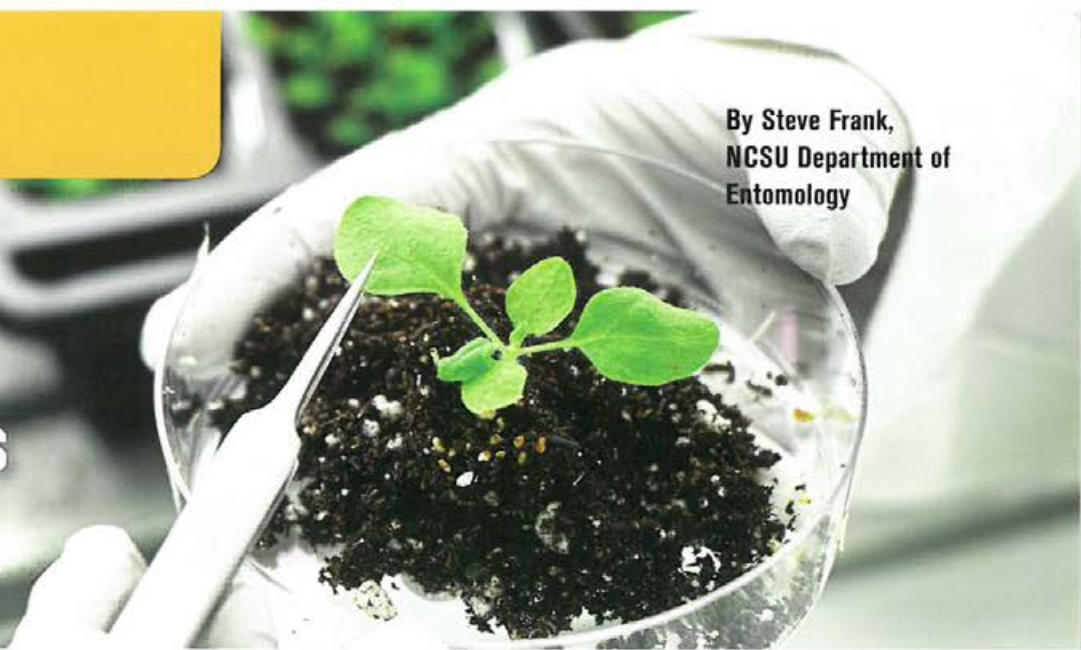


# New Research to Help You Beat Ambrosia Beetles



**E**xotic ambrosia beetles attack hundreds of tree species and kill them quickly. For years ambrosia beetles have been one of the most costly and damaging pests of nursery trees.

Fortunately, with the help of NCNLA research grants we have learned a lot about the biology and management of these pests over the past several years. We have even zeroed in on why ambrosia beetles attack particular trees and how to make trees less attractive. I will review the identification and biology of these beetles and bring you up to date on our latest research and management suggestions.

## Current and growing concerns

There are several ambrosia beetle species that attack nursery stock. The most common and damaging species here are the **granulate ambrosia beetle** (*Xylosandrus crassisculus*) and **black twig borer** *X. germanus*. In the past few years we gained a new member of our ambrosia beetle community. *Cnestus mutilatus*, the **camphor shot borer**, is widespread in Asia and was first detected in Mississippi in 1999. It has spread through much of the Southeast and we found it in North Carolina four years ago.

Last year, instead of one or two of these beetles we captured a couple dozen. It remains to be seen if this trend will continue but *C. mutilatus* is expected to spread throughout eastern North America. The most important thing about this new species is its size. Instead of the tiny 1 mm holes we are used to seeing, *C. mutilatus* makes holes three times as big.

The most damaging ambrosia beetles we are concerned with become active in early spring typically before bud burst of most tree species. Female beetles bore



Left: Camphor shot borer. Photo: Doug Stone, Mississippi State University, Bugwood.org.

Right: An overwatered dogwood with 'frass toothpick' structures created when ambrosia beetles bore into trees. Photo: S.D. Frank, NC State University

into trees, excavate a gallery, and lay eggs. They also inoculate trees with ambrosia fungus. The fungus grows within the gallery and is food for the larvae. Around 60 days later adult females emerge from the galleries to find new trees and start a new generation.

Granulate ambrosia beetles, and the other spring pests, attack most deciduous ornamental tree species in nurseries including styrax, red bud, magnolia, red maple, dogwood, ornamental cherry and other fruit trees, Japanese maple, golden rain tree, and oak.

## Prevention is the only option

Ambrosia beetles damage trees by boring into them and also by infesting them with the ambrosia fungus that clogs tree vascular systems. As beetles bore into trees they push out sawdust and frass in the shape of toothpicks that stick out of the trees. Infested trees die or become unmarketable due to holes or dead branches. Unfortunately, there is no way to kill the beetles or fungus once they enter the tree.



Steve Frank

Since 1979, the North Carolina Nursery & Landscape Association has provided over \$1 million in funding to research, endowment and program activities at NC State University. This industry research, in part supported by NCNLA's member dues premiums (silver, gold and platinum) and successful fundraising events throughout the year, demonstrates the effectiveness that private-sector collaboration with a world class public institution can provide. This is just one example of how NCNLA has partnered with NC State to provide solutions for green industry businesses here in North Carolina.



**Granulate ambrosia** (*Xylosandrus crassiusculus*)- Becoming active in early spring, one of the most costly and damaging pests of nursery trees, attacking over 200 tree species including many ornamentals. They damage trees by boring into them and also by infesting them with the ambrosia fungus that clogs tree vascular systems. Prevention is the only method of defense.



**Black twig borer** (*X. germanus*)- Most common species (along with Granulate ambrosia beetle). Attacks most deciduous ornamental tree species in nurseries, including styrax, red bud, magnolia, red maple, dogwood, ornamental cherry and other fruit trees, Japanese maple, golden rain tree, and oak.



**Camphor shot borer** (*Cnestus mutilatus*)- Widespread in Asia and was first detected in Mississippi in 1999. It has spread through much of the Southeast and we found it in North Carolina four years ago. Expected to spread throughout eastern North America. Most important thing about this species is its size. Instead of the tiny 1 mm holes we are used to seeing, *C. mutilatus* makes holes three times as big.

**Since there is no way to 'cure' trees after attacks, growers need to prevent ambrosia beetle attacks.**

The primary preventive measure has been permethrin applications in early spring when beetles become active. But our goal has been to figure out why ambrosia beetles attack nursery trees to begin with. In their Asian homelands they attack unhealthy, dying trees. So why do they attack our 'apparently healthy' nursery trees here?

**Soil moisture control is critical**

Last year I reported our research showing that many nursery trees don't smell that healthy to beetles. Ambrosia beetles are attracted to ethanol – that's what we use in ambrosia beetle traps. It turns out this is the same cue they use to find host trees. Trees produce ethanol when they are growing in soil that is too wet.

Waterlogged trees emit ethanol as a by-product of anaerobic root respiration and thus attract ambrosia beetle attacks. This explains why we found that ambrosia beetles waterlogged trees in experiments but never attacked trees with a reasonable amount of water.

What is reasonable? How wet is too wet? To answer this we grew dogwoods in pots with 10, 30, 50, 70, or 90 percent media moisture. After eight weeks trees grown in 10, 30, or 50 percent soil moisture had no attacks. Trees grown in 70 or 90 percent all had dozens of attacks.

**We recommend maintaining spring soil moisture below 50 percent as a first line of defense against ambrosia beetle attacks.**

It is pretty clear based on our research and research by colleagues in Ohio, Virginia, and Tennessee that **soil moisture is the primary factor influencing which trees get attacked and which don't.**

Our results suggest that if growers could maintain trees below the 50 percent media moisture threshold they may not even need to spray them. Of course this is probably not that easy.

We visited cooperating nurseries throughout Johnston and Wake counties for two years to measure the media moisture of trees in early spring. It turns out that most trees in most nurseries are growing in 70-90 percent media moisture in spring when ambrosia beetles peak.

**Some spraying may not be needed**

Remarkably, during several years of research with dogwoods, red buds, magnolias, and maples we never had a tree attacked that was growing in media moisture of 50 percent or less. Not one out of hundreds of trees. So we wondered if growers could stop spraying trees altogether if water management was perfect.

To answer this we conducted an experiment with Florida dogwoods and styrax. We grew trees either flooded or in 30 percent media moisture. Half the trees in each water treatment were sprayed with permethrin the other half were not.

After eight weeks no dogwoods, sprayed or unsprayed, grown in 30 percent moisture were attacked. For dogwoods spraying provided no benefit if media moisture was controlled.

Styrax trees, however, were attacked in every treatment. Flooded unsprayed styrax were heavily attacked, but even sprayed trees that were flooded got attacked. They are just that attractive to the beetles. In addition, even a few styrax grown in 30 percent moisture were attacked — but this was a couple attacks compared to hundreds in the flooded trees.

Thus we can't disband spraying altogether even with water management but some species may not need it.

Exotic ambrosia beetles are not going away and we are likely to get more species over time. They are very good at being pests but we are getting better at stopping them. Think about what you could do to keep plants drier next spring so they do not smell sick to beetles. This will give you a baseline level of protection from ambrosia beetle attacks. 🌿

About the Author: Steve Frank is Associate Professor and Extension Specialist in the Department of Entomology at North Carolina State University. His ambrosia beetle research is funded by the Horticultural Research Institute and the North Carolina Nursery and Landscape Association. You can find more information about his research on ambrosia beetles and other nursery and landscape pests on his website <http://EcolPM.org>. Follow @OrnaPests on Twitter to receive alerts about nursery and landscape pest activity.