Native Bee Habitat Management on Urban Farms in the Great Lakes Region

By Jennifer Roedel, Karma Thomas, Carolyn Miller, and Zsofia Szendrei

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Michigan State University Extension Bulletin E3527

MICHIGAN STATE UNIVERSITY | Extension

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As part of the Bee Urban Growers (BUG) Project

Funding and support provided by: NCR-SARE award LNC23-489 and NC-IPM award 2022-70006-38001

Translated into Spanish by: Micah Orieta; Syracuse-Onondaga Food Systems Alliance

Reviewed by: Stefanie Steele; The Xerces Society for Invertebrate Conservation, Tyler Bassett; Michigan Natural Features Inventory, and Lindsay Page; Kaleidoscope Farm

Featuring photography by: Joseph Ferraro, Carolyn Miller–MSU Beal Botanical Garden, Jennifer Roedel, MSU Entomology, and more

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Cover: *Halictus* sp. on Spiderwort **Photo credit:** Joseph Ferraro

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KEY TO NATIVE PLANT SYMBOLS

LIGHT CONDITIONS: the amount of sunlight this plant grows best in

MOISTURE CONDITIONS: the level of soil moisture this plant grows best with

SOIL TYPE: the types of soil this plant grows best in

STRATIFICATION TYPE: the type of seed stratification this plant needs for germination

NESTING SITE: this plant can be used as a nest by stem-nesting bees

PEST PREDATORS: this plant attracts insect pest predators

HOST PLANT: this plant is eaten by caterpillars of native butterflies and moths

CUT FLOWER: the flowers of this plant can be used for cut flower sales

CULINARY: parts of this plant have been reported as edible

MEDICINAL: parts of this plant have been reported as medicinal

NOT APPLICABLE

KEY TO ABBREVIATIONS

NatureServe Subnational Conservation Status Ranks

SX: Presumed Extirpated:
not located despite intensive searches

SH: Possibly Extirpated:
known only from historical occurrences, hope for rediscovery

S1: Critically Imperiled:
very high risk of extinction

S2: Imperiled:
high risk of extinction

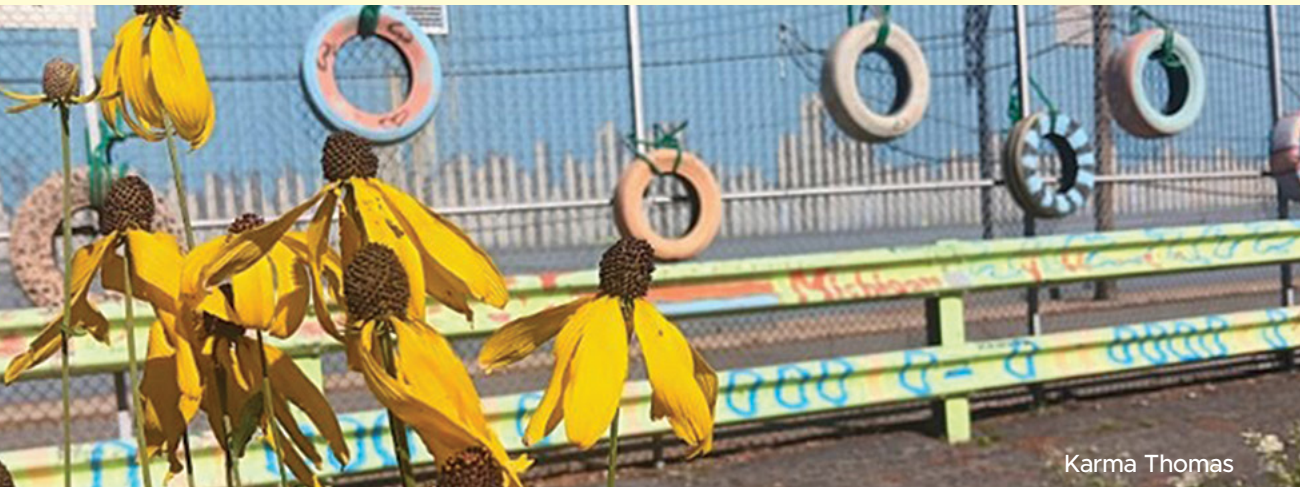
S3: Vulnerable:
moderate risk of extinction

S4: Apparently Secure:
fairly low risk of extinction

S5: Secure:
very low risk of extinction

SNR: Unranked:
conservation status not evaluated

INTRODUCTION



Yellow Coneflower blooming in a native wildflower planting at Cadillac Urban Gardens, Detroit, MI.

This pocket guide was designed to help urban growers manage pollinator habitat on farms in the Great Lakes Region. By doing so, farmers can increase the pollination services of native wild bees while helping to conserve them. In this guide, we focus on native wildflower plantings, which are a type of habitat made of herbaceous plants. Bees feed on the pollen and nectar from the flowers and build their nests within the plantings. About 30% of solitary bees will nest in hollow plant stems or holes in wood, like tree trunks or fallen logs. The other 70% of bees nest underground in patches of exposed soil. Native trees and shrubs are also an important type of habitat for bees to nest and feed in. Trees and shrubs usually bloom in early spring, so they are some of the first flowers bees can find. However, their larger size and longer lifespan can make them harder to manage in cities. The plants in this guide were selected because they thrive in urban environments. They also support the bees that are the most valuable pollinators to crops commonly grown on urban farms and gardens.

Pollinators and Food

Most of the crops that we grow need animals to pollinate them. Without pollination, some plants will not produce any fruit, or it will be small or misshapen. Bees are great pollinators of our food crops when they are present, but many farm practices can reduce their numbers. Because of this, farmers will commonly purchase hives of non-native European honey bees (*Apis mellifera*) for their farms. These hives are the nest or home to large colonies with an average of 60,000 bees. While the high numbers can boost crop yields, they also make the bees vulnerable to disease. Fortunately, there are many other species that also reliably pollinate the crops on your farm.

There are more than 4,000 species of wild bees that are native to North America. Most native bees are solitary, but they are still great at pollinating crops. Other insects like flies, beetles, wasps, butterflies, and moths are also good pollinators. These insects help conserve natural areas near farms. When a farm has a variety of pollinators it can lead to bigger crop harvests. In this guide, we focus on bees because more is known about them as crop pollinators, but all pollinators are important for sustainable urban farming.

A hoary squash bee sitting on a closed squash flower.

Threats to Pollinators

Native bees and other pollinators are in decline. Bees face many threats, and their impacts vary throughout the Great Lakes Region. Major threats include habitat loss, pesticide use, and climate change. Native bees are also at risk because of non-native species, like the European honey bee, which spread diseases and compete with other bees. In this guide, we use the conservation status ranks listed on page 5 to show the threat level of each species. This guide also shares tips for sustainable management and decision making to help slow the decline.

Introduced European honey bees can outcompete native bee species for floral resources.

Karen Fraser

INSTALLING YOUR WILDFLOWER PLANTING

Planning and preparation are important for planting a successful pollinator habitat on your farm. There are three phases of installing a new native wildflower planting:
1. Site selection 2. Site preparation 3. Plant establishment

1. Site Selection

When choosing where to establish your native planting, consider the following factors:

ENVIRONMENTAL CONDITIONS

Light: This can be impacted by season, trees, and nearby buildings or structures. These are the light conditions you may have on your farm:

- **Full:** 6+ hours of direct sunlight per day
- **Partial sun:** 4–6 hours of direct sunlight per day
- **Partial shade:** 2–4 hours of direct sunlight per day
- **Shade:** 0–2 hours of direct sunlight per day

Moisture: The amount of water present in your soil can determine which plants will do well in an area. These conditions range from dry to wet. Moisture is impacted by soil type, but also the amount of direct sunlight, vegetative cover, wind exposure, and ground slope. For example, a berm will have dry soil higher up the slope because of runoff and wind exposure.

Soil: There are different soil types and they impact which plant species will thrive in a space. The following are common soil types mentioned in this guide:

- **Sand:** Large particle size, moisture is drained quickly
- **Loam:** Mix of particle sizes, holds some moisture before draining
- **Clay:** Small particle size, holds lots of moisture

CROP PROXIMITY

Bees travel short distances and will likely visit your crops when their habitat is nearby. Smaller bees like sweat bees, mason bees, and small carpenter bees travel less than 500 yards when foraging. Larger bees like bumble bees, honey bees, and large carpenter bees will travel over a mile. If you rotate your crops, plant your habitat close to perennials like fruit trees or annual crops that need pollination.

LAYOUT

Native wildflower plantings are meant to be long-term additions to a space. Because most of the plants are perennial and will come back each year, it is important to plan their layout well. Plantings can take many shapes and sizes, but large, square plantings will attract the most pollinators and predators of pests to your farm. You can also plant your wildflowers in narrow strips surrounding or in between crop rows.

WEED PRESSURE

Choose an area where there is low weed pressure when possible. If there is high weed pressure where you would like to plant, controlling these weeds beforehand will save you time in the future. Try to have weeds under control 1–2 seasons before planting. Be aware of which unwanted species are there before planting to help identify weeds once your planting is established.

CHANCE OF DISTURBANCE

Choose somewhere plants are unlikely to be disturbed. Avoid property lines and curb strips. This reduces the risks of car pollutants, construction, neighbor herbicide and pesticide use, or mowing which can harm or destroy native plantings. Be aware of city laws and avoid planting in spaces when you do not have formal permission.

2. Site Preparation

The main goal of site preparation is to get rid of existing vegetation and expose bare soil to plant the native wildflowers of your choice. Doing this adequately greatly reduces weed pressure and future maintenance. Depending on how much time you have, there are different methods you can use:

PLANNING AHEAD

Tarping is a great method for site preparation but is best done at least one growing season before planting. This method uses a UV stable black plastic tarp or cardboard to heat and smother unwanted plants. During warmer, sunnier months you can use a clear plastic tarp, or solarization, instead. Spring is the best time to do either method, but early fall also works well. Mowing and removing woody plants before laying down tarp or cardboard can help it stay on the ground evenly. The soil can compact over time, but you can loosen it with a broadfork or cultivator before planting.

Lindsay Page

Tarping method is used on a farm to remove grass and other vegetation.

QUICK PREPARATION

Tillage can remove vegetation and turn soil to prepare your space for quick planting. It can also increase weed pressure by bringing seeds to the surface. Prepare the space before tillage by removing sod or large plants and raking debris. Although herbicides are a quick and effective way to remove vegetation, they can contaminate the soil and water. Their effects can be long lasting and harmful to plants and pollinators, so they are not recommended. Be aware of your city's laws about herbicide use if you decide to go this route. Only use non-persistent herbicides that are labeled as safe to use around pollinators.

Karma Thomas using a cultivator to prepare soil for a native wildflower planting.

Jennifer Roedel

Jennifer Roedel

SUPPRESSING WEEDS

When planting your native plants, you can use a mix of any untreated paper and untreated wood mulch to smother weeds. This is called the sheet mulch method. Start by laying paper over the weeds, then cover it with 4–6 inches of mulch. If you are planting on a slope, your mulch may not stay in place, so you might choose to use burlap instead. Avoid any type of permanent landscape fabric or plastic as these are not biodegradable and inhibit pollinators' access to the soil. It is important to choose a mulch that is untreated and free of weeds so that it will degrade quickly to allow plants to spread and limit weed growth. If weed pressure remains high and you need more mulch, you can reapply in the spring or early summer once plants have emerged from the soil.

The sheet mulch method is used in preparation of a native wildflower planting.

3. Plant Establishment

Choosing the right plants for your space is critical for starting a successful pollinator habitat. This is discussed on page 9. You can establish plants by using either seeds or plant starts (pre-started or rooted seedlings).

SOWING

It is best to sow native plant seeds in the fall when the seeds of most species native to the region are being naturally dispersed. This is because they need months of cold temperatures to germinate. Avoid extremely wet conditions when sowing as this can cause seeds to rot. When sowing a small space, broadcasting by hand is effective and efficient. You can also use a hand-held lawn spreader. Watering is not typically necessary after sowing, especially in months with more precipitation.

PLANT STARTS

Plant starts establish faster and are less likely to be outcompeted by weeds, but they can be costly and harder to source. You can buy them from a local native plant nursery or start your own from seed if plant starts are unavailable. Plant starts give you more control over the arrangement and design of your planting. Clumping plants by species can help you identify the plants for future maintenance and give your planting a more intentional look. You can install plant starts anytime between spring and fall frost. After planting, plant starts should be heavily watered to encourage root growth.

Wild Lupine is started by seed in containers at a local native plant nursery

Lindsay Page

CONTAINER GARDENING

You can grow many native plants in containers, which is helpful when you have limited or temporary space. Containers can be made of many materials like plastic, wood, clay, cement, or even fabric. Aim to use a container that is at least 12 inches deep, as they support stronger root growth. When planting, use a potting mix and avoid crowding plants. Plants in containers are more susceptible to extreme weather like drought and freezing. You will need to water plants in containers more often, but adding leaf litter or wood chips can help keep the soil moist. Freezing temperatures can also damage containers made of clay or plastic. It is still important to leave your plants outside all year to expose them to natural cold cycles, so you might consider using other types of containers.

Spotted Bee Balm and other native plants are grown in planters on an urban balcony.

Jeremie Fant

Aesthetics

Wildflower plantings do not always match the aesthetic preferences of our neighbors. Many cities also have laws about the appearance of gardens. Be aware of the laws in your city and follow these tips to make the look of your planting more appealing:

- Talk to your neighbors about their thoughts on pollinator plantings.
- Choose plants that are colorful and appeal to the community.
- Add signs that label the space as pollinator habitat.
- Use classic landscape elements like mulch, edging, and fencing.
- Stay on top of maintenance like weeding and trimming.
- Create a little library to provide resources on pollinators and native plants.

Pollinator habitat sign printed in English and Spanish at a native wildflower planting.

Jennifer Roedel

Financial Support

There are many organizations that can help you start your native wildflower planting. They can fund seeds, plant starts, tools, or planting labor. Some organizations can even share opportunities for you to have your habitat financially supported through a subsidy. Below is a non-extensive list of funding and support sources:

- **Natural Resources Conservation Service (NRCS)**
  - Conservation Innovation Grants (CIG)
  - Conservation Stewardship Program (CSP)
  - Environmental Quality Incentives Program (EQIP)
- **Farm Service Agency (FSA)**
  - Agricultural Conservation Easement Program (ACEP)
  - General and Continuous Conservation Reserve Program (CRP)
  - Conservation Reserve Enhancement Program (CREP)
  - State Acres for Wildlife Enhancement (SAFE)
- **United States Fish & Wildlife Service (USFWS)**
  - Partners for Wildlife Program (PWP)
  - State Wildlife Grants (SWG)
- **Non-profit organizations**
  - Garden Club of America
  - Pollinator Partnership
  - Wildflower Association of Michigan
  - Wild Ones
  - Xerces Society of Invertebrate Conservation
- **University research and extension programs**
- **Community garden resource centers**
- **Local libraries**

NATIVE PLANT SPECIES

In this section, we describe species of native plants you can use in your wildflower planting. These plants will attract both pollinators and predators of insect pests. To support pollinators throughout the year, it is important to choose plants that bloom at different times throughout the growing season. To help with this, we ordered the plant species in this guide by the start of their flowering period. You can use some of these plants for cooking, teas, medicine, cut flower sales, or other value-added products. The symbols on page 4 indicate the uses, growing conditions, and benefits of each plant species. This guide is not meant to instruct foraging, and you should not use it for this purpose. Make sure to do your research and be aware that the conditions around your farm can impact plant safety. Always consider herbicide and other pollutant exposure risks before using the plants in any way.

This guide focuses on wildflower plantings and will only cover flowering plants that are not woody. Other types of native plants are also important to pollinators and give them food and shelter. We briefly summarize the value of other plant types below:

Trees and Shrubs

Many native trees and shrubs start to flower earlier than herbaceous plants. This makes them very important for early spring bees looking for food. Natural wooded areas near your farm can be a great source of these. Hedgerows using native shrubs can also support wildlife while blocking wind, dust, and pollutants. Many trees and shrubs also have hollow stems or other holes that bees can nest in. Consider adding or keeping trees and shrubs from the table below on your farm when possible.

	Bee Favorites	Snacks for People
Willows	✓	
Dogwoods	✓	
Hawthorns	✓	
Prickly Ash	✓	
Chokeberry	✓	
Red Maple	✓	
Rhododendron	✓	
Bladdernut	✓	
Plum	✓	✓
Blueberry	✓	✓
Chokecherry	✓	✓
Serviceberries	✓	✓
Red Elderberry	✓	✓

Grasses, Sedges, and Rushes

There is more to pollinator habitat than flowers with nectar and pollen. Native grasses, sedges, and rushes do not usually have flowers that feed insects, but their stems give them shelter from the weather and predators. Bees and wasps also harvest their tissue to build their nests while many butterflies lay their eggs on them. These grasses and grass-like plants also have deep root systems, which improve soil health and support other plants. Adding them to your farm greatly improves the habitat for native plants and insects.

GOLDEN ALEXANDERS *Zizia aurea*

Growing Conditions:

Full sun–partial shade

Medium-wet—medium-dry

Sand, loam, clay

90–120 days, cold moist

Description:

Bloom: April–June
Color: Yellow
Height: 1–3 feet
Leaves: Compound (3 leaflets), oval, toothed

Eric Bartkowski

Wildlife Resources:

Mining bees, Metallic green sweat bees, Small sweat bees, Mason bees, Small carpenter bees, Masked bees, Wasps, Beetles, Moths, Butterflies, Black swallowtail butterfly (caterpillar)

Market Use:

VIRGINIA WATERLEAF *Hydrophyllum virginianum*

Growing Conditions:

Full shade–partial sun

Medium-wet—medium-dry

Sand, loam, clay

60–90 days, cold moist

Description:

Bloom: April–June

Color: Pink

Height: 1–2 feet

Leaves: Alternate, deeply divided (3–7 lobes), coarsely toothed

Chad Zirbel

Wildlife Resources:

Bumble bees, Banded sweat bees, Small carpenter bees, Mason bees, Mining bees, Wasps, Beetles, Flies

Market Use:

WILD STRAWBERRY *Fragaria virginiana*

Growing Conditions:

Full sun–partial shade

Medium-wet—dry

Sand, loam

60–90 days, cold moist

Description:

Bloom: April–June
Color: White
Height: 0–1 foot
Leaves: Compound (3 leaflets), oval-wedge, toothed

Sue Elwell

Wildlife Resources:

Small sweat bees, Banded sweat bees, Carpenter bees, Small carpenter bees, Butterflies, Moths

Market Use:

ROBIN'S PLANTAIN *Erigeron pulchellus*

Growing Conditions:

Full sun–partial shade

Medium–dry

Sand, loam, clay

60–90 days, cold moist

Description:

Bloom: May–June
Color: White–Blue
Height: 1 foot
Leaves: Alternate, oval, hairy underside

Bruce Cook

Wildlife Resources:

Bumble bees, Small sweat bees, Mason bees, Flies, Moths, Butterflies, Hummingbirds, Birds (seed)

Market Use:

N/A

WILD GERANIUM *Geranium maculatum*

Growing Conditions:

Full shade–partial shade

Medium-wet—dry

Sand, loam, clay

30 days, cold moist; scarification preferred

Description:

Bloom: May–June

Color: Pink

Height: 1–2 feet

Leaves: Deeply divided (3–7 lobes), toothed

Carolyn Miller

Wildlife Resources:

Bumble bees, Mining bees, Mason bees, Small carpenter bees, Metallic green sweat bees, Banded sweat bees, Small sweat bees, Flies, Beetles, Butterflies, Moths

Market Use:

WILD LUPINE *Lupinus perennis*

Growing Conditions:

Full sun

Dry

Sand

30 days, cold moist; scarification preferred

Description:

Bloom: May–June

Color: Blue, Purple

Height: 1–2 feet

Leaves: Circle of 7–11 hairy, linear leaflets

Carolyn Miller

Wildlife Resources:

Mining bees, Mason bees, Bumble bees, Small carpenter bees, Carpenter bees, Leafcutter bees, Small sweat bees, Flies, Karner blue butterfly (caterpillar)

Market Use:

FOXGLOVE BEARDTONGUE *Penstemon digitalis*

Growing Conditions:

Full sun–partial shade

Sand, loam, or clay

Medium-wet–medium-dry

60–90 days, cold moist

Description:

Bloom: May–July
Color: White
Height: 3–5 feet
Leaves: Opposite, narrow, egg-shaped

Carolyn Miller

Wildlife Resources:

Metallic green sweat bees, Augochlorine sweat bees, Banded sweat bees, Leafcutter bees, Bumble bees, Mason bees, Carpenter bees, Small carpenter bees, Leafcutter bees, Hummingbirds, Butterflies, Moths, Flies, Birds (seed)

Market Use:

OHIO SPIDERWORT *Tradescantia ohiensis*

Growing Conditions:

Full sun–partial shade

Sand, loam, clay

Medium–wet–dry

60–90 days, cold moist

Description:

Bloom: May–July
Color: Blue
Height: 2–3 feet
Leaves: Alternate, linear

Jason Leduc

Wildlife Resources:

Bumble bees, Mason bees, Metallic green sweat bees, Small sweat bees, Small carpenter bees, Butterflies

Market Use:

FIELD PUSSYTOES *Antennaria neglecta*

Growing Conditions:

Full sun

Dry

Sand

60–90 days, cold moist

Description:

Bloom: May–July

Color: White–Pale Purple

Height: 2–6 inches

Leaves: Alternate, pointed circle, very hairy

Marc Jalbert

Wildlife Resources:

Mining bees, Banded sweat bees, Small sweat bees, Wasps, Beetles, Flies, Moths, Butterflies, Painted Lady Butterfly, Birds (seed)

Market Use:

BALSAM RAGWORT *Packera paupercula*

Growing Conditions:

Full sun–partial shade

Medium-wet—dry

Loam, sand

60–90 days, cold moist

Description:

Bloom: May–August
Color: Yellow
Height: 1–2 feet
Leaves: Alternate, oval, toothed

Karma Thomas

Wildlife Resources:

Augochlorine sweat bees, Banded sweat bees, Mining bees, Leafcutter bees, Small carpenter bees, Mason bees, Flies, Butterflies, Beetles

Market Use:

N/A

LANCELEAF COREOPSIS *Coreopsis lanceolata*

Growing Conditions:

Full sun

Medium-dry—dry

Sand

60–90 days, cold moist

Description:

Bloom: May–August
Color: Yellow
Height: 1–2 feet
Leaves: Opposite, linear

Carolyn Miller

Wildlife Resources:

Bumble bees, Long-horned bees, Small carpenter bees, Leafcutter bees, Wasps, Butterflies, Moths, Flies, Beetles, Birds (seed)

Market Use:

HAREBELL *Campanula rotundifolia*

Growing Conditions:

Full sun–partial shade

Medium–dry

Sand, loam

60–90 days, cold moist

Description:

Bloom: May–August

Color: Purple

Height: 4–20 inches

Leaves: Heart-shaped at the bottom, alternate and grass-like higher up the stem

Carolyn Miller

Wildlife Resources:

N/A

Small carpenter bees, Masked bees, Metallic green sweat bees, Banded sweat bees, Small sweat bees, Augochlorine sweat bees, Leafcutter bees, Mason bees, Cellophane bees, Flies, Butterflies, Moths, Hummingbirds

Market Use:

PALE PURPLE CONEFLOWER *Echinacea pallida*

Growing Conditions:

Full sun–partial shade

Medium–dry

Sand, loam, clay

60–90 days, cold moist

Description:

Bloom: June–July
Color: Pink
Height: 2–4 feet
Leaves: Alternate, linear, widely spaced

Carolyn Miller

Wildlife Resources:

Mining bees, Bumble bees, Long-horned bees, Leafcutter bees, Metallic green sweat bees, Augochlorine sweat bees, Banded sweat bees, Carpenter bees, Wasps, Beetles, Flies, Butterflies, Moths, Birds (seed)

Market Use:

NODDING ONION *Allium cernuum*

Growing Conditions:

Full sun

Medium–dry

Sand, loam, clay

60–90 days, cold moist

Description:

Bloom: June–August
Color: Purple
Height: 2 feet
Leaves: Grass-like

Carolyn Miller

Wildlife Resources:

Small sweat bees, Bumble bees, Cellophane bees, Leafcutter bees, Flies, Beetles, Butterflies

Market Use:

SWAMP MILKWEED *Asclepias incarnata*

Growing Conditions:

Full sun–partial shade

Wet–medium

Sand, loam, clay

60–90 days, cold moist

Description:

Bloom: June–August
Color: Pink
Height: 3–5 feet
Leaves: Opposite, linear

Carolyn Miller

Wildlife Resources:

Bumble bees, Mining bees, Augochlorine sweat bees, Banded sweat bees, Small sweat bees, Leafcutter bees, Carpenter bees, Small carpenter bees, Masked bees, Wasps, Butterflies, Monarch Butterfly (caterpillar), Moths, Flies, Beetles, Hummingbirds

Market Use:

Not fit for raw consumption

BUTTERFLY MILKWEED *Asclepias tuberosa*

Growing Conditions:

Full sun–partial shade

Medium–dry

Sand

60–90 days, cold moist

Description:

Bloom: June–August
Color: Orange
Height: 1–3 feet
Leaves: Alternate, linear

Michelle Lopez

Wildlife Resources:

Bumble bees, Mining bees, Augochlorine sweat bees, Banded sweat bees, Small sweat bees, Leafcutter bees, Carpenter bees, Small carpenter bees, Masked bees, Wasps, Butterflies, Monarch Butterfly (caterpillar), Moths, Flies, Beetles, Hummingbirds

Market Use:

Not fit for raw consumption

POKE MILKWEED *Asclepias exaltata*

Growing Conditions:

Full shade–partial shade

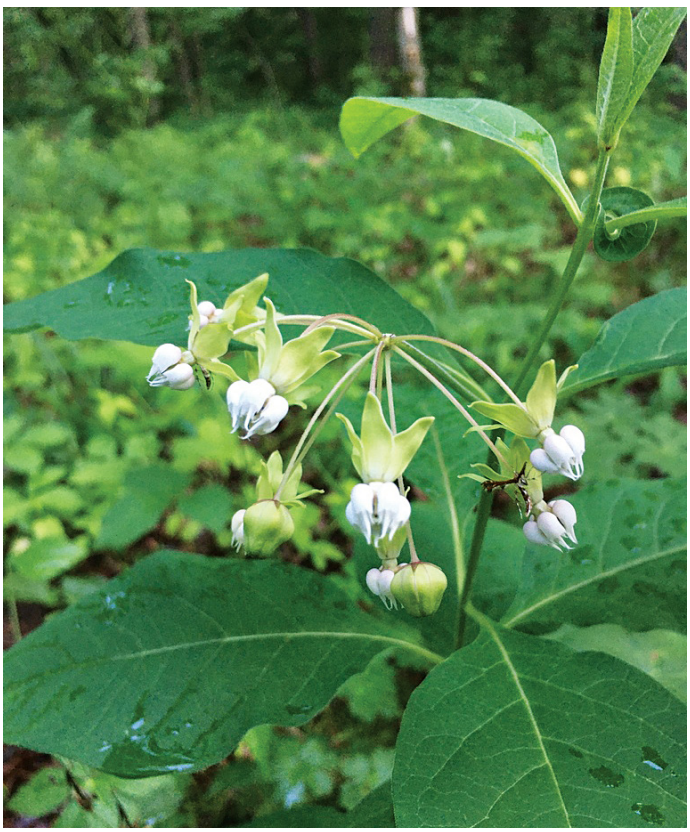
Medium-wet—medium-dry

Loam

60–90 days, cold moist

Description:

Bloom: June–August
Color: White
Height: 2–6 feet
Leaves: Alternate, oval



Marj Hoefs

Wildlife Resources:

Bumble bees, Wasps, Butterflies, Monarch Butterfly (caterpillar), Moths, Flies, Beetles, Hummingbirds

Market Use:

N/A

EASTERN PRICKLY PEAR *Opuntia cespitosa*

Growing Conditions:

Full sun

Dry

Sand

60–90 days, cold moist

Description:

Bloom: June–August
Color: Yellow
Height: 1 foot
Leaves: Spines

Mason Brock

Wildlife Resources:

Bumble bees, Carpenter bees, Long-horned bees, Leafcutter bees, Beetles, Butterflies, Moths

Market Use:

COMMON YARROW *Achillea millefolium*

Growing Conditions:

Full sun

Medium-wet—dry

Loam, sand, clay

60–90 days, cold moist

Description:

Bloom: June–September

Color: White

Height: 3 feet

Leaves: Alternate, fern-like

Carolyn Miller

Wildlife Resources:

Mining bees, Bumble bees, Mason bees, Augochlorine sweat bees, Banded sweat bees, Small sweat bees, Leafcutter bees, Small carpenter bees, Wasps, Butterflies, Moths, Flies, Beetles

Market Use:

COMMON BONESET *Eupatorium perfoliatum*

Growing Conditions:

Full sun

Loam, sand, clay

Wet–medium

60–90 days, cold moist

Description:

Bloom: June–September

Color: White

Height: 2–5 feet

Leaves: Opposite, fused together surrounding the stem

Jason Leduc

Wildlife Resources:

Mining bees, Masked bees, Metallic green sweat bees, Augochlorine sweat bees, Banded sweat bees, Small sweat bees, Wasps, Beetles, Flies, Butterflies, Moths, Birds (seed)

Market Use:

YELLOW CONEFLOWER *Ratibida pinnata*

Growing Conditions:

Full sun

Medium—medium-dry

Sand, loam, clay

60–90 days, cold moist

Description:

Bloom: June–September

Color: Yellow

Height: 3–5 feet

Leaves: Alternate, deeply divided (3–7 narrow lobes)

Jennifer Roedel

Wildlife Resources:

Augochlorine sweat bees, Banded sweat bees, Carpenter bees, Bumble bees, Leafcutter bees, Long-horned bees, Wasps, Beetles, Butterflies, Moths, Birds (seed)

Market Use:

CULVER'S ROOT *Veronicastrum virginicum*

Growing Conditions:

Full sun–partial shade

Medium-wet—medium-dry

Sand, loam, clay

60–90 days, cold moist

Description:

Bloom: June–September
Color: White
Height: 3–5 feet
Leaves: Whorled (3–7 leaves), linear-oval, toothed

Jennifer Roedel

Wildlife Resources:

Metallic green sweat bees, Small sweat bees, Bumble bees, Long-horned bees, Leafcutter bees, Masked bees, Carpenter bees, Wasps, Beetles, Flies, Butterflies, Moths

Market Use:

PURPLE PRAIRIE CLOVER *Dalea purpurea*

Growing Conditions:

Full sun

Medium–dry

Sand, loam, clay

60–90 days, cold dry or moist; aggressive scarification

Description:

Bloom: July–August

Color: Purple

Height: 1–3 feet

Leaves: Compound (3–7 leaflets), linear, alternate

Carolyn Miller

Wildlife Resources:

Bumble bees, Leafcutter bees, Metallic green sweat bees, Augochlorine sweat bees, Wasps, Beetles, Flies, Butterflies

Market Use:

MARSH BLAZING STAR *Liatris spicata*

Growing Conditions:

Full sun

Wet–medium

Sand, loam, clay

60–90 days, cold moist

Description:

Bloom: July–September
Color: Purple
Height: 2–4 feet
Leaves: Alternate, narrow

Carolyn Miller

Wildlife Resources:

Bumble bees, Small carpenter bees, Leafcutter bees, Banded sweat bees, Long-horned bees, Wasps, Flies, Beetles, Butterflies, Moths, Hummingbirds, Birds (seed)

Market Use:

HOARY VERVAIN *Verbena stricta*

Growing Conditions:

Full sun

Dry

Sand, loam

60–90 days, cold moist

Description:

Bloom: July–September

Color: Purple

Height: 2–4 feet

Leaves: Opposite, pointed oval, coarsely toothed, very hairy

Carolyn Miller

Wildlife Resources:

Metallic green sweat bees, Banded sweat bees, Leafcutter bees, Long-horned bees, Bumble bees, Small carpenter bees, Wasps, Beetles, Flies, Butterflies, Common buckeye butterfly (caterpillar), Moths, Hummingbirds, Birds (seed)

Market Use:

N/A

PURPLE CONEFLOWER *Echinacea purpurea*

Growing Conditions:

Full sun–partial shade

Medium-wet—medium-dry

Sand, loam, clay

60–90 days, cold moist

Description:

Bloom: July–September
Color: Purple
Height: 2–4 feet
Leaves: Alternate, oval

Carolyn Miller

Wildlife Resources:

Bumble bees, Metallic green sweat bees, Augochlorine sweat bees, Banded sweat bees, Carpenter bees, Small carpenter bees, Long-horned bees, Wasps, Flies, Beetles, Moths, Butterflies, Hummingbirds, Birds (seed)

Market Use:

BEE BALM/WILD BERGAMOT *Monarda fistulosa*

Growing Conditions:

Full sun–partial shade

Medium-wet—dry

Sand, loam, clay

60–90 days, cold moist

Description:

Bloom: July–September
Color: Purple
Height: 3–5 feet
Leaves: Opposite, tapering linear, coarsely toothed

Carolyn Miller

Wildlife Resources:

Bumble bees, Metallic green sweat bees, Leafcutter bees, Long-horned bees, Wasps, Beetles, Flies, Moths, Butterflies, Hummingbirds, Birds (seed)

Market Use:

SPOTTED BEE BALM/HORSEMINT
Monarda punctata

Growing Conditions:

Full sun

Medium-dry—dry

Sand

60–90 days, cold moist

Description:

Bloom: July–September
Color: Yellow
Height: 2 feet
Leaves: Opposite, tapering linear, finely toothed

Carolyn Miller

Wildlife Resources:

Bumble bees,
Long-horned bees,
Metallic green sweat bees, Augochlorine sweat bees,
Small sweat bees, Wasps, Beetles, Butterflies,
Karner blue butterfly

Market Use:

RATTLESNAKE MASTER *Eryngium yuccifolium*

Growing Conditions:

Full sun

Medium-wet—dry

Sand, loam, clay

60–90 days of moist

Description:

Bloom: July–September
Color: White
Height: 2–4 feet
Leaves: Sword-like, parallel veins, stiff, waxy

Carolyn Miller

Wildlife Resources:

Bumble bees, Small sweat bees, Masked bees, Wasp, Beetles, Flies, Moths, Butterflies

Market Use:

BLUE LOBELIA *Lobelia siphilitica*

Growing Conditions:

Full sun–partial shade

Clay, loam, sand

Wet—medium-dry

60–90 days of moist

Note: sow on soil surface

Description:

Bloom: July–September

Color: Blue

Height: 2–4 feet

Leaves: Alternate, oval, toothed

Lindsay Page

Wildlife Resources:

Bumble bees, Masked bees, Small carpenter bees, Metallic green sweat bees, Small sweat bees, Beetles, Butterflies, Moths, Hummingbirds

Market Use:

SPOTTED JOE-PYE WEED *Eutrochium maculatum*

Growing Conditions:

Full sun

Sand, loam, clay

Wet–medium

60–90 days, cold moist

Description:

Bloom: July–September
Color: Pink
Height: 3–6 feet
Leaves: Whorled (3–6 leaves), egg-shaped, toothed

Lindsay Page

Wildlife Resources:

Bumble bees, Leafcutter bees, Metallic green sweat bees, Long-horned bees, Wasps, Flies, Beetles, Moths, Butterflies, Birds (seed)

Market Use:

GIANT SUNFLOWER *Helianthus giganteus*

Growing Conditions:

Full sun

Medium–wet

Sand, loam

60–90 days, cold moist

Description:

Bloom: July–September

Color: Yellow

Height: 4–10 feet

Leaves: Alternate, long oval, toothed

Carolyn Miller

Wildlife Resources:

Mining bees, Bumble bees, Long-horned bees, Banded sweat bees, Small sweat bees, Wasps, Beetles, Flies, Butterflies, Birds (seed)

Market Use:

ORANGE CONEFLOWER *Rudbeckia fulgida*

Growing Conditions:

Full sun–partial shade

Medium-wet—dry

Clay, loam

60–90 days, cold moist

Description:

Bloom: July–October
Color: Yellow
Height: 1–3 feet
Leaves: Alternate, linear oval, hairy

Carolyn Miller

Wildlife Resources:

Mining bees, Long-horned bees, Metallic green sweat bees, Augochlorine sweat bees, Butterflies, Birds (seed)

Market Use:

BLACK-EYED SUSAN *Rudbeckia hirta*

Growing Conditions:

Full sun–partial shade

Medium-wet—dry

Sand, loam, clay

60–90 days, cold moist

Description:

Bloom: July–October, every other year

Color: Yellow

Height: 2–3 feet

Leaves: Alternate, narrow to egg-shaped, very hairy

Carolyn Miller

Wildlife Resources:

Long-horned bees, Metallic green sweat bees, Augochlorine sweat bees, Bumble bees, Leafcutter bees, Mining bees, Carpenter bees, Wasps, Beetles, Flies, Butterflies, Moths, Birds (seed)

Market Use:

ROUGH BLAZING STAR *Liatris aspera*

Growing Conditions:

Full sun–partial shade

Medium–dry

Sand, loam, clay

60–90 days, cold moist

Description:

Bloom: July–October
Color: Purple
Height: 3–5 feet
Leaves: Alternate, narrow

Carolyn Miller

Wildlife Resources:

Bumble bees, Small carpenter bees, Leafcutter bees, Metallic green sweat bees, Small sweat bees, Long-horned bees, Wasps, Flies, Beetles, Butterflies, Moths, Hummingbirds, Birds (seed)

Market Use:

WHITE TURTLEHEAD *Chelone glabra*

Growing Conditions:

Full sun–partial shade

Clay, loam, sand

Wet—medium-wet

60–90 days, cold moist

Description:

Bloom: August–September
Color: White
Height: 2–5 feet
Leaves: Opposite, narrow, toothed

Carolyn Miller

Wildlife Resources:

Bumble bees, Long-horned bees, Masked bees, Wasps, Flies, Butterflies, Hummingbirds

Market Use:

STIFF GOLDENROD *Oligoneuron rigidum* *(Solidago rigida)*

Growing Conditions:

Full sun–partial shade

Medium–dry

Sand, loam, clay

60–90 days, cold moist

Description:

Bloom: August–October
Color: Yellow
Height: 3–5 feet
Leaves: Alternate along stem, large leaves at base, oval-shaped, hairy

Jennifer Roedel

Wildlife Resources:

Bumble bees, Mining bees, Metallic green sweat bees, Augochlorine sweat bees, Banded sweat bees, Masked bees, Leafcutter bees, Carpenter bees, Small carpenter bees, Long-horned bees, Cellophane bees, Wasps, Flies, Beetles, Butterflies, Moths, Birds (seed)

Market Use:

SMOOTH BLUE ASTER *Symphyotrichum laeve*

Growing Conditions:

Full sun–partial shade

Medium-wet—medium-dry

Sand, clay, loam

60–90 days, cold moist

Description:

Bloom: August–October

Color: Blue

Height: 2–4 feet

Leaves: Alternate, oval or egg-shaped, clasping (lobes wrap around stem), smooth

Troy McConaghy

Wildlife Resources:

Metallic green sweat bees, Augochlorine sweat bees, Banded sweat bees, Small sweat bees, Mining bees, Bumble bees, Leafcutter bees, Long-horned bees, Carpenter bees, Small carpenter bees, Masked bees, Cellophane bees, Wasps, Beetles, Flies, Moths, Butterflies, Birds (seed)

Market Use:

N/A

NEW ENGLAND ASTER
Symphyotrichum novae-angliae

Growing Conditions:

Full sun–partial shade

Medium-wet—medium-dry

Clay, loam, sand

60–90 days, cold moist

Description:

Bloom: August–October

Color: Purple

Height: 3–5 feet

Leaves: Alternate, long/oval, clasping (lobes wrap around stem), hairy

Carolyn Miller

Wildlife Resources:

Metallic green sweat bees, Augochlorine sweat bees, Banded sweat bees, Small sweat bees, Mining bees, Bumble bees, Leafcutter bees, Long-horned bees, Carpenter bees, Small carpenter bees, Masked bees, Cellophane bees, Wasps, Beetles, Flies, Moths, Butterflies, Birds (seed)

Market Use:

SNEEZEWEED *Helenium autumnale*

Growing Conditions:

Full sun–partial shade

Wet–medium

Clay, loam

60–90 days, cold moist

Description:

Bloom: August–October

Color: Yellow

Height: 3–5 feet

Leaves: Alternate, linear-oval, wide teeth

Carolyn Miller

Wildlife Resources:

Metallic green sweat bees, Augochlorine sweat bees, Banded sweat bees, Small carpenter bees, Bumble bees, Long-horned bees, Wasps, Beetles, Flies, Butterflies, Moths, Birds (seed)

Market Use:

URBAN BEE COMMUNITIES

In this section, we give an overview of 17 groups of bees found in the Great Lakes Region. The overviews cover the social, nesting, and dietary behavior of each group or "genus." The conservation status ranks from page 5 are listed for each species. We also describe what the bees look like to help you know which species are on your farm. Identifying bees can be tricky, so there are more resources to help 112. There are many more bees found in the Great Lakes Region, but we focus on the most common and most important to crop pollination of *popular urban crops.

regionally abundant; these are the most common bees in the three largest metropolitan areas within each region of the Great Lakes

good crop pollination score; this bee genera pollinates **5 or less categories** of popular urban crops

great crop pollination score; this bee genera pollinates **6–10 categories** of popular urban crops

excellent crop pollination score; this bee genera pollinates **more than 11** categories of popular urban crops

*Categories of popular urban crops considered in this section: apple, pear, plum, cherry, tomato, watermelon, other melons, squash and pumpkin, cucumber, blackberry, raspberry, blueberry, strawberry, broad bean, and sunflower. These are common crops that greatly benefit from insect pollination. The following table gives an overview of the known pollinators for these crops.

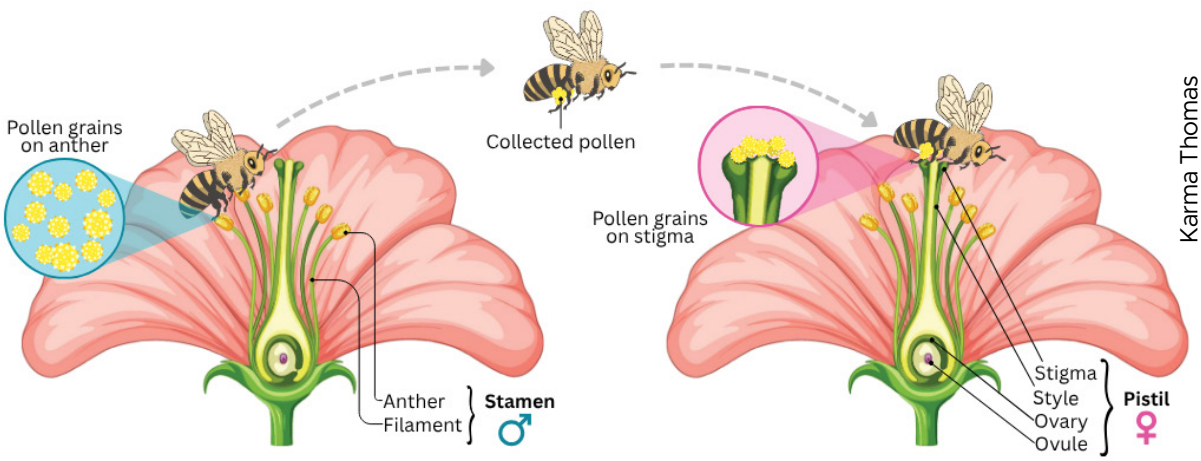
Overview of Known Crop Pollinators

Crop	Pollinators
Apple	*Apis*, *Andrena*, *Augochlora*, *Halictus*, *Osmia*, *Bombus*, hoverflies, and moths
Pear	*Apis*, *Bombus*, *Andrena*, *Osmia*, and hoverflies
Plum	*Apis*, *Bombus*, *Osmia*, *Andrena*, and *Colletes*
Cherry	*Apis*, *Osmia*, *Andrena*, *Halictus*, *Lasioglossum*, and *Bombus*
Tomato	*Bombus*, *Halictus*, *Agapostemon*, *Augochlora*, *Augochlorella*, *Augochloropsis*, *Lasioglossum*, and *Andrena*
Watermelon	*Lasioglossum*, *Augochlorella*, *Augochlora*, *Agapostemon*, *Halictus*, *Apis*, *Ceratina*, *Bombus*, *Xylocopa*, *Xenoglossa*, *Melissodes*, *Osmia*, *Megachile*, *Hylaeus*, and many other insects
Other Melons	*Apis*, *Bombus*, *Xenoglossa*, *Melissodes*, *Ceratina*, and many other insects
Squash and Pumpkin	*Xenoglossa*, *Bombus*, *Apis*, *Melissodes*, *Lasioglossum*, *Halictus*, *Agapostemon*, and *Augochlora*
Cucumber	*Apis*, *Bombus*, *Lasioglossum*, and flies
Blackberry	*Apis*, *Bombus*, *Ceratina*, *Hylaeus*, *Andrena*, hoverflies, butterflies, and beetles
Raspberry	*Bombus*, *Apis*, *Osmia*, *Ceratina*, *Hylaeus*, *Andrena*, and many other insects
Blueberry	*Apis*, *Bombus*, *Lasioglossum*, *Andrena*, *Halictus*, *Osmia*, *Colletes*, and *Megachile*
Strawberry	*Andrena*, *Apis*, *Lasioglossum*, *Osmia*, *Halictus*, and hoverflies
Broad Bean	*Apis*, *Bombus*, and hoverflies
Sunflower	*Apis*, *Bombus*, *Melissodes*, *Lasioglossum*, and *Halictus*

Pollination 101

Pollination is the movement of pollen from the "male" part of the flower to the "female" part of the flower. This is the way that flowering plants make seeds and reproduce. For some plants pollination is done by wind, but for many, it is done by insects. Some flowers even need the buzz of an insect, or "buzz pollination," to release pollen. This is very common for plants in the nightshade family like tomatoes and eggplants. It is also common, though usually less crucial, for plants in the heath family like blueberries and cranberries. To attract insects, flowers are colorful, fragrant, and make extra pollen and nectar.

Diagram showing steps of insect pollination



Karma Thomas

Any animal visiting a flower for nectar or pollen might act as a pollinator. Common floral visitors include flies, moths, butterflies, beetles, and wasps. Crop pollination by these insects is less well known and not discussed here, but can be important. By watching the way they interact with your flowers, you can learn a lot about them!

Home and Diet

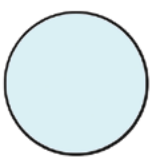
Most bees do not build hives, but many are still great architects. Bees will build nests in cavities, underground, or in hollow plant stems. Different species have unique adaptations to help them do this. Many secrete lining to make their nests waterproof, some have large mandibles for cutting plant material, and others are great at digging.

cavity nesting; large holes in trees, hollow logs, cracks in buildings, empty bird boxes, and old rodent holes

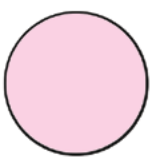
ground nesting; bare or exposed soil that can be dug into

tunnel nesting; hollow plant stems or narrow holes in trees, fallen logs, and occasionally rock crevices or snail shells

Once female bees build their nests, they will collect pollen to bring home to future offspring. Most bees are generalists and will collect pollen from any flower. Other species are pickier and stick to a specific group of plants. These bees are called specialists and are often the best pollinators for the plants they visit. Specialist bees tend to have unique adaptations that make getting pollen from the flowers they specialize on easier. These might be differently shaped bodies, longer hairs, or the ability to make their body buzz.



generalist; with crop pollination score



specialist; with crop pollination score

capable of buzz pollination; with crop pollination score

The social lives of bees

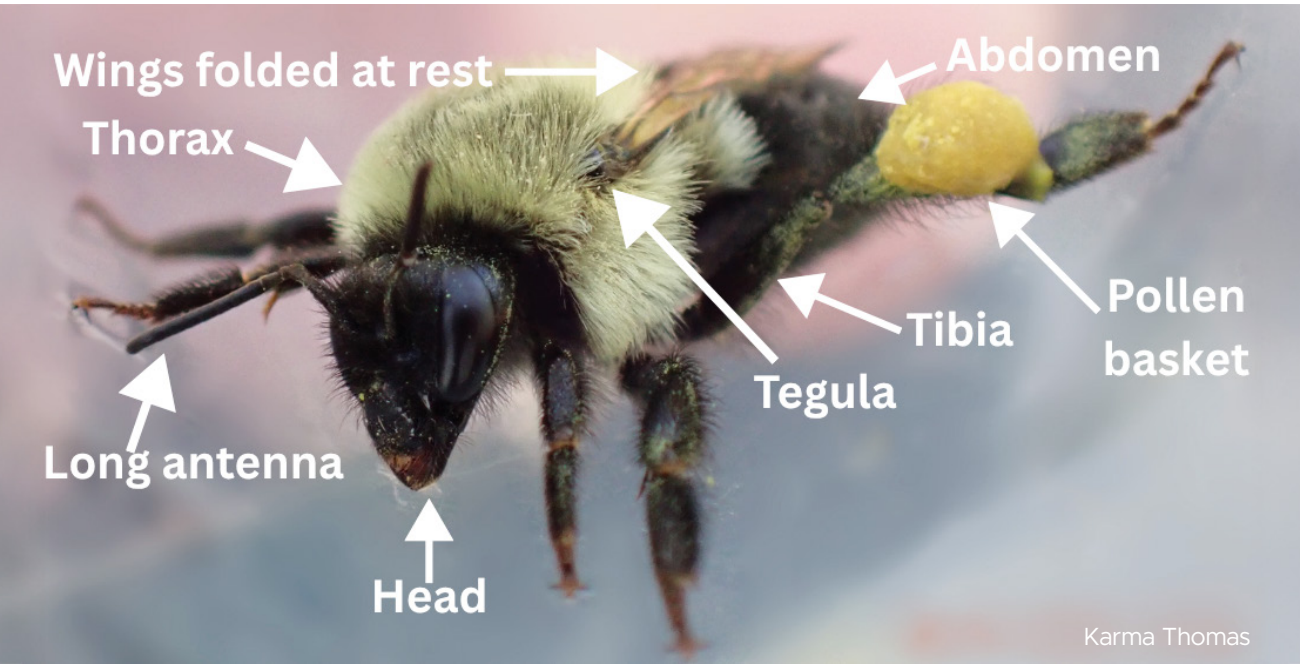
While a few species of bees are social and live in colonies with a queen, most bees are solitary and live alone. Some solitary species prefer to nest close to each other in a dense patch of solitary nests, called "aggregations." When these solitary nests share an entrance, the bees are "communal."


solitary


communal


social

Bee anatomy



Bees have six legs, three body parts, and two sets of wings.

ANDRENIDAE

MINING BEES *Andrena* spp.

Genus Overview:

Species in the Great Lakes Region: 31

Activity:

Identification:

Hairy; orange, white, or light gray on head and thorax

Abdomen with or without stripes

Long hairs on tibia giving robust appearance

Males with hairy mustache, slender legs, and abdomen

Size range: 5–18 mm

Joseph Ferraro

Andrena sp.

Ecology:

Crops pollinated: Apple, Pear, Plum, Cherry, Blackberry, Raspberry, Blueberry, Strawberry

Diet (forage plants): Asters, Black-Eyed Susan, Bloodroot, Bonesets, Common Yarrow, Echinacea, Field Pussytoes, Goat's Beard, Golden Alexanders, Goldenrods, Jacob's Ladder, Merrybells, Milkweeds, Roses, Sunflowers, Violets, Waterleaf, Wild Geranium, Wild Lupine, Yellow Coneflower. Many species specialize on these and other plants including Barren Strawberry, Dandelion, Indigo, Ragworts, Rockcress, Spring Beauty, and Trout Lily.

NASON'S MINING BEE *Andrena nasonii*

New York: S3 / Elsewhere: S5 SNR

Small with distinct, grayish stripes on the abdomen. They nest in sandy soils which are often hard to spot due to shifting soil. They are important apple pollinators.

Bernie Paquette

Andrena nasonii

REGULAR MINER BEE *Andrena regularis*

New York: S3 / Elsewhere: S5 SNR

Large with dark appearance and no stripes. Large mining bees are often the most common visitors to apple, blueberry, and cherry blossoms. They are very important pollinators of these crops. They deposit 2–3 times more pollen than honey bees per visit.

Molly Jacobson

Andrena regularis

CARLIN'S MINING BEE *Andrena carlini*

Indiana, New York: S4 / Elsewhere: S5 SNR

Very similar to *A. regularis* in ecology and appearance. The top of their thorax has lighter colored hairs. They are very common visitors to apple, cherry, and blueberry. They nest in aggregations in sandy soil near these crops. They are very important blueberry pollinators.

Keshava Mysore

Andrena carlini

CAROLINA MINER BEE *Andrena carolina*

Indiana, Ontario, New York: S3 / Elsewhere: SNR

Long face and short, sparse hairs. This species is a blueberry specialist. Their shape allows them to easily collect nectar and pollen from blueberry flowers. They are abundant in blueberry fields and are very important pollinators of this crop.

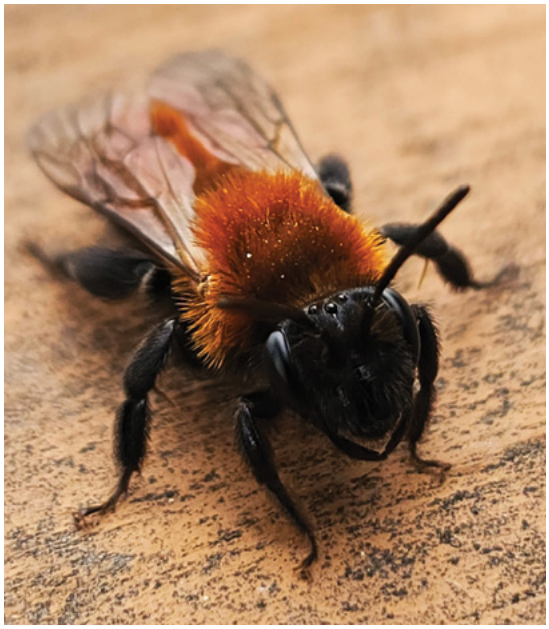
Spencer Hardy

Andrena carolina

MILWAUKEE MINER BEE *Andrena milwaukeensis*

New York: S3 / Elsewhere: S5 SNR

Black with fox orange hairs on the thorax and upper half of the abdomen, black hairs on tibia. This species is an important pollinator of blackberries and raspberries. They are commonly in and around understory shrubs.



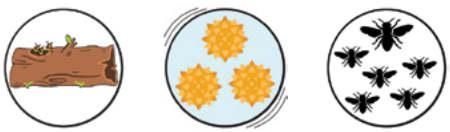
Andrena milwaukeensis

Kendra Parrish

APIDAE

HONEY BEES *Apis* spp.

Genus Overview:



Species in the Great Lakes Region: 1

Activity:

Identification:

Hairy; golden brown thorax and dense hair along eyes
Abdomen often starting amber then becoming brown or gold with black stripes. Broad, flat tibia

Size range: 14 mm (worker)

Ecology:

Crops pollinated: Apple, Pear, Plum, Cherry, Watermelon, Other Melons, Squash and Pumpkin, Cucumber, Blackberry, Raspberry, Blueberry, Strawberry, Broad Bean, Sunflower

Diet (forage plants): Most plants that produce nectar and are not buzz pollinated. Plants that need buzz pollination include the nightshade family and many from the heath family.

EUROPEAN HONEY BEE *Apis mellifera*

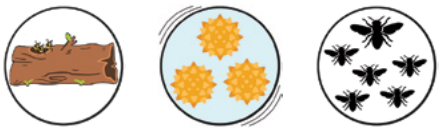
Joseph Ferraro

Apis mellifera

Introduced from Europe in the 1600s, it is the only species of honey bee in North America. This domesticated species lives in large colonies that can nest in hives made by humans. Farmers often have hives on their farms for crop pollination, wax, and honey production. They forage far and on a wide variety of plants which allows them to pollinate most crops in a large area. Because they can't buzz pollinate, they do not usually pollinate tomatoes. They are still important pollinators of blueberries, which are also buzz pollinated. They do this by scraping the pollen off the stamens.

BUMBLE BEES *Bombus* spp.

Genus Overview:



Species in the Great Lakes Region: 23

Activity:

Identification:

Hairy; black with white, yellow, orange, rust, or brown stripes on abdomen and thorax

Large and robust

Size range: 7–29 mm

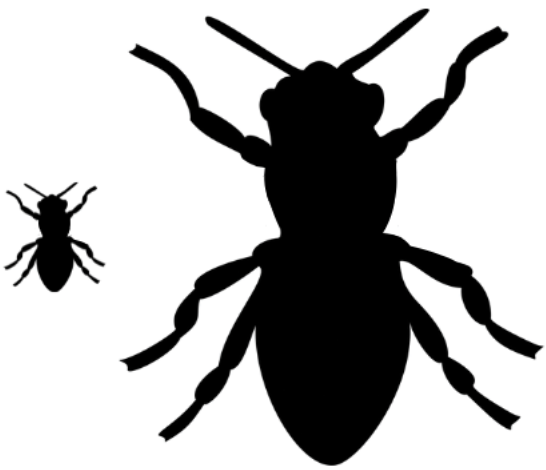
Joseph Ferraro

Bombus pensylvanicus

Ecology:

Crops pollinated:

Apple, Pear, Plum, Cherry, Tomato, Watermelon, Other Melons, Squash and Pumpkin, Cucumber, Blackberry, Raspberry, Blueberry, Broad Bean, Sunflower



Diet (forage plants): Anise Hyssop, Asters, Beardtongues, Bee Balm, Black-eyed Susan, Blazing Stars, Bluebells, Blue Lobelia, Bottle Gentian, Canada Milkvetch, Canada Tick Trefoil, Common Ironweed, Common Yarrow, Columbine, Coreopsis, Culver's Root, Echinacea, Golden Alexanders, Goldenrods, Jacob's Ladder, Larkspur, Milkweeds, Obedient Plant, Onions, Partridge Pea, Prairie Clover, Prairie Smoke, Prickly Pear, Rattlesnake Master, Robin's Plantain, Senna, Shooting Star, Sneezeweed, Solomon's Seal, Spiderworts, Spotted Bee Balm, Spotted Joe-Pye Weed, Sunflowers, Vervain, Virginia Waterleaf, White Indigo, White Turtlehead, Wild Geranium, Wild Lupine, White Turtlehead, Yellow Coneflower

COMMON EASTERN BUMBLE BEE *Bombus impatiens*

S5 SNR

Bombus impatiens

Joseph Ferraro

All black with a yellow thorax and one wide yellow band on the abdomen. They are very common and found in most habitats. Their large colonies forage on many plants and can buzz pollinate, which make them important pollinators of most crops. They are very important pollinators of apple, tomato, squash and pumpkin, and blueberry.

BROWN-BELTED BUMBLE BEE *Bombus griseocollis*

Wisconsin, New York: S4 / Elsewhere: S5 SNR

Similar to *B. impatiens* in ecology and appearance. They have a brown band on their abdomen and very dark wings. They nest in smaller colonies of 25–50 workers. These are underground or on the ground surface in many habitats.

Joseph Ferraro

Bombus griseocollis

RUSTY-PATCHED BUMBLE BEE *Bombus affinis*

Michigan, New York: SH / Elsewhere: S1

Similar to *B. impatiens*. They have longer hairs and a rusty-brown patch between their wings. Colonies nest underground in old rodent burrows. They forage on a wide variety of plants and pollinate many crops including plum, cherry, tomato, squash and pumpkin, blueberry, and sunflower. They are an endangered species and are very uncommon in most places. They are most common in Wisconsin and Minnesota.

Samantha Gallagher

BLACK AND GOLD BUMBLE BEE *Bombus auricomus*

Wisconsin, Indiana: S3 / Michigan, New York: S2

Elsewhere: S4 SNR

Large with short body hair that is black on the face, yellow on the back of the head, and yellow on the thorax with a black band between the wings. The abdomen is mostly black with yellow bands in the middle. Colonies form small nests on the ground surface.

Joseph Ferraro

Bombus auricomus

TWO-SPOTTED BUMBLE BEE *Bombus bimaculatus*

Wisconsin, Michigan, New York: S4

Elsewhere: S5 SNR

Bombus bimaculatus

Joseph Ferraro

Long hair that is mostly yellow on the thorax with a circular black patch between the wings. The upper half of the abdomen has a yellow "W" shaped band. Colonies typically nest underground but can use aboveground cavities. Nests are in extremely diverse landscapes, including sandy dunes and beaches.

GOLDEN NORTHERN BUMBLE BEE *Bombus fervidus*

Wisconsin: S2 / Elsewhere: S3 SNR

Almost all yellow with a mostly black head and face. Colonies nest in tall grasses, haystacks, or sometimes underground in old mouse nests.

Bombus fervidus

Joseph Ferraro

AMERICAN BUMBLE BEE *Bombus pensylvanicus*

Wisconsin, Michigan, New York: S1

Elsewhere: S3 SNR

Large with short black hair and yellow patches on the abdomen and thorax. Colonies mostly nest in tall grasses but are sometimes underground.

Bombus pensylvanicus

Joseph Ferraro

CONFUSING BUMBLE BEE *Bombus perplexus*

Wisconsin: S1 Michigan, Indiana, New York: S3

Elsewhere: S5 SNR

Long hair that is yellow on the thorax and the upper half of the abdomen. Males have an entirely yellow abdomen. Colonies mostly nest underground but may use hollow logs. They forage on many plants but commonly visit plum, cherry, blackberry, and raspberry.

Margaret Fisher

B. perplexus male

Kyla Moore

B. perplexus female

RED-BELTED BUMBLE BEE *Bombus rufocinctus*

Michigan, New York: S3 / Wisconsin: S4

Elsewhere: S5 SNR

Small bodied, short haired, and variable coloration. Their abdomen has a red band in the middle that is sometimes black. Colonies usually nest on or above ground level in diverse habitats.

Bombus rufocinctus

Reuven Martin

TRICOLORED BUMBLE BEE *Bombus ternarius*

Illinois: SX / Indiana: SH

Wisconsin, New York: S4 / Elsewhere: S5 SNR

Black head with yellow on top, a yellow abdomen with a black patch between the wings, and a yellow thorax with a red band in the middle and a black tip. Colonies nest underground, often near large stands of goldenrod. They forage on many plants but commonly visit blackberries and raspberries.

Charlie Mitchell

Bombus ternarius

LEMON CUCKOO BUMBLE BEE *Bombus citrinus*

New York: S2 / Wisconsin, Michigan, Ontario: S3

Elsewhere: S4 SNR

Bombus citrinus

Joseph Ferraro

Yellow thorax with a mostly black head. The abdomen is black and sometimes has a yellow band in the middle. This species is a brood parasite, meaning they lay their eggs in the nests of other bumble bee species rather than make their own. Brood parasites are less efficient pollinators because they do not intentionally collect pollen and do not have pollen baskets. They do commonly visit blackberries and raspberries for nectar.

SMALL CARPENTER BEES *Ceratina* spp.

Genus Overview:

Species in the Great Lakes Region: 4

Activity:

Ceratina sp.

Identification:

Metallic dark blue and mostly hairless

Small with a wide abdomen that ends in a sudden point

Males with a white mustache-like marking on their face

Joseph Ferraro

Size range: 2-9 mm

Ecology:

Crops pollinated:

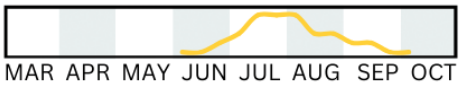
Watermelon, Other Melons, Squash and Pumpkin, Blackberry, Raspberry

Diet (forage plants): Asters, Beardtongues, Blazing Stars, Bloodroot, Blue-Eyed Grass, Blue Lobelia, Common Yarrow, Coreopsis, Echinacea, Goldenrods, Harebell, Hepatica, Leadplant, Milkweeds, Ragworts, Sneezeweed, Spiderworts, Vervain, Violets, Waterleaf, Wild Geranium, Wild Lupine, Wild Strawberry

SQUASH BEES *Xenoglossa (Eucera)* spp.

Genus Overview: **Species in the Great Lakes Region:** 1

Activity:



Identification: **Size range:** 9–16 mm

Similar to *Apis mellifera* but the tibia is not flat and has long, orange hairs. Hairs on the head and body are long and orange.

Ecology:

Crops pollinated:

Watermelon, Other Melons, Squash and Pumpkin

Diet (forage plants): Plants in the genus Cucurbita. This includes squashes like pumpkin and zucchini.

HOARY SQUASH BEE *Xenoglossa (Eucera) pruinosa*

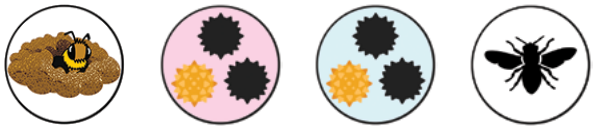
Ontario: S2 / Indiana: S4 / Elsewhere: SNR

This species is a specialist on plants in the genus Cucurbita. They mostly visit different types of squash like pumpkin and zucchini because their larvae need the pollen to develop. They will sometimes visit and pollinate related plants like melons. During the day, males will rest inside of these flowers. Females build their nests underground near the plants. They are extremely important pollinators of squash.

Xenoglossa (Eucera) pruinosa Bruce Cook

LONG-HORNED BEES *Melissodes* spp.

Genus Overview:



Species in the Great Lakes Region: 13

Activity:

Identification:

Robust shape with pale stripes on the abdomen

Males with very long antennae or "horns"

Females with very long, dense hairs on their tibia giving a robust shape

Size range: 6–18 mm

Joseph Ferraro

Melissodes sp.

Ecology:

Crops pollinated: Watermelon, Other Melons, Squash and Pumpkin, Sunflower

Diet (forage plants): Asters, Bee Balm, Black-Eyed Susan, Blazing Stars, Coreopsis, Culver's Root, Echinacea, Goldenrods, Hoary Vervain, Ironweed, Joe-Pye Weed, Prickly Pear, Smooth Oxeye, Sneezeweed, Spotted Bee Balm, Sunflowers, Thistles, White Turtlehead. Most species are specialists on flowers in the Asteraceae family.

TWO-SPOTTED LONG-HORNED BEE
Melissodes bimaculatus

New York: S4 / Elsewhere: S5 SNR

All black with two white spots near the tip of the abdomen. They are very common and often gather on foliage in groups. Unlike most bees in this genus, they are generalist foragers. They will visit many crops and are important pollinators of late-blooming squash like pumpkins.

Joseph Ferraro

Melissodes bimaculatus

AGILE LONG-HORNED BEE *Melissodes agilis*

New York: S2 / Ontario: S3

Elsewhere: S4 SNR

Very pale yellow to orange hairs. This species is a sunflower specialist. Their abundance makes them important pollinators.

Melissodes agilis

Molly Jacobson

LARGE CARPENTER BEES *Xylocopa* spp.

Genus Overview: **Size range:** 13–24 mm

Species in the Great Lakes Region: 1

Activity:

Identification:
Similar to *Bombus impatiens* but the abdomen is hairless and shiny and the head is more robust

Ecology:

Crops pollinated: Watermelon

Diet (forage plants): Asters, Beardtongues, Black-Eyed Susan, Culver's Root, Echinacea, Goldenrods, Ironweed, Milkweeds, Prickly Pear, Smooth Oxeye, Thistles, Wild Strawberry, Yellow Coneflower

EASTERN CARPENTER BEE *Xylocopa virginica*

S4

This species builds their nests in wood by drilling holes into it. They are most attracted to cedar and pine. You can prevent this behavior by applying paint or stain to structures or by offering them other nesting sites. They sometimes rob nectar from small flowers without pollinating them by cutting a slit into the petals. Their very high abundance still makes them important pollinators of native flowers. This helps support on-farm habitat for crop pollinating species.

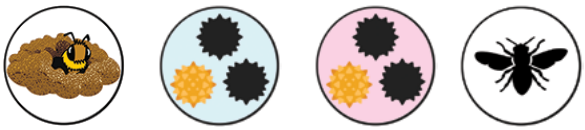
Joseph Ferraro

Xylocopa virginica

COLLETIDAE

CELLOPHANE BEES *Colletes* spp.

Genus Overview:



Species in the Great Lakes Region: 6

Activity:

Identification:
Similar to *Andrena*
Hairy thorax and head with hairs covering the face
Abdomen with prominent, pale colored stripes

Size range: 6–15 mm

Joseph Ferraro

Colletes sp.

Ecology:

Crops pollinated: Apple, Plum, Blueberry

Diet (forage plants): Ground Cherry and Onions. Many species are specialists on Clovers, Leadplant, Indigo, Goldenrods, Harebell, Asters, Ground Cherry, Alumroot, Blueberry, or Bellflowers.

UNEQUAL CELLOPHANE BEE *Colletes inaequalis*

S5 SNR

Larger than most mining bees. This species nests in aggregations in sandy soil. They are very common and forage on a wide variety of plants beginning in early spring. They commonly visit flowering trees and are important apple pollinators.

Joseph Ferraro

Colletes inaequalis

BLUEBERRY CELLOPHANE BEE *Colletes validus*

Indiana: S3 / Elsewhere: S4 SNR

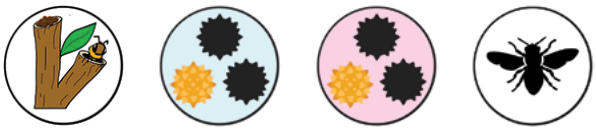
Similar to *C. inaequalis* but with an extremely long face. They nest in sandy soils in synchrony with blueberry bloom time. This species is a blueberry specialist and are important pollinators of this crop.

Amanda J. Ellis

Colletes validus

MASKED BEES *Hylaeus* spp.

Genus Overview:



Species in the Great Lakes Region: 10

Activity:

Hylaeus sp.

Joseph Ferraro

Identification:
Wasp-like
Small, almost hairless, mostly black with yellow masks on their faces

Size range: 3.5–9 mm

Ecology:

Crops pollinated:
Watermelon, Blackberry, Raspberry

Diet (forage plants): American Spikenard, Asters, Blue Lobelia, Bonesets, Canada Anemone, Culver's Root, Golden Alexanders, Goldenrods, Harebell, Milkweeds, Obedient Plant, Prairie Cinquefoil, Prairie Onion, Rattlesnake Master, Wild Quinine, White Turtlehead

METALLIC GREEN SWEAT BEES *Agapostemon* spp.

Genus Overview:

Species in the Great Lakes Region: 4

Activity:

Identification:
Metallic green
Males have an abdomen that is black with yellow stripes

Size range: 7–13 mm

Joseph Ferraro

Agapostemon sp.

Ecology:

Crops pollinated: Tomato, Watermelon, Squash and Pumpkin

Diet (forage plants): Asters, Beardtongues, Bee Balm, Black-Eyed Susan, Blue Lobelia, Blue Vervain, Bonesets, Culver's Root, Echinacea, Golden Alexanders, Goldenrods, Harebell, Hoary Vervain, Ironweed, Prairie Clover, Roses, Rough Blazing Star, Smooth Oxeye, Sneezeweed, Spiderworts, Spotted Joe-Pye Weed, Sumac, Wild Geranium, Wild Quinine. Preference for plants in the aster family.

BICOLORED STRIPED SWEAT BEE
Agapostemon virescens

New York: S3 / Elsewhere: S5 SNR

Agapostemon virescens

Joseph Ferraro

The only *Agapostemon* species where the female also has an abdomen that is black with white stripes. They forage on a wide range of flowers and are very abundant pollinators. They can also buzz pollinate.

AUGOCHLORINE SWEAT BEES
Augochlorini, Augochlorella spp.

Genus Overview:

Species in the Great Lakes Region: 2

Activity:

Augochlorella sp.

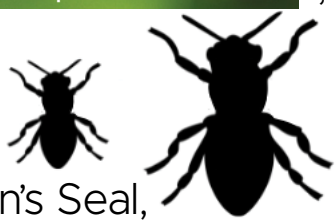
Joseph Ferraro

Identification: Similar to other green sweat bees. Abdomen without stripes and with gold highlights. *Females with light brown wings and tegula. Males a golden or brassy color with longer, thicker antennae*

Size range: 7–13 mm

Ecology:

Crops pollinated: Tomato, Watermelon, Squash and Pumpkin



Diet (forage plants): Alumroot, Asters, Black-Eyed Susan, Echinacea, False Solomon's Seal, Harebell, June Grass, Milkweeds, New Jersey Tea, Prairie Clover, Violets

AUGOCHLORINE SWEAT BEES
Augochlorini, Augochlora spp.

Genus Overview: **Species in the Great Lakes Region:** 1

Activity:

Identification:
Similar to other green sweat bees
Abdomen without stripes
Female with dark brown wings and tegula
Males slender with longer antennae and gold highlights on the abdomen

Size range: 5-9 mm

Joseph Ferraro

Augochlora pura

Ecology:

Crops pollinated: Tomato, Watermelon, Squash and Pumpkin

Diet (forage plants):
Asters, Beardtongue, Black-Eyed Susan, Common Yarrow, Goldenrod, Milkweed, Purple Prairie Clover, Ragwort, Smooth Oxeye, Sneezeweed

PURE SWEAT BEE *Augochlora pura*

New York: S4 / Elsewhere: S5 SNR

This is one of the only species of metallic green sweat bee that does not nest in the ground. They nest in cavities already present in rotting wood and prefer moist wood in shady areas. They are abundant and important apple pollinators and can buzz pollinate.

AUGOCHLORINE SWEAT BEES
Augochlorini, Augochloropsis spp.

Genus Overview:

Species in the Great Lakes Region: 2

Activity:

Identification:

Similar to other green sweat bees, can be blueish

Tegula is metallic and tibia is green

Abdomen without stripes and more robust than other *Augochlorini*

Size range: 6–12 mm

Molly Jacobson

Augochloropsis viridula

Ecology:

Crops pollinated: Tomato

Diet (forage plants):

Asters, Bonesets, Goldenrods, Milkweeds, Mountain Mint, Obedient Plant, Roses, Spotted Bee Balm, Yellow Coneflower

BANDED SWEAT BEES *Halictus* spp.

Genus Overview:

Species in the Great Lakes Region: 4

Activity:

Identification:
Hairy; dark with bold, light colored stripes on abdomen

Size range: 7–13 mm

Halictus sp. *on apple blossom*

Joseph Ferraro

Ecology:

Crops pollinated: Cherry, Tomato, Watermelon, Squash and Pumpkin, Blueberry, Strawberry, Sunflower

Diet (forage plants): Asters, Beardtongues, Blue Vervain, Bonesets, Marsh Blazing Star, Echinacea, Field Pussytoes, Fleabane, Goldenrods, Harebell, Leadplant, Milkweeds, Mountain Mint, New Jersey Tea, Ragworts, Sneezeweed, Sunflowers, Waterleaf, Wild Geranium, Wild Strawberry, Yarrow, Yellow Coneflower

LIGATED FURROW BEE *Halictus ligatus*

S5 SNR

Dark body and a very large head with a hooked cheek that gives the jaw an indented look. This species is very common and extremely abundant. They nest in large aggregations in well drained soil. They forage on a variety of flowers and can buzz pollinate, making them important pollinators, especially for apples and sunflowers.

Joseph Ferraro

Halicatus ligatus

SMALL SWEAT BEES *Lasioglossum* spp.

Genus Overview:

Species in the Great Lakes Region: 64

Activity:

Lasioglossum sp.

Identification:
Similar to *Halictus*
Small and dark, sometimes metallic
Abdomen with or without bold, pale colored stripes

Joseph Ferraro

Size range: 3–10 mm

Ecology:

Crops pollinated: Cherry, Tomato, Watermelon, Squash and Pumpkin, Cucumber, Blueberry, Strawberry, Sunflower

Diet (forage plants): Asters, Bishop's Cap, Bloodroot, Blue Lobelia, Bonesets, Columbine, Common Yarrow, Culver's Root, Field Pussytoes, Golden Alexanders, Harebell, Jacob's Ladder, Lance-leaf Figwort, Leadplant, Marsh Marigold, Milkweeds, Nodding Onion, Obedient Plant, Pasque Flower, Prairie Alumroot, Rattlesnake Master, Robin's Plantain, Rough Blazing Star, Spiderworts, Spotted Bee Balm, Sunflowers, Violets, Whorled Loosestrife, Wild Geranium, Wild Lupine, Wild Strawberry. Some species are specialists.

MEGACHILIDAE

LEAFCUTTER BEES *Megachile* spp.

Genus Overview:

Species in the Great Lakes Region: 17

Activity:

Identification:

Large mandibles and sharp teeth

Dark head and thorax with pale hairs

Abdomen with light colored stripes

Females have long hairs on the underside of their abdomen

Joseph Ferraro

Megachile sp.

Size range: 5–21 mm

Ecology:

Crops pollinated: Watermelon, Blueberry

Diet (forage plants): Anise Hyssop, Asters, Balsam Ragwort, Black-Eyed Susan, Beardtongue, Bee Balm, Blazing Star, Canada Anemone, Common Yarrow, Coreopsis, Culver's Root, Echinacea, Golden Alexanders, Harebell, Indigo, Joe-Pye Weed, Leadplant, Milkweeds, Nodding Onion, Prairie Clover, Prairie Onion, Prickly Pear, Tick Trefoil, Tickseed, Vervain, Yellow Coneflower. Some species are specialists.

CRANBERRY LEAFCUTTER BEE *Megachile addenda*

New York: S3 / Elsewhere: S4 SNR

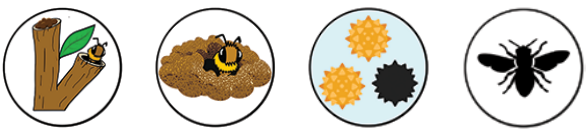
Megachile addenda

© Paula Sharp

Dark with light colored stripes on the abdomen and long, pale hairs on the face. This species nests underground in sandy soil. They are commonly present in and around cranberry bogs and are important pollinators of this crop. They are also widespread and abundant in urban and suburban areas and are great blueberry pollinators.

MASON BEES *Osmia* spp.

Genus Overview:



Activity:

Species in the Great Lakes Region: 14

Osmia sp.

Joseph Ferraro

Identification:
Very dark metallic blue or green
Relatively hairy

Size range: 5–17 mm

Ecology:

Crops pollinated: Apple, Pear, Plum, Cherry, Watermelon, Raspberry, Blueberry, Strawberry

Diet (forage plants): Bluebells, Common Yarrow, Golden Alexanders, Harebell, Robin's Plantain, Spiderworts, Waterleaf, Wild Geranium, Wild Lupine. Some species are specialists.

MAINE BLUEBERRY BEE *Osmia atriventris*

New York: S3 / Indiana: S4 / Elsewhere: S5 SNR

Very dark metallic blue. This species is widespread and builds its nests in hollow stems. They forage on a variety of flowers and are important blueberry pollinators.

Royal Tyler

Osmia atriventris

BLUE ORCHARD BEE *Osmia lignaria*

Indiana, New York: S3 / Elsewhere: S5 SNR

Similar to *O. atriventris* but slightly larger and hairier. They nest in hollow stems and natural cavities in wood. This species is a valuable pollinator of orchard crops like plum and cherry. They also pollinate blueberry, raspberry, and strawberry.

Joseph Ferraro

Osmia lignaria

HABITAT MAINTENANCE

After you install your wildflower planting, it is important to continue upkeep. In this section, we go over routine maintenance and provide a seasonal checklist to help guide you. We also cover pest management and plant propagation.

Routine Maintenance

WATERING

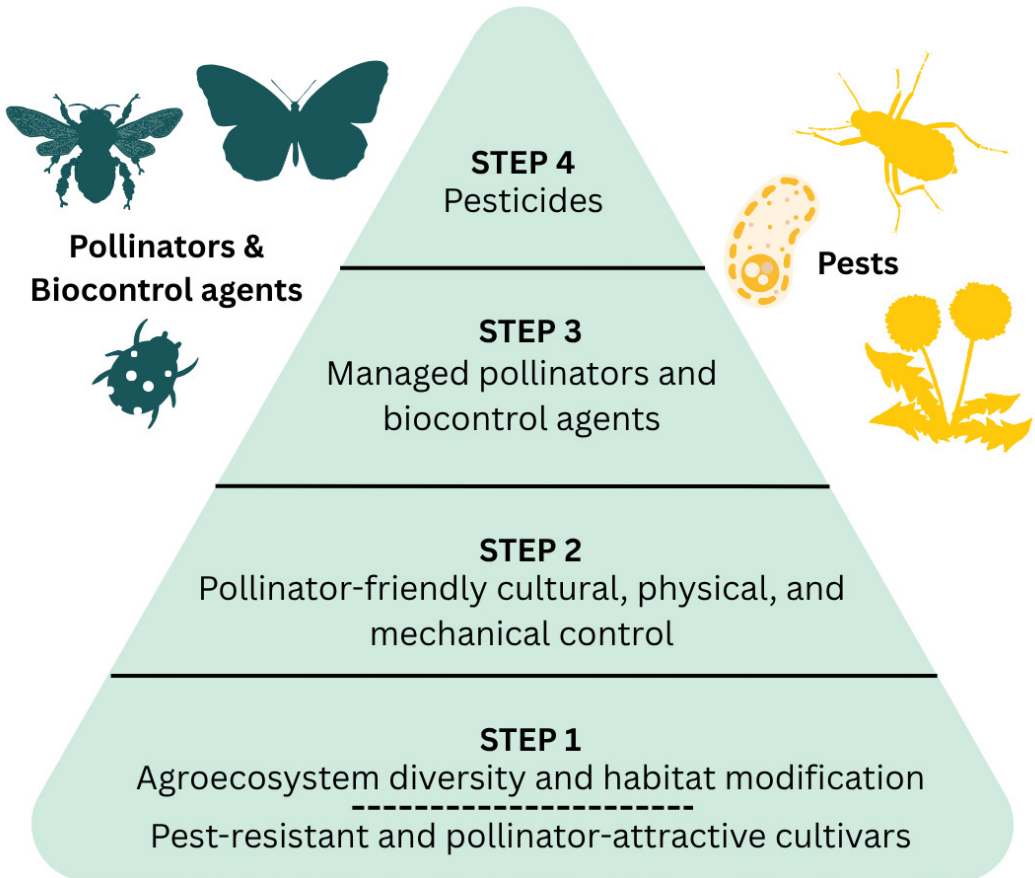
It is important to keep the soil in your planting hydrated, especially during the first year while the young plants are still establishing. When watering, it is best to avoid getting the leaves wet when possible. Too much moisture on your plants can encourage disease and fungal growth. Be sure to take your time watering, as you want to encourage your plants to grow deep roots. If you notice frequent wilting, this is a sign that you should spend more time watering.

WEEDING

Try to remove weeds before they start flowering to prevent them from overtaking your planting. Once they start producing seeds, weed control can become even more difficult. Be sure to remove the full root of the weed to reduce regrowth. Weeding your planting weekly is best but try to allocate time at least once a month during the growing season. Hand tools such as Japanese hand hoes and stirrup hoes can make weeding easier. Knowing how to identify your native plants or adding signs that label them can help you weed faster and with more confidence.

INTEGRATED PEST AND POLLINATOR MANAGEMENT (IPPM)

IPPM is a way to manage pests while helping pollinators and other helpful insects like predators and parasitoids. Predators eat pests, and parasitoids live inside pests, which eventually kills them. With IPPM, you control pests by changing the habitat before using pesticides. You can do this by planting native plants that attract predators and help keep pest numbers low. At low numbers, pests in your wildflower planting do not usually cause problems. Some insects can both control pests and help with pollination at different life stages. For instance, flower fly larvae eat pests, and as adults they become great crop pollinators. You can use the IPPM pyramid below to help you decide the best way to manage pests while protecting pollinators.



The IPPM pyramid. Adapted from Egan et al. 2020.

Some larger pests like deer, woodchucks, and rabbits will come to eat your flowers. You can keep them away by using fences, repellents, or even motion-activated sprinklers. Avoid using pesticides or other chemical inputs to reduce negative effects on pollinators.

Propagation

It is best to wait until your native plants are well-established before you start to propagate them. This usually takes 1–2 growing seasons. Once ready, there are two primary methods for this: seed and vegetative propagation.

SEED PROPAGATION

This method is best for most species of native plants. After flowering, your plants will go to seed. Once your planting is relatively full, you can consider collecting seeds. This is not necessary for your planting's success or growth, but it can give you more control of the design of your habitat. You can sow these seeds in other areas of your farm or locally distribute them to fellow farmers and gardeners. It is best to sow in the late fall or winter to expose seeds to cold temperatures.

If you are not ready to sow collected seeds at the end of the season, you can store them inside for 1–4 years. You will then need to give them a seed pretreatment, or "stratification," before you sow them. Without proper seed stratification, germination rates are lower and less synchronized.

There are three primary ways to prepare seeds:

1. **Cold Dry Stratification:** Seeds are kept at freezing temperatures (32˚F or below) for at least 30 days.
2. **Cold Moist Stratification:** Seeds are kept in a wet material and stored in the refrigerator (34-36˚F) for at least 30 days.
3. **Scarification:** Seeds are scratched with sandpaper. This is for seeds with hard seed coats.

The type of seed stratification you use will depend on the plant species. We have noted the preferred method for each species in the native plant section under "Growing Conditions."

Native wildflower seeds undergo cold moist stratification prior to sowing.

Karma Thomas

VEGETATIVE PROPAGATION

A few native plant species do best with vegetative propagation. You do this by separating roots, bulbs, corms, tubers, or rhizomes. For some plants, you can also take a stem or leaf cutting. The type of vegetative propagation that you use will depend on how a plant grows or spreads. Stem cuttings work well for woody plants like trees and shrubs. Root division is best for non-woody plants that are spread through runners like wild strawberry bee balm, yarrow, or common cinquefoil.

Wild strawberries have runners that can be separated to grow additional plants.

Karma Thomas

Maintaining Pollinator Nesting Sites

Native wildflower plantings can provide crucial nesting sites for bees. Having multiple kinds of pollinator nesting sites is the best way to support many species of bees.

For ground nesting bees: Seventy percent of solitary bees are ground nesting. They need bare or exposed soil to dig in so they can build their nests. Barriers like thick layers of mulch, sod, and concrete should be avoided because they reduce nesting space for these bees. Tillage can disturb and kill ground nesting bees, so eliminating or reducing this practice can help conserve these bees.

An unequal cellophane bee emerging from its underground nest.

Karma Thomas

For cavity nesting bees: Social bees like bumble bees and honey bees live in colonies so they need large cavities to nest in. This cavity nesting behavior is what allows them to readily nest in human-made bee hives. Cavities include large holes in trees, hollow logs, cracks in buildings, empty bird boxes, and old rodent tunnels underground. Rodent tunnels are especially important for queen bumble bees who usually spend winter underground but do not dig to build nests. Small piles of brush and leaf litter can insulate these nests.

Like honey bees, commercial bumble bee colonies can be bought or rented. However, these bees can be harmful and introduce diseases and parasites to native wild bees, so proceed with caution. Commercial bumble bee hives are best used short-term while you work to improve pollinator habitat that will attract native wild bees.

Jess Miller-Camp

A cavity-nesting species, the two-spotted bumble bee, uses an opening underneath a tree as a nest.

For tunnel nesting bees: The other 30% of solitary bees nest in hollow plant stems or in narrow holes in trees or fallen logs. Holes in wood are usually made by other insects or birds, but carpenter bees will make their own holes in soft, rotting wood. Leaving dead wood, like tree stumps and logs, supports cavity nesting bees. Cedar and pine are extra attractive to large carpenter bees and can help redirect them when they are trying to nest in your home or shed. Other bees, like masked bees, will nest in crevices in and between rocks. Leaving untouched stone piles can give these bees shelter.

Many tunnel nesting bees prefer to nest in hollow plant stems. Raspberries and other woody plants with hollow or pithy stems are great nesting sites for small bee species. Flower stalks from your native wildflower planting are the perfect nesting site for stem nesting bees. Seasonal maintenance of these stalks can promote these bees on your farm. Leave dead flower stalks over winter and cut them back in early spring before any bees are active. You can leave the cut stalks on the ground to decompose. To support different species of bees, cut the stalks at various heights (8–24 inches). Female bees will use the stalks to lay their eggs on balls of pollen they have collected.

Stems from old plant growth of Swamp Milkweed are cut back in the spring to create nesting habitat for tunnel nesting bees.

Karma Thomas

Bee hotels have become a popular alternative for tunnel nesting bees in place of cutback dead flower stalks and dead wood. You can build a bee hotel by using stem bundles and wooden blocks. Stem bundles can be made of cardboard tubes or by cutting stalks from plants with hollow stems and tying them together with wire string or tape. Phragmites, teasel, cup plant, and bamboo are popular plants to use in stem bundles. Tough, thick plant stems protect bees from parasitoids the best. When assembling your bundles, include a variety of tunnel lengths (5–8 inches) and widths ($^{1}/_{16}$ – $^{1}/_{2}$ inch) to accommodate bees of different sizes. Build wooden nest blocks out of untreated lumber and drill nest tunnels between $^{3}/_{32}$–$^{3}/_{8}$ inches wide and 3–5 inches deep. Bees will not use a tunnel with two ends so make sure stems and tunnels are closed at one end. Adding a roof to your bee hotel will protect bees and their nests from rain and moisture.

A bee hotel with removable "stems" and wooden blocks.

Rebecca Finneran

Karma Thomas assisting in annual bee hotel cleaning.

Solo Arman Mercene

Bee hotels can successfully host bees, but they can also introduce them to health risks. Bee hotels cause bees to nest in higher densities than they normally would in the wild. This can increase the spread of disease and attract more predators like parasitoid and paper wasps, ants, spiders, and birds. To avoid harming tunnel nesting bees, bee hotels must be well-maintained. Be sure to build or buy a bee hotel with removable “stems” or wooden blocks that you can clean or replace every winter if they are empty. You will see mud, leaves, or other plant matter blocking the end of stems and blocks that are in use. If cleaning, use a bleach solution and thoroughly scrub. During the summer, check on your bee hotel for moisture or infestations of ants, wasps, or spiders. Neglecting to maintain your bee hotel can bring in predators, parasites, and disease to your bees.

SEASONAL CHECKLIST

Timing is key when it comes to maintaining your native wildflower planting. It is important to complete tasks during the right season to best support plants and pollinators. Here we have a seasonal checklist to better help you know when tasks should be completed.

Management Checklist:

SPRING

- ☐ Start seeds indoors or greenhouse, or visit your local native plant nursery
- ☐ Cut back dead flower stalks
- ☐ Tarp down future pollinator habitat space for solarization

SUMMER

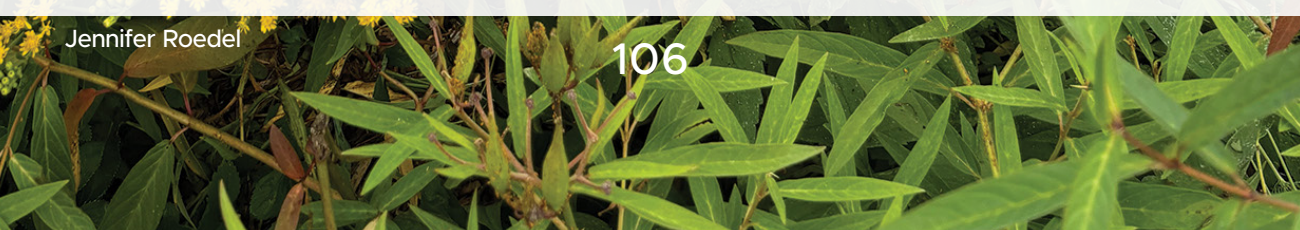
- ☐ Maintain watering
- ☐ Regular weeding
- ☐ Add mulch layer, if needed

FALL

- ☐ Sowing seeds
- ☐ Relocating leaves to other parts of farm or garden, if needed
- ☐ Remove weeds

WINTER

- ☐ Leave dead flower heads and stalks intact
- ☐ Leave the leaves
- ☐ Stratify seeds for next season
- ☐ Take down and clean bee hotel
- ☐ Plan future pollinator habitat



Jennifer Roedel

HABITAT-CENTERED COMMUNITY ENGAGEMENT

Urban farms and gardens are great hubs for gathering as a community. They can bring people together to grow, eat, share, and learn. These spaces can also help communities gain food sovereignty. Pollinator habitat can help create new ways to engage with your community while you:

- **Increase pollinator protection**
- **Participate in community science**
- **Support youth education in agriculture and wildlife sciences**

In this section, we share ways you can use your pollinator habitat and this guide to help you do this. We list some national organizations that have tips and resources to help with this as well. You can also talk to your local food banks, garden resource centers, nature centers, non-profits, and grassroots groups for resources that are specific and unique to your area. Resources might include learning materials, fun activities for kids, and chances to form new partnerships.

An on-farm field day is held at the Detroit Partnership for Food, Learning, and Innovation (DPFLI) to learn about pollinator habitat management.

Karma Thomas

Monarch butterfly visiting Swamp Milkweed at a native wildflower planting on an urban farm.

Jennifer Roedel

INCREASE POLLINATOR PROTECTION:

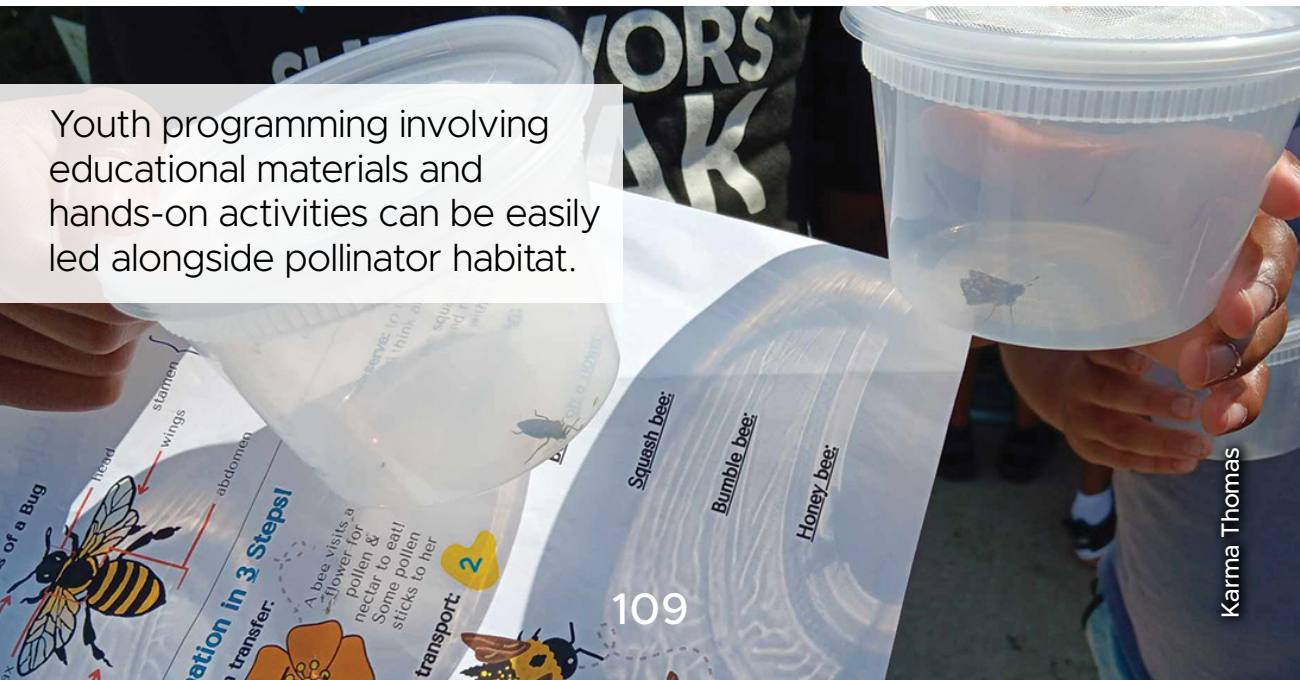
- Talk to your neighbors about your management practices and how they are important to pollinator conservation.
- Use this guide to recommend plants that support pollinators and other helpful insects to your neighbors, friends, and family.
- Host an on-farm field day or demonstration for people to learn about your pollinator management methods.
- Spread the word about biodiversity by registering your pollinator habitat as a Homegrown National Park.

PARTICIPATE IN COMMUNITY SCIENCE

- Use this guide to begin identifying bees and the native plants they visit.
- Partner with a research project from a local college or university.
- Use the iNaturalist app to track your farm's biodiversity and add to research projects.
- Visit wildones.org and The Xerces Society's Community Science web page for more local opportunities and resources.

SUPPORT YOUTH EDUCATION IN AGRICULTURE AND WILDLIFE SCIENCE

- Use this guide to lead "see-think-wonder" activities with kids ages K-12.
  - *Ask them what they see, what they think, and what they wonder about the insects around them.*
- Host youth groups interested in learning about food systems and pollinators.
  - Elementary, middle school, or high school green teams
  - Homeschoolers
  - Scouts
  - 4-H
- Share and allow kid-friendly learning material and activities to happen on your farm. Some resources can be found with:
  - Xerces Society X Kids Program
  - Homegrown National Park Kids
  - Monarch Joint Venture Chrysalis Crew
  - The Bee Urban Growers Project from Michigan State University



Youth programming involving educational materials and hands-on activities can be easily led alongside pollinator habitat.

Karma Thomas

RESOURCES

Insects

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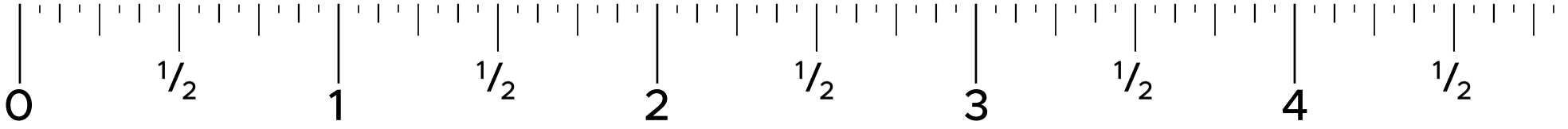
INDEX OF SPECIES

Plants:

Bees



Inches

MICHIGAN STATE UNIVERSITY Extension

Centimeters