GROWING KNOWLEDGE

Series content is coordinated by Dr. Lloyd Nackley, associate professor of nursery production and greenhouse management at Oregon State University in Corvallis, Oregon.

Oregon State University USDA

An ongoing series provided by Oregon State University in collaboration with the United States Department of Agriculture and in partnership with the Oregon Association of Nurseries

Pretty but pesky

Box tree moths pose a threat to Oregon nurseries

Figure 1: An adult box tree moth. PHOTO COURTESY OF USDA-APHIS

BY JANA LEE, NICHOLAS MCDONALD, AND CHRISTINE DODGE

The box tree moth, *Cydalima perspectalis* (Lepidoptera: Crambidae), is an attractive white moth with brown wing edges (Fig. 1). The caterpillars are a striking, vibrant green with black and white markings. Unfortunately, the caterpillars are devastating pests of boxwood (*Buxus* spp.) and can defoliate entire plants (Fig. 2).

Fast-spreading

Box tree moth is native to eastern Asia. It was first detected in Germany in 2006 and quickly spread throughout the European continent over the next decade. Their rapid spread was due in part to multiple accidental introductions, and the fact that there are native boxwoods in Europe facilitating the moth's spread in the wild. There are no native boxwoods in the continental United States, but boxwoods are popular ornamental plants and are common in cities and suburbs.

Box tree moth was first detected in North America in Toronto, Canada in 2018 (NAPPO 2019). From 2021 to 2025 it was confirmed in the United States in New York, Michigan, Ohio, Massachusetts, Pennsylvania, Delaware, Virginia, West Virginia, Kentucky, and Maryland. As of December 2025, there are federal quarantines in place restricting movement of boxwoods from Michigan, Ohio, New York, Massachusetts, Delaware, Pennsylvania, and West Virginia (USDA APHIS 2025).

While box tree moth has not been detected in Oregon, this pest is of great concern since Oregon is the top producer of boxwoods in the country, followed by California and Ohio.

Life cycle

Box tree moth are the only cat- »

erpillars known to feed on boxwood in the United States. This pest takes about a month to complete its life cycle from egg to adult and typically completes between 1–5 generations per year.

Each female moth can lay over 700 eggs in her lifetime. Adults generally live about two weeks and are strong fliers. Their rate of spread is variable, averaging 3–6 miles per year in Europe but with reports of sustained adult flights of over 20 miles.

Box tree moth has also been reported to complete its development on *Murraya paniculata* (orange jessamine). Reported host associations with *Euonymus alatus* (burning bush) and *E. japonicus* are conflicting and inconclusive, but a formal study found *E. alatus* and *E. fortunei* to not be suitable hosts for box tree moth survival or development (Wiesner 2023). Host association with *Ilex purpurea* (purple holly) has been disproven.

Control

If box tree moth is present, what can growers do? Current insecticide options are listed online (Frank et al. 2021). However, this pest is notably challenging to control because the caterpillars may be hidden within webbing or leaves, thus avoiding contact sprays.

Should this pest be suspected in Oregon, the potential life stage (egg, caterpillar, or adult) can be predicted using an online tool based on local weather (SAFARIS 2025). Physical control of picking off caterpillars and pruning infested branches is feasible for homeowners but not commercial operations.

A female pheromone attracts male box tree moths and can be used to monitor their presence/absence. Trials using semiochemical lures based on this pheromone have shown promise for mating disruption in field trials in Croatia and New York; further guidance is still pending.

Biological controls

Microbial biological control of box tree moth has been researched, with bacteria *Bacillus thuringiensis* var. *kurstaki* or var. *aizawai* and fungal pathogen *Beauveria bassiana* causing mortality in field trials. In addition, scientists have traveled to Asia and collected parasitoid wasps that attack box tree moth with the goal of releasing them in the United States as classical biological control agents.

Figure 2. Larval damage to boxwood plant. Two box tree moth pupae and one *Eriborus* sp. cocoon are visible. PHOTO COURTESY OF USDA-APHIS

Biological control would require little effort from growers as the wasps would reproduce and spread on their own to control the pest. Before such releases can be made, however, these potential biocontrol agents are evaluated in quarantine to determine host specificity and confirm that they will not attack non-target caterpillars or result in unintended negative consequences in the ecosystem.

Of the parasitoids collected, the wasp *Eriborus* sp. (*Hymenoptera*: *Ichneumonidae*) was the most commonly recovered from the native range of box tree moth in South Korea (Fig. 3). *Eriborus* sp. can attack all instars of box tree moth caterpillars and continues to develop as the caterpillar feeds. When the caterpillar reaches the fifth instar, the wasp will exit and pupate, killing the caterpillar in the process.

The USDA APHIS laboratory in Massachusetts is testing the safety of *Eriborus* sp. and whether it attacks cat-

erpillars of native moths and butterflies in the northeastern United States. This includes charismatic species like the luna moth and monarch butterfly, a variety of common moths across a diversity of families, and other moths in the families *Crambidae* and *Pyralidae*, which are closely related to box tree moth.

To conduct non-target testing, a female *Eriborus* sp. is exposed to a box tree moth caterpillar, then a non-target caterpillar, and then another box tree moth caterpillar in three back-to-back timed trials (Fig. 4). This is replicated at least 15 times for each non-target species tested. The ideal outcome is that the wasp attacks both box tree moth caterpillars, but not the non-target caterpillar. If a non-target caterpillar is attacked, new trials are conducted where wasps are presented with a choice of a box tree moth caterpillar and a non-target caterpillar simultaneously to determine the wasp's preference.

Figure 3. *Eriborus* sp. parasitizing a box tree moth larva. PHOTO COURTESY OF USDA-APHIS

Of 16 different families of caterpillars tested, *Eriborus* sp. was seen to attack several species in the families *Crambidae*, *Pyralidae*, and *Geometridae* but ignored all other non-target species. Importantly, no wasps developed from the attacked non-target caterpillars, and *Eriborus* sp. always preferred box tree moth caterpillars over non-targets.

The USDA APHIS lab is continuing to screen additional caterpillars of a variety of moth species, now focusing on other close relatives of box tree moth. Since they provide wasps with the caterpillar stage, their main challenge is to rear large numbers of caterpillars from cap-

tured adult moths.

It takes several years to get an imported wasp like *Eriborus* sp. approved for releases in the U.S., and they must consider what will happen in various geographic zones where releases might occur. While box tree moth is not present in Oregon, researchers are proactively checking the wasp's ability to attack native moths in Oregon and the West Coast, specifically those in the related families *Crambidae* and *Pyralidae*.

The USDA APHIS lab is collaborating with USDA ARS in Corvallis, Oregon to obtain local moths. Common Oregon moths are collected by sampling vegetation and via light traps. When adults of related moths are found, they are held together to mate and lay eggs. Thus far, eggs of the California grass-veneer, a crambid, have been shipped to the quarantine lab in Massachusetts to rear out

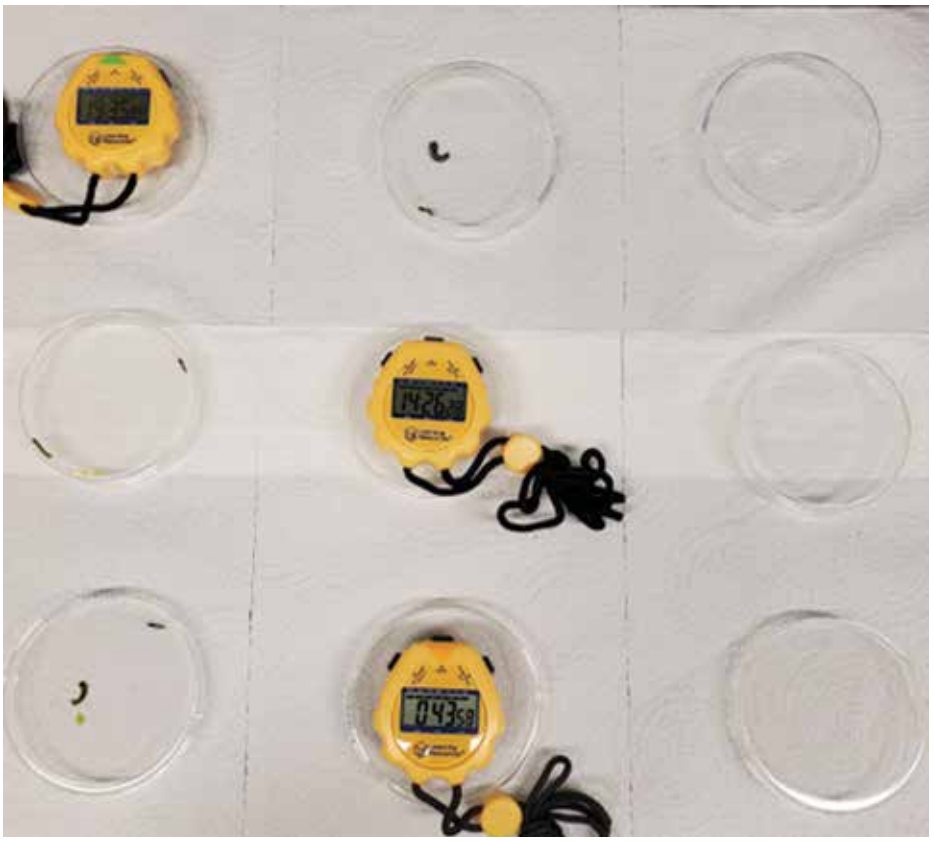

Figure 4. Host range testing arenas (each row is a replicate). In no-choice trials, Eriborus sp. individuals are moved across each row to sequentially encounter box tree moth, non-target, box tree moth. Each encounter lasts 30 min or until attack occurs. PHOTO COURTESY OF USDA-APHIS

and proceed with testing. Non-target host collection and testing in quarantine is continuing into 2026, so stay tuned for more updates.

If *Eriborus* sp. poses little risk to native moths in the U.S., it will likely be approved for release. Additionally, two more parasitoid wasps have been collected from box tree moth's native range and preparations to evaluate their host range are underway.

Jana Lee is a Research Entomologist at USDA ARS in Corvallis, Oregon. Her lab focuses on biological control and sustainable management of nursery and small fruit pests. Nicholas McDonald is a graduate student at Oregon State University who has assisted with collections. Christine Dodge is a Biological Scientist at USDA APHIS in Buzzards Bay, Massachusetts. Her lab group develops classical biological control methods for invasive insects.

References

Frank S, Gilrein D, Havers M, Palmer C. 2021. Insecticide options for box tree moth management. North Carolina State University Factsheet. May 27, 2021. https://ir4.cals.ncsu.edu/ehc/InvasiveSpecies/BTM_FactSheet_PotentialMitigationOptions_20210527.pdf

NAPPO. 2019. Detection of *Cydalima perspectalis* (box tree moth) in Ontario. Phytosanitary Alert System, North American Plant Protection Organization (NAPPO). https://www.pestalerts.org/oprDetail.cfm?oprID=782.

SAFARIS. 2025. PestCast: Box tree moth adult emergence forecast. Spatial Analytic Framework for Advanced Risk Information Systems (SAFARIS) Partnership between North Carolina State University and U.S. Department of Agriculture, Animal and Plant Health Inspection Service. https://safaris.cipm.info/safarispestmodel/StartupServlet?pestcast&pid=BTM

USDA APHIS. 2025. Box tree moth program. U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS). https://www.aphis.usda.gov/plant-pests-diseases/box-tree-moth

Wiesner A. 2023. Biology and behaviour of the box tree moth (*Cydalima perspectalis*) (Walker, 1859), an invasive nursery and landscape pest in southern Ontario. Master of Science Thesis. University of Guelph, Ontario, Canada. https://atrium.lib.uoguelph.ca/items/098663aa-cddb-4bfc-9a37-d519b83a89d0