

Flatheaded Borer Management in Nurseries with Winter Cover Crops

Karla Adesso, Axel Gonzalez, Jason Oliver and Anthony Witcher

Flatheaded Borers in Nurseries

Flatheaded borers are common and destructive pests of many species of deciduous ornamental, fruit, and nut trees. These borers are especially problematic in new plantings and stressed trees. Some species cause economic damage in North America, including the flatheaded appletree borer (*Chrysobothris femorata*) in the east and Pacific flatheaded borer (*Chrysobothris mali*) in the west.

Flatheaded borer larvae are distinctive. They have an enlarged thorax, giving the



Flatheaded Borer Larvae

appearance of a large, flattened head. The larval stage feeds in the cambium layer under the bark, interfering with the transport of water and nutrients in the vascular

system. Feeding creates galleries that can eventually girdle the tree, resulting in a compromised trunk structure or tree death. Larval damage is most evident in early spring and typically is located at the base of the trunk of affected trees. Frass and sawdust from feeding may become apparent when the bark splits open because of the tissue dying under the bark and presumably from winter temperature fluctuations. Ultimately, trees that survive borer attacks



Damage caused by flatheaded borer larvae

may be unmarketable due to aesthetic damage, as well as having shortened life spans due to vascular damage that may not be visible.

Adult female borers lay eggs during late spring and summer months. On young trees, flatheaded borers prefer to deposit eggs on the sunny side within 6 inches of the tree base and larval damage is often found within the lowest 12 inches of the trunk. Borers complete larval development within the tree and adults emerge in late spring and early summer of the following year.



Flatheaded Appletree Borer Adult

All adult flatheaded borers are bullet shaped and many species have metallic coloration on the wings. Flatheaded appletree borer are about 0.3-0.6 inches long and have dark olive-gray to brown wings with distinct blue or green on the back under the wings and metallic bronze on the underside. The adult stage may be difficult to find in the field so surveys for larval damage are the most effective way to determinate infestation status in nursery fields.

Conventional Management of Flatheaded Borers

The best way to prevent borer attacks is to minimize tree stress, which entails providing new transplants with suitable water and

nutrients and planting trees in locations favorable to the species and cultivar. New transplants with weakened root systems and trees with trunk injuries due to mechanical damage, and graft or bud union scaring may require preventative measures.

Adults and larvae can be managed with insecticide treatments. Bi-weekly trunk sprays of pyrethroid insecticides (e.g., OnyxPro, Perm-Up) can be used as a preventative treatment for adults during the active flight period. Trunk sprays can be somewhat unreliable since the activity period of the adult borers may change based on the region of the country and tree species of concern. In Tennessee, adult borers responsible for damage to maple trees are active from May-July.

Due to the extended adult activity period and larval life cycle, the application of systemic insecticides such as imidacloprid has been found to be more effective than contact sprays. Insecticides containing imidacloprid or other neonicotinoids take time to translocate from the roots to the rest of the plant, so applications must be made in advance of adult activity. In Tennessee, drench applications of imidacloprid are recommended by mid-April. For more information on systemic insecticide applications, see "[Controlling the Flatheaded Appletree Borer in Nurseries with Soil Applied Systemic Insecticides](#)", which is available on the Tennessee State University Extension website.

Protecting Nursery Plantings from Flatheaded Borers with Winter Cover Crops

Recent research has shown that winter cover crops grown at the base of nursery trees can reduce damage caused by flatheaded borers. Winter cover crops work as a natural barrier



Triticale used as winter cover crop

to female oviposition by hiding the base of the trees. The cover crop alters the environment around trees and provides habitat for predators and other borer natural enemies. Cover cropping is a new alternative recommendation for nursery growers for flatheaded borer management.

Characteristics of Cover Crops for Flatheaded Borer Protection

One of the first decisions a grower must make if adopting this practice is selecting a winter cover crop. Effective management requires that the cover crops will: 1) establish well from seed, 2) grow and persist throughout the necessary period (March-June), and 3) grow tall enough (~2 ft by May 1) to shade the tree trunks. In addition to these considerations, cover crops should be easy to manage and be economically viable for growers.

Cover Crops in New Nursery Blocks.

Winter cover crops can be sown in August or September prior to transplant of trees. Cover crops can be planted by using a seed drill, a multi-purpose seeder, or a broadcast spreader. The seed drill and multi-purpose seeder are more effective at placing seeds in direct contact with soil to maximize germination, while broadcast seeds will germinate more effectively if lightly disked

into the soil. The planting date, selection of planting method and seeding rate will vary according to the cover crop selected (see **Table 1**). New trees can be transplanted directly into the cover crop in the winter or following spring. Some rapid growing cover crops (annual ryegrass) may be planted in late winter if the window for fall planting is missed. Currently, we recommend a combination of a winter grain (winter wheat, triticale, or cereal rye) and crimson clover as an effective cover crop system for flatheaded borer management (see **Table 1**). When combining more than one cover crop species, planting rates of each species must be adjusted accordingly to maximize establishment. Higher seeding rates of grains (winter wheat, triticale, cereal rye) may be necessary if applying by broadcast.

Cover Crops in Established Nursery Blocks.

In subsequent years of production, cover crops must be planted while minimizing disturbance to the established tree root zone. Prior to application of cover crop seed, mow the middles. This practice will reduce weed competition and secure seed soil contact for proper germination. Seeds may be broadcast or drilled, however, to achieve germination of cover crops close to the base of trees, broadcast methods may be more effective in established tree rows. Current research support utilizing cover crops for the first two



Cover crop establishment in a plot with boxwood

years of the production cycle, while trees are establishing in the field. Although flatheaded borer damage may occur at any time on weakened or injured trees, newly transplanted trees are the most susceptible to borers and the overall benefits of cover crops (increased organic matter, weed control, etc.) will not be lessened. However, but the cover crop benefits associated with reduced borer attacks may decline as trees become established.

Cover Crop Considerations

Cover crop use in nurseries presents both advantages and disadvantages. In addition to the protection provided against flatheaded borers, cover crops are excellent tools for improving soil quality. Cover crops can benefit nursery production by reducing soil erosion, increasing soil organic matter, adding nitrogen to the soil (e.g., clover), acting as weed suppressants and reducing soil borne diseases.

The main disadvantage of cover cropping for borer management is the direct competition between the cover crop and the trees. Cover crops grown in tree rows will reduce growth of trees in the first year of



Crimson clover used as winter cover crop

transplant compared to trees grown in nursery rows that are maintained vegetation-free with an herbicide. The reduced tree growth is due to mainly to competition for water. Ongoing research will address if irrigating first year transplants or other modifications to the cover cropping systems can reduce the negative effects of cover crop competition. Currently, we recommend allowing the cover crop to senesce naturally in the field over summer. Middles can be mowed in late July or August in preparation for a new cover crop planting or transition to conventional herbicide managed tree rows.

Table 1. Cover Crops Recommended for Use in the Southeastern United States for Flatheaded Borer Management

Cover Crop*	Seeding Depth (inches)	Seeding Rate (lb / acre)		Optimal Seeding Timing	Other Benefits
		Drill	Broadcast		
Winter Wheat	½–1 ½	60–120	90–150	Late Aug–Oct	Great for forage and grain production.
Cereal Rye	¾–2	60–120	90–150	Late Aug–Oct	Reduces nitrogen losses from leaching.
Triticale	½–1 ½	60–120	90–150	Late Aug–Oct	Great for weed suppression and biomass production.
Annual Ryegrass	0–1/2	10–20	20–30	Mid-August to end of September	Helps preventing erosion, captures residual nitrogen, and builds soil organic matter.
Crimson Clover	¼–1/2	15–20	25–30	Late Aug–Oct	Excellent source of pollen for pollinators and helps fixing nitrogen.
Cereal + Crimson Clover	½–1 ½	60+15	90+30	Late Aug–Oct	Excellent mix that will provide the best of both cover crops such as nitrogen fixation and weeds suppression.

*These cover crops have been evaluated in the field against flatheaded borers. Other crops may also be suitable for this purpose.

References

Blalock, Adam and Jason Oliver. 2014. Controlling the flatheaded appletree borer in nurseries with soil applied systemic insecticides. ANR-ENT-01-2014.

Clark, Andy. ed. 2012. Managing cover crops profitably, 3rd edition. SARE Outreach, College Park, MD.

Dawadi, Sujan, Jason B. Oliver, Paul O’Neal and Karla M. Adesso. 2019. Management of flatheaded appletree borer (*Chrysobothris femorata* Olivier) in woody ornamental nursery production with a winter cover crop. Pest Management Science. 75: 1971–1978. DOI 10.1002/ps.5310.

Hale, Frank. 2012. PB1589 Commercial Insect and Mite Control for Trees, Shrubs and Flowers. PB1589. https://trace.tennessee.edu/utk_agexcomhort/51.

For additional information, contact your local nursery specialist at:

Tennessee State University, Otis L. Floyd Nursery Research Center

472 Cadillac Lane McMinnville, TN 37110

<http://www.tnstate.edu/agriculture/nrc/>

931-668-3023

Funding Support

Funding for this work was supported by USDA National Institute of Food and Agriculture Evans-Allen project (1017798), Southern SARE (OS17-101, LS18-287) and the Specialty Crop Research Initiative (2020-51181-32199).

Precautionary Statement

To protect people and the environment, pesticides should be used safely. This is everyone's responsibility, especially the user. Read and follow label directions carefully before you buy, mix, apply, store or dispose of a pesticide. According to laws regulating pesticides, they must be used only as directed by the label.

Disclaimer

This publication contains pesticide recommendations that are subject to change at any time. The recommendations in this publication are provided only as a guide. It is always the pesticide applicator's responsibility, by law, to read and follow all current label directions for the specific pesticide being used. The label always takes precedence over the recommendations found in this publication. Use of trade, brand, or active ingredient names in this publication is for clarity and information; it does not imply approval of the product to the exclusion of others that may be of similar and suitable composition, nor does it guarantee or warrant the standard of the product.

The author(s) and Tennessee State University assume no liability resulting from the use of these recommendations.



TSU-22-023(B)12a-13515 – *Tennessee State University does not discriminate against students, employees, or applicants for admission or employment on the basis of race, color, religion, creed, national origin, sex, sexual orientation, gender identity/expression, disability, age, status as a protected veteran, genetic information, or any other legally protected class with respect to all employment, programs and activities sponsored by Tennessee State University. The following person has been designated to handle inquiries regarding non-discrimination policies: Tiffany Cox, Director, Office of Equity and Inclusion, tcox9@tnstate.edu, or Justin Harris, Assistant Director, Office of Equity and Inclusion, jharri11@tnstate.edu, 3500 John Merritt Blvd., McWherter Administration Building, Suite 260, Nashville, TN 37209, 615-963-7435. The Tennessee State University policy on nondiscrimination can be found at www.tnstate.edu/nondiscrimination.*