



Saskatchewan Ministry of Environment

Forest Pest Fact Sheet

EASTERN SPRUCE BUDWORM, (*Choristoneura fumiferana*)

BACKGROUND

The eastern spruce budworm is the most destructive and widely distributed forest defoliator in North America. The destructive phase of this pest is the larva or caterpillar stage. Lengthy large scale population outbreaks have caused widespread mortality in spruce/fir forests.

DISTRIBUTION

The range of the eastern spruce budworm is transcontinental extending from the east coast of North America to Alaska.

DESCRIPTION OF LIFE STAGES

The adult moth has a wingspread of 21 mm to 30 mm. It is grey-brown in colour with silvery white patches on the forewings. The eggs, which are light green, are deposited on the needles in elongate masses containing about 20 to 40 eggs. Eggs are laid in two rows, which overlap like shingles on a roof. Mature larvae are about 20 mm to 23 mm long. The body is a dark greenish-brown colour with rows of small pale spots on the back. The head is dark brown. Pupae are about 12 mm long, are pale green when first formed and later turn reddish-brown.

Spruce budworm adult moth



Image: Natural Resources Canada,
Canadian Forest Service,
Northern Forestry Centre

Spruce budworm egg mass



Image: Natural Resources Canada,
Canadian Forest Service, Northern Forestry Centre

Spruce budworm mature larva



Image: Natural Resources Canada,
Canadian Forest Service,
Northern Forestry Centre

Spruce budworm pupa



Image: Natural Resources Canada,
Canadian Forest Service,
Northern Forestry Centre

HOST SPECIES

Balsam fir and white spruce are the preferred host species of the spruce budworm. Red, black and Colorado spruce are also suitable host trees. On occasion, tamarack, pine, and hemlock may be fed upon. In Saskatchewan, spruce budworm feeds on white spruce, balsam fir and to a lesser extent black spruce, as well as the introduced Colorado spruce.

LIFE CYCLE

The spruce budworm has one generation per year. Female moths lay eggs in July on the underside of needles. The eggs hatch in about ten days. The tiny larvae spin silken covers called hibernacula under buds and bark crevices. Once in the hibernacula, the larvae moult to the second stage or instar and remain there until the following spring. They emerge with the warm weather in late April and early May prior to bud expansion. Larvae mine old needles, unopened buds and male flowers. Later they feed in expanding buds and between shoots. When populations are high, old foliage will also be eaten once the new foliage has been consumed. Feeding is completed in approximately five weeks depending on weather conditions. Larvae pass through six instars during their development. Fully grown larvae change to pupae in mid to late June. Adults emerge in early July, mate and lay their eggs.

SIGNS, SYMPTOMS AND DAMAGE

Needles are seldom completely consumed by the larvae, but are often clipped at the base and webbed together. These dead needles persist on the trees for a few weeks giving trees a scorched appearance in mid-summer. When populations are low and moderate, partial loss of new foliage occurs, particularly in the upper portion of the tree. During severe persistent infestations, all of the new foliage plus some old foliage may be destroyed for several successive years. Buds and developing shoots may be killed in their formative stages. White spruce will experience branch and top mortality after three or four years of severe feeding damage. Complete tree mortality can occur following five to six years of severe infestation. Balsam fir, which possesses less foliage than spruce, may be killed following three years of severe feeding damage.

Severe defoliation



Image: Manitoba Conservation

Scorched appearance from feeding



Image: Claude Monier, Natural Resources Canada, Canadian Forest Service

Tree mortality from repeated severe defoliation



Image: Manitoba Conservation

MANAGEMENT PRESCRIPTIONS

When spruce budworm populations persist at high levels, it is necessary to apply registered insecticides to prevent tree mortality. Chemical insecticides often used to combat spruce budworm include dimethoate and malathion. These products kill budworm either on contact or by ingestion. Biological insecticides, such as *Bacillus thuringiensis kurstaki*, and reduced-risk pesticides, such as Mimic (tebufenozide), may also be used. Budworm larvae cease feeding and die when these products are ingested. Insecticides should be applied when larval development has reached third to fourth instar (approximately 6 mm to 10 mm in length), in synchrony with the elongation and flaring open of current-year shoots. At this point, larvae are exposed and vulnerable to the insecticide. Successful application controls the larvae before they reach the

later instars in which the majority of feeding takes place. The timing for control varies from year to year, but is generally late May to mid-June in Saskatchewan.

REFERENCES FOR ADDITIONAL INFORMATION

Spruce Budworm in the Eastern United States
Daniel R. Kucera¹¹ and Peter W. Orr
Forest Insect & Disease Leaflet 160
U.S. Department of Agriculture Forest Service
<http://www.na.fs.fed.us/spfo/pubs/fidls/sbw/budworm.htm>

Spruce budworm
Government of Alberta, Sustainable Resource Development
<http://srd.alberta.ca/BioDiversityStewardship/Forests/ForestHealth/CommonTreeInsectsAndDiseases/SpruceBudworm.aspx>

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<http://cfs.nrcan.gc.ca/news/455>