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Ontario's Draft **POLLINATOR HEALTH ACTION PLAN**

For Consultation Purposes

January 2016

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LETTER FROM THE MINISTER OF AGRICULTURE, FOOD AND RURAL AFFAIRS



As Ontario continues to take a leadership role in the protection of pollinators, I am pleased to introduce you to Ontario's draft Pollinator Health Action Plan. As part of the province's broader Pollinator Health Strategy, this draft Action Plan is designed to help improve the health of insect pollinators, both managed and wild, and in turn support a strong, successful agri-food sector and a healthy environment.

I would like to take this opportunity as Minister of Agriculture, Food and Rural Affairs, to recognize and thank Ontario farmers for the steps already taken to help reduce pesticide impacts on pollinators. This draft plan builds on the changes the agriculture sector has made – we are now looking to forge partnerships with other groups and sectors to continue our path forward to improved pollinator health.

The draft Action Plan proposes actions to address four key stressors that are known to impact pollinator health. It also identifies current gaps in our knowledge of managed and wild pollinators, areas where we want to conduct more research. This draft Action Plan suggests direction, points for discussion and further development as we move forward on a path that supports a sustainable food supply, resilient ecosystems and a strong economy for Ontario.

A collaborative approach is at the core of our efforts to protect pollinators, and it is our goal to encourage and inspire actions and ideas from all sectors of society. New partners and private sector commitments are essential to achieve results and realize Ontario's potential for improved pollinator health.

I invite you to read Ontario's draft Pollinator Health Action Plan and share your ideas as we continue to work together toward achieving our goals.

Sincerely,

A stylized, handwritten signature in black ink, appearing to read 'J. Leal'.

Jeff Leal
Minister of Agriculture, Food and Rural Affairs

INTRODUCTION

Pollinators are vital to a healthy ecosystem and they play a crucial role in Ontario's agriculture sector. They provide one of our planet's most important ecosystem services. Over one third of our diet comes directly or indirectly from insect-pollinated plants, and about 80 per cent of wild flowering plant species would not exist without pollination. Pollinators are essential to our agricultural sector — managed and wild pollinators contribute \$992 million annually to Ontario's economy. They are also extremely important to biodiversity — the variety of life on earth — making them critical to the health of our environment. A robust and resilient pollinator population means a healthy Ontario for all of us.

The Ontario government in partnership with the public, industry, academia and private sector are joining forces and working together to find a solution. Farmers have already taken on a leadership role in this area. In addition to adapting to the requirements set out by Ontario Regulation 63/09 under the *Pesticides Act* to reduce neonicotinoid-treated corn and soybean seed use, farmers participate in many different environmental stewardship programs.

Through *Growing Forward 2*, a federal/provincial funding program, farmers have accessed cost-share funding to enable farm families to increase their environmental awareness and identify areas of environmental concern through developing Environmental Farm Plans (EFP). Once completed, *Growing Forward 2* supports EFP-identified actions that may support pollinator habitat such as building wind breaks and planting cover crops.

Another example of farmers taking positive voluntary action to protect pollinator health is the Species at Risk Farm Incentive Program (SARFIP), which provides farm businesses with access to cost-shared funding to implement Best Management Practices

(BMPs) that help protect essential habitats of species at risk, which could include certain pollinators. This is funded by the Ministry of Natural Resources and Forestry's Species at Risk Stewardship Fund, and the Government of Canada as part of the National Conservation Plan through the federal Habitat Stewardship Program for Species at Risk.

The agricultural sector cannot do this alone — this issue requires all Ontarians to take action. From individuals to community groups and environmental organizations, it is time for others to step forward and commit funding, land, time and effort to protect pollinators.

The following draft Pollinator Health Action Plan identifies potential actions that have been informed through an ongoing consultation process with key stakeholders and the broader public. Starting in November 2014, the government released a comprehensive discussion paper on pollinator health and consulted on a regulatory proposal to reduce the use of neonicotinoid pesticides in Ontario. The discussion paper "*Pollinator Health: A Proposal for Enhancing Pollinator Health and Reducing the Use of Neonicotinoid Pesticides in Ontario*" was

posted on the Regulatory and Environmental Registries for 61 days to solicit broad public input. In addition to the posting, meetings were held with more than 450 participants. Over 50,000 comments were received from a broad range of stakeholders, including industry (growers, beekeepers and farm associations), academia, environmental and conservation groups and individuals. Approximately 97 per cent of the comments received were supportive of pollinator health. It was clear from this engagement that there is strong support for enhancing the health of pollinators and a variety of actions were brought forward.

Taking a deeper dive on key issues, the Pollinator Health Action Plan forum was held with key stakeholders on August 25, 2015 in Guelph, Ontario. More than 50 attendees, including leaders from across sectors, participated in the interactive forum which brought together a range of experts and stakeholders to address issues that included:

- addressing pollinator health stressors
- improving pollinator health
- leveraging partnership opportunities
- identifying actions needed/next steps

A number of opportunity areas were identified during the forum, which have been incorporated in the development of the draft Action Plan.

The draft plan builds on the feedback heard to date and is a call to action for all Ontarians to play a key role in enhancing pollinator health. Our vision is for Ontario to be home to healthy pollinator populations that contribute

to a sustainable food supply and support resilient ecosystems and a strong economy. Please take the time to read through this document carefully and provide us with your suggestions for improving pollinator health – it is the responsibility of each of us to make a difference.

Our Pollinators

Many species provide pollination services world-wide, including a small number of birds and mammals. In Ontario, the majority of pollinators are insects. Bees are the most specialized insect pollinator due to a variety of physical traits allowing them to collect and store pollen. Wild bees come in a wide variety of sizes, shapes, and colors. Wild bees are also diverse in their requirements, such as habitat, nesting sites, the types of flowers they visit, and their season of activity. In Ontario, solitary and social ground nesters are the most common groups of wild bees. Accordingly, this draft Action Plan focuses on two main groups of insect pollinators: wild pollinators, such as bumble bees, butterflies, beetles and flies, and managed bees, including honey bees and certain species of bumble bees.

Managed Bees

Managed honey bees not only produce honey, they also pollinate a broad range of crops. They are the most economically valuable pollinators world-wide, accounting for 80 per cent of global agricultural crop pollination. Managed honey bees in Ontario visit and pollinate a broad range of crops including apples, apricots, asparagus, blueberries, squash, and canola.

In 2015, Ontario had over 2500 registered beekeepers managing a total of over 100,000 honey bee colonies. In 2015, Ontario Beekeepers produced an estimated 3,747 tons of honey worth a total of \$33.9 million. In addition to honey, beekeepers also produce beeswax products for retail sales. Perhaps most importantly, horticulture producers pay beekeepers to have their hives provide “pollination services” to increase reproduction and yield. Ontario honey bee colonies are also transported every year to pollinate about \$71 million of the blueberry and cranberry crops in eastern Canada - and the demand for pollination services continues to rise.

Other species of managed pollinators in North America include bumble bees, alfalfa leafcutter bees and orchard bees. Bumble bees are increasingly used in Europe and here in Canada as the primary managed pollinator for greenhouse tomato and pepper production. They are now being tested as potential pollinators for cranberries, blueberries and ginseng.

Wild Pollinators

Pollination helps to sustain all organisms in an ecosystem that depend on resources from flowering plants (e.g., seeds for birds, shelter provided by flowering trees and shrubs, etc.). While managed honey bees are perhaps the most well-known pollinator, wild bees are more effective pollinators on a per bee basis. Some species of wild pollinators have been found to carry greater quantities of pollen grains making them more efficient pollinators. Wild pollinators have been found to forage in cooler conditions than honey bees, which allows for pollination of plants blooming in early spring and late fall.

Research has shown that increasing honey bee pollinator efficiency in agriculture can be accomplished by encouraging or introducing other wild bee species to an area. The presence of wild bees has been found to increase the individual pollinating efficiency of honey bees when compared to an orchard that was pollinated by honey bees alone.

Previous studies show Ontario as a Canadian biodiversity hotspot for wild pollinators, with 409 of 809 nationally recorded bee species being found here – the highest bee diversity of any province. Ontario is also the last province in which the formerly widespread rusty patched bumble bee can be found. Unfortunately, the current population status and diversity of most wild pollinators in Ontario is relatively unknown. Declines in wild pollinator populations have been documented in Europe, Asia, Central America, South America, Africa and Australia, with almost 50 per cent of insect extinctions documented globally involving flower-visiting species.

Why Action is Important

Throughout the past several years, Ontario beekeepers have experienced significant honey bee colony losses during both the summer production season and over winter.

Since 2007, overwintering losses have averaged 35 per cent, reaching an all-time high of 58 per cent in 2014. Most recently in 2015, a 38 per cent overwintering loss was recorded. Although this is a slight improvement over 2014, it is still greater than what is considered sustainable by the industry, which is 15 per cent annual overwinter loss. If the trend for over-winter

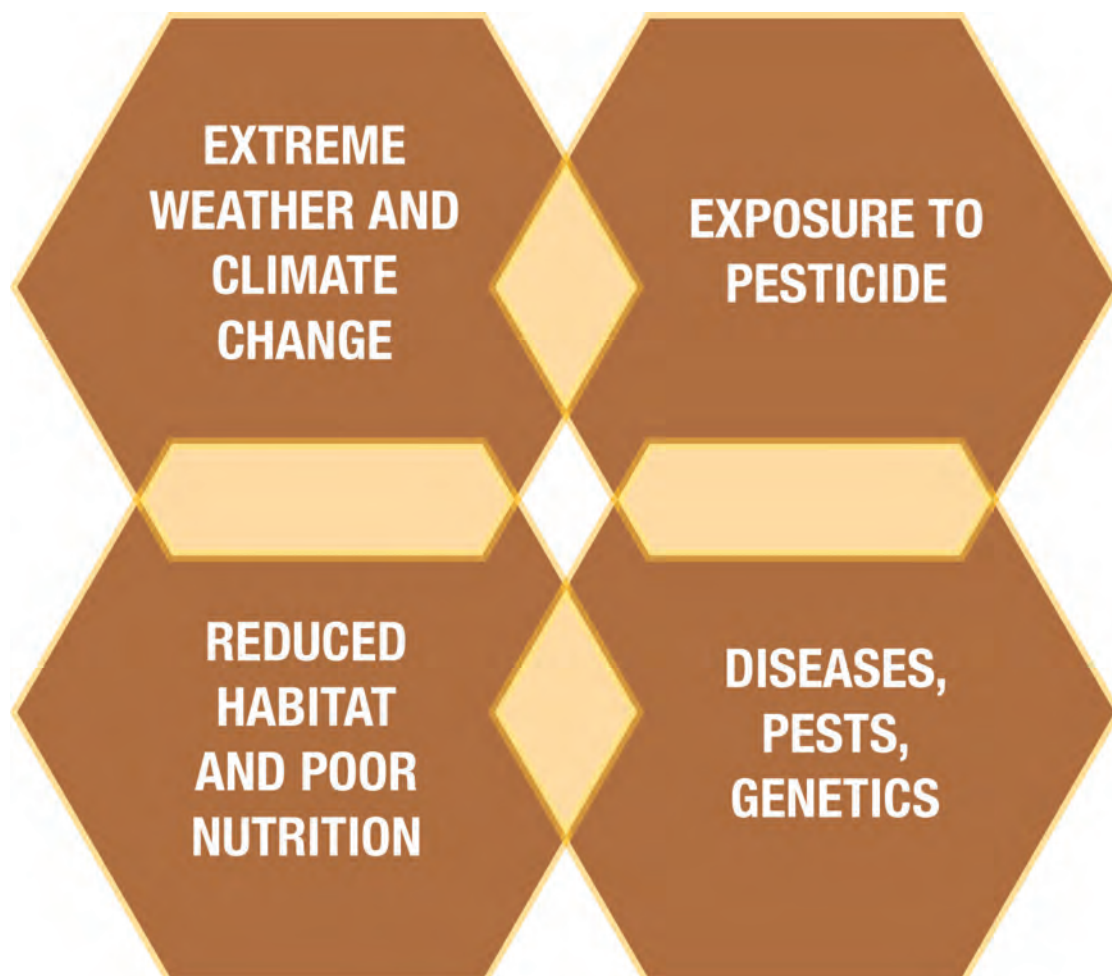
and in-season losses continues, there is a risk that beekeeping in Ontario will no longer be economically viable, meaning a significant economic cost not only to the beekeeping sector, but also to agriculture.

Although information on wild pollinators in Ontario is limited, trends suggest that pollinator declines are a result of the interacting impacts of several environmental stressors. Global evidence is showing climate change is one of the leading causal factors affecting wild pollinator populations. Habitat fragmentation reduces the size of pollinator populations by increasing their isolation and transforming the lands to a less favourable environment.

Potential Causes of Pollinator Declines

Despite the indispensable role that pollinators play, studies show that pollinators are under increasing stress. The cause is thought to have several causes or “stressors”. These stressors can be grouped into four broad categories:

- Reduced Habitat and Poor Nutrition
- Diseases, Pests, Genetics
- Exposure to Pesticides
- Extreme Weather and Climate Change



PUTTING THE PLAN INTO ACTION – PARTNERSHIPS

The provincial government cannot act alone – establishing proactive, multi-faceted partnerships with the public, industry, academia and the private sector is essential to improving and sustaining pollinator health.

All aspects of the Action Plan have the potential for partnerships. Research activities are being coordinated among the provincial government and partners in academic institutions as well as the private sector.

Educational activities, through partnership with various stakeholders, will promote the adoption and implementation of practices that benefit pollinators and their habitats, and increase the understanding of the important role pollinators play in Ontario.

How Change In Urban and Rural Settings Can Make a Difference

Pollinator health is a concern to everyone and there are a number of initiatives outside of government that are currently supporting pollinators.

Pollination Guelph is promoting the protection of pollinators and their habitat, particularly in urban areas. They do this by creating pollinator friendly demonstration gardens, landscaping, and a prairie/meadow habitat in Guelph, while hosting pollinator focused events and providing education to the public across southern Ontario on the importance of pollinators and use of native plants in gardens.

Ontario Nature's Youth Council started a campaign to protect pollinators through the development of posters and videos

highlighting pollinator friendly plants. The Youth Council has also planned and hosted volunteer events in communities to plant pollinator friendly plants.

Master Gardeners of Ontario have created, in various communities across the province, public education programs targeting home gardeners and school groups that speak to the importance of planting native plants and the impacts of invasive species.

Whether engaging the public to participate in research and monitoring activities, partnering with municipalities and organizations to plant pollinator-friendly gardens with local seed or enhancing government-owned land to increase nutrition options for pollinators, partnerships are critical to the success of the Action Plan. Every person can contribute to habitat creation whether through a small container garden or large backyard garden. These examples build on the many existing public-private partnerships and support provincial biodiversity strategies.

Partnerships in Practice

Ontario Waste Management Association (OWMA)

- The OWMA is committed to partnering with the Ontario government to promote the creation of wildlife habitat at waste management facilities.

- In addition to the work several of its members have already undertaken to support the creation of wildlife habitat, the government will work with OWMA to identify opportunities to dedicate land to create pollinator ‘zones’, and explore opportunities to increase participation within the sector.

Pollinator Partnership

- The Ontario government is working with Pollinator Partnership to facilitate the development and delivery of education, awareness and guidance materials for establishing and maintaining pollinator habitat on a variety of landscapes across Ontario.
- The guidelines will identify how to find opportunities to create pollinator habitat on public infrastructure holdings, commercial properties, parks and natural areas, and will be an important resource for large-scale landowners and managers.

The government will act as a catalyst to help all groups continue to create partnerships and programs that promote pollinator health. Communities, non-governmental

organizations, industry and farmers have a common goal, to protect Ontario’s pollinators. Farmers are incredible stewards of the land and can provide pollinator services to promote increased habitat and nutrition.

Since 2005, Ontario farmers have demonstrated a strong commitment to the environment, completing more than 23,500 voluntary on-farm projects. These investments represent a total investment of \$353 million in on-farm improvements, including \$99 million in federal-provincial cost-share funding, approximately \$26 million leveraged from other cost-share programs and \$228 million of farmers’ money.

We challenge all parties, including environmental organizations, conservation groups, academia, industry, and communities to join our farmers and be part of the solution by pooling their resources. We invite organizations from across Ontario to invest in the coming year to promote environmental stewardship and pollinator health. The government will recognize these important investments by all of these groups.



Butterflies on Echinacea / J. Burt



Honey Bee on Milkweed/ D.J. Hawke

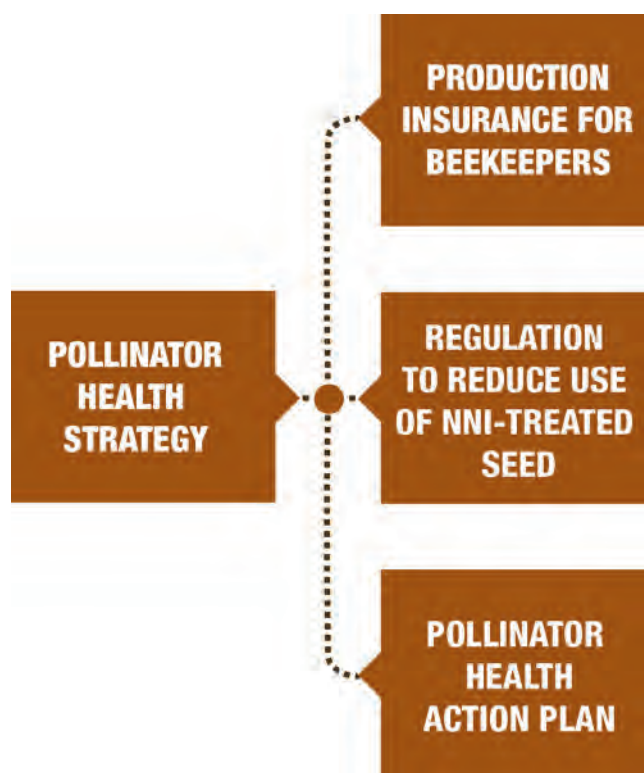
ONTARIO'S POLLINATOR HEALTH STRATEGY

In November, 2014, the Ontario government launched the province's first Pollinator Health Strategy highlighting two aspirational targets:

- To reduce overwinter mortality rates for managed honey bees to 15 per cent or lower by 2020.
- To achieve an 80 per cent reduction in the number of acres planted with neonicotinoid-treated corn and soybean seed by 2017.

During the development of the Strategy, stakeholders, including the public, provided input to help shape the draft Action Plan.

The first two components of the Strategy – financial support for the beekeeping sector and a regulation to reduce the use of neonicotinoid-treated corn and soybean seeds – have been launched.



The Bee Mortality Production Insurance Program

To support a viable beekeeping industry and financially help beekeepers rebuild after colony losses, Ontario initiated the Beekeeper Financial Assistance Program (BFAP). The BFAP was a temporary compensation program launched in response to high bee mortality incidents. In fall 2015, the province transitioned from BFAP to a permanent, self-sustaining bee mortality insurance plan to address the need for a longer-term, actuarially sound program.

Regulation Of NNI-Coated Corn And Soybean Seed

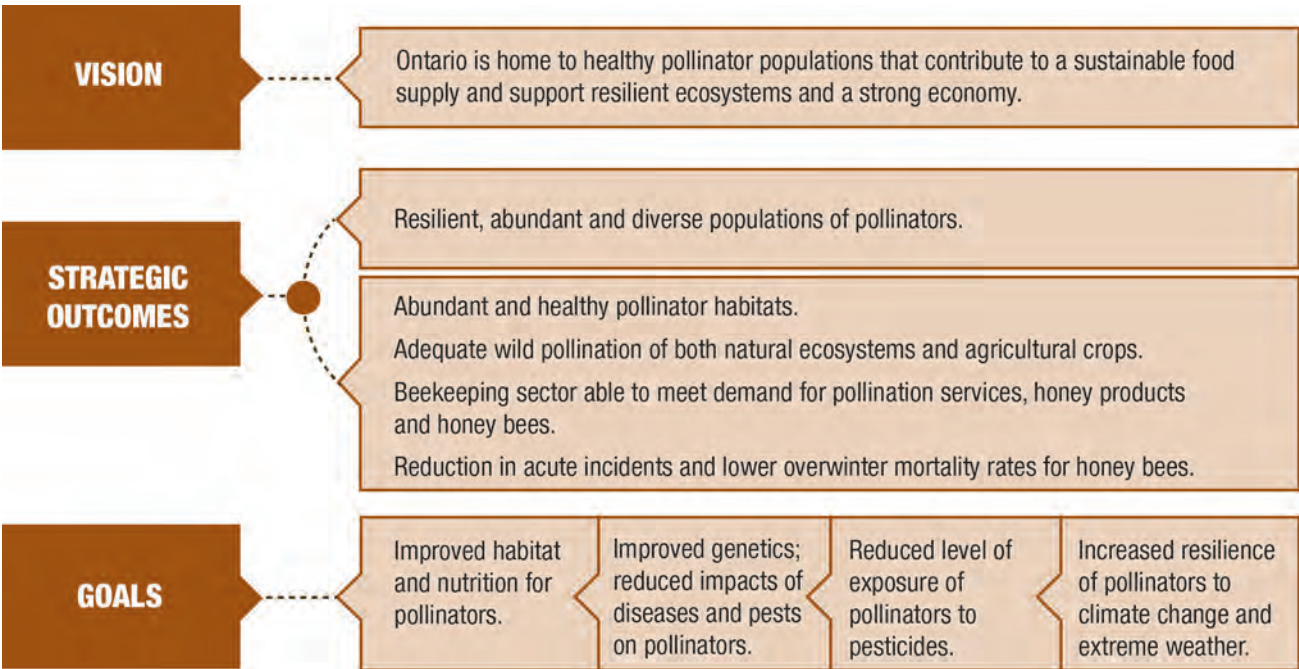
On June 9, 2015, amendments to Ontario Regulation 63/09 under the *Pesticides Act* were filed. The majority of the amendments came into effect on July 1, 2015 and they will be fully phased-in over two growing seasons. The regulation created a new class of pesticides for corn and soybean seeds treated with neonicotinoid insecticide, and restricted its use to where there is demonstrated need due to the presence of pests.

Pollinator Health Action Plan

The Action Plan is the third component of the Strategy. By developing partnerships and initiatives that strengthen pollinator health, we believe that we will achieve Ontario's vision to be home to healthy pollinator populations that contribute to a sustainable food supply and support resilient ecosystems and a strong economy.

POLLINATOR HEALTH ACTION PLAN – VISION AND APPROACH

In order to make progress towards achieving our strategic outcomes and vision, Ontario is taking action to address each of the four stressors identified as impacting pollinator health, as well as building on research and monitoring efforts.



Four Stressors Part 1: Reduced Habitat and Poor Nutrition

Habitat loss is thought to be an important factor contributing to wild bee declines and most likely all pollinator declines. Pollinators depend on habitat for food and shelter, and are threatened by its degradation, fragmentation and loss. Land-use changes alter the availability and balance of pollinator food sources, such as flowers providing nectar and pollen, and the availability of nesting sites.

Habitat fragmentation is defined as a patchy distribution of original habitats, resulting in an overall reduction in habitat size surrounded

by regions of less hospitable or inadequate habitats for pollinators. Consequently, it reduces the potential sizes of pollinator populations by increasing their isolation and transforming the landscape into a new and less favourable environment. Isolated, fragmented habitats lead to loss of genetic diversity, which in turn increases the chances of inbreeding and ultimately extinction.

The abrupt change in the ecosystem from habitat destruction results in reduced diversity and can change the overall composition of pollinator communities. These changes make it difficult for populations to recover.

In southern Ontario, the availability of pollinator food sources and nesting sites has been reduced through the conversion of habitat to intensive farmland and urban/industrial use. While development and intensification have likely had particularly negative impacts on wild pollinators, there is evidence of impacts on managed honey bee populations as well. For example, research has shown that the quality and diversity of available pollen can affect honey bee physiology including their ability to cope with disease.

To maintain effective pollination services by both wild and managed pollinators, managed land should be interspersed with more natural areas providing pollen sources from flowering trees, plants and shrubs from early spring to late autumn.

PARTNER PROFILE

Royal Botanical Gardens in Hamilton, Ontario, is enhancing practices in several of its gardens to support and increase the education and awareness of the importance of pollinators in our environment, and to support pollinator friendly habitats.

What We've Learned

- Urban landscapes have the potential to host diverse and intact wild bee communities through the creation and enhancement of residential gardens, parks and other spaces.
- Mixed and pollen-diverse habitat on farmland in close proximity to pollinator-dependent crops (e.g., buffer strips and hedgerows with pollinator-friendly tree species) or within cropped fields (e.g.,

wildflower strips) can improve pollination services and potentially increase yields on certain commodities. These investments may not require taking productive land out of production.

- The more natural or semi-natural habitat available for managed honey bees, the more nutritionally diverse food resources are available to them.
- Managed bees fed low-quality pollen supplements do not live as long, and are more sensitive to pesticides than bees fed high-quality pollen diets.
- Wild pollinators require a diverse range of nesting sites – from ground nesting solitary bees to cavity nesting bees and colonies requiring hives.
- Through consultations, people have expressed frustration with the lack of availability of native plants and seed mixes to support habitat creation efforts.

Potential Actions by the Province

- The province is leading the efforts to restore, create, protect and promote pollinator habitat across Ontario through the following action areas:
 - Building on province-wide efforts to improve natural heritage and biodiversity conservation, including Ontario's Biodiversity Strategy, and working to strengthen planning policies around natural heritage protection and with municipalities to promote development of robust, well-connected Natural Heritage Systems.
 - Consider opportunities to review current Ontario Public Services (OPS) policies, guidelines and programs

with a pollinator health and habitat restoration and/or enhancement focus. For example: landfill standards guidelines, planning for Crown Lands and reviewing the OPS Realty Policy.

- Investigate options on Ministry of Transportation lands to increase pollinator habitat on lands that could be suitable to supporting a more pollinator friendly environment.
- Establishing and implementing strategic partnerships with different levels of government, agencies and industry to enhance pollinator habitat across Ontario.
- Identifying actions to support and enhance pollinator habitat, including work to:
 - Define wild pollinator habitat and appropriate criteria.
 - Assess land cover data to identify and map probable pollinator habitat.
 - Develop options for an aspirational habitat target and a framework to measure and report progress.
- Implementing outreach initiatives to forge partnerships and raise awareness and understanding of ways to support Ontario's pollinators through:
 - Establishing a central pollinator health webpage for the government of Ontario.
 - Facilitate the development of guidance materials for pollinator habitat creation for large-scale land managers.

Potential Additional Action Areas

- Integrate pollinator health education into a range of post-secondary education programs such as landscape design and property management.
- Assess the availability of native Ontario seed mixes.
- Research the relationship between pollinators and at-risk flowering plants in Ontario.
- Explore opportunities to establish and highlight a "Pollinator Week" for the province where activities could be launched, highlighted and reported on to encourage pollinator awareness, education and action.
- Work with Aboriginal communities to support their involvement in the stewardship of pollinator habitat.
- Work with Stewardship Network of Ontario to encourage pollinator habitat conservation on private lands through sharing and exchanging information (e.g. BMPs) with local stewardship councils.
- Increase public awareness of pollinator health through Ontario Parks' Natural Heritage Education Program.
- Explore the possibility of launching a provincial "Pollinator Garden Challenge" to encourage every Ontarian to take steps to create pollinator-friendly habitat in their own backyards and communities.

Four Stressors Part 2: Diseases, Pests, Genetics

Managed bees and native pollinators suffer from a range of diseases and pest infestations. The best documented are those that affect honey bees. However, viruses, fungi and parasites are also known to infect wild pollinator species. In addition to naturally occurring diseases and pathogens, in recent years there have been concerns about pathogens crossing over from managed bumble bee and honey bee populations to Ontario's wild pollinator populations. Emerging pests and diseases are considered one of the key risks to pollinators.

Honey bees are genetically selected for a variety of desired traits including docile behaviour, increased honey production and resistance to certain pests and diseases. By identifying different genetic traits, beekeepers may be able to identify traits of interest and selectively breed bees that are more resilient to pathogens. Researchers in Ontario have investigated the role of genetics in resistance to pests and disease with some positive results. Some honey bees, for example, have been found to be less susceptible to the tracheal mite. Selecting for mite-resistant honey bees may provide additional protection against pests and diseases, especially as parasitic bee mites can develop resistance to established methods of treatment.

According to research, a significant destructive factor influencing the loss of honey bee colonies over the winter in Ontario is the parasitic mite, *Varroa destructor*. Varroa are relatively large external parasites that feed on the body fluids of adult and developing

honey bees. Among other things, varroa can transmit pathogens, particularly viruses (e.g., deformed wing virus). Varroa mites have spread from their original range in Asia to most parts of the world, including Ontario in the early 1990s. Although almost all honey bee colonies in North America are now infected with varroa, the main challenge is the ability of beekeepers to effectively control the severity of infestations.

PARTNER PROFILE

Alternative Land Use Services (ALUS) is a community-developed, farmer delivered program that gives Canadians the opportunity to play an active role in building a healthier environment by providing support to farmers to enhance and maintain ecosystem services. ALUS partners with farmers to retain and reconstruct natural areas. These rehabilitated areas have natural benefits such as creating habitat for fish and wildlife, species at risk and native pollinator insects. Active in Ontario since 2007, hundreds of Ontario farm families are involved in ALUS projects across the province, including pollinator patch planting and environmental stewardship tours.

While there are treatments that help maintain low levels of varroa infestation, treatment resistance in some varroa populations is common. Varroa continue to be a significant challenge for maintaining honey bee health. As such, mite control is an essential beekeeping practice for the survival of honey bee colonies. It is therefore important for us to understand the best ways to control varroa levels in colonies, while causing minimal harm to the honey bees themselves.

There are other pests and diseases that pose health risks to managed bees. American foulbrood (a bacterial disease) is one of the most virulent and contagious honey bee diseases and can destroy colonies and contaminate beekeeping equipment. Other bacterial diseases, such as fungi and viruses, are a reoccurring issue faced by beekeepers.

The small hive beetle (*Aethina tumida*) is an emerging pest in Ontario although it has not been implicated to date in widespread colony losses.

Researchers are now examining the importance of interactions, not only between diseases and other environmental stressors (e.g., disease and nutrition or exposure to pesticides), but also within the stressors themselves (e.g., varroa infestations with other pathogens) that affect individual bee health and colony resilience.

What We've Learned

- Through consultations, we've heard that technology transfer programs with beekeepers increase adoption of BMPs.
- Development of BMPs and integrated pest management strategies for honey bees requires applied research and data specific to Ontario. This includes establishing thresholds for treatment and protocols for monitoring.
- Management of honey bee pests and diseases is critical to addressing colony losses and to minimizing the spread of pests and pathogens within and among species.
- Honey bee genetics may play a role in how resilient colonies are to pest infestations.

- Collecting pest and disease information through apiary inspections is important to providing a better picture of colony health in Ontario.
- Early detection of emerging pests and diseases and early development of strategies is critical to minimizing the initial impact of honey bee pests.
- There is increasing industry demand for education and training around beekeeper BMPs and integrated pest management practices.

PARTNER PROFILE

The University of Guelph's Animal Health Laboratory has developed laboratory testing for honey bee pathogens and pests. This lab testing supports the ministry's Apiary Program to enhance honey bee health monitoring.

Potential Actions by the Province

- Partner with industry through education and awareness initiatives for the implementation of beekeeper BMPs such as targeted efforts to address high-risk pests and diseases (varroa and small hive beetle) and to compile and review a standardized suite of BMP resources.
- To support the sustainability of the beekeeping sector in Ontario, conduct a review of the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) legislation to assess potential for implementing mandatory training for registered beekeepers, and implementing traceability requirements for moving colonies using an appropriate legal mechanism.

- Require BMPs to be followed in order to qualify for funding assistance programs (e.g., production insurance).
- Enhance monitoring and surveillance efforts of managed bees, including pest and pathogen presence, and improving biosecurity protocols to reduce pathogen spread from managed bees to wild pollinators.
- Provide information for beekeepers on integrated pest management options.
- Network with researchers and governments in other jurisdictions on pollinator health issues.
- Strengthen honey bee genetics through supporting the “Ontario Resistant Honey Bee Selections Program” which provides access to genetically selected honey bees resistant to pests and diseases.
- Continue to work to improve honey bee disease management, including working with:
 - Pest Management Regulatory Agency to approve new treatments for varroa.
 - National Bee Health Roundtable to coordinate varroa management efforts nationally.
 - Ontario Beekeepers’ Association to collect baseline data on the prevalence of honey bee pests and diseases, and to implement a multi-faceted Small Hive Beetle Strategy.

Potential Additional Action Areas

- Strengthen beekeeper management practices and education by:
 - Partnering with stakeholders to

address high risk pests and diseases (e.g., varroa mite, small hive beetle) by expanding technology transfer efforts through on-line and train-the-trainer programming.

- Compiling and updating a suite of standardized, peer-reviewed BMP resources for beekeepers.

Four Stressors Part 3: Exposure to Pesticides

The term “pesticide” refers to a broad category of products that are specifically designed to control a pest. A pesticide can control a fungus, a weed or an insect pest. The category of pesticide that typically poses the greatest potential risk for both wild and managed bees is insecticides. While pesticides are intended to control insect pests, they can also harm beneficial insects like bees.

In Ontario, the use of pesticides in agriculture has changed over the past few decades. There has been more emphasis on reducing the risks to human health and the environment and improving education efforts on how to use pesticides safely and properly. Additionally there have been increased efforts to move towards reduced risk pesticides that tend to be more targeted in the pests that they control and; therefore, not as broad spectrum as the pesticides used in the past.

Neonicotinoid pesticides, commonly used as a systemic seed treatment, have been the topic of much attention and debate in the context of pollinator health. They are widely used in agriculture around the world and have been used in Ontario since the mid-1990s.

However, a growing body of scientific evidence shows that some neonicotinoids are highly toxic to honey bees and other insect pollinators. Impacts that have been reported include reduced longevity of adult bees, impaired foraging and navigational abilities, impaired learning and memory performance, reduced tolerance to pathogens and reduced colony development and reproduction. In addition, there have been a number of documented incidents in field conditions where honey bees have been both suspected and confirmed to be impacted by the use of neonicotinoid-treated corn and soybean seeds.

In March 2015, a draft regulation was posted to the Environmental and Regulatory Registries that would restrict the use of neonicotinoid-treated corn and soybean seed to those acres where there is a demonstrated need. The regulation created a new class of pesticides for corn and soybean seeds treated with the neonicotinoids: imidacloprid, thiamethoxam and clothianidin, and rules for their sale and use.

In July 2015, Ontario became the first North American jurisdiction to legislate restrictions that apply to neonicotinoid-treated corn and soybean seeds, under the *Pesticides Act*. In addition, farmers have taken an active role to support pollinator health by implementing the Pest Management Regulatory Agency's interim mandatory protective measures for corn and soybean production. This includes using dust-reducing seed flow lubricants, implementing new packaging standards and making costly changes to planting equipment by installing deflectors.

In an effort to enhance our understanding of Class 12 pesticides, the Ontario government is monitoring activities related to the regulation including pollen monitoring studies,

a land-use study using satellite imagery, laboratory toxicity testing to understand the potential impacts of neonicotinoid pesticides on non-target aquatic life and monitoring pesticide residue levels in water and soil.

In addition to pesticides used to protect field crops, pesticide exposure occurs when beekeepers apply products directly to their hives to control parasitic mites, fungal and bacterial infections. To date, there has been research on the effects of pest and pathogen treatments, including natural products such as essential oils, on honey bee health. Continued research into beekeeping management systems, chemical controls and the effect on pollinators is essential component of an integrated pest management framework.

What We've Learned

- Farmers have already made, and continue to make, significant contributions to support pollinator health. While voluntary progress in pesticide reduction and habitat creation on agricultural lands continues, new efforts and expectations should be balanced across all sectors in Ontario.
- Beekeeper use of insecticides and fungicides within hives to treat pests such as mites can negatively affect the bees themselves under some circumstances. Continued efforts to enhance and improve BMPs for beekeepers would ensure appropriate use of these products.
- Monitoring of neonicotinoids in the environment would help to establish baseline data so future trends can be analyzed.

PARTNER PROFILE

The Great Lakes Agricultural Stewardship Initiative funded under *Growing Forward 2* includes a cost-share program, the Farmland Health Incentive Program (FHIP) offering cost-share funding for farmers to implement BMPs that improve soil health and pollinator health. The FHIP is delivered by the Ontario Soil and Crop Improvement Association. Eligible BMPs that may benefit pollinator health include planting cover crops, buffer strips, field windbreaks and fragile land retirement. Through an innovative program design, the FHIP offers farmers the opportunity to access a five per cent pollinator bonus for adapting their FHIP projects in ways that enhance and support on-farm pollinator habitat or pollinator food sources.

beehives for the purpose of reducing bee exposures.

- Provide financial support for producers to acquire dust deflectors for planting equipment through the Great Lakes Agricultural Stewardship Initiative.
- Enhance provincial monitoring efforts to track changes in agricultural practices stemming from the implementation of Ontario Regulation 63/09.
- Monitor neonicotinoid concentrations in the environment.

Potential Additional Action Areas

- Profile and highlight BMPs for pesticide use in agriculture.
- Improve beekeeper education on the effectiveness of honey bee pest treatments.
- Support research in selective breeding strategies for honey bees resistant to pests and diseases.

Potential Actions by the Province

- Increase education and outreach activities to stakeholder groups on BMPs and integrated pest management to support the implementation of Ontario Regulation 63/09 under the *Pesticides Act*.
- Support integrated pest management training for growers.
- Enhance sector outreach to support beekeeper education around the use of appropriate pest treatments in-hive.
- Continue to work with industry to support agricultural production and land stewardship practices that reduce pollinator pesticides exposure.
- Explore opportunities to facilitate completion and launch of an e-tool to alert pesticide applicators of nearby



Bombus Impatiens / Wasyl Bakowsky

Four Stressors Part 4: Climate Change and Weather

The Earth's climate is changing. Globally, there is evidence of increasing air and ocean temperatures, widespread melting of snow and ice and rising sea levels. In Canada, we are already seeing rising temperatures, shifting rainfall patterns and increases in certain types of hazardous weather such as heat waves. Recent studies have shown that wild pollinators are highly vulnerable to climate change.

Although precise impacts can be difficult to predict, climate change could contribute to pollinator declines by modifying the balance between bees and their environment, including exposure and susceptibility to diseases. There is evidence of climate change causing earlier spring thaws which have resulted in many plants flowering sooner than usual. Consequently, pollinator species could undergo population declines if plants bloom at times when pollinators are dormant. Pollinators also require continuous availability of food resources, and shifts in key seasonal changes such as flowering time and emergence of insects, could lead to gaps in the succession of flowers causing a lack of food for longer-lived pollinators or colonies.

The geographic ranges of pollinators are also shifting as temperatures increase. Bees that thrive in tropical environments are predicted to expand their ranges, whereas bees that thrive in narrow-ranged temperate climates will likely experience range reductions and are at risk for population decline.

In addition to the gradual increase in temperature, climate change causes more frequent extreme weather events like storms, floods, heat waves and droughts. Extreme weather fluctuations can have severe impacts on pollinators already stressed by climate change. Less mobile pollinators, such as small beetles and ground nesting bees, may be the most seriously impacted by events such as flooding. Extreme weather can kill individual insects, but can also negatively impact entire colonies or local populations by interrupting foraging and mating and lowering individual and colony success.

PARTNER PROFILE

The Ontario Ministry of Agriculture, Food and Rural Affairs and the Ministry of Environment and Climate Change are offering Integrated Pest Management (IPM) training for corn and soybean crops through the University of Guelph Ridgetown Campus. The course covers topics such as IPM principles including corn and soybean pest identification, planting BMPs, the new regulatory requirements regarding Class 12 pesticides and pollinator protection from neonicotinoid exposure.

An example of extreme weather in Ontario was the record-breaking early spring thaw in 2012. The 2012 thaw, caused by much warmer than normal seasonal temperatures, significantly impacted Ontario ecosystems. There were reports of fruit trees that bloomed five weeks ahead of schedule and were then extensively damaged by the frost that hit Ontario in late April of that year. The flash freeze wiped out about 80 per cent of Ontario's apple blossoms and resulted in less than half of the expected the yields for

tender fruit growers. The intense heat, then cold, combined with infrequent food supply for pollinators, illustrates how climate change can put intense pressure on pollinators and lead to serious pollinator health issues and mortalities.

Honey bees originally evolved in warm climates in the Asian tropics. Sub-populations in Northern Europe adapted to withstand colder winters like those in temperate regions of North America and Europe. Despite the ability of honey bees to store winter food reserves and thermoregulate in tight clusters, long or extremely cold winters can result in colony death, especially when combined with other factors.

Long and harsh winters only account for some of Ontario's honey bee colony losses. The overall patterns of colony loss may be due to interactions between a range of factors, including pests, pathogens and diseases and management practices. Climate change may shift the balance between the honey bee, its plant environment and its diseases.



Hairstreak Butterfly / Colin Jones

What We've Learned

- In consultations, we heard that stakeholders think existing initiatives around climate change (such as the provincial government's Climate Change Strategy and Action Plan) should support pollinator health.
- For managed honey bees, implementing over-winter BMPs can improve colony chances of surviving harsh winters.
- Actions to improve habitat and resilience of bees will help to mitigate the negative effects of climate change.

Potential Actions by the Province

- As part of Ontario's Climate Change Strategy, and forthcoming five-year Climate Change Action Plan to be released in 2016, the government will explore opportunities to align climate change objectives with agriculture and the natural system to support pollinator health. By building on existing measures such as: managing and restoring wetlands and forests; increasing green spaces that provide habitat for pollinators; and promoting BMPs that can help both wild and managed pollinators survive gradual changes in climate and extreme weather events, the province will take action to reduce the vulnerabilities and strengthen the resilience of natural systems and agriculture.

Potential Additional Action Areas

- Investigate and promote BMPs that can help honey bees survive harsh winters and extreme weather events.
- Conduct climate change vulnerability assessments for select wild pollinator species.

PARTNER PROFILE

The Ministry of Natural Resources and Forestry has partnered with the Ontario Biodiversity Council representing conservation and environmental groups, industry associations, Aboriginal organizations, academia and government agencies to conserve biodiversity and build an ecologically sustainable and strong future for the province. Ontario's Biodiversity Strategy lays out a vision where biodiversity loss is halted and recovery is advanced - People value, protect and enhance biodiversity and the ecosystem services essential for human health and well-being. Conserving Ontario's biodiversity will enhance resilience and buffer against various threats on pollinators, such as habitat loss, invasive species and climate change.

RESEARCH AND MONITORING

Pollinator health is complex, and knowledge gaps remain regarding how these stressors interact. Current research tells us that the health of pollinators needs to be improved, and that populations of certain species are declining. Yet in Ontario, the current population status of most wild pollinators is relatively unknown. Researchers have identified gaps in current knowledge of pollinators and pollinator declines, and have prioritized research efforts that are needed to close the gaps.

To help fill these gaps and build on knowledge, the Ontario government will continue to align and leverage existing research programs. In addition, robust monitoring programs will be established to track and measure how the Action Plan is making a difference. Through this adaptive management approach, we will continue to learn and incorporate new findings.

The Ontario government will prioritize and fund research projects that improve our knowledge of the key stressors influencing pollinator health and support research to understand, prevent and recover from pollinator losses. Research and monitoring will provide ongoing evidence to support the Action Plan's implementation and allow us to adapt our efforts over time.

What We're Doing

- Monitoring bumble bee species diversity and tracking population levels over time in southwestern Ontario.
- Monitoring honey bee populations, disease and conditions through the Apiary Inspection Program.
- Continuing to align and leverage existing research programs such as the Ontario Ministry of Agriculture, Food and Rural Affairs-University of Guelph Partnership Agreement and OMAFRA's open research programs.

Potential Action Areas

- Launch a special "Call for Proposals" to fund new pollinator health research projects to fill knowledge gaps for example, understanding how varroa infestations interact with other stressors, studying implications of climate change for Ontario's pollinators and assessing the effectiveness of various land management practices.
- Enhance honey bee monitoring to better track and establish baselines for beekeeper BMPs, pests and disease prevalence, health status and colony losses.

ONTARIO'S COMMITMENT TO POLLINATOR HEALTH

The Ontario government is committed to improving pollinator health and reversing population declines through the work related to the Action Plan and other projects. Several initiatives and partnerships are at the forefront of these efforts, including public and stakeholder consultations.

Ontario Bee Health Working Group

The Ontario Bee Health Working Group was formed in 2013 and was represented by a broad range of stakeholders including federal and provincial government, industry, scientists, farmers and beekeepers. The Group's final report outlined 13 options – many of which have since been implemented to mitigate declining honey bee populations.

National Bee Health Round Table

The Ontario government participates on the National Bee Health Round Table, established by the federal government in partnership with industry in March 2014, with the goal to provide national coordination on bee health. In December 2014, the National Bee Health Action Plan was launched to help facilitate the continued growth of a healthy, innovative and profitable apiculture sector across Canada. The National Bee Health Roundtable is a key partner in Ontario's efforts to protect pollinators. Initiatives through the Roundtable will be leveraged through the Action Plan.



Monarch Butterfly / Colin Jones

CONCLUSION

Pollinators are vital to a healthy ecosystem and they play a crucial role in Ontario's agriculture sector. By working together as partners and contributors, we can take actions that will support Ontario's pollinator populations and the ecosystem services they provide.

The draft Action Plan is your opportunity to play an active role in this important process at a critical time. Your comments and ideas will help us finalize the Action Plan and implement the steps needed to ensure robust and healthy pollinator populations.

We have already begun work on several parts of the draft Action Plan. Ongoing public input and adapting our strategies

based on that input will be essential to achieving our goals. We will be keeping our partners and the public informed on the progress of the draft Action Plan, including reporting on our aspirational targets.

The draft Action Plan identifies many opportunities for engaging Ontarians of all ages in our efforts to help pollinators. From individuals, to schools, community groups and businesses – everyone has an important role to play. By working together we can collectively take steps to reverse pollinator losses and improve pollinator health across Ontario. Pollinators belong to all of us; we are all accountable for their protection.

HOW TO COMMENT ON THE ACTION PLAN

- Comments can be submitted online through the Environmental Registry: www.ebr.gov.on.ca/ERS-WEB-External/ during the time identified within the posting.
- Additionally, please visit www.omafra.gov.on.ca/english/pollinator/meeting-reg.htm to find out how you can participate in an online survey to gain public feedback on the draft Action Plan.

We want to hear about what your organization does to help pollinators. Let us know by emailing pollinatorhealth@ontario.ca

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Apis mellifera DA / D.A. Sutherland