FGC Forest Genetics Council of British Columbia

Cone and Seed Insect Pest Leaflet No. 6

British Columbia Ministry of Forests and Range,
Tree Improvement Branch, Saanichton, BC

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SPRUCE SEEDWORM

(Cydia strobilella)

Cydia strobilella moth on interior spruce foliage (W. Strong)

TAXONOMY:

Order: Lepidoptera (moths and butterflies)

Family: Tortricidae (a very large family with many common names, usually referred to as "tortricids")

HOSTS: All spruces (*Picea* spp.) in North America.

DISTRIBUTION: Widespread throughout the range of spruce in Canada and the western and northeastern United States.

DAMAGE: Seedworm larvae can cause major damage to spruce seed crops. Young larvae tunnel through cone tissue and bore into individual seeds. Seeds are partially to completely consumed and often become fused to cone scales. Apart from premature opening, no external evidence of larval feeding damage is visible on cones.

Seed damage caused by *Cydia strobilella* (top); undamaged seeds (bottom) (Canadian Forestry Service)

IMPORTANCE: In British Columbia, spruce seedworm is primarily an issue for interior spruce cone crops. A single larva may destroy

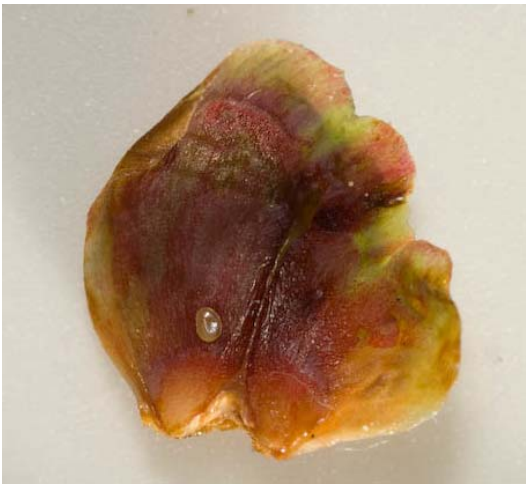
between 10-20 seeds or approximately 30% of the filled seeds per cone. Attacked cones open prematurely and seed is shed prior to cone harvest. To date, coastal spruce cone crops have not been impacted by spruce seedworm.

Spruce seedworm larvae overwinter in cones and, usually, most are removed from seed orchards during cone harvest. Thus, spruce seed orchards grown in isolation from natural spruce stands rarely develop high densities of spruce seedworm. Natural spruce stands and orchards grown near to them are at greater risk to damage from spruce seedworm.

Description

LIFE HISTORY: One generation per year.

EGG: Eggs are pale to dark tan, spherical, flattened, about 0.5 mm in diameter. Eggs are deposited singly on or between conelet scales during or shortly after cone pollination.



Cydia strobilella egg on a dissected cone scale (D. Manastyrski)

Close up of *Cydia strobilella* egg on a dissected cone scale (D. Manastyrski)

LARVA: Larvae are creamy white with a brown head capsule and thoracic shield. There are 4 larval instars; mature larvae are about 10 mm long. Early instars consume seeds; in late summer, mature larvae tunnel into the central cone axis to overwinter. Overwintering larvae may enter extended diapause and remain inside cones for one or more years prior to pupation.

Mature *Cydia strobilella* larva in axis of bisected cone (W. Strong)

Close up of mature *Cydia strobilella* larva in spruce cone axis
(D. Manastyrski)

PUPA: Light amber, later darkening to black, about 4.0 mm to 6.5 mm long. Pupation occurs within the cone axis just prior to spring budburst.

ADULT: Small moth (wingspan 8 – 11 mm), greyish-brown wings with distinctive silvery cross-bands on the forewings. Adults are only present for a short time during the spruce pollination period (late April-May).

Cydia strobilella adult on spruce cone (D. Manastyrski)

Insect stage calendar

Spring pollination period	Post pollination to late summer	Winter
Adult females lay individual eggs between scales of spruce female conelets during pollination period.	Larvae consume seeds and migrate to cone axis to overwinter.	Mature larvae overwinter then pupate just before spring budburst. Larvae may enter extended diapause for more than 1 year.

Monitoring and control of *Cydia strobilella*

Estimate *Cydia* populations by counting seedworm eggs in random samples of cones collected after pollination period. Follow protocol stated below.

Foliar spray of systemic insecticide at appropriate time should provide control.

Detection and Monitoring

Populations of spruce seedworm should be monitored on an annual basis in spruce seed orchards and controlled when necessary. Spruce seedworm monitoring is carried out in British Columbia interior seed orchards concurrently with spruce cone maggot (*Strobilomyia neanthracina*) monitoring and follows the same protocols.

Accurate population size estimates and damage predictions can be made by counting seedworm eggs in random samples of conelets collected immediately after pollination period when the majority of spruce conelets have "closed" (usually around mid-May in spruce orchards in interior British Columbia). Samples should consist of 1 conelet from the mid-crown of each of a minimum of 50 trees.

Dissect each conelet under a microscope and record the number of eggs observed. A decision to control seedworm populations will depend in part upon the current value of a crop and the immediate need for seed. An average of 0.3 eggs / conelet indicates a probable seed loss of 15%; this is a suitable spray threshold in most circumstances. Because each larva can cause about the same amount of damage as a spruce cone maggot larva, the egg counts for the two species are combined and a threshold of 0.3 eggs per cone includes eggs of both species.

To determine whether or not a natural stand spruce cone crop is worth harvesting, randomly collect samples of mature cones prior to harvest and determine the level of spruce seedworm damage and the number of filled seeds per cone.

Management and Control

If predicted seed loss is unacceptable, a foliar spray of systemic insecticides applied when the majority of spruce cones are horizontal should provide good control. Currently, dimethoate-based products are the only insecticides registered in Canada and likely to provide effective control of *Cydia strobilella*.

In spruce seed orchards, non-crop cones should be picked and destroyed before spring to kill overwintering larvae. This will help reduce the numbers of seedworms that survive to adulthood in the local population.

Various aspects of the chemical ecology of *Cydia strobilella* are understood, including its sex pheromone and its response to some other environmental stimuli. However, this knowledge has not yet been incorporated into monitoring or control programmes in British Columbia because spruce seedworm is not considered to be a high priority seed orchard pest here. Seedworm control through pheromone-based mating disruption has been shown to be an effective management technique in eastern Canada.

Key References

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