

Technical Guide

Technical Guide for Preserving and Creating Habitat for Pollinators on Ontario's Farms







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SECTION I

Who is this guide for?

This guide has been created for farmers in Ontario who want to act to preserve, or create, pollinator habitat on their land. Actions that support pollinators improve the farm environment as well as the resilience of your farm business. Throughout this guide you will read stories of other farmers who have taken action across agricultural communities in Ontario to become pollinator champions. In Chatham-Kent, Blake Vince uses cover crops to improve his soil and feed the bees. In Bancroft, the Kellys are protecting the natural landscape to enhance their blueberry yield through the use of wild pollinators, and the Adams are retiring marginal land from field crop production to create a bee pasture. Whether your goal is to enhance crop pollination or increase the stewardship value of your land, this guide provides concrete examples to guide you.

Three simple ways to support pollinators on your farm:

1. Keep the natural habitat you already have.
2. Enhance habitat where you can, especially in combination with other Best Management Practices.
3. Reduce the use of pesticides where possible.

How to use this guide

This guide presents three strategies for protecting and creating habitat for pollinators on farmland and outlines specific actions and farming practices that are beneficial to crop production and pollinators. Some of these actions can be applied to all farms, while others may be more specific to certain systems. Motivation for taking action may be to meet production goals, such as: increasing yield; stewardship goals, such as: erosion control; or, business goals such as branding. Regardless of motivation, combining goals into a single action is cost efficient. Wherever possible, combine actions that support pollinators with other Best Management Practices (BMPs) to take advantage of cost-share opportunities, so that a single stewardship action can provide multiple benefits at a reduced cost.

Section 1 introduces the topic of pollinators on farms, including challenges and opportunities.

Section 2 explains key strategies and provides concrete actions that can be combined with other BMPs.

Section 3 provides actions specific to different farm types and shares the stories of pollinator champions

Section 4 contains planting guides, and other resources, to help you enhance your farm for pollinators.



Photo: Diane Wilson

Who are the pollinators?

Pollinators play a key role in maintaining healthy ecosystems and abundant food by enabling flowering plants to reproduce. In fact, 35% of the volume of food produced is reliant, to some extent, on pollinators¹. There are many different types of pollinators, including bees, butterflies, flies, moths and birds. Thousands of unique species are responsible for pollinating most of the world's flowering plants, including over 850 bees and wasps native to Canada. However, all of them share the same basic need for foraging habitat and nesting habitat, and all need protection from pesticide exposure. This guide will focus on bees, which are the most effective pollinators of both crops and most wild plants, but the actions you take for bees will also benefit other pollinators.

Native bees

There are over 400 species of native bees in Ontario. A few species, including the common eastern bumblebee and the blue orchard bee, have been domesticated and are managed for crop pollination, but the vast majority of native bees are wild. Most species live a solitary life while a minority are social and form colonies. Generalist species, like bumblebees, forage on a wide variety of crops and wildflowers, while specialist species, such as the squash bee, are dependent on a limited group of plants for survival. In Ontario, there have been documented population declines in some bee species over the last few decades. The rusty-patch bumble bee was once common in eastern North America, but by the mid-1990s the population had dramatically declined. It was last seen in Ontario in 2009, despite extensive targeted searches in the last several years². The cause, or causes, of its disappearance remain unknown, but the loss of this once-common species is a reminder that native pollinator conservation is important.

Solitary bees:

About 70 per cent of solitary bees, such as sweat bees and miner bees, nest in the ground by excavating small vertical tunnels. Carpenter bees, most leaf cutter bees and mason bees nest in hollow twigs, cavities, or in wood. Different solitary bees are active at different times of the growing season: Some are only active in the spring, summer or fall, while others are active throughout the season. Solitary bees pose very little stinging risk at any time.

Bumble bees

There are 14 species of bumble bees across Ontario. Bumble bees are especially effective pollinators because they 'buzz' pollinate: By vibrating their entire body at a high frequency, they are able to dislodge pollen in tight flowers that are inaccessible to other bees. Bumble bees nest underground in abandoned rodent burrows or above ground in bunching grasses and plant litter. They can also be found nesting in houses or barns. Wild bumble bees form small colonies that are initiated in the spring by queens that have overwintered in the ground. These queens build colonies that last a season and produce a new generation of queens at the end of the season. The next generation of bumble bees is dependent on the survival of these



Photo: Steve Fletcher



Photo: Derrick Ditchburn



Photo: Leif Richardson

new queens who mate, overwinter underground and repeat the cycle the following spring. Bumble bees are active from April until October and feed on flowers throughout that time. Although bumble bees are defensive around their nests and will sting, they pose little stinging risk when they are foraging unless disturbed.

Honey bees

Colonies of honey bees have been the workhorses of crop pollination for years in Canada. They were imported from Europe to North America almost 400 years ago for honey and beeswax production and are the most common managed bee species in Ontario. They live in large social colonies in hives provided by beekeepers. Honey bee colonies may live for many years if managed well and protected from undue stress. Farmers often enter into pollination contracts with beekeepers to obtain their pollination services. Managed honey bee populations have been under great stress in Ontario from a variety of factors such as pest and disease, habitat loss, pesticide exposure and climate change, leading to problems with overwintering and survival.

BEE FACTS

- Native bees are important crop pollinators and wild flowering plants depend on them.
- Bees need a diversity of flowers that bloom from early spring into late fall.
- Native bees nest and overwinter underground, in bunching grasses, in logs and hollow stems and many other places.
- Honey bees are important non-native managed pollinators that also provide honey and beeswax.
- Different bees have different tongue lengths. This will determine which flowers they can use for forage.



Why Pollinators are Important to Farms

Many farms in Ontario grow crops that depend upon bees for pollination services. These farms would experience reductions in yield and quality without insect pollination services. Whether you grow crops pollinated by insects or not, providing habitat on your farm contributes to a thriving agricultural economy in Ontario.

Farm families in Ontario value diverse foods. Pollinators are responsible for many of the nutrient-rich fruits and vegetable foods we eat. They are also crucial to oil seed crops like canola and other foods that we enjoy such as apples, peaches, tomatoes, and squash. Even dairy products, beef and lamb are dependent upon pollinators as the seeds used to grow legume hay are the product of insect pollination.

Farmers are stewards of the land in Ontario. They understand that there is a strong link between sustainable agricultural production and the health of the natural environment. In addition to pollinating crops, pollinators contribute to environmental health by pollinating about 90 per cent of flowering wild plants. These plants in turn produce seeds and fruit that feed wildlife.

Farmers, like most people in Ontario, enjoy and value flowering wild plants for their beauty. Pollinators need these same plants and these plants need the pollinators too.

Farmers are not the only ones responsible for taking action to support pollinators. All kinds of people and organizations in both rural and urban settings are working together to protect and create pollinator habitat. People in cities are taking action through programs that encourage planting pollinator gardens while reducing and eliminating pesticide use. Municipalities are creating pollinator-friendly habitat in parks, along trails, and even decommissioned landfill sites. Utilities and roadside managers are incorporating pollinator habitat on the properties they manage while governments, conservation authorities, and not-for-profit organizations are providing funding and expertise to establish new pollinator habitats. Universities have undertaken research to increase our collective knowledge of pollinators and schools are including pollinator gardens on their grounds. This is a job that involves everyone!



Photo: Danelle Hevron Studio

Challenges to Pollinator Conservation on Farms

Farmers are business people as well as stewards of their lands. They must balance business goals with environmental goals, meaning that pollinator solutions must be practical, simple and affordable. Below are common challenges to conserving pollinators on farms.

- **Economic viability:** Farms need to make a profit to survive. Protecting and enhancing pollinator habitat on farms may affect that profit. Farmland is valuable and in some parts of the province, especially in the southwest, it is in short supply. Taking good farmland out of production to create pollinator habitat may not make financial sense in these situations.
- **Space Issues:** In areas of intensive agriculture there is not much natural land for pollinator habitat, yet these are often the areas that would benefit from pollinators for crop pollination.
- **Space Issues:** On-farm features that provide habitat for pollinators, such as hedgerows around fields, have been removed to accommodate the large machinery used in field crop production.
- **Pest Control Issues:** Pest control actions may include the use of substances that result in unwanted effects on pollinators.
- **Global issues:** Populations of wild and managed pollinators are declining worldwide. The causes of this decline are complex, and protecting and creating habitat on farms is only one of the solutions needed.



Opportunities to Support Pollinators on Farms

Though there are challenges to pollinator conservation on farms, there are also opportunities. Ideally, actions you take for pollinators will also have other business, production, and stewardship benefits.

- Protecting pollinator habitat can be as simple as keeping the natural areas you already have.
- Creating and protecting habitat for wild bees and other pollinators can ensure, and even increase, your crop yield and quality.
- Pollinator habitat can be combined with other Best Management Practices (BMPs). By including flowering plants in projects for erosion control, nutrient loss mitigation, and water quality support you can get multiple benefits with a single action as well as access cost-share funding.
- Even if your crops don't need insect pollination, they may be contributing to the pollinator habitat on your farm.
- Pollinator habitat can play an important role in pest reduction by hosting other beneficial insects that prey on insect crop pests. This may result in reduced costs for insecticides.
- Enhancing pollinator habitat on your farm can help you 'brand' your business and demonstrate your stewardship values to your business partners and clients, as well as to the general public.
 - Increasingly, consumers are influenced by environmental branding in the food purchasing choices they make.
 - You can certify your farm as 'bee-friendly', giving you access to a logo that can be used on your website and on signage.
- Pollinator habitat also makes your farm more attractive and increases the quality of life for your family.



SECTION II

Three Strategies for Pollinator Conservation on Farms

Bees need:

- pollen and nectar from early spring until late fall
- places to nest and overwinter
- some protection from pesticides

Fortunately, three relatively simple strategies, can result in substantial positive impacts on bees. The first, and easiest, strategy proposed in this guide fits almost any farm. It involves keeping the sources of food and shelter for bees that you already have on the farm. The other two strategies, enhancing bee habitat and reducing pesticide exposure, can be more involved. For farmers who want to take these extra steps, there are government-funded stewardship programs and other organizations that can provide cost-share funding and technical support (see page 29). Farmers

seeking to enhance crop pollination by native bees can see a return on their investment in habitat creation within four to five years.

The three strategies:

1. **Keep** the natural habitat you already have.
2. **Enhance** habitat, especially in combination with other Best Management Practices.
3. **Reduce** the use of pesticides.



Photo: Leah Lewis



Strategy 1:

Keep the natural habitat you already have

One of the best things you can do for pollinators is to keep the sources of food and shelter for bees that are already on your farm. These resources are found in the semi-natural and natural areas on the farm and in the wider landscape. Conservation areas, wetlands and woodlots are examples of natural areas, while fence lines, riparian buffers, pastures, and roadsides are considered semi-natural because they are often mowed or sprayed and contain mixes of native and non-native vegetation. Several studies indicate that farms in landscapes with at least 23 per cent of these types of cover can meet their crop pollination requirements from wild pollinators.^{1,3,5} According to Statistics Canada's 2011 Agricultural Census, most farm types in Ontario are already at 22 per cent cover or higher, excluding hog farms, vegetable farms, and grain/oilseed farms. Removing a feature like a perimeter hedgerow on a 100 acre (50 ha) farm represents the loss of an asset worth approximately \$12,000 (which is only the cost of re-establishment and does not take into account the financial benefits it provides to crops or cattle).

- Keep farm features like hedgerows, ponds, wind-breaks, riparian buffers, grassy areas, and woodlots.
- Limit mowing of ditches, roadsides, and grassy areas to once a year or less to provide nesting habitat for bees and places for butterflies to lay their eggs.
- Wait to mow until after plants have bloomed, but before they go to seed. This helps provide food for pollinators and prevents weeds from spreading to your fields.
- Keep dead trees, downed logs and shrub and flower stems for cavity-nesting bees wherever it is practical to do so.
- Leave patches of bare, undisturbed soil for ground-nesting bees.
- Tolerate non-invasive native plants on marginal land or field edges and corners in cases where these species do not pose a risk.

CASE STUDY 1

Keeping Hedgerows on the Buckhorn Berry Farm

Buckhorn Berry Farm, in Peterborough County, is owned by the McLean Family. It is a 187-acre 'pick-your-own' mixed vegetable and fruit farm with 120 workable acres and about 36 per cent natural cover. Crops include strawberries, raspberries, black currants, pumpkins, sweetcorn, peas, beans, and tomatoes, as well as asparagus. Many of the farm's crops require pollination by bees, especially the fruit crops and pumpkins.

Because of the varied nature of their cropping system, the McLeans keep the hedgerows that divides their farm into small fields of about 10 acres. Farm laneways follow the hedgerows throughout the farm and provide access to the fields. This combination of small, contained fields and laneways is well-suited to their pick-your-own business model. The hedgerows not only enhance the beauty of the farm and make it more attractive to visitors, but also create beneficial micro-climates in each field. By keeping these hedgerows, the McLeans did not incur the heavy costs of tree and stone removal and have maintained a natural feature worth tens of thousands of dollars in plant material alone.

The unexpected benefit of keeping the hedgerows intact and tolerating other natural spaces on the farm has been the free pollination services to the vegetable and fruit crops provided by the wild bees. These bees nest in the undisturbed field edges, around the laneways, in the hollow stems of plants such as sumac growing in the hedgerows, and in cavities within rockpiles in the hedgerows. The hedgerows provide alternative sources of nectar and pollen for native bees when there are no crops in bloom as well as cover for overwintering bumblebee queens. Unsurprisingly, the McLeans do not need to rent managed honeybees because Buckhorn Berry Farm gets all the pollination services it needs from native bees already present on the farm.

Strategy 2: Enhance habitat

Whether your goal is to ensure crop pollination or simply to increase the stewardship value of your land, enhancing habitat for bees is simple: Provide sources of food and shelter as already described above, and protect these sites from pesticides. Habitat enhancement involves costs both in land and in plant material. To minimize expense and effort, combine pollinator habitat with other stewardship and BMP projects, including native flowering shrubs and flowers in a riparian buffer to prevent nutrient losses into waterways. Choose a mix of plants that provide a variety of benefits to the system you are creating. You can find suggestions for plant selections on p.30.

Basic considerations for habitat creation include:

- Provide blooms from April to October:
 - Include at least three flowering species per season.
 - Include clumping native grasses in the flower mix.
 - Choose different flower shapes to accommodate bees with different tongue lengths
- Include nesting and overwintering sites:
 - Leave bare spots for ground nesting bees;
 - Minimize soil disturbances to protect ground nesting species;
 - Include hollow twigs and stems; tall and bunching grasses; and fallen logs.
- Protect habitat from pesticide exposure:
 - Locate new habitat at least 150m from where pesticides are used or;
 - Use a non-flowering buffer like a shrubby windbreak between the habitat and cropped land (bees can fly through the windbreak to your crops for pollination, but the buffer can protect the habitat from spray).
 - Reduce pesticide use, select reduced risk pesticides, and practise Integrated Pest Management.
 - Be especially mindful of pesticides whose labels note they are toxic to bees.
 - Avoid tank mixes or pre-mixed products that may contain additional active and inactive ingredients that can also have negative impacts.
- For crop pollination, locate habitat within bees' flying range
 - Locate habitat within 750m or less of crop field edges to attract larger-bodied species like bumble bees.
 - Many solitary bees have flying ranges of less than 350m
- Avoid disturbing habitat
 - To protect bees and other beneficial insects, do not mow more than 20 per cent of habitat per year.
 - Mow a different section every year.

Photo: JP Anderson

Enhance Habitat

Pollinator Habitat Enhancement tools for the farm

Buffers:

- Create strips of vegetation along waterways, drainage ditches, around ponds, and along the edges of cropland to provide pollinator habitat and to mitigate erosion and nutrient loss from cultivated fields.
- Include native and non-native flowering shrubs, trees, broadleaf plants and grasses, depending on the location and long-term goals.
- Seed or establish bare root cuttings in spring.

Windbreaks:

- Plant strips of shrubs and trees on field or property perimeters to offer pollinator habitat and reduce wind speed and erosion.
- Include native flowering shrubs and trees.
- Avoid plants that may be alternative hosts for diseases or pests of your crop.
- Establish seedlings or bare root cuttings in early spring or early fall.
- It takes five-10 years to maximize the benefit of a hedgerow.
- Farm business benefits: reduces feed consumption of cattle; increases yield in dry conditions; increases beneficial insects; and reduces mortality in lambs.

Cover Crops:

- Plant cover crops within cropland to improve soil health and prevent erosion.
- Include non-native legume, grass and broadleaf species (single species or mix).
- Use cover crops in no-till, strip-till, or conventional till systems in annual or perennial crop systems.
- Seed at various times during the season to match fallow periods between crops.
- Learn which cover crops are best in your area by asking other farmers and government specialists.

Bee Pastures:

- Annual or perennial plantings used in parcels of land 0.5 acre or more that are marginal to crop production because of their slope, lack of fertility, stoniness, wetness, fragility, or inaccessibility to large machinery.
- Include a combination of native grasses and flowering plants that do not interfere with surrounding cropland.
- Seed in fall if you are using native species that benefit from cold exposure for germination.

Wildflower strips:

- Strips of flowering annuals used primarily in and around crop fields to increase pollination of crops.
- Include a combination of native and non-native flowering plants that flower when your crop is not in flower.
- Seed in spring if using annuals or seed in fall if you are using native species that benefit from cold exposure for germination.



Buffers

Implementing buffer plantings around ponds, along waterways, and on cultivated field edges is the recommended BMP to reduce erosion, mitigate nutrient loss, and increase water quality on farms. This is important for farms whose waterways feed directly or indirectly into the Great Lakes, especially Lake Erie. Pollinator habitat can be integrated into buffer plantings with very little extra cost or effort. Buffer plantings that incorporate pollinator plants add natural beauty and recreational value for the families living on the farm.

- Government farm stewardship programs (see Appendix) provide cost-share funding for buffer plantings, including bonuses if pollinator habitat is integrated.
- Consult with your local conservation authority. They may have additional funding for buffer plantings and may provide access to volunteers for planting.
- For established ponds and waterways with vegetation in place, plant bare root seedlings or potted shrubs and broadleaf plants into the established vegetation to increase pollinator habitat. Mulch heavily around new plants.
- For new ponds with high erosion potential at the pond edges, seed an annual nurse cover crop of rye, oats or low-growing white clover as well as warm-season native grasses. Plant bare root native shrubs and potted broadleaf and clumping grasses in groupings, with moisture tolerant species closer to the pond edge.
- Plant native aquatic plants such as pickerelweed within ponds also. Pickerelweed provides foraging habitat for a specialist native bee.
- Native shrubs such as elderberry, sumac, raspberry or blackberry that can be used in buffer plantings also provide nesting sites for bees, berries for birds, or cover for wildlife in general.



CASE STUDY 2

Rocky Lane Farm Turns a Drainage Project into a Pond and Bee Habitat

Bob and Gail Irvine, of Rocky Lane Farm, in Peterborough County, raise a closed breeding flock of purebred Dorset sheep on their 100 acre farm. They use an intensively managed rotational grazing pasture system and are leaders in Ontario in flock health management and genetic improvement.

In an effort to improve their hay and pasture land, the Irvines decided to install subsoil drains in a field that was often waterlogged. Through the efforts of the Kawartha Farm Stewardship Collaborative (KFSC), the Irvines were able to access funds and technical help from Ducks Unlimited to create a duck-pairing pond to receive the water drained from the pasture. Because they were willing to delay cutting hay and grazing sheep on their newly drained land every year until after Bobolinks and Meadowlarks fledged, they were able to access additional cost-share funding from the Species at Risk Farmer Incentive Program (SARFIP). This funding also helped to pay for plants used to establish pollinator habitat in a half-acre buffer area around their new pond. The project was further supported by technical expertise and funding from a local not-for-profit called Farms at Work.

Three years later, the pond is alive with fish, frogs and ducks. A wide variety of interesting native plants and pollinators live in and around it. The Irvine family enjoys the beauty of the pond in all seasons and regularly engages in recreational activities such as swimming, fishing, and skating there.

Windbreaks

Windbreaks protect crops, livestock and soil by creating beneficial micro-climates where wind speed is reduced and temperature is moderated. By incorporating native flowering trees and shrubs, windbreaks can also support bees and insects that prey on crop pests⁶. A windbreak that supports pollinators can be designed to fit your farming system. For example, windbreaks in orchards should not include mountain ash or hawthorn because they are alternative hosts for apple scab, and those in cereal crops should not include barberry, the alternative host of cereal rust.

- Government farm stewardship programs (see Appendix) provide cost-share funding for windbreaks, including bonuses if pollinator habitat is integrated.
- Choose a variety of trees, shrubs, and forbs of different heights, different growth habits, and different flowering times to create a low-density windbreak where light can be seen through about 70 per cent of the face. This spreads snow evenly over the field and reduces soil erosion and soil moisture.
- Windbreaks take five-10 years to provide maximum benefit.
- Avoid plants that are alternative hosts for your crops' pests and diseases.
- Ensure trees and shrubs are planted on soils that best suit them

Costing a Windbreak that Provides Pollinator Habitat

Objective: To create a medium density 6 meter-wide windbreak using native shrubs and trees along the north and west sides of a 100 acre (50 ha) parcel of land to simultaneously reduce wind erosion, increase yields of field crops, and create pollinator habitat.

Amount of Land Retired from Production: 1.2 ha or 2.4 per cent of the farm

At a rental cost of \$400/acre (\$800/hectare) the land retired from production to plant the windbreak could be valued at \$960/year. This represents the combined cost of reducing soil erosion, increasing crop productivity, and sustaining pollinators.

Plant Material Costs: \$12,000 or \$1/meter of wind break
A rough estimate of costs for the purchase of native trees and shrubs assumes the use of commercially available bare rootstock, a spacing of 1 plant/m² and an average cost of \$1/plant. With the above assumptions, the cost of the planting would be \$12,000, or \$1/meter of planting. Between \$4800-\$7800 could be recovered through cost-share funding.

Hypothetical Cost of Creating a North-west Perimeter Planting on a 50-ha Farm with Cost-share Funding (2015 values)			
	% Cost Share Funding	Amount Paid by Cost-share Program	Amount Paid by Farm
Project Cost without cost-share Funding:	–	–	\$12,000
Maximum Cost-share Funding	60% + 5% top-up	\$7800	\$4200
Minimum Cost-share Funding	35% + 5% top-up	\$4800	\$7200

CASE STUDY 3

Re-Establishing Windbreaks on a Grain Farm—We leave this world but the land stays.

Shelley and Tony Spruit have been farming for 28 years, including, a 2000 animal farrow to finish pig operation for 10 years. They grow cash crops such as wheat, soybeans, corn, and barley on their farm in Dundas County, in eastern Ontario. “We have tried to structure our farm to help encourage other large scale farmers to integrate environmental stewardship at every level of their farming practices,” says Shelley Spruit. The Spruits are heavily involved in preserving heirloom seed and they also trial wheat and oats for the Manitoba Research Station’s project on adaptable grains. Although most of their crops are wind-pollinated, with technical help from Alternative Land Use Service (ALUS), the Spruits have taken action to re-establish windbreaks along field perimeters and plant marginal land with native trees, fruit-bearing shrubs, and native roses that provide forage for native bees and other wildlife. When asked why, Shelley points out: “We leave this world, but the land stays.”

Marginal lands

Most farms contain small sections of land that are fragile, unprofitable to crop, or that are not under production. These marginal lands can be enhanced for pollinators by creating bee pastures. A bee pasture is an area 0.5 acres or larger, managed to sustain bee reproduction. It contains mixes of flower species that provide abundant blooms from early spring into late fall, as well as grasses, and even flowering shrubs when space or location permits. Grasses, bare ground, hollow stems and dead logs should be included within or near the pasture to provide nesting and overwintering sites.

Bee pastures are a great tool for farmers who want to enhance crop pollination and remove fragile and unprofitable land from production. Many farmers who don't need insect pollination are also establishing bee pastures for stewardship reasons. For crop pollination purposes, bee pastures should be created within 150-750m of crop edges (or less, if there is little risk of pesticide drift), which is the typical foraging range of most native bees. Good locations for bee pastures are turf areas, land around service buildings, non-productive field corners and small and/or oddly shaped fields where it is difficult to manoeuvre machinery. Choose the location that suits your farm and minimizes the risk of pesticides drifting onto the bee pasture. Bee pastures can be placed close to the road near the farm entrance and can include signage to brand your farm as a pollinator-friendly farm.

- Include early spring, summer and late fall blooms in your bee pasture so bees have abundant pollen and nectar throughout the growing season.
- Include mostly native flowers in your bee pasture, with a smaller proportion of native grasses for egg laying and nesting habitat.
- Cut seed costs, include non-native perennial species like yellow sweet clover, non-native vetches, red clover, alfalfa and phacelia.
- Make sure there are nesting resources like bare ground, hollow stems and logs in or close to the bee pasture.
- Create bee pastures 0.5 acre or larger that can be left undisturbed.



Photo: Lee Solter

Cover crops

Increasingly, farmers in Ontario are using cover crops for soil health improvement, erosion prevention, weed control and even for cattle forage. With thoughtful management, farmers can add bee habitat to the benefits their cover crops provide. The main consideration for managing cover crops for pollinators is that the cover crop must produce flowers and must have time to flower for bees to benefit. Like flowering cash crops, cover crops in annual systems are ‘feast-or-famine’ for pollinators, since they only bloom for a short period of time between other crops. For this reason, it is important to provide habitat on non-productive lands as well. In this way, cover crops are integrated into a ‘whole farm’ approach to production and conservation.

- Wait until most of the cover crop has flowered before termination or leave strips of standing cover crop to sustain beneficial insects.
 - Consider methods of termination like roller-crimping and winterkill, which are less disruptive for beneficial insects than tillage and herbicides.
 - Maintain bee habitat on non-productive parts of the farm to complement the ‘feast-or-famine’ cover crop scenario for pollinators.
 - Leave as much cover crop residue as possible to protect beneficial insect eggs and overwintering adults.
 - Minimize insecticide use following cover crops. By boosting beneficial insects through cover crops and IPM, you may have less pest pressure.
- In perennial systems like orchards or berry farms, use a low, perennial flowering cover crop between crop rows that includes species like clover, trefoil, buckwheat, vetch or phacelia.
 - In annual cropping systems like corn/soybean/wheat rotations, there may be fewer opportunities for cover crops to bloom before termination because of the relatively short growing season in Ontario. Identify fallow periods between crops and determine which species can flower within that period of time.

Seasonal Opportunities

Overwinter:

Winter canola is a good pollinator species to include with an overwintering cover crop like rye grass, because it can bloom in the early spring.

Mid-summer

Flowering legumes and species like buckwheat, sunflower, flax, fava beans, radishes, crimson clover and Austrian winter peas with a mix of warm and cool season grasses can be seeded after a wheat harvest in July-August to supply a staggered mix of blooms into late fall.

Summer fallow

A summer fallow provides an excellent opportunity to include flowering broadleaf and legume cover crops for pollinators. Plant selection can include annual species that flower at different times to provide pollen and nectar throughout the growing season.

CASE STUDY 4

Blake Vince's Cover Crops for Soil and Bee Health

Blake Vince farms 1,300 acres of no-till corn/soybean/wheat in Chatham-Kent. Cover crops have been an integral part of his farm for many years, and he's constantly looking to improve and fine-tune his mixes. "You want to have living roots in the soil for as long as possible, to keep the soil healthy, alive and aerated," says Blake. "After my winter wheat harvest, I use a mix of warm and cool season grasses with flowering broadleaves and legumes: sunflower, flax, fava beans, phacelia, sunn

hemp, radishes, crimson clover and Austrian winter peas. This mix not only benefits my crops, but also has the added bonus of providing pollen and nectar for the bees. It's a win-win situation". Blake has travelled in Europe, South and North America, Australia and New Zealand as a Nuffield Scholar to learn about how cover crop works and to share his knowledge with other farmers. "Most people feel overwhelmed by the thought of it, but when they start getting their hands dirty with cover crops they always tell me 'I didn't realize how simple this can be.'" Blake encourages other farmers to think of soil health as the central focus of farm stewardship. This is where cover crops play an integral role by enhancing both soil and bee health.

Strategy 3:

Reduce pesticide use

Controlling pests is an important part of farming that may involve the use of pesticides. However, certain farm practices may have unwanted effects on bees. For example, herbicide use can eliminate some plants that pollinators use for foraging or laying eggs while insecticides can impact bees either through direct exposure from crop visitation, or indirect exposure when treatment residues are present in wild vegetation, in soil and in water. Importantly, not all insecticides are equally harmful to all species of bees. In some cases, even if bees exposed to insecticides do not die immediately they may experience negative effects on their foraging, learning, and mating behaviours. With thoughtful management, these unwanted effects can be reduced. In fact, many farmers are proactively using dust deflectors and fluency agents on their vacuum planters to help pollinators.

- Read and follow all label directions for all pesticides you use on the farm. Labels are legal documents.
- Communicate with local beekeepers throughout the season.
- Notify local beekeepers when planning insecticide treatments. This allows beekeepers to plan and protect their hives from unnecessary exposure.
- Time applications to minimize exposure:

- Never apply when flowering crops are in bloom.
- Follow weather and wind speed application guidelines.
- Apply in the evenings after dark if possible.

- Use a fluency agent and deflector equipment to reduce the insecticide-contaminated dust from treated seed that is exhausted from vacuum planters.
- Minimize herbicide treatments:
 - Choose treatments that target your specific weed problem rather than broad spectrum pre-mixed products.
 - Use spot treatments where possible.
 - Apply IPM tools such as crop rotation to weed management.
 - Tolerate weeds in places where they do not interfere directly with production or serve as a host to pest insects or disease.
 - Note that common milkweed, the larval host plant for monarch butterflies, has been removed from the Ontario noxious weed list and is critical to the butterfly's survival.



Photo: Danelle Hevron Studio



CASE STUDY 5

Quinte IPM—A Co-operative Approach to Reducing Pesticide Use on Farms

Quinte IPM is a collaborative effort established in 1984 by IPM specialist Margaret Appleby and a cooperative of apple, berry and grape growers. The cooperative allows

growers to pool their resources together to hire an OMAFRA-trained scout to monitor pests from May to August. Each grower provides a map of their growing area and guidance on where and what should be monitored based on past pest history. The scout reports on findings to the growers on a weekly basis who then use these to make pest management decisions with guidance from the IPM specialist. These records are also used by growers to meet the requirements of the GLOBAL-G.A.P. food safety program.

This cooperative approach allows growers to pool their resources to reduce their costs and increase the effectiveness of IPM by ensuring that scouting is done regularly. For the 12-15 farms that are members, the fee is \$1000 per site for 18 weeks, or \$56 per week. With regular monitoring of insects and diseases in the orchards, vineyards and berry fields, growers are implementing the first three steps of IPM: identification, monitoring, and determining thresholds with written records.

Armed with the scouting information, the growers of the Quinte IPM cooperative no longer apply pesticides on a calendar basis but only when needed and as a last resort. With the phasing out of broad-spectrum pesticides in favour of reduced-risk pesticides and bio-pesticides, exact timing of applications is crucial for success in pest control. The monitoring data for each farm provides the information to get the timing right and reduces unwanted pesticide exposure for pollinators and other beneficial insects.

Integrated Pest Management (IPM)

All farms can benefit from applying the principles of IPM to their operations. Pollinators benefit from the same IPM practices that encourage natural enemies of many crop pests. Natural enemies are predatory and parasitoid insects that feed on insect pests. In Ontario, for example, lady beetles and a parasitoid wasp can be found in soybean fields preying on aphids. Access IPM specialists and explore IPM opportunities through Ontario Ministry of Agriculture, Food and Rural Affairs' (OMAFRA) resources, such as the online Ontario Crop IPM tool. IPM strategies that are effective across all operations include:

- Promoting soil health through no-till, cover crops, controlling erosion and reducing fungicide applications that can interfere with beneficial soil fungi and other organisms. This supports healthy crops that can better resist pests.
- Using crop rotations on annual crops to break pest life cycles.
- Encouraging natural enemies of crop pests by providing habitat and reducing pesticide use.
- Tolerating pest populations below economic damage thresholds.
- Using chemical controls at the right time and in the right way in response to specific pest monitoring information on your farm. This saves money, reduces the risk of resistance, and reduces exposure risk to all beneficial insects.

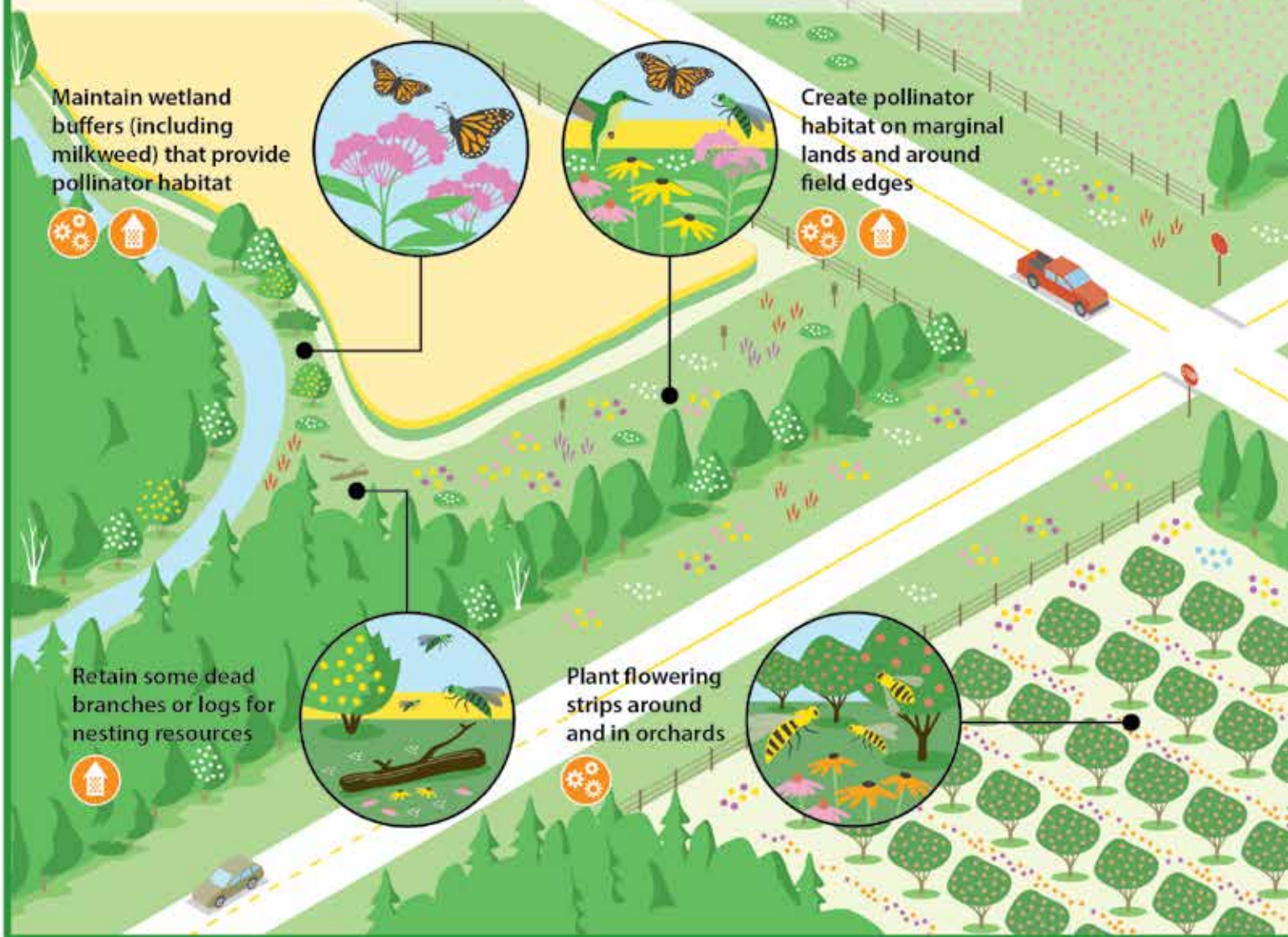
Enhancing Agricultural Habitat for Pollinators

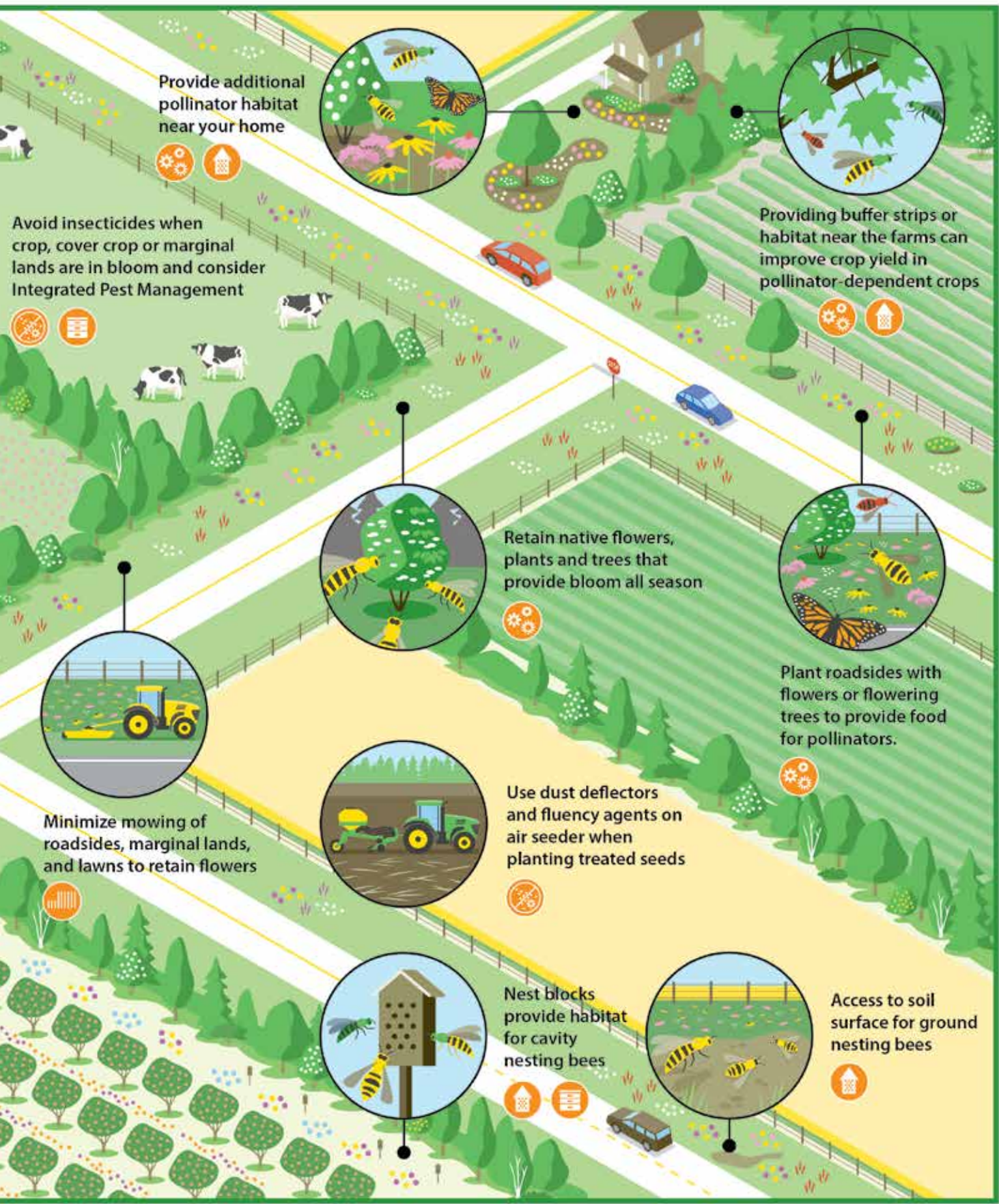
The global decline in the health of pollinators threatens natural ecosystem integrity and agricultural productivity. Here are the key actions that can be taken on agricultural lands to enhance pollinator habitat and mitigate practices that could harm pollinators.

Key actions that a farmer can take:

-  Increase flower diversity
-  Provide nest sites
-  Reduce impact of mowing
-  Reduce pesticides
-  Communicate with beekeepers about pesticide applications

Consider incorporating strategies that are most appropriate and beneficial to pollinators based on opportunities and risks associated with each operation or context.





Provide additional pollinator habitat near your home



Providing buffer strips or habitat near the farms can improve crop yield in pollinator-dependent crops



Avoid insecticides when crop, cover crop or marginal lands are in bloom and consider Integrated Pest Management



Retain native flowers, plants and trees that provide bloom all season



Plant roadsides with flowers or flowering trees to provide food for pollinators.



Minimize mowing of roadsides, marginal lands, and lawns to retain flowers



Use dust deflectors and fluency agents on air seeder when planting treated seeds



Nest blocks provide habitat for cavity nesting bees



Access to soil surface for ground nesting bees



SECTION III

Suggested Actions for Specific Farm Types

In this section, you will find suggested actions designed to support pollinators on specific farm types in Ontario. Generally vegetable, small fruit and orchard farms are more dependent upon the pollination services of native bees, whereas pasture or field crop farms are less so. However all farm types can provide habitat for native bees.

Recommendations outline:

- which of the pollinator habitat creation tools described earlier would be most effective for a specific farm type,
- how to manage specific crops to increase their value to pollinators, and
- how to mitigate bees' risk of exposure to pesticides, if they are used on the farm.

Case studies of real pollinator champions from the farming community are featured to demonstrate the many ways in which Ontario farmers are integrating pollinator habitat into their farming systems.

CASE STUDY 6

How a Pumpkin Farm Celebrates the Squash Bee

Strom's Farm and Bakery is a second generation farm run by Channing and Amy Storm, located in Wellington County. The farm grows sweet corn and pumpkins that are marketed in an on-farm store as well as at its annual Corn Maze and Harvest Fun events. In the 1990s, the Stroms learned that their pumpkin crops were being pollinated by a native solitary bee called the squash bee. The squash bees nest in the ground in and around the pumpkin fields, but they also nest in a large aggregation comprised of thousands of nests on the lawn behind the Strom's house. The squash bees pose no



stinging threat, and Amy affectionately calls them “our gentle bees”. Because they play such an important role in their farm business, the Stroms celebrate their squash bees in a number of ways. They have made the effort to learn about the squash bee and enjoy educating the many visitors to the farm about the important role the squash bees play in pollinating pumpkins. The Stroms avoid exposing their squash bees to insecticide residues during the pumpkin bloom period. In 2015, the Stroms participated in ongoing research into the effects of insecticides on squash bees. Through careful management, the Stroms are able to obtain all of the pollination services they need for their pumpkin crop from native squash bees. Fortunately, squash bees are common and can be found on many farms that grow pumpkins or squash in Ontario.

Vegetable farms

Vegetables like tomatoes and cucurbits (pumpkin, squash, zucchini, cucumbers, melons) are especially dependent upon insect pollinators to produce a crop. All of these crops can be pollinated by native bees. Below are strategies to attract wild bees to your vegetable crop.

- Establish bee pastures, flower strips or flowering hedgerows within 750m of vegetable crops to provide nectar and pollen for native bees throughout the season from April to October. These can include flowering native and non-native species.
- Reduce pesticide use on the crop when and where feasible. Do not apply insecticides during bloom.
- Protect bee pastures, flower strips, and windbreaks from pesticide exposure.
- Provide undisturbed bumble bee nesting and overwintering areas near to the bee foraging habitat by letting grassy areas grow tall and fall over.
- Maintain undisturbed areas of ground for ground-nesting bees.

Field tomatoes:

Field tomatoes greatly benefit from the “buzz” pollination provided by wild bumble bees to release their tightly held pollen. An on-farm study in California found that pollination by wild bees substantially increased the size of field-grown cherry tomatoes⁴.

- Provide nectar-rich flower sources in a flowering strip beside tomato crops because tomato plants provide pollen only, and bees need nectar to feed on while they forage for pollen.
- Provide bumble bee nesting and overwintering sites as described above.

Cucurbit crops:

These crops include pumpkin, squashes, gourds, cucumbers, and melons.

All cucurbits are dependent upon insect pollination because they have separate male and female flowers. A variety of native bees can pollinate most cucurbit

crops, but the most efficient pollinator of pumpkins and squashes is the native squash bee. The squash bee is a common solitary bee that gathers only pumpkin and squash nectar and pollen to feed its young. Squash bees also mate on the flowers and males sleep in wilted pumpkin or squash flowers. Female squash bees make their nests in the ground around the crop.

- Provide nectar sources like milkweed for squash bees to feed on in case they emerge before the squash crop is in flower.
- Protect squash bee nests by keeping tillage shallow within fields or creating dedicated bare, un-tilled areas at the edges of the field for bee nesting.
- Refer to product labels for pollinator safety statements. Avoid insecticide applications that pose a risk to pollinators.

Other vegetable crops that may not need insect pollination but are attractive to native bees when they are in bloom are asparagus and beans. Avoid applying insecticides to all of these crops when in bloom. Broccoli, rhubarb, and parsley also produce bee-attractive blooms but they are not usually allowed to flower. Take advantage of the contribution of these crops by making small management changes:

- Broccoli: Allow non-marketable secondary heads to go to flower.
- Rhubarb: At the end of the harvest season, allow flower heads to form and bloom for a short period before removing them.
- Parsley: Allow parsley plants to remain in the ground over the winter. They will bloom early the next season to support early spring bees.



Photo: Bill Johnson

Orchards

Most orchard crops rely on effective insect pollination for high quality fruit. Many wild bees are more effective than honeybees at pollinating orchard crops because they are active in the cool, damp conditions that are so common during orchard bloom periods. Even if you use honeybees in your orchard, increasing native bee abundance and diversity can benefit crop production above and beyond honeybees' contribution. For example, only 250 female blue orchard bees (also known as orchard mason bees) are needed to pollinate an acre of apples, where approximately 15,000–20,000 honeybees (1.5-2 hives) would be needed to perform the same task. Native bees will work in colder, windier and wetter conditions than honeybees. Many native bees that provide pollination in orchards are active both before and after orchard bloom and they need alternative sources of nectar and pollen during those periods as well as protection from exposure to pesticides.

There are opportunities for orchard growers to attract and maintain strong native pollinator populations on their crop. This should be done with caution, though, as many pesticides used in orchards can be detrimental to native bees. While there are regulations prohibiting the application of substances that harm bees during the pollination period, they only protect beneficial insects during orchard bloom. Hosting a permanent population of native bees in orchards means protecting them throughout their active period. This can be accomplished by limiting pesticide applications as much as possible.



Creating Bee Pastures near Orchards:

In orchards where pesticides are frequently applied, it may be best to create alternative sources of nectar in bee pastures located 150-750m from the orchard planting or to create a windbreak between the orchard and the bee pasture if they are in proximity to each other. Protecting bee pastures from pesticides in this way reduces the likelihood of unintended exposure of wild pollinators to pesticides. If you are concerned that blooms from the bee pasture might compete with the crop for pollination services, choose species that flower outside the crop bloom period.

Using Cover Crops in the Orchard:

Any growers (conventional or organic) who use advanced IPM should be able to sustain populations of wild bees directly in their orchard. Like bee pastures outside the orchard, establishing wildflower strips and flowering cover crops in the orchard understory can help sustain bees when the orchard is not in bloom. If legumes are used, these flowering cover crops can also provide benefit to the orchard by increasing soil fertility. Remember that these cover crops are only beneficial to bees if they are allowed to flower.

- It is illegal to apply insecticides during orchard bloom in Ontario. Protect wild bees from exposure to pesticides throughout their activity period.
- Attract wild bees to your crop by creating bee pastures near the orchard or flowering cover crops or flower strips within the orchard, depending on your pest management system.
- Limit competition for crop pollination services by choosing species for bee pastures, flower strips, and flowering cover crops that flower outside crop bloom time, or by mowing these plantings during crop bloom.
- Keep natural nesting sites like bare ground, bunching grasses and hollow stems near or in bee pastures and wildflower strips.
- Provide nesting boxes for managed cavity-nesting orchard species like the blue orchard bee.



Small fruit farms

You can enhance your farm environment to attract wild bees to strawberry, blueberry, raspberry and gooseberry crops. Farms with small fields in areas with a good amount of natural cover often already have all their pollination needs met by wild bees. Larger farms or those in areas with little natural cover can create habitat for bees that will help ensure their crops are well pollinated. Even if you use honeybees, hosting wild bees can benefit yield because they are more effective pollinators and will work in colder, windier and wetter conditions than honeybees.

- Create a 'bee pasture' within 750m of your field; include early flowering pussy willows to support spring miner bees.
- Plant annual or perennial wildflower strips around your field and minimize the risk of pesticide exposure by practising IPM or by incorporating a buffer of tall grass between the wildflowers and the crop.
- For all berry crops except strawberry and lowbush blueberry, plant a low growing perennial flowering cover crop that includes legumes between crop rows. Protect bees from pesticide exposure when your cover crop is in bloom by waiting until after bloom to spray, or by mowing a few days before spraying.
- Establish flowering hedgerows around your crop field and include bumble bee nesting and overwintering sites there.

- Provide bare, undisturbed soil for ground nesting bees and standing logs, cavities in wood, pithy shrub stems or artificial nests for a wide variety of bees.
- Reduce your pesticide use to protect bees and other beneficial insects.

Raspberry:

A small change in management of raspberry canes can make a large difference to the small carpenter bee, which nests in the hollow canes. Instead of destroying pruned canes after harvest, bundle them and leave them close to the crop or in surrounding hedgerows until after the next season's bloom, after which they can be discarded in the usual manner.

Blueberry:

Over 60 species of native bees have been found on blueberry crops, though miner bees, sweat bees and bumble bees are most common. Bumble bees are up to six times more efficient than honey bees as pollinators of blueberries because they can buzz pollinate. Producers who want to attract native bees for blueberry pollination should provide early sources of pollen from pussy willows and maintain undisturbed nesting areas. A study of blueberry crops in Michigan found that growers who installed wildflower strips to enhance pollinators saw a net yield and profit increase four to five years after establishment; when cost-share funding was used the time to net profit was within three years.⁷

CASE STUDY 7

Kelly's Blueberry Farm

Roger and Valerie Kelly have been growing low-bush blueberries for 37 years on their high country farm in Hastings County, north of Bancroft, Ontario. In establishing their blueberry planting, the Kellys propagated plant material from wild stands to increase the genetic variability of their crop. On their 200 acre farm, they manage four acres of blueberries along with a variety of other unusual cultivated and wild berry crops adapted to their northern location. Now that their blueberry bushes are well established, instead of installing netting to keep birds away from the crop, they have built and installed birdhouses and perches to welcome them. By allowing the birds to share in the harvest, they have become allies in pest control while still maintaining the berry yields needed to sustain the Kelly's business. This has helped eliminate the use of insecticides on the crop. As a result of their pest management system and the extensive natural lands surrounding their blueberry crop, their blueberry crop hums with solitary bees and at least five species of wild bumble bees during bloom. After the blueberry flowering period is over, these wild bees find plenty of alternative forage in the forest edge plants, on the other berry crops, and in a 25 acre area that has naturalized into a bee pasture from former strawberry and hay fields. The bee pasture is mowed annually to keep the forest from encroaching. Customers that pick blueberries at the Kelly's farm enjoy the beauty and abundance of fruit grown on a farm that supports its own native pollinators.

Field crop farms

Although some field crops do not need insect pollination, oil seed crops such as canola, sunflower, and some varieties of soybean benefit from the pollination services of bees.

Wild pollinators play a significant role in canola pollination and their services can be harnessed to cut hive rental costs. A 2007 study in Alberta indicated that converting 30 per cent of canola crop area into natural habitat resulted in more yield and income on the remaining 70 per cent than could be expected from the original canola area because of the pollination services that wild bees provide.³

Some soybean varieties provide nectar and pollen to wild solitary bees, even though they may not all benefit from the bees' pollination services. Bees, and honeybees in particular, can be found visiting corn when there are few other pollen sources available. Potatoes can also provide nectar and pollen to wild bees when the crop is in flower prior to harvest.

- Include pollinator habitat in windbreaks:
 - Windbreaks have been shown to increase field crop production 10-25 per cent in dry conditions by reducing water loss from both the soil surface and the plant.
 - Page 30 explains windbreaks and describes the pollinator plants that can be used effectively in a windbreak.
- Include flowering cover crops in your rotation.
 - You can explore cover crops on page 32.
- Create bee pasture on marginal or inefficient parcels of land
 - Because of the limitations of large machinery, some parcels may be too wet, too small or too irregularly shaped to grow crops efficiently.
 - For information about bee pastures (see page 31).



CASE STUDY 8

Making Bee Pasture on Marginal Land on a Grain Farm

Bill and Donna Adams have been farming since 1979. They and their son, Terry, grow corn, wheat, and soybeans on 500 acres in Northumberland County. “We’re both from farms and proud of it,” says Donna. “When we found out that pollinators are in trouble, we just had to do our part.” They contacted Farms at Work, a local not-for-profit organization, to get technical help to create a bee pasture on a two-acre piece of land that is not suitable for growing grain.

Farms at Work suggested using a commercially available native seed mix that fit the budget that the Adams had in mind, and did not include common milkweed, which the Adams wished to avoid for crop production reasons. The Adams paid for part of the seed cost, contributed the land, and took responsibility for preparing it and for seeding the bee pasture in the early fall. They were also able to access cost-share funding through government programs and their local conservation authority. Through collaboration, the Adams were able to achieve their goal of supporting local pollinator populations and will put up a sign branding the farm as pollinator friendly.

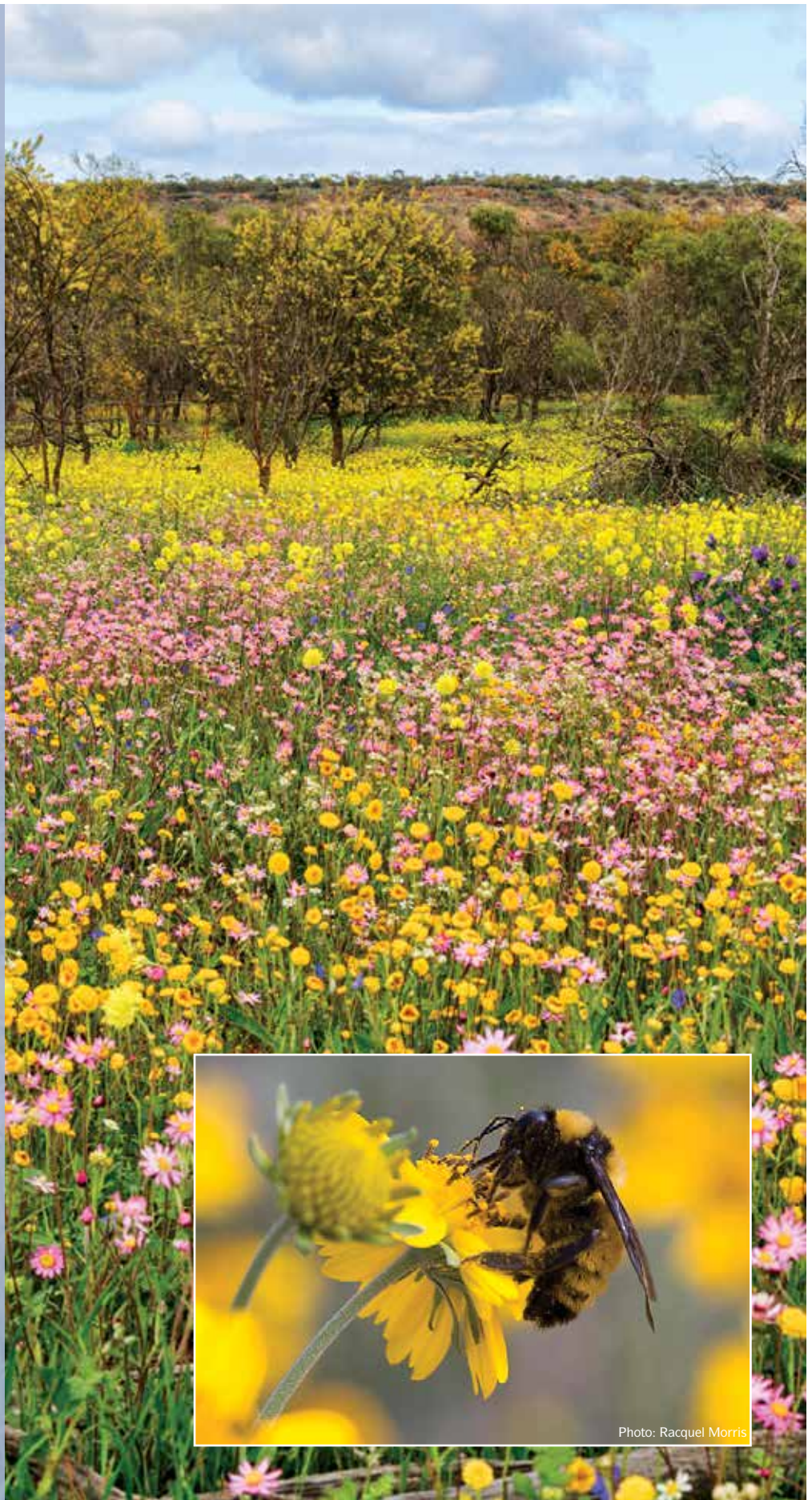


Photo: Racquel Morris



Pastures, forage and hay fields

Having pastures and hay fields in the farming landscape contributes to a healthy environment for bees, butterflies and other pollinators. These types of fields provide areas with less pesticide pressure and soil disturbance where pollinators can find pollen and nectar, and can nest and lay eggs. If you have pastures, forage or hay fields, keep them! If you need to put those fields to other uses, consider maintaining at least 0.5 acre part of them as a bee pasture.

Farmers can take an extra step to benefit pollinators and increase their grass yield by practicing rotational grazing. Under rotational grazing, fields are divided into smaller sections and grazed for short periods of time before being left to recover for longer periods. For bees, butterflies and other beneficial insects, leaving sections ungrazed for extended periods of time creates varied plant height where they can find food, shelter and nesting sites. Broadleaf plants in pastures may also have the opportunity to flower.

- Pastures, forage and hay fields play an important part in a providing habitat for bees, butterflies and other pollinators on farms.
- Including flowering species like alfalfa, clover, peas and trefoil in your pasture also benefits bees if you allow them to go to flower before they are grazed or cut. Even allowing a pasture or hay crop to go to 10% flower before cutting or grazing is beneficial.
- Rotational grazing can increase a pasture's grass yield and enhance habitat for pollinators.
- Create a warm season pasture for your cattle with native grasses and flowers that sustains bees and butterflies throughout the growing season.

CASE STUDY 9

Tallgrass Prairie Pasture at the Y U Ranch

Bryan and Cathy Gilvesy, of Y U Ranch, in Norfolk County, have pioneered the restoration of tallgrass prairie on their property. Using a combination of rotational grazing and prescribed burns, they maintain 45 acres of native tallgrass prairie plus conventional grass pastures. In the hot summer months, the tallgrass prairie provides diverse, quality forage for the cattle while sustaining a diverse population of pollinators year round. These grasses mature quite late in the season, but are able to tolerate temperatures over 30 °C and with their deep roots, are very drought tolerant. The tallgrass prairie provides the opportunity to graze cattle intensively during the hottest and driest part of the summer (July 15 – Aug 15), allowing the cool season pastures an opportunity to recover.

The Gilvesy's management efforts have increased the diversity and abundance of pollinators on their ranch. Bryan cites the 850 species of bees and wasps native to Canada as the inspiration for their pollinator efforts, which include planting Norfolk County's first pollinator hedgerow. "This 'seasonal' grazing technique also allows graziers to clearly identify their role as providers of key environmental solutions" says Bryan. "This technique is important not only for native species, but also for the grassland ecotype which sinks significant amounts of carbon through the extensive root system." Y U Ranch's warm season pasture includes native species like switchgrass, Indian grass, big and little bluestem, and side oats gramma, as well as legumes and flowers like coreopsis, cup plant and false sunflower.



SECTION IV:

Resources:

Cost-share funding and stewardship programs

Stewardship programs that provide cost-share funding to farm conservation projects recognize that because all of society benefits from a healthy farm environment, society also has a responsibility to support farmers' stewardship actions. Farmers can access cost-share funding from government, conservation and farm organizations. Many of these can also provide technical support for projects involving waterways and ponds. Some may even be able to provide volunteer labour to help establish your new planting.

Establishing new bee habitat can be a great way to create partnerships with local organizations and demonstrate farm stewardship to your community. You can do this by inviting school groups, naturalist clubs and other farmers to visit and learn about the bee habitat you've created on your farm. Put up a sign that advertises your pollinator habitat and good farm stewardship as part of a branding program, especially if your planting is visible from the road.

Government funding:

Your local Ontario Soil and Crop Improvement Association (OSCIA) can help you access cost-share funding from the federal and provincial governments. Most program options are not specific to pollinators, so it is up to you to include pollinator-friendly plant species in your BMP project, although some programs do provide a bonus for combining pollinator habitat with other BMPs.

Farm organizations

Organizations like Alternative Land Use Service (ALUS) and Farms at Work collaborate closely with farmers in some counties in Ontario to find cost-share opportunities and provide technical support for stewardship actions.

Conservation authorities

Conservation Authorities have expert knowledge of local environments and often manage programs dedicated to farm stewardship, especially around water bodies. They can help identify the best place on your farm for a habitat project, support some of the costs and help you establish your new plantings, often with volunteer labour.

Conservation organizations

Ducks Unlimited can provide financial and technical support for wildlife pond projects. Ducks Unlimited encourages pollinator plantings around these projects, though no funding is available for pollinator plants. Local nature clubs can also provide expertise about native plants and wildlife.

Certification programs

If you meet six simple criteria, you can brand your farm with the 'Bee-Friendly Farming' certification program offered by Pollinator Partnership. You can include their logo on your signage and business materials. Monarch Watch also provides certification for monarch butterfly habitat.

Planting Guide

The plants on this list have been chosen because they are easy to source and will not interfere with production on farms

Windbreaks							
Plant Name		Soil Type	Flowering Period			Contributes	
			Spring Apr-May	Summer Jun-July	Fall Aug-Sept	Nectar, Pollen	Nests/Egg laying sites
Trees							
Basswood	<i>Tilia</i> spp.	well drained		x		x	
Maple	<i>Acer</i> spp.	moist	x			x	
Spruce	<i>Picea</i> spp.	moderately to well drained	Not a pollinator plant but good foundational windbreak plant				
Flowering Shrubs							
Canada plum	<i>Prunus nigra</i>	dry to moist, well drained	x			x	
Chokecherry	<i>Prunus virginiana</i>	dry to moist, well drained		x		x	
Elderberry	<i>Rhus</i> spp.	dry to moist, well drained				x	x
Pussywillow	<i>Salix discolor</i>	moist and well drained	x			x	
Serviceberry	<i>Amelanchier</i> spp.	moist and well drained	x			x	
Sumac	<i>Sambucas</i> spp.	well drained		x		x	x
Wild raspberry or blackberry	<i>Rubus</i> spp.	well drained	x			x	x
Witch hazel	<i>Hamamelis virginiana</i>	moist, well drained			x	x	
Broadleaf Flowering Plants							
Meadowsweet	<i>Filipendula</i> spp.	moist to wet		x		x	
Goldenrod	<i>Solidago</i> spp.	dry, well drained			x	x	
Sneezeweed	<i>Helenium</i> spp.	moist to wet soils			x	x	
Milkweed	<i>Asclepias</i> spp.	dry and well drained		x		x	x

Buffers and Bee Pastures							
Plant Name	Scientific Name	Soil Type	Flowering Period			Contributes	
			Spring Apr-May	Summer Jun-July	Fall Aug-Sept	Nectar/ pollen	Nests/egg laying site
Broadleaf Flowering Plants							
Black Eyed Susan	<i>Rudbeckia hirta</i>			X	X	X	
Blue Vervain	<i>Verbena hastata</i>	moist to wet, well drained		X	X	X	
Common Milkweed	<i>Asclepias syriaca</i>	dry to well drained		X		X	X
Dwarf Blazing Star	<i>Liatris cylindracea</i>	dry; alkaline		X		X	
Evening Primrose	<i>Oenothera biennis</i>	sandy, well drained		X		X	
Foxglove Beardtongue	<i>Penstemon digitalis</i>	dry, well drained		X	X	X	
Golden Alexander	<i>Zizia aurea</i>	moist, well drained					
Grey Headed Coneflower	<i>Ratibida pinnata</i>	moist, well drained		X	X	X	
Hairy Beard Tongue	<i>Penstemon hirsutus</i>	well drained		X		X	
New England Aster	<i>Symphyotrichum novae-angliae</i>	moist and well drained					
New York Aster	<i>Symphyotrichum novi-belgii</i>	dry to medium, well drained					
Prairie Cinquefoil	<i>Drymocallis arguta</i>	dry to medium		X	X	X	
Queen of the Prairie	<i>Filipendula rubra</i>	moist, well drained		X		X	
Slender Mountain Mint	<i>Pycnanthemum tenuifolium</i>	moist to dry		X	X	X	
Smooth Aster	<i>Symphyotrichum laeve</i>	dry to medium, well drained					
Sneezeweed	<i>Helenium autumnale</i>	medium to wet			X	X	
Spiked Blazing Star	<i>Liatris spicata</i>	medium to moist		X	X	X	
Stiff goldenrod	<i>Oligoneurom rigidum</i>	medium					
Upland White Aster	<i>Solidago ptarmicoides</i>	dry to medium			X	X	
Virginia Mountain Mint	<i>Pycnanthemum virginianum</i>	moist		X	X	X	
Grasses and Sedges							
Bottle Brush Grass	<i>Hystrix patula</i>	dry to medium					
Fringed Brome	<i>Bromus ciliatus</i>	moist					
Side Oats Grama	<i>Bouteloua curtipendula</i>	dry to medium					
Slender Wheat Grass	<i>Elymus trachycaulus</i>	dry to moist					
Flowering Shrubs							
Canada plum	<i>Prunus nigra</i>	dry to moist, well drained	X			X	
Chokecherry	<i>Prunus virginiana</i>	dry to moist, well drained	X			X	
Elderberry	<i>Rhus spp.</i>	dry to moist, well drained		X		X	X
Highbush cranberry	<i>Viburnum opulus</i>	moist and well drained		X			
Pussy willow	<i>Salix discolor</i>	moist and well drained	X				
Serviceberry	<i>Amelanchier spp.</i>	moist and well drained	X			X	
Sumac	<i>Sambucas spp.</i>	well drained	X			X	X
Wild raspberry/blackberry	<i>Rubus spp.</i>	well drained		X		X	X
Witch hazel	<i>Hamamelis virginiana</i>	moist and well drained	X			X	

Planting Guide

Riparian Buffers							
Plant Name	Scientific Name	Soil Type	Flowering Period			Contributes	
			Spring Apr-May	Summer Jun-July	Fall Aug-Sept	Nectar/ pollen	Nests/egg laying site
Flowering Shrubs							
Serviceberries	<i>Amelanchier</i> spp.	moist and well drained	x			x	
Alternate leaf dogwood	<i>Cornus alternifolia</i>	medium	x	x		x	
Winterberry	<i>Ilex verticillata</i>	medium to wet	x			x	
Northern spicebush	<i>Lindera benzoin</i>	medium	x			x	
Eastern ninebark	<i>Physocarpus opulifolius</i>	dry to medium	x	x		x	
Chokecherry	<i>Prunus virginiana</i>	dry to moist, well drained	x			x	
Pussy willow	<i>Salix discolor</i>	moist and well drained	x			x	
Broadleaf Flowering Plants							
False Indigo	<i>Baptisia australis</i>	dry to medium	x	x		x	
Swamp milkweed	<i>Asclepias incarnata</i>	medium to wet		x		x	x
White turtlehead	<i>Chelone glabra</i>	medium to wet		x		x	
Spotted Joe Pye weed	<i>Eutrochium maculatum</i>	medium to wet			x	x	
Common boneset	<i>Eupatorium perfoliatum</i>	medium to wet			x	x	
Sneezeweed	<i>Helenium autumnale</i>	medium to wet			x	x	
Wild bergamot	<i>Monarda fistulosa</i>	dry to medium		x		x	
Cardinal flower	<i>Lobelia cardinalis</i>	medium to wet		x		x	
Great blue lobelia	<i>Lobelia siphilitica</i>	medium to moist		x		x	
Hairy beardtongue	<i>Penstemon hirsutus</i>	well drained	x	x		x	
Heart-leaved aster	<i>Symphyotrichum cordifolium</i>	dry to medium			x	x	
Showy goldenrod	<i>Solidago speciosa</i>	dry to medium			x	x	
Golden Alexanders	<i>Zizia aurea</i>	moist, well drained	x			x	
Swamp verbena	<i>Verbena hastata</i>	moist to wet, well drained		x	x	x	
Grasses and Sedges							
Bluejoint	<i>Calamagrostis canadensis</i>	moist to wet, well drained					x
Big bluestem	<i>Andropogon gerardii</i>	dry to medium					x
Canada wildrye	<i>Elymus canadensis</i>	dry to medium					x

Cover Crops	
Conservation service	Pollinator-friendly cover crops
Nitrogen source	alfalfa, white clover, red clover, cowpea, lupin, partridge pea, sun hemp, vetch
Nitrogen scavenger	phacelia, canola, sunflower
Erosion control	canola, cowpea, crimson clover, white clover
Weed management	buckwheat, canola, cowpea, sun hemp, sunflower
Nematode management	canola, other brassicas and mustards
Reducing compaction	canola, radish, lupines, brassicas and mustards

(source: Cover cropping for pollinators and beneficial insects, SARE 2015)

Additional Resources:

Most of these resources are available free online

Alternative Land Use Service. 2015. Tallgrass Prairie Guide

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Other Pollinators

Butterflies

A diverse group of butterflies are present in areas that provide bright flowers, water sources, and specific host plants. Numerous trees, shrubs, and herbaceous plants support butterfly populations. Some of the butterflies found in southwestern Ontario are Brush-footed, Gossamer-winged, Swallowtail, Parnassian, Skipper, White, Sulphur and Monarch butterflies. Monarch butterfly populations have been declining since the 1980s and many people, farmers included, are taking action to reverse this decline by planting milkweed, the monarch's larval host. Butterflies usually look for flowers that provide a good landing platform. Wet mud areas provide butterflies with both the moisture and minerals they need to stay healthy. Some butterflies eat rotten fruit and even dung.

Moths

Although some moths are agricultural pests, many are not. Moths are most easily distinguished from butterflies by their antennae. Butterfly antennae are simple with a swelling at the end. Moth antennae differ from simple to featherlike, but never have a swelling at the tip. In addition, butterflies typically are active during the day while moths are active at night. Butterfly bodies are not very hairy, while moth bodies are quite hairy and stouter. Moths, generally less colourful than butterflies, also play a role in pollination. They are attracted to flowers that are strongly sweet smelling, open in late afternoon or night, and are typically white or pale coloured.

Beetles

More than 9000 species of beetles are found in Canada and some are pests of agricultural crops. However many are beneficial and some can be found on flower heads and so may play a role in pollination. Beetle pollinated plants tend to be large, strong scented flowers with their sexual organs exposed such as magnolia, sweetshrub, paw paws, and yellow pond lilies.



Flies

Flies primarily pollinate small flowers that bloom under shade and in seasonally moist habitats. The National Research Council's Status of Pollinators in North America study states that flies are economically important as pollinators for a range of annual and bulbous ornamental flowers. Plants pollinated by the fly include the American pawpaw, skunk cabbage, goldenrod, and members of the carrot family like Queen Anne's lace.

Birds

Hummingbirds play a role in pollination in North America. Their long beaks and tongues draw nectar from tubular flowers. Pollen is carried on both the beaks and feathers of different hummingbirds. Bright coloured tubular flowers attract hummingbirds and unlike bees, hummingbirds can see the colour red.



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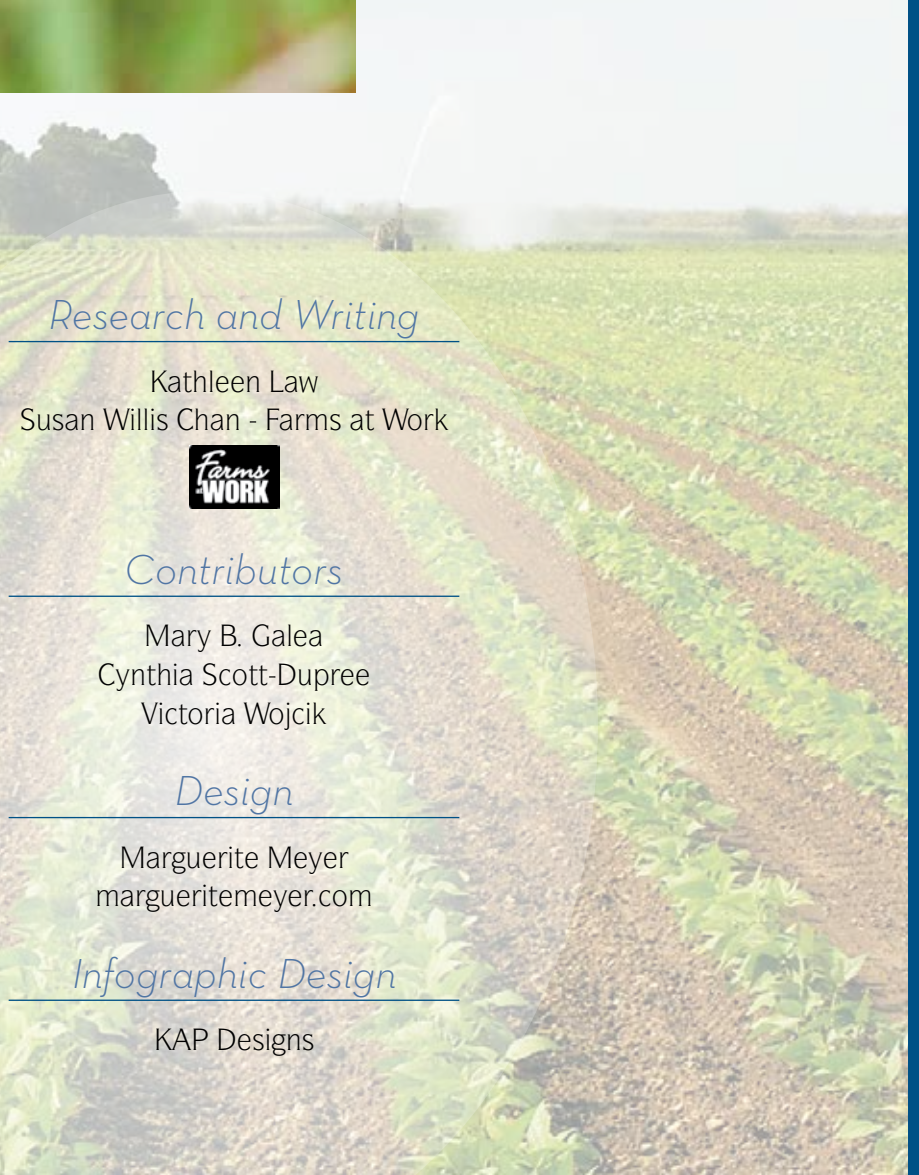
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