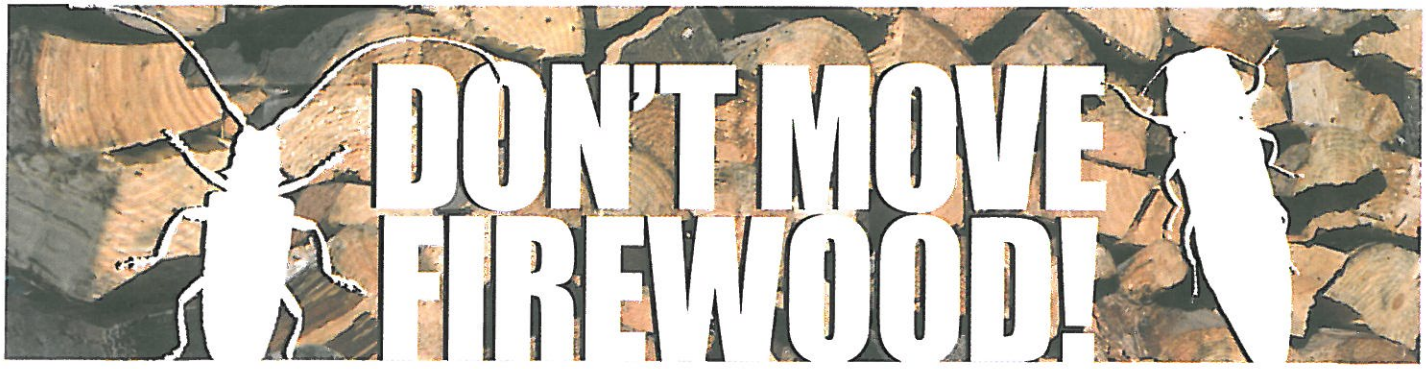

You could be killing our trees!

FIREWOOD QUESTIONS & ANSWERS

FIREWOOD AND INSECTS

✓ Why is firewood so bad? Other kinds of wood are moved and nobody says it's a problem.

Firewood itself isn't the problem–what's bad is moving it from one place to another. The bark on firewood can harbor insects and diseases that kill trees. Many of these pests have spread in loads of firewood. Commercial lumber, unlike most firewood, is typically kiln-dried, which kills most pests.

✓ What are these bugs that are supposed to be so bad? I don't see trees dying from them.

There are many bugs, not native to New York or the U.S. that could kill trees in our campgrounds, forests and communities. These include the Emerald ash borer, (attacks ash trees), Asian long-horned beetle (attacks maples and many others) and Sirex woodwasp (attacks pines). The Emerald ash borer killed millions of trees as it spread from Michigan to Ohio.

✓ So why are these bugs such a problem all of a sudden? Where did they come from?

Along with lower prices, our global economy brings imported goods that often arrive on wood pallets or in wood crates. The Emerald ash borer and Asian long-horned beetle came from Asia in wooden packing material. Sirex woodwasp arrived in wood packing, probably from Europe, but possibly from South America, Australia or Africa.

✓ Okay, so these bugs kill a few trees. Can't you just spray or something?

Unfortunately, many of these pests bore deeply into the wood and are not killed by surface sprays. Effective registered pesticides are not yet available. This leaves our forests unprotect-

ed. If spraying is an option, it is typically used only for small groups of of high-value trees on private property. When Emerald ash borers or Asian long-horned beetles are found, all nearby trees of the species they attack are cut to prevent spreading. Millions of ash trees have been cut in attempts to stop the spread of the ash borer.

✓ So what are DEC and OPRHP doing about this, besides telling people not to bring firewood from outside the local area around the campground?

They are working with federal agencies, other states and provinces to stop the spread of these pests and diseases and to safeguard against introduction of others. After Sirex woodwasp was found in Oswego County, DEC monitored its spread. Although Emerald ash borer has not yet been found in New York, DEC is trying to determine where it is likely to show up and how it may spread.

✓ What kinds of firewood shouldn't be moved?

All firewood can harbor dangerous pests or diseases–don't move any of it. Use only locally cut firewood. "Local" means from less than 50 miles. Never move wood from a quarantined area. (States include: Michigan, Illinois, Ohio, New Jersey, New York City, Long Island and the Province of Ontario.)

FIREWOOD AND CAMPGROUNDS

✓ Can I gather my own firewood around the campground?

Don't count on it. Most popular campgrounds may already be picked clean. In areas where firewood gathering has damaged live trees, it may be restricted or banned completely. Dead and downed wood also provides important habitat for woodland animals and helps to renew the soil. Campers must be prepared to buy firewood.

✓ How can I be sure I'll have firewood if I can't bring it?

Firewood should be available from local vendors. DEC and OPRHP are working to assure that firewood will be available from local sources.

✓ Why pay for firewood when I can bring my own for free?

Most people who camp enjoy being in the woods. Consider the value of the forest compared to a few dollars saved on firewood. If trees are killed by pests brought in on firewood, what will this forest look like? Would you still want to camp there? Is firewood free if it kills trees in your favorite campground...or in your backyard? Why not save weight and space for other gear—food, beverage, bikes, etc—and burn your own firewood at home? Your children will thank you when they go camping.

DON'T MOVE FIREWOOD.
OBTAIN IT LOCALLY.

To learn more go to these websites:

www.dec.ny.gov www.nysparks.state.ny.us www.na.fs.fed.us

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Cornell University
Cooperative Extension

What homeowners need to know about the Emerald Ash Borer

Mark Whitmore, Cornell University, Department of Natural Resources, Ithaca, NY 14853. May 2011

The Emerald Ash Borer (EAB) is a beetle that was introduced into the Detroit area from eastern Asia in the mid 1990's. First detected in 2002 it was already widespread and had killed ash trees over many hundreds of square miles. Despite intense eradication efforts EAB has currently spread to 15 states and 2 Canadian provinces, primarily through their inadvertent transport in firewood. To date there has been no resistance to the beetle detected in native ash trees and there are no effective area-wide treatments to stop EAB population growth. It appears that most, if not all ash trees in the Northeast are threatened with eventual infestation and death.

EAB was first detected in New York State in 2009 in the Town of Randolph, Cattaraugus County. This was a relatively small population and an effort was immediately initiated to reduce the number of EAB and slow their spread. In 2010 there were five more detections of EAB in New York ranging in size from only a few infested trees to one in Ulster County where over 65 square miles of heavily infested and dead ash trees were found. As in 2009, efforts are underway in all these locations to slow the spread. Currently about 99.2% of New York's forests are uninfested. Now is the time to prepare and hopefully the state's strategy to slow the spread will give everyone time to plan ahead and minimize economic impacts.

What do you as a homeowner need to do in preparation for the arrival of EAB? The first thing is don't panic! The infestations in New York State are still relatively small. You have time to plan ahead. Here is a list of things to consider:

- **Know your ash trees.** Find out if you have any ash trees on your property. Determine their size and relative health; this will be important in determining your priorities for management.
- **Know your property lines.** Resolve any questions about who is responsible for a particular tree so decisions can be made.
- **Determine your management strategy.** There are no effective area-wide treatments for EAB. The only effective treatment is the single tree application of systemic insecticides. However, not all are equally effective. Research the different insecticides registered for use in New York State and when application is warranted at www.nyis.info.

- **Know where the nearest EAB infestation is.** This is important because if you have chosen to treat your trees you should wait until the EAB is less than 10 miles away. You will need to treat your trees every year or two and you will be wasting your money if EAB is not yet a threat. Find maps of NY infestations at www.nyis.info.
- **Not all trees will respond the same to treatment.** Young, vigorously growing trees are going to respond best to application of systemic insecticides. Large trees that have been repeatedly pruned or have lost large branches may have a compromised vascular system and may not be able to spread the insecticide evenly throughout the crown. These trees may have large branches killed by EAB, and be aesthetically changed or even dangerous.
- **Consider removal and replacement.** Large or damaged trees might best be removed and replaced. The long term need to treat trees and the associated costs may also help you determine whether or not to replace a tree. It is difficult to say how long EAB will remain active in your area but experience from the Midwest indicates it may be 10 years or more.
- **Beware of guarantees to save your trees.** It's easy to save a tree if there are no EAB in your vicinity and it will often take more than 3 years for a tree to die. So beware of short term guarantees to save your tree. Work with reputable arborists who know EAB and the long-term commitment needed to save a tree.
- **Know the signs and symptoms of EAB.** Monitor your trees regularly and report your findings to your local CCE office www.cce.cornell.edu, the NYSDEC at (866) 640-0652, or at www.beetledetectives.com.
- **Get involved in your community.** Help neighbors ID their ash trees. Become a part of your local EAB Task Force to help develop a Community EAB Response Plan.
- Learn about all the issues surrounding the Emerald Ash Borer so you can make good, informed decisions. www.nyis.info.

Pest Alert

United States
Department of Agriculture
Forest Service
Northeastern Area
State and Private Forestry
NA-PR-02-04
Reprinted May 2010

Emerald Ash Borer

A beetle from Asia, *Agrilus planipennis* Fairmaire (Coleoptera: Buprestidae), was identified in July 2002 as the cause of widespread ash (*Fraxinus* spp.) tree decline and mortality in southeastern Michigan and Windsor, Ontario, Canada. Larval feeding in the tissue between the bark and sapwood disrupts transport of nutrients and water in a tree, eventually causing branches and the entire tree to die. Tens of millions of ash trees in forest, rural, and urban areas have already been killed or are heavily infested by this pest.

A. planipennis has been found throughout Michigan, across much of Ohio, and in parts of Indiana, Illinois, Maryland, Missouri, Pennsylvania, Virginia, West Virginia and Wisconsin. Infestations have also been found in more areas of Ontario and in the province of Quebec. The insect is likely to be found in additional areas as detection surveys continue. Evidence suggests that *A. planipennis* is generally established in an area for several years before it is detected.

The broad distribution of this pest in the United States and Canada is primarily due to people inadvertently transporting infested ash nursery stock, unprocessed logs, firewood, and other ash commodities. Federal and state quarantines in infested states now regulate transport of these products.

Identification

Adult beetles are generally larger and brighter green (Fig. 1) than the native North American *Agrilus* species. Adults are slender, elongate, and 7.5 to 13.5 mm long. Males are smaller than females and have fine hairs, which the females lack, on the ventral side of the thorax. Adults are usually bronze, golden, or reddish green overall, with darker, metallic emerald green wing covers. The dorsal side of the abdomen is metallic purplish red and can be seen when the wings are spread (Fig. 2). The prothorax, the segment behind the head and to which the first pair of legs is attached, is slightly wider than the head and the same width as the base of the wing covers.

Figure 1. Adult emerald ash borer.

Larvae reach a length of 26 to 32 mm, are white to cream-colored, and dorso-ventrally flattened (Fig. 3). The brown head is mostly retracted into the prothorax, and only the mouthparts are visible. The abdomen has 10 segments, and the last segment has a pair of brown, pincer-like appendages.

Figure 2. Purplish red abdomen on adult beetle.

Biology

A. planipennis generally has a 1-year life cycle. In the upper Midwest, adult beetles begin emerging in May or early June. Beetle activity peaks between mid June and early July, and continues into August. Beetles probably live for about 3 weeks, although some have survived for more than 6 weeks in the laboratory. Beetles generally are most active during the day, particularly when it is warm and sunny. Most beetles appear to remain in protected locations in bark crevices or on foliage during rain or high winds.

Figure 3. Second, third, and fourth stage larvae.

Throughout their lives beetles feed on ash foliage, usually leaving small, irregularly shaped patches along the leaf margins. At least a few days of feeding are needed before beetles mate, and an additional 1 to 2 weeks of feeding may be needed before females begin laying eggs. Females can mate multiple times. Each female probably lays 30-60 eggs during an average lifespan, but a long-lived female may lay more than 200 eggs. Eggs are deposited individually in bark crevices or under bark flaps on the trunk or branches, and soon darken to a reddish brown. Eggs hatch in 7 to 10 days.

After hatching, first instar larvae chew through the bark and into the phloem and cambial region. Larvae feed on phloem for several weeks, creating serpentine (S-shaped) galleries packed with fine sawdust-like frass. As a larva grows, its gallery becomes progressively wider (Fig. 4). Beetle galleries often etch the outer sapwood. The length of the gallery generally ranges from 10 to 50 cm. Feeding is usually completed in autumn.

Figure 4. Gallery of an emerald ash borer larva.

Prepupal larvae overwinter in shallow chambers, roughly 1 cm deep, excavated in the outer sapwood or in the bark on thick-barked trees. Pupation begins in

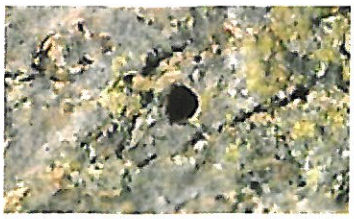

Figure 5. D-shaped hole where an adult beetle emerged.

Figure 6. Jagged holes left by woodpeckers feeding on larvae.

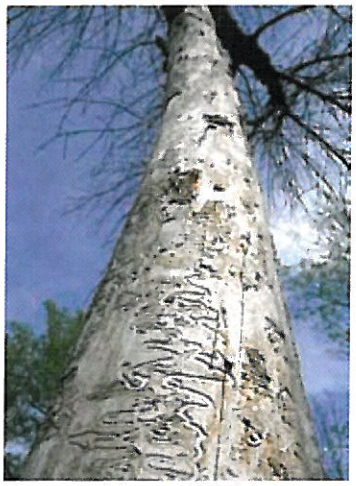

Figure 7. Ash tree killed by emerald ash borer. Note the serpentine galleries.

Figure 8. Epicormic branching on a heavily infested ash tree.

late April or May. Newly eclosed adults often remain in the pupal chamber or bark for 1 to 2 weeks before emerging head-first through a D-shaped exit hole that is 3 to 4 mm in diameter (Fig. 5).

Studies in Michigan indicate 2 years may be required for *A. planipennis* to develop in newly infested ash trees that are relatively healthy. In these trees, many *A. planipennis* overwinter as early instars, feed a second summer, overwinter as prepupae, and emerge the following summer. In trees stressed by physical injury, high *A. planipennis* densities, or other problems, all or nearly all larvae develop in a single year. Whether a 2-year life cycle will occur in warmer southern states is not yet known.

Distribution and Hosts

A. planipennis is native to Asia and is found in China and Korea. It is also reported in Japan, Mongolia, the Russian Far East, and Taiwan. In China, high populations of *A. planipennis* occur primarily in *Fraxinus chinensis* and *F. rhynchophylla*, usually when those trees are stressed by drought or injury. Other Asian hosts (*F. mandshurica* var. *japonica*, *Ulmus davidiana* var. *japonica*, *Juglans mandshurica* var. *sieboldiana*, and *Pterocarya rhoifolia*) may be colonized by this or a related species.

In North America *A. planipennis* has attacked only ash trees. Host preference of *A. planipennis* or resistance among North American ash species may vary. Green ash (*F. pennsylvanica*) and black ash (*F. nigra*), for example, appear to be highly preferred, while white ash (*F. americana*) and blue ash (*F. quadrangulata*) are less preferred. At this time all species and varieties of native ash in North America appear to be at risk from this pest.

Signs and Symptoms

It is difficult to detect *A. planipennis* in newly infested trees because they exhibit few, if any, external symptoms. Jagged holes excavated by woodpeckers feeding on late instar or prepupal larvae may be the first sign that a tree is infested (Fig. 6). D-shaped exit holes left by emerging adult beetles may be seen on branches or the trunk, especially on trees with smooth bark (Fig 5). Bark may split vertically over larval feeding galleries. When the bark is removed from infested trees, the distinct, frass-filled larval galleries that etch the outer sapwood and phloem are readily visible (Fig. 4 and Fig. 7). An elliptical area of discolored sapwood, usually a result of secondary infection by fungal pathogens, sometimes surrounds galleries.

As *A. planipennis* densities build, foliage wilts, branches die, and the tree canopy becomes increasingly thin. Many trees appear to lose about 30 to 50 percent of the canopy after only a few years of infestation. Trees may die after 3 to 4 years of heavy infestation (Fig. 7). Epicormic shoots may arise on the trunk or branches of the tree (Fig. 8), often at the margin of live and dead tissue. Dense root sprouting sometimes occurs after trees die.

A. planipennis larvae have developed in branches and trunks ranging from 2.5 cm (1 inch) to 140 cm (55 inches) in diameter. Although stressed trees are initially more attractive to *A. planipennis* than healthy trees are, in many areas all or nearly all ash trees greater than 3 cm in diameter have been attacked.

Resources

For more information on the emerald ash borer and related topics...

- Visit the following Web sites:
  - Multi-agency Emerald Ash Borer Web Site: www.emeraldashborer.info
  - USDA Forest Service: www.na.fs.fed.us/fhp/eab/
  - USDA Animal and Plant Health Inspection Service: www.aphis.usda.gov/plant_health/
- Contact your state Department of Agriculture, State Forester, or Cooperative Extension Office.

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Edward Czerwinski, Ontario Ministry of Natural Resources, www.forestryimages.org

EAB Regulations and Quarantines

- March 2012 - NYS Department of Agriculture and Markets (DAM) issued an "Emergency Rulemaking" amending their statewide EAB quarantine to add Orange County (quarantined by DEC and USDA APHIS last summer) and Albany County (not currently under DEC or APHIS quarantine). This action was taken in response to EAB detections, in traps last summer at the USMA campus area in West Point (Orange County), and in October in Selkirk (southern Albany County). This action restricts the movement of ash logs or wood (such as tree trimmings), ash nursery stock and all firewood out of Orange and Albany Counties, unless done under a Compliance Agreement from NYSDAM.
- August 2011 - Orange County has been added to the DEC eastern New York quarantine area (Ulster and Greene Counties). Read this Emergency Quarantine Order. (PDF, 60 KB) This amended Order, which includes updated rules and regulations to be consistent with the NYS Department of Agriculture and Markets quarantine, will take effect 10 days after it is filed with the three previously mentioned County Clerk offices.
- The New York State Department of Environmental Conservation (DEC) and the Department of Agriculture and Markets (DAM) enacted a quarantine encompassing the majority of western New York, as well as Greene and Ulster Counties that restrict the movement of ash trees, ash products and firewood from all wood species in order to limit the potential introduction of EAB to other areas of the state.
- The state's quarantine order imposes restrictions on the intrastate movement of certain "regulated articles." The order specifically defines regulated articles as:
  - Entire ash trees of any size, inclusive of nursery stock
  - Any part of ash trees, including leaves, bark, stumps, limbs, branches, and roots
  - Ash lumber or ash logs of any length
  - Any item made from or containing ash wood
  - Any article, product or means of conveyance determined by APHIS, NYSDAM or the Department to present a risk of spreading the EAB infestation
  - Firewood from any tree species
  - Wood chips and bark mulch from any tree species, larger than 1 inch in two dimensions, whether composted or uncomposted
- New York's order prohibits the movement of regulated articles beyond the quarantined counties without certification or compliance agreements issued by NYS DAM or USDA APHIS. The state order also restricts the movement of the regulated wood products into or through the quarantine district by requiring several provisions including, but not limited to documentation listing the origin and destination of shipments, and prohibiting transporters from unnecessarily stopping while traveling through the quarantine district.

For more information, please visit: http://www.dec.ny.gov/animals/47761.html

Forest Pest Web Resources

NYS DEC Emerald Ash Borer Page: http://www.dec.ny.gov/animals/7253.html

Cornell Cooperative Extension Emerald Ash Borer page:
http://www.nyis.info/index.php?action=eab
CCE Emerald Ash Borer Community Preparedness Workbook:
http://www.nyis.info/index.php?action=cg_plan

Survey and report for EAB: http://www.dec.ny.gov/animals/72136.html

Pesticide Information: http://www.nyis.info/index.php?action=eab_control_options

National Emerald Ash Borer Site: http://emeraldashborer.info/

National Asian Longhorned Beetle Site: http://beetlebusters.info/

National "Don't Move Firewood" Site (includes educational information):
http://www.dontmovefirewood.org/

Tree Benefits Calculator: http://www.treebenefits.com/calculator/

Purdue's EAB Cost Calculator: http://extension.entm.purdue.edu/treecomputer/

New York State Emerald Ash Borer Quarantine: http://www.dec.ny.gov/animals/47761.html

New York State Department of Agriculture and Markets Emerald Ash Borer Quarantine Compliance Agreement Information: http://www.agmkt.state.ny.us/PI/eab.html

Federal Compliance Agreement Information:
http://www.aphis.usda.gov/plant_health/plant_pest_info/emerald_ash_b/regulatory.shtm

Urban Forestry Council: www.nysurbanforestycouncil.com

Tree Identification: http://www.treelink.org/whattree/index.htm

For more information on WNY EAB Taskforce contact:

Paul Fuhrman
WNY Partnership for Regional Invasive Species Management (PRISM), 716-684-8060 or PFuhrmann@ene.com

Sharon Bachman
Cornell Cooperative Extension of Erie County, 716-652-5400 x 150 or sin2@cornell.edu

Woodland Health

A column focusing on topics that might limit the health, vigor and productivity of our private or public woodlands

COORDINATED BY MARK WHITMORE

WOODLOT MANAGEMENT AND THE EMERALD ASH BORER

BY MARK WHITMORE AND PETE SMALLIDGE

Woodlot owners in New York will at some time be dealing with the Emerald Ash Borer (EAB), *Agrilus planipennis*. In the last issue of the New York Forest Owner we provided an update on the EAB situation in New York; please refer to this article for background information. In this article we will focus specifically on what you can be doing as a woodlot owner to prepare for the EAB.

One of the most important things to remember is that EAB is not currently widespread in New York so most woodlot owners have time to plan ahead and benefit from additional ash volume growth. Indeed, if the state's efforts to "Slow the Spread" are successful we will have even more time to develop and implement management strategies. One thing to consider is that every year your woodlot is EAB free the ash volume is increasing and in some stands this can be significant. Right now we really have no good guesses about how fast EAB will be moving through the state. However, if people stop moving infested firewood, many of the states' woodlot owners will have perhaps several more years before the EAB arrives in their neighborhood. So cool your heels if you've been thinking about liquidating your ashets and start planning ahead to minimize EAB impacts.

The specific course of action a landowner selects will depend on their objectives, abundance and maturity of ash in their woodland, the abundance and quality of other species in the woodland, owner's geographic proximity to EAB infestation, the availability of markets, and owner's ability to complete or coordinate work tasks in the woods.

The attitudes and resources of the private forest owner will influence management decisions in response to EAB. Forest owners who seek productive forests may want to be proactive to capture value while markets are favorable but should be mindful of lost volume if EAB is not near. Forest owners who will be able to personally utilize ash or sell in nearby markets may want to wait for the insect to arrive and harvest at that time. Owners who desire minimal manipulation of their woods similarly may wait and then respond to manage effects that may cascade from ash mortality, such as invasive plants, less desirable regeneration, loss of diversity or reduced forest stocking. Each owner needs to personally assess their objectives, and consult with forestry professionals attuned to the owner's objectives, to guide their strategy and timing for a response to EAB.

Effective management of forests in anticipation of EAB requires knowledge of forest characteristics such as the variety of other desired tree species, presence of invasive plants, forest density, tree age and average tree diameter. Most forest owners should work with a forester to acquire this information. Information on how to select a forester is available through Cornell University Cooperative Extension and at *www.ForestConnect.info*. The NYS Department of Environmental Conservation (DEC) provides free Stewardship management planning advice to forest owners upon their re-

In young stands with mixed species, consider cutting some ash that shade desired species to promote species diversity and reduce ash abundance.

find that one rare individual that may be resistant to EAB.

Markets for ash in New York have remained remarkably resilient despite the implementation of quarantine regulation over large parts of the state and the flood of ash into the marketplace resulting from panic selling. This is largely because the regulating agencies, NYS Department of Agriculture and Markets and USDA APHIS, have been proactive with education and implementation of regulations that work with industry to enable commerce in a responsible manner.

When forests are disturbed through natural processes or management activities, they experience some type of change. Forests typically display predictable patterns of response, depending on local condition, existing interfering vegetation, current deer populations, and the type of disturbance. Specific conditions or actions that might inhibit the development of healthy and ecologically functional forests following EAB include: the spread of invasive plants that compete with desirable plants, deer browsing that reduces desirable species, logging disturbance without attention to water quality best management practices, high-grade (diameter limit) harvests that remove all or most of the valuable trees prior to effective forest regeneration, damage to the root systems or stems of residual trees during logging, or removal of desired trees needed for seed production.

Lastly, now is the time to begin planning for the worst case scenario where the vast majority of our ash is killed. If we do nothing our genetic resources for possibly reintroducing ash into our future forests will be minimal. We should be collecting seed and preserving it now, before the EAB takes this resource away. There is a National Ash Tree Seed Collection Initiative by the USDA to conserve ash seed and information can be found at: *http://www.nsl.fs.fed.us/geneticconservation_ash.html*

Cornell University Cooperative Extension recommends these steps for private forest owners:

1. Work with professionals to evaluate your need and desire to manage the impact and extent of mortality associated with EAB relative to your ownership objectives. Your ownership objectives influence the following recommendations. Be calm and deliberate in your decision making.

2. Determine the current status of EAB in New York by checking the DEC website and identify any revisions to management recommendations. EAB status may change more than once each year. Consider geographic location and the need for timely actions.

3. Assess the abundance and age of ash in your forest. Consult with a forester to learn how ash abundance in your woodlands, relative to other species, will be affected by the potential complete loss of ash.

4. In young forests or those that have low ash density, you could harvest or kill the ash that compete (shade) with other desired trees. This will retain some ash that are not competing and will ensure that a mixture of species is thriving when the EAB arrives and affects your forest.

5. In mature forests and those with high densities of ash, identify potential markets and harvest ash trees to capture the best value. Avoid the temptation to include other species in the harvest to make the harvest viable. Retain vigorous and dominant stems of other species to form the remaining and future forest. The arrival of EAB into NY has resulted in quarantines but markets have remained robust and agencies are working hard to minimize any disruption of commerce.

6. Call Before Your Cut: Consult with a forester, DEC or Cooperating Forester, prior to making decisions to cut or not to cut.

For more EAB Information please refer to the table on the previous page.

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Mark Whitmore is a forest entomologist in the Cornell University Department of Natural Resources and the chair of the NY Forest Health Advisory Council.

Cornell University
College of Agriculture and Life Sciences
Department of Natural Resources

Insecticide Treatment of Ash Trees in New York for Emerald Ash Borer

Mark Whitmore, Dept. of Natural Resources, Cornell University. January 2012.

Insecticide treatment is an option for protecting high-value ash trees from attack by the Emerald Ash Borer (EAB). However, there are a number of issues that should be considered by homeowners and communities to minimize costs and the environmental impacts associated with pesticide use. First of all, the best way to save money is to NOT treat your trees if you don't need to. Most of the EAB discoveries in New York State are still small and quite localized (as of November, 2011), as in South Buffalo (Erie County), Rochester (Monroe County), Caledonia (Livingston County), Pembroke (Genesee County), and West Point (Orange County. For the purposes of this discussion these small infestations will be referred to as Tier I infestations as set forth in the NYS Department of Environmental Conservation (DEC) EAB Response Plan (www.dec.ny.gov/docs/lands_forests_pdf/eabresponseplan.pdf). EAB has likely spread from these locations but not very far, and when populations are small it can be years before additional trees in the area begin showing symptoms. Homeowners and municipalities that choose to protect high value ash trees living within 1 mile of the "core" of these small Tier I infestations should consider treating their trees soon. Trees with a healthy crown will respond well to treatment and EAB larvae in the tree will be killed by the insecticide. Treatment of trees farther away would be premature - at this time.

As EAB populations build in a given area, the recommended distance from the leading edge of the infestation for treatment action increases. For instance, the Chili (Monroe County), Lancaster (Erie County), Bath (Steuben County), and Randolph (Cattaraugus County) infestations currently involve a few thousand infested trees and have spread about 2 miles from the original infestation center. These infestations are considered Tier II infestations. EAB populations have been building at these sites, trees are dying more rapidly, and dispersal rates are increasing. In Tier II infestations the recommendation would be for homeowners and municipalities within 10 miles of the infestation "core" consider treating their trees, with urgency increasing the closer to the "core" you are. Once again, even if your trees do have low numbers of EAB in them, if they still have a healthy crown they will respond to treatment. Once crown dieback becomes greater than 50%, the likelihood of tree recovery is poor and removal is recommended.

At the height of large, spreading populations, Tier III infestations, the recommended distance for treatment action increases to 15 miles away. The current EAB infestation in the Kingston/Saugerties area (Ulster and Greene Counties) is the only Tier III infestation currently in New York State. In Tier III infestations immediate action would be required to protect trees within and near the "core" delimited area because EAB populations are at high levels, trees are dying at a faster rate, and dispersal is accelerated. Again, it is important that landowners pay close attention to local EAB detection efforts as well as the health of their trees; treatment may still be effective with the onset of early symptoms up to 50% canopy decline.

It will take several years for Tier I and Tier II infestations to develop into Tier III infestations, especially if management efforts by the DEC are effective at slowing the spread through implementation of the SLAM (Slow Ash Mortality) program. While planning your treatment activities, it is important to follow recent developments in your area. It is also important to locate reputable licensed pesticide applicators who are familiar with EAB biology and treatments. Demand for the services of pesticide applicators in your area might present difficulties for the timely treatment of your trees. If the demand for the services of your chosen pesticide applicator is high then you might want to treat your trees with a multi-year insecticide ahead of the current recommended treatment range.

Another issue is your choice of pesticide. Scientists working on EAB in the Midwest have recently compiled the results of their work with insecticide treatments. This guide provides the most current recommendations and guidance on insecticide options for protecting ash trees from EAB.

http://www.emeraldashborer.info/files/Multistate_EAB_Insecticide_Fact_Sheet.pdf

CAUTION: New York State residents can only use products labeled for use in NYS and have to work with certified pesticide applicators to apply restricted use pesticides. A table of all insecticides registered to control EAB in New York can be found at:

http://www.nyis.info/pdf/EAB%20Chemical%20Treatment%20Summary.pdf

One of the important concepts to consider is that when there are few EAB around, as in Tier I infestations at this time, just about any product will keep your trees looking green for one year. EAB can take years to kill trees in Tier I infestations. However, when EAB populations build to Tier II & III, tree death is more rapid and only the most efficacious insecticides are effective.

Another issue to consider is that some products currently registered in NY need to be applied every year and others every two or three years. Products registered for homeowner use need to be applied once a year to protect your tree from EAB. In the Midwest, EAB remains active in an area for 10 years or more. We don't know how long EAB will be lurking in NY forests, but assuming it will be similar to the Midwest, the costs of insecticide application add up over time. All research at this time indicates the need to regularly treat trees as long as EAB is in the area and if you neglect to treat your tree when it needs a booster, your whole investment may be in jeopardy.

Maps of current infestations in NYS and many educational materials for are available on the Cornell Cooperative Extension website:

http://nyis.info/eab

Current infestation maps and many other resources are also available at the DEC website:

http://www.dec.ny.gov/animals/7253.html

www.emeraldashborer.info

Frequently Asked Questions Regarding Potential Side Effects of Systemic Insecticides Used To Control Emerald Ash Borer

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What systemic insecticides are commonly used to protect ash trees from emerald ash borer (EAB)?

Systemic insecticides containing the active ingredients imidacloprid, dinotefuran or emamectin benzoate are commonly used to protect ash trees from EAB. All three are registered for agricultural use and have been designated by the Environmental Protection Agency as Reduced-Risk insecticides for certain uses on food crops. The most widely used insecticide in the world, imidacloprid has been utilized for many years to control pests of agricultural crops, turfgrass, and landscape plants. Because of its low toxicity to mammals, it is also used to control fleas and ticks on pets. Dinotefuran is a relatively new product that has properties similar to those of imidacloprid, but it has not been researched as thoroughly. Emamectin benzoate, derived from a naturally occurring soil bacterium, has been registered for more than 10 years as a foliar spray to control pests in vegetable and cotton fields and parasitic sea lice in salmon aquaculture. Similar products are used in veterinary medicine as wormers for dogs, horses, and other animals.

The invasive emerald ash borer has killed millions of ash trees in North America.

To control EAB, some products containing imidacloprid or dinotefuran are applied as a drench directly to the surface of the soil or injected a few inches under the soil surface. Dinotefuran can also be applied by spraying the bark on the lower five feet of the trunk. Emamectin benzoate and specific formulations of imidacloprid are injected directly into the base of the tree trunk. Systemic insecticides are transported within the vascular system of the tree from the roots and trunk to the branches and leaves. This reduces hazards such as drift of pesticide to non-target sites and applicator exposure that can be associated with spraying trees with broad-spectrum insecticides, and has less impact on beneficial insects and other non-target organisms. Many products registered for control of EAB can be applied only by licensed applicators. In all cases, the law requires that anybody applying pesticides comply with instructions and restrictions on the label.

Ash trees lining a street before (left) and after (right) they were decimated by EAB.

Precautions should be taken to prevent pesticides from reaching surface or groundwater.

Will systemic insecticides applied to the soil impact ground or surface water quality?

Several surveys have been conducted in the United States and Canada to monitor imidacloprid in surface and groundwater. Results indicate that imidacloprid is rarely detected in surface water in agricultural or urban areas. Similar monitoring studies have not been conducted with dinotefuran, which is more soluble in water. In the presence of sunlight, imidacloprid and dinotefuran are very unstable in water and degrade rapidly, which reduces their environmental risk to surface water.

When not exposed to light, imidacloprid and dinotefuran break down slowly in water, and thus have the potential to persist in groundwater for extended periods. In surveys of groundwater, imidacloprid was usually not detected. When detected, it was present at very low levels, mostly at concentrations less than 1 part per billion (ppb) with a maximum of 7 ppb, which are below levels of concern for human health. The detections have generally occurred in areas with porous rocky or sandy soils with little organic matter, where the risk of leaching is high — and/or where the water table was close to the surface.

Every precaution should be taken to protect surface and groundwater from pesticide contamination. Trunk-injected insecticides pose little risk to ground and surface water when used as directed because the material is placed inside the tree.

To protect groundwater, soil applications of systemic insecticides should be made immediately adjacent to the trunk of the tree, which increases uptake (and efficacy) because the high density of absorptive roots in this area filters the chemical from the soil. Systemic insecticides bind to varying degrees to organic matter, silt, and clay, which restricts their movement in soil. They should not be applied to porous sandy soils lacking organic matter, especially where the water table is shallow, or when heavy rain is predicted within the next 24 hours.

To protect surface water, systemic insecticides should not be applied to soil near ponds, lakes, or streams. Soil drenches should not be applied to sloped surfaces from which runoff can occur, nor should pesticides be misapplied carelessly to impervious surfaces such as sidewalks or streets, or otherwise allowed to reach conduits to surface water such as drains, ditches, or gutters.

The imidacloprid profile presented in the Extension Toxicology Network Pesticide Information concluded there is generally not a high risk of groundwater contamination when products are used as directed and appropriate precautions are taken. Similarly, the Canadian Water Quality Guidelines for the Protection of Aquatic Life noted that when imidacloprid is used correctly, it does not characteristically leach into deeper soil layers.

Will these insecticides impact aquatic organisms?

The toxicity of imidacloprid to aquatic life varies. Studies indicate it has low toxicity to fish, amphibians, and some aquatic invertebrates such as Daphnia (small aquatic crustaceans), but high toxicity to other invertebrates such as mysid shrimp (a salt water species) and larvae of some aquatic insects such as midges, black flies, and mosquitoes. Dinotefuran is not as thoroughly researched, but existing data reflect a pattern of toxicity similar to that of imidacloprid. Toxicity to fish and Daphnia is low, while mysid shrimp are sensitive. As previously noted, imidacloprid and dinotefuran are broken down rapidly in water when exposed to light. In the rare occasions when imidacloprid has been detected in surface water, the levels were too low (less than 1 ppb) to impact even sensitive aquatic organisms.

Imidacloprid soil injections have been widely used in ravines of Smoky Mountain National Park and other forested areas to control hemlock woolly adelgid, an invasive insect that is devastating hemlock trees in the Appalachian Mountains. A risk assessment prepared for the USDA Forest Service ("Imidacloprid — Human Health and Ecological Risk Assessment") concluded that these treatments pose negligible risk to aquatic organisms when applied as directed to clay or loam soils, and that even a worst-case scenario of a major spill of imidacloprid into a small pond would have negligible effects on fish, amphibians, or tolerant aquatic invertebrates. When used as directed, imidacloprid soil treatments for EAB control are unlikely to impact aquatic organisms.

What about insecticide residues in senesced leaves that fall from trees in autumn?

This question has not been thoroughly researched. One study conducted in experimental microcosms found that imidacloprid residues in senesced (dead) leaves from treated trees had no effect on microbial respiration or decomposition, or survival of leaf-shredding insects that decompose dead vegetation. Insect feeding rates were decreased by imidacloprid concentrations of 1.3 parts per million (ppm), while lower concentrations (0.8 ppm) had no effect. When leaf-shredding insects or earthworms were given senesced maple leaves with higher concentrations of imidacloprid (3-11 ppm), their feeding rates were reduced but their survival was not affected. In another microcosm study, imidacloprid inhibited breakdown of leaf litter, but foliar concentrations in this study (18-30 ppm fresh weight) were more than an order of magnitude higher than those reported in leaves from trees treated for EAB control. In all of these experiments, organisms were exposed only to leaves from treated trees. In many situations, leaves from treated ash trees would be mixed with senesced leaves of other species growing nearby.

Similar studies have not been conducted with emamectin benzoate, which is broken down rapidly by microbial activity and sunlight. Because of its short residual activity on the surface of leaves, it is considered a biorational insecticide compatible with integrated pest management programs, including biological control. These characteristics suggest that environmental impacts will be negligible as emamectin benzoate is released from decomposing leaves. Regulatory agencies concluded that foliar applications of emamectin benzoate to vegetable crops will have no adverse effects on ground or surface water, birds, mammals, fish, or aquatic invertebrates when used as directed.

Will these insecticides harm honey bees?

Ash trees are wind-pollinated and are not a nectar source for bees. Furthermore, ash flowers are produced early in the growing season and are present for only a limited number of days. It is highly unlikely that bees would be exposed to systemic insecticides applied to ash.

Flowering plants that are pollinated by bees or other insects should not be planted immediately adjacent to ash or other trees that will be treated with systemic insecticides applied to the soil, as they may also absorb insecticide. Honey bees and other insects can be affected when systemic insecticides

Honey bees and other pollinators can be harmed by insecticides applied to flowering plants.

are translocated to nectar and pollen. Imidacloprid is fatal to honey bees when it reaches high enough concentrations, and can have harmful sublethal effects at lower concentrations.

There has been much concern recently about the potential role of imidacloprid and related neonicotinoid insecticides in colony collapse disorder (CCD). Research is ongoing to investigate the relative effects of pesticides, bee pathogens and parasites, and nutrition on honey bee health. To date there are no conclusive answers, but researchers have not been able to establish a link between imidacloprid and CCD. Stronger evidence implicates a combination of pathogens as well as other pesticides used in hives to control pests that afflict bees.

Will these insecticides harm other insects?

All of the systemic insecticides used to control EAB will impact other species of insects that feed on treated ash trees. However, ash trees that are not treated will be killed by EAB, which will also impact these insects. Some products can affect many kinds of insects, while others affect only certain groups of insects. For example, emamectin benzoate has been shown to affect a broad range of plant-feeding insects. Products with imidacloprid generally have little effect on caterpillars, mites, and armored scales, but will impact most sawflies, leaf-feeding beetles, and sap-feeding insects such as aphids and soft scales. Studies have shown that beneficial insect predators and parasitoids — such as lady beetles, lacewings, and parasitic wasps — can be killed by indirect exposure to imidacloprid through their prey, or directly by feeding on nectar from treated plants. However, systemic insecticides are generally considered to have less impact on natural enemies than broad-spectrum insecticides applied as foliar or cover sprays.

Woodpeckers are important predators of overwintering EAB larvae.

Will these insecticides harm woodpeckers?

This is unlikely. Woodpeckers feed on live, mature EAB larvae, mostly in late fall, winter and early spring. Many of these mature larvae overwinter in the nonliving, outer bark where they will not be exposed to systemic insecticides. Imidacloprid, dinotefuran, and emamectin benzoate are much more toxic to insects than to birds that have been tested, and insecticide concentrations that have been measured in treated trees are far below the levels known to be toxic to birds. An EAB larva that has been killed by insecticide will desiccate quickly and decompose. There is little evidence that woodpeckers will feed on larval cadavers. Furthermore, living larvae that are suitable prey for woodpeckers will not have been exposed to a lethal dose of insecticide, and these products do not bio-accumulate in animals in the way that fat-soluble insecticides such as DDT do. In Michigan and Ohio, where EAB has been established for several years, many ash trees have been treated with systemic insecticides. There have been no reported cases of woodpecker poisoning caused by insecticides applied for control of EAB.

Does injecting insecticides into trunks injure the trees?

Drilling through the outer bark creates a wound in the tree. The response of the tree to these wounds is affected by factors such as the size and depth of the hole and the vigor of the tree. In recent studies, the injury associated with drilling holes and injecting two insecticide products (Imicide® applied with Mauget® capsules and TREE-age™ applied with the Arborjet Tree IV™ and Quickjet™) into trunks of ash trees was examined. In nearly all cases, ash trees that were relatively healthy and properly injected showed little evidence of damage. New, healthy wood was produced over the injection sites and there was no evidence of pathogen infection, decay, or other signs of serious injury. Other devices used to inject ash trees generate wounds that differ from those caused by drilling discrete holes in the tree. However, their impact has not been thoroughly evaluated in research projects. We do know that untreated ash trees in areas with EAB infestations will eventually be killed.

Will treating ash trees result in development of resistance of EAB to insecticides?

This is highly unlikely. Pests typically evolve resistance to pesticides only in situations where a high proportion of the insect population was subjected to strong selection pressure. For example, pesticide resistance has evolved in insect and weed populations in agricultural fields, greenhouses, and grain storage bins where nearly all of the pest population was exposed to the pesticide. Ash trees are very common in many natural environments. Landscape trees represent a small fraction of all the ash that will be colonized by EAB in a given area, and only a small proportion of high-value trees will ever be treated to control EAB. Thus, most of the EAB population will never be exposed to insecticides. Because the selection pressure is so low, and there will be plenty of cross breeding with individuals that have never been exposed to insecticides, the risk of a resistant EAB population evolving is minimal.

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Tree Replacement Guidelines and Options

When it comes time to choose a replacement tree for your landscape there are many options. Help ensure long-term health and value by following a few simple steps.

- ❑**Conduct a thorough Site Evaluation**
- ❑**Identify the right Tree Characteristics**
- ❑**Purchase a Quality Tree**
- ❑**Plant the tree correctly**

Site Evaluation. Put the "Right Tree in the Right Place." Don't waste your money on a tree that won't survive or one that doesn't fit into your landscape.
These are the things to consider before you choose which tree you will purchase.

- ❑Hardiness Zone - Will your tree survive the winter?
- ❑Soil
  - ❑pH - Some trees cannot tolerate high pH, others cannot tolerate very low pH
  - ❑Drainage, texture and compaction - Standing water, droughty areas; trees have different tolerances
  - ❑Size of planting area and depth of soil (tree lawn, backyard, etc.) - Fit your tree to your landscape
- ❑Physical obstructions
  - ❑Overhead wires (Consider short trees or columnar varieties)
  - ❑Proximity to buildings, curbs, and driveways (Fit your tree to your landscape and keep in mind the ultimate size of the tree)

Tree characteristics. There is more than just beauty to think about when selecting what your tree should look like.

- ❑Height of the tree- Do you need a short or a tall tree?
- ❑Shape of the canopy- Round, wide spreading, or columnar?
- ❑Evergreen or deciduous?
- ❑Growth rate- One that will grow very fast, or one that takes it time?
- ❑Fruit- Some trees have "messy" fruit (honeylocust, horsechestnut).

Once you have your limitations identified you can narrow down your tree choices and really choose "The Right Tree in the Right Place." A thorough list of tree characteristics and a comprehensive site evaluation worksheet can be found in "Recommended Urban Trees: Site Assessment and Tree Selection for Stress Tolerance" from the Urban Horticulture Institute at Cornell University.
http://www.hort.cornell.edu/uhi/outreach/recurbtree/.
And, check Cornell's Woody Plant Database to see images of your options and to search for trees by different characteristics http://woodyplants.mannlib.cornell.edu/ .

See Table 1 for a list of some trees to consider. Disclaimer- not all trees will work for all sites! Conduct a site evaluation.

Purchase a quality tree. Make a list of 3-4 tree choices and shop at a nursery you trust; also remember they may be able to order a variety for you. When choosing the one to take home, select a tree that is free of serious insect and disease problems and physical damage and has proper branch arrangements. Also, choose a tree that has been properly grown and has a good sized root ball that free of weeds.

Steps to thoughtful planting. Once you have chosen your high-quality, perfectly suited tree at the nursery, follow these basic tree planting steps.

1. Secure your tree during its ride home. Tie up the canopy, tarp the foliage, or place the trees inside a vehicle. Secure the tree to vehicle so it does not roll during transport.
2. Measure your root ball and dig your hole accordingly. The hole should be only as deep as the roots and 3 times the diameter of the ball/container.
    - Remember: The top of the root system should be just below the surface of the soil and the root system may be buried inside the container/ball. Use a probe to find the depth of the roots inside the root ball and subtract that from the height of the ball.
3. Place the tree in the properly dug hole and then remove as much of the wire basket, burlap, and twine as you can. It may take a long time to degrade, and can hinder root growth. Push any of the wire basket or burlap that you cannot cut off into the bottom of the hole, where it will do less harm
4. Or, carefully remove the tree from its container. Check for circling roots and correct problematic ones.
5. Center the tree and backfill. Water and tamp the soil as you backfill to ensure air pockets are eliminated.
6. Do not place excess soil on top of the root system. The top of root system should be just at or below the soil surface and the trunk flare just above the soil surface.
7. Water the tree thoroughly once hole is backfilled.
8. Place 2-4" of woodchips or mulch around the tree, cover as wide of an area as you can. Be sure to leave a gap between the mulch and the tree's trunk. Woodchips and mulch piled up against the truck can cause disease problems.
9. Deeply water your new tree every few days the first year. Ensure water is penetrating deep into the soil by watering slowly for a long time.
10. Staking trees is usually not necessary. But if you must, use non-damaging material and remove it after one year.

For more information about proper tree planting see:

- ❑ "Recommended Urban Trees" http://www.hort.cornell.edu/uhi/outreach/recurbtree/. The steps are thoroughly described in the back of the book.
- ❑ http://treesaregood.org - Tree care web site from the International Society of Arboriculture

Table 1: Tree Suggestions: Remember- not all of these trees will be successful for you! Conduct a site evaluation and read up on the tree you want. Each tree's common name is followed by the scientific name and the USDA Hardiness Zone.

Small Trees- under 30'	Medium Trees- under 60'	Tall Trees- over 60'	
Serviceberry *Amelanchier spp.* – 3b	Red Horsechestnut *Aesculus x carnea* – 5a	Catalpa *Catalpa speciosa* - 4a	London Planetree *Platanus x acerifolia* – 5b
Hornbeam (Ironwood) *Carpinus caroliniana* – 3b	River Birch *Betula nigra* – 4a	Hackberry *Celtis occidentalis* – 3a	Bur Oak *Quercus macrocarpa* – 3a
Eastern Redbud *Cercis canadensis* – 3b	Katsura Tree *Ceradiphyllum japonica* – 5a	Ginkgo *Ginkgo biloba* – 4b	Northern Red Oak *Quercus rubra* – 3b
Hawthorn (Washington, Winter King) *Crataegus spp.* – 4a	Turkish Filbert *Corylus colurna* – 5a	Honeylocust- thornless *Gleditsia triacanthos inermis* – 4b	Baldcypress *Taxodium distichum* – 5a
Hophornbeam *Ostrya virginiana* – 3b;	Hardy Rubber Tree *Eucommia ulmoides* – 5b	Kentucky Coffeetree *Gymnocladus dioicus* – 4a	Basswood *Tilia americana* – 3a
Columnar Sargent Cherry *Prunus sargentii 'Columnaris'*– 4a	English Oak *Quercus robur* – 5b	Tulip Poplar *Liriodendron tulipifera* – 5b	Hybrid Elm cultivars (Accolade, Danada Charm) *Ulmus x species* – 3b -5a
Japanese Tree Lilac *Syringa reticulata* – 3a	Littleleaf Linden *Tilia cordata* – 3b	Black Tupelo *Nyssa sylvatica* – 5a	Zelkova *Zelkova serrata* – 5b

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