

2014 PROVINCIAL APIARIST ANNUAL REPORT - ONTARIO

Overview

The 2014 field season was a mix of challenges and opportunities for beekeepers in Ontario. Winter loss reported in the spring of 2014 (58 percent) was the highest loss reported to date. As a result of these high winter losses, many operations focussed on rebuilding colony numbers this season. In 2014, Ontario bee colonies (30,800 colonies) left the province for pollination services in greater numbers than in previous years. Additionally, beekeepers reported in-season bee mortality incidents within the active bee season. Ontario addressed these in-season incidents by increased inspections and the collection of samples for laboratory analysis (pesticide residues, honey bee pathogens, etc.). Although varroa mite infestation remains an issue facing beekeepers, field data suggests that commercial beekeeping operations were able to maintain effective management of this threat to bee health during the 2014 season. The Ontario Beekeeping Industry statistics for 2014 are summarized in Appendix I.

Honey Production

Although some areas of Ontario saw a reduction in yield, honey production during the 2014 season averaged 72.62 lbs / colony which is increased compared to the 2013 season (65.26 lbs / colony). The spring of 2014 was cool, rainy and arrived late in many parts of Ontario which in addition to other factors, may have contributed to the localized reduction in honey yield. Delays or failure of honey bee colonies to build up to strength was reported anecdotally by some beekeepers which limited their ability to harvest available nectar resources. However, higher temperatures in late summer and early fall contributed to a substantial late fall nectar flow which increased the honey yield for many beekeepers.

Pollination

The demand for pollination services for berry crops in Eastern Canada has increased in recent years. Since 2010, the number of Ontario colonies used for pollination in other provinces has increased by more than doubled (an increase of 18,200 colonies; Table 1). In 2014, nearly one third of the managed Ontario honey bee colonies left the province to pollinate blueberries, cranberries and canola in the provinces of Quebec, New Brunswick and Nova Scotia and Prince Edward Island. Eastern Canada and Northern Ontario are planning to increase the blueberry acreage within the next decade which will further increase the demand for pollination services up to an additional 100,000 honey bee colonies. The proposed expansion of the blueberry industry may provide additional opportunities for the beekeeping industry to expand and diversify.

Table 1: The number of Ontario honey bee colonies which left the province during the active bee season for pollination services.

Year	Colonies sent for out-of-province pollination services (#)
2010	12,600
2011	14,700
2012	26,000
2013	24,400
2014	30,800

Prevalence of Diseases and Pests in Ontario

Varroa and Tracheal Mites

Similar to 2013, the 2014 beekeeping season was characterized by low levels of varroa mite infestation. It is recommended that hives should be treated when varroa infestations reach 2 percent in May or 3 percent in August (Guzman *et al.*, 2010; OMAFRA, 2014).

The level of varroa mite infestation observed at commercial beekeeping operations (50 colonies or greater) was below established treatment thresholds throughout the season (Fig. 1) and indicates that beekeepers have had success in managing this pest. Field inspections in 2013 also indicated levels of varroa infestation below the treatment threshold. This suggests that many commercial beekeepers were able to maintain varroa levels below damaging levels due to effective management strategies. The level of varroa infestation at non-commercial operations (fewer than 50 colonies), was below established treatment thresholds in the spring of 2014 and at or above treatment thresholds in the fall (Fig. 2). Although the sample size for non-commercial beekeepers was limited, this indicates a need for improved varroa management in some operations.

Varroa management in Ontario honey bee colonies remains important to colony survival. Beekeepers should focus on an overall integrated pest management approach to control varroa and ensure that their selected treatment strategy is used properly and effectively. It is essential that beekeepers monitor their hives regularly for varroa infestation and treat early before colony damage occurs.

For more information about varroa mites, please read:

Varroa Mite – Biology and Diagnosis available at

<http://www.omafra.gov.on.ca/english/food/inspection/bees/varroa-biology.htm>

Varroa Mite – Sampling and Monitoring Infestation Levels available at

<http://www.omafra.gov.on.ca/english/food/inspection/bees/varroa-sampling.htm>

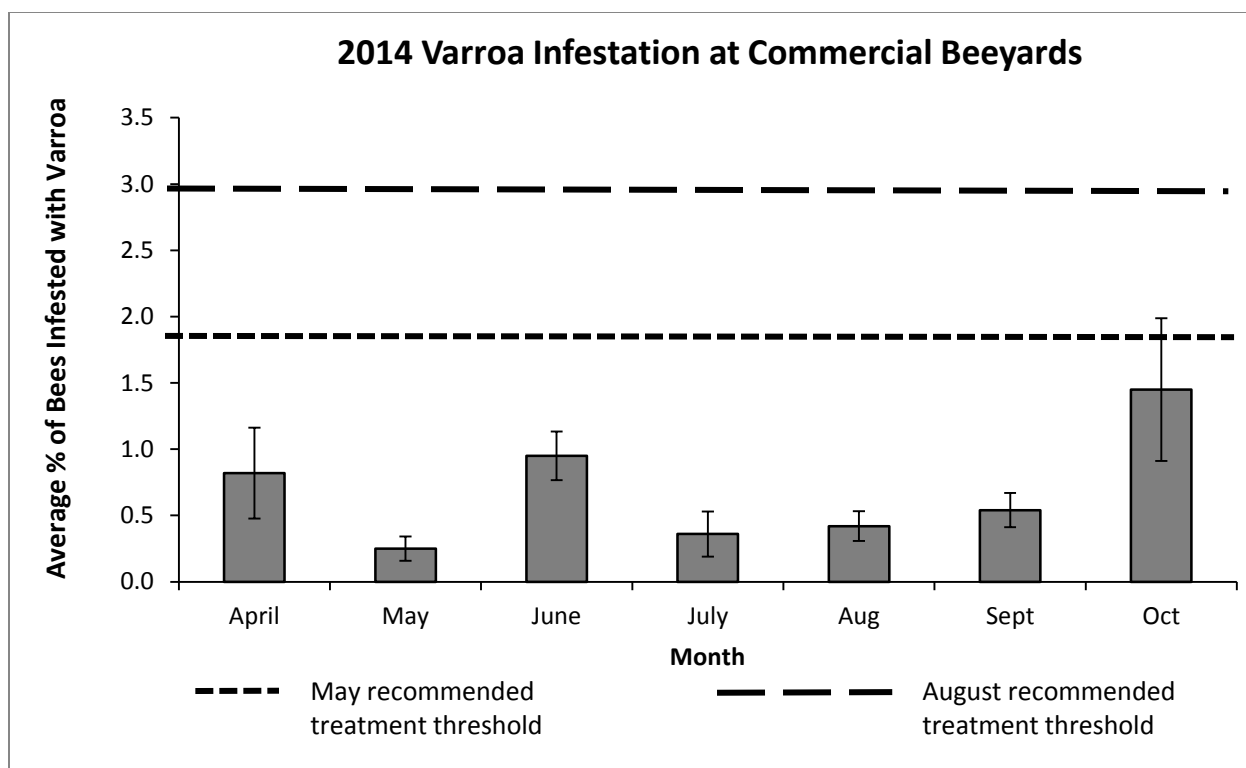


Figure 1: Average number of bees (percent and standard error) at commercial beeyards with varroa infestations documented by apiary inspectors.

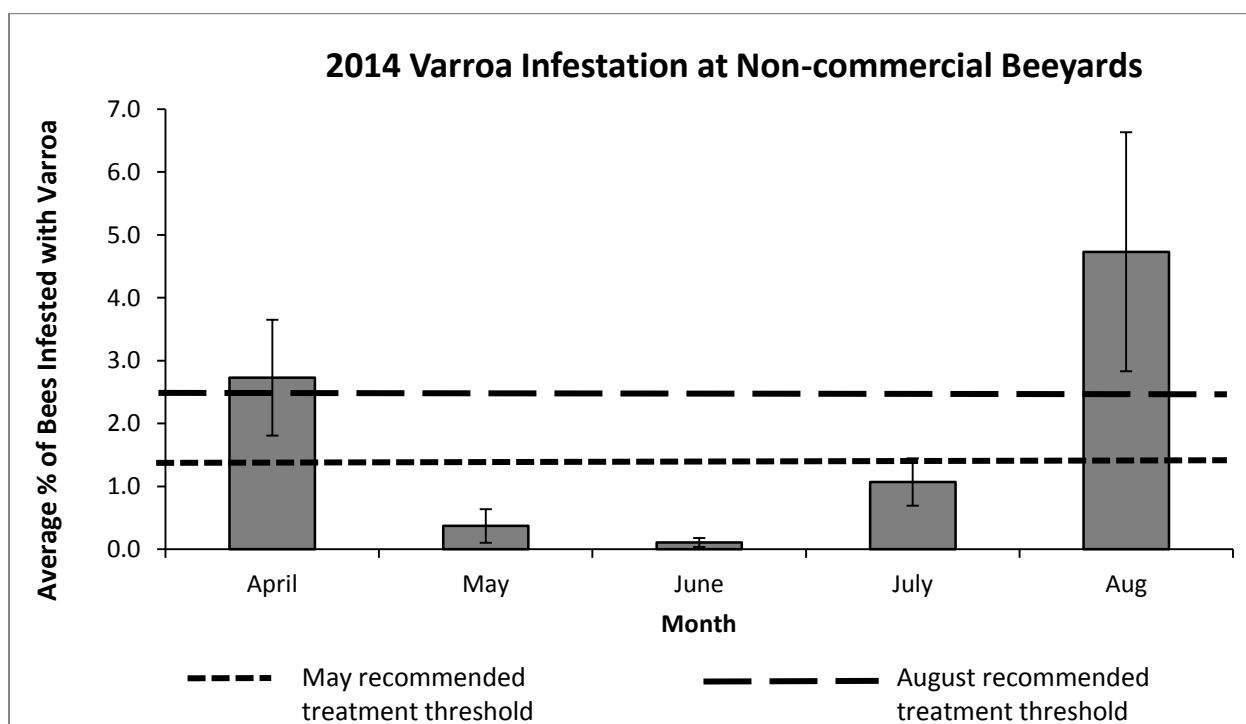


Figure 2: Average number of bees (percent and standard error) at non-commercial beeyards with varroa infestations documented by apiary inspectors.

American Foulbrood (AFB) and Other Brood Diseases

A bacterial disease of honey bee brood known as American Foulbrood (AFB) (*Paenibacillus larvae*) was found in 48 beeyards, representing 117 honey bee colonies or 0.86 percent of inspected colonies in Ontario. This figure may reflect the focus on "at-risk" beeyards, based on proximity to other infected locations.

Other brood diseases that were tracked by the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) Apiary Program include European Foulbrood (*Melissococcus plutonius*), chalkbrood (*Ascosphaera apis*), and sacbrood virus (see appendix II for more details).

Small Hive Beetle

Colonies were visually inspected for the presence of small Hive Beetle (SHB) adults and larvae. In total, 14,336 honey bee colonies located at 1,405 sites were inspected for the presence of SHB and only one infected site (23 colonies) was identified (see appendix II for more details). This indicates a decrease in the number of SHB positive sites documented in 2013, 2012, and 2011. The SHB positive site was identified in Niagara County, close to the New York State border. All 23 honey bee colonies and associated equipment were voluntarily destroyed by the beekeeper. The SHB quarantine area remains in place for Essex County and part of Chatham-Kent County.

For more information on biosecurity practices and identification of SHB, please read:
www.omafra.gov.on.ca/english/food/inspection/bees/biosecurity.htm
www.omafra.gov.on.ca/english/food/inspection/bees/shb-reportfindings.pdf

2014 Ontario Apiculture Survey Results

Honey Bee Winter Loss

The Ontario provincial winter loss survey, conducted by the OMAFRA's Apiary Program, was sent to all registered commercial beekeepers (n = 247). For the purpose of this survey, a commercial beekeeper was defined as an operation with 50 or more colonies. In addition to the survey, field inspections were completed in the spring of 2014 at 140 beeyards to document the level of winter loss (the number of hives which did not survive the winter). Since 2010, a commercially viable hive has been defined in Ontario's survey as having four or more viable frames of bees in the spring. Results indicated there was no correlation between winter mortality and operation size, geographical region or type of varroa treatment utilized by the beekeeper.

The results of the survey responses estimated the overall winter loss (honey bee mortality during the winter months of 2013/14) among Ontario commercial beekeepers at 58 percent which is greater than losses reported in any other year (Fig. 3). High variation in winter loss was observed among commercial beekeepers (Fig. 4). Individual beekeeper winter loss ranged from 0 percent to 100 percent with a standard deviation of 27.6 and a median of 54 percent. Although mortality rates for managed honey bee hives vary from year to year, the level generally considered to be acceptable and sustainable by most apiculturists is 15 percent (Furgala and McCutcheon, 1992; CAPA, 2007 to 2014). The winter loss observed for commercial beekeepers in 2014 is generally

considered not economically sustainable to maintain the honey bee population in Ontario.

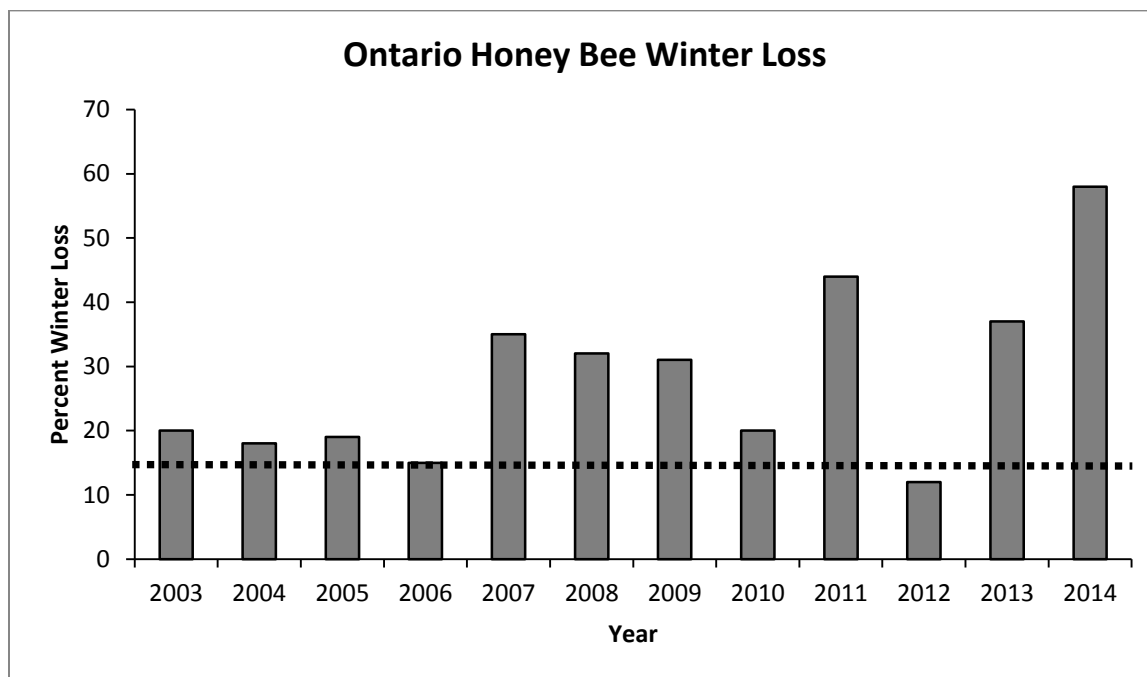


Figure 3: Percentage of Ontario commercial honey bee colonies which did not survive the winter (winter loss). The dotted horizontal line denotes the acceptable winter loss threshold (15 percent).

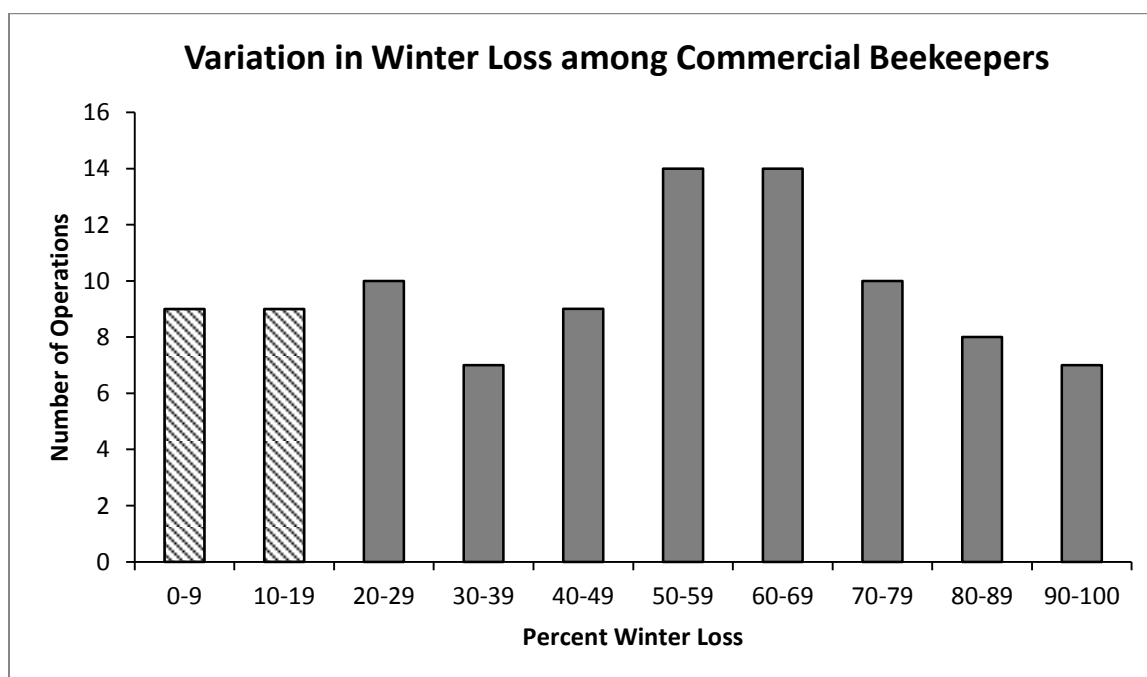


Figure 4: Variation in winter loss for individual commercial beekeepers. The patterned bars represent beekeeping operations at or near the level of acceptable level of winter loss (15% mortality).

The available data for non-commercial beekeepers estimates the overall winter loss to be 44 percent. Although non-commercial operations saw less winter loss than commercial operations, this estimate remains elevated compared to the 15 percent acceptable loss threshold. Differences in winter loss rate was not statistically significant when beekeepers were analyzed by operation size (number of colonies managed).

Beekeepers were asked to identify the reasons for colony mortality and responses were based on symptoms, beekeeper experience and judgment/speculation. The most common reasons for winter loss cited by commercial beekeepers in 2013/2014 were (in order of greatest response to lowest):

- 1) starvation;
- 2) weather;
- 3) chronic pesticide exposure;
- 4) unknown;
- 5) weak colonies;
- 6) acute pesticide exposure;
- 7) other;
- 8) nosema (fungal infection); and
- 9) ineffective varroa control.

Most beekeepers gave several or a combination of reasons to explain the winter loss observed at their sites. A single honey bee colony can be exposed to multiple stressors and there may be different factors responsible for the death of a proportion of colonies in a beekeeping operation or beeyard.

Honey Bee “in-season” Mortality

During the beekeeping season of 2014, there were multiple reports from beekeepers experiencing in-season mortality incidents, particularly in southwestern Ontario. In-season mortality incidents are characterized by the mass disappearance of worker bees from the hive; dead and dying bees at the entrance of the colony; the loss of the honey bee queen and failure of the colony to develop. Across the province, 52 beekeepers reported in-season mortality incidents to the Pest Management Regulatory Agency (PMRA) at 322 beeyards[‡]. These incidents remain under investigation.

[‡]Beekeeper in-season incident numbers as reported on November 25th, 2014 in PMRA’s report, Update on Neonicotinoid Pesticides and Bee Health. Prior to the release of the PMRA’s November 25, 2014 report, OMAFRA’s provincial apiarist reported to the Ontario Beekeepers’ Association at their annual general meeting that 62 beekeepers reported in-season mortality incidents at 345 beeyards. PMRA conducts a thorough analysis of beekeeper reported incidents to ensure incidents are unique and have occurred in-season. PMRA will be providing an update once analysis from 2014 has been completed.

In-season incidents were reported by beekeepers to the Pest Management Regulatory Agency (PMRA). Incident sites were visited by OMAFRA to investigate beekeeper management practices and to test for pests/diseases and PMRA collected samples of dead and dying bees to test for multiple pesticide residues including those commonly used on corn and soybean seed (clothianidin and thiamethoxam). In-season mortality incidents will be further analyzed to evaluate the components of the suspected residue, beekeeper management, honey bee symptoms and pathology.

The number of reported incidents during the 2014 planting season (May/June) was lower than those reported during the 2013 planting season (May). It is possible that this decrease is due to the implementation of the interim mandatory protective measures, including the usage of lubricant on treated seeds (see appendix III), as well as other voluntary measures (e.g. use of deflectors) by corn and soy growers. Unusual weather patterns such as the cold, wet spring in southwestern Ontario resulted in corn planting at a later date and less intensively than in previous years, possibly influencing the reduction in the number of mortality incidents. Additionally, there was a low number of surviving honey bee colonies in spring of 2014 and nearly a third of those colonies left the province for pollination services prior to the planting season which may have also contributed to the lower number of reported incidents during May/June 2014.

Overall, it is difficult to make conclusions based on a single field season and it is important to track this issue over several years to understand the impact of weather, the routes of neonicotinoid exposure and the factors that influence bee health. Further monitoring and surveillance of honey bee health and pesticide residues in the environment are important to clarify and address the relationship between neonicotinoids and pollinator health. Further research, analysis of winter loss and in-season incident reporting, and environmental assessments are ongoing.

The most recent interim report from the PMRA can be accessed: <http://hc-sc.gc.ca/cps-spc/pubs/pest/fact-fiche/neonicotinoid/neonicotinoid-eng.php>

Management Strategies

Modern beekeeping requires a high degree of specialized management for both colony production and colony health. General practices for beekeepers include: feeding and providing insulation at the appropriate time of year, frequent examination of queen health and the development of the colony population, regular monitoring for pests and diseases, knowledge of colony pest levels (e.g. varroa), treatment of honey bee diseases, overwintering strategies and biosecurity practices.

Beekeepers are encouraged to continue practicing Best Management Practices and maintain accurate records of their BMPs, especially emphasizing the key factors known to influence mortality such as insulation, feeding, and mite control (<http://www.omafra.gov.on.ca/english/food/inspection/bees/bmpwinter.pdf>). Additionally, beekeepers may reference the management guidelines from the (Ontario

Beekeepers' Association Technology Transfer Program (<http://www.ontariobee.com/outreach/ttp>) and participate in workshops on beekeeper management and integrated pest management (<http://www.omafra.gov.on.ca/english/food/inspection/bees/2014-treatment.pdf>).

Pest/Disease Management Practices

Varroa mites are the primary pest that can impact the survival of honey bee colonies when not properly managed (Guzman et al., 2010). Ontario beekeepers have a variety of chemical treatment options available to manage varroa mites. The most popular synthetic acaricide treatment is Apivar®, while there is limited use of Checkmite++™ by beekeepers. There are documented resistance issues with Checkmite++™ and Apistan® in Ontario. Although there are populations of varroa in Ontario that are resistant to Apistan®, this resistance can vary (70 to 90 percent efficacy). As such, beekeepers are still using Apistan® in rotation with other mite treatments. Beekeepers must also be aware that tracheal mites can still cause damage to honey bee colonies at higher levels, especially when in combination with high levels of varroa infestations.

American Foulbrood is the most serious brood disease of honey bee colonies. Beekeepers must be aware of biosecurity practices related to this pathogen, regulatory requirements, and the available treatment options.

Small hive beetle was first detected in Ontario in 2010 and remains a concern for honey bee colonies. Biosecurity practices are in place for small hive beetle and management practices have been developed in conjunction with small hive beetle specialists from jurisdictions that have experienced infestations.

For more information on the biology and management of honey bee pests and diseases, please read An Introduction to Honey Bee Pests and Diseases in Ontario, available at <http://www.omafra.gov.on.ca/english/food/inspection/bees/intro-bee-pests.htm>

Issues with Queen Health

Beekeepers in Ontario are reporting high levels of queen loss and supersedure, which is the replacement of a queen by the honey bee colony. On average, 22 percent of commercial beekeepers and 8 percent of non-commercial beekeepers reported issues with queens in their colonies in 2014. When analyzed by region, 28 percent of colonies in Southern Ontario were impacted by queen issues which is significantly increased compared to queen issues experienced by colonies in the rest of the province. As part of normal best management practices and efforts to rebuild colonies after losses, honey bee queens are replaced regularly. Ontario beekeepers access new honey bee queens from a variety of sources, such as local colonies but also from external sources (California, Hawaii, Australia, Chile, etc.; Fig. 5). There was no statistical correlation between winter loss and source queen.

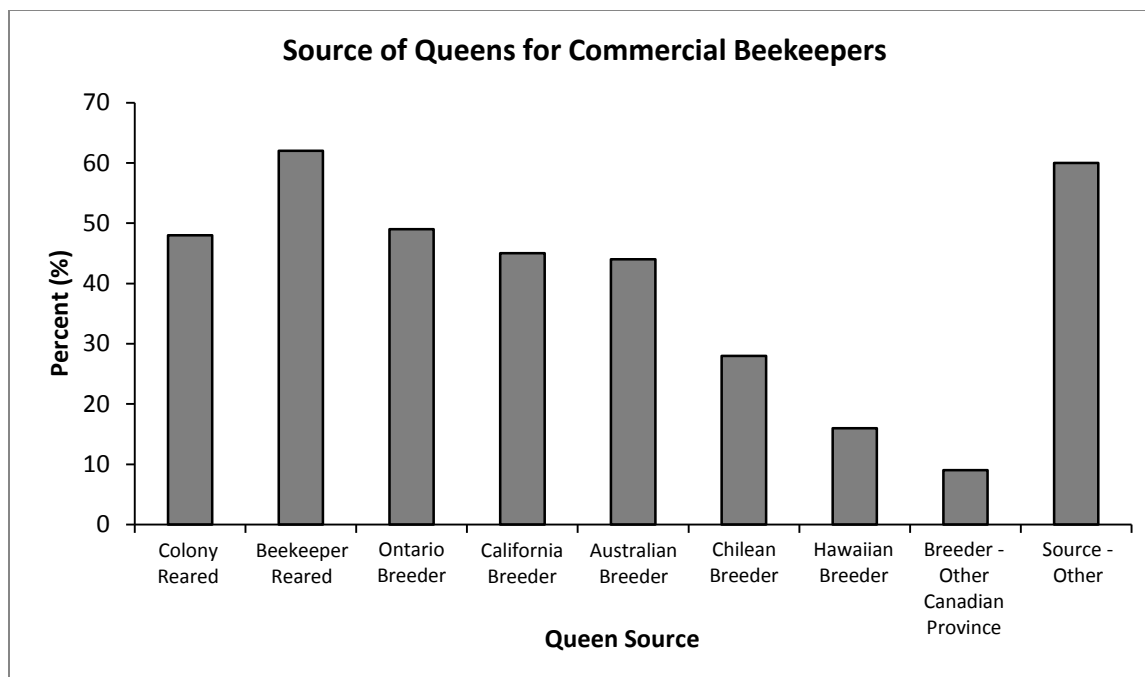


Figure 5: Origin of honey bee queens used by commercial beekeepers in Ontario.

Importation of Honey Bees to Ontario

The population of honey bees at the end of 2014 was 112,000 colonies which was a direct result of actions to rebuild from winter losses and the expansion of new operations. To rebuild following 2013/2014 winter losses, Ontario beekeepers imported high numbers of honey bees from New Zealand and Australia (packages) as well as Hawaii and California (queens). A smaller number of queens were imported (100) from Denmark for specialized breeding stock and genetics. Overall, 33,050 honey bee queens 8,100 honey bee packages, 1,600 colonies and 9,000 supers were imported to Ontario in 2014. Although required for colony rebuilding and diversification, the importation of bees from outside sources increases the risk of disease and pest introduction to Ontario colonies. Looking forward to 2015, it is important for beekeepers to ensure they follow the recommended biosecurity and bee health best management practices to ensure healthy colonies.

References

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Furgala B., McCutcheon D.M. 1992. Wintering productive colonies. In Graham J M (Ed). The hive and the honey bee (revised edition). Dadant and Sons; Hamilton, IL, USA. pp. 829-868.

Guzman-Novoa E., Eccles L., Calvete Y., McGowan J., Kelly P. and Correa-Benitez A. 2010. Varroa destructor is the main culprit for death and reduced populations of overwintered honey bees in Ontario, Canada. Apidologie. 4 (4): 443-451.

OMAFRA. 2014. 2014 Ontario Treatment Recommendations for Honey Bee Disease and Mite Control.

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Appendix I

Ontario Beekeeping Industry Statistics 2014¹

- Number of active beekeepers: 3,262 (end of 2014 season)
- Number of producing colonies: 112,800 (end of 2014 season)
- Average honey yield/colony: 72.62 lb (32.94. kg) colony (end of 2014 season)
- Total estimated honey crop: 8,192,000 lb (3,716,000 kg) (end of 2014 season)
- Colonies wintered last year (years 2012/2013): 97,500 (end of 2013 season)
- Winter mortality: 58 % (reported spring 2014)

¹Data acquired through OMAFRA's Apiary Program registry, the Ontario Provincial Winter Loss Survey, and apiary field inspections.

Appendix II

Number of Ontario colonies inspected and infected by bee pests or diseases in 2014.

Disease/Pest ²	Colonies Inspected (#)	Colonies Infected (#)	Percent Infection
American Foulbrood (AFB)	14,336	124	0.86%
European Foulbrood (EFB)	14,336	3	0.02%
Chalkbrood	14,336	550	3.84%
Sacbrood virus (SBV)	14,336	52	0.36%
Small Hive Beetle (SHB)	14,336	23	0.16%

²The level of varroa infestation was measured using different methodology and is therefore not presented in this table. Please see page 3 for varroa information.

Appendix III

Initiatives and Strategies to Address Honey Bee and Pollinator Health

There are multiple strategies that have been recently initiated to address honey bee and pollinator health issues. The following is a summary of some of these initiatives over the last two years:

Pest Management Regulatory Agency

The PMRA implemented interim mandatory protective measures for corn and soybean production for the 2014 planting season that included:

- Requiring the use of safer dust-reducing seed flow lubricants;
- Requiring adherence to safer seed planting practices;
- Requiring new pesticide and seed package labels with enhanced warnings; and
- Requiring updated information be provided to support the continued need for neonicotinoid treatment on up to 100% of corn seed and 50% of soybean seed.

As the 2014 planting season progressed, the PMRA monitored the effect of these measures to protect bees from exposure to neonicotinoid insecticides and reported the results in a November 25, 2014 *Update on Neonicotinoid Pesticides and Bee Health* report (<http://www.hc-sc.gc.ca/cps-spc/pubs/pest/fact-fiche/neonicotinoid/neonicotinoid-eng.php>). The PMRA reported a 70 percent decrease in in-season bee mortality incidents during the planting season (May 2014). Although the risk mitigation measures contributed to this decrease in mortality incidents, there are other factors which contributed as well. For example, the very wet and cold spring in southwestern Ontario resulted in an extended time period for corn planting in 2014 as opposed to the intensive planting observed in 2012 and 2013. Additionally, the weather contributed to changes in the timing of bee foraging activity and available forage relative to the timing of corn planting.

Ontario Bee Health Working Group

The Ontario government established the Ontario Bee Health Working Group for 2013 and early 2014 to provide advice on how to prevent honey bee mortality in relation to corn and soybean seeds treated with neonicotinoid insecticides. The working group membership included Ministry staff from OMAFRA, MOECC, PMRA, including specialists in the area of pesticides, field crops and apiculture, along with beekeepers, grain farmers, and pesticide/agrochemical industries. There were a number of recommendations identified by the Working Group and the majority of recommendations have been implemented or are in progress (link to Ontario Bee Health Working Group Report: <http://www.omafra.gov.on.ca/english/about/beehealthworkinggroupreport.htm>)

Ontario Pollinator Health Strategy

In 2014, OMAFRA was mandated to strengthen pollinator health by working with other ministries to develop a Pollinator Health Strategy for Ontario. The provincial strategy is a multi-pronged approach including:

- Development of a Pollinator Health Action Plan;
- A regulatory system for the use of neonicotinoid-treated seed to be in effect by July 1, 2015; and
- Financial assistance for beekeepers that have experienced significant losses.

A broad range of stakeholders are being consulted in the development of a Pollinator Health Action Plan and the regulatory proposal to reduce the use of neonicotinoid-treated seeds. Stakeholders include beekeepers, farmers, environmental groups, aboriginal peoples and forestry. Stakeholder engagement sessions were held in December and January. The following link is to the provincial strategy discussion paper: www.omafra.gov.on.ca/english/pollinator/discuss-paper.pdf.

National Bee Health Roundtable

In 2014, The Federal Government, in partnership with industry, established a National Bee Health Roundtable to address issues facing apiculture in Canada. This group includes a diverse representation of stakeholders including those from the agriculture and beekeeping communities, representatives from provincial governments as well as Agriculture and Agri-Food Canada and the PMRA. A national strategy on bee health was launched in December 2014. The National Bee Health Action Plan can be viewed at the following link:

<http://www.agr.gc.ca/eng/industry-markets-and-trade/value-chain-roundtables/bee-health/objectives-and-priorities/?id=1409836063106>

Beekeepers Financial Assistance Program

In the 2014 season the Ontario government provided financial compensation to beekeepers experiencing significant losses through the Beekeepers Financial Assistance Program. The program provided compensation to beekeepers whose hives experienced high bee mortalities and complements existing government programming. In 2014, the program financed the replacement of lost bee colonies and rebuilding of healthy colonies. The Beekeepers Financial Assistance program is extended for the 2015 season and will continue to be delivered by Agricorp in cooperation with the OMAFRA. For more information, contact Agricorp or visit:

www.omafra.gov.on.ca/english/about/2015financial.htm