

6 February 2013

Prepared by Marion Paibomesai & Margaret Appleby, OMAFRA

marion.paibomesai@ontario.ca
519-826-4963

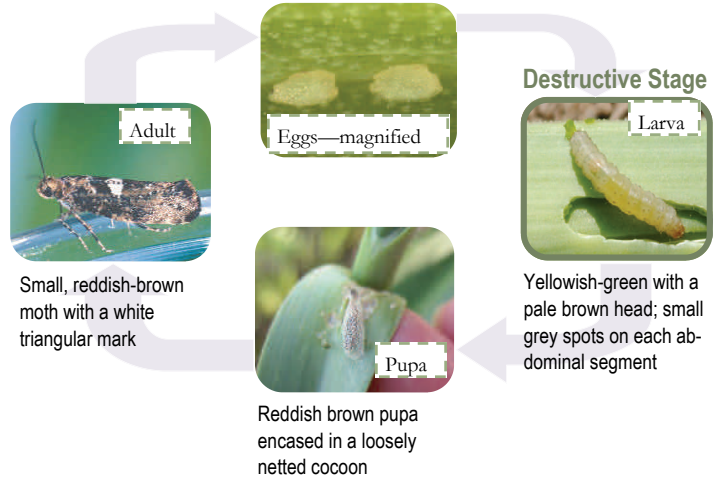


What are Leek Moth?

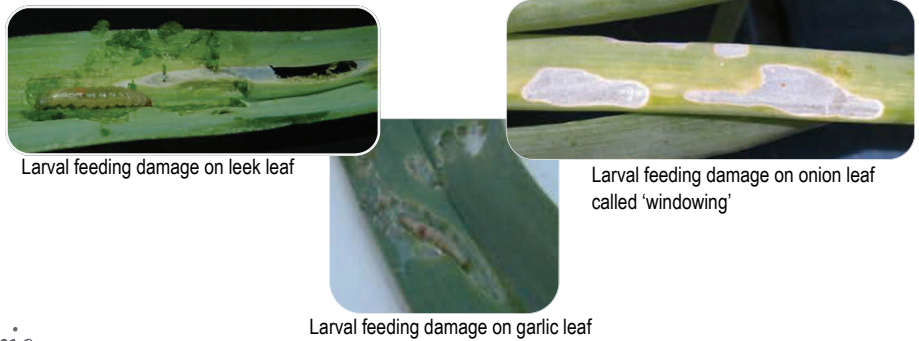
The leek moth, *Acrolepiopsis assectella*, is an invasive species of European origin, which causes feeding damage on *Allium* spp. including vegetable crops (dry bulb onions, green onions, garlic, leeks, etc.) and native plants (wild garlic, ramp, etc.). It was first identified in the Ottawa area in 1993 and recognized as a new introduction by the scientific community in 1997. Leek moth has caused significant damage to allium crops, particularly those grown by organic market garden producers in eastern Ontario and southwestern Quebec.

Leek moth is considered a regulated pest in the U.S. and will likely affect all Ontario and Quebec exports of green *Allium* spp. to the U.S. Leek moth was positively identified in the U.S. in Upper New York State in 2009 through 2011 and Vermont.

Leek Moth Lifecycle



Leek Moth Damage



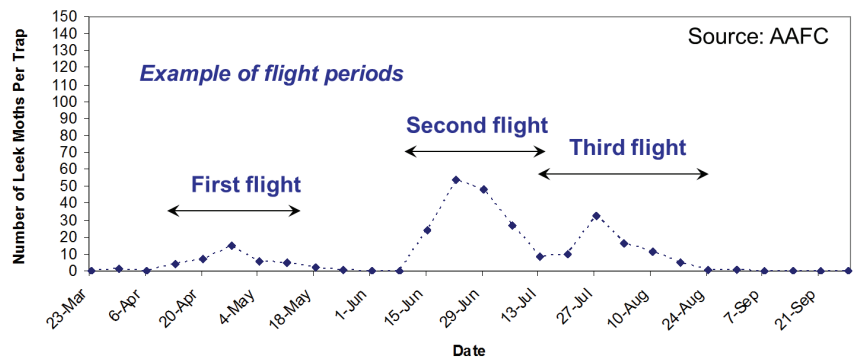
Leek Moth Flights in Ontario

- Based on data from Eastern Ontario, there are 3 flights periods/year = One overwintering generation, two more generations during season
 - Predicted to have 3-4 generations in Southern Ontario, maybe up to 5 generations in extreme southwestern parts of the province
 - Limited data for Southwestern Ontario

• Likely overwinter as adult moths in buildings, plant debris and hedges. In the next year, adults start emerging late April to early May when daytime temperatures reach 15°C

- Number of moths generally increases over the season
- Degree day model exists to help determine flight timing during the season

• Can be monitored using Delta I or II traps with pheromone lure to attract male leek moth



Past Surveys of Leek Moth in Ontario

From a survey in 2007, leek moth were trapped in central Ontario with no captures in allium growing regions in southwestern Ontario. During the 2011 growing season, the Fresh Vegetable Growers of Ontario supported a small survey for leek moth in southwestern Ontario. The goal of this survey was to determine if the leek moth had spread into major allium growing regions in the province. From this survey, leek moth were captured in Waterloo County, which is the furthest west leek moth has been found in Ontario (**Figure 1**). Leek moth were also caught in Simcoe County and York Region (**Figure 2**).

Interestingly, several specimens of the carrion flower moth (*Acrolepiopsis incertella*), a leek moth look-alike, were captured in the pheromone traps placed in wild leeks in Oxford County. Not a pest of *Allium* spp., the carrion flower moth is harmless native moth species that looks very similar and is closely related to the leek moth. In general, there is typically one generation per year of carrion flower moth with first generation adults emerging from May to June. The range of this species covers most of eastern U.S., with southern Ontario at the most northern part of its range.

In 2011, the carrion flower moth population peaked in early June, which showed no overlap with the leek moth populations monitored in the same season in Southwestern Ontario (**Figure 2**, based on 2011 data). It is not known whether or not the carrion flower moth is attracted to the leek moth specific pheromone lure.

With the possible overlap of leek moth and carrion flower moth ranges, it is important to track the emergence patterns of each species.

According to research done by Peter Mason, a Research Scientist from Agriculture and Agri-Food Canada (AAFC) in Ottawa, it is predicted that the leek moth will continue to move south and west of areas where it is currently found. It is also predicted that more generations of leek moth may occur in extreme southwest regions of the province.

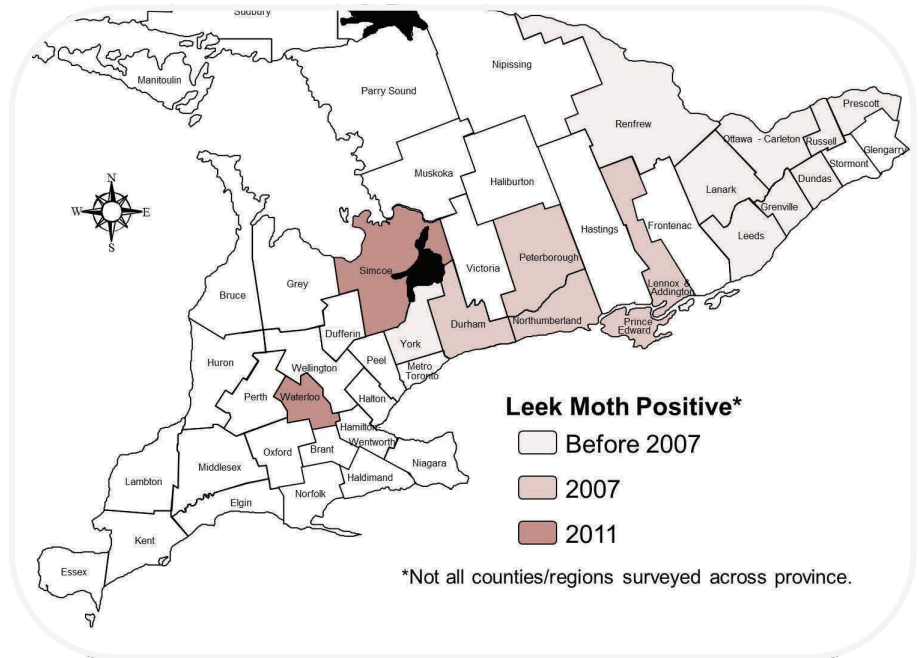


Figure 1. Distribution of leek moth across Southern Ontario, 2011.

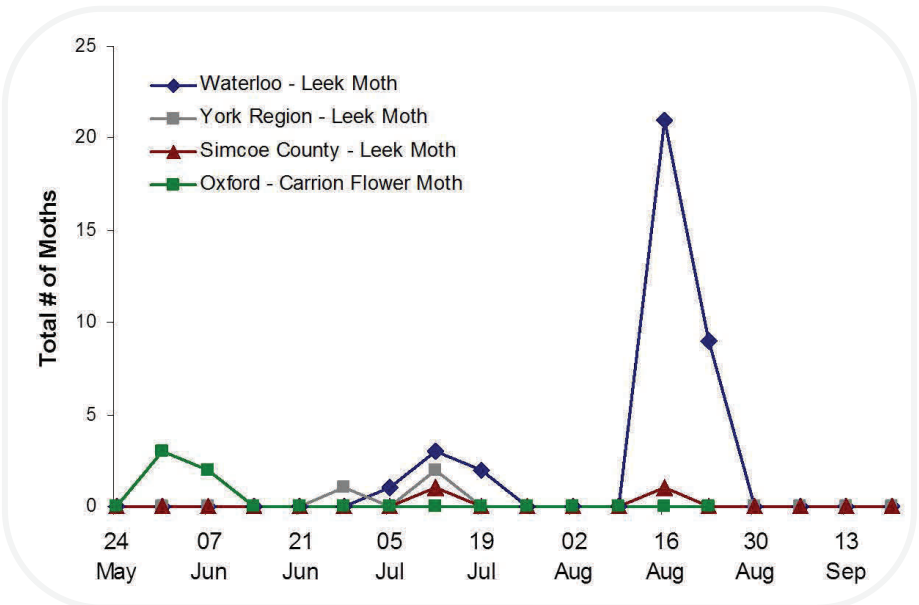


Figure 2. Total number of leek moth and carrion flower moth, 2011.

Distinguishing between leek moth and carrion flower moth adults requires microscopic examination of mating organs.



Look-Alikes! Leek Moth (left) and Carrion Flower Moth (right)

Objectives & Methods for 2012 Survey

The objective of this survey was to determine the distribution of leek moth in allium growing regions of southwestern Ontario during the 2012 growing season in various allium crops.

Adult leek moths (males) were monitored using commercial pheromone lures and Delta I traps (Distributions Solida). Traps were installed at several locations in southwestern Ontario including, Waterloo Region, Wellington County, Oxford County, Brant County, Perth and Grey Counties in garlic, leeks and wild leeks.

At each site, one or two pheromone traps were installed at the field edge between mid-April and beginning of June and changed on a weekly or biweekly basis until late August. At sites where leek moth were detected or where allium crops were actively growing, the traps were maintained until the end of September. Trap liners were examined and numbers of leek moth were recorded.



Leek moth pheromone trap

Overall Results

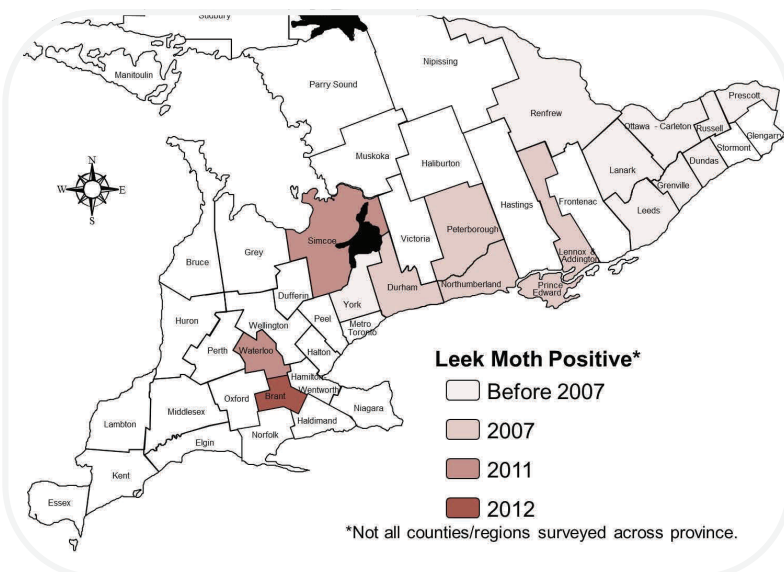


Figure 3. Distribution of leek moth across Southern Ontario, 2012.

In 2011, carrion flower moths were captured in wild leeks from early to mid-June. While in 2012, carrion flower moths were captured earlier from early to mid-May. Earlier emergence was likely due to the warm March temperatures. Not a pest of *Allium* spp., the carrion flower moth is harmless native moth species that looks very similar to the leek moth. In 2011, the carrion flower moth population peaked in early June, which showed no overlap with the leek moth populations monitored in Southwestern Ontario (Figure 2). However, in 2012, the carrion flower moth emergence was very close to overlapping with the first flight of leek moth (Figure 4).

Two years of data suggests that the carrion flower moth may be attracted to the pheromone trap, but this would need to be confirmed. Also, distinguishing between the two species requires specific training, thus there will be some follow-up with researchers to determine a possible quick identification method for the future.

Of the 7 sites monitored during the 2012 season, leek moth were captured at two sites (Brant County and Waterloo Region, Figures 3 and 4). A single leek moth was captured at a Brant County site.

Traps were installed in mid-April to attempt to capture the first flight. However, only part of the first flight was captured due to early leek moth emergence likely as a result of warm temperatures in March 2012. Leek moth populations peaked in late April, late June and late August with perhaps another peak in early September, which suggests a potential of 4 flight periods (Figure 4), but with very low population numbers and limited data it is difficult to determine if there is indeed a fourth flight occurring. The 2012 counts were low compared to 2011 counts (highest number of moths captured at one site at one collection date in 2011 = 21, in 2012 = 2) (Figure 4).

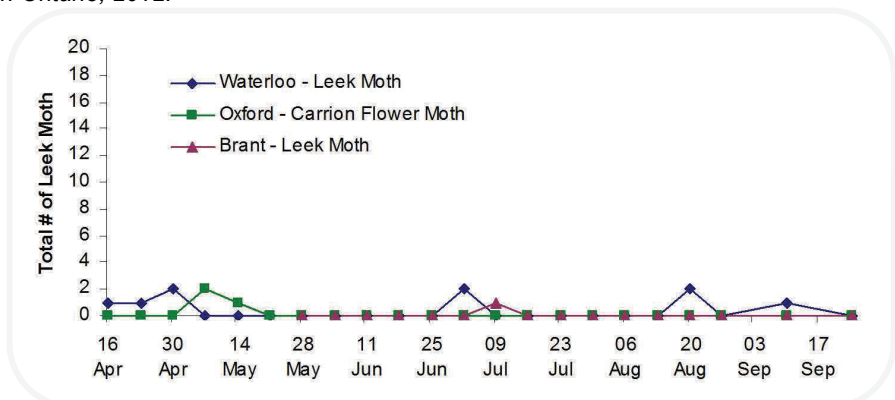


Figure 4. Total number of leek moth and carrion flower moth, 2012.

From the last two years of survey work, leek moth has been identified in Waterloo Region, Simcoe County and Brant County, demonstrating that the leek moth is spreading south and west as previously predicted by AAFC. Overall, this data provides important information that can be used to help determine the rate of spread of leek moth across allium growing regions.

Leek Moth Management Tips

Goal is to prevent infestation and minimize populations

- Exclusion via **floating row covers** which are anchored to ground with bags filled with sand or gravel, filled firehose, etc.—**not supported with hoops**
 - May be removed for weeding during day, replaced before dusk
 - In Eastern Ontario, installed before or as soon as you catch leek moth in the traps maintained until harvest or end of last flight of the season
- **Crop rotation** — Avoid growing alliums year after year in same location
- **Avoid planting near infested areas**
- **Early harvest** to avoid damage from high populations later in the season
- **Sanitation** by destroying plant debris (burn or bury!)
- **Monitoring with pheromone traps** to time row cover and pest control product applications
(list of products on next page)

Pheromone Trap Information

- Delta I or II trap with sticky liner with leek moth specific pheromone lures (various suppliers)
- Installed ~1 m from edge of field in crop beginning in late March (or earlier when daytime temperature reach 15°C) until harvest
- Change liners weekly and lures biweekly, recording # of leek moth every week



Resources

There are various resources and updates available for leek moth information, including:

- **Leek Moth ID sheet** (Contact Marion Paibomesai for copies)
 - Laminated quick reference sheet will help with identification of different leek moth life stages and damage
- **OMAFRA Factsheet: Leek Moth – A Pest of Allium Crops** <http://www.omafra.gov.on.ca/english/crops/facts/08-009.htm>
- **Ontario CropIPM Leek Moth page** <http://www.omafra.gov.on.ca/IPM/english/onions/insects/leek-moth.html>
 - More pictures of leek moth life stages and damage
 - Information also available on other pests of allium crops
- Seasonal Updates on **ONvegetables.com blog** <http://onvegetables.com/>
- Please contact Marion Paibomesai if you suspect damage or have any questions at 519-826 4963, marion.paibomesai@ontario.ca

Pest Control Products for Leek Moth Control

Timing of pest control product application depends on the pest and product being used. For leek moth, there is specific timing information for registered products. For most products, applications are timed 7-10 days after peak trap captures based on pheromone trapping. The following table is provided as a guide only. Read the latest product label before using a pest control product. Labels for registered products may be found on the Search Pesticide Labels PMRA website <http://pr-rp.hc-sc.gc.ca/lr-re/index-eng.php>. Growers must be certified through the Grower Pesticide Safety Course in order to buy and use certain classes of pesticides.

Product <i>Active ingredient</i>	Crops	Pre-Harvest Interval	Pest on Label	Chemical Group—Family Name for Resistance Management Application Notes
Warrior, Matador 120EC <i>lambda-cyhalothrin</i>	garlic, elephant garlic, leek, dry bulb onion, green onion, Welch onion, shallots	14	Control of leek moth	Group 3A – pyrethroid Apply in 500 L/ha of water. Maximum of 3 applications/season.
Success 480SC, Entrust 80W <i>spinosad</i>	Crop Group 3-07, Bulb Vegetables: garlic, great-headed garlic, dry bulb onion, green onions, leeks, chives [fresh market], Chinese chives [fresh leaves], wild leek, shallots, bunching onion, tree onion [tops], welsh onion	3	Suppression of leek moth larvae	Group 5 – spinosyn Apply one week after peak pheromone trap captures for leek moth. Evening applications provide better control. Maximum of 3 applications/season. Entrust 80 W is organic. Check with certification body before use.
Delegate WG <i>spinetoram</i>	Crop Group 3, Bulb Vegetables: garlic, great-headed garlic, leek, dry bulb onion, green onion, Welch onion, shallot	3	Suppression of leek moth	Group 5 – spinosyn Use higher rates when insect pressure is high or insects are in advanced growth stages. Apply one week after peak pheromone trap captures for leek moth. Targets hatching eggs and small larvae. Maximum of 3 applications/season.
Bioprotec CAF <i>Bacillus thuringiensis</i> subspecies <i>kurstaki</i>	Chives, garlic, green onions, leeks, onions, shallots	0	Suppression of leek moth	Group 11 – biological The use of pheromone trap is critical to application timing, as this product must be ingested by larvae. Apply 7-10 days after peak flights as determined by pheromone traps. Thorough coverage of foliage is essential.

Photo Credits

Leek Moth Adult 1 & 2—J.F. Landry, AAFC
Carrion Flower Moth Adult—J.F. Landry, AAFC
Leek Moth Eggs—Andrea Brauner, AAFC
Row Cover 1 & 2—Andrea Brauner, AAFC