree, shrub and herbaceous plant species, as well as an even larger number of faunal species for which forests provide habitat. Forested ecosystems have continuously adapted and evolved over thousands of years, as insect, plant and animal species are naturally, intentionally or inadvertently introduced or extirpated from ecosystems. Prevention and mitigation of invasive plants, insects and disease introductions are important for the maintenance of healthy and productive forests.*

From "Michigan Forest Resource Assessment & Strategy"

June 2010



# Heterobasidion Root Disease

Efforts to delimit the occurrence of *Heterobasidion* root disease (HRD) continued in 2012. Surveys were concentrated in the northwest Lower Peninsula in the region where HRD was confirmed in 2011. Numerous pockets of pine mortality in actively managed plantations were surveyed this year. No new infections of HRD were confirmed.



Unlike many forest insects and diseases that are attracted to stands stressed by lack of management, HRD is most commonly found in actively managed forest stands.

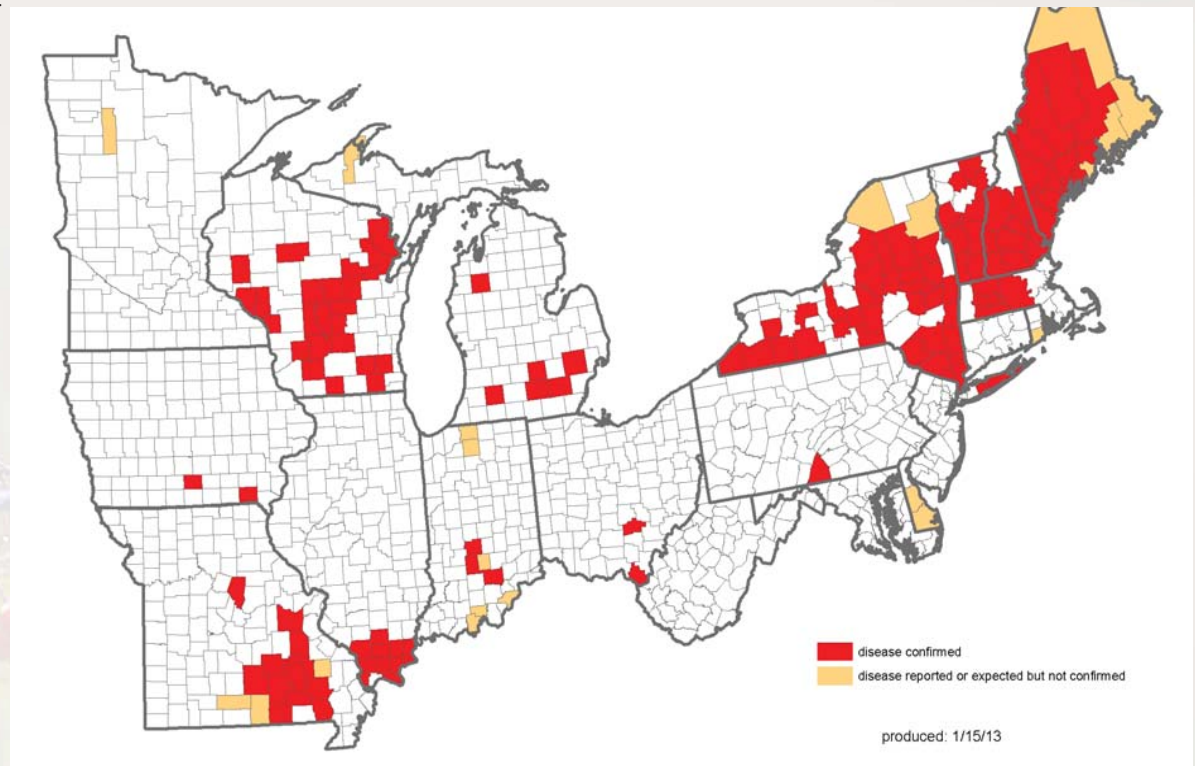
In Michigan, red pine, jack pine and white

pine are most susceptible. Fresh cut stumps provide an ideal entry path for spores of HRD, which move through grafted roots to infect healthy trees. Infected trees suffer from thinned crowns and reduced height, diameter and shoot growth. Over time, circular pockets of dead and dying trees mark the progression of the disease.

Caused by the fungus *Heterobasidion irregulare* (formerly *Heterobasidion annosum*), this disease is considered among the most destructive fungi in North American forests. Effective control measures for HRD have been developed. Fungicides applied to freshly cut stumps prevent HRD from entering and moving to healthy trees through the root system. This approach, while effective, would pose additional costs and restrictions on the harvest of Michigan's pine resources.

With the discovery of an active HRD infection in Wexford County in 2011, and with HRD being established across much of our neighboring state Wisconsin, early identification and containment of HRD in Michigan has become a forest health priority.

In 2013 the Department of Natural Resources will work with Michigan Technological University to conduct statewide surveys to delimit the presence and distribution of HRD in Michigan. Intensified identification of pockets of pine mortality through routine inventory and by aerial survey will be important in developing an adequate pool of potential HRD sites to aid in this statewide survey.



Distribution of *Heterobasidion* Root Disease in the northeastern U.S. – 2012.

# Asian Longhorned Beetle

With the detection of Asian longhorned beetle (ALB) in Bethel, Ohio – only a four-hour drive from Michigan’s southern border – the Department



of Natural Resources has intensified efforts of early detection to prevent this destructive forest pest from becoming established in Michigan.

In late April 2012, several staff from the DNR Forest Resources Division (FRD) and the Michigan Department of Agriculture and Rural Development traveled to Bethel to get firsthand experience

with an active ALB infestation. The staff’s impression was that this is a slow-spreading type of infestation that is very difficult to control.

The potential for accidental spread by human activity, through the movement of firewood or other wood products, prior to detection means the potential for outlier populations is a serious concern. It is estimated that the infestation in Bethel had been established for more than 10 years before it was discovered. That is 10 years prior to the implementation of any quarantine restricting the movement of wood products out of the area. Ten years in which someone could have unknowingly spread ALB from the infested area.

In cooperation with DNR Parks and Recreation Division employees and volunteers, FRD staff surveyed for ALB in 61 state parks and recreation

areas in 2012. Surveys were targeted to high-risk locations with susceptible host species: maple, elm, willow and birch. In addition to these visual surveys, the DNR instituted a pheromone-trapping program that specifically targeted campgrounds known to have been visited by residents of documented ALB areas. This was tracked using visitors’ home zip codes.

Campgrounds are of the greatest concern and pose the highest risk because ALB can easily be transported in firewood. Traps were installed and monitored throughout the period when adult ALB would be active, if they were present. No ALB were detected as a result of the 2012 survey.



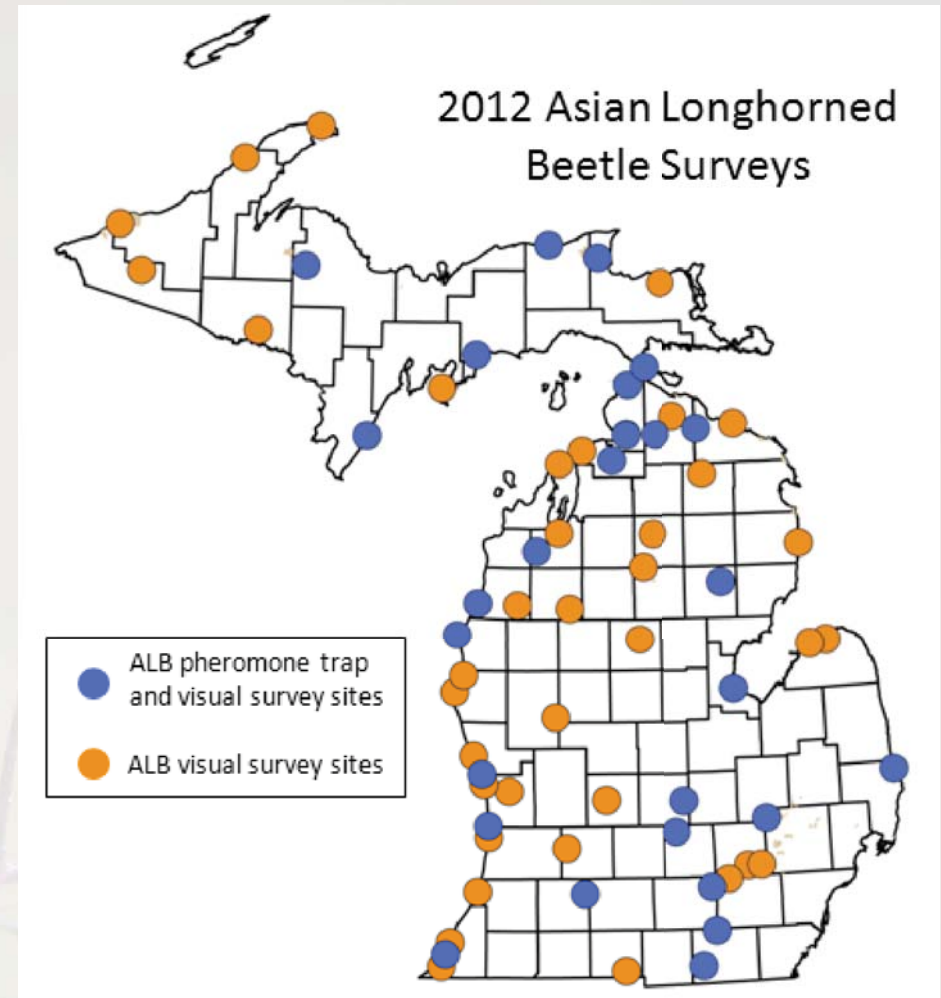
*Asian longhorned beetle infested firewood.*

# Asian Longhorned Beetle *continued*

Forest Health Program staff also inspected numerous sites to follow up on reports from concerned citizens whose descriptions of observations matched ALB symptoms.

During the 2012 season, there was an increase in the number of suspect specimens being reported by the public to DNR offices across the state. In most credible cases these were the native white-spotted pine sawyer beetle – not ALB. The increase in reporting is encouraging in that it indicates an increased public awareness of the threat ALB poses to Michigan's forests.

Plans for 2013 are to expand and continue these cooperative efforts at early detection of ALB in high-risk areas.



# Beech Bark Disease

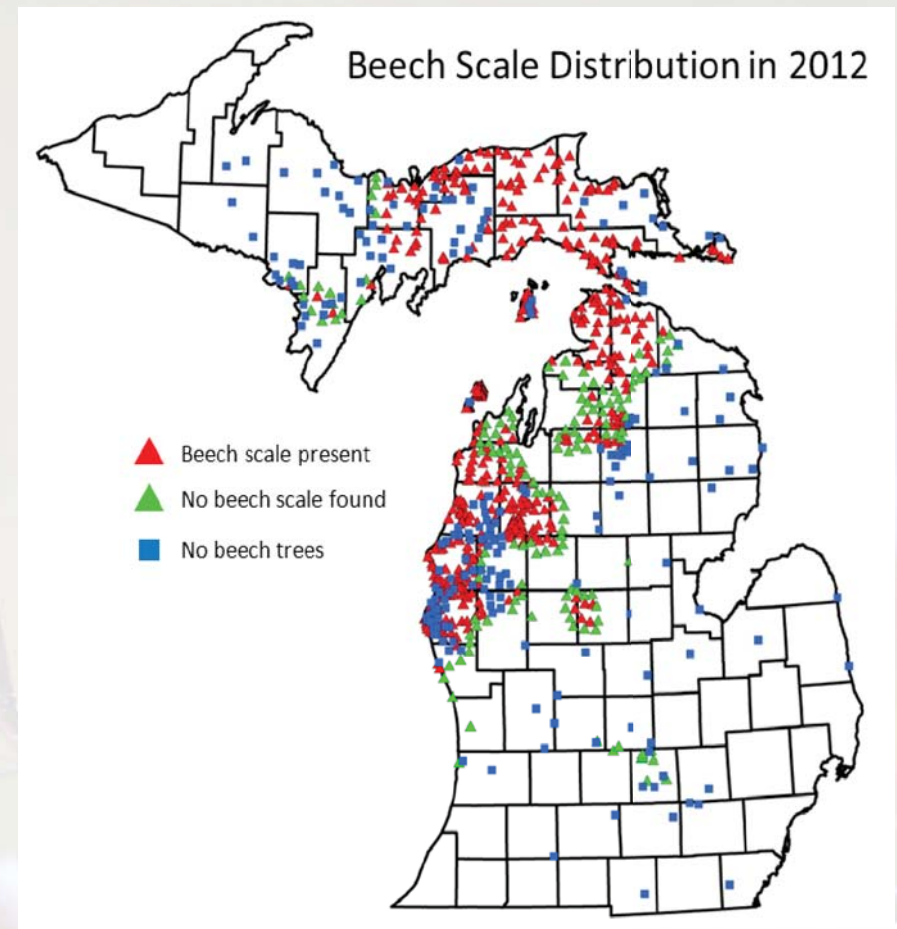


Scale-infested beech trees marked for salvage.

Since the discovery of beech bark disease (BBD) in 2000, this exotic disease has spread widely through Michigan's forests. BBD is initiated by a scale insect that attaches to the tree and feeds on sap. Damage from this feeding allows one of two *Neonectria* fungi to invade the tree. The fungus inhibits the flow of sap through infested portions of the tree, causing a general decline in tree health – eventually killing it. Controlling the natural spread of BBD is not feasible because both the scale and fungus are moved by the wind. According to the latest U.S. Department of

Agriculture Forest Service Forest Inventory and Analysis (FIA) data for the period 2007-2011, there are 31.6 million American beech trees greater than 5 inches in diameter and 2.5 million standing dead beech in the same size category. The FIA report estimates annual beech mortality in this time period to be 5.3 million cubic feet of growing stock beech and 21.1 million board feet of sawtimber beech. Much of this loss is in the eastern Upper Peninsula

where the beech resource has been greatly affected. Michigan's American beech resource is under attack as newly infested areas are being reported in the Lower Peninsula every year.



J.B. Wieferich and D.G. McCullough, 2012.

# Beech Bark Disease Research Update

## Progression and Impact of Beech Bark Disease in Michigan

*James Wieferich and Dr. Deborah McCullough*

*Michigan State University*

In 2012 we revisited beech bark disease (BBD) plots established in 2002 and 2003 to document changes in beech scale density, tree mortality and crown condition, understory and overstory tree species composition, and down woody material.



*Forest health specialists study the results of beech bark disease.*

In 2003, beech scale was present in only 23 of the 62 sites, including 14 sites in the Upper Peninsula (U.P.) and nine in the Lower Peninsula (L.P.). Beech scale is now present in 55 of the 62 sites, including 33 of the 34 sites in the U.P. and 22 of the 28 sites in the L.P. Overall, 44 sites are heavily infested, including 26 sites in the U.P. and

18 sites in the L.P. Most of the beech range in the U.P. is now infested by beech scale, with the exception of one site in an area west of Marquette that remains uninfested.

On average, beech mortality has doubled since 2002 and is especially high in the eastern U.P. In the 14 U.P. stands that were infested with beech scale in 2003, 49.4 percent of beech trees are now dead. In contrast, only 8.5 percent of beech trees are dead in the nine previously infested stands in the L.P.

Sugar maple and red maple seedlings dominated regeneration in the study stands. Beech dominated the sapling size class, accounting for 62.7 percent of all saplings, followed by sugar maple (18.3 percent) and ironwood (4.9 percent).

While the total volume of down woody material in 2012 and 2002 is similar, the proportion of the pieces that are relatively fresh has increased substantially. This increase appears to reflect beech mortality. Of the fresh down woody material, 94.3 percent of the pieces were identifiable and of those, 68.3 percent were beech. In high mortality areas in the U.P., we encountered numerous beech snags that have yet to fall. Composition of down woody material will likely continue to shift from older decayed logs to fresh beech logs as beech snags break and fall to the ground.

Beech scale has become established across most of the beech range in the U.P. and in much of the northwest and north central L.P., including several islands in Lake Michigan and Lake Huron.

Between 2005 and 2007, beech scale infestations expanded by an average of 4 km and 1.5 km per year in the U.P. and the L.P., respectively. More recent data from 2008-2012 suggest beech scale spread rates are extremely variable; some areas spread rapidly (more than 6 km per year), while spread in other regions was less than 1 km per year. In the L.P., establishment of satellite populations of beech scale at distances greater than 20 km from the nearest infested site probably reflect long-distance dispersal of beech scale by humans or birds. Most of these satellite populations have now coalesced, which may increase overall spread rates. The most recent infestation, discovered in Isabella County in 2010, remains relatively localized.

Data from 2007-2008 suggested beech scale preferentially colonized the northern face of beech trees compared to the southern face in newly infested areas. Some winter mortality occurs, but effects are not strong.

# Resistant American Beech Project

Since 2002, the Department of Natural Resources has been working with the Northern Research Station (NRS) of the U.S. Department of Agriculture Forest Service to select and breed American beech trees for resistance to beech bark disease (BBD).

Beech trees that are resistant to BBD are resistant to the beech scale insect. Cuttings from potentially resistant beech are sent to the NRS where they are grown and tested for scale-resistance. Techniques to propagate resistant trees through grafting have been developed, and genetic tests of full- and half-sibling families have demonstrated that BBD resistance is heritable and breeding resistant beech is possible. These genetic studies indicated that when both parents are resistant, approximately 50 percent of the progeny can be expected to be resistant.

Project efforts are now focused on identifying, selecting and propagating resistant beech for establishing seed orchards. These orchards will provide seed to generate resistant seedlings for restoration plantings so that healthy American beech trees will persist in Michigan forests. Planting of the first resistant American beech seed orchard began in 2011 at the Brighton Tree Improvement Center. To date, a total of 74 resistant trees have been planted. Unfortunately, heavy deer browsing and drought conditions claimed all but 39. Plans are to fence the orchard and install irrigation which will greatly increase survival and growth rates.

Work continues to complete the Brighton seed orchard by 2014. A total of 170 trees will consist of 20 different BBD-resistant genotypes, with eight or more ramets made from each genotype. A ramet is a vegetatively reproduced copy of a plant, so each ramet will have almost precisely the same genotype as the original parent tree. To create a ramet, a cutting is taken from a BBD-resistant beech tree, which is grafted to root stock to produce a plant with identical genetics.

So far, five different resistant parent combinations have produced an average of 52 percent resistant progeny. Subsets of seedlings from these families were out-planted in November 2011 in the Upper Peninsula in an area heavily impacted by BBD. Their one-year survival rate has exceeded 95 percent. They will continue to be monitored for growth characteristics and scale-resistance. The original full-sibling families generated in 2002 were planted along with half-sibling families and controls in a research plot at the Holden Arboretum in Kirtland, Ohio, in 2006. In 2012, field testing of these families was initiated so that correlations can be made between the early seedling screen scale-resistance phenotypes and the performance of the now 10-year-old trees growing in the field.



*Resistant beech tree  
at Brighton Tree  
Improvement Center  
seed orchard.*

# Emerald Ash Borer

The Department of Natural Resources is involved in many projects to prepare Michigan's yet unaffected urban and rural forests for the arrival of the emerald ash borer (EAB). The DNR is also working to cope with the loss of ash trees and implement restoration of affected forests and neighborhoods.

During the camping season, DNR Parks and Recreation Division employees inspect all firewood brought in by campers entering state parks. When found, firewood that is not in compliance with the EAB quarantine is seized and burned.



According to the latest U.S. Department of Agriculture (USDA) Forest Service's Forest Inventory and Analysis (FIA) data for the period 2007-2011, there are 162.8 million ash trees greater than 5 inches in diameter, and 17.9 million standing dead ash in the same size category. This number does not include ash on non-forest lands, such as urban and suburban environments. The FIA report estimates annual ash mortality in forested environments of 35.8 million cubic feet annually, and 78.5 million board feet of ash sawtimber per year.

## Surveys and Quarantines

No new Michigan counties were added to the EAB quarantine in 2012. The Michigan Department of Agriculture and Rural Development (MDARD) and the USDA Animal and Plant Health Inspection Service continue to survey uninfested counties in the western Upper Peninsula. They deploy purple traps baited with an aromatic lure called manuka oil. Traps are placed around high-risk areas such as campgrounds and sawmills and along travel pathways. There were no detections in the uninfested, nonquarantined counties of the western Upper Peninsula.

The USDA's Animal and Plant Health Inspection Service (APHIS) issued a federal order updating its EAB quarantine policy. The federal order allows unrestricted interstate movement of regulated articles within contiguous federal quarantine boundaries, with the exception of movements to protected areas within the existing quarantine area. The change became effective on July 1, 2012.

With these changes to federal regulations, Michigan's EAB quarantine remains in effect. EAB quarantine requirements for regulated articles moved entirely within Michigan are unchanged.

Regulated articles, including all hardwood firewood, cannot be moved without a compliance agreement in these circumstances:

- Moving articles from the Lower Peninsula to the Upper Peninsula; and
- Moving articles from quarantined areas of the eastern Upper Peninsula to nonquarantined counties of the central or western Upper Peninsula.

For those who move regulated articles across state lines, the effects of the federal EAB quarantine include the following changes:

- A federal certificate or limited permit is no longer needed to ship articles regulated by the EAB quarantine out of the Lower Peninsula into or through Ohio or Indiana; however, if the final destination of the articles is outside the contiguous federal quarantine boundaries or into the protected area of Illinois or Indiana, a federal certificate or limited permit is still required.
- A federal certificate or limited permit is no longer needed to move articles regulated by the EAB quarantine into the Lower Peninsula from areas inside of the contiguous federal quarantine boundaries.

# Emerald Ash Borer *continued*

There is still a general advisory against moving firewood due to associated accidental introduction or spread of potentially devastating forest pests such as EAB, Asian longhorned beetle, oak wilt and others. People are encouraged to purchase firewood as close to where they will use it as possible and should not take any unused firewood home with them or move it to another camping location. Remember to “burn it where you buy it.”

For more information on EAB, please visit [www.emeraldashborer.info](http://www.emeraldashborer.info) or visit the MDARD website at [www.michigan.gov/mdard](http://www.michigan.gov/mdard).

## Slow Ash Mortality Project

A pilot project was initiated in 2008 to test the latest concepts for managing EAB populations. The project is called SLAM, which stands for “Slow Ash Mortality.” The areas selected for this study include two outlying infestations in the Upper Peninsula. These EAB outliers are in the St. Ignace/Moran area of Mackinac County and the Laurium area of Houghton and Keweenaw counties.

The primary goals of the project include:

- Reducing EAB population growth and rates of tree mortality in the core areas;
- Detecting and preventing satellite populations from expanding and becoming core populations;
- Developing and maintaining regular communications and consistent messages with the local landowners in and around the project area; and
- Assisting local woodland owners and homeowners in making environmentally and fiscally responsible decisions regarding their ash trees and woodlands.

Three Asian wasps that attack EAB eggs or larvae have been released in areas of the Lower Peninsula and in two areas of the Upper Peninsula. The parasitoids are *Tetrastichus planipennisi*, *Spathius agrili* and *Oobius agrili*. Although no additional wasps were released in 2012, evaluations of past releases report that all three parasitoids are surviving and being recovered at the Houghton County SLAM site as well as at the Garden Peninsula site in Delta County.



*Bark stripped by woodpeckers feeding on emerald ash borer larvae.*

For more information on SLAM, visit [www.slameab.info](http://www.slameab.info).



# Spring Defoliators

Populations of forest tent caterpillar, gypsy moth and other spring hardwood defoliators remained low in Michigan during 2012. Very little caterpillar activity was observed in forests around the state, allowing trees an opportunity to recover from the heavy defoliation suffered during the 2009 and 2010 growing seasons in northcentral and northwestern regions of the Lower Peninsula.

The effects defoliation has on tree growth and survival are a function of several factors, including: when during the growing season defoliation occurs; intensity of the defoliation; and whether other stressors, such as drought and frost damage, are also affecting trees.

When less than half of a healthy tree's leaves are lost to defoliation in the spring and early summer, there are relatively few long-term effects. The partially defoliated trees remain in this condition until fall, when leaves turn color and drop normally.

Heavy defoliation, when more than half of the leaves are consumed, can have serious consequences to tree health. The re-flush of new leaves (that

heavy defoliation often triggers) uses up energy resources that trees would otherwise use for growth, to heal wounds and to create chemicals to defend against attacks from insects and diseases.

Repeated heavy defoliation, especially when it occurs in consecutive years, can lead to dieback and tree death, especially when trees are already stressed from other causes. Slow, irreversible deterioration of a tree's condition caused by multiple stressing events that leads to death is called decline.

Recent droughty conditions, along with periodic spring frost events, have led to extensive tree decline in the northern Lower Peninsula. See the feature article on ash and beech decline for more information.

Research indicates that trees can take up to five years to recover from the negative effects of heavy defoliation once insect populations subside. Fortunately, forest tent caterpillar and gypsy moth populations are expected to remain low for several years now that populations of parasites and other natural enemies are high.

# Eastern Larch Beetle

Impacts of eastern larch beetle (ELB), *Dendroctonus simplex*, continue to be reported occasionally to the Department of Natural Resources. These impacts are on isolated pockets of tamarack (*Larix laricina*) in the eastern and south-central areas of the Upper Peninsula. This bark beetle became an epidemic as tamarack was stressed by two consecutive years of defoliation by the larch casebearer (*Coleophora laricella*) in 2001 and 2002. The repeated droughts of the last decade and associated stresses have contributed to continued ELB activity. With a return to normal rainfall, these satellite populations of ELB should diminish.



Pockets of mortality caused by eastern larch beetle.

# Hemlock Woolly Adelgid

The most common long-range hemlock woolly adelgid (HWA) dispersal occurs as a result of people moving or transplanting infected nursery stock or landscape trees.



*Cottony white HWA adults on balsam fir twig.*

In March 2012, an alert landscaper notified the Department of Natural Resources to report what he believed was HWA on a hedge of hemlock trees in New Buffalo. DNR forest health personnel contacted the Michigan Department of Agriculture and Rural Development (MDARD) who, with the help of the forest health staff, conducted a survey

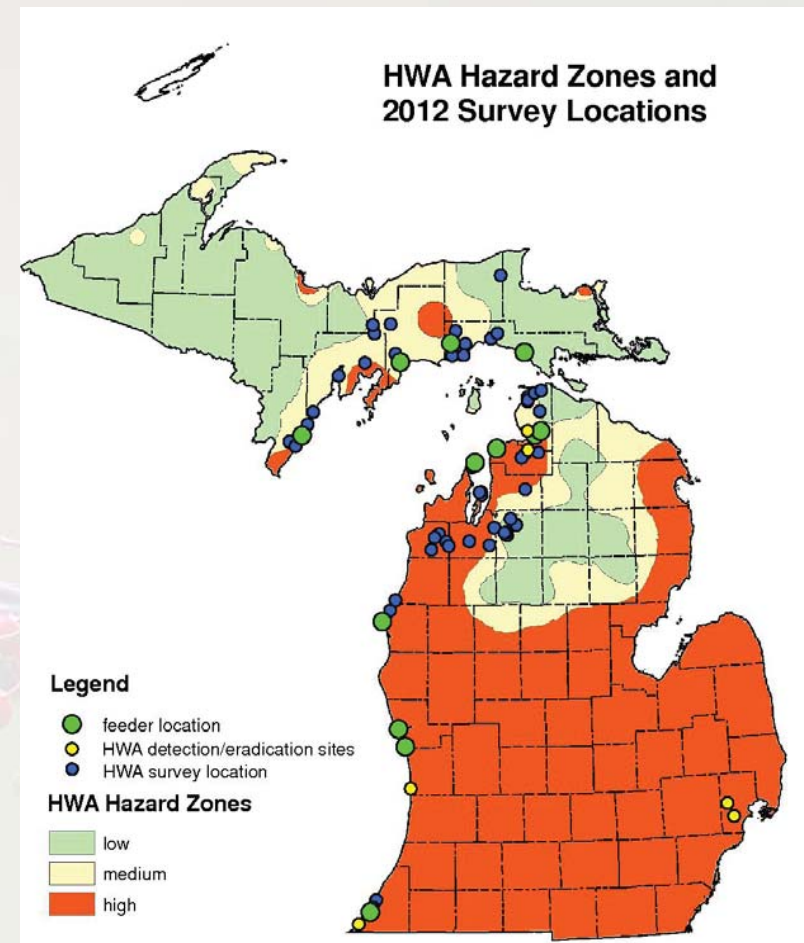
of the area surrounding the newly reported infestation. Survey crews confirmed the reported HWA and discovered a second infestation within a half-mile of the original site.

All infested trees were removed and destroyed. In addition, healthy trees in the immediate vicinity of the infestation received treatment with a systemic insecticide to ensure HWA eradication of the affected area. MDARD will continue to monitor and conduct follow-up surveys for the next three years. Trace-back investigations revealed that the infested trees were planted approximately 10 years ago – prior to the establishment of the HWA quarantine in Michigan.

The second most common method of long-range HWA dispersal is by birds, with black-capped chickadees and nuthatches being active and abundant in hemlock forests.

Forest health staff theorized that if HWA crawlers were already present in an area but at very low levels, not yet detectable, concentrated bird activity near a feeding station would eventually lead to detectable HWA

levels in the immediate vicinity. This would occur over a period of time, through repeated activity of the birds at the feeders. In 2012, 12 bird feeder stations were established in high-risk areas along the Lake Michigan shoreline and in the vicinity of previous HWA introductions. The feeders were maintained throughout the summer when adelgid crawlers are most active. The sites were surveyed for HWA in fall 2012. No HWA was detected. Surveys for HWA at other locations are ongoing and can be conducted throughout the year.



# Oak Wilt



Oak wilt (*Ceratocystis fagacearum*) is one of the most serious tree diseases in the eastern United States, killing thousands of oaks each year in forests, woodlots and home landscapes. Oak wilt was first identified in 1944. The extent of its impact wasn't realized until the 1980s. Only in the last few years

has oak wilt been reclassified as an exotic disease.

Although oak wilt can infect many species of oak, trees in the northern red oak, pin oak, black oak, scarlet oak and red oak hybrids are most susceptible. Infected red oaks die within days or weeks of being infected. Members of the white oak group are much less susceptible and rarely die from the disease.

Oak wilt spreads from tree to tree through connected root systems. Untreated, the fungus spreads to adjacent red oak trees, often killing large groups of trees within a few years, eventually killing all nearby root-grafted oaks. Oak wilt spores that can spread the disease overland are produced only in the year following tree mortality. Insects move these spores to fresh oak wounds from April through July. Trees, logs and firewood from killed trees produce these spores.

Oak wilt is established widely in the southern Lower Peninsula with spotty distribution in the northern Lower and Upper peninsulas. One method of spread is by movement of firewood, so as the public moves northward into forested areas, the risk of spreading this disease grows. Cut wood is used on camping trips where it can be a source of fungus the following year.

Property values can be significantly reduced due to the loss of many trees when a single tree is infected. Acorns produced by oaks are a valuable food source of wildlife. More than 180 different kinds of birds and mammals use oak acorns, including popular species such as white-tailed deer, squirrels, turkey, wood ducks, woodpeckers and others.

Effective oak wilt management programs use a variety of strategies to limit the spread of oak wilt.

Following is some basic guidance:

- Avoid wounding or pruning oak trees from April 15 to July 15.
- Do not move infected wood off-site without debarking, chipping or properly drying it. If infected wood cannot be destroyed before the following April, tightly cover cut logs and firewood with plastic tarps from April 15 to July 15.

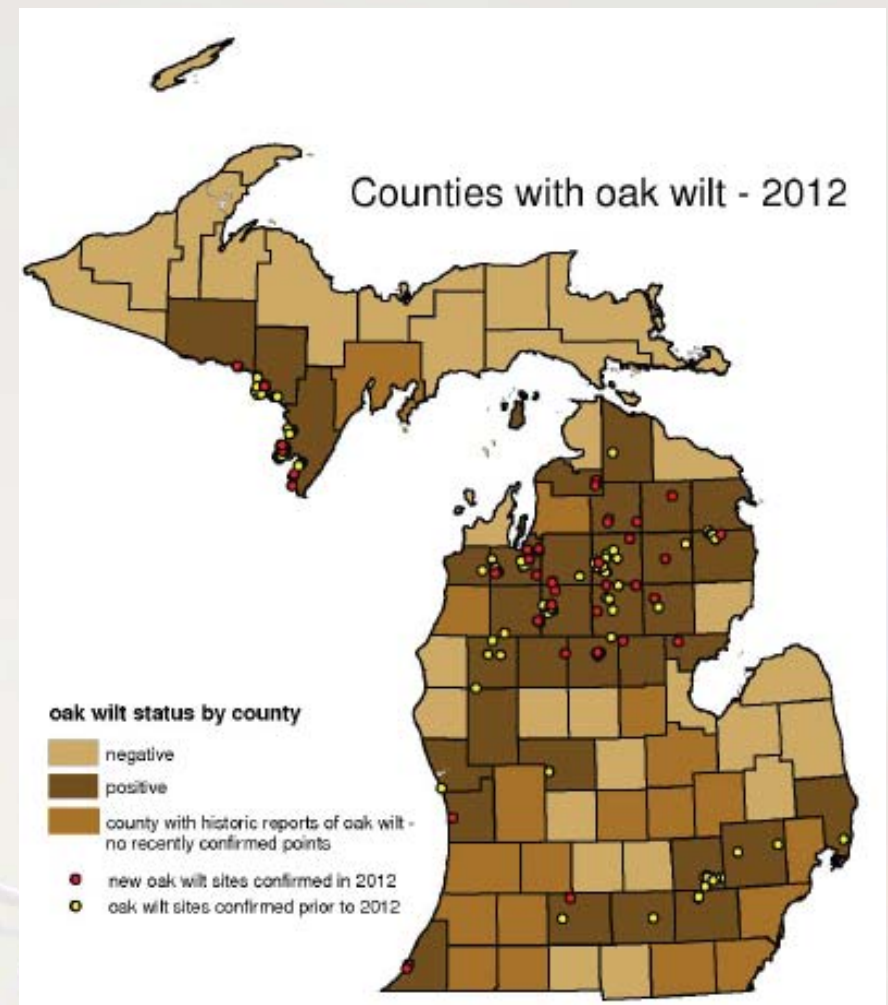


*Impact of oak wilt in Ogemaw County.*

# Oak Wilt *continued*

- Stop the underground spread of oak wilt by breaking root-graft connections between likely diseased and healthy oaks. A professional should be consulted to ensure proper placement of root-graft barriers. Vibratory plows used to lay underground cable are fitted with a special blade which breaks root grafts to a depth of 60 inches. All red oaks inside the root-graft barriers are considered potentially infected and should be removed only after root-grafts are disrupted.
- If oak wilt is detected in the year it was newly introduced via overland spread, removing the infected tree and stump before the next growing season removes oak wilt without affecting adjacent oaks. The next growing season, the fungus moves through root-grafts to neighboring trees – sometimes as much as 100 feet or more away, necessitating the aforementioned treatments resulting in the loss of many surrounding red oak.

For more information on oak wilt management, use the following link:  
[michigansaf.org/forestinfo/Health/E2764-OakWilt.pdf](http://michigansaf.org/forestinfo/Health/E2764-OakWilt.pdf)



# Upper Peninsula Oak Wilt Control Project

The U.S. Department of Agriculture Forest Service, Forest Health Protection Program continued providing Oak Wilt Suppression funds in 2012. Michigan Technological University's Department of Natural Resources and the Environment joined the Michigan Department of Natural Resources in an effort to rid the Upper Peninsula (U.P.) of oak wilt.

The long-term objectives of this effort are to:

- Remove oak wilt from the U.P. by detecting and treating infection centers on all ownerships;
- Educate affected communities to prevent the reintroduction of oak wilt; and
- Demonstrate an approach for detecting and effectively treating oak wilt infection centers throughout Michigan.

A vibratory plow was used to establish approximately 20,000 feet of root graft barriers to isolate and remove oak wilt pockets in Menominee and Iron counties. Although much has been achieved, oak wilt is still active in areas of both counties and in southern Dickinson County. About 300 infection centers have been successfully eliminated to date. Oak wilt was detected in Iron County for the first time in 2010. A big obstacle to the DNR's efforts to stop the spread of oak wilt is the movement of infected firewood and logs.

Confirming oak wilt as the cause of oak mortality is not always easy. Not all oak mortality is oak wilt-caused. Oak mortality and decline in the last decade is the result of drought, late-spring frosts, two-lined chestnut borer and a mature to over-mature northern pin oak resource. The DNR has stepped up efforts to detect and confirm oak wilt where symptoms are found. Knowledge of the number and distribution of oak wilt pockets is crucial to understanding short-and long-term impacts of oak wilt on Michigan's oak resource. This knowledge is also needed as we seek funding to combat the continued spread of oak wilt and resulting loss of oak resources.

Michigan State University Extension evaluated past U.P. oak wilt suppression efforts in 2011. Many treated areas in Menominee and Dickinson counties remain free of oak wilt. Although much has been achieved, there remain untreated oak wilt pockets. Until removed, these untreated oak wilt pockets serve as a source of inoculum for the continued overland spread to adjacent oak resources and to more distant areas via movement of firewood and logs.



*Department of Natural Resources fire officers install root graft barriers with a vibratory plow in Menominee County.*

# Spruce Budworm

Epidemics of spruce budworm, *Choristoneura fumiferana*, periodically cause extensive damage and tree mortality in spruce and fir forests across the northeastern United States and Canada.



Historically, epidemics have occurred on a 30-year to 50-year cycle. The last epidemic ended in Michigan in 1982. Outbreaks typically last 10 to 15 years and result in the loss of millions of trees.

The vast majority of Michigan's spruce and fir resources are in the Upper Peninsula (U.P.) and new areas of budworm defoliation were discovered there in 2012. This outbreak follows a reduction in spruce budworm activity in 2011, which followed alarmingly widespread infestations in 2010.

The western U.P. has the largest area of budworm activity due to the abundance of over-mature spruce/fir forest. Top kill and tree mortality is common in these stands. It is uncertain if the increase in spruce budworm activity over the last few years in the U.P. is a precursor to the next large-scale event.

Historically, balsam fir was the species most severely damaged by the spruce budworm. Spruce mixed with balsam fir was more likely to suffer budworm damage than spruce in pure stands. However, in the last few years, spruce plantations without a balsam fir component have been heavily defoliated.

Stresses from persistent drought over the last decade are likely contributing to increased spruce budworm activity, especially in spruce

plantations. A return to more normal precipitation may help restore the vigor of our spruce and fir resources. Department of Natural Resources staff is also seeing declines in spruce plantations unrelated to spruce budworm activity.



*Heavy spruce budworm damage in Dickinson County in Michigan's Upper Peninsula.*

# Thousand Cankers Disease and Walnut Twig Beetle

In May 2010, the Michigan Department of Agriculture and Rural Development (MDARD) established a quarantine to protect walnut (*Juglans spp.*) from thousand cankers disease (TCD). TCD is an insect-disease complex involving the walnut twig beetle, *Pityophthorus juglandis*, and a fungus, *Geosmithia morbida*.

TCD currently occurs in Arizona, California, Colorado, Idaho, Nevada, New Mexico, Oregon, Washington and Utah – states where the walnut twig beetle is native. The disease affects only eastern black walnut trees that have been transplanted in these western states; native walnut species appear to be resistant. Walnut twig beetles carry the fungus to black walnut trees where cankers form at the feeding site. Heavily infested trees produce an abundance of cankers which eventually kill the trees. It appears that the range of this beetle is slowly spreading eastward,



Walnut twig beetle emergence holes.

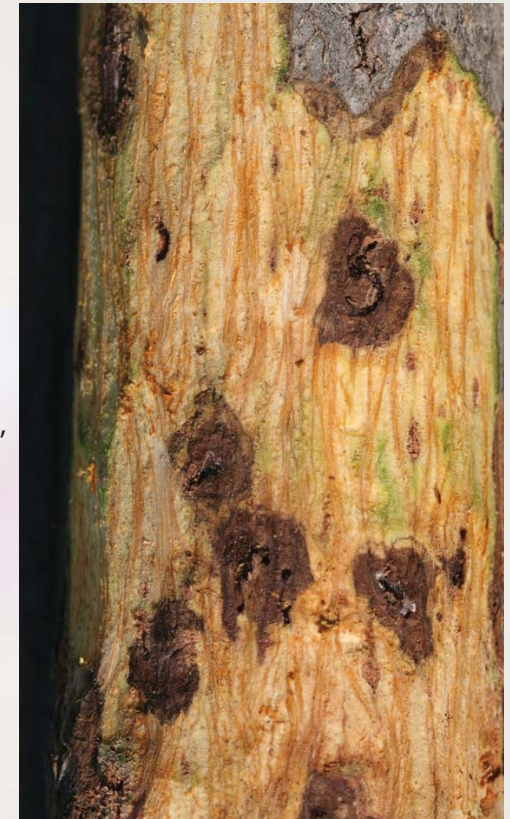
threatening walnut trees in eastern states. In 2011, Virginia and Pennsylvania were added to Tennessee as states east of the Mississippi River with TCD.

In 2012, Ohio reported finding the walnut twig beetle in Butler County. Eight beetles were found in the traps. Officials have quarantined walnut products from leaving the site of discovery.

At this time, there have been no trees determined to be infested with TCD in Ohio.

Michigan's quarantine restricts the movement of the following from TCD-infected states into Michigan:

- All plants and plant parts of the genus *Juglans*, including but not limited to: nursery stock, budwood, scionwood and green lumber; other living, dead, cut or fallen wood, including logs, stumps, roots and branches; composted and non-composted chips;
- Hardwood firewood; or
- Any article, product or means of transportation that risks the spread of walnut twig beetle or fungus.



TCD cankers.

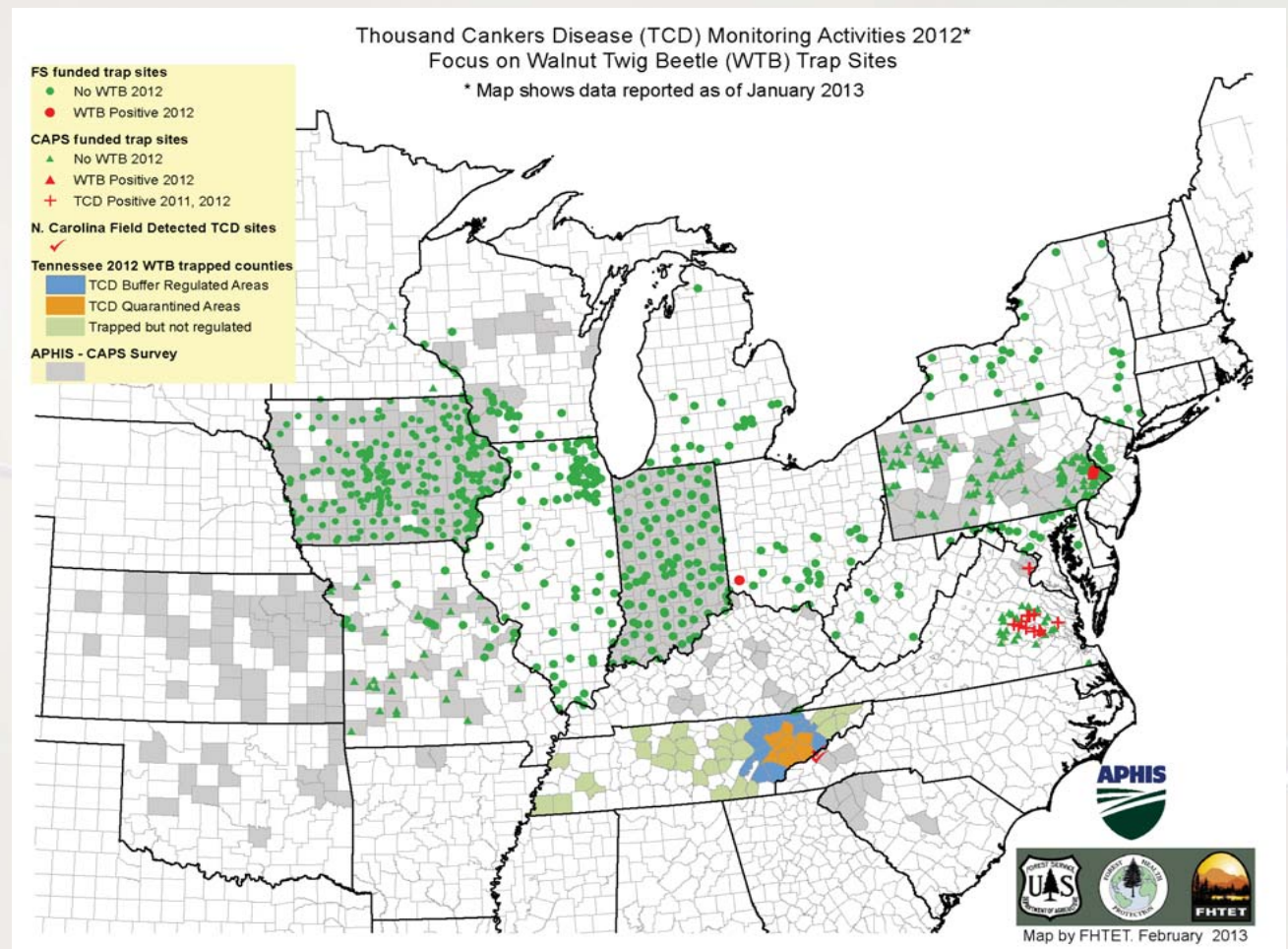
# Thousand Cankers Disease and Walnut Twig Beetle *continued*

Articles that are not a threat and are exempt from the quarantine include:

- Nuts, nut meats and hulls;
- Processed lumber that is 100 percent bark-free and kiln-dried with squared edges; and
- Finished wood products without bark.

In 2012, to support the TCD quarantine, the Department of Natural Resources conducted a walnut twig beetle pheromone-trapping survey. Following established guidelines of the United States Department of Agriculture, pheromone traps were installed and maintained at 18 locations across southern Lower Michigan. One additional trap was located in the northern Lower Peninsula. No walnut twig beetles were detected in trap samples from the 2012 season. Tree canopy surveys were also conducted at these and other sites to look for signs of walnut decline that might indicate the presence of TCD. No symptoms of TCD were detected.

In 2013, MDARD will expand walnut twig beetle pheromone-trapping surveys to cover the 27 southernmost counties in the Lower Peninsula.





# Jack Pine Budworm

The jack pine budworm, *Choristoneura pinus*, is an insect native to North America. Jack pine budworm populations play a historic role in the



perpetuation of jack pine forests. Periodic outbreaks lead to dieback and mortality in older jack pine stands. This makes these stands more susceptible to catastrophic fires which, in turn, results in the dense regeneration of young jack pine stands. Modern firefighting

efforts and current management practices promote harvesting jack pine before it becomes over-mature and susceptible to budworm defoliation. This has minimized the impacts of budworm but outbreaks still occur periodically across Michigan's jack pine forests.

Jack pine budworm populations appear to be building in portions of the north-central Lower Peninsula. While jack pine forests 60 years old and older were historically at highest risk, defoliation has been documented across a wide range of age classes. Mortality and dieback are most common in older jack pine stands that have been moderately to heavily defoliated in two or more consecutive years. Droughty conditions in recent years could exacerbate these effects. Next year's weather conditions may determine if this buildup progresses into an outbreak or if we see a return to normal population levels.

# Balsam Woolly Adelgid

With the support of the Department of Natural Resources, the Michigan Department of Agriculture and Rural Development is drafting a balsam woolly adelgid (BWA), *Adelges piceae*, quarantine.



Introduced from Europe around 1900, BWA is considered a serious pest of all true firs in the genus *Abies*, including balsam and Fraser fir.

Balsam woolly adelgids were first noticed in Maine in 1908. Since that time, billions of board

feet of fir timber have been killed by balsam woolly adelgids in North America. BWA is now distributed throughout eastern and western North America, affecting firs in forests, seed production, landscaping and Christmas tree farms. To date, this insect has not been found in Michigan.

Balsam woolly adelgids secrete an irritating salivary substance, which is injected into the host tree as the insect feeds. This substance causes unusual growth, such as swelling or “gouting” which distorts the tree’s normal growth pattern. A heavy stem attack may kill an otherwise healthy tree in three or four years. As the tree dies, portions of the crown or the entire crown will turn red. The wood of heavily infested trees becomes darkened and brittle.

Balsam fir is an important source of pulp and dimensional lumber. The U.S. Department of Agriculture Forest Service’s Forest Inventory and Analysis Program reports Michigan’s balsam fir resource to comprise of 1.9 billion trees greater than or equal to 1 inch in diameter. This equates to a volume of 903 million board feet of sawtimber, or 463 million cubic feet of wood fiber.

Balsam, of course, has been a popular Christmas tree for more than 400 years. Wildlife also relies extensively on this tree for food and shelter. Moose rely on balsam fir as a major food source during the winter months. Balsam fir provides a minor part of the diet for both the spruce grouse and the ruffed grouse. Buds, tips and needles are consumed, and more feeding occurs in winter than in summer. Thickets of balsam fir provide shelter for both of these grouse species. The use of balsam fir by deer for cover and shelter is also well documented.

The balsam woolly adelgids infest firs in southern Canada and the United States, where they occur in the Pacific Northwest, Northeastern states and in the Appalachian Mountains as far south as North Carolina. Adelgids appear as white, woolly dots about the size of pin heads on the surface of the tree’s bole, limbs and buds.

The distribution of BWA was thought to be limited in its northern distribution by cold weather. However, in talking with experts from affected areas of Canada and the United States, it is believed that BWA could overwinter in Michigan as it survives well in areas of eastern Canada. In locations that get really cold (minus 10 degrees Fahrenheit or colder, for example), the adelgids survive beneath the cover of snow.



*Balsam woolly adelgid on bark.*

For more information on BWA, go to [www.na.fs.fed.us/pubs/fidls/bwa.pdf](http://www.na.fs.fed.us/pubs/fidls/bwa.pdf).

# Firewood Movement

Firewood movement continues to be of concern as a pathway for the movement of invasive pests into and around Michigan. A large number of invasive pests are known to hitch a ride on firewood that's moved from infested areas to uninfested locations such as camps, campsites and individual homes. The list of pests spreading via firewood includes emerald ash borer (EAB), Asian longhorned beetle, beech bark disease, gypsy moth, Sirex woodwasp, various bark beetles, oak wilt, Dutch elm disease, butternut canker and sudden oak death (to name a few). Fortunately, only some of these are currently found in Michigan.

Michigan is known as a playground for outdoor recreation in the Midwest and eastern United States. Travelers come regularly from distant points to engage in various forms of "Pure Michigan" outdoor recreation. Many of these folks bring firewood, as it is a tradition. Also, Michiganders are known for "going up north" to get away from it all. Many of us traditionally brought firewood to favorite campsites, camps or cottages. Michigan learned a hard lesson with EAB: moving firewood rapidly



spreads invasive pests over long distances. To allow this to be repeated with other invasive pests merely compounds the disaster and puts at risk more of the natural beauty so many Michiganders and others travel long distances to enjoy.

Michigan currently has an EAB quarantine that limits hardwood firewood movement from the Lower Peninsula, which is considered to be generally infested, to the Upper Peninsula, which is considered only partly infested; and from certain parts of the Upper Peninsula, which are infested, to other parts of the Upper Peninsula that are not. Beyond that, ash firewood can't be brought onto state land, including state parks, by order of the director of the Department of Natural Resources. The National Park Service has banned the practice of bringing firewood into the Sleeping Bear Dunes National Lakeshore from other areas. Some private campgrounds also do not accept firewood from outside of the immediate area.

In a cooperative effort, the Department of Natural Resources, U.S. Department of Agriculture Forest Service (USDA-FS), Michigan Department of Agriculture and Rural Development, Michigan State University and Michigan Technological University have promoted the "Don't Move Firewood" message in various formats throughout the state. Campaigns supported primarily by USDA-FS Emerald ash borer funding, and Farm Bill funding focused on Asian longhorned beetle, have made the public keenly aware of the dangers of moving firewood.

The public continues to want to move firewood, but is much more diligent about moving it only short distances, adhering to quarantine restrictions, and moving it only in a safe manner. This conscientious concern is largely due to the intense outreach and education efforts related to EAB. However, the ever-increasing risks associated with firewood movement have prompted consideration of whether current restrictions are strong enough, or if more restrictions are needed.

# Firewood Movement *continued*

Evidence continues to accumulate indicating oak wilt is being spread to even more locations, and the fear of an Asian longhorned beetle invasion in Michigan due to firewood originating from out-of-state infestations – Ohio, for example – is making foresters and regulators consider additional prevention measures.

As the list of pests transported on firewood continues to grow and the list of invasive species near our borders expands, firewood movement must be scrutinized even more carefully. Many other states have firewood quarantines, or bans on firewood movement both into and within the state. A review of current firewood restrictions in Michigan has been proposed for 2013, and managers in key agencies are considering the proposal.



# Forest Decline

*Forest decline refers to a gradual loss of tree growth and vigor. Declining trees often have some combination of off-color leaves, early leaf drop, poor growth and dieback of twigs and branches. This condition usually progresses slowly over several years. During this time trees may be susceptible to some combination of insect attacks, diseases and adverse weather conditions like drought and late frosts. These stressors can further reduce growth and may increase the likelihood that the tree will die.*



# Maple Decline

Michigan Technological University, USDA Forest Service Evaluation Monitoring Project,  
Maple Decline in the Western Upper Peninsula

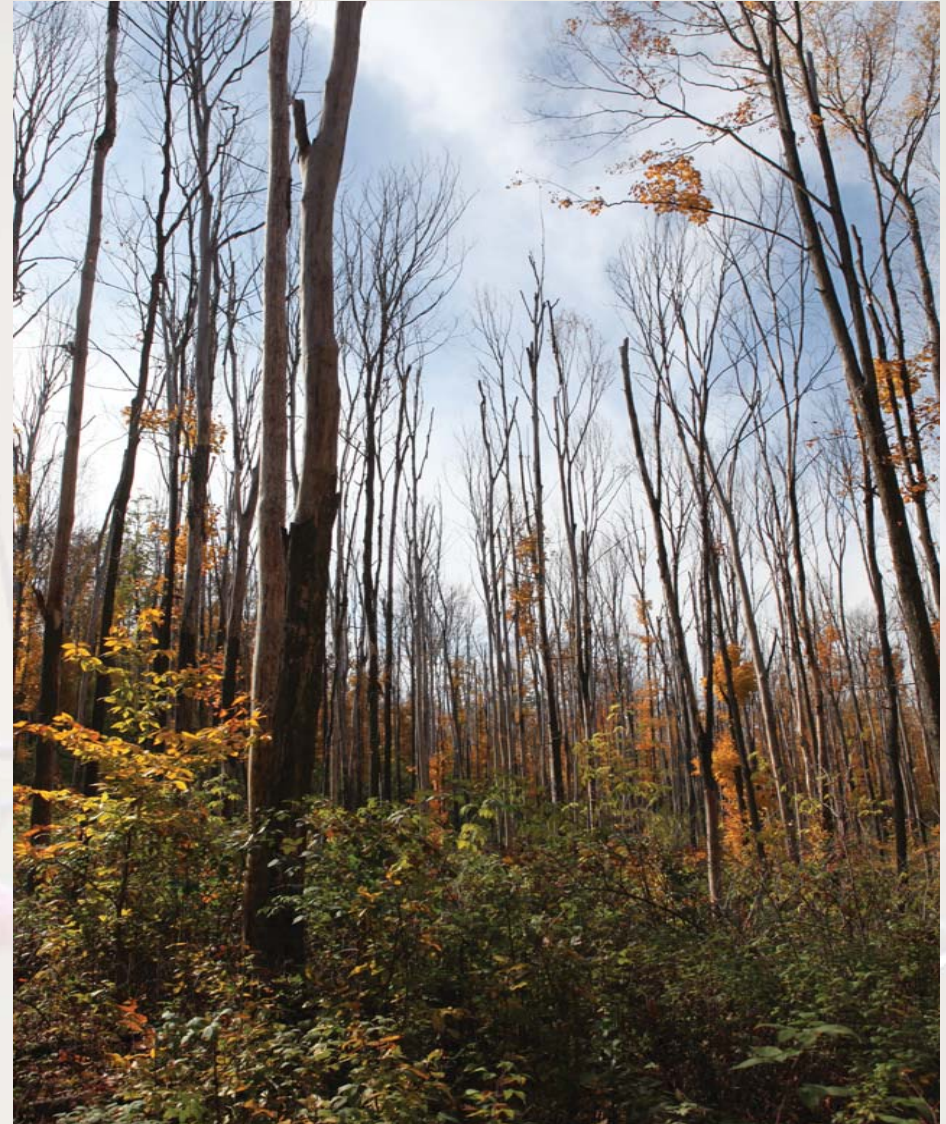
*PhD. Candidate Tara Ball and Dr. Andrew Storer*

Sugar maple dieback continues to be seen in Michigan's Upper Peninsula (U.P.), northern Wisconsin and eastern Minnesota.

In 2012, the average sugar maple dieback the U.P. was 12.4 percent with more than half (56 percent) of plots having 10 percent dieback or greater; and 11 percent of plots having 25 to 76 percent crown dieback (with 94 maple health plots primarily in the western U.P.). A vigorous sugar maple stand should have less than 10 percent dieback. Average percent dieback is down from 19.6 percent in 2011 in the same western U.P. plots.

Old dead twigs and branches that have previously been recorded as dieback have likely decayed and dropped over winter. Soil and foliar nutrient analysis suggest specific site variations in deficient, toxic or antagonistic levels of soil calcium, magnesium, phosphorus, potassium, manganese and aluminum and other metals that may have predisposed trees to decline. Moderately dry drought conditions in recent years, especially in the western U.P., have likely further contributed to maple dieback and decline.

Tree ring analysis indicates a decreasing trend in annual maple growth for at least the past six decades with strong correlations to precipitation and snow cover. Climatic and other factors such as sugar maple borer, soil pH and texture, and management history are continuing to be analyzed. The progress of maple dieback will continue to be monitored in the region, with the ultimate goal of incorporating findings into updated management plans to prevent or mitigate timber loss from maple dieback in northern hardwood forests.



# Maple Decline *continued*

## 2012 Maple Decline in Michigan

Although reports from the Michigan Technological University Maple Decline Evaluation Monitoring Project show that maple decline in study plots was down from 2011 levels, several new areas of severe decline associated with management practices on stressed sites were reported in 2012. Several areas of maple decline resulting in significant maple mortality were detected in the northwest region of the northern Lower Peninsula (Kalkaska, Missaukee, Wexford, Grand Traverse and Benzie counties); and in the north-central U.P. (Marquette County). Approximately 500 acres of high-quality northern hardwood sites in the northern Lower Peninsula were impacted. In addition to sugar maple mortality, high-quality northern red oaks when present in these northern Lower Peninsula stands were also affected.

Drought continues to be a major factor contributing to maple decline. Management also appears to be a factor in reported 2012 decline and mortality. All of the stands that experienced mortality in the northern Lower Peninsula were thinned or selectively harvested a year or two before, or during the heavy forest tent caterpillar defoliation from 2009 to 2010.

Trees stressed by drought, management and heavy defoliation were at increased risk of decline and mortality due to below threshold energy reserves caused by the combination of stressors. Tree decline and death can result directly from a loss of energy reserves, but more commonly, this predisposes (weakens) trees to attacks by secondary invaders (insects and diseases) such as Armillaria root rot or, in the case of oaks, the two-lined chestnut borer.



# Drought and Forest Health

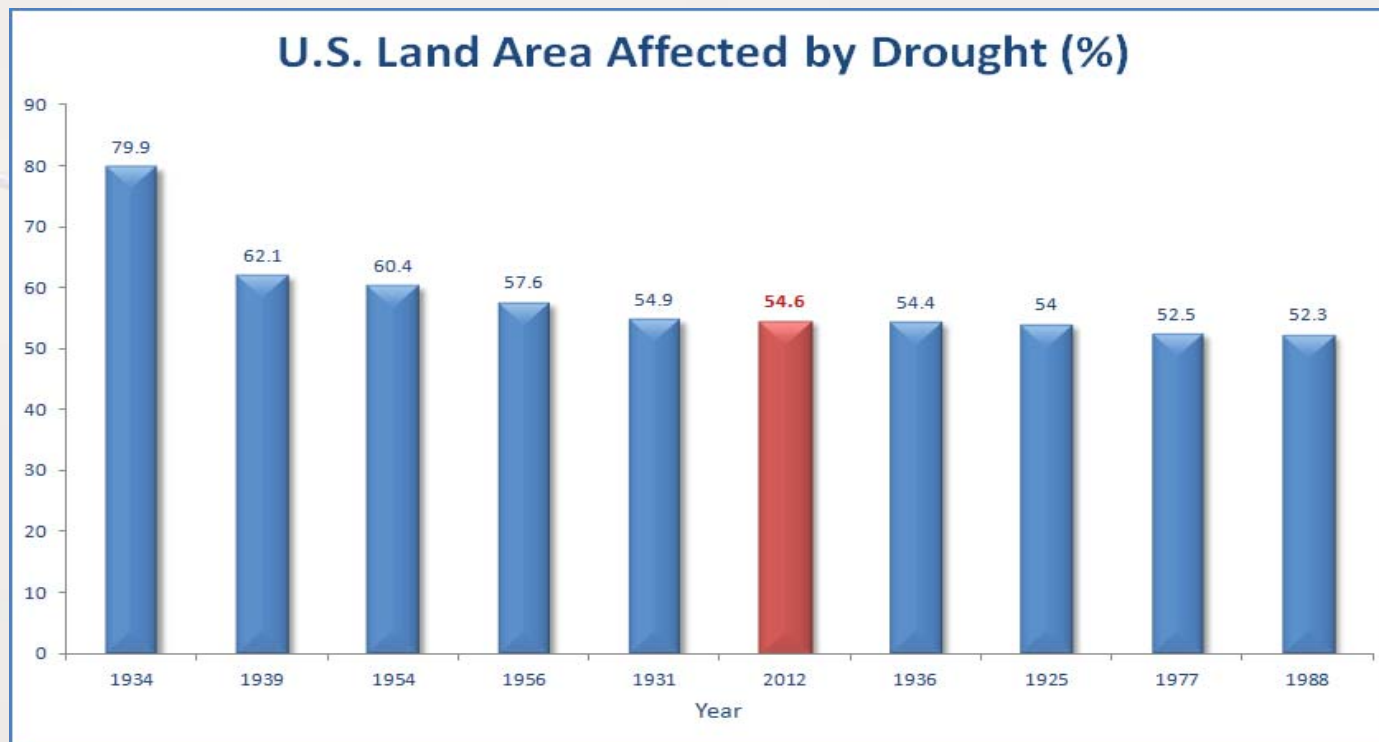
How dry was it in 2012? It was so dry that:

- Lake Michigan water levels are currently within 2 inches of the all-time low set in 1964;
- By the end of June, the drought ranked as the sixth largest since weather records began in 1895; and
- Moderate or greater drought covered 56 percent of the nation.

Drought years have contributed greatly to many of Michigan's forest declines and to the buildup of secondary pests such as the forest tent caterpillar, gypsy moth, spruce budworm, Armillaria, two-lined chestnut borer and jack pine budworm. By lowering the tree's energy reserves, drought increases a tree's susceptibility and vulnerability to attacks from insects and diseases. Stressed trees recover more slowly from such attacks.

Although drought is known as a major stressor, it is one of many factors affecting a tree's susceptibility and vulnerability, such as site quality, tree age, management activities, defoliation from late spring frosts and infestation of insects mentioned above.

In the past decade we have reported declines of aspen, hickory, maple, oak, spruce and white pine in Michigan. We continue to see declines in these tree types, especially in areas affected by drought. Southern areas of the western Upper Peninsula and much of the Lower Peninsula experienced drought conditions in 2012. Other areas that had a return to close-to-normal rainfall reported differing levels of recovery. However, it takes years for trees to rebuild energy reserves and corresponding defenses to pest attacks.





# White Pine Dieback

Dieback and mortality of understory white pine continued to expand during 2012 in the north-central Lower Peninsula. First detected in 2006, this decline is associated with white pine growing below oak and aspen trees on sandy soils adjacent to the Au Sable and Manistee river corridors. Needle discoloration and branch dieback are also occurring on large white pine trees in these areas.

In addition, what appears to be similar damage was observed for the first time on understory white pine in the Munising District of Hiawatha National Forest in the Upper Peninsula.

Branch flagging and dieback appear to be associated with stem cankers, often found below lichen attached to the affected branches. To date, two fungi – *Diplodia* and *Therrya* spp. – have been isolated from these cankers.

Efforts are needed to determine the role of fungal pathogens in this problem (and their association with common white pine lichen species) and to assess whether drought and other stressors are predisposing white pine to this decline.



Collecting branches from white pine affected by decline.

# Invasive Plants

*The existence and health of Michigan's natural places depends on controlling the introduction and spread of invasive plants. Invasive species are foreign to the ecosystem and are likely to cause economic, environmental or human harm.*



# Invasive Plant Control

## American Recovery and Reinvestment Act Project Follow-up Evaluation of 2010 and 2011 Treatment of Select Ecological Reference Areas

Four sites in Michigan were surveyed and treated for invasive plant control in 2010 and 2011, utilizing funding from the American Recovery and Reinvestment Act (ARRA).

These sites were: Maxton Plains Alvar (Chippewa County); Shakey Lakes Oak-Pine Barrens (Menominee County); Van Etten Floodplain (Iosco County); and select locations along the North Branch Au Sable River (Crawford and Otsego counties). Observational surveys were conducted in 2012 near the end of the first growing season following treatment of these sites. The observational method was used due to funding restrictions making more formal surveys impractical.

To determine effectiveness of treatments, transects were walked, where practical, that intersected the more dense areas of invasive plants, as well as locations where threatened and endangered species had been noted.

An area approximately 8 feet on either side of the transect lines was carefully observed for evidence of living invasive plant species originally mapped on the area. Generally speaking, only scattered individual plants were found of any invasive species.

**Maxton Plains Alvar:** No regrowth of leafy spurge was observed on the treated acreage.

**Shakey Lakes Oak-Pine Barrens:** Spotty resprouting of leafy spurge in a previously heavily infested 20-acre area was observed. Giant hogweed returned in the form of smaller plants and lesser numbers than the pretreatment population. Retreatment is planned for spring 2013 for both the leafy spurge and giant hogweed.

For both Shakey Lakes and Maxton Plains, even heavily infested areas from the initial surveys contained only widely scattered individual plants

of St. John's wort, spotted knapweed, common mullein and Canada thistle in 2012. Roadsides were particularly free of invasive plants. Natural revegetation by noninvasive plant species was taking place in most of the treated areas. None of the previously identified threatened and endangered species appeared to be harmed.

**Van Etten Floodplain:** Common burdock was observed in small numbers of small plants in treated areas. A local volunteer group pulled the resprouting burdock in the floodplain in 2012. White sweet clover



*Common mullein plants reinvaded a site treated by the DNR, but in much smaller numbers.*

# Invasive Plant Control *continued*

cover was also significantly reduced with only very small individual patches returning following treatment.

**Au Sable River:** A local volunteer group is committed to removing purple loosestrife from along the river. In 2011, loosestrife flowers and seed heads had been clipped and disposed off-site. In 2012, volunteers pulled the remaining loosestrife plants as well as any resprouted plants from other previously treated areas along the North Branch Au Sable River.



*Leafy spurge did not return to the DNR's treated site in 2012.*



*Giant hogweed (like the example shown here), treated in the fall of 2011, regrew much smaller plants in 2012. Sap from this plant can cause swelling, blistering and permanent scarring.*

# Other Forest Health Highlights

*From a wildfire in the Upper Peninsula that burned more than 21,000 acres, to a snowstorm that caused extensive damage in the northern Lower Peninsula – Michigan’s natural resources were affected by, and continue to recover from, the extremes of 2012. The following section discusses the Department of Natural Resources’ work responding to and monitoring the events and pests that impacted the health of Michigan’s trees.*



# Lower Peninsula Locust Leafminer

Defoliation from the locust leafminer, *Odontota dorsalis*, was common throughout much of the southwestern part of the Lower Peninsula in 2012. Locally, heavy defoliation was found in and around Calhoun and northern Kent counties. Locust leafminer larvae mine through leaf tissue causing foliage to turn gray or brown, sometimes giving the appearance of early fall colors in heavily affected areas.

The 2012 damage was apparent along many roads and highways throughout southern Michigan. The locust leafminer is a late-season defoliator that generally causes minimal loss of growth and very rarely, in combination with other stress factors, may cause occasional tree mortality.



# Lower Peninsula March Snowstorm

The northwest Lower Peninsula experienced an extraordinary snowstorm in early March that dumped more than 20 inches of heavy wet snow on parts of Leelanau, Benzie and Grand Traverse counties. The storm caused extensive damage to trees and local utility providers worked for more than a week to clear lines of broken trees and branches. Damage to forest resources was widespread across the region. Softwoods, especially pines and aspen, were most severely affected.

Several red pine plantations that had recently been thinned experienced significant amounts of main stem breakage. Jack pine plantations experienced both breakage and severe bending from the weight of the

snow. White pine appeared more prone to branch breakage and less susceptible to main stem breakage. Aspen saplings in several areas were bent over completely to the ground. Salvage efforts were undertaken to utilize some of the damaged pine product from this storm.

Heavy accumulation of fresh pine debris in early spring posed a serious risk of pine bark beetle population buildup. Bark beetles are capable of producing three generations per year and the dry conditions that persisted through spring and summer contributed to a dramatic increase in bark beetle populations. Numerous small pockets of pine mortality due to bark beetle infestations were observed late in the summer across the region affected by the storm.

Bark beetle populations can fluctuate rapidly and spring 2013 weather will play a major role. With persistent dry conditions we will likely see a continuation of the current elevated population. If drought conditions ease and massive amounts of fresh dead pine material are not present, next year's bark beetle populations should begin to return to normal levels.

Bark beetle populations can fluctuate rapidly and spring 2013 weather will play a major role. With persistent dry conditions we will likely see a continuation of the current elevated population. If drought conditions ease and massive amounts of fresh dead pine material are not present, next year's bark beetle populations should begin to return to normal levels.



# Upper Peninsula Duck Lake Fire

A fire that started with a lightning strike in Luce County in the Upper Peninsula on May 23, 2012, expanded 11 miles north and six miles east and west until it was stopped by Lake Superior. The fire burned until June 13, 2012.

A total of 21,069 acres of forest land burned, with 15,700 of those acres on state-managed land. The southern end of the zone contained hemlock, birch and red maple. A few miles north, red and white pines were mixed with jack pine. And toward the sandy north end, mature jack pine dominated the dune-like ecosystem at the Lake Superior shore. There were 141 properties within the perimeter of the fire. Of those, a total of 136 structures were lost.

The fire burned so hot in many areas that it removed what little organic matter could be found in the sandy, sterile soils. Regenerating trees on



40 - 2012 Forest Health Highlights

some of these areas will likely pose a challenge. Timber was quickly assessed and sales set up to salvage about 10,000 acres of charred timber. It was a race against the clock to remove logs before they were infested by pine sawyer beetles,

*Monochamus scutellatus*, and bark beetles. In total, 53,857 cords of logs and pulp were sold. This equates to 2,100 logging truckloads. By early October, about half of the acreage had been harvested.



In the northern part of its range, the pine sawyer beetle (also known as the white-spotted sawyer) requires almost two years to complete its life cycle. Pine sawyer beetles generally begin laying eggs early in July and continue through the summer to early September.

As the larva grows, its galleries become wider and deeper, scoring the surfaces of the wood. By mid-to-late summer the larva bores down into the wood cylinder. An oval-shaped entrance hole marks the gallery where it begins moving deep into the wood. By midsummer the larva has reached its deepest point of penetration, which may vary from 1 inch to more than 6 inches from the surface of the wood.

A check of sawyer beetle activity in late August found some borers had formed entrance holes in trees in a few of the burned-over areas. Larvae stop feeding with the onset of freezing temperatures and resume feeding



# Upper Peninsula

## Duck Lake Fire *continued*

the following spring as temperatures rise. The goal is to have all the logs harvested by spring 2013, before borer activity resumes.

Although one might expect a buildup of bark beetles, very little occurrence of bark beetle activity was detected within the burn area during the late summer survey.

In the many acres of charred pine seedlings and small saplings of 1 inch to 5 inches in diameter killed by the fire, there were no signs of borer or bark beetle activity. These heavily charred trees were apparently cooked sufficiently that they offered little suitable substrate for larval development.

Harvesting a significant portion of the larger, merchantable trees via timber sales before next spring will slow beetle population buildup. The beetles that infested the harvested logs will be removed from the area. The Department of Natural Resources will continue monitoring both sawyer beetle and bark beetle activity in 2013.



# Miscellaneous Upper Peninsula Pests

## Web-Spinning Sawfly

A persistent infestation of web-spinning sawfly, *Cephalcia* spp., on a 20-acre red pine plantation was suppressed with a Dimilin 25W treatment in 2012. Dimilin is in a family of insecticides called insect growth regulators (IGR). An IGR interrupts growth by preventing development of the exoskeleton, leading to premature death of the insect. Dimilin and other IGR have less of an effect on beneficial insects than traditional chemical insecticides, and are considered more environmentally friendly. The red pine had been defoliated for six consecutive years due to the sawfly infestation. The treatment is expected to reduce populations to below damage thresholds, thus enhancing tree growth and reducing time to crown closure. It should also reduce future sawfly impacts and sawfly population potential.



## Western Conifer Seed Bug

There were many reports of the western conifer seed bug, *Leptoglossus occidentalis*, in and around Michigan homes in 2012. This critter is also known as “leaf-footed bug” due to the appearance of its hind legs. This is a species of “true bug” (*Heteroptera*) in the family *Coreidae*. It was originally native to the warm-temperate western states of California, Oregon and Nevada. In recent years the western conifer seed bug has expanded its range in the United States and has also become an invasive pest in parts of Europe.

The western conifer seed bug frequently congregates on the outside of buildings in late summer and early fall, commonly observed around windows and doors. An infestation of this bug reduces the quality and viability of conifer seed crops.

