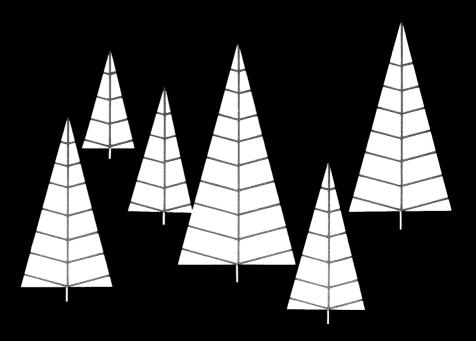
1972

SPRUE & BALSAM FIRE SALUFILES IN THE PRAIRIE PROVINCES



V.Hildahl L.O.T.Peterson

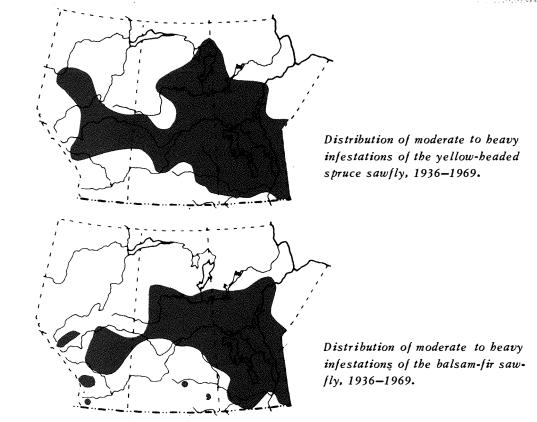
introduction

Sawflies are defoliators of natural and planted spruce and fir in North America. Although several species are native throughout the range of their host trees, only three: the yellow-headed spruce sawfly, the green-headed spruce sawfly and the balsam-fir sawfly are important in the Prairie Provinces. All three species may occur simultaneously or separately on the same host trees.

In prairie plantings, the yellow-headed spruce sawfly is usually the most destructive and widespread. However, in areas adjacent to natural coniferous stands the balsam-fir sawfly can be a serious pest. The green-headed spruce sawfly rarely occurs at high population levels, thus damage is usually limited to individual trees.

'Pikonema alaskensis (Rob.)
'Pikonema dimmockii (Cress.)
'Neodiprion abietis complex





history of infestations

The first spruce sawfly outbreaks in North America were recorded more than one hundred years ago. Since then, extensive infestations have been noted from time to time in various forest regions. In the Prairie Provinces, records of periodic outbreaks in the northern coniferous forests date back to the 1930's when annual surveys were commenced by the Canadian Forest Insect Survey. In 1940 important infestations of the yellowheaded spruce sawfly, which caused severe defoliation of black and white spruce, were recorded throughout central Alberta and Saskatchewan. Between 1955 and 1960, a severe outbreak of the same species caused 90 per cent mortality of black spruce stands in the Rene-Hatchet-Wollaston lakes area north of the Churchill River in Saskatchewan.

Similarly, an outbreak of the balsam-fir sawfly between 1960 and 1965 in the Interlake area (between lakes Winnipeg and Manitoba) resulted in heavy mortality of balsam fir over some 3,600 square miles.

Distribution of moderate

infestations of the green-headed spruce sawfly, 1936-1969.

Infestations on planted conifers in the southern portions of the provinces became a serious problem in the 1920's—some 15 years after the federal program of seedling production for farm plantings was initiated. The first major outbreak occurred in 1927 and involved the balsamfir sawfly in the Moose Mountain Provincial Park of Saskatchewan. Since then, sawfly distribution and intensity has fluctuated from year to year throughout the entire parkland and prairie zones, and persistent infestations have caused notable top— and tree—killing in many localized areas.

host trees

In the Prairie Provinces, the principal hosts of these sawflies are black spruce, white spruce, Engelmann spruce and balsam fir. Colorado, Norway and red spruce also are important host species of the yellow-headed spruce sawfly where they are planted for ornamental or shelterbelt purposes; the balsam-fir sawfly commonly attacks Norway spruce and occasionally infests tamarack.

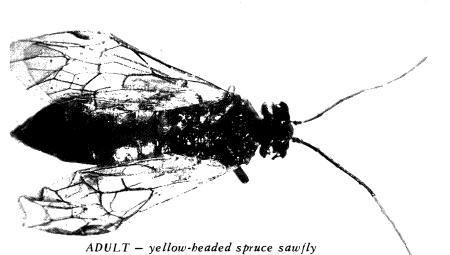
life stages

Adult — Adult sawflies resemble small wasps, have four transparent wings and vary in total body length from one-quarter to one-half inch. Females have a saw-like appendage (hence the common name) at the posterior end of the body for cutting slits in the needles within which the eggs are deposited.

Egg - Eggs are minute (approximately 1.0 mm in length), blunt spindle-shaped and translucent greenish-yellow. Two eye



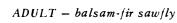
X 10





LARVA - yellow-headed spruce sawfly







LARVA - balsam-fir sawfly

spots become visible at one end of each egg just before hatching.

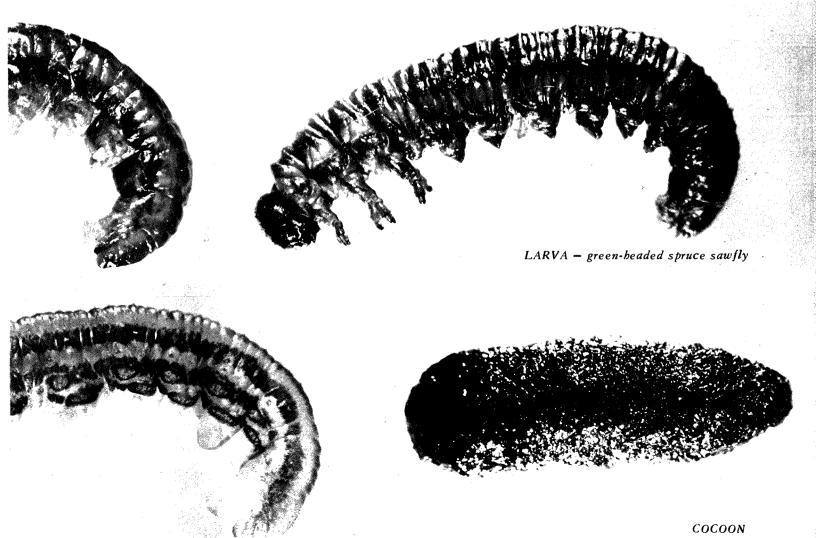
Larva — Larvae have three pairs of legs on the front portion of the body and seven or eight pairs of fleshy feet (prolegs) on the abdomen. Each larva is approximately three-quarters of an inch long

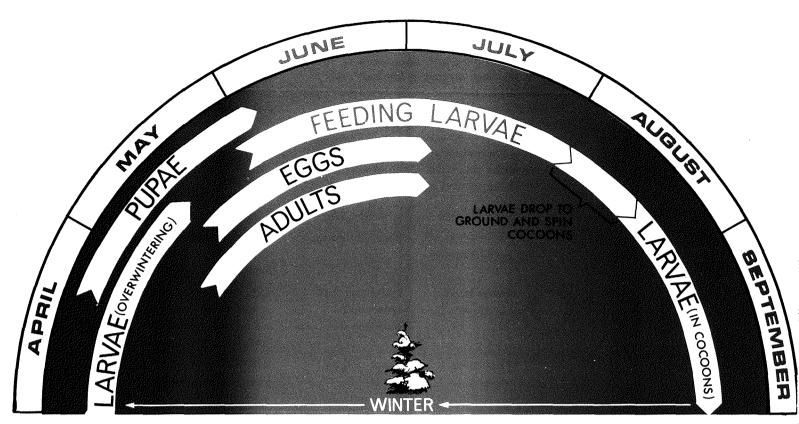
when full grown.

Pupa – Pupae are enclosed in an oval, light brown to reddish-brown, papery cocoon about one-half inch long. Frequently the cocoon has particles of debris or soil adhering to it.

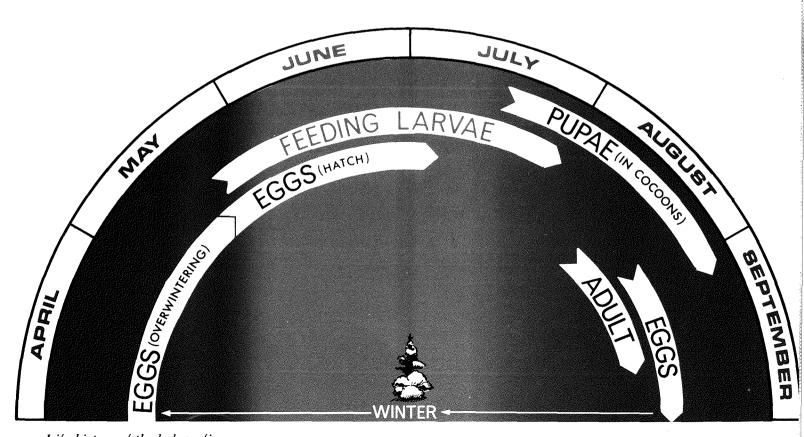
The colour characteristics of the adults and larvae by which the different species may be distinguished are:

SPECIES	ADULT	LARVA
Yellow-headed spruce sawfly	Reddish-brown	Body yellowish-green, hairless with broad, brown stripes; head reddish-brown
Green-headed spruce sawfly	Light and dark brown with greenish abdomen	Body yellowish-green with faint broken white lines on the back and a broad white line on each side; head bright green
Balsam-fir sawfly	Light or dark brown	Body dull green with six darker green stripes; head shiny black





Lise history of the yellow-and greenheaded spruce sawslies.



Life history of the balsam-fir sawfly.



Feeding yellow-headed spruce sawfly larvae.

life history and habits

In the Prairie Provinces the three sawflies complete their life cycle in one year. Although the life history of the balsamfir sawfly is somewhat different from that of the yellow- and green-headed spruce sawflies, the period of time, June and July, over which the feeding larvae are active is common to all.

The yellow-headed and green-headed spruce sawflies lay their eggs in the spring (May to early July), usually in slits cut between the new needles of the host tree just as the bud scales are cast off. Hatching follows an incubation period of 7 to 14 days, subject to spring temperatures.

Females of the balsam-fir sawfly lay their eggs in August and September in slits cut in the needles, generally depositing only one egg (which protrudes slightly) per needle. The insect overwinters in the egg stage and hatching takes place from late May to July of the following year, depending on geographical

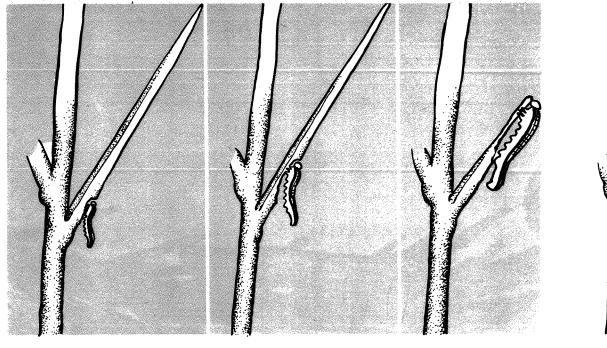
location and accompanying climatic con-

ditions.

Sawfly larvae pass through several stages of growth during their 30 to 40 day feeding period. They feed gregariously in colonies, especially during the early part of their development. When feeding, they usually curl the posterior end of the body downwards or upwards, and if disturbed raise both ends in a very characteristic manner.

Mature larvae of the yellow-headed and green-headed spruce sawflies drop from the trees and spin cocoons in the lower duff layer or mineral soil where they overwinter. Pupation and adult emergence occurs during the following spring.

Full grown larvae of the balsam-fir sawfly spin cocoons either on the foliage or in the surface litter on the ground near the base of the infested tree. Pupation takes place within the cocoon and adults emerge the same season.



Sequence of injury to needles by feeding larvae.

Adults of the three species prefer the southern exposure of host trees for mating and egg laying.

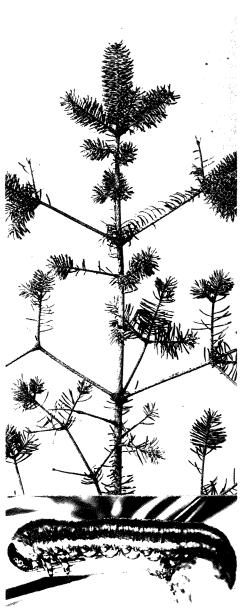
The yellow-headed and green-headed spruce sawflies generally attack new growth, initially feeding on small pieces of the needles. As the larvae develop, more of the needle is consumed until a short, brown stub is left. In contrast, the balsam-fir sawfly characteristically feeds on the old needles during larval development; gradually moving to the new foliage when a food shortage occurs. Its initial feeding habits are similar to the other species; small pieces of tissues at the basal portions of the needles are eaten first but as feeding progresses only stubs remain.

damage

In heavy sawfly outbreaks, infested trees are often completely stripped of the old and new needles. As the season progresses affected trees take on a distinct reddish color, normally visible from long distances.

Persistent infestations will reduce growth and cause a deterioration in tree appearance. Two or more consecutive years of severe defoliation either kill the trees outright or weaken them to the extent that they become susceptible to encroaching vegetation, attack by other insects, or weather stresses (not normally injurious to trees) such as short periods of drought.

Balsam fir defoliated by the balsam-fir sawfly.





control

Parasites, predators, disease and restricted food supplies are important in regulating sawfly abundance. These natural factors, however, often fail to keep outbreaks in check and applied control is necessary to prevent serious tree damage.

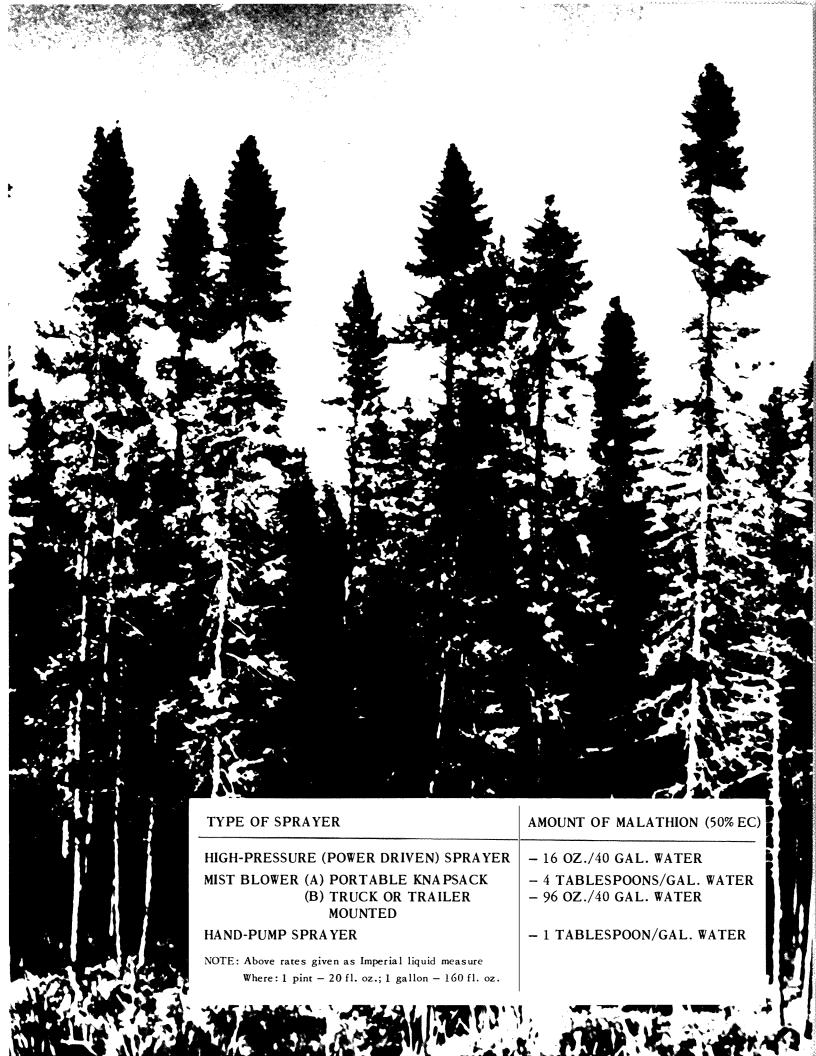
The timely application of a suitable insecticide is an effective remedy. Treat-

ment should be carried out in June and July as soon as possible after the larvae appear. Malathion 50% emulsifiable concentrate at the rates given in the table is an effective control. Application can be achieved with high-pressure sprayers equipped with a hose and gun, low-volume mist blowers, or hand-pumped sprayers.

Hi-volume hydraulic sprayer ▲

Lo-volume mist blower ▶





The selection of equipment for applying the insecticide depends on the size and number of trees to be sprayed. Handpumped sprayers are usually adequate for treating young ornamental trees. On the other hand, power-operated equipment is required for spraying tall trees or if large numbers require treatment.

Thorough coverage of the trees with the insecticide is necessary to kill the sawfly larvae. With high-pressure equipment, sufficient spray mixture should be used to wet the foliage thoroughly without drenching. Application at 400 pounds per square inch pressure may be required for treating tall trees. Mist-blowers (equipped with a fan to deliver a strong air blast) are designed to apply a low volume of highly concentrated insecticide mixture, and only enough should be used to moisten the foliage.

Insecticidal dusts also may be employed for controlling spruce sawflies, particularly on individual trees. Derris powder (rotenone) is the most effective and may be applied with a plunger-type hand duster. In addition, hand picking and destroying the sawfly larvae is an efficient method of controlling sawflies when one or two trees are involved.

In forested areas, aerial application of insecticides is the most practical method of preventing sawfly damage to valuable natural stands and plantations. However, the decision to spray with aircraft should be based on insect surveys which will indicate the risk of continued high population levels.

The selection of the proper insecticide for aerial application is also important. New chemicals are constantly being developed, screened and evaluated for efficacy. Some of these may prove more effective and economical than Malathion in these large scale control operations.

Malathion and derris powder are poisonous to man and other warm-blooded animals. Always read and carefully follow the directions and safety precautions given on the manufacturer's label.

selected reading

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Additional information or copies of this report may be obtained from:

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