



OKANAGAN-KOOTENAY STERILE INSECT RELEASE PROGRAM

MEASURING PROGRAM SUCCESS: 2025 SEASON RESULTS

EXECUTIVE SUMMARY

The Okanagan-Kootenay Sterile Insect Release (OKSIR) Program must monitor codling moth populations to effectively manage them. The ways the Program monitors and manages this pest are discussed in the **BACKGROUND** sections of this document (this section stays unchanged in each annual report). The data from these monitoring tools, and management activities, are summarized and placed in historical context below. The underlying reasons for the trends observed are discussed as well. Quick summaries of these results are reported in the shaded boxes on the right-hand column of this document and more detailed descriptions are provided in the body text. The *Italicized* text on the right column explains how to interpret each figure.

- Codling moth populations have decreased by more than 92% since the start of the Program. Codling moth captures in pheromone traps were similar this year compared to last year (**SECTION 1**). Overall fewer wild moths were captured this year compared to last, but fewer traps were also operated this season. There was no correlation between orchards with fewer traps and orchards with more damage.
- Codling moth infestations improved in some areas and got worse in others. Overall, slightly more orchards had worse infestations in 2025 compared to 2024. 86% of the program area has no or extremely low levels of damaged fruit (**SECTION 2**). The Program fell just short of its target of >90% of the acreage of pome fruit have $\leq 0.2\%$ fruit infested by the codling moth. No single cause was identified for the overall increase in codling moth damage. Different circumstances contributed to the increases or decreases in codling moth damage in each orchard.
- The Urban Program continues to keep infestations in backyard apple and pear trees low. 78% of the urban properties visited are codling moth free (**SECTION 4**). There were slightly fewer properties free from codling moth in 2025 compared to 2024.
- The program recommends pesticide applications to orchards that need supplemental controls to suppress codling moth populations. The SIR program recommended similar numbers of sprays in 2025 to 2024. The Program estimates that 77% of the orchards are not spraying to control the codling moth (**SECTION 5**).

BACKGROUND

The Okanagan-Kootenay Sterile Insect Release (SIR) Program is an area-wide, integrated pest management program that exists to protect the pome fruit (apple, pear, and quince) industry in the Okanagan, Similkameen, and Shuswap Valleys from infestations of the codling moth in an environmentally friendly way. Four regional districts participate in the Program, including the Regional District of Okanagan Similkameen (RDOS), Regional District of Central Okanagan (RDCO), Regional District of North Okanagan (RDNO), and Columbia Shuswap Regional District (CSRD).

When the Program began releasing sterile insects in 1994, its objective was to eradicate the codling moth from the pome fruit growing regions of the southern interior of British Columbia. Eradication was to proceed progressively from south to north across 3 eradication zones. By the early 2000's, it was evident that achieving this objective would be significantly more difficult and more expensive than expected, and it was abandoned. The program changed its objective to managing codling moth to economically tolerable levels that would not require growers to spray for codling moth. **The target of $\leq 0.2\%$ infested fruit in $> 90\%$ of the Program area is set as its new goal.**

Today the Program no longer manages in terms of eradication zones, but it does manage this pest on an area-wide basis. An area-wide approach is the most efficient and effective way of managing mobile pests because pests do not respect property boundaries. The Program provides several services to support growers in managing this pest, including sterile insect releases, monitoring, supplemental control strategies (mating disruption, fruit removal, tree removal, etc.), recommendations on how to best integrate pest management tools, and has the legal authority to enforce the removal of abandoned orchards and wild pome fruit trees. The Program supports the industry through a coordinated approach, allowing all growers to benefit collectively from the low pest population. While the Program supports growers, it cannot and should not run their farms for them. The ultimate responsibility to mitigate undue growth and spread of this serious pest lies with the property owner. The Program is the only one of its kind and coveted by pome fruit industries around the globe.

The following document reports measurements of codling moth populations, fruit infestation, pesticide usage, and infested backyard trees in urban properties, in our service areas for the 2025 growing season. These results are summarized and placed in historical context.

This document reports codling moth conditions for the 2025 growing season.

This column will provide a quick summary of the main results. More detail is provided in the main body of the report.

The background information and historical context in this document will not change year over year; however updated results for the current season will be highlighted in these boxes for quick reference.

2025 Results begin on page 8

What is the Codling Moth?

The codling moth is the most serious pest of apples around the globe and is an important pest of pears. Larvae (caterpillars) of the codling moth tunnel into fruit to feed on the seeds, making it unfit for human consumption and unsaleable. Once the moth larvae are inside the fruit, they cannot be killed by pesticides or predators, making this pest very difficult to manage. After the larvae finish feeding, they transform into moths that can fly long distances to infest more fruit and more trees. If codling moth populations are left unmanaged, they can rapidly grow to a point where 90% of the fruit in an orchard will be rendered unfit for sale and human consumption.

Measuring Codling Moth Populations

The Program uses different methods to collect information about codling moth populations. Each of these monitoring tools has their own strengths and limitations. No one method alone can provide all the information needed to monitor populations and manage this pest.

- *Pheromone Traps* — Pheromone baited traps exploit the chemical communication between adult male and female moths. Female moths release sex pheromones that attract potential mates. Male codling moths are attracted to traps baited with a synthetic sex pheromone, tricking the males into thinking they are finding a mate. Instead, the males are caught inside the trap on a sticky card. These traps provide information about codling moth populations BEFORE eggs hatch and crops are infested, providing an important early warning for growers. However, trap effectiveness is limited by wind, rain, cold temperatures, topography, proximity to the wild moth populations, and competition from pheromones produced by the sterile insects we release. Consequently, traps can sometimes miss wild populations. The Program operated over 2500 pheromone baited traps in 2025. There is a density of slightly less than 1 pheromone trap per ha in every pome fruit orchard in the Program area. Traps are checked weekly during the time codling moths are flying. All wild and sterile moths caught on the sticky cards are counted and the sticky bottoms are replaced.
- *Damage Surveys* — Counting infested fruit provides valuable information about the size and location of a codling moth population, as well as an assessment of the tools that supplement sterile insect releases. Unfortunately, once the larvae are in the apple and damage can be seen, it is too late to prevent it. Counting infested fruit can be expensive. Surveys can be either widespread (when Program staff are “scouting” for damage during their

The Program uses traps, damage surveys, and bands to collect information about codling moth populations.

Each of these tool captures a snapshot of a different life stage of the codling moth and are used together to understand how populations are impacting growers and changing year over year.

regular orchard work and covering large areas) or focussed (when they are conducted in a systematic manner to gauge moth population changes year over year). Damage scouting during the season is a valuable tool for monitoring codling moths; however, these observations are hard to standardize and analyse. This report focusses on standardized damage samples conducted at harvest time.

- *Larvae Traps (Bands)* — Codling moths spend the winter as larvae, spinning cocoons in the cracks and crevices of the bark of apple and pear trees. A strip of corrugated cardboard wrapped around the trunk of the tree resembles a suitable overwintering site for larvae and “catch” larvae when they spin their overwintering cocoons. These cardboard strips can be removed at the end of the year and larvae can be easily counted. These “bands” provide information about where and how many moths will emerge the following season.

Managing Codling Moth Populations

Collectively, the Program and growers use multiple tools to manage this pest. As with monitoring tools, management tools have their own strengths and limitations as well. The Program’s goal is to help growers combine the appropriate tools from their toolbox to provide effective, economical, and environmentally friendly control of the codling moth.

- *Sterile Insect Release* — In order for sterile insects to be effective, the chances of two wild insects finding each other must be low. This is achieved by greatly outnumbering the wild population with sterile insects. The larger the wild population, the harder and more costly it is to outnumber the population and prevent mating. Sterile insect technique works best and is most cost effective for small to moderate pest populations.
- *Pesticides* — Pesticides are the sledgehammer in the pest management toolbox. A conventional pesticide spray typically kills 90% of the target life stage (less for organic sprays) regardless of the population size. This makes pesticides very cost effective for controlling large populations, but less cost effective for controlling small populations. The downsides of pesticides are that they can have negative impacts on the environment, farm workers, and beneficial insects; pests can develop resistance to pesticides over time; and the costs of multiple applications of pesticides can quickly add up. Relying on pesticides alone creates a “pesticide treadmill”, where continuous applications of pesticides, in increasing concentrations, are needed to keep pest populations in check.

There are multiple tools in the pest management toolbox. Sterile insect releases, judicious pesticide applications, mating disruption, and cultural control methods are combined to provide, effective, economical, and environmentally friendly codling moth control.

- *Mating Disruption* — Pheromone-mediated mating disruption (MD) is another “soft” approach to pest management. Like SIR, it disrupts mating between wild pests. It works by flooding a target area with synthetic sex pheromone of the pest. When working as it should, the sexual-chemical communication between moths is disrupted and mating is prevented or delayed. This approach has many of the same strengths and weaknesses as SIR. Mating disruption is used in many places around the world as the foundation of codling moth management. The SIR Program tested the use of mating disruption against the codling moth in half of its area from 2011-2014. Wild moth populations, fruit damage, and sprays increased in the areas where MD was being used compared to the area that remained under SIR. The Program returned to area wide releases of sterile insects in 2015. Today the Program will layer MD on top of SIR to combat codling moth hotspots. This is particularly useful in organic orchards, where the available pesticides are limited.
- *Cultural Control* — Cultural control methods refer to growing practices that can be used to reduce codling moth numbers. Removing infested fruit from trees and the ground and disposing of it properly eliminates moths that were missed by other tools. This can be a useful tool in organic orchards where sprays are not very strong or in conventional orchards with severe infestations. Appropriate pruning and fruit thinning improves spray coverage which helps with the management of many pests, including codling moths. In some instances, fruit stripping and hard pruning may be required to eliminate an infestation. Hard pruning and fruit stripping work best on single trees or tiny, non-commercial blocks where the owner may not be able to care for the tree(s) properly.

The Program provided mating disruption as a supplemental management tool for 236 acres of apple/pear orchards in 2025.

The Program recommends pesticides are used only to bring large populations, or “hotspots”, down to the size where they can be controlled by sterile insect releases alone. Hotspot orchards can be defined as properties that harbor a disproportionately high population of codling moths compared to the surrounding areas. Wild moths from these orchards cause economically significant losses to the crop within that orchard and create serious problems for neighboring orchards as well. If wild females mate in a hotspot and then they disperse to neighboring properties, the sterile insects released in a pest free orchard cannot protect that property from the problem population. Hotspots occur when a moderate size wild population goes undetected or is detected but the grower decides not to supplement SIR with additional control measures (spraying, removing infested fruit, etc.). Uncontrolled hot spots grow exponentially, creating serious problems.



Adult Codling moth (left) and codling moth larvae feeding on an apple (right). Photos courtesy BC Ministry of Agriculture

Codling moth adult (left) and larvae feeding on the core of an apple (right). Photos courtesy BC Ministry of Agriculture.

Evan Esch MSc is the Program's Entomologist and is a Professional Agrologist in good standing with the BC Institute of Agrologists. Pest management recommendations are made under his direction in accordance with Provincial legislation outlined in the Professional Governance Act.

As mentioned above, pheromone baited traps can provide early warnings of damage caused by the codling moth. When the Program is working as intended, wild moths (where present) are captured in traps by Program staff. This information is relayed to the grower and posted online in real-time. Information about local moth populations, historical infestation levels, weather, and pest-development models are synthesized by the Program's Entomologist, Mr. Evan Esch MSc PAg, to prescribe a management Program for the grower. If the management Program (increased releases of sterile insects, pesticide sprays, cultural control, etc.) is executed correctly, damage can be prevented, or at least, minimized. Evaluations of damaged fruit are necessary to determine effectiveness of the Program's and growers' combined management efforts. Different measures of codling moth populations and pesticide usage are discussed in five sections below.

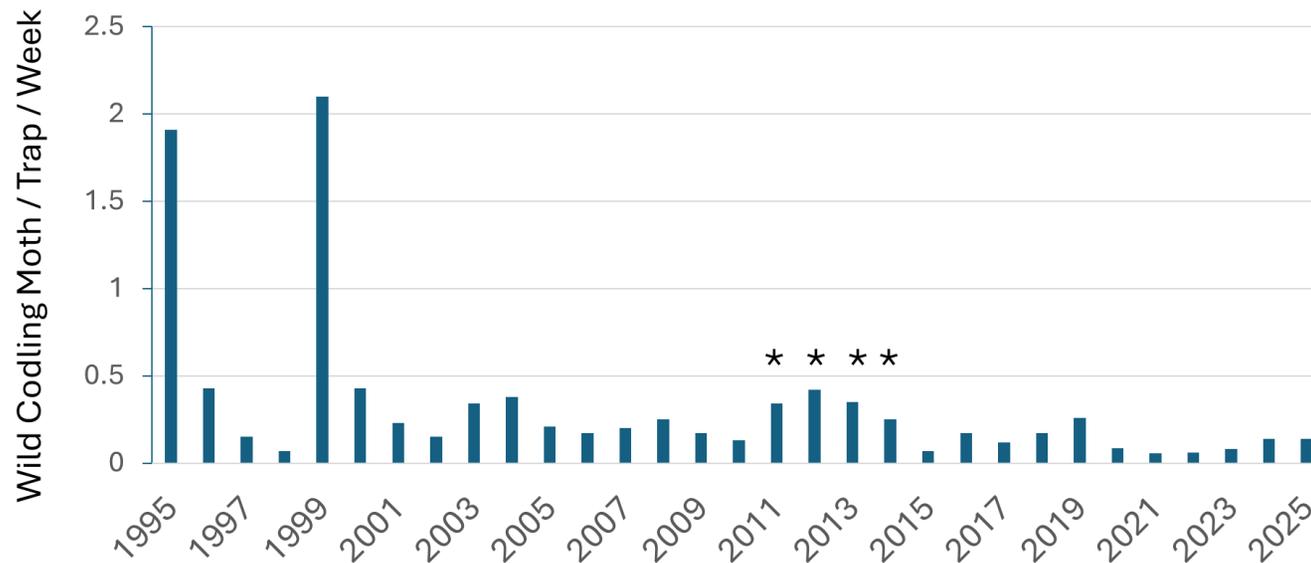
SECTION 1

Wild Codling Moth Captures in Pheromone Baited Traps

Codling Moth Captures in Historical Context

The Program traps moths in every apple and pear orchard in the service area weekly, during the apple growing season. All this data, except for 1994, has been archived by the Program. Sterile insect releases began in 1994, 2000, and 2002 in zones 1,2, and 3, respectively. The large changes in wild captures in these early 2000/s reflects the expansion of trapping into zones 2 and 3. Wild codling moth captures decreased precipitously in each Program zone, due to pre-release sanitation efforts and sterile moth releases. Average, weekly wild codling moth captures have decrease by 92% from pre-Program levels.

Average CM/Trap/Week Area 1999-2025



* Mating disruption was used in zones 2 & 3 instead of SIR, and the Program used a different type of pheromone trap, so these years are not directly comparable with the others.

The heights of the bars in the figure show average wild codling moths caught each week for a given year. Shorter bars, show lower weekly catches.

Changes in Wild Codling Moth Captures From 2024 to 2025

The Program operates a large network of pheromone baited traps, at a significant expense. Traps have been installed at a uniform density of 1 trap/ha for many years. This is 2-10 times the density used in other apple growing regions in North America. In 2025, the Program reduced the number of traps by ~15%, from about 3000 to about 2500. Traps were removed from large, contiguous apple orchards and/or orchards with a history of extremely low codling moth populations. Traps were also added to some codling moth hot spot, particularly around bin piles and packing plants. In 2025, the average trap density was 0.96 traps/ha. Comparisons of wild captures between 2024 and 2025 must take this change into account.

Overall, fewer wild moths were captured in 2025 (7375) compared to 2024 (8481); however, there were also fewer traps in 2025. The average number of wild moths / trap / week was almost exactly the same in 2025 (0.144 wilds/trap/week) as in 2024 (0.141 wilds/trap/week). It is important to note that the removal of traps was not random, with 500 traps being removed from orchards which typically have low counts. This likely skewed the average wild moth per trap higher in 2025, compared to 2024. This suggests that the wild codling moth population was similar, or slightly smaller this year compared to last. However, averaging wild moth captures across so many traps can obscure important trends in the data. Changes in wild moth captures are explored in more depth below.

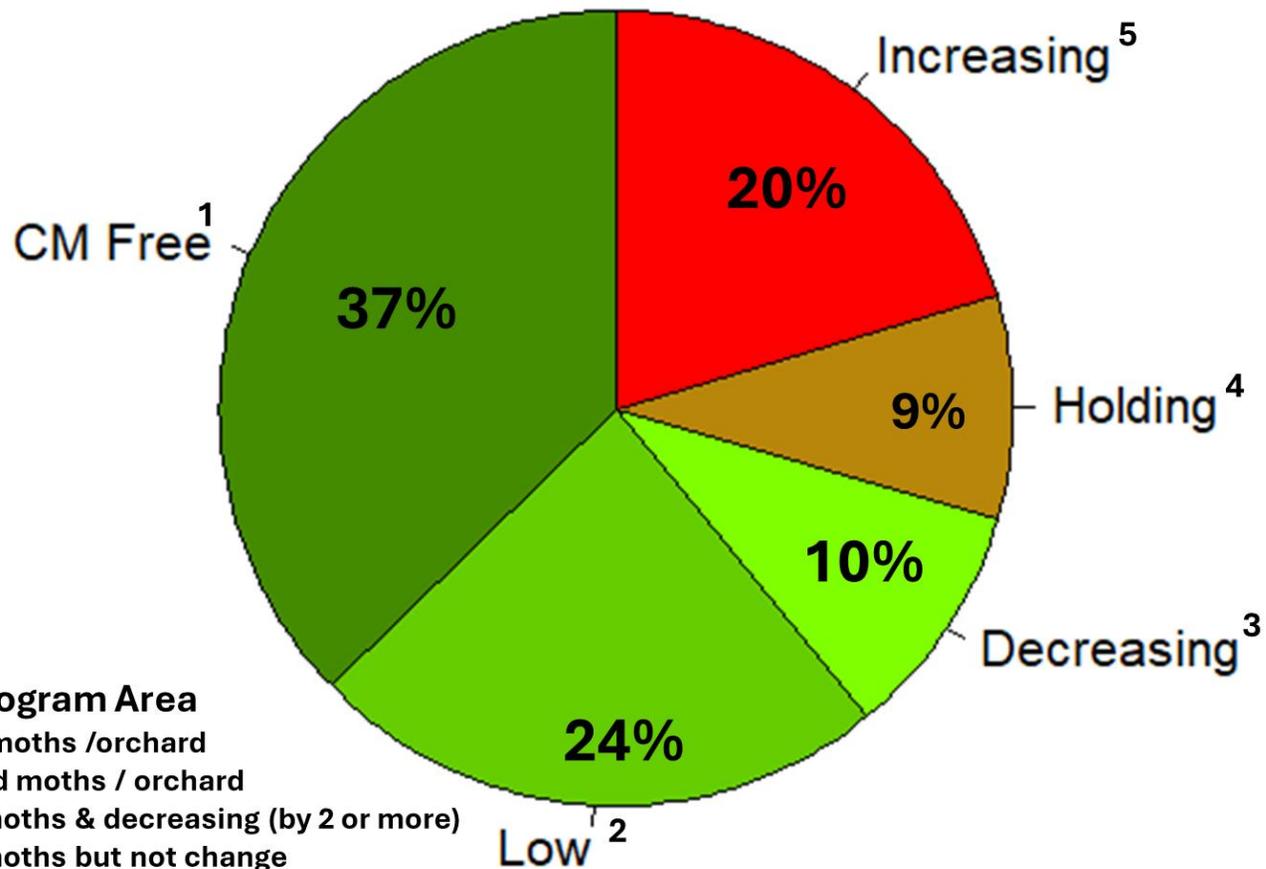
Most of the Program area had no or extremely low codling moth populations. In 2025, 37% of the Program area did not capture any wild moths (*CM Free*) while 24% had extremely small (*Low*) levels of codling moth capturing only 1 or 2 wild moths all season long in all the orchard's traps (see pie chart below). These results are similar to 2024. 39% of the Program area had some higher level of codling moth (3 or more wilds moths caught all season long in multiple traps is a population of concern. For context, the Program recommends a spray when a single trap catches 4 wild moths over a 2-week period.). Of those orchards with a codling moth population of more than 3 wild moths, 10% had fewer moths this year than last year (*Decreasing*), 9% stayed the same (*Holding*), and 20% captured more wilds this year than last year (*Increasing*) (see the pie chart below).

Compared to 2024, there were more orchards with lower wild moth captures and fewer orchards with greater wild moth captures in the previous year. Most of the changes in wild codling moth populations are small, and inconsequential for orchard management. A small number orchard (~5%) had major improvements in their wild moth captures and a small number or orchards (~5%) had major increases in wild codling moth populations. Direct comparisons between counts in 2025 are difficult to make this year, because of the major change to the trapping network.

Total wild captures decreased in 2025 with 7375 wild moths captured compared to 8481 in 2024. There were fewer traps operated in 2025.

Overall, the average number of wild moths /trap / weeks was nearly identical between the last two years. This suggests the codling moth populations were similar this year compared to last.

Changes in Wild Moth Captures from 2024 to 2025



***% of Program Area**

- ¹ No wild moths /orchard
- ² 1 to 2 wild moths / orchard
- ³ >2 wild moths & decreasing (by 2 or more)
- ⁴ >2 wild moths but not change
- ⁵ >2 wild moths & increasing (by 2 or more)

The slices of the pie show changes in wild moth captures from last year to this year.

Most of the program area has no or very few codling moths (CM Free & Low slices).

Of the 39% of orchards that had a detectable moth population 10% had decreasing captures, 9% stayed the same, and 20% (red slice) had populations that got bigger in 2025. These orchards will be focus of program efforts in the 2026 season.

Each year it is a small number of orchards that harbor the majority of the wild moth populations and contribute disproportionately to the damage and spread of this pest. **The worst 10% of the orchards in the Program area accounted for 55% of all the wild moths captured in the entire Program area.** Containing codling moth populations in hot spots is both a challenge and priority for the program and will continue to be a major focus of its resources.

How Did Changes to the Trapping Network Impact Program Operations?

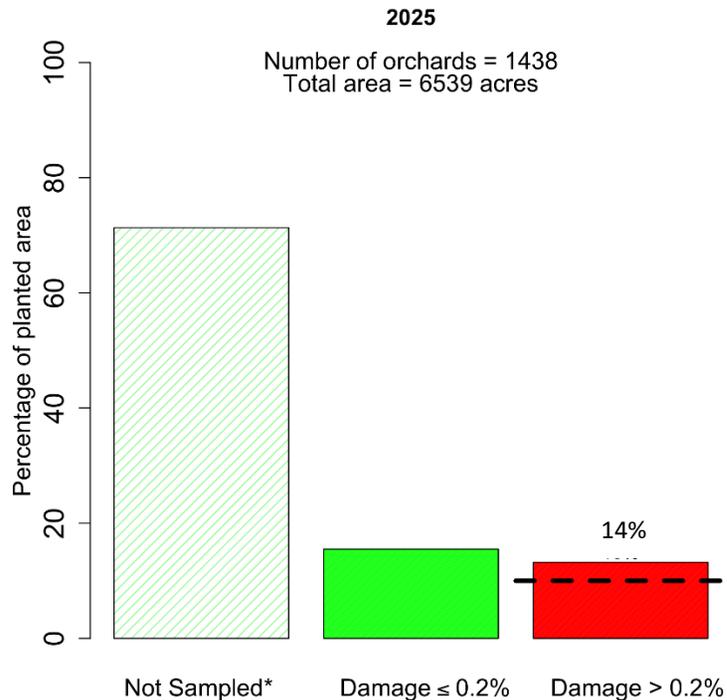
Pheromone traps act as an early warning system for an orchard because they can detect moths before they have an opportunity to cause damage. Checking these traps weekly during the codling moth season is a significant component of the Program's field operations. Reducing the number of traps has the obvious advantage of reducing costs and keeping the Program affordable for growers and residents. The trade-off with this reduction is that the Program could potentially miss some wild codling moth populations in time to prevent damage.

An analysis of 2025 results found no correlation between orchards with fewer traps and more damage this season compared to last. There were 17 orchards that had fewer traps and more damaged fruit this season compared to last year. 16 out of 17 of these orchards detected moderate codling moth populations and received spray recommendations from Program staff. The one instance which did not receive a spray recommendation had a codling moth infestation on the edge of the orchard, which usually happens when moths move from another infested orchard or wild tree into the impacted orchard. These types of infestations are difficult to detect/prevent. These results suggests that the overall reduction of traps did not negatively impact codling moth monitoring. The density of traps in the Program area is still much higher that is used in other apple growing regions and provided valuable information to program staff.

Pheromone traps are an imperfect monitoring tool and will not always detect wild moths before damage occurs. The other main tool the Program uses to monitor wild codling moth populations are damage surveys. The results of damage surveys are discussed below.

SECTION 2 Infested Fruit

Program Area Below Damage Target



Systematic damage surveys are conducted to evaluate changes in codling moth damage year over year. Because damage surveys are expensive, only orchards with known or suspected codling moth populations are sampled. Orchards with no or extremely low wild populations and no signs of damaged observed during the season are not sampled. These are assumed to have little or no infested fruit. Systematic surveys were conducted on 29% (452 orchards) of the Program area, just prior to harvest to determine the amount of infested fruit present. **These surveys are not random, they target infested areas within infested orchards, meaning they overestimate the total amount of damage in an orchard.**

The Program has a target that 90% of the area should have of $\leq 0.2\%$ infested fruit. **This target was not met in 2025, with only 86% of orchards having $\leq 0.2\%$ infested fruit.** This is a decrease from last season, where 91% of the program acreage met this target.

For context, 0.2% infested fruit is an extremely low level of infestation. At this level, the economic losses to the crop are negligible and sterile insect releases alone should be enough to control the codling moth. 0.2% infested fruit equates to 1 in 500 fruit or approximately 1 unmarketable fruit for every 7 boxes of apples produced. Being above this threshold does not necessarily represent a major problem for the orchard. Being above this target does not necessarily constitute a problem for the orchard. However, at this the codling moth can be easily controlled by sterile insects alone. Above this level, more sterile insects and/or additional tools are needed to control the pest.

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86% of orchards had $\leq 0.2\%$ infested fruit in 2024.

The height of the bars shows the percentage of apple acreage that met SIR's damage target of $\leq 0.2\%$ infested fruit.

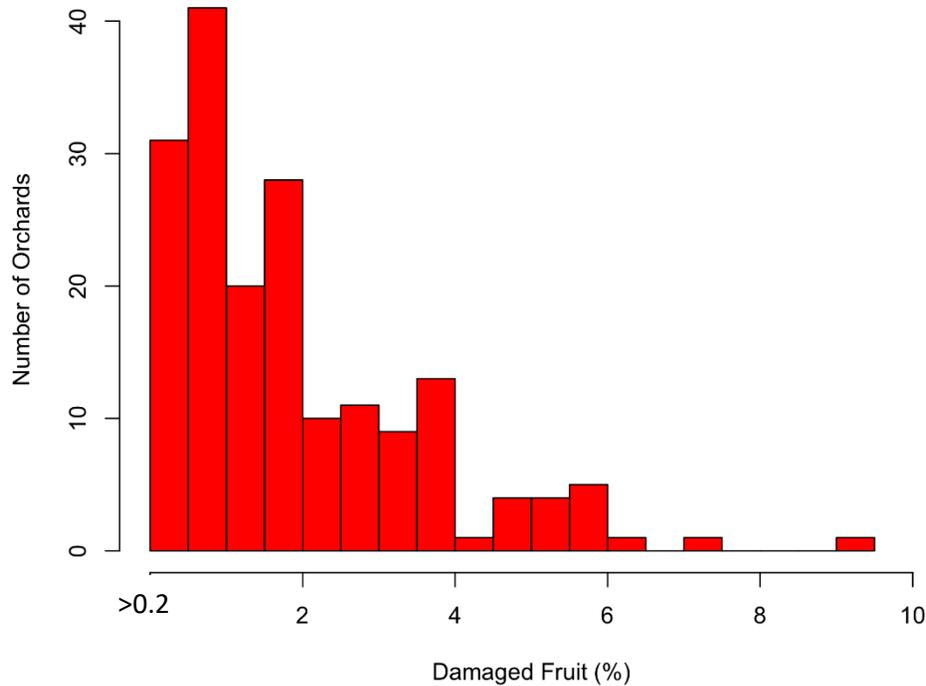
*The **hashed green bar** shows orchards with no or extremely low moth populations. These orchards were not sampled (it is unlikely they are infested).*

*The **solid green bar** shows the orchards that were sampled and were below the target for infested fruit.*

*The **red bar** shows orchards that were sampled and were the above the damage target.*

Damage Severity

Distribution of Damaged Orchards (Excluding Outliers)



disproportionately to the codling moth population. Damage this severe is the result of willful neglect, financial crisis, or other severe horticultural problem on the farm. Orchards this badly infested need aggressive spray Programs to get them back to the level where sterile moths have any chance of controlling the populations. If orchards continue to be severely infested for multiple seasons, and there are no signs of improvement, this may trigger referral to the Program's compliance department which is responsible for enforcing SIR's pest management bylaws.

Fourteen percent of the Program area had >0.2% infested fruit (in at least part of the orchard). Of these orchards exceeding our damage targets, most were just above the damage threshold. This histogram shows the number of orchards with fruit infestation levels in 0.5% increments from >0.2% to 10% (e.g. > 0.2% to 0.5%, 0.5 % to 1.0%, 1.0% to 1.5%, ... 9.5-10%).

Most of the orchards that exceeded our damage target had 1% infested fruit or less, an amount considered negligible by most growers.

A handful of orchards (15 properties) had greater than 10% infested fruit, with the damage ranging from 10.6% to 26% of fruit infested. As discussed above, this small number of badly infested orchards contribute

86% of the program area met its damage target.

14% of the Program area had >0.2% infested fruit. **Of those orchards that exceeded this level, most exceeded it by a small amount.**

The heights of the bars show the number of orchards within various degrees of infestation in 0.5% increments, from >0.2% to 10%.

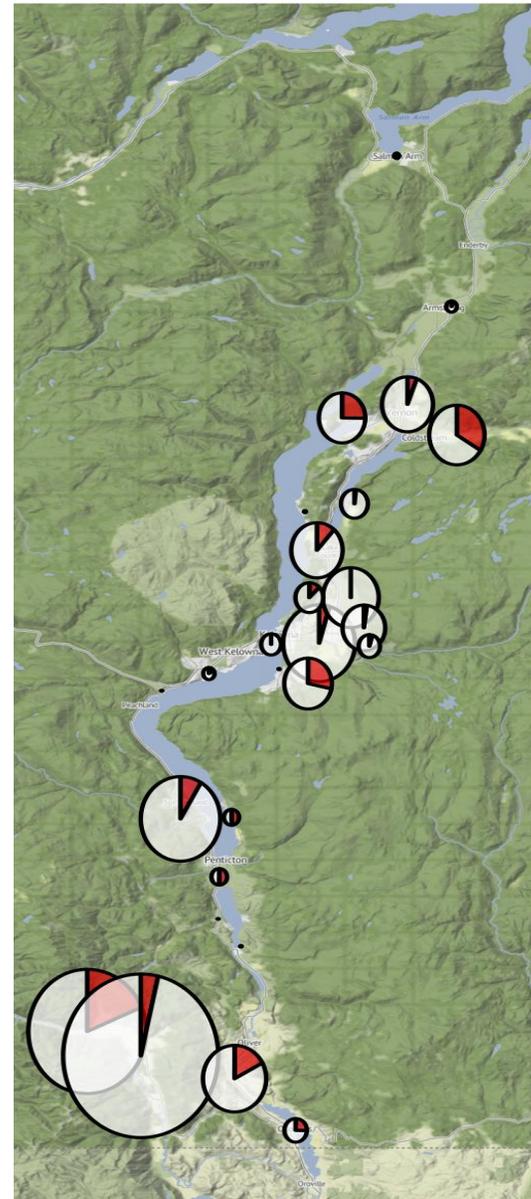
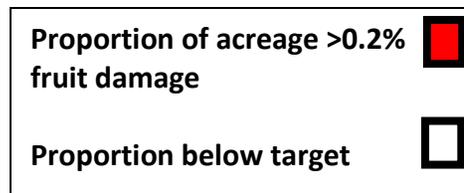
Fruit Damage by Region

The acreage of pome fruit grown and the degree to which that fruit is damaged by codling moth varies by region. This map depicts how many acres of pome fruit are grown in each region (based on size of the pie chart) and the proportion of orchards having $>0.2\%$ infested fruit (red slice of the pie chart). The proportion of acres above the damage target is reported in Appendix 1.

Overall, there were fewer orchards reaching the damage target in 2025 with 86% of the program area having $\leq 0.2\%$ infested fruit. This is a slight increase compared to 2024, which had the lowest level in the past 3 years of 91% of the area reaching the target. This proportion, or orchards meeting the damage target, is comparable to Program results over the past decade.

Generally, the main pome fruit producing regions have lower levels of damage. Large, contiguous, commercial orchards are easier to treat with sterile insects, monitor, and manage. There is also less interface with urban and wild hosts in these areas.

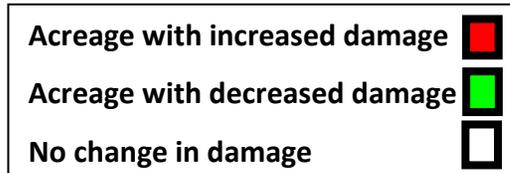
The regions with less acreage have smaller, more fragmented orchards with more urban interface. These smaller blocks are harder to control with sterile insect releases, harder to monitor, and in some instances harder to spray. These regions also tend to have more hobby farms or semi-commercial operations that do not manage pests with the same rigor as larger, commercial growers. Often these small orchards lack the equipment and expertise to effectively manage pests. Areas like Osoyoos, Penticton, Naramata, West Kelowna, and Salmon Arm have higher proportions of orchards with codling moth infestations.



This map shows where the apples & pears are grown based on the size of the pie charts. Larger pie charts are more pome fruit acreage in that area. Red slices of the pie chart represent the proportion of orchards in that region that had $>0.2\%$ infested fruit.

Changes in Fruit Damage

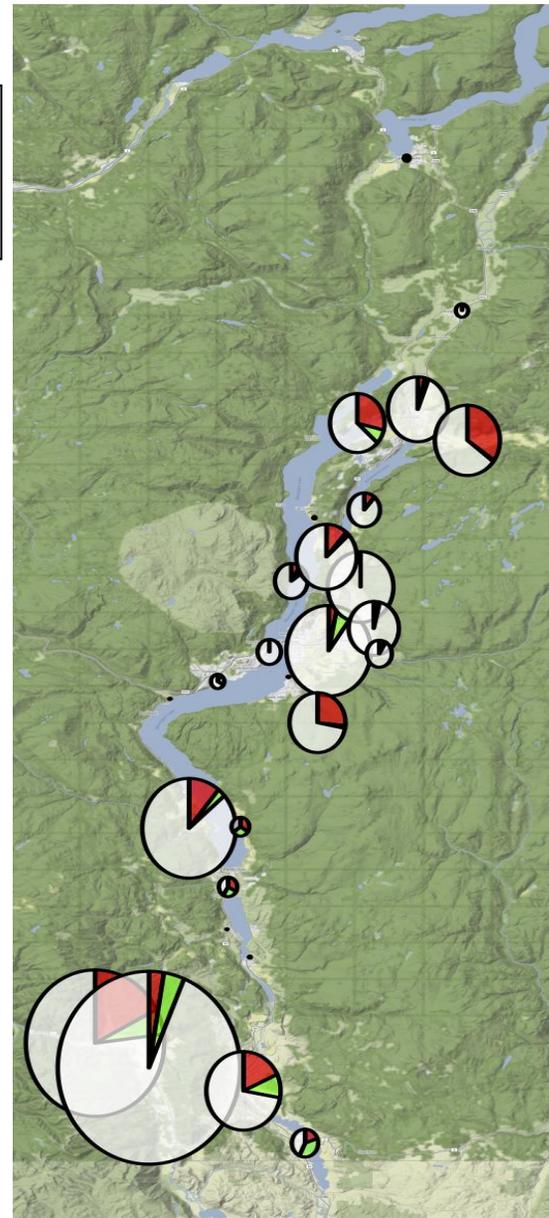
Every season, some orchards have more damage while other orchards have less damage than in the previous season. In 2025, there were more orchards with greater damage than there were with less damage.



Like the map above, this map depicts the acreage of pome fruit grown in each region, based on the size of the pie chart. Red slices of the pie charts show orchards that had more infested fruit this year compared to last, while green slices show orchards that had less damage this year than last year. White slices represent orchards that had no change in damaged fruit (this includes orchards that have no damage or were not sampled. Orchards that were not sampled showed no signs of infestation throughout the growing season). These changes in damage might be large or they might be as small as one more/less infested fruit out of 500 sampled. Reporting the same statistics year over year is one way the program remains accountable. These results are reported in Appendix 2.

There was no single, common factor that could be identified as the cause for the overall increase in damaged fruit in 2025. Different causes for infestations were identified in different regions.

Increases in damaged fruit were concentrated around packing plants and their associated bin piles in Cawston and Keremeos. Some of these increases in damage were likely from the recent movement of codling moth on infested apple bins, while other increases were from previous infestations of codling moth that were not completely contained.



This map, like the one above, shows where most of the apples & pears are grown (based on the size of the pie charts). Red slices of the pie charts represent the proportion of orchards where there was MORE damage this year than last. Green slices indicate orchards where there was LESS damage this year than last. White slices represent orchards with NO change in damage or were not sampled.

A number of badly infested “hot spot” orchards also contributed to increases of infested fruit. This occurred in Oliver, Osoyoos, Penticton, Naramata, South Kelowna, Belle Vista and Coldstream. A hot spot can be described as an orchard where the codling moth population has escaped the control of sterile insect releases alone. Unless additional management tools are applied correctly, the population can grow exponentially and spread quickly to surrounding orchards. In some instances, hot spots were contained by well timed sprays applied properly by the grower. In other instances, incorrect pesticide timing or coverage caused the spray(s) to not work as expected.

Abandoned and neglected apple orchards/apple blocks contributed to codling moth problems in some areas, most notably in Keremeos, Oliver, Summerland, Coldstream and Belle Vista.

Changes in the amount of infested fruit between years reveals where the Program is succeeding and where it needs to invest more resources to contain codling moth populations in the upcoming season.

SECTION 3

Codling Moth Larvae (Banding)

Cardboard bands are used to monitor codling moth populations in both orchards and backyard trees. The focus of banding efforts in orchards in 2025 was to collect larvae to increase the genetic diversity of the colony at the rearing facility. Consequently, resources were focused on installing and removing bands, rather than counting larvae collected. There is no orchard banding data to report for the 2025 growing season.

Urban banding is discussed below.

SECTION 4

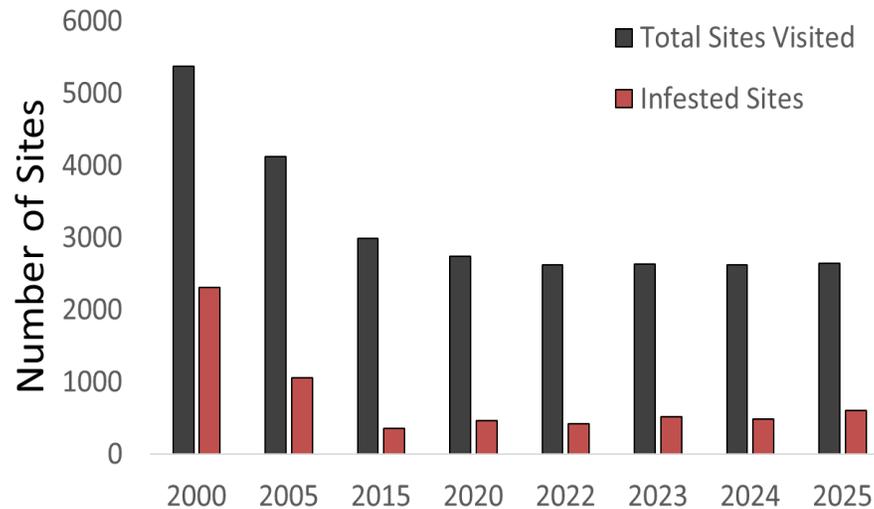
Background: Backyard Apple Trees

While many Okanagan residents enjoy growing backyard fruit, most fruit tree owners do not manage pests with the same rigor as commercial fruit growers. Many residents lack the knowledge, resources, or physical ability to manage pests in their trees. Other residents may be unaware that fruit trees are growing on their property.

Backyard apple and pear trees can create problems for commercial orchards because pests do not respect property lines. If wild moths mate and become fertilized in backyard trees, and fly to a neighboring commercial orchard, the sterile moths released in that orchard will not protect the fruit from being damaged. Consequently, a community-based approach to pest management is required.

When the program first started, and its goal was eradication, it worked very aggressively to remove as many wild trees and abandoned orchards as possible. These trees were refuges for the wild pest populations and an obstacle to eradication. As the Program's mandate has evolved from eradication to suppression, so did its approach to backyard apple and pear trees.

Today the Program focuses its resources on backyard apple, pear, and quince trees within 200 m of commercial orchards. Program staff visit these trees multiple times a season to ensure responsible tree ownership and that they are free from infestation. If trees are found to be infested, program staff work with the homeowner to convey the importance of pest management and provide information necessary for the homeowner to take care of their



The SIR Urban Program focuses on trees within 200 m of commercial orchards but can visit any property that is infested.

78% of the urban residences visited in 2025 were completely free of codling moth.

backyard trees. If homeowners refuse to reduce pest populations in their backyard trees, the program can carry out this work itself and charge the cost to a homeowner's taxes as a last resort.

The program does not release sterile insects in urban backyards, instead we recommend homeowners hire professionals to spray the trees or to pick off the infested fruit by hand themselves. Keeping infestations out of backyard trees allows all members of the community to benefit from reduced pesticide usage in the region.

Backyard Infestations in 2025

Over the years, both the total number of backyard trees and the number of sites with infested trees have declined. In 2025, 598 of the 2638 (78%) properties visited were free of infestation. This is a small decrease compared to 2024, where 82% of properties were free of infestation.

SECTION 5

Background: Pesticide Reduction

For most of the 20th century, pesticides were the main tool for controlling all agricultural pests, including the codling moth. Before the start of the OKSIR Program, the average grower applied 2-3 applications of broad-spectrum insecticides per season to control the codling moth. These pesticides not only killed pests, but also the beneficial insects that lived in the orchards, creating a situation where pests required constant control by pesticides. These pesticides also created hazards for farm workers and those living on and around orchards.

Supporting local agriculture while reducing pesticide usage is the main reason for the Program's existence. While pesticides are still used judiciously to control codling moth hot spots, the amount of pesticide, in terms of both the kilograms of pesticides used and number of sprays applied (and/or recommended), have decreased dramatically since the Program began.

It is difficult to measure exactly how much pesticide is used against the codling moth every season. One way to do this is to look at the amount of pesticide sold in the Program area. Pesticides sales are provincially regulated; thus all sales are recorded in a government database and are available for analysis.

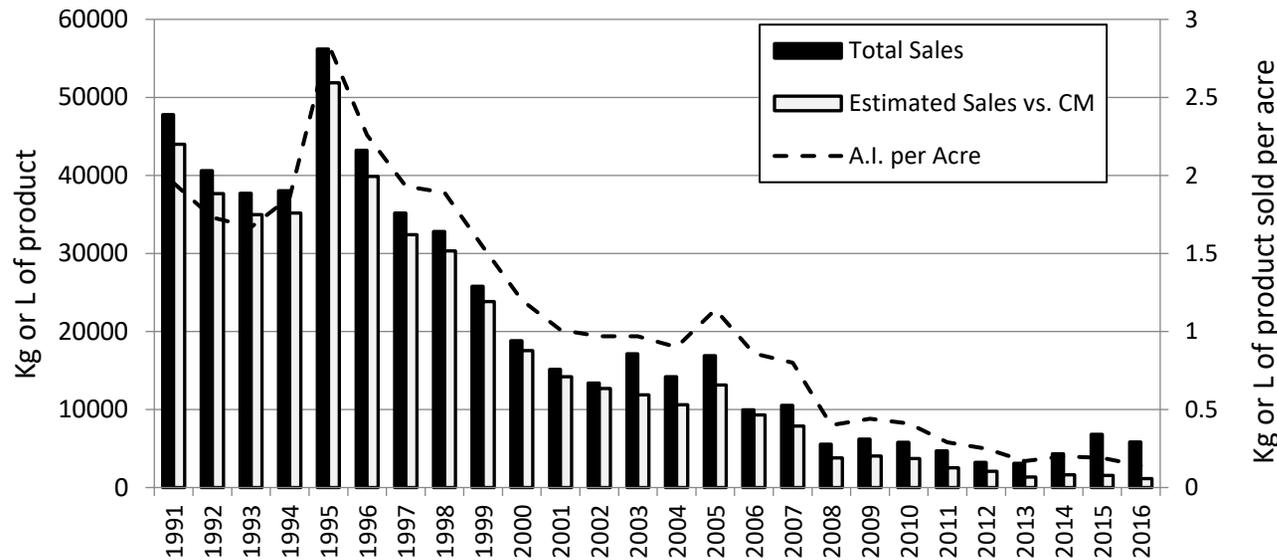
Between 1991 and 2016, the quantity (Kg or L of active ingredient) of pesticides sold (that are registered for use against the codling moth) has decreased by 88%. However, the total acreage of pome fruit in the Okanagan has also decreased from 1991-2016, so it is likely that the quantity of pesticides purchased would also have decrease. Taking the decrease in acreage into account, the quantity of pesticide (active ingredient of pesticide/acre) has decreased by 93%. Furthermore, some of these pesticides sold are used against more than one pest and/or on different crops.

For example, Delegate® is a pesticide used to control spotted wing drosophila, a serious pest of cherries, as well as the codling moth. The increased sales of Delegate® is most likely driven by the invasion of this serious pest, rather than increased codling moth populations. This increase can be seen starting in 2013, around the time when this pest was becoming a serious problem. Local pesticides sales representatives and former Ministry of Agriculture staff have estimated that the pesticides used against the codling moth have decreased by 97% from 1991 to 2016.

Over the past 30 years, the formulations and active ingredients have changed as well. Newer formulations of pesticides require a lower amount of active ingredient per acre, sometimes by as much as 75% less, which would also account for some of this decrease. While none of these measures are perfect, they all suggest major decreases in pesticide usage in the Program area for codling moth management.

Pesticide usage against the codling moth is difficult to measure, because it would require voluntary reporting by every grower. Pesticide sales data suggest that it has decreased by 88-97%, when correcting for changes in acreage and usages against other pests.

Total Annual Sales and Estimated Use of CM Control Products (kg or L) , 1991-2016, OKSIR Program Area



The majority of apple and pear growers do not spray to control the codling moth. The Program recommends that 23% of growers supplement sterile insect releases with at least 1 application of pesticide.

Estimating Pesticide Usage Estimates from Spray Recommendations in 2025

Another way to evaluate pesticide usage is through counting the number of sprays recommended. As active ingredients and formulations of pesticides have changed, more sprays are needed to reach the level of control of the older, more toxic pesticide products. Prior to the start of the SIR Program, estimates suggest the average grower applied 2-3 applications of broad-spectrum insecticides per season to control codling moth. Broad spectrum residues would last 3 weeks and kill any insects that contacted them, including beneficial ones.

Today, 3-5 applications of “reduced risk” insecticides are needed to achieve the same level of control as with 2-3 of the older products. Reduced risk insecticide residues last for 10-14 days and need to be either ingested by the pest or applied directly to the eggs. This means that the days of controlling multiple orchard pests with a single

spray are largely behind us. As many as 10 applications of organic pesticides would be required for the same period of coverage as older, broad-spectrum insecticides.

The Program’s staff makes recommendations to growers based on the amount of infested fruit found and/or the number of wild moths captured. The Program estimates that approximately 23% of growers were spraying for codling moth in 2025 based on its recommendations. Some of these growers are spraying once or twice while others need to spray more often (see table below).

| Year | No spray recommended | 1-2 sprays Recommended | 3+ sprays Recommended |
|------|----------------------|------------------------|-----------------------|
| 2019 | 72% | 13% | 15% |
| 2020 | 76% | 8% | 15% |
| 2021 | 79% | 9% | 9% |
| 2022 | 84% | 3% | 13% |
| 2023 | 82% | 5% | 13% |
| 2024 | 77% | 8% | 15% |
| 2025 | 77% | 10% | 13% |

CONCLUSIONS

The SIR Program continues to work with growers and residents to keep codling moth populations at extremely low levels. The vast majority of pome fruit acreage (86%) had extremely low levels of infested fruit ($\leq 0.2\%$). 78% of residential properties with pome fruit trees were free of codling moth.

The Program fell just short of its target of 90% of orchards with $\leq 0.2\%$, infested fruit. However, this proportion is well with the average range of the past decade. We estimate that 77% of the orchards are not applying any pesticides to control the

codling moth. The measures the program uses to gauge its success have limitations; however, they all independently support the same conclusion, that the SIR Program is achieving effective, economic, and environmentally friendly control of the codling moth on nearly 90% of the acreage.

Every season, some codling moth infestations improve while others worsen. While the average number of wild moths per trap was the same in 2025 compared to 2024, there were slightly more orchards with worsening codling moth infestations, and a larger proportion of the program acreage above the damage threshold. Slightly fewer urban properties were free from codling moth in 2025 (78%) compared to 2024 (82%). There was no one common factor that could be identified as the cause for the slight increases. Instead, the challenges facing each area and orchard were often different and unique to the growers and region in which increases were seen.

A small proportion of orchards, less than 10%, account for the majority of all wild moths captured (55%) and contribute to most of the infested fruit found in the Program area. Some of our worst hot spot orchards showed significant improvement, while other hot spots orchards stayed the same or worsened.

Codling moth populations in hot spot orchards are too large to be controlled by sterile insect releases alone. Supplementary tactics, like mating disruption and sprays must be applied to bring the pest populations down under control. Codling moths can spread short distances out of hot spots to neighboring orchards and longer distances to packing facilities in infested apple bins. The challenge for the SIR Program continues to be identifying these growing populations and working to coordinate pest management activities to contain the problems before they grow and spread.

Appendix 1

| Area | Total Acreage | Acres Above Damage Target | Acres Below Damage Target |
|---------------|---------------|---------------------------|---------------------------|
| Bella Vista | 298 | 75 | 223 |
| Belgo | 137 | 6 | 131 |
| Benvoulin | 127 | 0 | 127 |
| BX | 327 | 19 | 308 |
| Carrs Landing | 12 | 1 | 11 |
| Coldstream | 355 | 120 | 235 |
| Cawston | 995 | 36 | 959 |
| East Kelowna | 461 | 22 | 439 |
| Ellison | 359 | 0 | 359 |
| Glenmore | 178 | 23 | 155 |
| Kaleden | 4 | 2 | 3 |
| Keremeos | 755 | 141 | 615 |
| Naramata | 96 | 47 | 49 |
| OK Falls | 10 | 0 | 10 |
| Oliver | 405 | 70 | 336 |
| OK Mission | 7 | 3 | 4 |
| Osoyoos | 144 | 37 | 107 |
| Oyama | 172 | 3 | 169 |
| Peachland | 6 | 6 | 0 |
| Penticton | 100 | 51 | 50 |
| Rutland | 274 | 6 | 267 |
| Salmon Arm | 32 | 15 | 17 |
| Spallumcheen | 67 | 2 | 65 |
| Summerland | 510 | 44 | 467 |
| South Kelowna | 305 | 87 | 219 |
| Winfield | 330 | 38 | 291 |
| West Kelowna | 73 | 12 | 61 |

Appendix 2

| Area | Total Acreage | Acreage with Increased Damage | Acreage with Decreased Damage | Acreage with no change |
|---------------|---------------|-------------------------------|-------------------------------|------------------------|
| Bella Vista | 298 | 86 | 23 | 188 |
| Belgo | 137 | 10 | 2 | 125 |
| Benvoulin | 127 | 0 | 0 | 127 |
| BX | 327 | 13 | 6 | 308 |
| Carrs Landing | 12 | 1 | 0 | 11 |
| Cold Stream | 355 | 123 | 3 | 229 |
| Cawston | 995 | 26 | 36 | 933 |
| East Kelowna | 461 | 15 | 31 | 415 |
| Ellison | 359 | 0 | 0 | 359 |
| Glenmore | 178 | 16 | 11 | 151 |
| Kaleden | 4 | 2 | 0 | 3 |
| Keremeos | 755 | 131 | 43 | 581 |
| Naramata | 96 | 33 | 30 | 34 |
| OK Falls | 10 | 5 | 0 | 5 |
| Oliver | 405 | 73 | 40 | 293 |
| OK Mission | 7 | 2 | 4 | 1 |
| Osoyoos | 144 | 28 | 54 | 62 |
| Oyama | 172 | 19 | 1 | 152 |
| Peachland | 6 | 0 | 6 | 0 |
| Penticton | 100 | 33 | 26 | 41 |
| Rutland | 274 | 8 | 3 | 263 |
| Salmon Arm | 32 | 13 | 15 | 3 |
| Armstrong | 67 | 0 | 2 | 65 |
| Summerland | 510 | 55 | 14 | 441 |
| South Kelowna | 305 | 81 | 4 | 220 |
| Winfield | 330 | 38 | 6 | 286 |
| West Kelowna | 73 | 5 | 20 | 49 |