



Billion Dollar Bugs and why we don't move firewood

by Dave Heithaus



Asian Long-horned Beetle. By Kyle T. Ramirez via Wikimedia Commons

They spread disease, lay waste to timber stands and drive their native counterparts into disarray and extinction.

They travel from the far-flung corners of the globe and advance mercilessly across the landscape. They have no natural predators; they cannot be easily stopped. No, not Swedish rock bands... exotic, invasive insects!

No, Literally. Insects. It's not a metaphor for ABBA.

We write a lot about the importance of maintaining healthy populations of native plant species while limiting the spread of noxious, invasive plants- so much so that the topic of invasive insects hasn't shared much of the limelight. Partly because there's only so much Prozac in the world and partly because the insects

make the plants look like a basket full of kittens and candy.

In reality, the two blights work hand in hand to alter our landscape for the lousy. While invasive plants crowd out natives, their six-legged counterparts clear spaces for the next surge.

Small in stature, these creatures pack a wallop. Kind of like Rocky Balboa if Rocky was more evil than plucky. And had six legs. And ate wood. And there were a bunch of him.

So not really that much like Rocky at all.

But destructive still: each year, wood-boring pests are responsible for billions of dollars in damages in the United States. Yes, that is a "B". Almost every region in the US faces pressure from invasive plants and insects. In Ohio we're stuck with some of the worst.

Sprinkle that Zoloft onto a big bowl of chocolate ice cream 'cause here we go! [As a disclaimer, whoever named these creatures threw adjectives around like rice at a wedding so we're left with an awful lot of three-letter abbreviations.]

ALB: The Asian Long-horned Beetle

The Asian Long-horned Beetle (pictured left) was first discovered in Ohio in 2011. Like many of our immigrant forebears, the ALB most likely arrived in New York. Rather than the allure of jobs in the 1890's they were drawn to the rich pastel culture of the 1980's and all of the delicious hardwood growing amongst the hair bands, parachute pants and velour tracksuits. They travelled here to pursue their dreams in wooden packing material from Asia.

Adult ALBs can be seen from spring through fall in most climates. They are the bruisers of our invasive gallery, growing up to 1.5" in length with antennae over twice as long. They sport a shiny black body with white spots on their wings. Their flight is generally limited to short sorties- a good thing as it helps to limit their rate of spread. Often, ALBs lay their eggs on the same tree they emerge from and seldom travel more than a few hundred yards.

As usual, it's the young'uns that can cause the mischief. Larvae emerge from eggs laid near the surface of the bark and burrow into the phloem and cambium layers to feed. During the year they take to mature, they'll eventually chew their way into sapwood and heartwood. Between May and October, with a nice mid-

summer peak, the larvae chew their way back out to the surface. Sort of a cross between Puck and the Alien in grub form.

All of this chewing does a number on the host. Tunnels and holes left by the larvae weaken the tree structurally, disrupt nutrient flow and open pathways for further infection. Even a stout and healthy tree cannot withstand too much attention from ALBs.

ALB's favor hardwoods. They do not show a significant preference for age or size class so they pose a serious threat to both the timber and nursery industries. Maple, willow and elm are the most commonly impacted trees in the US but ALBs have also been observed on sycamore, birch, buckeye, ash and a number of fruiting and ornamental trees and shrubs.

As there are no chemical or biological controls for ALB, detection and quarantine are the keys to prevention. Infected trees will show a number of 3/8 to 3/4 inch exit holes as well as frass (sawdust and grub poo) on lower branches, leaves or the ground. After several generations of infestation, a tree will also display die-off among its branches. Unfortunately, removing and burning an affected tree is the only practical way of destroying ALB larvae.

Ohio is the fifth state in which ALB has been identified and is currently under quarantine. Thankfully, ALBs have only been detected in Claremont County and a ban has been placed on the transport of any wooden material or debris from the area.

As disastrous as an unchecked outbreak can be, so far management agencies have been proactive in detection and control efforts. ALB has been successfully removed from Illinois and sections of New Jersey and contained in New York and Massachusetts. We're the latest front but with vigilance, we too shall prevail!

Report potential infestations to the Ohio Department of Agriculture at

855-252-6450 or the USDA at asianlonghornedbeetle.com.

Rule of thumb (and law): don't transport wood! If you cut or purchase fire wood, burn it where you collect it.

EAB: Emerald Ash Borer

If you've heard of one nasty on this list it would probably be the infamous Emerald Ash Borer. Or the Armageddon beetle if you're an ash tree. It has already killed tens of millions and may well have in its capacity a crack at all 8.7 billion ash trees in the United States.

First discovered near Toledo in 2003 (via Michigan... thanks for that), it has now spread to almost every corner of the state. Though we have not yet observed it on the BFEC preserve, it was first document in Knox County two years ago. Adults are small (1/2" by 1/8") and a lustrous green color. They are active from May through September.

Whereas containment offers some hope of keeping the ALB at bay, the ash borer has thwarted all attempts to slow its spread. Now considered a state-wide pest, county to county

quarantines on moving wood have been dropped. That being the case, it's still a good idea to limit transport of wood from a collection site. There are many unaffected pockets of forest and no reason to help the enemy disperse any faster than they can on their own.

Left to their own devices, EABs can move over ten miles per year- humans moving firewood have facilitated an even faster rate of spread. Satellite populations crop up wherever infested wood has been moved. These satellites quickly expand into one another and huge areas become affected.

EABs work quickly, often killing their host trees in 3-5 years. Ash borer larvae feast on the layer just beneath the bark (cambium). In feasting, they create a dense web of tunnels that prevents the tree from transporting essential nutrients. Weakened and starved, the tree dies from the top down.

Signs of an infected tree include dead sections in the upper story, sprouting of runners near the base of the tree, peeling bark and unusually active, smiling woodpeckers. Upon emergence, EAB larvae also leave a num-

Clockwise from right: 1) Emerald ash borer larvae kill ash trees by eating wood just under the bark. After pupating there, they emerge as adults and leave behind a "D" shaped hole. 2) The hemlock wooly adelgid is a tiny, white bug that sucks sap from branches. 3) At 1.5" long, the conspicuous size of Asian long-horned beetles and the holes it creates may help people win the battle against this invasive insect.



Photo: Wikimedia Commons

Photo: bugwood.org / Wikimedia Commons

ber of D-shaped exit holes about 1/8" in diameter.

In a period of ten years, an EAB infestation will kill approximately... oh, say 100% of the ash trees in a stand. Worse, the speed with which they kill young trees prevents re-seeding and steals any real hope of renewal once the tidal wave of destruction has moved on to the next wood lot.

At present there are no practical chemical, biological or mechanical control methods for EABs in large forested areas. In urban areas, trees can be thinned, removed or treated with pesticides. Researchers have identified several parasitoid wasps that assist to control the pests in their native range but none have been imported in significant numbers.

The environmental and economic impact of the Ash borer on Ohio is sobering. Ash trees make up as much as 10% of all the trees in the state and are a cornerstone of the elm-ash-cottonwood forest type. Wide-scale die offs due to ash borers will leave voids in ecosystems already facing pressure from invasive plants and human development.

We won't be getting off easy either. The timber industry faces losses of up to 2 billion dollars and land owners could be out as much as 1 billion for the removal and disposal of dead or infected trees. Any cynical entrepreneurs out there may want to invest in a chainsaw and a chipper shredder.

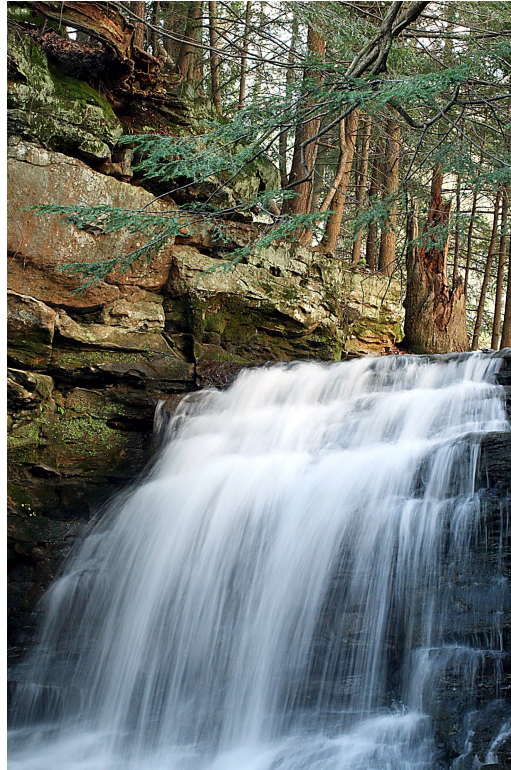
Why is the EAB so destructive?

Like all exotic invasive organisms the problem is one of context. Back at home, they've been in a long-running evolutionary dance with their hosts, predators and environment. Here, none of those mechanisms maintaining ecosystem balance are in place. Essentially, the EAB showed up coughing Ebola and carrying a laser cannon in one hand and a thing that shoots circular saw

blades in the other. Our ash trees feature immune deficiency and pellet pistols.

In its native range, the EAB faces resistant trees, predators and parasites. Here... sticky purple monitoring boxes.

Depressed yet? No? Let's keep going then.



Hemlock trees are found in just a few spots in Knox County, like the steep, picturesque valley walls of the Kokosing River near Millwood. Pictured above, a hemlock branch hangs over the Honey Run waterfall. Photo courtesy Shanna Hart.

HWA: Hemlock Woolly Adelgid

Let's try a fun exercise in nightmares. Picture your favorite, secluded grove of mature hemlock trees. Mohican, Hocking Hills... Now picture the surface of the moon. Now use the topography of the former with the number of hemlock trees from the latter. Which brings us to...

The impossible-to-comfortably-pronounce Hemlock Woolly Adelgid. (a-del-jed). This tiny nuisance was first encountered in the western United States in the 1920's. A sepa-

rate introduction occurred in the 1950's in Virginia and that's the one we're interested in here in Ohio.

The leading edge of infestation currently runs just north of the Ohio River. 2012 saw the first confirmed sightings in Ohio and pesticides and removals have been initiated. That kind of proactive approach is good because at 1/16th of an inch, the HWA is still capable of some pretty terrible things.

Attracted to both Canadian and Carolina Hemlocks, HWAs feed on the phloem sap from young twigs. Drinking the life blood of the tree slows then stops new growth, desiccates and defoliates the tree and eventually leaves it either dead or so seriously depleted that secondary causes finish the job.

Think tiny, sticky little sap vampires. They generally finish up their dirty work in four to ten years. As HWAs have spread through the Appalachians, they have shown themselves willing and able to wipe out large stands of hemlock. Research suggests that a worst case scenario would see a region devoid of hemlock trees in the next decade.

Detection and early treatment is the best way to slow the spread of this horrible little beastly. The most obvious sign of infestation is the presence of white, silky egg sacs at the base of needles. These egg sacks are easy to observe on infected trees from late

October through June. While government agencies inspect known stands of Hemlock across the state, homeowners are encouraged to monitor their own trees and report any signs of HWAs.

If HWAs are discovered, there are several ways of going about inviting them to take a nice long dirt nap.

On smaller trees, non-toxic insecticidal soaps can be applied to the foliage to kill HWAs. Foliar insecticides are also effective but can have longer lasting environmental impacts.

For larger trees where it isn't practical to spray all of the foliage, bark sprays or soil drenches can be effective. Insecticides can also be injected directly into the tree. The hemlock will absorb the chemical cocktail and transport it to foliage where it can turn the tables on the miniature monsters.

In a twist, another imported insect can act as a biological control for HWAs. A black lady beetle native to Japan has been identified as an effective predator. With a taste for HWAs and very little else, several hundred thousand of these beetles have been released and are chewing up adelgids as fast as they can.

As a final shred of hope, it appears that HWAs are not particularly cold-hardy. Following extended periods of cold, populations can be dramatically reduced. A bit of a double-edged sword if you don't like winter but... at least living hemlocks look pretty in the snow.

TCD & WTB: Thousand Canker Disease & the Walnut Twig Beetle

Just to round out an impressive display of three letter abbreviations: the one-two punch of Thousand Cankers Disease and the Walnut Twig Beetle.

While the Walnut Twig Beetle is the only creature on this list from North America, it is still considered invasive in OH.

Originally hailing from Arizona the WTB spent much of its existence living amongst Arizona walnuts; a species resistant to their charms. It was a beetle stricken with wanderlust though and it inexorably began traveling east and in the direction of our lovely and valuable black walnuts.

Horribly, it did not travel alone... You see, the WTB has a little friend

called *Geosmithia morbida* or GM. GM is a fungus. A nasty little fungus that causes Thousand Canker Disease (TCD) which is not, as it should really be, the result of a bad Chinese lunch buffet. No, instead it is a deadly affliction that black walnuts are particularly susceptible to.

It draws its colorful name from numerous elliptical lesions, or cankers, that appear on an infected tree's branches. Each time the WTB bores a hole, it deposits fungus inside the tree. The fungus damages the phloem and cambium and disrupts nutrient flow. After a few years of the beetles' feeding and depositing GM, few trees survive.

Symptoms of TCD include a yellowing of foliage that precedes dying leaves and eventually branch mortality. Often an affected tree's bark will feature dark stains around the cankers. Before the end, bore holes and cankers will be visible on both branches and the main trunk. There is no known treatment for TCD.

The dynamics of how are speculative but a symbiotic relationship has clearly evolved between the insect and the fungus. The fungus allows itself to become food for the insect in exchange for something most fungi have a limited capacity for: travel. TWBs' mobility allows for much faster dispersal than GM could manage on its own. In fact, GM has not been found anywhere that TWBs have not. This brings us to the word of the day: "entomochoric", or dispersed by insects. By goodwill or coercion is immaterial but in this case both the TWB and GM seem to be getting a slice of the pie.

Again, early detection and quarantine are essential to slow the spread of TCD. It is possible to treat individual bore holes chemically but the magnitude of most infections renders

this inefficient at best. The reality is that TCD is like a harder to handle Dutch elm disease. While DED (ha, that's a good one...) was carried by insects that generally attacked branches and not the main trunk, pruning was an okay way to slow them down. The WTBs willingness to go anywhere and bore anything prevents pruning from being effective.

Gypsy Moth

Finally, no abbreviations!

They won't steal our children away in the night, but the traveling gypsy moth is having a go at our hardwood stands. A generalist when it comes to ravaging, this charmer feasts on over 300 different types of trees and shrubs.

With a focus on foliage, the moth favors oaks in the buckeye state. In force, gypsy moth caterpillars can defoliate a tree in a single season. Few trees can last more than a couple of years while infested.

The Ohio Department of Agriculture, together with the US Department of Agriculture, has been waging a war since 1989. As the moths spread, the Gypsy Moth Suppression Program targeted infested areas for pesticide application. In the late 1990's, the entire state was screened using pheromone traps. By assessing moth distributions around the state, officials have been able to draw a ragged line diagonally across the state from the northwest. East of this line (including Knox County) is considered heavily infested and top priority for suppression. West of the line, a broad 60 mile swath (think DMZ) known as the STS or "Slow The Spread" Action Zone. Here, trees are monitored and aggressively treated to hold the line.



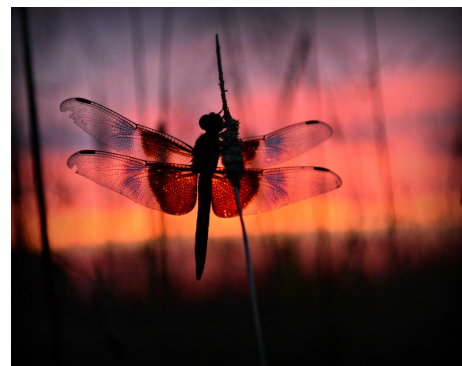
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Knox County Shines in Photo Contest

Thanks to the artistic eye of 60 participants, the beauty of Knox County nature shone through in the BFEC's 10th annual photo contest in October. We'd like to thank all of the photographers for taking the time to notice and to share their inspiring images in this collective appreciation of Knox County nature.

Congratulations to all of our winners! In order from 1st to 3rd place: Adult division - Betsy Heer (left), Heather Laher, and Shanna Hart. Student division - Madeleine Manly (middle), September Garduno, and Kelsey Trulik. Children's division: Marissa Davis (right), Paden Spencer and Beckett Pechon- Elkins.

See more entries at kenyon.edu/bfec, or better yet, admire them all year long with our **photo contest calendar!** To order yours, contact us at 740-427-5053 or kerkhoffj@kenyon.edu.



New Research in Colony Collapse Disorder



Bees of all stripes (including this honeybee) flock to pussy willow blooms in March. Residents can give a helping hand to pollinators by planting favorite food plants like this one.

U.S. beekeepers continue to report an alarmingly high rate of hive losses due to colony collapse disorder (CCD). First reported in 2006, the phenomena causes entire colonies to abandon hives, which is problematic not only because we like honey. Honeybees are used extensively to pollinate crops; one out of every three bites of food that you take can be attributed, directly or indirectly, to bee pollination.

Various reasons for CCD have been proposed, including parasites, disease, stress, poor nutrition, and pesticides. Complicating matters further is the possibility that these stressors interact to cause the problem.

We last wrote about this issue in 2012, when Harvard researchers released a study implicating a class of pesticides called neonicotinoids. They were initially thought to be less toxic to wildlife, but "sub-lethal" doses, which don't kill bees right away, may later cause neurological dysfunction that leaves bees disoriented and unable to navigate home.

The same researchers have now released a second study linking neonicotinoid pesticides to CCD. The study also found no link between CCD and a parasite, which researchers had suspected. Under pressure from bee keepers, environmental groups and law makers, the U.S. EPA is reviewing its registration of neonicotinoids, though it won't be completed until 2017-18. The European Union has placed a two-year ban on the pesticides to conduct further review.

Calendar of Events

*All events are free, open to the public, and start from the BFEC Resource Center unless stated otherwise.
9781 Laymon Road, Gambier Ohio | 740-427-5050 | dohertyh@kenyon.edu | bfec.kenyon.edu*

An Evening with Paul Strauss: Herbalist, Conservationist, Author

Thursday, Jan. 15th, 7pm. Herbalist-author Paul Strauss will join us to share his story of reclaiming hundreds of acres of strip-mined land in southeastern Ohio to create a botanical sanctuary. Paul now operates Equinox Botanicals and teaches undergrad and graduate students about medicinal herbs. The evening will begin with brief excerpts from an award-winning film about Paul, *The Sanctity of Sanctuary*, to be followed by remarks and Q&A about herbalism, living close to the land, and “passing on the green spark.” Books and DVDs will be available for purchase. Rain date - Jan. 22nd. Co-sponsored by the Knox County Park District.

Winter Wildlife Survival - Saturday, February 7th,

1pm. How do animals survive the winter? Which ones hibernate and which ones are afoot? Join us for a short presentation for all ages about fascinating wildlife survival tactics. Take a walk, weather permitting, to look for animal tracks and winter homes.



Insects: the Good, the Bad, and the Ugly

Saturday, March 7, 1pm. Join naturalist Jeff Avalon as he talks about the exciting world of insects, including those that are loved, spurned, or seem to be the product of science fiction. Explore insect collections indoors and take a walk, weather permitting, to find evidence of insects outdoors.

The Dance of Spring: Timberdoodles - Saturday March 21, 6:30 p.m. Honey Run

Highlands Park, 10816 Millersburg Rd. Former Metro Park Chief Naturalist Gary Moore will lead a foray to the courtship grounds of a truly unusual wild creature known as the Timberdoodle, Bogsucker or American Woodcock. Their courtship flights are fascinating as they wing skyward to impress the fairer gender to propagate and nest on the highland fields. Join us for more “Doodle” lore and a short sunset hike to highlight their antics as they begin a performance Aldo Leopold called “Dancers in the sky.” Meet at the park entrance at 10816 Millersburg Road (US 62), just south of Millwood (near Caves Rd). Co-sponsored by the Knox Co. Park District - visit knoxcountyparks.org for more park information.

Bald Eagles Along the Kokosing - Saturday, April 4th, 1:00 - 4:30pm

Join us to learn and experience how the national emblem has fared well in and around Knox County. The event will start with an indoor program to explore eagle lore and objects with former Metro Parks Chief Naturalist Gary Moore. Brad Perkins, veteran volunteer eagle nest monitor, will also join us to share his experiences and photography. We'll then car pool a short distance to a nesting site along the Kokosing where (with luck) we'll view Eagles that may be feeding young. Spotting scopes and binoculars will be provided for viewing from a respectful distance. All ages welcome. Co-sponsored by the Knox County Park District.

Celebrate Earth Day! Sunday, April 19 - Kenyon Athletic Center

Earth Day Challenge Half Marathon & 4 Mile Run/Walk

Celebrate Earth Day with your feet! Participants of all abilities are invited to walk, run or a little of both for a half marathon or 4 miler. Race begins at 8am, then stay to enjoy post-race amenities and the Earth Day Festival. More info and registration at www.premierraces.com, or contact hofferberthj@kenyon.edu.

Earth Day Festival: Healthy People ~ Healthy World

Keep yourself and the planet healthy - two goals that go hand-in-hand! Enjoy this FREE event from 10am - 2pm with exhibits, vendors, kids' activities, farm marketers, live music & more. The Earth Day Festival uniquely brings together the best in local resources. Celebrate Earth Day by shopping green and connecting with groups that support healthy living for ourselves and our world. Look for more information coming soon about gardening and cooking workshops!

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Our Donors

Glen Hill Orchard, for donating cider apples for the Harvest Festival; Barry & Susan Bowden, for donating to our Field Trip Scholarship Fund.

Our Volunteers

In the office, classroom, gardens and on the trails: Claire Brautigam, September Garduno, Shirley Hughes, and Quinn Rathcamp.

Field Trip Volunteers: thank you the 40 student and community volunteers who helped us with one of our busiest fall seasons ever, with 560 elementary students visiting! Special thanks to Marcia Barnhart, Kay Burrows, Erin Kelske, Sam Lagasse, Lauren Michael,

Cecina Morrow, Quinn Rathkamp, Sarah Spurgin, Emily Vachon, and Pamela Woodworth for their extra time and effort.

Harvest Festival: Kenyon Chapter of Theta Delta Phi, Nancy Chapel, Alma Urbano-Torres, Jia He, Brianna Levesque, Jacob Sharfetter, Quinn Rathcamp, and Willa Kerkhoff.

Son of Mudman Trail Races: Chris Gillen and Haley Acker

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There are many reasons to become a member of the BFEC, including the satisfaction of knowing you're a part of critical education and conservation programs. Receive preferred access to popular workshops, a hard copy of our newsletters, and 10% discount on bird seed. Thank you for your support!

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Our Mission

The BFEC at Kenyon College exists to engage Central Ohioans of all ages with nature, and to support the goals of Kenyon College by conserving the natural diversity of the Kokosing River valley and providing opportunities for education and research.

Director of Facilities

David Heithaus

Director of Programming

Heather Doherty

Facility & Program Assistant

Jill Kerkhoff

Upcoming Events

Thursday	Jan. 15	An Evening with Paul Strauss: Herbalist, Conservationist, Author
Saturday	Feb. 7	Winter Wildlife Survival
Saturday	Mar. 7	Insects: the Good, the Bad, and the Ugly
Saturday	Mar. 21	Timberdoodles and the Dance of Spring
Saturday	Apr. 4	Eagles Along the Kokosing
Sunday	Apr. 19	<i>Save the Date</i> - Knox County Celebrates Earth Day!

Events details inside and at bfec.kenyon.edu



Brown Family Environmental Center
at Kenyon College
P.O. Box 508, Gambier, Ohio 43022



