

FOREST Pest LEAFLET

Gray Spruce Looper

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Introduction

The gray spruce looper, *Caripeta divisata*, is common in British Columbia but only occasionally causes visible damage. The first record of damage was in 1961 when stands of western hemlock, *Tsuga heterophylla*, in the Zymoetz River area near Terrace were lightly defoliated. The next and most recent outbreak was in 1990 and 1991 in southeastern B.C. Moderate and severe defoliation caused top kill and mortality of mainly western hemlock over more than 4000 ha near Arrow, Slokan, Box and Duncan lakes.

This insect is known widely in North America. In some publications and at some locations in eastern Canada and the United States it is also known as the gray forest looper.

Distribution and hosts

The gray spruce looper occurs across Canada and the northern United States. However, outbreak populations and significant damage have apparently been restricted to B.C.

Although first identified on spruce, population build-up and noticeable



Mid to late instar larvae

defoliation have been limited to stands mainly composed of western hemlock. Residual feeding, occasionally severe, occurs on all associated conifers: Douglas-fir, *Pseudotsuga menziesii*, western larch, *Larix occidentalis*, Engelmann spruce, *Picea engelmannii*, western white pine, *Pinus monticola*, lodgepole pine, *Pinus contorta*, alpine fir, *Abies lasiocarpa*, and to a lesser extent western red cedar, *Thuja plicata*.

Description and life history

There is one generation annually in B.C., which overwinters in the pupal stage.

Egg: About 1 mm long, elliptical, orange to brown; may occur singly or in small groups on underside of a needle; laid June to mid-July.

Larva: Up to about 45 mm long when



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mature, gray to brown with off-white and/or yellow to green markings. Early instars are mainly green. They move by arching then straightening, a characteristic of all loopers. The larvae are solitary feeders and are active from late July into October.

Pupa: Brown, about 16 mm long; overwinters in forest duff and soil.

Adult: Moths with an average wingspan of 32 mm (range 25-38 mm) fly from June to mid-July. Fore wings have brown to gray proximal and distal margins, and an intermediate brown irregular band punctuated by a forward white spot. Hind wings are white with an intermediate gray band.

Damage

Most defoliation occurs from September to early October as the larvae mature. Visible signs of feeding usually progress from the upper crown downwards. When numbers of larvae are high, varying degrees of top dieback and tree mortality may result since both old and new needles are consumed. The impact of damage caused by the gray spruce looper can best be assessed the next spring, after the full extent of bud flush on the host trees and before any new feeding by the looper.

In the 1990-1991 outbreak in southeastern B.C., 35 infestations of mostly moderate to severe defoliation occurred over a total of 4060 ha. Most defoliation occurred on flat or east-facing slopes next to lakes, suggesting that micro-climate influences this insect. The impact of the looper in representative stands of semi-mature to mature western hemlock progressed as follows:

After one year of defoliation:

In severely defoliated stands direct mortality averaged 12%; 70% of remaining live trees sustained dieback of the entire upper crown and 26% had dieback through the mid-crown.



Mature larva, mounted, and moth

In moderately defoliated stands there was no mortality but dieback of at least two-thirds of the upper crown occurred in 37% of the hemlock.

After two years of defoliation:

In a stand severely defoliated for two years 78% of the hemlock were killed. When severe defoliation was followed by moderate or light defoliation, mortality declined to 46 and 14 percent, respectively. There was no direct mortality after two years of moderate or light defoliation.

Post-outbreak impact:

Secondary mortality of hemlock that sustained top kill was expected since secondary mortality had been recorded for up to 5 years after outbreaks of the western hemlock looper, *Lambdina fiscellaria lugubrosa*. The weakened trees were killed by climatic stresses such as drought or winter weather, root disease, and secondary insects such as bark beetles. Secondary mortality after the gray spruce looper outbreak was assessed near Slocan Lake: 31% of hemlock were dead in 1993 compared to 14% after feeding ended in 1991. The extent of crown dieback in the remaining live trees averaged 41%, compared to 53% in 1992, so additional mortality is possible.

Defoliation of codominant conifers, especially Douglas-fir, was usually limited to lower crown feeding by larvae dispersing from infested hemlock. Understory trees of all associated conifers except western red cedar were occasionally severely defoliated and killed but the extent was variable and not quantified.

Management

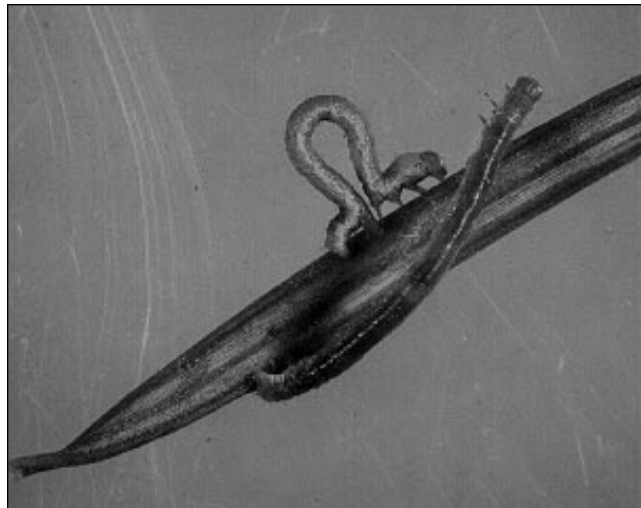
No specific recommendations have been developed to prevent outbreaks or minimize damage by the gray spruce looper. A synthetic pheromone is under development and will likely be used for monitoring or forecasting populations after further research and field testing. Direct control methods, including the use of a registered insecticide such as *Bacillus thuringiensis* var. *kurstaki* (Btk), a bacterium affecting insects only, remain untested. For the latest information on direct treatment, including the potential use of Btk to protect valuable trees such as those in parks, consult local forestry, horticultural, or pesticide control personnel.

Naturally occurring diseases appear to be important in regulating looper populations and played a large

role in the collapse of the outbreak in southeastern B.C. Larvae reared from mass collections near Slocan and Arrow Lakes all died in 1992 when the population collapsed, up from an average of 72% mortality in 1991 and 27% in 1990. The main causes were pathogenic fungi, *Paecilomyces* sp. and *Entomophaga* sp. These figures only approximate the field situation since some contamination of healthy larvae was likely during mass shipment and rearing. Larval parasitism in each year remained minor at about 1%.

Selected references

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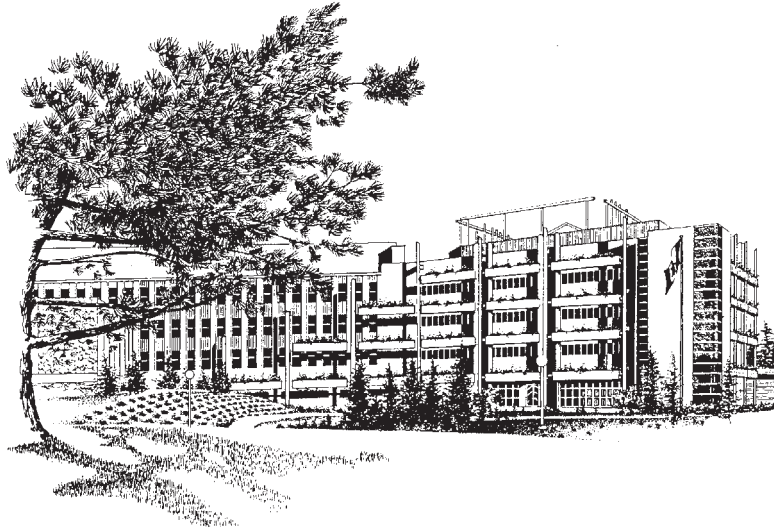
Early instar larvae on a western hemlock needle



Severely defoliated stand of western hemlock

- Unger, L.; Stewart, A. 1994. Forest insect and disease conditions Nelson Forest Region 1993. Nat. Res. Can., Can. For. Serv., FIDS Rept. 94-3. 40 p.

*A copy of this report is available for study in the library of the Pacific Forestry Centre in Victoria.



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