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Outlook for ash in your forest: results of emerald ash borer research and implications for management

Kathleen S. Knight, USDA Forest Service

Since its accidental introduction near Detroit, Michigan, in the mid-1990s, emerald ash borer (EAB) has rapidly spread through much of the U.S. and adjacent Canada, leaving millions of dead ash trees in Midwestern states (4,11). Unfortunately, EAB attacks trees as small as an inch in stem diameter and it attacks all five ash species native to the region – white, green, black, pumpkin, and blue. Nearly 100% of the trees attacked by the beetle eventually die (5 but see 10). Yearly monitoring of ash forest sites across Ohio began in 2005 to understand the effects of EAB on ash populations and forests. Several interesting results have emerged. Mortality was first evident in northwest Ohio sites in 2006, most of the Toledo area plots reached >95% mortality of ash trees by 2009, and many of the central Ohio sites had reached >95% mortality by 2013. At a single stand scale, it can take 3 to 6 years for the ash trees to decline from healthy to nearly complete mortality (Figure 1). Partway through the infestation, it is typical to see a mix of healthy, declining, and dead trees. After ash trees die, they rapidly become brittle and fall. In our sites, over 80% of the trees fell within 5 years of death. We found several factors were related to how quickly the trees die, including the initial health of the trees (initially healthier trees live longer) and ash density (trees in stands with greater ash density live longer) (6). As the infestation progresses and the EAB populations build to high levels, mortality accelerates until nearly all the trees have died (Figure 1). Then, after nearly exhausting their food source, EAB populations crash to low levels but persist, probably feeding on small ash saplings as the saplings become large enough to be attacked.

Galleries as a result of emerald ash borer

The loss of ash from forest ecosystems may cause a cascade of effects (3), from growth of competing trees that now find themselves with less competition, to invasive plant species taking advantage of the light that reaches the forest floor as canopy gaps open, to massive amounts of coarse woody debris piling up in ash floodplain forest, to effects on insects and wildlife. We have shown how maples and elms grow rapidly in response to ash mortality, how forest productivity can decline due to EAB (2), and how woodpeckers take advantage of the new food source EAB larvae provide

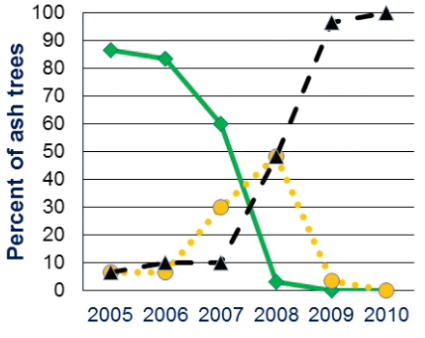

Figure 1. Ash mortality at an EAB-infested site in northwest Ohio - one of the most rapidly declining sites we studied.

(1). The largest effects of EAB are most likely to be seen where ash trees are the dominant species in the canopy and few other tree species are poised to fill in the gaps left behind by the ash (2).

While collecting data in our northwest Ohio ash sites in 2009, we noticed a few surviving large healthy-looking ash trees in a sea of EAB-killed trees. We performed a complete survey of the site in 2010, two years after >95% of the ash trees at the site had died, and found 111 healthy "lingering" ash trees representing less than 1% of the original population of over 11,000 ash trees (7). We have continued to monitor these trees, and many of the trees have remained healthy although some have died. We are studying whether these ash trees might have natural tolerance or resistance to EAB, and the preliminary results from greenhouse experiments look promising. Research and controlled breeding efforts for these "lingering" ash trees are ongoing (8). Ash produces mast crops of seeds approximately every 1-5 years, which can create carpets of newly germinated ash seedlings on the forest floor the two summers after the mast year. Unfortunately, the seeds do not appear to persist in the seed bank for more than a few years, and as the canopy ash trees die the periodic abundant production of ash seedlings is eliminated (5). In many sites, only an even-aged cohort of ash seedlings, too small to be attacked by EAB, remains after the canopy ash trees are killed. Ash seed collection efforts are underway to preserve ash germplasm for future research and restoration efforts (9).

What do these findings mean for management of your woodlot, park, or forest? First, if you get a good mast year for ash seed, connect with the ash seed collection program to see if more collections are needed in your area (9). Next, decide whether you prefer to remove or treat the ash trees or to allow EAB to kill 99% of them. Although excellent insecticide options are available for landscape trees (11), it costs too much to deploy them across an entire forest. If you desire pre-emptive harvests, work with a forester to use good practices that will sustain forest cover and follow quarantine laws to avoid further spreading EAB. Watch for and manage invasive plant species that may take advantage of conditions created by EAB, and plant other tree species in ash-dominated areas if necessary. If you opt for natural mortality, have a plan to deal with hazard trees (dead trees that could fall on people or property due to their location), and be on the lookout for "lingering" ash trees (at least two years after most trees have died) and let us know about them! I hope that we can use EAB as an opportunity to create more diverse and resilient forests in the future.

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Wood You Know- Sugar Maple *(Acer saccharum)*

Eric McConnell, Ph.D., Forest Products Specialist

Over 100 species of maples are found throughout the world, all in the northern hemisphere. While we often think of maples and the timber and non-timber forest products they produce as being exclusive to North America, species of the *Acer* genus are actually most abundant in Asia (from the Himalayan region east to central China). We have 14 species native to North America, with five considered commercially important to the wood markets of the eastern U.S. Sugar

and black maples are considered hard maples while red and silver maples along with boxelder are considered soft maples. As the name implies, hard maples are heavier, denser, and thus “harder” on the average than the soft maple species.

Lumber sawn from both sugar and black maples is sold as hard maple because the wood structure of each species is largely indistinguishable from the other. Sugar maple, though, comprises the majority of hard maple marketed products. Sugar maple is considered a “white” wood, and clear portions of the outer sapwood are highly valued. Lumber separated through grading as “Sap and Better” can command a premium price. The “whiteness” of sugar maple lumber sawn from Ohio timber, though, is generally less than that found in New England. Occasionally, wavy grained, “curly” maple lumber as well as boards containing birdseye figures can be obtained. However, it is not possible to evaluate this potential when conducting a timber inventory.

Sugar maple is found throughout our state's woodlands. It is a shade tolerant species and prefers sites with moist, well-drained soils. Sugar maple bark is known to have many “faces,” as its appearance can vary with tree age. Sugar maple timber is merchandised to a number of markets, including veneer, lumber, railties, and pulpwood depending on its size and quality. Ohio hard maple sawtimber, for example, has averaged $400-630 per thousand board feet (MBF) on the stump while delivered sawlogs have recently sold for average prices ranging from $230-900/MBF across all grades (both prices based on Doyle). One inch thick 4/4 kiln-dried Appalachian lumber prices per MBF have ranged from $1,740 for FAS down to $990 for #2 common. Furniture, flooring, and cabinets are common consumer products. Others include bowling pins, billiard cues, as well as dance and basketball floors.

The wood of sugar maple varies from white to pinkish, being a light reddish brown at its darkest. While sugar maple is a diffuse-porous hardwood, it is quite dense in spite of this characteristic, with a density comparable to red oak. The pores are generally of the same size and distributed evenly about the annual ring. Each annual ring is fairly distinct from one another due to a dark band of latewood found at the end of each growing season.

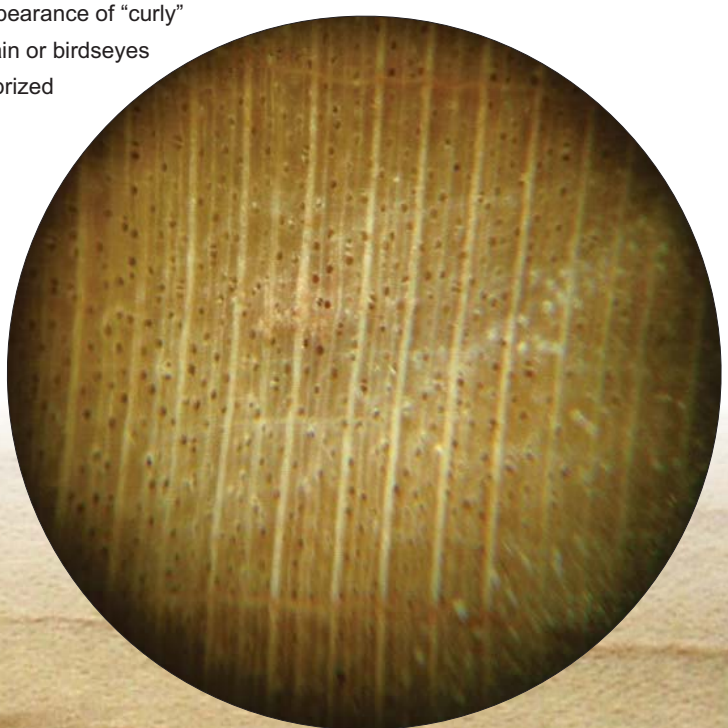
Sugar maple contains an abundance of wood rays, though they are not considered “broad” like those found in beech and sycamore. Many can be seen packed together on the tangential (flat or plain sawn) surface as short pinkish lines. The rays will also often appear as flecks on the radial (quartersawn) surface. The larger rays can be seen on the cross section with the naked eye and are similar in size to the largest pores when viewed with a hand lens. More powerful magnification reveals smaller rays interspersed between the larger ones. The following will assist you in identifying sugar maple when viewing the cross section- “Diffuse porous, lacking broad rays, with rays equal in size to the larger pores.”

On-farm use rivals wood use for this species, as sugar maple is the principal species tapped for maple sap. Maple sugaring is frequently a family-oriented activity, one that can provide forest landowners supplemental income and even timber stand management when caring for the sugarbush. The industry often uses a direct-to-consumer marketing approach, which offers consumers a unique “forest-to-fork” opportunity. Ohio commonly ranks in the middle among the ten major maple syrup producing states, with Geauga County being the hub of mapling activities.

<u>Structural Characteristics</u>

Pore distribution: Diffuse porous

Grain: Straight grained generally, but the occasional appearance of “curly” grain or birdseyes is prized



Heartwood: Pinkish to a light reddish brown. Little to no resistance to decay.
Sapwood: White, with a reddish tinge

Physical Properties

Density: 39.3 lbs/ft^3 at 12% moisture content
Flat grain shrinkage: 9.9%
Vertical grain shrinkage: 4.8%
Estimated air-drying time for 4/4 lumber to 20% moisture content: 50-165 days

Mechanical Properties at 12% Moisture Content

Bending Strength: 15,800 psi
Compression strength parallel to the grain: 7,830 psi
Shear strength parallel to the grain: 2,330 psi

Machining and Finishing Properties

Planing: Fair	Shaping: Good
Turning: Very good	Boring: Excellent
Mortising: Excellent	Sanding: Poor
Avoids Nail Splitting: Poor	Staining and polishing: Satisfactory
Avoids Screw Splitting: Fair	Bondability: Satisfactory

IT'S NEWT ANOTHER SPECIES!

Marne Titchenell, Wildlife Program Specialist

In May of last year, I had the pleasure to participate in monitoring several vernal pools in east central Ohio. May, in case you are unaware, is prime time for catching salamander larvae. In addition to several larvae of unidentified mole salamanders (identification at this stage in the life cycle requires a microscope – not something handy while standing in a 3 foot deep pool), we caught a male and female red-spotted newt (*Notophthalmus viridescens*), also known as the eastern newt. The olive-green, aquatic red-spotted newt is a truly fascinating amphibian. It belongs to the family Salamandridae, which encompasses salamanders and newts. This family is divided into two groups, the true salamanders which typically have smooth skin, and the drier, rougher skinned newts. The red-spotted newt however, while classified as a newt, has both smooth and rough skin at different stages of its life. This is due to the fact that red-spotted newts undergo a metamorphosis atypical of most Ohio amphibians.

The olive-green and smooth skinned aquatic red-spotted newts that we caught were mature, breeding adults. In fact, the dark colored toe pads that indicate a male red-spotted newt were clearly seen on the male's tiny feet, and the female looked a bit too swollen to have been simply overfed. Likely, she was preparing to lay eggs very soon. What many people may not realize is that those two salamanders were already on the 4th stage of their life cycle. Wait – the 4th stage? Isn't amphibian metamorphosis typically composed of 3 stages; the egg, the larvae, and the breeding adult? Typically yes, but with red-spotted newts there is an extra stage - the red eft stage. Have you ever encountered a bright orange, rough skinned salamander with red spots while walking in the woods, especially after or during a rain? It's not (or it's newt) another species of salamander, but the red eft stage of the red-spotted newt! After the egg of a red-spotted newt hatches, the larva undergoes metamorphosis and leaves the water as a terrestrial red eft. The eft has well developed lungs, limbs, and eye lids and sports its bright reddish-orange skin for a reason - a sign of toxicity to predators. All stages of the red-spotted newt produce toxic skin secretions that make then unpalatable to predators, but the red eft stage is ten times more toxic than the aquatic adult stage. Some predators, like garter snakes and northern water snakes,


Red eft Photo: Linda Haugen - USDA Forest Service - Bugwood.org

can tolerate newt toxins, but many other reptile and amphibian predators have severe reactions. In humans, the toxin can be irritating to our skin, so be sure to wash your hands thoroughly after handling a red-spotted newt.

The newt will spend 2-3 years of its life as a red eft before the 4th and final stage of its life cycle occurs, the return of the red eft (sounds like a title to a sci-fi novel) to the water as an olive-green, aquatic red-spotted newt. At this stage in its life, the newt is now sexually reproductive and able to mate. It will live out the rest of its life in that form, anywhere from 5-15 years! Interestingly, there is variation in the extended life cycle of the red-spotted newt across its range. In some populations, the red eft is skipped. This usually occurs in sandy coastal habitats where suitable land cover for the red eft is lacking. The larvae therefore develop into juveniles that remain in the water and eventually mature into adults. In other area, including Ohio, if conditions occur that cause adults to leave the water, additional changes occur such as a reduction in the dorsal tail fin and development of rougher, tougher skin. When they adults return to the water, they will change once again to regain their previous aquatic features. Without a doubt, the red-spotted newt is well adapted to be successful within a wide range of environmental conditions.

Ohio has an impressive 24 species of salamanders, including the red-spotted newt. To learn more about the diverse array of these silent amphibians, see OSU Bulletin 941 “Getting to Know Salamanders in Ohio: Life History and Management” at http://go.osu.edu/salamander .

Upcoming Classes include Chainsaw Safety

Kathy Smith, Extension Program Director – Forestry

As always, there are a variety of classes offered through Woodland Stewards this year. One of the challenges to running this program is figuring out what classes to rotate out and which new ones should be rotated into the mix. Some of that has to do with demand and some is dictated by events that are going on around the state. One of those events is the continued loss of our ash trees as emerald ash borer continues to move across the state. Some counties have been through the die off and some are just beginning to feel the pain. However, they all have in common the need to bring down trees in the safest manner as possible. To that end we have teamed up with the Ohio Forestry Association to offer a couple of chainsaw safety classes.

Learn more about using a chainsaw safely at our upcoming classes.

On **June 6th** there will be a class titled '*Custom CSAW*' offered at Ohio State Mansfield. This half day class is focused on the homeowner/landowner and volunteers and provides a good core class for those needing to learn some of the basics of operating a chainsaw safely. In this class each participant will not fell a tree, however each participant will use a chainsaw to cut an already downed tree in order to demonstrate the ability to handle the saw. The cost for this class is $50.

On **June 20th** there will be a class titled '*CSAW Level 1*' also offered at Ohio State Mansfield. This 8 hour class has a lecture portion in the morning and a hands-on portion in the afternoon. The class focuses on personal protective equipment (PPE), safety features of the chainsaw head, five point safety check, maintenance of the power head and guide bar, components of the saw tooth, angles and their functions, proper filing, and the reactive forces of the chain and guide bar. The field section covers benefits of open-face felling, benefits of using a hinge & bore method, five step pre-felling plan, tree felling demonstration, and participant tree felling. In this course each participant will fell a tree under the guidance of an instructor. For Ohio Forestry Association members' registration for this class is $100 for nonmembers it is $150.

The Ohio Forestry Association offers chainsaw safety classes in other areas of the state and you can see the rest of their calendar on their website at http://ohioforest.org

Many times the thought is 'I just need to cut that limb up' but the simplest job can easily become a life changing experience with one false move of the saw. Before you have that life changing experience make sure you know how to handle the saw properly, and know what safety equipment you should be wearing in conjunction with the saw.

Calendar of Events

June 13	Name That Tree	Ohio State Mansfield
July 18	Name That Tree	Medina County
July 25	Introduction to Invasive Species	Auglaize County
August 15	Tree Diagnostic Workshop	Ohio State Mansfield
August 16	Wildlife in Your Woods	Holden Arboretum
September 16-18	Farm Science Review	London, Ohio
October 2	Your Woods, Water & Wildlife	Medina County

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Kathy L. Smith
Program Director - Forestry
Ohio Woodland Stewards Program Coordinator

Contact Us!
For program information contact Mary Slyby at 614-688-3421
by email:
ohiowoods@osu.edu
or by mail at:
Ohio Woodland Stewards Program
School of Environment & Natural Resources
210 Kottman Hall
2021 Coffey Road
Columbus, OH 43210