BACKGROUND
The jack pine budworm is native to North America. It is the most important defoliator of jack pine throughout much of the tree’s range. Severe outbreaks seriously affect the growth and quality of vast areas of pine. In addition to jack pine, it also feeds on other species of pine.

DISTRIBUTION
Jack pine budworm occurs throughout the range of jack pine, extending from the north eastern United States to the Northwest Territories. However, epidemic populations occur mainly in the Great Lakes region, central and northwestern Ontario, Manitoba, and Saskatchewan.

DESCRIPTION OF LIFE STAGES
Adult moths have rust-coloured forewings with silvery white patches. Their wingspan ranges from 15 mm to 28 mm. Elongate masses containing light green eggs are deposited on the needles. Approximately 40 eggs are laid in two rows that overlap similar to shingles on a roof. Mature larvae have a reddish-brown body with yellowish sides and two rows of white dots along their back. They are 20 mm to 22 mm long. The head is shiny reddish-brown to black. Pupae are approximately 12 mm long. They are pale green when first formed and later become dark reddish-brown.
HOST SPECIES
Jack pine is the preferred host. However, other native pines such as red pine, lodgepole pine and white pine may also be fed upon. In Saskatchewan, jack pine and the introduced Scots pine are the main hosts.

LIFE CYCLE
Female moths lay eggs through mid-July to early August. The eggs hatch in seven to 10 days. Upon emergence, first instar larvae spin a silken cover, called hibernacula, under bark scales or between needles. In the hibernacula, larvae molt to the second instar and remain there until the following spring. Second instar larvae emerge in late May and early June as pollen is being produced in the male cones of jack pine. Larvae feed initially on pollen and then move to the new foliage when it becomes well developed. Larvae feed for a period of approximately six weeks. Jack pine budworm larvae have six or seven instars. Following the larval feeding period, pupation occurs among the needles or between webbed shoots from early to late July. Moths emerge in late July and early August, mate and lay eggs. There is one generation per year. Jack pine budworm outbreaks often last only two to four years. The most important factor contributing to population collapse is the reduction in pollen cone production that occurs after sustained severe defoliation. Without the nutritious pollen food source, there is a high mortality rate in young larvae.

SIGNS, SYMPTOMS AND DAMAGE
When populations are low and moderate, damage is restricted to a partial loss of the new foliage, particularly in the upper crown of the tree. Needles are seldom consumed entirely, but are often clipped at the base and webbed together. The accumulation of dead needles and feeding debris gives trees a scorched appearance in mid-summer. At high population levels, much of the current foliage is destroyed. The most severe defoliation tends to occur in the upper portion of the tree, which often results in top-kill. Since outbreaks tend to be short lived, reduced vigour, substantial growth loss and tree deformity from top-kill are more common than outright tree mortality. Tree mortality may occur after two to three years of severe defoliation if trees are over mature or stressed from other causes such as drought, disease or insect attack.
MANAGEMENT PRESCRIPTIONS
During severe outbreaks, control measures may be required to protect high-value stands against top kill, volume loss and mortality. Insecticides should be applied when larval development has reached peak fourth instar, in synchrony with full bud flush. Larvae are exposed and vulnerable to the insecticide at this stage. As well, treatment at this stage results in less damage, as the later instars do the majority of feeding. Currently, the biological insecticide Bacillus thuringiensis kurstaki and the low-risk insecticide Mimic (tebufenozoide) are the only insecticides registered in Canada for jack pine budworm control.

REFERENCES FOR ADDITIONAL INFORMATION
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