

Pine Sawflies

Feed on older needles, leaving distinctive stubs

Name and Description—*Neodiprion* spp. and *Zadiprion* spp. [Hymenoptera: Diprionidae]

Adult pine sawflies are thick-waisted wasps about 1/2 inch (10-12 mm) long (fig. 1). Females are yellowish brown, and the smaller males are mostly black, bearing feathery antennae. Pine sawfly larval appearance varies by species and by larval stage, but most are green or yellowish green in color with black, tan, or orange head capsules (figs. 2-3). Mature larvae are about 3/8 inch (10 mm) long. Both caterpillars (order Lepidoptera) and sawfly larvae have three pairs of true legs, but sawfly larvae have six or more pairs of fleshy prolegs behind their legs along the abdomen, while caterpillars have two to five pairs of prolegs. The head and jaws of sawfly larvae point downward, perpendicular to the long axis of the body, while caterpillar heads and jaws point forward, in line with the body length. Although not completely accurate, a quick test to distinguish sawfly larvae from caterpillars can be done based on their behavior—sawflies frequently feed in groups, and, when disturbed, the entire group tends to pulsate or wave their bodies, often in unison. This reaction is thought to be defensive. A papery, cylindrical cocoon covers sawfly pupae, which form in the soil. Eggs are laid in slits cut in the edge of living pine needles (fig. 4). There are six pine-feeding *Neodiprion* spp. in the region and two pine-feeding *Zadiprion* spp. Differentiating among *Neodiprion* spp., especially among the five that feed on ponderosa pine, can be difficult given the considerable resemblance and variation among closely related species and recent taxonomic changes.

Hosts—Pines, particularly ponderosa pine and pinyon, but rarely on other pines and Douglas-fir

Life Cycle—*Neodiprion* spp. pine sawflies have a 1-year life cycle that is similar among species but differs in timing of life stages. They overwinter either as eggs inserted into pine needles or as full-grown larvae within cocoons in the ground litter or soil. The species that overwinter as eggs begin feeding upon hatching early in spring, while species that overwinter as larvae pupate in spring, emerge and mate as adults, and lay eggs in pine needles. Consequently, young *Neodiprion* spp. sawfly larvae are found in either spring-summer or summer-fall, feeding gregariously on older foliage. Young larvae consume only the outer needle tissue and leave the central ribs intact. The central ribs later turn yellow-brown and break off. Older larvae feed singly and consume most of the needle, often leaving a distinctive stub. Species of spring-summer feeders generally consume only old needles, completing their feeding before pine shoots have elongated, and enter the soil to pupate. Adults emerge late in



Figure 1. Adult sawfly female (*Neodiprion* spp.) laying an egg in a ponderosa pine needle. Photo: Michael R. Wagner, Northern Arizona University.



Figure 2. Late stage larvae of *Neodiprion gillettei* feeding on ponderosa pine. Photo: Southwestern Region, USDA Forest Service.



Figure 3. Late stage larvae of *Zadiprion rohweri* feeding on pinyon pine. Photo: Michael R. Wagner, Northern Arizona University.



Figure 4. Rows of *Neodiprion autumnalis* eggs inserted into ponderosa pine needles. Photo: Mark Harrell, Nebraska Forest Service.

Pine Sawflies - page 2

summer and lay eggs in live needles to overwinter. Species of summer-fall feeders consume both old and new pine needles, complete feeding in late summer, and enter the litter or soil, forming cocoons in which they overwinter.

Zadiprion townsendii (Cockerell), the bull pine sawfly, is the only sawfly species whose larvae feed on ponderosa pine in winter, weather permitting. The larvae are wormlike, dark green to black with gold flecking, and feed gregariously (fig. 5). Larvae are about half-grown by the onset of winter and are mature by May or June. The mature larvae burrow into the soil and spin a cocoon. Some pupate, emerge, mate, and lay eggs in pine needles, concentrating on the upper areas of trees that hatch that same summer. Others delay pupation and subsequent events until late summer or the following season. The entire life cycle takes 1-2 years to complete.

Zadiprion rohweri (Middleton) (fig. 408) reportedly has two generations per year on pinyon.

Damage—Infested trees have sparse foliage and thin crowns. Consumption of older needles gives pines a tufted appearance that is created by current year needles growing on the tips of branches stripped of older foliage (fig. 6). Consumption of all old and new needles in one season has a greater impact on pine health. When dense larval populations descend together to enter the soil and spin cocoons, they can cause considerable consternation. Different species have different preferences for the size of host attacked and location on the host where they feed. Pine sawflies typically attack open-grown trees or areas where pine is growing at a low density, often on poorer sites with dry, shallow soils. In some cases, prolonged drought is accompanied by pine sawfly outbreaks. The same trees are frequently defoliated year after year while others nearby may remain largely unaffected. In general, defoliation causes slower growth. Repeated defoliation can result in top-kill. Although relatively rare, pine mortality may occur, particularly if bark beetles attack trees weakened by defoliation.

Management—Typically, predators, parasites, viral disease, and foliage depletion manage to reduce pine sawfly outbreak populations within 2-3 years. Consequently, active management is often not necessary. When only a few colonies of larvae are present on small pines, they can be picked off by hand or washed off with a high-pressure hose. Registered insecticides can be used effectively when larvae are present across an area in large numbers and some control is appropriate. Insecticides should be applied as soon as possible after egg hatch for best control on high-value pines. Note that biological insecticides that only target Lepidoptera are ineffective against sawflies. Because the last larval stages consume the most foliage, control is often sought after most of the annual defoliation has occurred and larvae are too large to be killed efficiently by insecticide.



Figure 5. Late stage larvae of *Zadiprion townsendii* feeding on ponderosa pine. Photo: Michael R. Wagner, Northern Arizona University.



Figure 6. Feeding on old needles by *Neodiprion autumnalis* in the Nebraska Panhandle resulted in a tufted appearance on defoliated ponderosa pine. Photo: Todd Nordeen, Nebraska Game and Parks Commission.

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