



Lake States Forest Health Watch



August 1, 2004

About this newsletter...

The Forest Health Protection unit of the Forest Service located in St. Paul, Minnesota produces this newsletter. Our intent is to keep Federal land managers in the Upper Great Lakes region abreast of forest health related issues such as insect and pathogen outbreaks. We need your assistance, please contact us with your observations.

What happened this spring and early summer...

Introduced basswood thrips – Widespread thrips damage on basswood was reported in northeastern Wisconsin. Thrips feeding results in very early-season defoliation on basswood. Leaves are damaged as they emerge (see photo) from the bud stage producing trees with a ragged appearance. This insect has been active in the Great Lakes region since the early 1980's when it was first identified as a pest. The initial thrips outbreak in the region lasted through the 1980's. During that time period many basswood trees in northern Wisconsin, eastern Minnesota, and the U.P. survived the annual spring leaf damage but grew little. Since the early 1990's outbreaks have been more localized with small pockets of damage reported. Many of our basswood trees have branch and crown dieback related to thrips damage. For more see:

http://www.na.fs.fed.us/spfo/pubs/howtos/ht_bassthrips/ht_bassthrips.htm



Thrips damage on basswood

Jack pine budworm – Jack pine budworm populations have risen to high levels in many parts of the northern Lake States. Defoliation was reported on the Hiawatha, Ottawa and Huron Forests. Defoliation was also observed in northwestern Wisconsin, in the vicinity of Chequamegon. In addition to widespread defoliation we have also received reports of large numbers of budworm moths at a couple of different locations. Because this is the first year of the outbreak in many locations and because of the numerous reports of large moth numbers we would expect defoliation to expand in area next summer. Infested trees can be easily observed at this time of year, look for trees that appear to be brown or red in color. Close examination should reveal extensive webbing holding many clipped needles. It is not unusual to have about 5-10 percent tree mortality and 10 percent top-kill following an outbreak. An outbreak tends to last 2-3 years before declining. If outbreaks persist, more extensive mortality can occur. For further information see: http://www.na.fs.fed.us/spfo/pubs/howtos/ht_jack/ht_jack.htm



Budworm-caused mortality

Spruce budworm – Reports of spruce budworm defoliation increased this spring. In addition to the more “normal” reports from northern Minnesota we have also observed defoliation in a number of scattered locations in northern Wisconsin and the U.P.. In Wisconsin and Michigan, budworm activity is occurring mostly in white spruce plantations. In Minnesota defoliation is occurring in natural stands of balsam fir and spruce, as well as in white spruce plantations.

Reports of widespread tree declines...

We have several large scale decline events ongoing in the region at this time. Oak mortality is at high levels in northwestern Wisconsin, northcentral Minnesota and on the parts of the Huron-Manistee National Forest. Black ash dieback and decline is evident in many locations and mortality is widespread in white spruce plantations in northern Wisconsin and adjacent parts of the U.P. Our spring edition of this newsletter reported additional information on these concerns, little improvement has been noted this summer. In addition, we have reports of extensive tamarack mortality in some locations as well as paper birch decline along Minnesota's north shore of Lake Superior.

Oak mortality – Two-lined chestnut borer, *Agrilus bilineatus*, has killed large numbers of oaks, especially in northwestern Wisconsin. Oak mortality in the area was first reported in late summer of 2002. In this situation, we believe a couple of stressing agents were involved; defoliation by forest tent caterpillar and drought. The defoliation occurred between 2000 and 2002. Trees dying this year should become evident (brick-red leaves) in August through early September. Therefore, we should soon have a good idea if this outbreak is declining. For more information on two-lined chestnut borer see: <http://www.na.fs.fed.us/spfo/pubs/fidls/chestnutborer/chestnutborer.htm>



Black ash decline – In the region, many black ash stands have widespread decline symptoms and high levels of mortality. We believe much of 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. Some of the most extensive damage can be seen south and west of Duluth, Minnesota. Black ash decline has occurred on several occasions over the last 10-15 years. Drought in the late 1980's, several late frosts and anthracnose outbreaks have all been blamed for past episodes. This year's damage appears to be very significant with extensive mortality in many locations.

White spruce plantation decline and mortality – As we reported in our May 2004 issue, tree decline and mortality were evident in a large number of white spruce plantations within the Park Falls District of the Chequamegon National Forest and the Kenton District of the Ottawa National Forest. Mortality is extensive in a number of 30-50 year old plantations. No indication of improvement in tree health has been observed this summer. In fact, further mortality and damage is evident in many stands. Spruce budworm defoliation was present in many of these areas, this will further stress many trees.

Paper birch decline – The north shore of Lake Superior is one of the most scenic drives in Minnesota. Unfortunately, it is also a great place to view paper birch decline. The shoreline has extensive stands of older paper birch that have been in a constant state of decline over the last decade. This year the dieback and mortality is very pronounced. Drought is probably the main culprit. But, a very old birch resource is another problem. In addition, lots of lakeshore development and road construction is occurring. Birch is very sensitive to drought and site disturbance, the combination is proving deadly. Maintaining extensive mature paper birch stands in the area is a difficult proposition. In order to maintain a large birch component, the age structure must be shifted to younger more vigorous stands. The older trees will continue to be infested with bronze birch borer and armillaria root disease and mortality will continue at high levels even if drought conditions ease.



Tamarack mortality – Two years ago we first reported tamarack mortality on the increase in Minnesota. Since then mortality has also been observed in Wisconsin and the U.P. Much of this has been attributed to an outbreak of eastern larch beetle, *Dendroctonus simplex*. Why this native beetle has become a widespread tree killer is not fully understood. We have had numerous reports of defoliation by larch casebearer in areas and we have had persistent drought conditions in some areas. In addition, we have a tamarack resource that is maturing. This year, reports of dead and dying tamarack are not as common as last year, so perhaps conditions are improving.

Late summer insects and diseases...

The following are some of our more commonly reported tree problems in late summer and early fall.

Fall webworm – This is one of our more common late season caterpillars in the upper Midwest. It is well named with the large webs becoming evident as fall approaches. The caterpillars produce the webbing that encloses leaves, branches and sometimes entire trees. This species is most common in the central U.S. where it feeds on walnuts, hickories, American elm and many other hardwood species. In the northern portions of the Great lakes region it is more commonly observed on fruit trees including our wild cherries. It should not be confused with eastern tent caterpillar. That species makes a very neat, tidy tent that does not enclose foliage and it occurs early in the spring.

A tent formed on cherry by the fall webworm



Introduced pine sawfly – This non-native sawfly is most commonly encountered in late summer through September feeding on eastern white pine. It can be found on all of our native pines but does prefer white pine. We have had some recent localized outbreaks around Hayward, Wisconsin, and in the eastern end of the U.P. Watch for white pine trees that appear very thin in the crown. The larvae have a shiny black head and easily identifiable pattern of spots (see photo).



White pine weevil – In mid- to late summer white pine weevil killed terminals on white pine become visible (see photo). During the early spring and summer, the larval stage of this destructive insect feeds inside last-year's terminal. By this time of year the feeding damage is extensive and results in girdling of the terminal. Watch for the dead terminals that form a classic "shepherd's crook" (see photo). White pine growing in full sunlight are most prone to attack. Jack and Scotch pine, white, Norway and blue spruce are also attacked.



Multicolored Asian ladybeetle – So, where have all those nasty ladybeetles gone? Well, they are still around busily feeding on aphids and scale insects in trees and in farm fields. They will return in mass as soon as we get our first couple of frosts in the fall. It is difficult to predict this year's population. However, it has not been a great summer for aphids so perhaps the ladybeetle numbers will be down.

Aspen blotchminer – These blotch mines on aspen leaves have been very common in the past 5-7 years. Each mine contains a small caterpillar that becomes a tiny moth. One to 8 mines can occur on a single leaf. This leaf feeding occurs late in the summer and does not appear to cause significant damage to trees.



Updates on exotic pests...

Our May 2004 edition of this newsletter provided extensive updates on beech bark disease, gypsy moth, emerald ash borer and sudden oak death. Please refer to that edition for information on those exotics. Past editions of our newsletters can be accessed at <http://www.na.fs.fed.us/spfo/pubs/newsletters/lshw/index.html>

In place of further updates we have what we may refer to as our rogues gallery. Here are some images of the “bad bugs”, exotic insects and pathogens that are on the doorstep of our Great Lakes forests. If you see anything suspicious please collect a sample, take a photograph, send us a note, contact someone who can identify what looks unusual or out of place. We may actually be able to eliminate a problem pest if we find it soon after introduction occurs. For many pests, campgrounds seem to be one area of introduction. Firewood is the likely culprit.

Emerald ash borer -- Watch for dead and declining ash trees. The ash tree on the left is heavily infested, woodpeckers have been removing the outer bark searching for larvae. Look for the light-colored patches that indicate woodpecker activity. The center and right side photos illustrate the gallery pattern found under the bark. For more information visit: <http://www.na.fs.fed.us/spfo/eab/index.html>



Sudden oak Death – also referred to as SOD. Movement via infested nursery material is a major concern. Watch for unexplained oak mortality, black bleeding cankers on dying oaks should draw your attention. For more information visit: <http://www.na.fs.fed.us/sod/index.htm>



Ooze bleeds from a canker on an infected oak.

Hemlock woolly adelgid – A very significant threat for our native hemlock resource, currently found in the eastern U.S. This insect has shown up in Michigan and Missouri on infested nursery material. Watch for white cottony masses clustered at the base of needles. For more information visit:

<http://www.fs.fed.us/na/morgantown/fhp/hwa/hwasite>



Beech bark disease – Already present in the eastern U.P. and the Ludington area of Lower Michigan. This disease/insect combination decimates American beech. Watch for white cottony material (beech scale) covering the bark on beech (photo on left). Diseased trees often snap or break in windstorms (photo on right).



State forest health units...

We are lucky in the Great Lakes region to have three states (Michigan, Minnesota and Wisconsin), that have experienced, highly qualified forest health staffs. We would encourage all of our federal land managers to develop a working relationship with these folks, they can provide a wealth of information. Our Forest Health unit here in St. Paul does have the responsibility for providing insect and disease assistance to federal lands. But, in many situations a DNR entomologist or pathologist can provide a more local perspective. We work closely with our state cooperators to provide a consistent message across state, county, federal and private lands. For a list of state forest health staff in Minnesota and Wisconsin you can visit the following web sites.

Minnesota <http://www.dnr.state.mn.us/contact/rfhs.html>

Wisconsin <http://www.dnr.state.wi.us/org/land/Forestry/FH/Staff/index.htm>

Michigan In the U.P. contact Bob Heyd, Michigan DNR in Marquette, heydr@michigan.gov (906) 228-6562. In the Lower Peninsula contact Roger Mech, Michigan DNR in Lansing, mechr@michigan.gov (517) 335-4408.

Quiz...

Test your knowledge. The photograph on the left is a jack pine with a large number of swellings or galls on its branches and main stem. The center photo is a small diameter white pine branch with a frothy wet mass at the base of the new growth. The photo on the right hand side is an older American elm with several branches in the upper crown “flagging” with yellow and brown leaves.



Quiz answers...

In the first photograph (left), the swellings or branch galls are referred to as eastern gall rust. This rust can also be found on Scotch pine. The swollen spherical galls are caused by a rust fungus that requires both pine and oak (the alternate host) to complete its life cycle. During spring these galls produce bright orange spores. The spores infect oak leaves that later produce an additional spore stage that infects new pine needles. Galls appear on pines one to two years after infection. One or two branch galls generally have minimal impact on a tree but seedlings and young trees can be killed by galls on the main stem. Galls can girdle branches. The center photo shows a spittle mass formed by the pine spittlebug. This is a very common insect found feeding on many of our conifers. If you wipe away the spittle you should find one or more immature spittlebugs feeding on the pine twig. Heavy populations of pine spittlebug can occur and can cause localized damage. But, most of the time only scattered spittle masses are observed. The American elm is showing classic symptoms of Dutch elm disease. This disease is making a resurgence in many parts of the Great Lakes region.

Upcoming forest health workshops...

The 2004 Annual Gypsy Moth Review, November 8-11, Indianapolis, IN.

This annual meeting is sponsored by the National Gypsy Moth Management Board. Updates are provided on a range of topics related to gypsy moth management and the status of infestations throughout the region. In addition, information is also presented on the status of other exotic insects and diseases. For more information contact Phil Marshall, Indiana DNR, pmarshall@hsonline.net

Publications and resources...

Almost all of our publications are available via our home page found on the World Wide Web. This can be accessed at:

<http://www.na.fs.fed.us/spfo/>

Copies can be obtained by contacting our office at the address or phone number listed to the right.

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Update on butternut and butternut canker...

The following update was developed from information provided by Dr. Michael Ostry, Research Pathologist with the North Central Research Station. Mike recently co-authored a paper titled, Spread of butternut canker in North America, host range, evidence of resistance within butternut populations and conservation genetics. This paper was published in **Black walnut in a new century, proceedings of the 6th Walnut Council research symposium**, Gen. Tech. Rep. NC-243, published in 2004. Below is a condensed version of that paper. A copy of the symposium proceedings can be requested via the following web site: <http://ncrs.fs.fed.us/pubs/viewpub.asp?key=1988>

Butternut (*Juglans cinerea* L.) is being killed throughout its range by a canker caused by the fungus *Sirococcus clavigignenti-juglandacearum*, described as a new species in 1979. Although there are no reports of this fungus outside of North America, it is thought to be an exotic pathogen. The most recent FIA survey data examined for butternut (NCRS, FIA website, Oct. 2003) revealed that overall in 7 Midwestern states the number of butternut trees in all size classes decreased by 23%, though the number of trees recorded increased in 3 of the states. The states with a **decrease** in the number of trees and the inventory interval from which the data were collected are as follows: Michigan 89% (1993-2001), Illinois 87% (1998-2002), Wisconsin 44% (1996-2001), and Iowa 40% (1990-2001). An **increase** in the number of butternut trees was recorded in Minnesota 55% (1990-2002), Indiana 41% (1998-2002) and Missouri 25% (1989-2002). However, this increase in number of trees was predominantly in the smallest size class (1.0-2.9 inch); the number of trees in all other size classes revealed decreases ranging from 13% (11.0-12.9 inch) to 100% (21.0+). Larger butternut are becoming rare. Those trees that do still exist are likely to be heavily cankered.

Butternut was listed under Category 2 on the list of Endangered and Threatened Plants under the Federal Endangered Species Act of 1973, however, this category has been eliminated and currently butternut has no official listing status. The first state to enact a measure to conserve butternut was Minnesota where in 1992 a moratorium on the harvest of healthy butternut on state lands was enacted. Butternut remains a “species of concern” or a “sensitive species” in many states and is a Regional Forester Sensitive Species in the Eastern Region on 13 of the 16 National Forests. In Canada, butternut was listed endangered by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) in November 2003.

Spread of the pathogen

The first reported occurrence of butternut canker was from southwestern Wisconsin in 1967 where all but two butternut trees in a 40-acre woodlot were diseased. A 1976 survey of butternut in 36 Wisconsin counties revealed that 31 and 9 percent of the trees were diseased and dead, respectively. In contrast, in a 1992 resurvey of 32 Wisconsin counties 92 and 27 percent of the trees were diseased and dead, respectively.

A survey for butternut canker in the eastern United States revealed that the disease was present in at least 14 of the 16 states surveyed. In that report the authors mention the disease had essentially eliminated many populations of butternut in North and South Carolina. Early reports of butternut decline throughout the northeastern United States were attributed to the fungus *Melanconis juglandis* that causes branch dieback but not stem cankers. These reports may have mistakenly attributed tree decline to *M. juglandis* and butternut canker may have been present much earlier than reported.

Natural and experimental host range

Butternut is the only species that is killed by this canker disease. However, using artificial inoculations of greenhouse seedlings several other hardwood species have been shown to be susceptible and may be able to harbor the fungus. Species in *Carya*, that were demonstrated to be susceptible include pecan and shagbark hickory. Although not causing large cankers, the fungus was recovered beyond the inoculation point from northern red, black, and white oak, and black cherry. Bitternut hickory also has been shown to support the growth of the pathogen. These preliminary results indicate that genera other than *Juglans* may serve as a reservoir of the pathogen within forest stands.

Evidence of resistance

In many areas throughout its range, apparently healthy butternut trees have been found growing adjacent to trees infected and killed by the disease. Some of the monitored trees have remained healthy for over 12 years despite the severe disease on neighboring trees, minimizing the likelihood that disease escape is responsible for trees being symptom-free. Although these relatively rare trees may be disease resistant, experimental data is not yet available to demonstrate the existence of effective resistance.

Collections have been made from a number of trees that show evidence of resistance. Although it is too early for reporting definitive results from screening trials, indications are that infection resulted from all inoculation dates and several selected butternut lines have limited canker development compared to unselected or diseased source trees. As with inoculations of plants in the greenhouse, screening trees in the field this way may allow us to separate groups of highly resistant selections from those that are highly susceptible.

The current evidence of resistance mechanisms is circumstantial based on examining butternut over the years in search of trees that may have disease resistance. Mike Ostry and his colleagues have detected two bark phenotypes on trees of the same size and relative age. One is a dark colored bark with deep bark fissures resembling the bark of eastern black walnut. The other is a light gray bark color with shallow bark fissures. These bark types and various intermediate types have been found on adjacent trees in many woodlots in Minnesota and Wisconsin. Often the dark/deep bark phenotype is associated with healthy trees and the light/shallow bark with diseased trees.

One concern regarding the resistance issue is that some of the trees collected to date that show signs of resistance may indeed be hybrids between butternut and other *Juglans* species. Butternut hybridizes with Persian walnut to produce *J. x quadrangularata* (Carr.) Rehd., with Japanese walnut to produce *J. x bixbyi* Rehd and with heartnut to produce "buartnut". Field observations indicate that buarts are more common in old, abandoned farmyards, on pasture edges, and in the yards of houses in small, rural towns. The leaves of buarts may be greener and more persistent than those of butternut, not abscising until well into October; whereas butternut leaves typically turn yellow and abscise in early to mid-September. There are reports that butternut also hybridizes with little walnut (*J. microcarpa* Berland) and Manchurian walnut (*J. mandshurica* Maxim.). Work is now being conducted on genetic markers that can be used to uncover the lineage of these trees.

Conclusions

Since the detection of butternut canker in 1967 researchers have clarified several aspects of the disease, including the description of the causal agent, its biology, a partial host range, and they have documented limited examples of potentially disease resistant trees. However, many gaps remain in our knowledge including the origin of the pathogen, the level of genetic diversity in butternut across its range, and silvicultural techniques to retain butternut in our forests and to restore the species where it has been eliminated by the disease.

Butternut is rapidly being lost in our forests from a variety of causes in addition to butternut canker. Genetic diversity in species such as butternut is needed for its long-term survival, future adaptation and evolution. There is an urgent need to conserve genetic diversity among butternut populations before valuable populations are lost.

If you locate healthy butternut trees that have no signs of cankering please contact Mike Ostry (mostry@fs.fed.us). Disease free butternut trees, especially in areas where the disease is prevalent may be invaluable in ensuring the survival of butternut. For more on butternut canker see: http://www.na.fs.fed.us/spfo/pubs/howtos/ht_but/ht_but.htm