



Cranberry Integrated Pest Management Final Report



Project Leader: Leah Madore
Pest Management Specialist

Acknowledgements

I would like to thank the previous Pest Management Specialists that created and worked on this project, both Ruth-Ann Blanchard and Jane White, as well as all the producers that took part in this monitoring project - Lomond's Farm Ltd., Bob McFatrige, Walter Calloway, The Other Side Farms, and Deadman's Bay Cranberry Research Site. I would also like to thank the technicians that carried out field work - John Linfield, Dave Collins, Peter Compagnon and Margaret Barns. The comments and suggestions made by the editors Afton Madore and Carolyn Parsons were also greatly appreciated.

Table of Contents

Introduction	4-5
Methods & Materials	6
Results	7-9
Discussion	10-11
Sweep Netting	10
Pheromone Trapping	10
Action Thresholds	10-11
Conclusions	12
References	13

Introduction

Pest monitoring sites and data collecting are valuable information for producers. They can help producers understand the pest problems they are having and implement an integrated pest management (IPM) program that is right for their farm. An IPM program is important to have established so that pests/environmental conditions that can be economically severe are monitored, prevented and controlled. An action threshold is set for each pest, the point at which the pest population or environmental conditions indicates that action must be taken (US.EPA, 2009).

The cranberry industry in Newfoundland and Labrador is growing significantly. With this growth, IPM is becoming more important to implement. Proper pest identification is key to good pest control. The Black-headed Fireworm (*Rhopobota naevana*), the Cranberry Girdler (*Chrysoteuchia topiaria*), the Sparganothis Fruitworm (*Sparganothis sulphureana*) and the Cranberry Fruitworm (*Acrobasis vaccinii*) were the species of interest in this project. These four species are of great importance to the cranberry industry in Newfoundland and Labrador as they can be some of the most economically severe pests found on cranberry. Through the use of an IPM program large economic losses may be avoided.

Overwintering eggs of the Black-headed Fireworm (*Rhopobota naevana*) tend to be found on the underside of cranberry leaves. In the spring, damage is caused by the first generation of the caterpillars. The eggs hatch around late April to early June. The newly hatched larvae burrow into the leaf and move up to the growing tip of the upright runners. The first sign of infestation by this pest is the presence of furrows in the leaves. The larvae may tunnel into unopened buds or web together the terminal leaves of uprights with silk and feed inside this shelter or “tent”. After a feeding period of three to five weeks, fully grown larvae pupate in the trash layer or within their tents. The first generation adults are active and lay eggs from late May to mid June. Other cranberry producing areas across Canada, such as Quebec and British Columbia, have typically seen two generations of this pest. The second generation eggs are laid toward the tips of the uprights, on the underside of leaves. The second generation larvae occur from mid June to the last of August. The adults fly from mid July through September and the cycle repeats (BCCGA, 2008) (Leslie, ND) (Landry, Roy, Turcotte, 2000).

The Cranberry Girdler (*Chrysoteuchia topiaria*) overwinters as a mature larvae wrapped in a silk cocoon covered with soil. The moths emerge from the soil and take flight from early June until mid July. Eggs are scattered on the trash of the cranberry beds during the flight period. The larvae emerge after a period of four to 14 days, depending on temperature. Young larvae feed on soft tissues such as crowns, leaves and roots of grasses, whereas mature larvae feed on the bark of the cranberry roots and underground stems, girdling and severing vines. Larvae do most of their damage from late August through early September. The affected plants turn red, then brown. The symptoms are usually visible in the fall or following spring after the damage has occurred. As well, the presence of excrement in strands of silk near the damaged stalks can be seen. This pest typically has only one generation per year (BCCGA, 2008) (Leslie, ND) (Landry, Roy, Turcotte, 2000).

The Sparganothis Fruitworm (*Sparganothis sulphureana*) overwinters in the early larval stage on the flooded beds. They come out of hibernation around mid May, when new growth begins in the spring. The larvae mature in June and July while feeding on the foliage and blossoms. The larvae web continues to expand to include more leaves which eventually skeletonize the leaves turning them brown. They pupate for seven to 12 days and the adults emerge throughout July. Other cranberry producing areas across Canada, such as Quebec and British Columbia, have typically seen two generations of this pest. Oviposition occurs within two days after emergence and the second generation emerges from the egg mass in nine to 12 days. They begin feeding on the foliage and directly on the fruit. Each larva mines three to five berries and scars the surface of several others. This generation causes the most damage. The second generation larvae pupate after 50-60 days (in August) within the fruit or on a webbed upright. The adults emerge in late August through September, and the eggs again are laid within two days. The larvae emerge and the caterpillars go into hibernation by mid to late September (Mahr, 2005) (Leslie, ND) (Landry, Roy, Turcotte, 2000).

The Cranberry Fruitworm (*Acrobasis vaccinii*) overwinters as a fully grown larva in a cocoon made of silk and soil particles. It is found under weeds and soil debris near the soil surface. In the spring, the larvae pupate and moths emerge from bloom to fruit set. After eggs are laid on the developing small green fruit, the eggs hatch in about five days, which is temperature dependant. Thereafter the larvae move to the stem end of the fruit, enter the fruit, and feed inside the berry. The caterpillars of this species only damage the fruit, and cause them to redden prematurely. The entrance hole into the berry will be covered with silk, and can be seen near the peduncle, as well frass/excrement can be found in the fruit. The infested fruits shrivel up and can remain attached to the peduncle until the following spring. Typically this pest has only one generation per year (OMAFRA, 2008) (Longstroth, 1999) (Leslie, ND) (Landry, Roy, Turcotte, 2000).

Methods and Materials

Five on-farm sites were established province-wide to monitor the populations of Black-headed Fireworm, Cranberry Girdler, Sparganothis Fruitworm and Cranberry Fruitworm on commercial cranberry farms. These five farms, totaling 30 acres, were monitored on a seven to ten day interval through the use of sweep netting and pheromone trapping over a three-year period.

Sweep net sampling began at bud break and was carried out until August, although, during the flowering stage, the frequency of the monitoring was reduced to avoid damaging the flowers. Sweeps were made using a V-, Z-, or W- shaped route consecutively through the marshland. The sweep nets were emptied onto a drop sheet and the species of interest were counted as well as beneficials and any other observations recorded.

Adult moth activity of all species was collected using IPM wing traps (Tréce Kits) baited with species specific pheromone. One trap for each species was placed on each farm. The traps were placed in areas where the prevailing winds were upwind so the scent would be carried across the marshland.

Results

Pheromone trapping:

Black-headed Fireworm:

The Black-headed Fireworm was detected across the province of Newfoundland and Labrador (Fig.1). There are usually two generations per year, although little to no second generation activity was actively captured during this project.

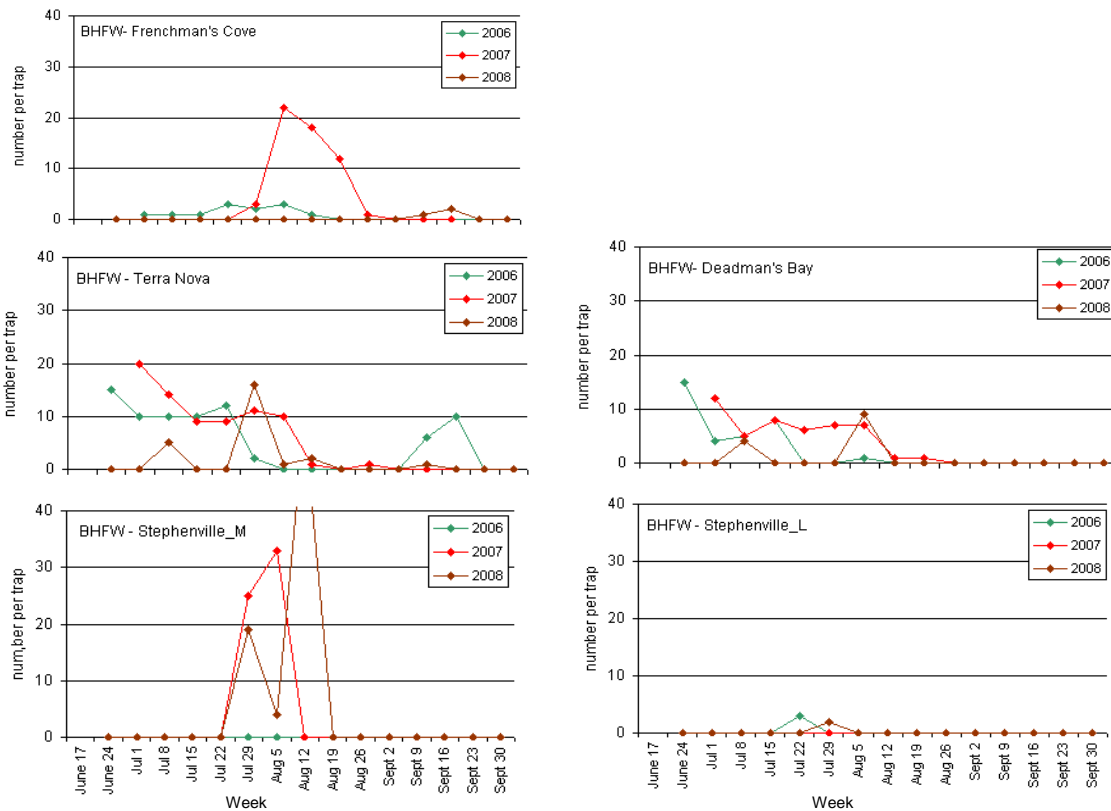


Figure 1: Pheromone trap catches of adult Black-headed fireworm (*Rhopobota naevana*) 2006-2008.

Cultural and biological treatments are available, but more are needed. When using a pesticide treatment to control these pests it must be remembered that timing is critical for control. Some of the alternative hosts for this pest include mountain ash, cherry, apple and other *Vaccinium* spp. It is suggested that the alternative hosts surrounding cranberry beds be controlled to deter these pests from finding an alternative food source (Landry, Roy, Turcotte, 2000).

Cranberry Girdler:

The Cranberry Girdler was found to be well distributed across Newfoundland and Labrador (Fig. 2). The moths were found to be present from emergence (in late June) throughout the summer and into mid-August.

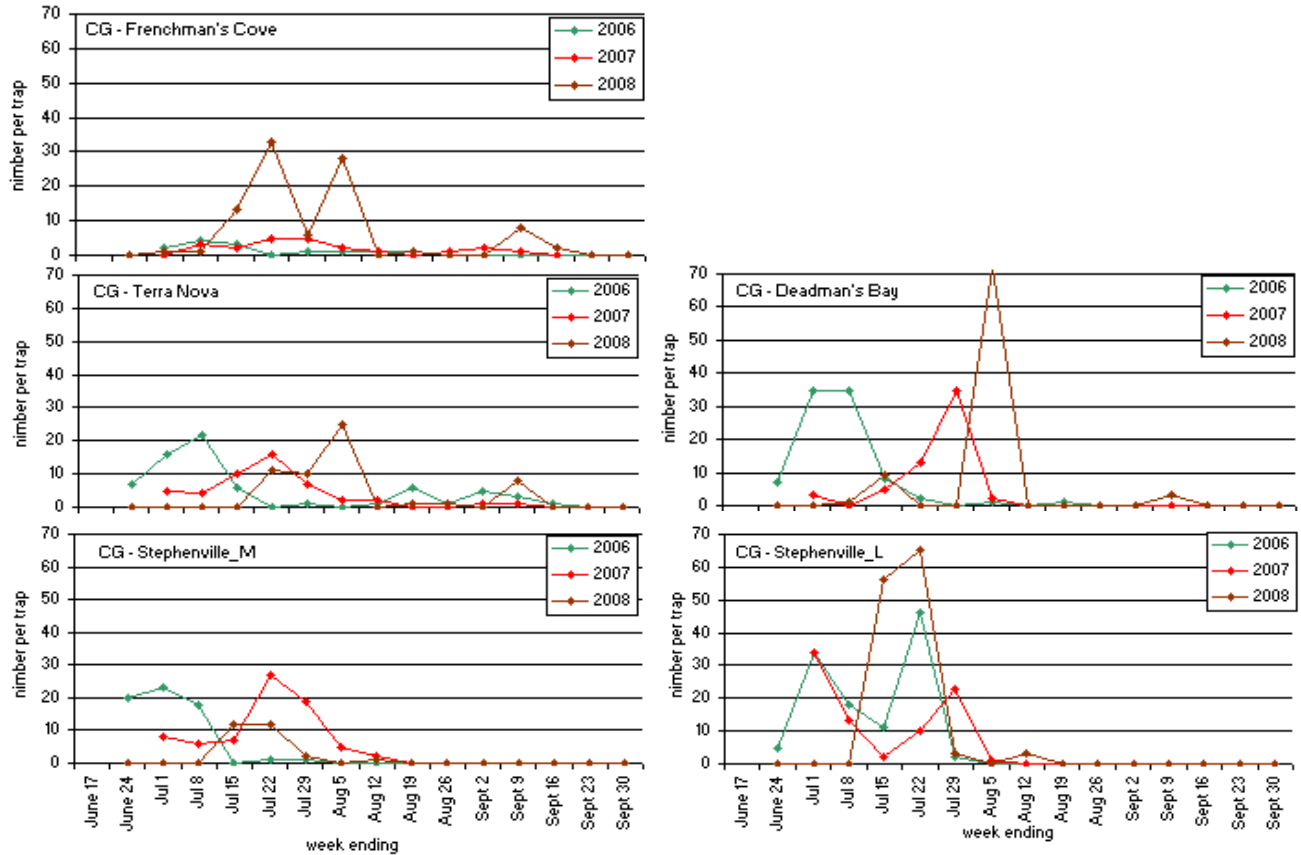


Figure 2: Pheromone trap catches of adult Cranberry Girdler (*Chrysoteuchia topiaria*) 2006-2008.

Sparganothis Fruitworm:

The Sparganothis Fruitworm, although few specimens were found in 2006 and 2007, was captured sporadically in both traps and larval scouting in 2008. The populations were found to be lower at the west coast sampling sites than at the east coast sites. The adults were found to emerge mid-June and early-August, as there are typically two generations per year.

Cranberry Fruitworm:

The Cranberry Fruitworm was found to be distributed across the province (Fig 3). Throughout this project, population numbers appeared to be somewhat lower at the west coast sites sampled than the east coast sites sampled. The activity of the adult moth was found to be mid-July to mid-August in Newfoundland and Labrador. As the populations progressed and grew each year, it was found that the Cranberry Fruitworm had the highest populations throughout each season on nearly all the locations.

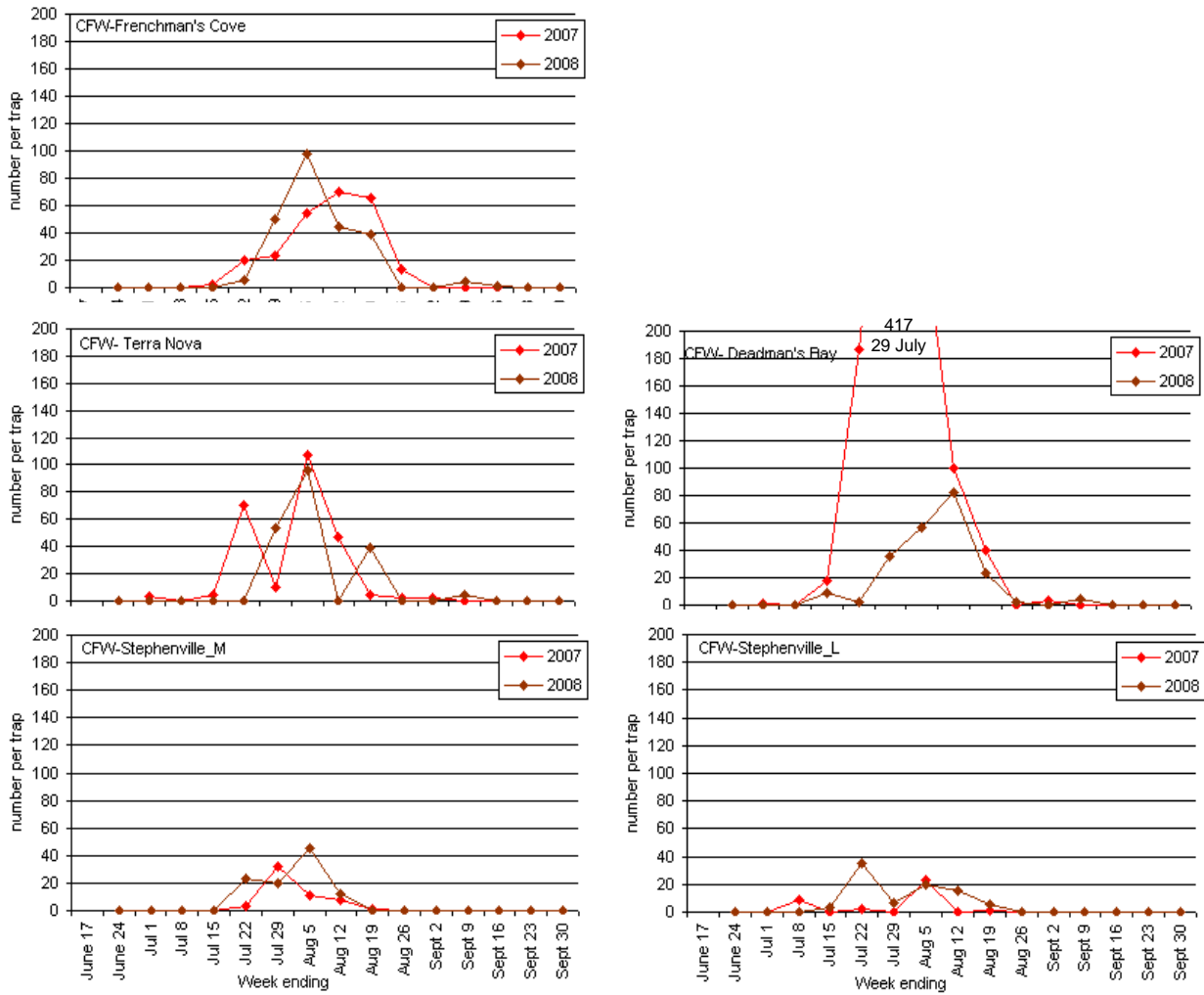


Figure 3: Pheromone trap catches of adult Cranberry Fruitworm (*Acrobasis vaccinii*) 2007-2008.

Discussion

Sweep netting:

The larvae of the Black-headed Fireworm were found across the province from mid June to early July. This pest had the highest populations of the four species of interest found during sweep net monitoring. There were very few Cranberry Girdler larvae found during sweep net counts. The larvae of the Sparganothis Fruitworm were found across the province during early June, with sporadic population numbers during the netting season. The Cranberry Fruitworm larvae had consistently low populations across the province for the three years of monitoring. They were found from late June to early September.

While monitoring through the use of sweep netting, there were abundant populations of beneficial insects found throughout this project. These beneficials were assorted genus of Arachnids (spiders), assorted genus of bees (native and non-native) and wasps, as well as some Lepidoptera (butterfly/moth) species.

Pheromone trapping:

The monitoring sites were setup at the end of May/beginning of June. For each site, the traps were placed out the middle of June and populations were detected at the end of June/beginning of July. The Cranberry Girdler seemed to be the first species of interest to arrive, followed by the Cranberry Fruitworm and the Black-headed Fireworm respectively. The Sparganothis Fruitworm was found only on certain bogs in very small numbers.

The populations seemed to be highest for all species of interest from mid-July to mid-August and diminished near the middle of August/beginning of September. The Black-headed Fireworm and Cranberry Fruitworm were found in higher numbers than the other pests monitored, therefore the possibility of higher damage to the crop could occur with these pests. In order to determine if a pest will be economically damaging to a crop, the action threshold can be calculated. If populations of pests are above these thresholds, control measures should be taken.

Action Thresholds:

The Black-headed Fireworm should be monitored for damage and symptoms on the cranberry plants. A visual inspection is advisable to see whether there are any webs. Proper identification of this pest is key to choosing control measures. This pest can be held at an action threshold of 1-2 larvae per sweep set (20 sweeps) (Allard, Le Duc, Turcotte, 2004).

There is no action threshold currently available for the Cranberry Girdler. This pest is a secondary pest and is not always found in economical numbers, therefore no thresholds have been established for this pest. A common practice is that once a cumulative count of 100 adults per trap is found during the first days of August, controls may be initiated. It

is, however, important to monitor adult Girdlers in traps to know whether the control method chosen is effective.

Sparganothis Fruitworm again should be visually inspected during monitoring. The larvae can be found by gently pulling on the web holding the leaves together. The action threshold is therefore based on net captures of five larvae per sweep set (20 sweeps) (Allard, Le Duc, Turcotte, 2004).

As for the Cranberry Fruitworm, an action threshold can be established from the number of viable eggs found in the fruit. See table 6 below taken from The Eastern Canada Cranberry IPM Manual (Allard, Le Duc, Turcotte, 2004).

Table 6: Fruit Sampling to monitor Cranberry Fruitworm		
Number of hectares (acres) per bed	Number of fruit sampled	Number of viable eggs determining the action threshold
0-2 (0-5)	200-250	1
2-3 (5-7)	251-350	2
3-3.5 (7-9)	351-450	3
For every additional 2 acres	Add 100 fruit	Add 1 egg

It was found that the Cranberry Fruitworm hit its action threshold and had the highest populations out of the species of interest at most locations. The Black-headed Fireworm also hit its threshold but had only a moderate population in most locations, but high population on the west coast site. The Cranberry Girdlers population peaked in July but did not meet its action threshold, as well as the Sparganothis Fruitworm had low populations throughout the various locations.

Other species of insect pests found during this monitoring project include the Cranberry blossomworm (*Epiglaea apiat*), the Rusty Tussock moth (*Orgyia antiqua*), the Black cutworm (*Agrotis ipsilon*), and the False armyworm (*Xylena nupera*). Although these pests did not reach the action thresholds at the sampling locations, proper identification and quantification are key to monitor the population fluxes of these potentially economic pests.

Conclusions

This project has monitored Black-headed Fireworm, Cranberry Girdler, Sparganothis Fruitworm, and Cranberry Fruitworm populations throughout various locations in Newfoundland and Labrador from 2006 to 2009. Populations of each species of interest were detected at the end of June/beginning of July and seemed to peak from mid-July to mid-August and diminish near mid-August/early-September.

It was found that the Black-headed Fireworm met its action threshold in late 2007 as in 2008. The Cranberry Fruitworm was at its threshold in 2007 and 2008. The Cranberry Girdlers numbers peaked, but it did not meet the threshold. The Sparganothis Fruitworm populations were too low to meet the action threshold.

As a result that the Black-headed Fireworm and Cranberry Fruitworm met their action thresholds, it is suggested that integrated pest management should be established across Newfoundland and Labrador on all cranberry farms, including proper monitoring techniques, particularly for these two pests.

As the cranberry industry grows within this province, IPM programs will become more important. This monitoring project was established to identify the economically important cranberry pests within the province of Newfoundland and Labrador. The high populations of Cranberry Fruitworm and Black-headed Fireworm show that these pests are economically important to the cranberry industry of Newfoundland and Labrador. Monitoring and proper pest identification is key to good pest control as well as the basis for any IPM program.

Possible future research endeavors and recommendations include: early monitoring for arrival dates of species that do not overwinter in Newfoundland and Labrador. The Department of Natural Resources will assist producers in establishing IPM programs on their farms as well as monitor new potentially economic pests. As there are plans to expand the cranberry industry within Newfoundland and Labrador it would be of benefit to producers and the agricultural industry in general, to closely monitor these new developments for new potential threats.

References

Allard, F., Le Duc, I., Turcotte, C. 2004. Eastern Canada Cranberry IPM Manual. Available at: <http://www.pmra-arla.gc.ca/english/pdf/spm/ipmcranberries-e.pdf> Accessed on 18 March 2010.

British Columbia Cranberry Growers Association (BCCGA). 2008. Integrated Pest Management Guide. Available at: <http://www.bccranberrygrowers.com/ipm/dormfw.htm> Accessed on 11 January 2010.

Landry, J-F., Roy, M., Turcotte, C. 2000. Cranberry Pests of Quebec: An Identification Guide. Cranberries. 2000. p. 19-21, 34-36, 37-39, 64-66.

Leslie, R. ND. Handbook of Integrated Pest Management for Turf and Ornamentals. Available at: <http://books.google.ca/books> Accessed on 15 March 2010.

Longstroth, M. 1999. Cranberry Fruitworm. University of Michigan State. Available at: <http://web1.msue.msu.edu/vanburen/fcranfrw.htm> Accessed on 14 February 2010.

Mahr, D. 2005. Sparganothis Fruitworm. University of Wisconsin. Available at: http://www.hort.wisc.edu/cran/mgt_articles/articles_pest_mgt/insects/profiles_insects/SPFRUIT.pdf Accessed on 14 February 2010.

Ontario Ministry of Agriculture Food and Rural Affairs (OMAFRA). 2008. Control of Cranberry and Cherry Fruitworm in Highbush Blueberries. Available at: <http://www.omafra.gov.on.ca/english/crops/hort/news/hortmatt/2005/08hrt05a5.htm> Accessed on 10 February 2010.

U.S. Environmental Protection Agency (US.EPA). 2009. Integrated Pest Management. Available at: <http://www.epa.gov/oecaagct/tpm.html#Protects%20Health> Accessed on 12 February, 2010.

For additional information regarding this report or any other publication, please contact your nearest Agricultural Office, Production Specialist or Pest Management Specialist.

Provincial Agriculture Building
308 Brookfield Road
PO Box 8700
St. John's, NL
A1B 4J6
Phone: (709) 729-6588
Fax: (709) 729-0205

Fortis Building, 2nd Floor
4 Herald Avenue
PO Box 2006
Corner Brook, NL
A2H 6J8
Phone: (709) 637-2046
Fax: (709) 637-2365

