PennState Extension



# Bagworms

Bagworm is a caterpillar that molts into a moth in the adult stage. They are easiest to identify by the bags they construct as they feed. Damage includes needle discoloration and injury.

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**Bagworm larva inside open bag. Courtesy of Pennsylvania DCNR Forestry Archive, Bugwood.org (#5020082)**

***Thyridopteryx ephemeraeformis*** **(Haworth)**

## Hosts

- All species of Christmas trees and ornamental conifers
- Occasionally found on deciduous trees and shrubs
- Host list includes more than 120 species of trees and shrubs

## Damage Potential

- Moderate–high

## Symptoms and Signs

- Brown spots on foliage
- Missing needles (current year's growth)
- Brown, conelike bags hanging from branches
- Dead branches

## Causes of Similar Symptoms

- Gypsy moths occasionally defoliate some Christmas trees
- Grass bagworm and snail-cased bagworm occasionally found on conifers but do not cause damage

## Identification

Bagworm is a caterpillar that molts into a moth in the adult stage. They are easiest to identify by the bags they construct as they feed. Bags on spruce will look completely different from those on arborvitae or honey locust because the host plant material is incorporated into the bag. Each bag can be up to 1½–2½ inches (38–63 millimeters, mm) long when the larva is mature. If you observe a bag closely, you will see that the caterpillar's shiny black head and first pair of legs are exposed as it feeds. The robust body of the caterpillar is pale yellow, mottled with black, and may be up to 1½ inches (38 mm) long when mature.

Adult bagworms are seldom seen. Females have no wings and never emerge from the bag they construct in the caterpillar stage. Since they do not have wings or legs, they resemble maggots. The male moths have two pairs of wings and three pairs of legs. Their wings are transparent with black borders and their bodies are dark and fuzzy. Male bagworms are about ¾ inch (15–18 mm) long from head to the tip of the abdomen. Their wingspan is approximately 1 inch (25 mm).

## Biology and Life Cycle

Bagworms overwinter as eggs inside the bag constructed by the female (Figure 1). In late May through mid-June, eggs hatch and the larvae crawl out the bottom of this bag. They spin down on a thin strand of silk (a habit known as “ballooning"). Larvae will settle to feed on lower branches or may be blown to nearby plants during the ballooning stage. When they reach a suitable host, the larvae begin to feed and produce silk to construct individual bags around their bodies (Figure 2). Plant debris is woven into each bag to camouflage and protect the larva. The larva feeds through an opening at the top of the bag, while the pointed end of the bag dangles from the host. Very young larvae may carry their bags in a snail-like manner for a short time (Figure 3).

Figure 1. Bagworm eggs inside the female's bag. Courtesy of Sandy Gardosik, PDA

Figure 2. Immature larvae feeding on Douglas-fir; needles show symptoms of early damage. Courtesy of Sandy Gardosik, PDA

Figure 3. Immature bagworm larva. Courtesy of Sandy Gardosik, PDA

Only the newly hatched larva and the male moth can be found outside a protective bag. As the larva grows, it enlarges the bag by adding more silk and plant material (Figure 4). The bag is attached to branches of the host with loose strands of silk and can be moved to get to fresh plant material (Figure 5). After feeding for 8–10 weeks, the larva firmly attaches the bag to a branch with stronger, more durable silk and pupates inside the bag (Figure 6). About 4 weeks later, the adult male bagworm emerges.

Figure 4. Bagworm larva inside open bag. Courtesy of Pennsylvania DCNR Forestry Archive, Bugwood.org (#5020082)

Figure 5. Heavy bagworm infestation on Colorado blue spruce. Courtesy of Rayanne D. Lehman, PDA

Figure 6. Bagworm larval bag attached with silk to eastern white pine. Courtesy of Cathy Thomas, PDA

After a male moth (Figure 7) emerges through the bottom of the bag, the pupal case can occasionally be seen partially protruding from the empty bag (Figure 8). The female never leaves her bag but positions herself over a small opening in the bottom of the bag and begins to emit sex pheromones to attract male moths. Mating occurs with the male outside the bag and female inside. Adults do not feed and die shortly after mating. Each female can produce 300–1,000 eggs before dying. The eggs will remain inside the female's mummified body, inside her bag, through the winter. If you squeeze a bag containing eggs during the winter months, the small, whitish eggs will ooze out and may resemble minute tapioca. Only one generation of bagworm occurs per year in Pennsylvania.

Figure 7. Adult male bagworm adhered to a pheromone-baited sticky trap. Courtesy of Tracey Olson, PDA

Figure 8. Pupal case exposed after male bagworm emergence. Courtesy of Sandy Gardosik, PDA

## Monitoring and Management Strategies

### Plantation Establishment

- No recommendations are available at this time.

### Preseason

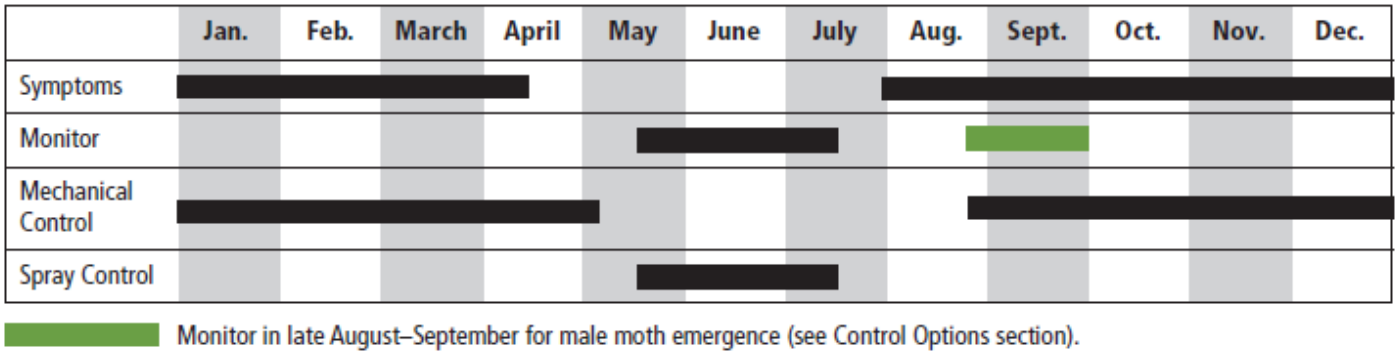
- Before new growth starts, scout trees for brown bags; hand-pick and destroy bags. Remove tough silk around the branch to prevent girdling as the branch grows.

- Before mid-May, tag at least one tree infested with bagworm to monitor for emergence of larvae.

### Growing Season

- Threshold level: At this time, no threshold level has been established, but infestations on spruce can easily cause economic damage.
- Scout for emerging young larvae on lower branches in late May to early June. Typically, emerging larvae drop down from bags to begin feeding and gradually move to the top of the plant as they mature.
- Growing degree days: Based on observations in Pennsylvania, larvae emerge at 650–750 GDDs.
- At the end of the season, evaluate results and update records.

**Calendar of Activity**




## Control Options

### Biological

- Bagworm has several naturally occurring insect predators (wasps and hornets) and parasitoids (wasps and flies) (Figure 9), fungal parasites, and bird predators. No species are available for augmentation at this time.

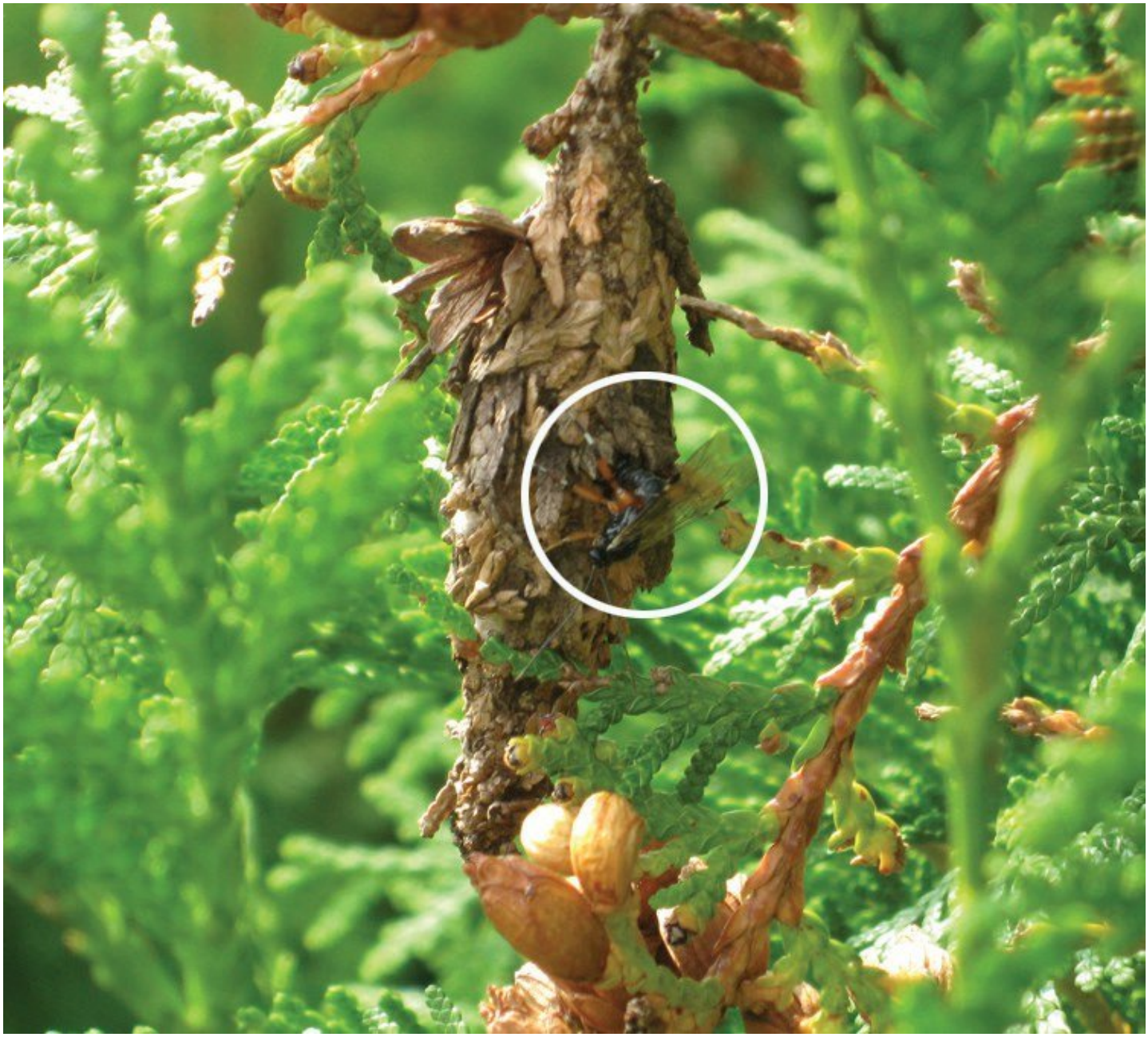


Figure 9. Parasitoid wasp (circled) inserting her eggs into the bagworm larval case. Courtesy of Sarah Pickel, PDA

## Mechanical

- Hand-picking and destroying bags anytime during growing season or in spring before eggs hatch can be very effective in eliminating a localized infestation.
- Remove and burn or finely chip severely infested trees within and around the plantation.

## Biorational

- *Bacillus thuringiensis* (Bt) is a bacterium that kills specific insects, such as caterpillars, but is safer for natural enemies. It is most effective when used against young larvae. Larvae must consume Bt on the plant material; therefore, coverage and timing are critical.
- Pheromone traps can be deployed in August to trap male moths and decrease the number of mated females (Figure 10). These traps contain a chemical that attracts males by mimicking the female sex pheromone. When males are trapped, fewer matings occur and the number of overwintering eggs will decrease.

Figure 10. Bagworm pheromone-baited sticky trap. Courtesy of Sarah Pickel, PDA

## Chemical

- Insecticides are most effective when applied to young larvae. After first treatment, monitor populations to determine if second treatment is warranted.

## Next Crop/Prevention

- Inspect new seedlings for signs of bags; remove bags.