



## Pine Sawflies

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**Feeding damage from European pine sawfly. Courtesy of Sandy Gardosik, PDA**

- European Pine Sawfly, *Neodiprion sertifer* (Geoffroy)
- Introduced Pine Sawfly, *Diprion similis* (Hartig)
- Redheaded Pine Sawfly, *Neodiprion lecontei* (Fitch)

### Hosts

- European and redheaded pine sawflies: Scotch, red, Mugo, Jack, and Austrian pines
- Introduced pine sawfly: eastern white pine

## Damage Potential

- Moderate

## Symptoms and Signs

- Complete defoliation or sparse, patchy, missing foliage anywhere on the tree
- Needles may appear brown, wilted, and strawlike or twisted, as if singed
- Clusters of young larvae feeding on needles

## Causes of Similar Symptoms

- None

## Identification

Adult pine sawflies are seldom seen. They are related to and resemble bees in size and shape. They have two pairs of transparent wings but are not capable of stinging. Instead of a stinger, the female has a sawlike ovipositor that she uses to make a slit in the edge of a needle. She deposits a single egg into each slit and several eggs in a needle.

The larvae are caterpillar-like with six or more pairs of prolegs on the abdomen. Moth and butterfly caterpillars have five or fewer prolegs. Both types of larvae also have three pairs of jointed true legs. Larvae use their chewing mouthparts to consume entire needles, which can result in extensive defoliation.

Young larvae feed in colonies or clusters and can defoliate entire trees, depending on the size of the colony and tree. A distinguishing habit of the larvae is that they collectively rear back when a hand is waved over the cluster.

### European Pine Sawfly

Larvae are dull gray green with a shiny black head (Figure 1). They have light green and black stripes running the length of the body and are capable of growing to approximately 1 inch (25 mm) long. Larvae feed on previous year's growth, causing a decrease in growth rate but not tree death since they do not attack current growth. Young larvae eat only the outside of old growth, leaving the needles brown and strawlike behind the green, current growth. Older larvae eat the entire needle, leaving behind only the needle sheath. The adults are brown, flylike insects that are ½ inch (12 mm) long.



Figure 1. Colony of feeding European pine sawfly larvae. Courtesy of Steven Katovich, USDA Forest Service, Bugwood.org (#5369986)

## Introduced Pine Sawfly

Larvae are black or dark brown with two dark stripes down the back and yellow and white patches on the sides. The head is black and shiny, and the underside is pale yellow or white (Figure 2). They can grow up to 1 inch (25 mm) long. The larvae feed in groups when young and singly as they mature. Depending on the generation, larvae may eat old needles or new growth. The cocoon of the introduced pine sawfly is a strong, brown, semiglossy, textured cylinder. Adults are chunky and have black heads and thoraxes. Males are  $\frac{1}{4}$  inch (7 mm) long with brown or black abdomens, and females are  $\frac{1}{3}$  inch (8 mm) long with black and yellow abdomens.



Figure 2. Introduced pine sawfly larva. Courtesy of Sandy Gardosik, PDA

### Redheaded Pine Sawfly

Newly hatched larvae are white, unspotted, and have a brown or black head. As larvae feed and mature, they develop a red head and two to four rows of brown/black spots on the yellow body (Figure 3). The last segment has a larger black patch on its sides. They can grow to 1 inch (25 mm) long. This species prefers younger trees in shaded areas. The larvae eat old needles first, but heavy infestation or additional generations will cause new growth to be eaten as well. Young larvae eat the outside of the needles, leaving behind brown, strawlike needles, while older larvae consume the entire needle. The cocoon is a papery, yet tough, brown cylinder with rounded ends. Adult females are reddish brown and have a black abdomen with white spots. Males are slender and black with feathery antennae. Females tend to be larger than males.



## European Pine Sawfly

European pine sawflies overwinter as yellow eggs deposited in the needles (Figure 4). The eggs hatch in April through mid-May. Larvae feed as a colony (10-100 larvae) and eat previous year's growth through July (Figure 5). Three to four larvae may be seen feeding on a single needle. When the larvae are fully grown, they drop to the ground and pupate around mid-August to early September.



Figure 4. European pine sawfly eggs. Courtesy of Rayanne D. Lehman, PDA



Figure 5. Colony of feeding European pine sawfly larvae. Courtesy of Rayanne D. Lehman, PDA

Adults emerge in mid- to late September and mate (Figure 6). They only live a few days and do not feed. Using the sawlike ovipositor, females lay 6-8 eggs per needle and may use 10-12 needles for oviposition. One generation occurs per year.



Figure 6. European pine sawfly adult. Courtesy of Louis-Michel Nageleisen, Département de la Santé des Forêts, Bugwood.org (#2102003)

## Introduced Pine Sawfly

Introduced pine sawflies overwinter as prepupae in cocoons on the ground in leaf litter. They pupate in early spring, with adults emerging in May through early June. Some prepupae may exhibit diapause, meaning they may overwinter additional seasons before becoming adults. Adults mate, and the females lay light bluish-colored eggs in the needles and cover them with a green, frothy substance. Females each lay approximately 70 eggs with 10 eggs per needle (Figure 7). Eggs hatch in roughly 2 weeks and colonies of larvae begin eating old-growth needles. As the larvae mature, they feed solitarily until fully mature (Figure 8). Around early July, larvae spin cocoons and pupate a short time afterward. Cocoons can be found among the needles, at the base of branches, and within bark crevices (Fig. 9). Adults emerge, peaking in early August. They mate and again lay eggs. These eggs hatch around one week later, and the larvae begin feeding on old- and current-

growth needles. In September, the larvae drop to the ground to overwinter as prepupae. Two generations normally occur per year, although a partial or full third generation can occur if weather conditions are favorable.



Figure 7. Introduced pine sawfly eggs. Courtesy of John H. Ghent, USDA Forest Service, Bugwood.org (#0488043)



Figure 8. Mature introduced pine sawfly larva feeding solitarily. Courtesy of PDA



Figure 9. Introduced pine sawfly cocoon on twig. Courtesy of Rayanne D. Lehman, PDA

## Redheaded Pine Sawfly

Similar to the introduced pine sawflies, the redheaded pine sawflies overwinter as prepupae and may exhibit diapause. They pupate in spring and adults emerge a few weeks later. Females deposit approximately 100 eggs, which hatch around one month later. Larvae feed in colonies for 5–6 weeks. They begin feeding on old growth first but will also consume new growth during a heavy infestation (Figure 10). When mature, the larvae drop to the ground and spin a cocoon to overwinter. In some southern locations, a second generation is produced in the same season. In those cases, first-generation larvae feed for a shorter time before pupating and creating the second generation. Populations of redheaded pine sawflies tend to be somewhat cyclic. Outbreaks of high populations resulting in heavy defoliation for several years are followed by periods of low populations with little damage.



Figure 10. Feeding damage from redheaded pine sawfly larvae. Courtesy of Sandy Gardosik, PDA

## Monitoring and Management Strategies

### Plantation Establishment

- Plant nonpine species that are not susceptible to sawfly damage.

### Preseason

- In winter and early spring, inspect trees for European pine sawfly eggs deposited in the needles. Tag trees to monitor for larvae.
- Remove trees that are larger than market-able size so they don't serve as reservoirs for sawflies.

## Growing Season

- Encourage natural predators.
- Scout for young larvae feeding on needles beginning in May. Look for strawlike, brown needles and missing foliage through-out the season.
- Growing degree days: European pine sawflies emerge at 78–220 GDDs.
- Threshold level:
  - For introduced pine sawflies and redheaded pine sawflies, treatment may be warranted if more than 50 random trees in a young plantation have 10 larvae per tree or if they exhibit sawfly damage. Treat older plantations when damage level will hurt sale.
  - For European pine sawflies, treatment may be warranted if there is a large infestation and the tree is within 3 years of harvest.
- At the end of the season, evaluate results and update records.

## Control Options

### Biological

- Birds, rodents, parasites, viruses, and other predators can help decrease sawfly populations but are often not enough to manage the pest in a plantation setting.

### Mechanical

- Prune infested branches of trees not ready for harvest if plantation infestation is small.
- Remove larvae by hand and squash or place them in soapy water for several days (small infestations only).

### Biorational

- Apply a horticultural oil or insecticidal soap labeled for control of sawflies when larvae are very young.

## Chemical

- Spot treat young larval infestations with a registered virus or insecticide labeled for sawfly control. Note: Bt (*Bacillus thuringiensis*) will not control sawflies.
- Apply an insecticide labeled for sawfly control to entire plantation when young larvae are present if more than 25 percent of trees are infested.
- Chemical treatment may be needed more than once per season, depending on the species of sawflies.

## Next Crop/Prevention

- Purchase and plant pest-free nursery stock from a reputable company.

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