

PINE NEEDLE SCALE

IN THE PRAIRIE PROVINCES



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Liaison & Services Note MS-L-5
Canada Department of Fisheries & Forestry

Forestry Branch, March, 1969

Frontispiece – Leo Hartman farm, Elrose, Saskatchewan.

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

Dept. of the Environment
Northern Forest Research Centre
Canadian Forestry Service
5320-122 Street
Edmonton 70, Alberta

Although this brochure contains the latest technical information available, application of the chemical recommendations is at the user's risk and subject to any law that may apply.

Illustrator – John Wiens.

Reprinted JUNE, 1973



Pine needle scale on Scots pine.

INTRODUCTION

The pine needle scale (*Phenacaspis pinifoliae* (Fitch), (Homoptera: Diaspididae) is a major insect pest of planted spruces and pines in the agricultural regions of Manitoba, Saskatchewan and Alberta. Shelterbelts and ornamental host trees which are subjected to sustained attack for several years may ultimately be killed. More often, however, vigor is reduced and the trees may then succumb from attacks by secondary insects such as borers and bark beetles or to adverse weather conditions. The scale is found also in pine stands in the forested zones of these provinces but infestations seldom reach serious proportions and damage usually is negligible.

There are two chief means by which pine needle scale is spread: by the wind, which disseminates infestations from tree to tree; and by the distribution of infested nursery stock, on which detection of the minute insects before shipping is extremely difficult.

HISTORY OF INFESTATIONS

Infestations of the pine needle scale have occurred throughout Canada – from the Atlantic Provinces to British Columbia – but serious injury has been recorded most frequently in the Prairie Provinces. The relative scarcity, and hence greater appreciation, of evergreen trees on the prairies are probably the main reasons for the more frequent reports from this area.

Severe infestations of the scale have been recorded in the Prairie Provinces for more than 40 years. This period spans the era of intensive outplanting of trees in the agricultural zone where evergreen planting programs for city and town beautification, parks, and field and farmstead shelterbelts have created new environments for populations of the tiny scale insect. Severe injury and some mortality of trees have occurred during this period in Calgary, Lloydminster, Saskatoon, Regina, Yorkton, Estevan, Brandon, Winnipeg, and several smaller communities. Also, the P.F.R.A. Tree Nursery at Indian Head, Saskatchewan has sustained periodic severe outbreaks which have affected spruce production.

HOST TREES

The pine needle scale attacks numerous species of conifers including the spruces (*Picea* spp.), pines (*Pinus* spp.), hemlocks (*Tsuga* spp.), firs (*Abies* spp.) and Douglas-fir (*Pseudotsuga menziesii* (Mirb.) Franco).

Host preference of the insect may be determined to some extent by the geographical distribution and concentration of these tree species. For example, pines are most frequently infested east of the Mississippi River in the United States, white spruce (*P. glauca* (Moench) Voss) in central Canada, and Douglas-fir in British Columbia.

The introduction of host trees into areas outside their normal range does not lessen the possibility of attacks and injury by the pest. In the Prairie Provinces white spruce, Colorado spruce (*P. pungens* Engelm.), and Scots pine (*P. sylvestris* L.) which have been widely planted for ornamental and shelterbelt purposes often become severely infested.

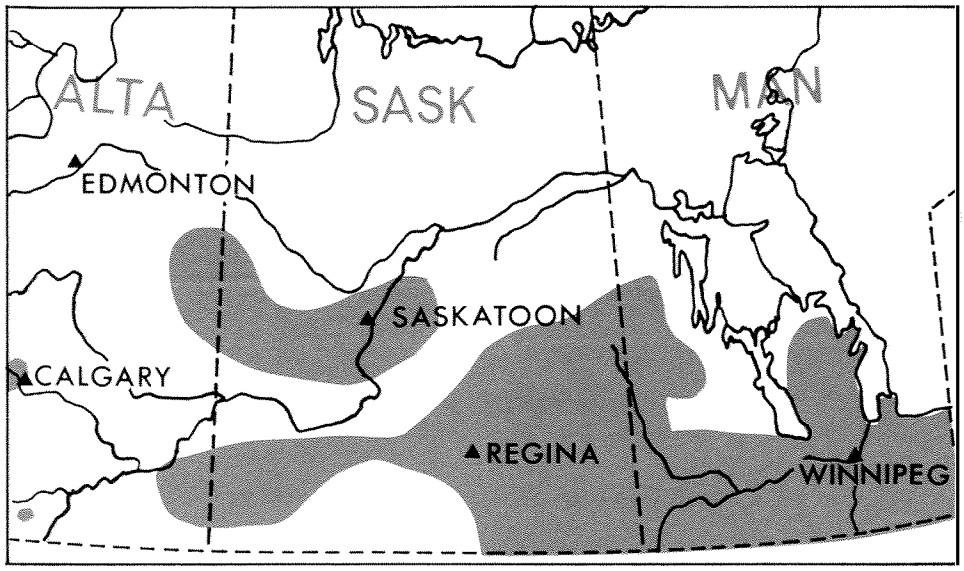
LIFE STAGES

ADULT – The presence of pine needle scale on the foliage of host trees can be detected by white waxy secretions which cover the bodies of the mature male and female insects. Although the mature scale is only about 0.1 inches long, the thin scale-like coverings approach 0.3 inches in length.

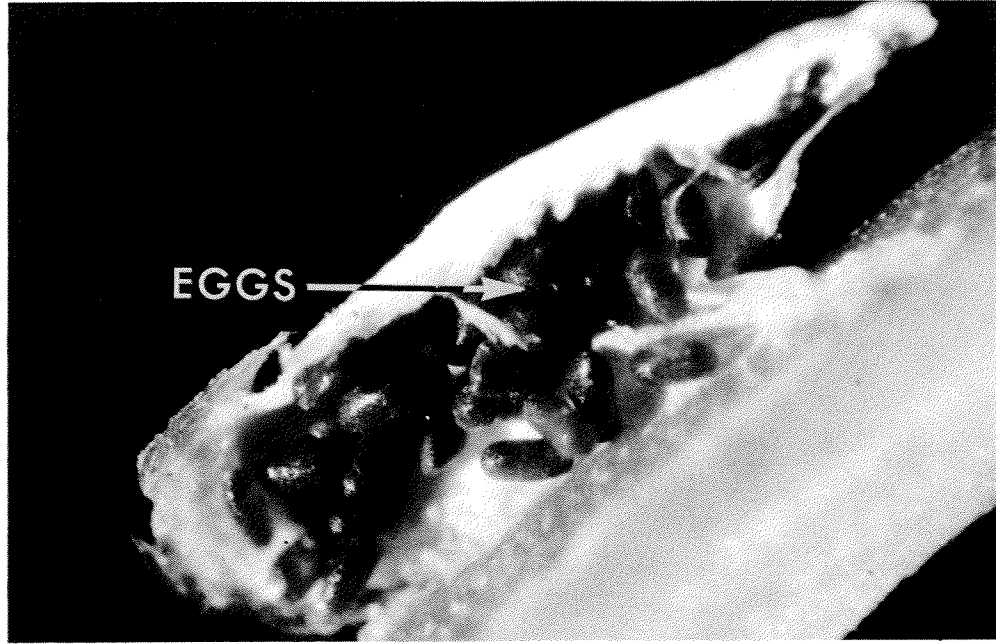
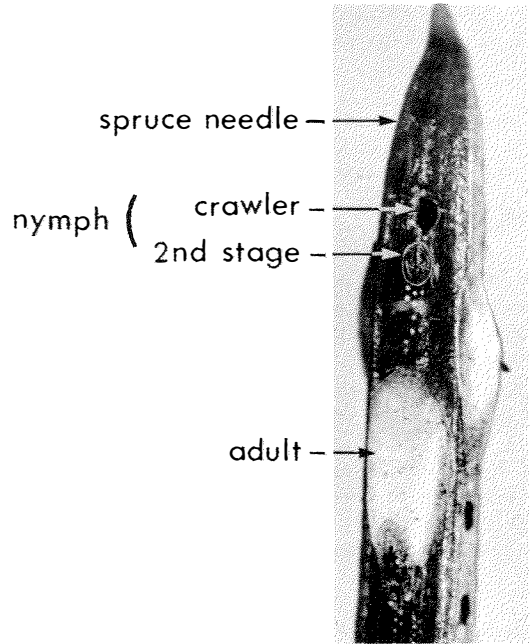
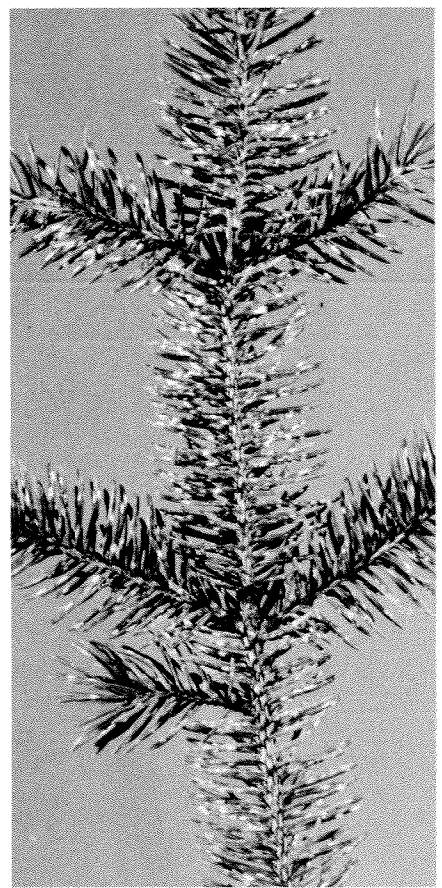
The adult female scales are degenerate in appearance when compared with more complex insects such as bees and beetles. They do not develop functional legs or wings, have sac-like bodies, and long hair-like mouthparts for obtaining sap from the needle. Male scales, on the other hand, develop wings and legs and are capable of flight at maturity.

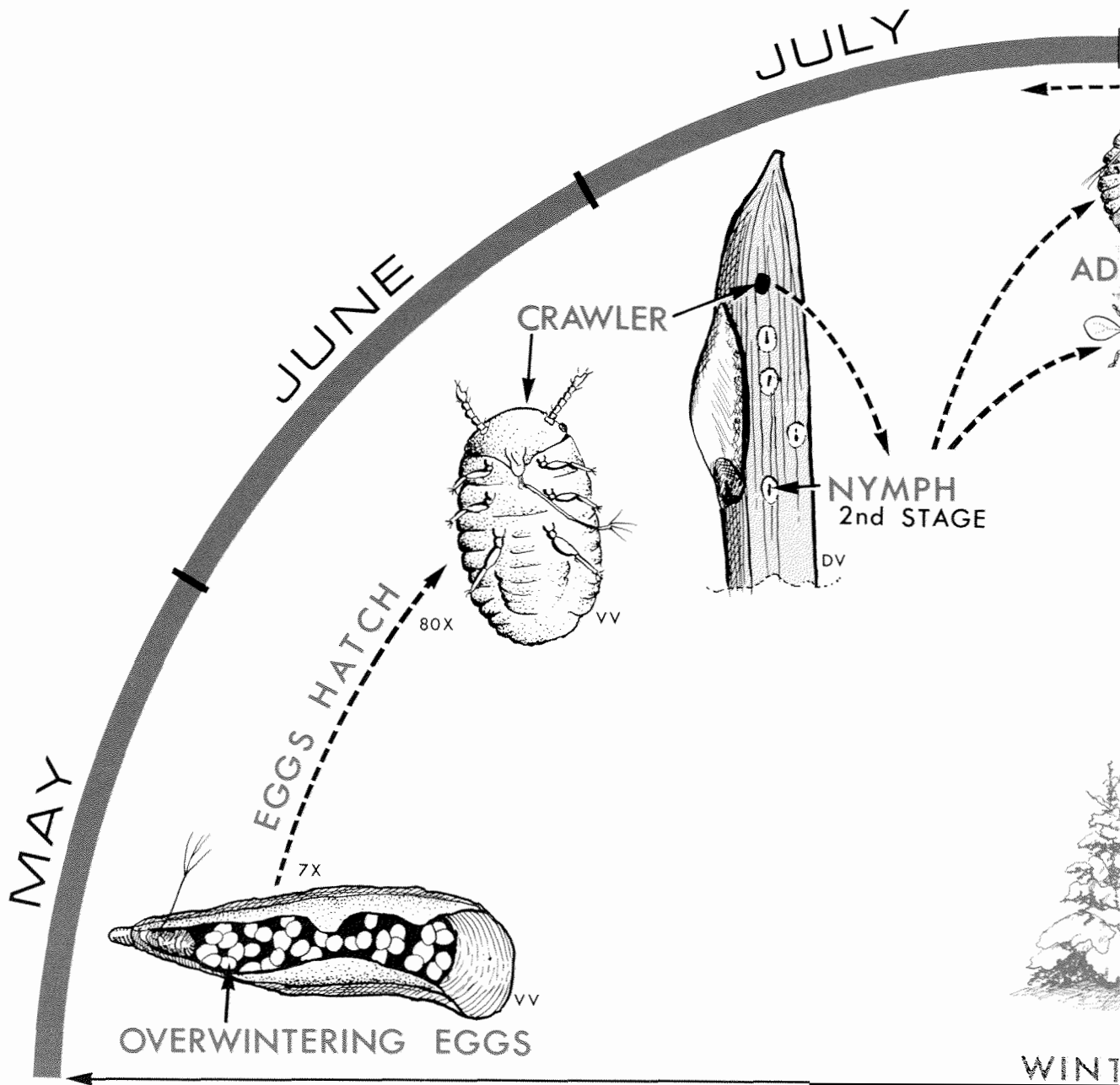
NYMPH – Upon hatching, the young crawlers (first-stage nymphs) are minute, reddish-pink, oval insects. Gradually, as the nymph ages, the body shape flattens and color changes to light brown.

EGGS – Eggs are deposited behind the female in the protective pocket under the scale covering. They are reddish to purplish and oval. The number of eggs deposited by each female may range from fewer than 10 to 100 or more.



Distribution of moderate to severe infestations, 1920-1968.
 Severe infestation on white spruce. ▶



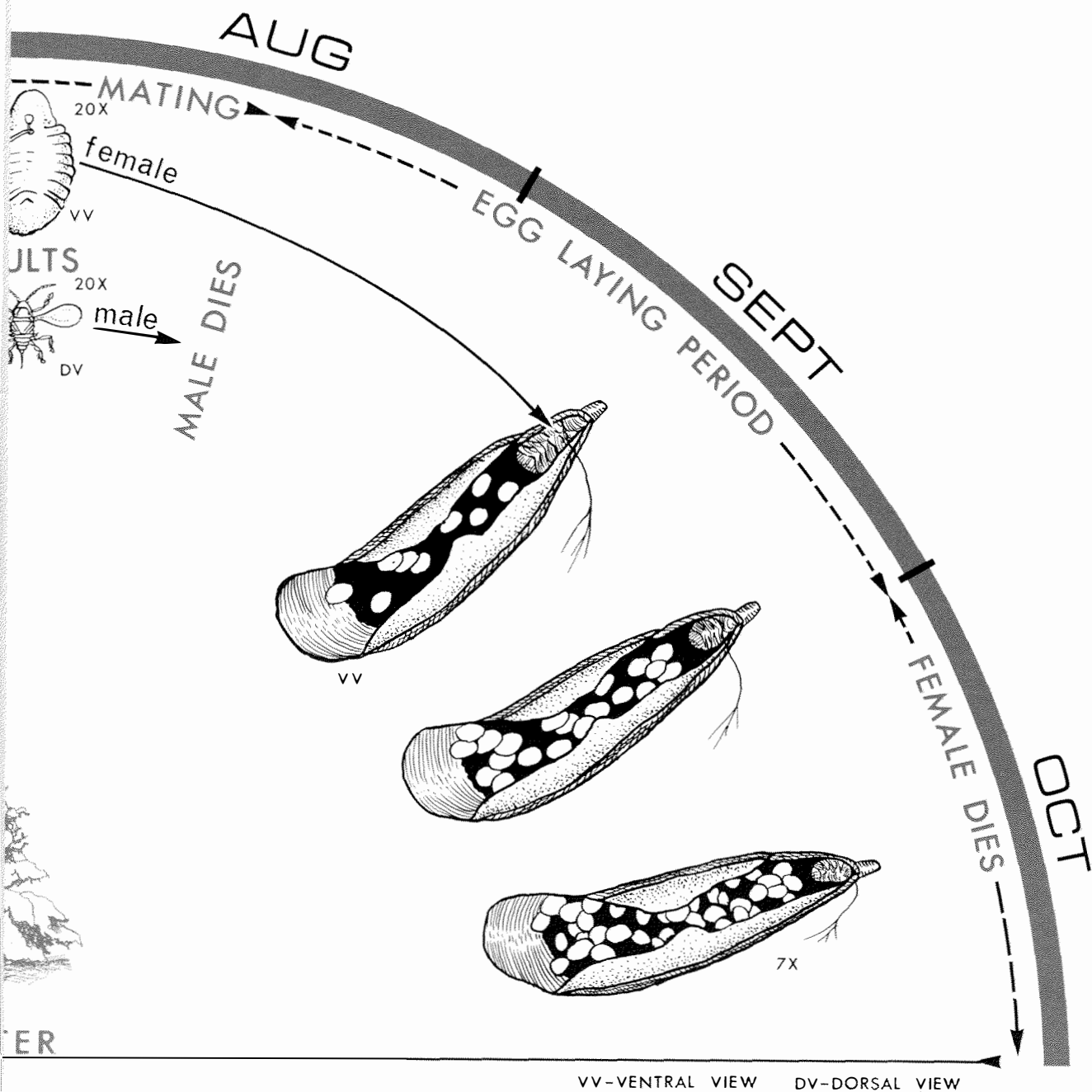


Life stages of the pine needle scale.

LIFE HISTORY AND HABITS

There is one generation of the pine needle scale each year in the Prairie Provinces. It overwinters in the egg stage beneath the protective covering of the scale. Hatching is greatly influenced by spring and early summer weather conditions. Hot, dry weather in May stimulates early and rapid hatching whereas cool, wet weather delays incubation and prolongs the hatching period. Commencement of hatching at Indian Head, Saskatchewan, recorded for more than 15 years, varied from May 26 to June 26. The average date for commencement of hatching for this locality was June 6. In the greater Winnipeg area hatching usually begins between June 10 and 12. The hatching period may extend from one to two weeks.

The newly-hatched crawlers disperse and settle on the surface of both old and new needles. After settling, the female crawlers molt (shed their external skins) and become second-



stage nymphs. About three weeks later they molt again and become adults. The female adult then commences to secrete the white scale covering, completing it about mid-August. The male crawler, after settling, molts only once to become an adult. It then forms a scale covering under which it develops into a tiny winged insect which is very different from the female.

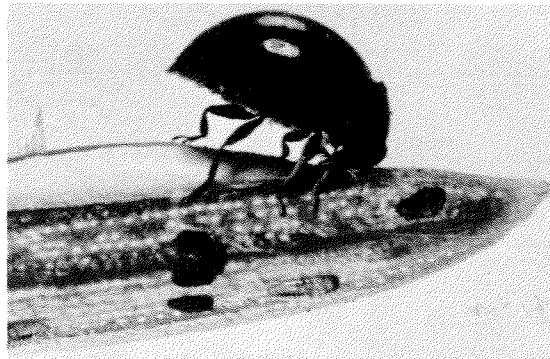
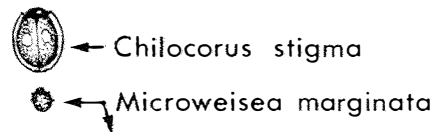
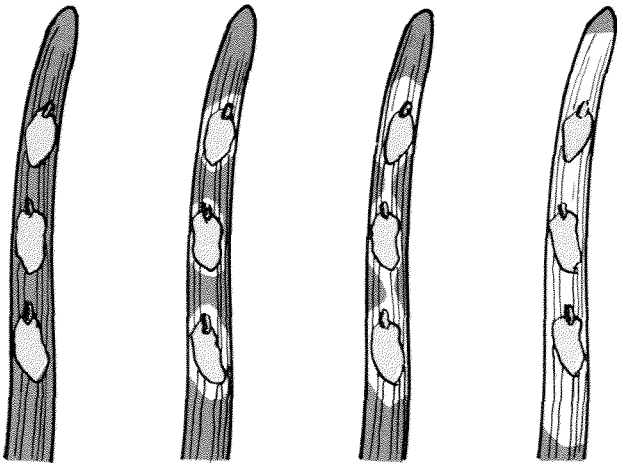
The adult males emerge from their scale coverings during late July and August, and mate with the females. Frequently, during this period they may be seen hovering in swarms in sunny protected places amongst infested trees. Egg-laying (oviposition) begins about mid-August and continues until late October unless stopped by cold weather. As oviposition progresses, the body of the female shrinks and provides additional space for egg accumulation under the scale secretion.

INJURY

The establishment of many scale insects on the foliage of host trees usually results in a distinct sequence of injury symptoms. A yellowish area develops under each insect regardless of population density. When 20 or more scales occur on a single spruce needle (50 or more on a pine needle) the discolored areas tend to coalesce. At this stage of injury the trees acquire an off-color appearance due to the abundance of white scales and yellowish foliage. Many needles attacked in this manner drop prematurely, adding to the unhealthy appearance.

Sustained heavy attack for two or more years may cause many spruces to lose most of their needles. The effect on pines is usually a reduction in new needle size to about half normal length. Trees attacked in this manner may be killed.

Infestations of the spruce spider mite (*Oligonychus ununguis* (Jacobi)) may occur concurrently with scale infestations on spruce, and this additional injury leads to rapid decline in tree vigor. After trees have been weakened by either scale or combined scale-spider mite infestations they may become susceptible to attack by other insect pests such as wood borers and bark beetles, or to weather stresses (for example, short periods of drought) not normally injurious to healthy trees.



Symptom development showing the coalescing of injured areas.

Lady beetle feeding on mature scale.

CONTROL

Weather, predators and parasites all assist in natural control of pine needle scale. Extreme heat or heavy rain soon after hatching will destroy many crawlers. Larvae and adults of ladybird beetles (particularly the twice-stabbed lady beetle, *Chilocorus stigma* (Say), and the tiny *Microweisea marginata* Lec. in prairie regions) feed on all stages of this insect; in old infestations these predators may become numerous. Parasitic wasps also destroy some females.

When natural controls fail, serious damage may be prevented by applied control measures. Treating of infested trees with malathion 50% emulsifiable concentrate (a liquid formulation that mixes readily with water) at the rates shown in the table is recommended.

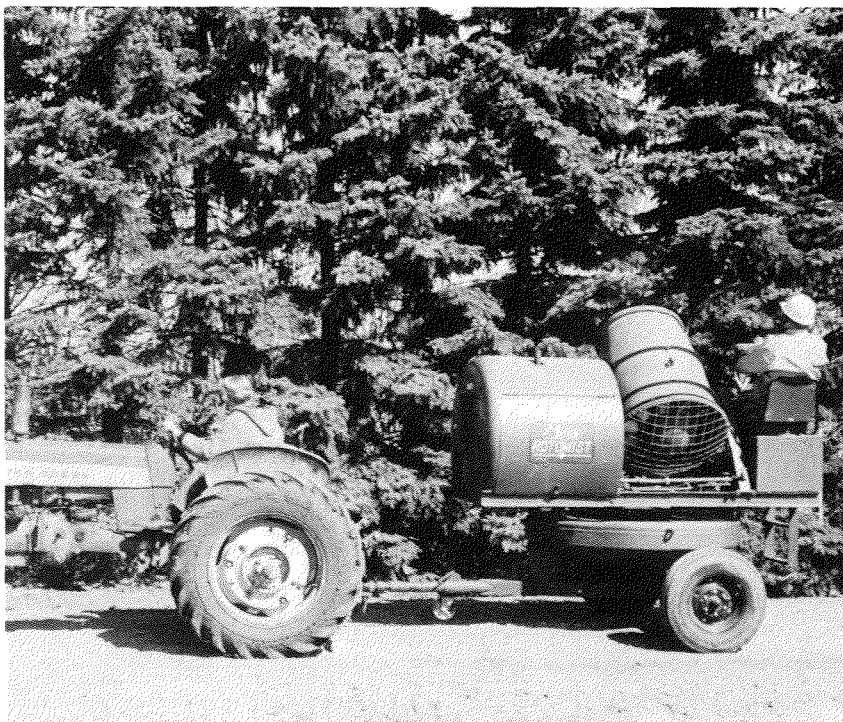
The selection of equipment for applying the insecticide will depend upon the size, number and importance of the trees to be treated. Two types of sprayers are available – hydraulic sprayers (ranging from hand-operated sprayers to gasoline-powered machines) and mist blowers. The hydraulic sprayer depends on a large volume of water to carry the insecticide to the trees. Spraying with this equipment thus involves wetting the foliage until the spray deposit begins to drip. Mist blowers deliver a very fine spray in a fast-moving air stream, hence require a much smaller quantity of spray mixture (but at a higher insecticide concentration), and the trees should be sprayed only to the point where foliage begins to glisten.

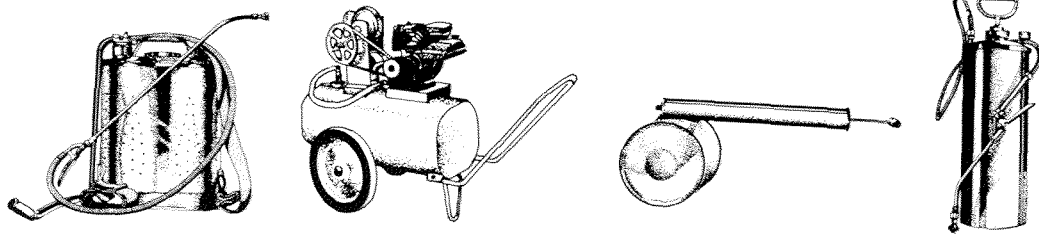
TYPE OF SPRAYER	– AMOUNT OF MALATHION (50% E.C.)
HAND-PUMP SPRAYER	– 1½ TABLESPOONS/GAL. WATER
HYDRAULIC (HIGH PRESSURE, POWER DRIVEN) SPRAYER	– 1 3/5 PINTS/40 GAL. WATER
MIST BLOWER (A) PORTABLE KNAPSACK – TYPE	4 TABLESPOONS/GAL. WATER
(B) TRUCK OR TRAILER – MOUNTED TYPE	4 4/5 PINTS/40 GAL. WATER

NOTE: ABOVE RATES GIVEN AS IMPERIAL LIQUID
MEASURE WHERE:
1 PINT – 20 FL. OZ.; 1 GALLON – 160 FL. OZ.

Lo-volume mist blower.

Hi-volume hydraulic sprayer.





Portable mist blower.

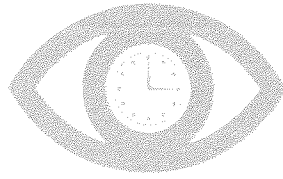
Small hydraulic sprayers.

Two very important considerations in successful pine needle scale control operations are:

- (1) correct timing of application
- (2) thorough spray coverage of infested foliage

Careless and poorly timed spraying will not produce the desired results. Two applications during the growing season may be required. The first application should be made between June 1 and June 20 (exact time varies depending upon locality and spring weather conditions) to control the susceptible (unprotected) crawler stage. If the growing season is unusually early, however, it should be made about June 1-10, or about June 15-20 if the season is late. The second application should be made during the second week in August to kill females which may have survived the first treatment. If the treatments cannot be made during the periods recommended above, a later application in June for the first treatment or an earlier application in August for the second treatment may be worthwhile, especially if the scale infestation is severe. The percentage of crawlers or adult females killed with the later treatment, however, would be less as fewer of the insects would be in the susceptible stages of development.

TAKE TIME



OBSERVE LABEL
DIRECTIONS

Malathion is poisonous to man, other warm-blooded animals and also to fish. Always read carefully and follow the safety precautions given on the manufacturer's label.

SELECTED READING

Brown, C. E. 1958. Dispersal of pine needle scale, *Phenacaspis pinifoliae* (Fitch). Can. Ent. 90:685-690.

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Phenacaspis pinifoliae (Fitch) on Scots Pine Needles

