

GROWERTALKS

Pest Management

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What Happened with Ambrosia Beetles in 2018?

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Small beetles that overwinter in the base of trees in the nursery and the surrounding forest trees become active each spring when the temperature reaches into 65 to 70F (18 to 21C) temperature range. Most nursery operators are so busy at tree bud break they fail to notice small, wet areas occurring on the trunks of susceptible trees.

This isn't something that should be ignored. The wet spot on the trunk is sap oozing from wounds from non-native species of ambrosia beetles that are chewing into the trunk of nursery trees. Within a short time after the wet areas show up on the trunk, frass tubes begin to project from the trunks of infested trees and the game is over—your nursery tree is in decline, heading toward death.

Pictured: Adult female ambrosia beetle (Xylosandrus germanus).

In Maryland, back in 1997, we first found a small ambrosia beetle called *Xylosandrus germanus* killing an acre planting of sytrax trees in a nursery. We published this find in a refereed journal shortly afterwards. Since this time, we've found this beetle expanding its range, finding new nurseries to attack with several species of landscape plants being damaged.

These borers are two species of Xyloborini beetles including *X. germanus* and *Xylosandrus crassiusculus*. Both *X. germanus* and *X. crassiusculus* are found in over 32 states in the continental U.S., infesting nursery and landscape plant material.

During the 2013/2014 winter, we experienced a weather front called a Polar Vortex. The central and Eastern seaboard of the U.S. experienced a cold front with a vise-like grip. Many were predicting that many insects would be killed by the extreme cold weather. The thing that the low temperatures and extended cold did was weaken many species of nursery and landscape trees. Weakened trees produce ethyl alcohol and ambrosia beetles are attracted to it.

Most native ambrosia beetles attack weakened trees and rarely cause major economic loss in nurseries. The cold weather was record-setting for the Midwest and East Coast in the winter of 2014 and caused frost cracking on

trunks and death of branches on many nursery species. The ambrosia beetle up-swing in 2014 activity was related to the winter weakening of trees. We may see a repeat of this in 2018 after our January extreme cold period.

In the winter of 2017/2018, central and eastern parts of North America again experienced an extensive and extremely cold period, but this time, it was caused by a bomb blast or winter cyclone weather pattern. In the end, we experienced a similar winter cold pattern to 2013/2014. This set us up for another influx of damage from these two ambrosia beetles.

Beetle background

Two invasive ambrosia beetle species of Xyloborini beetles have become a problem for several nursery growers in the Midwest and East Coast. One is *Xylosandrus germanus*, native to Japan, Korea, Vietnam and China. The beetle was described by Buchanan (1941) and the beetle's galleries were described by Hoffmann (1942) in elms and red maple.

The second ambrosia beetle causing loss in Maryland nurseries is the granulate ambrosia beetle, *Xylosandrus crassiusculus* (Motschulsky, once referred to as the "Asian" ambrosia beetle). This is a minute ambrosia beetle of Asian origin that was first detected in the continental United States near Charleston, South Carolina, in 1974.

The biology of *Xylosandrus* ambrosia beetles is really different from bark beetles. Both have fungus associated, but ambrosia beetles use the fungi as food and don't consume the wood of the host tree for nourishment. Beetles captured in traps are females, as males are rarely observed outside of the host tree. Females, upon emergence, are already mated and looking for a tree to attack and lay eggs. In the summer, there's about a 55- to 60-day period between generations. Each year, the emergence of females varies, but damage is most apparent when we experience a short stretch of warm weather, usually above 70F (21C) in the spring.

A brief history of damage

Adult beetles are attracted to trees that are giving large amounts of the volatiles from alcohol production. In Maryland, we're using ethyl alcohol-baited Lindgren funnel traps to monitor for the adult flight activity of these ambrosia beetles.

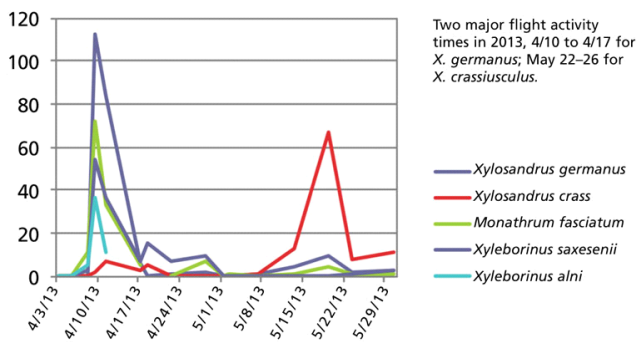
The lifecycle in infested plants is 50 to 55 days during the active growing season. Females chew through the tree bark and tunnel straight into the heartwood. As she creates this tunnel, she will push a tube of frass out, which projects from the trunk of the tree as thin toothpick-like threads. The female beetle plant ambrosia fungus into the tunnel (*Ambrosiella spp*). The fungi colonize the wood and the larvae feed on the fungi, making galleries in the heartwood. The males don't fly and mate with the females in the galleries of small chambers. The females chew through the bark and emerge. In most years, we don't see damage from the second generation.

However, in 2007, we did receive samples of ambrosia beetle fresh damage, wood frass tubes projecting from plants, in *Styrax*, yellowwood and crepe myrtle in July and August, which indicates there was damage in 2007 from the second generation. In August 2009, we received a sample of an active infestation in red maple. The red maple was growing in a wetland planting site that had high moisture content.

The ambrosia beetle has caused extensive damage to a wide range of plants from 2002 to 2014, a time period in which we've been monitoring their activity in Maryland. *Xylosandrus germanus* and *X. crassiusculus* have been recorded feeding on over 140 different species of plants. Some tree species that are commonly submitted to our lab have been damaged or killed by *Xylosandrus germanus* and *Xylosandrus crassiusculus*, include yellowwood, birch,

stryax, redbud, hybrid dogwoods, oriental persimmon, pawpaw, hybrid chestnuts and crepe myrtle.

And these invasive *Xylosandrus* spp. are attacking what appear to be healthy trees. For example, in 2008, one nursery had major damage in 50 London Plane trees, 30 river birch and 30 Zelkova, all of which had been in the ground for two years and appeared to be growing vigorously and healthy the season before. In another nursery, we examined heavy damage in sweet bay magnolia, sugar maple, *Styrax* and Chinese dogwood, and again all of the trees had healthy amounts of growth the season before the infestation. Each of these nurseries was supplying plants with supplemental watering through a trickle irrigation system.



In another case, a 2-acre private arboretum with an extensive planting of azaleas sent in samples that were being damaged by a *Xylosandrus crassiusculus*. The manager reported extensive loss of azalea plants in 2008 and each subsequent year through 2014.

In April 2014, nurseries reported heavy damage on yellowwood trees, hybrid dogwood Venus, *Styrax* and redbud. In another nursery, they lost over 60 trees in 2014 including zelkova and redbud. In May 2014, we had reports of *X. crassiusculus* damaging European

beech, *Carpinus*, Paperbark maple, *Cornus kousa* hybrids, Rose of Sharon and Japanese maple. We also had an IPM scout reporting ambrosia beetle attacks on mature Stayman apples grafted on M-7 understocks in an orchard in Maryland. In a second case, we found *Xylosandrus* damaging sweet cherry in another orchard.

In June of 2014, we received a call from a Pennsylvania grower in Bucks County. This grower is growing in a fairly fertile clay loam soil in the ground. They had a problem with ambrosia beetles 12 years ago and hadn't seen any problems until that year. He basically had the same tree species we saw attacked by ambrosia beetles in Maryland this year, including yellowwood, Chinese redbud, Stellar series dogwoods, Japanese maple, paperbark maples, zelkova, crape myrtle and *Halesia*.

In addition, he had *Cornus florida* (native dogwoods) being attacked by *Xylosandrus*. The tree age varied from 2- to 4-year-old plants that were well established in the nursery field. The interesting thing is that I've observed *Cornus kousa* and the hybrid Stellar series damaged in the past, but not native dogwoods.

He noted within a month after the native dogwoods were attacked by ambrosia beetles, the wood was very brittle and snapped easily. He didn't observe this in the other tree species. It might be the winter desiccated the branches on the native dogwood. We haven't observed any winter damage to *Cornus florida* in our Maryland nurseries.

The European beech started to leaf out in the spring of 2014, then the leaves collapsed after the ambrosia beetle damage occurred. Some of the branches failed to leaf out, but others expanded their leaves, then collapsed. The interesting thing is that three weeks ago when I observed the trees, they still had 20% to 30% of the foliage expanded and looked fairly good.

When I spoke with the nursery manager, he said nine trees had totally collapsed. These trees had 8-in. to 10-in. caliper. One tree I looked at with him three weeks earlier (this tree was much larger than the rest) that had been root-pruned in October actually looked pretty good. Foliage was out on over 90% of the tree.

Three weeks after the first observation, we found two lower limbs showed collapsed leaves and ambrosia beetle damage on those branches. The rest of the tree looked good, but he said, since this time, over 50% of the foliage collapsed and they found ambrosia beetles holes throughout the branches. The owner was thoroughly disgusted and had the European beech, paperbark maples and Styrax all cut down and removed. They estimate they suffered a little over \$320,000 of tree loss this year.

In Ohio, Chris Ranger was finding *Xylosandrus* attacking Sugar maple and redbuds. Each tree that was being attacked had frost cracking on the trunk from the cold 2014 winter.

Work at North Carolina State University by Steven Frank has found that trees that are held waterlogged produce large amounts of alcohol and are highly attractive to ambrosia beetle attack. If trees are held very wet before foliage has emerged, and the plant can transpire excess water through foliage, then the likelihood of attack is highest. It's suspected that waterlogged plant material, under these anaerobic root conditions, produce large amounts of alcohol.

Some growers in Maryland have noted increased ambrosia beetle activity in plants growing in fields that retain moisture for great lengths of time. In other cases, nurseries growing in sandy loam and clay loam with good drainage still report heavy losses in spring, usually the first generation, in plant material.

Management

Pyrethroids have been found to provide a level of control of attacking adults if applied prior to the closing of the galleries with frass. In the nursery, either permethrin or bifenthrin has been used to control ambrosia beetles, applying these materials to the main trunk and major branches. Once the beetles are in the tree and have frass packed in the entry holes, they're isolated from the outside. If infestations occur, affected plants should be removed and burned or chipped and composted, and trunks of remaining plants should be treated with an insecticide labeled for this pest.

Once an infestation starts, some nursery managers left the damaged trees as trap trees and then destroyed them before the end of the 55-day life cycle.

2018

At the time I'm writing this article, we've had a wet, cool spring and seen very little or any activity from ambrosia beetles this season. I suspect, following such a cold winter, that we'll see damage similar to what we saw in 2014. I would love to have feedback from readers on activity this spring in your state. **GT**

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