

Winter moth: detection & management

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Winter moth is an invasive insect originally from Europe. It was found in Nova Scotia in the 1930s and Cape Cod, MA in the 1990s. Since the 1990s it has spread throughout coastal areas of New England - north into Maine and south through Rhode Island into Connecticut and Long Island, NY. Female winter moths have reduced wings and cannot fly, limiting how quickly winter moths spread. It's unknown at this time whether or not winter moths will stay confined to coastal areas or spread inland throughout New England and New York. During 2015 growing season, winter moths could be found as far west as Worcester, MA and western RI.

Adult winter moths emerge from the ground between Thanksgiving and Christmas. In areas of high winter moth populations hundreds of male moths are attracted at night to porch lights and lighted windows. Small, gray, female moths can be found climbing up tree trunks and buildings. After mating female moths climb trees and deposit eggs singly in crevices of trunks and branches, depositing 150-350 eggs per female. Eggs hatch in early spring and tiny, olive-green caterpillars 'wriggle' into swollen or recently opened buds, such as blueberry flower buds. Inside blueberry buds, caterpillars feed on flower parts, destroying blueberry flowers and inhibiting future pollination. After a couple of weeks, caterpillars can be found feeding on blueberry leaves. Full size caterpillars are bright-green inchworms with pale longitudinal stripes.

Winter moth caterpillars feed on a variety of hosts including oak, maple, apple, birch, elm, ash, crabapple, cherry, and blueberry. Large winter moth populations can defoliate hardwood forests and landscape trees. Generally, the year before winter moths destroy a blueberry crop, leaves of nearby deciduous trees have lacy holes from winter moth caterpillar feeding. An excellent monitoring technique is to scout nearby maple and oak leaves for the characteristic lacy caterpillar feeding damage. Once winter moth damage is found on surrounding trees, control in blueberry bushes is probably needed the following spring. Before winter moths have infested an area no control is needed.

Timing is critical to protect blueberry flowers from winter moth caterpillars. An insecticide must be sprayed in the spring when winter moth eggs begin hatching. Once eggs hatch, tiny larvae move into blueberry buds where they will be protected from insecticides. Experience (not spray trials) has shown that Imidan applied when eggs begin to hatch gives excellent control. For organic production, Entrust is the best insecticide choice. If additional insecticide is needed later, *Bacillus thuringiensis* (Bt) products can be used. Bt is not effective for the first spray because winter moth caterpillars do not feed as they enter buds and Bt must be ingested to be effective.

Dormant oil applied before eggs hatch may be helpful. Dormant oil can also be mixed with the first insecticide application. For dormant oil to be effective thorough coverage is essential therefore bushes must be well pruned. Dormant oil will not help control winter moth caterpillars that 'balloon' into blueberry bushes from surrounding trees. Ballooning occurs when caterpillars spin a silken thread and are carried by the wind. Oak tree buds are still dormant when winter moth eggs hatch so caterpillars hatching on oak trees are especially prone to ballooning onto nearby blueberries. Through April and May caterpillars can crawl or balloon onto blueberry plants from nearby deciduous trees. Scouting blueberries for winter moth is needed until caterpillars finish feeding late May - early June. At this time winter moth caterpillars drop to the ground on silken threads, enter the soil to form a cocoon and pupate. Pupae remain in the soil until late November when adult moths emerge again.

To help time sprays for egg hatch in early spring, tree bands can be set up in November. When a climbing female moth encounters a tree band it tends to deposit many eggs below the tree band. These eggs can be monitored in the spring for hatching. Winter moth eggs are first green and then become orange within 2-3 weeks. In the spring, a couple of days before hatching, orange eggs turn light blue. This color change can be monitored using a hand lens and allows growers to pinpoint when hatching will take place.

A parasitic fly, *Cyzenis albicans*, has been released at 40 locations in New England since 2005. These flies have been recovered at 17 of the release sites and are believed to be controlling winter moths at one release site so far. The future looks bright for winter moth biological control, but winter moths will not disappear and will need to be monitored and probably controlled in commercial blueberry fields for the foreseeable future.

To be added to my winter moth egg hatching email list please send me an email at hfh@uri.edu.