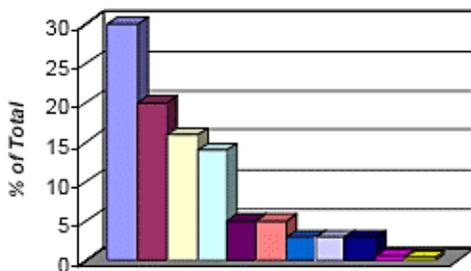


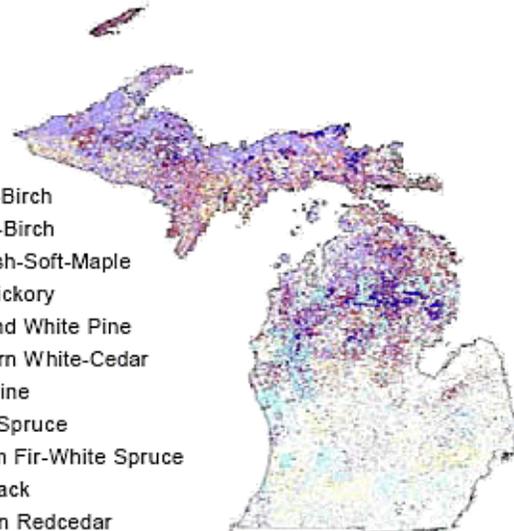


Forests comprise 53% of the land area of the state, or about 19.3 million acres. These forests are a critical component of Michigan’s environment and economy for the recreational opportunities and the products they provide. Forestry related industries and manufacturing employ 150,000 people statewide and annually contribute \$9 billion to the state’s economy. Additionally, forest-based tourism and recreation support 50,000 jobs and add \$3 billion to Michigan’s economy. Michigan’s forests contribute to clean air, water, and reduce soil erosion.

### Major Forest Types Of Michigan



- Maple-Birch
- Aspen-Birch
- Elm-Ash-Soft-Maple
- Oak-Hickory
- Red and White Pine
- Northern White-Cedar
- Jack Pine
- Black Spruce
- Balsam Fir-White Spruce
- Tamarack
- Eastern Redcedar



We continue to find remote, outlying **emerald ash borer** (EAB) populations in Michigan. These outliers mostly represent pre-quarantine (e.g. year 2002 and earlier) spread of EAB.

The 2005 EAB detection at Brimley was the first in Michigan’s Upper Peninsula. The Michigan Department of Agriculture (MDA) and Michigan Department of Natural Resource (DNR) acted quickly to remove this population. All ash greater than one inch in diameter were removed within ½ mile of infested trees and burned. This was a 2002 introduction at Brimley State Park. It does not reflect on quarantine efforts to stop EAB at the Mackinac Bridge or DNR efforts banning the movement of ash onto state and federal lands, both of which began in 2005. No other EAB outliers have been detected in the Upper Peninsula.

New EAB detections are the result of statewide trap tree surveys by the MDA and Michigan Technological University (MTU). The MTU survey is sponsored by the USDA Forest Service. Many of the new 2005 detections in Northern Lower Michigan and the one in the Upper Peninsula resulted from the MTU risk based survey. Risk was defined using maps

of the state's ash resources and state park databases showing visits from residents of EAB infested counties. Trap trees were deployed in 135 high risk state and federal parks and campgrounds throughout Michigan and northern Wisconsin. The survey effort also included visual inspections of firewood and ash trees in these and adjacent areas. For more info visit:

<http://www.emeraldashborer.org>

The MDA EAB quarantine was revised on October 31, 2005. The quarantine includes 21 quarantined counties in the southeast Michigan and 31 outliers with quarantine boundaries defined by townships which buffer remote EAB sites. All counties in the Lower Peninsula are either quarantined or regulated. No hardwood firewood or ash trees parts or products can move from quarantined areas or out of the Lower Peninsula without MDA inspection and approval. Visit the MDA website for specific quarantine language and updates at:

<http://www.michigan.gov/mda>

Beginning in the fall of 2004, the DNR conducts firewood sweeps in December after closure of the firearm deer hunting season. All hardwood firewood left at State Forest Campgrounds & State Parks is burned.

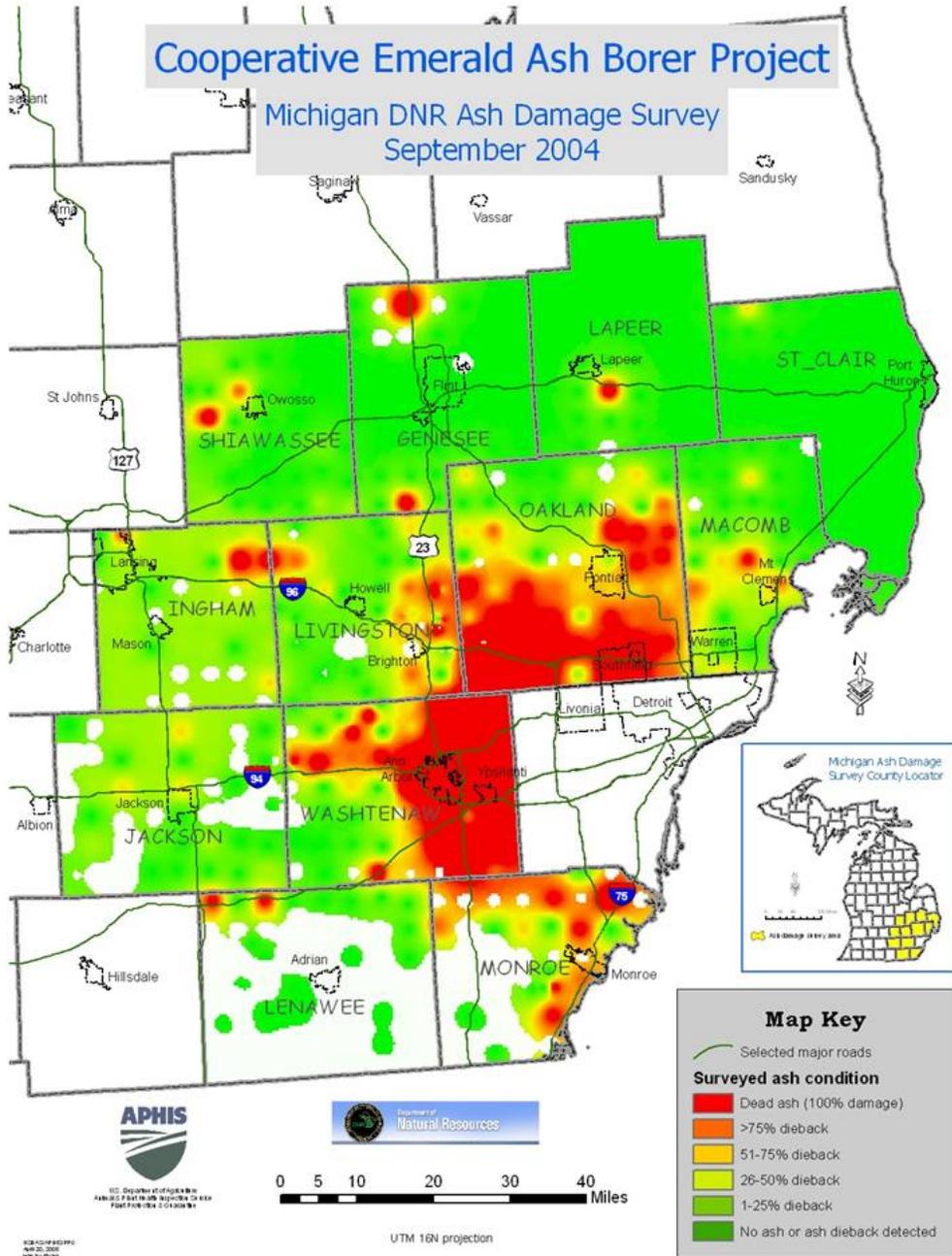
The Forest, Mineral and Fire Management Division (FMFM) of the DNR adopted ash management guidelines for use on state lands. Accelerated commercial harvests will be used to remove ash on state lands within ½ mile of EAB outliers. Harvest of ash resources within 5 miles of EAB populations will be high priority. Conventional forest management practices will be employed to increase tree species diversity and decrease ash components where ash comprises a "significant" component of the forest resource. This harvesting reduces but doesn't eliminate ash. Once EAB reaches stands managed with these guidelines, lower ash densities will reduce EAB impacts, and allow the harvest / salvage of remaining merchantable ash with less risk of creating under-stocked stands.

The DNR awarded \$521,332 in grants (USDA Forest Service Funds) to 39 Michigan communities and non-profit organizations for tree planting projects. This grant program helps communities replace EAB killed ash. Affected communities and non-profit organizations within the original 20 emerald ash borer quarantined counties and past outlier communities were eligible for financial and technical assistance in support of tree planting projects. This is the third round of tree planting grant assistance.

The USDA Forest Service funded Rural Ash Monitoring Plot System was initiated during summer of 2004. This project is collaboration between the University of Michigan and MTU. A total of 400 forest health monitoring plots were established in stands containing ash throughout Michigan. The objective is to detect EAB presence in Michigan's rural ash containing forests and to monitor current conditions and changes over time. This effort will provide baseline data to evaluate EAB induced forest resources impacts. Understanding of EAB population and host interactions is used to generate an EAB risk model. The model is used to create maps which direct and prioritize survey and management activities.



With assistance from USDA APHIS and the Michigan Department of Agriculture, an ash damage survey was conducted in late 2004 to assess impacts of EAB. The objective was to determine the relative impacts of EAB in and around the original core counties. Subsequent damage assessments will use remote sensed imagery and ground data to determine ash trees per acre and volume of ash affected, and provide information about the amount of ash in urban landscapes.



The demand for hazard tree training has greatly increased. Personnel managing state parks and state forest campgrounds are facing new challenges due to EAB induced ash

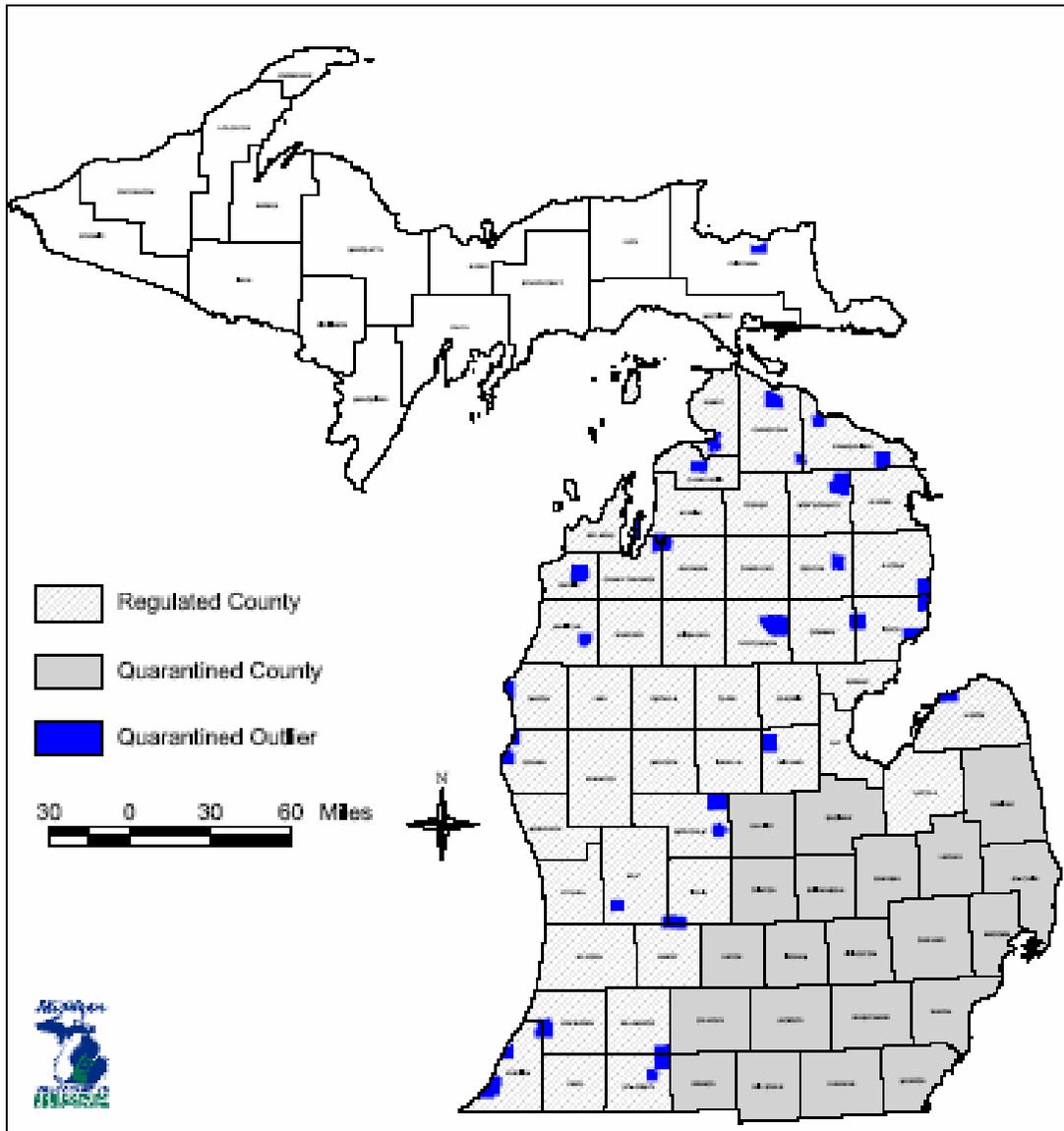
morality in SE Michigan, and the spread of beech bark disease. Recognizing and removing hazardous trees is very costly as are tree and landscape restoration activities.

Regulating the movement of firewood by the general public from infested areas remains the most difficult of tasks. The message: **DON'T MOVE FIREWOOD!**

Visit the following websites for updates on EAB management, surveys and research:

<http://www.emeraldashborer.info>

<http://www.na.fs.fed.us/fhp/eab/mgmt/mgmt.shtm>



**Black Ash Decline and Mortality** continues to be common in many parts of the state. This is related to past drought conditions. Trees growing in wet soils, such as black ash, often

suffer during droughts. Wetland trees tend to develop shallow root systems that cannot cope with a prolonged drop in soil moisture. Rising water tables after a prolonged drought may also drown deeper roots developed as the tree sought moisture during the drought years.

A **White Ash Root Rot** is causing extensive wind throw of mature ash in high quality northern hardwood stands in Northern Lower Michigan. Stresses from overstocking may be involved. University and USDA Forest Service forest pathologists and entomologists visited ash decline areas in Northern Lower Michigan. Ash yellows was diagnosed as one of the causal agents of decline. Armillaria and other root pathogens are also involved. Further study based on these findings will follow. Understanding ash health is paramount in understanding ash resource susceptibility to EAB.

A [Hemlock Woolly Adelgid](#) quarantine continues to restrict movement of eastern hemlock into Michigan from infested counties of other states. All eastern hemlock shipments require a phytosanitary certificate. This follows the interception of the insect at two Michigan nurseries in 2000.



Hemlock woolly adelgid, which is dispersed by wind and by movement of infested firewood, feeds on tree sap, killing needles, twigs and branches. Infested trees eventually die.

Rapid early detection surveys for the adelgid were conducted statewide for the fourth straight year in hemlock stands and in areas adjacent to nurseries. This is part of a Forest Health Monitoring Evaluation Monitoring project. No adelgids were found in 2005.

From the [Michigan Department of Agriculture](#): Two recent interceptions of **Hemlock Woolly Adelgid** (HWA) on nursery stock and an increase in quarantine violations elicited a large scale survey and information gathering program in 2005. A total of 6,387 hemlocks were inspected at 196 nurseries statewide between May and October. Firms were also queried regarding the sources of HWA nursery stock and sizes and dates of shipments. One hundred and seven trees were rejected for quarantine violations and several hundred were restricted pending proper certification. In addition, 877 hemlocks were inspected at 46 native stands in the Upper Peninsula and Northern Lower Peninsula during the same period. In total, over 7,200 hemlocks were inspected in 62 of Michigan's 83 counties. No hemlock woolly adelgids were detected.

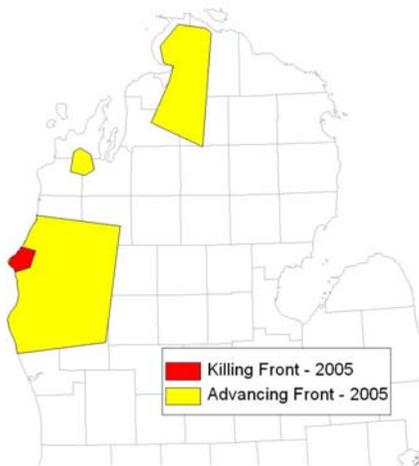
[Beech Bark Disease](#) (BBD) continues to threaten Michigan's American beech resource. Beech is a component of 7.2 million acres of Maple-Beech-Birch type. This represents 138 million beech trees in all size classes. Of these, 15 million larger beech (greater than 9-inch diameter) are highly vulnerable to tree mortality. BBD is presently killing beech trees in areas infested with beech scale for 10 years or more. Many hundreds of acres of American beech are being harvested in the killing front areas of the eastern Upper Peninsula.

The USDA Forest Service Research Facility in Delaware, Ohio continues to collect scions from Michigan's resistant trees to study **Beech Bark Disease Resistance**. Scions from resistant American beech were again collected in December, 2005 and sent to the



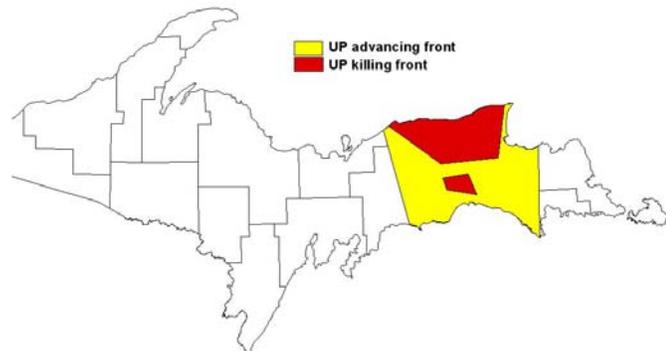
Delaware, OH USFS research facility. Michigan has also agreed to host 1 or 2 seed orchards for propagating resistant seed beginning in the fall, 2006.

The University of Michigan continues to expand the **Beech Bark Disease Monitoring & Impact Analysis System** plot network. Data collected for the BBDMIAS and also field observations during summer 2005 revealed new beech scale infestations in several areas. Counties in the Lower Peninsula that had new or increasing infestations include Antrim, Emmet, Leelanau, Manistee, Newaygo, Otsego and Wexford Counties. In addition, field crews observed very light scale populations in Cheboygan County and on Bois Blanc Island.



Using data from the BBDMIAS, an effort was begun in 2004 to calculate the current and projected spread of beech bark disease in Michigan. The goal is to develop a model based on empirical data to predict how rapidly beech scale and beech bark disease will spread through Michigan and to determine if spread rates in Michigan are consistent with estimates from other regions of North America. To date it appears the **spread rate** of beech scale in Michigan is about double that published for the Northeast, or about **10-15 miles per year**. Spread rates will vary from stand to stand since the beech resource in the Lower Peninsula is much more fragmented than the Upper Peninsula. It believed that the beech scale in the Upper Peninsula was already widely distributed before the initial detection in 2000.

Most of Chippewa, Luce and Mackinac Counties are now included in the advancing front and several new areas of infestation were found west of the previous boundary, primarily in Schoolcraft and Alger Counties. Beech scale in a plot on Drummond Island was reported as having light scale but has not been confirmed.



On a positive note, mortality did not increase as dramatically as scale populations and most areas are still in the early stages of scale infestation. The most dramatic increase in beech mortality was in Tahquamenon Falls State Park on the Chippewa/Luce County border where over 90% of the beech overstory is either dead or severely declining.



**Oak Wilt** continues to spread naturally and artificially through much of the Lower Peninsula and in the south central Upper Peninsula. Movement of oak wilt on firewood is plaguing efforts to slow the spread of this fatal oak disease.



To slow the overland spread of oak wilt, harvesting restrictions are observed on state land. Harvesting activities in forests where red oak trees remain after harvest cannot be cut between April 15 and July 15. **Sap-feeding beetles** responsible for spreading oak wilt are most active during this time. These small (1/4-inch long) beetles can pick up spores from diseased trees and transmit them to oak trees that have been damaged during logging operations.

US Forest Service Oak Wilt Suppression funds for detecting and treating oak wilt epicenters in Michigan's Upper Peninsula were not available in 2005. However, detection efforts and landowners contacts continued in efforts to rid the Upper Peninsula of this threat to its oak resources.

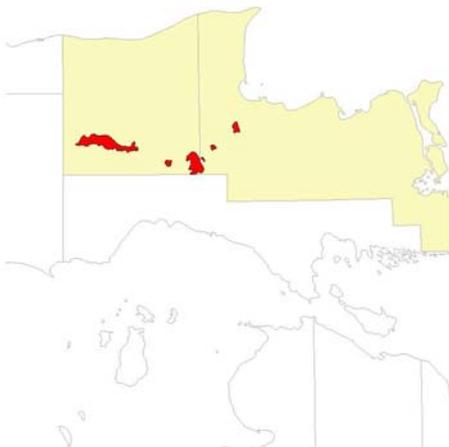
For information about identifying and preventing oak wilt, visit:

<http://www.extension.bpp.msu.edu/oakwilt2.pdf>

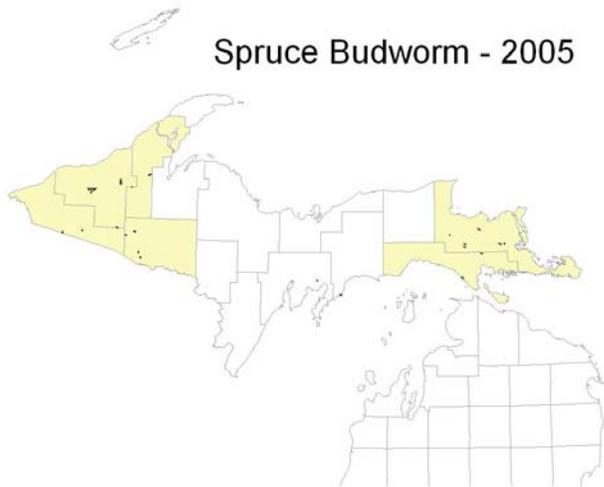
**Sudden Oak Death** (now known as **Ramorum Blight**) (*Phytophthora ramorum* [SOD]) has not been detected in Michigan's nurseries, urban forests or forest lands.

The **Michigan Department of Agriculture** participated in the National **Ramorum Blight** Nursery Survey again in 2005. Surveys were conducted at 33 production nurseries known or suspected of receiving nursery stock from infested areas of California, Oregon, Washington, and/or British Columbia. A total of 758 plants were sampled. Three samples are being processed as suspected *P. ramorum*. Since 2004, nearly 3,000 samples have been taken throughout the Lower Peninsula. No *P. ramorum* has been detected to date.

### Eastern Larch Beetle - 2005



**Eastern Larch Beetle**, *Dendroctonus simplex*, populations in Eastern and the South Central Upper Peninsula caused 25,717 acres of mortality in 2005. This bark beetle became epidemic in tamarack (*Larix laricina*) stressed trees from the drought of 2000-2001 and repeated defoliation by the **Larch Casebearer** (*Coleophora laricella*). The casebearer is an introduced needle-mining insect. While populations are usually brought under control within 2 years by parasite natural enemies, repeated heavy defoliation can cause branch dieback or tree mortality.



[Spruce Budworm](#) was defoliated 9471 acres in several counties in Michigan's Upper Peninsula. Areas of light budworm defoliation have been visible for the last few years. Areas of mature to over mature spruce/fir in the south central Upper Peninsula (south western Menominee County) have top kill and tree mortality caused by repeated defoliations.

The [Michigan Invasive Plant Council](#) strives to increase awareness, education and management of invasive plants. **Scots Pine** (*Pinus sylvestris*) is

systematically being removed from state forestlands. Prescribed fire is one tool being tried to reduce [Spotted Knapweed](#) (*Centaurea maculosa*) populations in oak savannas in the south central Upper Peninsula., **Cluster head pink** (*Dianthus carthusianorum*) was detected in the Upper Peninsula and with efforts to eradicate planned in 2006. **Common buckthorn** (*Rhamnus cathartica*) plagues many areas of the state. The Seney Wildlife Refuge continues to battle buckthorn populations with herbicides and prescribed fire.

[Garlic Mustard](#) (*Alliaria petiolata*) monitoring, management and eradication projects are gaining momentum in Michigan. Public and private organizations are cooperating in efforts to remove and keep garlic mustard from establishing in new areas of Upper Michigan and the Northwest Lower Peninsula. A seventy acre northern hardwoods site in the Eastern Upper Peninsula has a seven year prescribed burn plan which includes follow-up use of glyphosate herbicide to treat plants missed by fire. Treatments are designed to contain the spread of the plant and eventually eliminate garlic mustard. Additional monitoring of plant community response to burning and herbicide treatments is planned for 2006.



#### [Giant-hogweed](#) *Heracleum*

*mantegazzianum*) has been found in 11 Michigan counties. First discovered in 2001, Giant Hogweed has now been confirmed in the following counties: Branch, Calhoun, Gogebic, Ingham, Jackson, Kalamazoo, Kent, Manistee, Oakland, Ottawa and Saginaw.

Only a few small scattered pockets of aspen and oak defoliation remain as evidence of the large scale [Forest Tent Caterpillar](#) (FTC) (*Malacosoma disstria*) epidemic which began in 2000.

The [Red-Headed Pine Sawfly](#) (*Neodiprion lecontei*) periodically defoliates young red and jack pine. Sawfly populations have

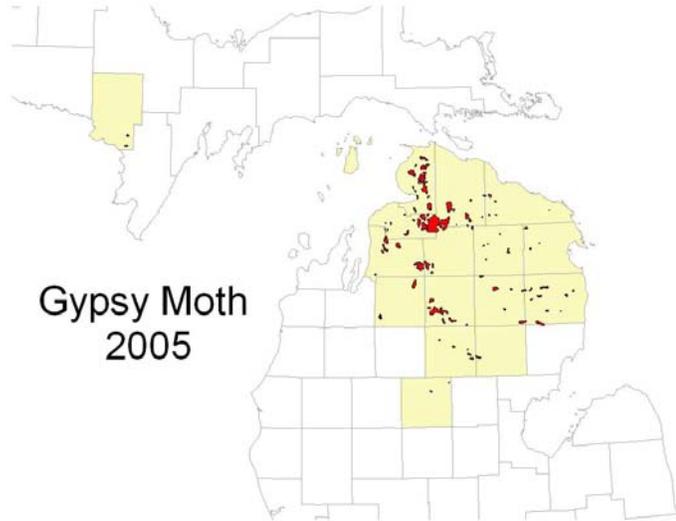
been active in the eastern Upper Peninsula and the northern Lower Peninsula beginning in 2002. Dimlin 4L was aerially applied to 480 acres of infested plantation red pine in 2005.

For information about identifying and controlling redheaded pine sawfly, visit:

[http://www.na.fs.fed.us/spfo/pubs/fidls/pine\\_sawfly/pinesawfly.htm](http://www.na.fs.fed.us/spfo/pubs/fidls/pine_sawfly/pinesawfly.htm)

**Gypsy moth** (*Lymantria dispar*) defoliated 148,525 acres of oak forests statewide in 2005, up from 45,244 acres in 2004. A warm, dry spring did not favor *Entomophaga* development, so overall state populations of gypsy moth will likely increase in 2006.

According to a Michigan Department of Agriculture report a total of 4,316 acres in six counties in the Lower Peninsula were treated as part of the Cooperative Gypsy Moth Suppression Program in 2005. This was a significantly smaller acreage than 2004, when 24,581 acres were treated in 11 counties, and represents the second smallest treatment acreage since the program's inception in the 1980's.



The **Jack pine budworm** (*Choristoneura pinus pinus*) is considered the most significant pest of jack pine. Stands older than 50 years are vulnerable to damage. Jack pine over 50 years old that has suffered 2 or more defoliations during the past 3 years is at highest risk of top kill or mortality. Tree mortality and top-kill resulting from budworm defoliation creates fuel for intense wildfires. Harvesting stands when they reach maturity can minimize budworm-caused tree mortality and reduce the threat of damaging wildfires.

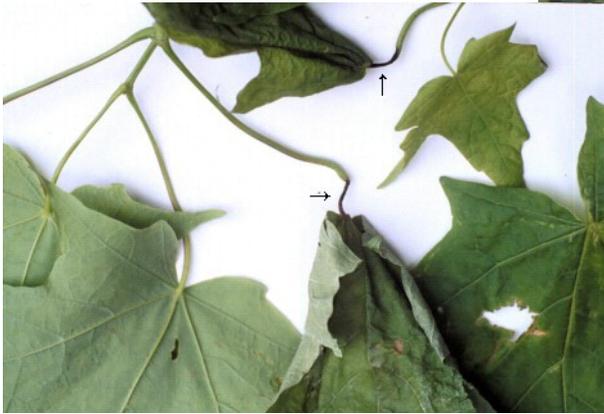
The current jack pine budworm epidemic defoliated 201,470 acres this year and has spread to many jack pine areas of the Upper Peninsula. Student assistants were used to assess budworm impacts on high risk stands. Based on these impact surveys many stands are being salvaged and pre-salvaged. Other stands were targeted for 2006 evaluation.



High risk stands were also recommended for harvest in the Northern Lower Peninsula based on stand vulnerability budworm damage and defoliation surveys. Budworm populations in the Lower Peninsula are subsiding.

### Bugs on the Screen

**Maple Tar Spot** was a common site on Norway maple leaves in 2005. Other maples are also infected. Fungi in the genus *Rhytisma* infect the leaves of maples causing the characteristic black spots to form on upper leaf surfaces. Heavy infections can cause early leaf drop in the fall. Black spots grow in diameter and thickness until late summer.



Reports of leaves dropping from maples in June were common in 2005. Although drought and other tree stressors also cause premature leaf drop, **Maple Petiole Borers**, *Caulocampus acericaulis*, were the culprit in most cases. These are a tiny non-stinging wasp called sawflies. Sawfly larvae feed in the petioles (stems) of maple leaves in the spring. Green leaves without most of their petiole litter the ground by late spring.

This leaf loss is not considered a serious tree health threat.

### Research Update

Dr. Gerard Adams, Michigan State University was contracted to map the spread of [Dogwood Anthracnose](#) in the Southern Lower Peninsula. Fifty GPS-positioned permanent impact plots were established in natural dogwood stands in 30 counties. The advancing front of the epidemic has spread to five additional counties in the last five years. To date, at least 11 counties in Michigan have become infested. The impacts reported in this study are of infestations impacting native forest stands, excluding additional counties where the pathogen infests only ornamental *Cornus florida* in private gardens and nurseries.

Dr. Gerard Adams, Michigan State University was contracted to determine how to grow red and jack pine seedlings in Michigan which are free of [Diplodia sapinea](#) (a.k.a. *Sphaeropsis sapinea*). Red pine cones were purchased for seed to supply the future needs of DNR nursery plantings. These seed stores were evaluated by origin to determine availability of Diplodia free seed. Additionally, the encroachment of *D. sapinea* into clean stands will be monitored in future years to estimate rate of infestation over time. This should provide an estimate the durability of the non-infested nature of clean seed stock following out-planting.



The **North Central Region Risk Mapping Project** expanded in 2004 to include states in the Northeastern and Southern Regions. This effort, begun in 2000 in cooperation with USFS State & Private Forestry and, beginning this year, the USFS Forest Health Technology Enterprise Team, brings together forest health and Geographic Information System (GIS) resources to design and produce forest insect and disease risk models. **Multi-criterion modeling (MCM)** is used to predict the risk of major forest types becoming infested by (susceptibility) and dying from (vulnerability) various native and exotic forest pests. MCM combines a variety of GIS data (criteria), including soil, tree, climate and forest health information, into detailed maps that will assist resource professionals in planning and conducting forest health management activities.

For additional information about this project, see:

<http://www.fs.fed.us/foresthealth/mcm/>

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