



Photo: Mike Haas

Managing Black Stem Borer in Michigan Tree Fruits

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BIOLOGY, DISTRIBUTION, KEY CHARACTERISTICS

Distribution of black stem borer in Michigan. The black stem borer, *Xylosandrus germanus* (Blanford), is an introduced pest that was first found in the United States in New York grapes in the 1930's (1). It was first reported in Michigan in 1980 and is now well established. A 2015 trapping survey conducted by the Tree Fruit Entomology program found black stem borer adults in all the major tree fruit producing counties in Michigan with the highest capture rates in Southwest and Fruit Ridge sites.

Black stem borer biology. Overwintering adults are found in galleries at the base of infested trees and become active in late April or early May, after one or two consecutive days of 68°F or higher, often coinciding with blooming forsythia (6). Adults are about 2mm (0.08 in.) long and females outnumber males by 10 to 1. Only the females are known to fly, and once mated they bore into young trees to create brood chambers consisting of a series of tunnels and chambers called galleries. The entrance to each tunnel is about 1mm (0.04 in.) in diameter and continues horizontally into the sapwood for about the length of the female's body. At that point, the tunnel branches off into one or more chambers, sometimes into the heartwood. Female stem borers carry a symbiotic fungus (*Ambrosia hartigii*) on their bodies that they use to seed the galleries in which they lay their eggs (Figure 1). The growing fungus provides all the food needed for the developing larvae as well as for the adults.

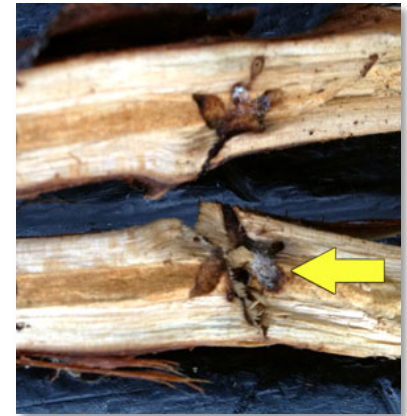


Figure 1. Brood galleries where eggs are laid and larvae develop. Whitish material is *Ambrosia* fungus, which is the food for both larvae and adults.
Photo: Bill Shane.

Black stem borer adults are attracted to stressed trees although they have been known to infest trees do not appear to be stressed (2). Injured trees produce ethanol, which is attractive to this beetle. Black stem borers generally prefer trees that are 4 inches or less in diameter. Host plants of the black stem borer are many, including forest and ornamental species. The beetles invade orchards from the edge and are found in greater numbers in neighboring woods. They are known to fly 100 meters (328.1 ft.) or more to colonize new trees (3).

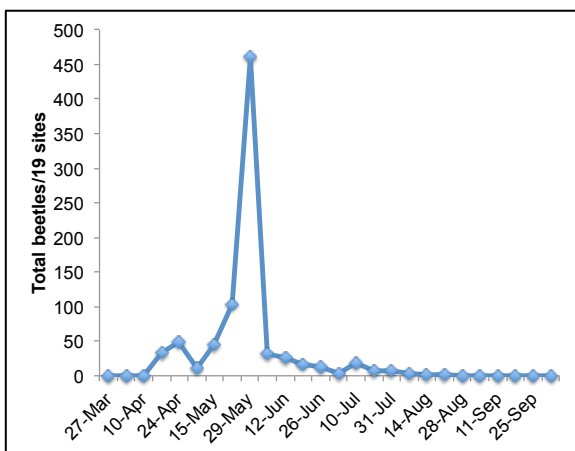


Figure 2. Seasonal captures of black stem borer in ethanol-baited traps in Michigan, 2016.

Black stem borer lifecycle. Female black stem borers come out of overwintering and begin flying in search of new trees to infest in late April or early May. Within the galleries created by the mated female, eggs are laid at the rate of one per day with each female depositing up to 18 eggs. Larvae hatch from the eggs 6 days later at 24°C (75.2°F) (4). There are three larval stages, all of which are passed within the brood chamber, feeding on the ambrosia fungus growing in the galleries. Larval development takes about 12 days, the pupal stage typically lasts 7 days, and the time from egg to adult is about 25 days at 24°C (4). It is likely they have 2 generations per year in Michigan. The seasonal pattern of black stem borer adult flight in Michigan is shown in Figure 2.

For more information, see: Agnello, A., D. Breth, E. Tee, K. Cox and H.R. Warren. 2015. *Ambrosia* beetle – An emergent apple pest. *New York Fruit Quarterly*. 23(1):25-28.

MONITORING & MANAGEMENT

Monitoring. Look for signs of infestation on the trees, including 1 mm diameter entrance holes with sawdust toothpicks protruding from them (Figure 3), dark discoloration on the bark, oozing sap, and dry, blistered bark. Use a simple trap to monitor female activity in the spring: cut 2-4 windows in the body of a plastic 1 or 2-liter bottle that has a cap (Figure 4). Hang it upside down at a height of 0.5 m (1.6 ft.), in the orchard edge near wooded areas (5). Bait the trap with ethanol using one of the following methods:

1. Squirt about a quarter cup of ethanol-based hand sanitizer (unscented) into the cap end (bottom) of your trap. If using this method, traps must be checked daily because the sanitizer will form a crust on the surface after 24 hours.
2. Pour a cup of cheap vodka into the cap end of the trap.
3. Purchase a ready-made ethanol lure (Standard Release ethanol lures, AgBio, Inc., Westminster, CO) to hang inside the trap and fill the bottom of the trap with soapy water or a small amount of antifreeze. If using this method, traps should be checked at least once per week.

These beetles are very tiny and require the use of a microscope and training to identify them correctly to species. Your local Michigan State University Extension fruit educator can help.

Management. The time to spray an insecticide for this pest is when females are flying in the spring before colonizing new trees. Young trees near the perimeter of orchards, especially near woodlots, are at greatest risk of injury. Because they are so tiny, it is difficult to monitor for adults to determine the optimum time to apply an insecticide, but a trap as described above can help time applications.

Pyrethroid insecticides applied as trunk sprays, have shown the most promise in reducing the number of new infestations within a season (7). The application of bio-repellents applied to trunks of stressed trees may also reduce infestation. Although not registered specifically for black stem borer control in Michigan, permethrin is an effective material for reducing the number of new trees attacked in the spring. In apples, green fruitworm and spotted tentiform leafminers are insects listed on the permethrin label and commonly occur around the same time as the spring black stem borer flight (Figure 2). Apple bloom occurs near this time also, so precautions must be taken to protect pollinators.

Unlike sprays for other borers, systemic insecticides are not recommended against this pest because larvae and adults in brood galleries feed on the ambrosia fungus, not plant tissue.

Later in the season, the best management strategy is to remove and burn trees that are 75 percent or more dead or dying. It is also important to make sure that all large prunings and brush piles are either burned or chipped and composted as piles of prunings and chips, have been implicated as sources of new infestations.



Figure 3. Sawdust toothpicks protruding from black stem borer entry holes; wind and rain easily knock them off the trees. *Photo: Mike Haas.*



Figure 4. Simple trap; inverted juice container with sides cut away. *Photo: Mike Haas.*

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