Forest Insect
& Disease
Leaflet
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U.S. Department
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# *Saratoga Spittlebug*

**Louis F. Wilson** [1]

The Saratoga spittlebug, *Aphrophora saratogensis* (Fitch)[2], so called because it was first collected in Saratoga County, N. Y., is a native insect that is destructive to several species of pine in Eastern North America. It occurs wherever its host grows, from Maine to Minnesota in the United States and in the southern portions of the adjacent Canadian Provinces.

The adult of this insect often destroys young pines, especially in plantations where its alternate hosts are abundant. Natural-grown and large trees usually are less injured.

## Hosts

Red pine is the preferred host of the adult spittlebug. Jack pine follows, although decreased planting of this species in recent years has lessened its importance as a host. Scots pine, which is increasingly planted for Christmas trees, is occasionally injured by the spittlebug.

White pine is frequently fed upon but seldom damaged severely. Adult spittlebugs thought

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to be *Aphrophora saratogensis* have been collected from pitch pine, tamarack, balsam fir, and northern white-cedar—usually from trees near infested red pine.

The nymphs require two alternate hosts for their development. The early stages or instars feed on herbaceous species of plants of the forest floor such as brambles (raspberry and blackberry), orange hawkweed, everlasting, aster, and many others. Older nymphs feed on sweet-fern (fig. 1) and willow sprouts.

## Damage

Young trees between 0.6 m and 4.6 m (2 and 15 ft) tall are injured by the adult spittlebug attack. The first symptoms of injury are one or more reddish or reddish-brown (flagged) branches in the upper crown (fig. 2).

Scraping the outer bark from

[1] Principal insect ecologist, North Central Forest Experiment Station, Forest Service, U.S. Department of Agriculture, Michigan State University, East Lansing.

[2] Homoptera, Cercopidae.

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**Figure 1.—Sweet-fern plant—the principal host of the spittlebug nymph.**

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**Figure 2.—Red pine showing flagging symptoms from adult spittlebug feeding.**

the 2-year-old internodes of the flagged branches will reveal tan or brown flecks on the surface of the wood and inner bark (fig. 3), which confirms the injury caused by this spittlebug. These are puncture wounds or scars that develop at the location of adult feeding. If these puncture wounds are numerous, the nutrient transport in the branches is restricted and the branches die, resulting in the flagging symptom.

Continued heavy feeding results in increased flagging, top kill, stem deformity, and tree death. The worst injury always occurs where there are abundant alternate hosts for the nymphs.

## Description

The egg is about 2 mm (0.08 in) long and teardrop shaped. When freshly laid in summer it is glistening yellow. After overwintering it is purple with a reddish spot.

The first four nymphal stages, which are found in spittlemasses on the alternate host plants, have have bright scarlet abdomens bordered by black at the sides and jet black heads and bodies. The fifth stage nymph is dark brown.

The adult is a winged, boat-shaped insect (see cover photo) about 8 mm (0.3 in) long. It is tan with whitish markings, which makes it difficult to see against the buds or bark of its hosts. The female is slightly larger than the male and is distinguished by its swordlike ovipositor. This spittlebug can be readily distinguished from related species by a white arrow-shaped marking on top of the head and body.

## Life History and Habits

The spittlebug has one generation each year. On red pine the eggs are laid under the outer scales of buds in the upper branches. Several eggs are usually laid in each bud causing noticeable bumps on the outer surface of the bud. On jack pine the eggs are laid in the needle sheaths; apparently the buds are too hard and resinous.

Nymphs hatch from the eggs in early May, drop to the ground, seek out alternate host plants, and feed. As they feed they form a spittlemass, which prevents desiccation and protects them from enemies. The young nymphs feed on several species of plants; older

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**Figure 3.—Puncture wounds caused by adult spittlebugs feeding on wood of pine host.**

nymphs congregate on sweet-fern and up to 50 may inhabit a large "community" spittlemass. In late June or early July, when full grown, the nymphs leave the spittlemasses, climb up the alternate hosts, and shed their skin to become adults. Adults fly to the pine hosts and feed on the sap of the branches until the end of September. Most of the feeding injury occurs from mid-July to mid-August. Mating occurs soon after transformation to the adult stage, and egg laying begins within a few days.

## Control

Adverse weather kills young spittlebugs. The nymphs are susceptible to desiccation during dry hot weather, especially in open stands where ground cover is sparse. During late spring, short periods of air temperatures in the low 20's (°F) or longer periods of 30° F kill many exposed nymphs.

Several biological agents reduce spittlebug populations, but none are considered an effective control. Eggs are attacked by two tiny wasps, *Ooctonus aphrophorae* Milliron and *Tumidiscapus cercopiphagus* Milliron, but known parasitization has not exceeded 5 percent. Certain flies, *Verrallia virginica* Banks, have caused up to 50-percent parasitization of the adult spittlebugs, and adults and nymphs are occasionally preyed upon by ants, spiders, and birds. Parasites of the nymphs are unknown.

Sweet-fern is the most important alternate host for Saratoga spittlebug population buildup. The kind and number of alternate hosts should be considered when selecting planting sites. A prospective site or stand can be risk-rated by comparing the percentage of sweet-fern to the percentage of other ground cover. Assumptions made in applying the risk-rating system are: (1) the pine stockings will be 200 or more trees per acre; (2) the site index is 50 or higher; and (3) the spittlebug is present on the site or in the general viciniy. Well-stocked stands of pine more than 3 m (10 ft) tall and not yet showing visible spittlebug injury symptoms are safe and need not be risk-rated.

After the percentages of sweet-fern and other ground cover are determined, risk-rate the area using the graph shown in figure 4. The graph predicts three classes of potential injury—*light*, *moderate*, and *heavy*. *Light* injury indicates the pines may have no visible external symptoms, even though feeding scars may be present on the branches. *Moderate* injury indicates the pines will have some growth reduction, some crooked stems, and an occasional

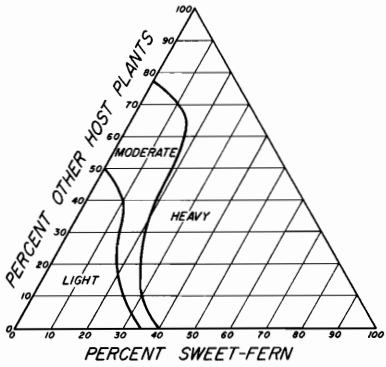


**Figure 4.—Spittlebug risk-rating triangle. To determine potential injury level, plot the percentage of ground occupied by sweet-fern against the percentage of ground occupied by other suitable hosts.**

dead or dying shoot (flagging). *Heavy* injury indicates most of the pines will be stunted with crooked stems and many will be either flagged, top-killed, or dead.

The following procedure is suggested for risk-rating a young pine plantation or area where pine is considered for planting: (1) Delimit the size of the area to be risk-rated by the degree of clustering of the alternate hosts. The more patchy the vegetation, the smaller should be the area risk-rated. In very patchy stands risk-rate each half acre; in more uniform stands rate several acres together. (2) Estimate the percentage of the ground occupied by sweet-fern. (3) Estimate the percentage of the ground occupied by all other hosts together (all other broadleaf herbs, ferns, etc.). Do not consider grass and bare soil in the estimate. (4) Plot the percentage of sweet-fern against the percentage of all other hosts on the graph (fig. 4). The point where the coordinates intercept on the graph indicates the potential injury class for the area rated.

For example, if you plot 10 percent sweet-fern against 20 percent other hosts, the potential injury given by the graph is predicted to be *light*. If, however, you plot 30 percent sweet-fern against 30 percent other hosts, the potential injury is predicted to be *heavy*.

After a plantation or unplanted area is risk-rated, decide whether the area needs treatment. If the area was risk-rated above the *light* injury category, avoid planting, or treat the alternate hosts. If the risk of injury is *moderate* or *heavy*, attempt to reduce the alternate host ground cover, especially sweet-fern. This should be done as early as possible before spittlebug populations buildup, and preferably before the trees are 1 m (3 ft) tall. Herbicides can be used to reduce the numbers of some of the alternate hosts.

If herbicidal control of alternate hosts is not feasible, aerial or ground applications of insecticides may be used to suppress the spittlebug in the nymphal or adult stages. Consult your county extension agent, State agriculture experiment station, or State or Federal forest office to obtain current information concerning chemical control.

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