

# Codling Moth

## What You Should Know



The Okanagan-Kootenay Sterile Insect Release Program is a regional initiative to eliminate codling moth from apple and pear orchards in the Okanagan, Similkameen, Shuswap and Creston Valleys. Eliminating the number one pest of BC's tree fruit industry will reduce the use of pesticides in our environment and allow us to produce cleaner fruit.

A successful area-wide program requires everyone's cooperation. Both commercial growers and homeowners must take steps to keep their host trees free of infestation. The most effective way to prevent codling moth is to strip all apple, pear, crabapple and quince fruit by early June, or remove problem trees entirely. SIR offers incentives to anyone who strips or removes host trees. (Call us for details.)

Producing a crop of codling moth-free fruit requires a combination of management strategies. Property owners should be aware of the moth's life cycle as well as appropriate control methods. This brochure outlines techniques that will help you keep your trees codling moth-free.



OKANAGAN-KOOTENAY  
STERILE INSECT RELEASE PROGRAM

*It's Working...  
Because of You!*

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~CODLING MOTH UPDATE LINE~

**1-888-601-1112**



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## History of Codling Moth in British Columbia

The codling moth is not indigenous to North America, but was accidentally introduced in Canada and the USA in the 1800's. It arrived in BC in the early 1900's, first appearing in orchards on Vancouver Island. By 1916 it was causing extensive damage in the Okanagan and other interior regions. Spread of the moth was facilitated by human activities such as planting infested nursery stock and moving infested fruit and containers from region to region, as well as by the movement of the moth itself. Because it is not native to BC there are few natural predators to help keep the population in check. As a result, humans have had to rely heavily on pesticide application for control.

## Orchard-Urban Interface

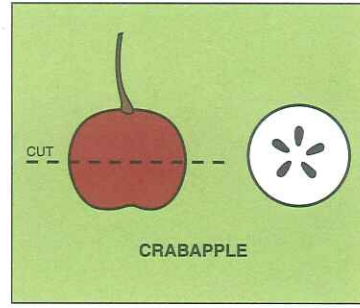
One of the problems with the spread of codling moth in our interior valleys is the close proximity of urban and rural residential properties to commercial orchards. Infested backyard trees affect adjacent orchards, and vice versa. Homeowners must be aware that leaving infested fruit on their trees can impact the livelihood of nearby orchardists. Working together to eliminate moth populations is critical to the success of an area-wide management program.



## Codling Moth Hosts

In BC, codling moth attacks pome fruits like apples, pears, ornamental crabapples, and quince (including flowering quince). Pome fruits have a characteristic core containing seeds on which the moth larvae feed. Rarely are other fruits attacked. If

wild populations are high, you may see a damaged walnut, plum, peach, or other soft fruit, but these trees will not sustain a codling moth population. Crabapples are often confused with flowering plums or hawthorns, but can be distinguished from them by slicing a fruit in half. A star-shaped arrangement of seeds indicates a crabapple. Fruit from plums and hawthorns do not have this seed pattern.



## Life Cycle of the Codling Moth

Codling moths overwinter as mature larvae in cocoons in crevices of the bark of host trees, in leaf litter, bark mulch and landscape plantings surrounding the trees, and on wooden structures such as fruit bins, woodpiles and sheds. Moth development is temperature dependent; during warm years they develop more rapidly than when the weather is cooler. In southern BC there are two generations of codling moth each year, and in warmer years a partial third generation can occur.

In spring the larvae pupate inside their cocoons, and typically begin emerging as adult moths in late April and early May (in the South Okanagan and Similkameen). The emergence period occurs over several weeks, and can be delayed by cool weather. The moths are about 12 mm long, grey-brown in color, with fine white bands and distinctive copper wing tips.

The moths are most active at dusk, with mating occurring when temperatures are above 15 degrees Celsius. The females lay 20-75 fertilized eggs singly on the fruit, leaves and twigs of host trees. Eggs take 3-6 weeks to hatch, depending on spring temperatures.

First brood egg hatch occurs about three weeks after petal fall, generally in late May or early June in the South Okanagan. In cooler regions such as the



Creston Valley, egg hatch can be much later.

As the young larvae hatch, they crawl to nearby fruit and begin to burrow inside. Once inside they are protected from contact pesticides, so chemical applications must be timed to provide coverage for peak egg hatch. This is one reason why the pest is so difficult to control. Larvae feed inside the fruit for 3-5 weeks, depending on ambient air temperatures. Usually they tunnel through the fruit to the core to feed on the seeds.

Mature larvae are up to 20 mm long and pinkish-white with brown heads. Once the larvae have matured, they exit the fruit and seek out crevices in bark and other sheltered places in which to spin cocoons and pupate. This process takes approximately 2 weeks.

Most first brood larvae pupate in the summer and emerge as adult moths in late July and early August. However, variations in microclimates extend this emergence period.

Some first brood larvae do not pupate immediately, but enter diapause (hibernation) and emerge as adults the following year. How many of these larvae enter diapause is influenced by weather conditions and other factors.

Second brood larvae go through the same cycle, although more quickly due to higher summer temperatures. Most larvae of this generation exit the fruit, spin cocoons and enter diapause until the following spring. However in long, hot summers some will pupate immediately, giving rise to a third brood. This generation appears in late August and September. Due to cool fall temperatures in our region, third brood larvae are seldom able to complete development. They can cause significant damage however, since chemicals are not applied late in the season.

## Codling Moth Damage

Codling moth larvae attack only the fruit; they do not feed on leaves or twigs, nor do they build webs. Look for damage anywhere on the skin surface and at the calyx or blossom end. As larvae feed and develop, they push crumbly brown frass from entry holes.



# Codling Moth Control

## Infested Fruit Removal and Disposal

Inspect trees weekly, including the upper canopy, and remove all infested fruit. Pick up windfalls. Moth infested fruit must not be left on trees or on the ground at any time. If you regularly find infested fruit, consider stripping your trees to prevent further infestation. Strip all fruit in June if you have had a serious moth problem.

Larvae can continue to feed and develop in dropped or composted fruit, so ensure proper disposal. Thoroughly crush infested fruit or put it in a pail of soapy water for several days to kill all larvae. Infested fruit can also be double-bagged and put out for garbage pick-up.

### Points to Remember:

- Remove infested fruit immediately.
- Pick up and properly dispose of all windfalls.
- Do not compost infested fruit unless it has been crushed or immersed in water for several days.

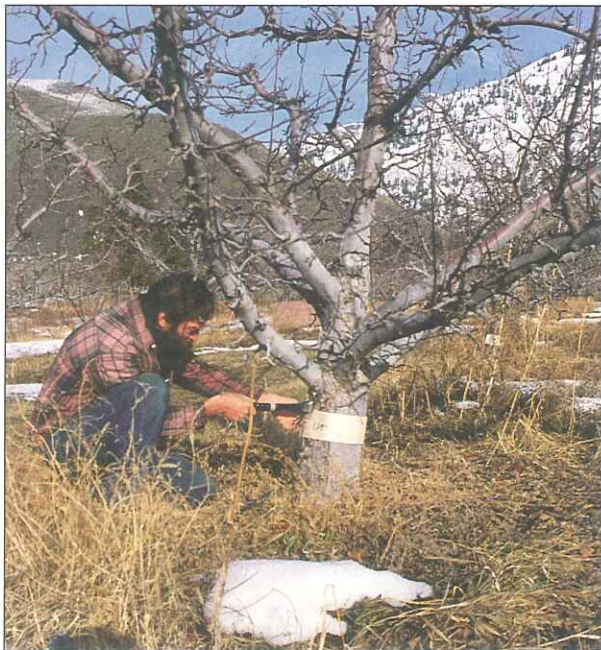
## Tree Banding

Banding the trunks of host trees with single-sided corrugated cardboard bands and replacing them regularly is helpful in detecting and reducing codling moth populations. After feeding inside fruit, mature larvae seek protected locations like crevices in bark to complete development. The cardboard provides similar shelter. Removing and destroying the banding destroys any larvae present.

To capture first brood larvae, apply bands by mid-June. Bands should be replaced every 10 days starting in July. Old bands should be destroyed immediately to prevent larvae from emerging as adults. By mid-August bands can be left in place until late fall. If you are only applying bands to capture the overwintering second brood larvae, apply them by early August.

Place bands snugly around the trunk (a staple gun works well) about 45-60 cm above the ground, with corrugations facing inward. In large trees bands should be placed around main scaffold branches as well. Make sure irrigation is directed away from bands.

The SIR Program uses banding extensively in urban and orchard areas. Contact us if you want to band your trees.



## Blossom Thinning

If you wish to strip your tree completely, you can strip the blossoms off as they finish flowering. This ensures that no fruit develop for the season. It is usually easier to spot showy blossoms than to find developing fruit that blend in with the foliage. Blossoms must be removed by hand, as there are no chemical thinners registered for residential use.

## Pruning and Thinning the Tree

Pruning your trees is helpful in controlling codling moth. Reducing the height of the tree and thinning to open the canopy improves spray coverage. A low, open tree is easier to monitor, making it less likely that infested fruit will be overlooked. Infestations often appear in the upper canopy, which can be too high to monitor effectively.

## Thinning and Harvesting the Fruit

Thinning your crop to one fruit per cluster helps control codling moth for the following reasons: females often lay eggs where two fruit touch (making damage difficult to detect), fewer fruit makes it easier to inspect for damage, and pesticide coverage is enhanced if you are using chemicals. (Thinning also increases the size of remaining fruit.)

Harvesting fruit in the fall will ensure that late season infestations are not overlooked. It also reduces the chance of bears harvesting the fruit for you!

## Minimizing Overwintering Sites



Codling moth larvae seek out protected places to overwinter and pupate. The flaking, fissured bark of many apple, pear and crabapple varieties provides shelter for larvae. Scraping loose bark from the trunks will reduce the number of pupating sites.

Larvae also pupate on the ground in debris, leaf litter, landscape plantings and mulches under your tree. Surrounding your tree with a manicured lawn also limits available pupating sites.

Locate woodpiles, compost bins, sheds and other wooden structures away from your trees, as larvae will spin up on wooden materials they find nearby. Larvae also spin up on bins placed in orchards for harvesting. Bins and fruit wood (used for firewood) have historically been transported between distinct geographical areas, facilitating the spread of codling moth.

## Chemical Control

Where high urban moth populations exist, chemical control requires multiple spray applications and near continuous coverage from egg hatch (e.g. late May - early June in the South Okanagan) to the end of August. With low moth populations, two well-timed 1st brood sprays and one or two 2nd brood sprays may be sufficient. Chemicals seldom provide 100% control, so inspect weekly and remove infested fruit. If you choose to use chemical controls, we recommend hiring a professional.



## Spray Timing

Codling moth sprays are intended to destroy hatching larvae. SIR field staff and industry specialists monitor traps as well as maximum and minimum temperatures during April and May, in order to accurately predict egg hatch. In this way sprays can be timed for maximum effect.

Timing for 1st and 2nd brood sprays is available through SIR's codling moth update line at **1-888-601-1112**. However, your particular microclimate may differ from orchards in your region. Properties with south and west exposures are hotter, speeding up moth development, while cool and shady northern aspects slow development down.

## Baits and Bug Zappers

There are no commercially available baits for female codling moths. Home-brewed concoctions are sometimes employed to attract moths and prevent fruit damage, but none are scientifically proven. Research may result in an effective bait in the future. Bug zappers are not useful in controlling codling moth and can be detrimental, as they indiscriminately kill all insects, including beneficial ones.

## Birds, Bats and Bugs

No parasite or predator alone offers good codling moth control, but wild birds, chickens and several types of insects feed on larvae, and bats and birds capture moths in flight. Some insects will parasitize larvae or eggs. Encouraging birds and beneficial insects in your yard by providing a variety of food and nectar sources as well as shelter will help control codling moth and other damaging pests.

## Sterile Moth Release

The cornerstone of the SIR Program, sterile moth release is an innovative technology involving the mass rearing, sterilizing and release of codling moth into apple and pear orchards. Mass releases overwhelm the wild moths, so that few or no fertile matings occur. The wild population is thus reduced and eventually eliminated, with no toxic effects.



## Trapping

Pheromone traps are useful in detecting moth populations, but do not control infestations. Males are attracted by a lure that mimics the chemical emitted by females calling mates. Once drawn to the trap, they become mired in tanglefoot.

**SIR uses traps throughout the release area to:**

1. determine the ratio of sterile moths to wild moths
2. determine if wild moths are present & require controls
3. monitor general population trends