

**NDSU**

EXTENSION



# 2024

The logo for 'Field to Fork' is centered within the zero of the '2024'. It features the words 'Field' and 'FORK' in a bold, sans-serif font, with 'to' in a smaller font between them. A blue fork is positioned behind the text, and a red tomato is at the bottom left of the logo.

[www.ag.ndsu.edu/food](http://www.ag.ndsu.edu/food) EXTENDING KNOWLEDGE >> CHANGING LIVES



# Upcoming Webinars

- **April 24 - Making Nature at Home in Your Landscape**  
- Carrie Knutson, Extension Agent, Agriculture & Natural Resources - Horticulture, NDSU
- **May 1 - Growing Produce Safely for Consumption, Sales or Donation**  
- Londa Nwadike, Associate Professor of Food Safety, Kansas State University and University of Missouri Extension



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Presenter

Audio Settings

Chat

Raise Hand

Q&A

Leave

- **Please complete the short online survey** that will be emailed to you after today's webinar. It will take just a couple minutes!
- Be sure to sign up for an opportunity to win a prize in the drawing. After submitting the survey, a form to fill out with your name/address will appear.

***Acknowledgement: This project was supported by the U.S. Department of Agriculture's (USDA) Agricultural Marketing Service through 21SCBPND1069. Its contents are solely the responsibility of the authors and do not necessarily represent the official views of the USDA.***





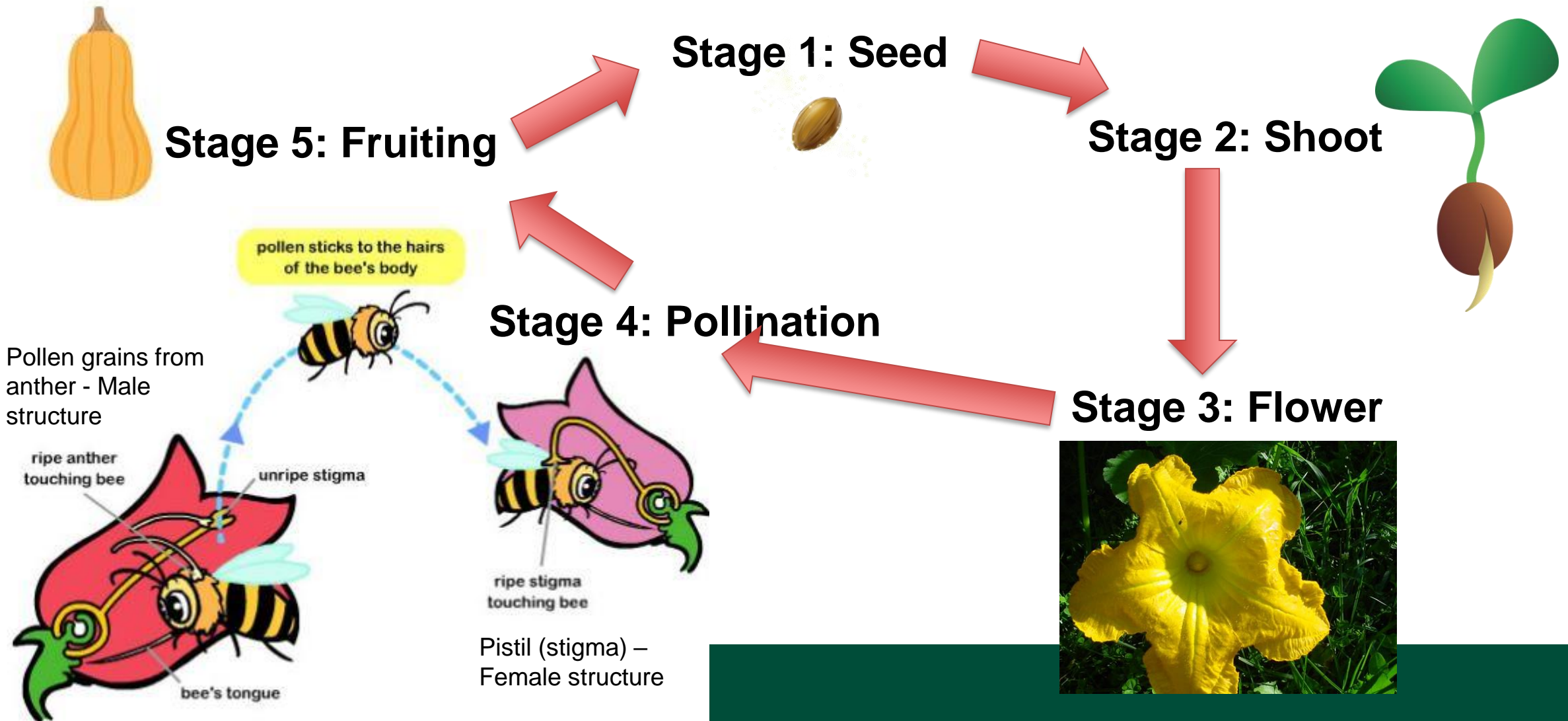
April 17

# The Role of Bees in my Fruit and Vegetable Gardens

Janet Knodel, Professor and Extension Entomologist, NDSU



# Plant Reproduction and Importance of Bees





# Importance of Honey Bees and Native Pollinators



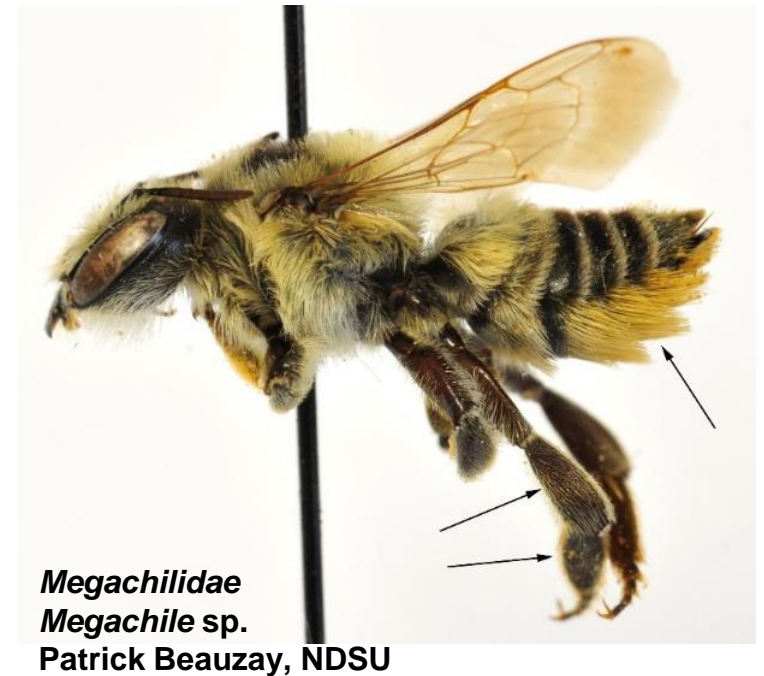
Vital part of agriculture and natural ecosystems

- 35% of the world food crop production depends on pollinators
- Honey bees account for 80% of all insect pollination in agricultural crops
- Honey bee pollination valued at \$20-30 billion in the U.S.
- ND – No. 1 honey-production, produced 31.2 million pounds of honey valued at over \$82 million (2022)



# What Makes a Bee a Bee?

- Pollen-collecting hairs called scopae
- Baskets called corbicula on hind legs





# What Makes a Bee a Bee?

- Usually hairy, but not always!
- At least some body hairs branched, but you will need a microscope to see this!



# Common Backyard Fruits and Vegetables and Bee Pollination

Backyard Crops	Honey Bees	Bumble Bees	Other Native Bees	Bee pollination required?
Apples	✓	✓	Mining bees, Sweat bees, Mason bees	Yes
Beans (string)	✓	✓	Unknown	Not required
Cucumbers	✓	✓	Long-horned bees, Mining bees	Yes, for many varieties
Eggplant	No	✓		Not required
Muskmelon	✓	✓	Small carpenter bees,	Yes





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Eggplant	No	✓		Not required
Muskmelon	✓	✓	Small carpenter bees, Long-horned bees, Green sweat bees	Yes
Peas	✓	✓	Large carpenter bees	Not required
Pears	✓	✓	Mason bees, Mining bees	Yes
Peppers	✓	✓		Not required
Plums	✓	✓	Mason bees, Digger bees	Yes

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Peppers	✓	✓		Not required
Plums	✓	✓	Mason bees, Digger bees	Yes
Pumpkins, squash, zucchini	✓	✓	Green sweat bees, Long-horned bees	Yes
Sour cherry	✓	✓	Mason bees	Yes
Raspberries	✓	✓	Mason bees, Mining bees, Cellophane bees, Sweat bees	No, but beneficial
Strawberries	✓	✓	Mining bees, Sweat bees, Mason bees	No, but beneficial
Tomatoes	No	✓		No, but beneficial





# Plants Pollinated by Bumble Bees



- **Tomatoes**
- **Melons**
- **Cucumber**
- **Squash**
- **Pumpkin**



- **Blueberries**
- **Blackberries**
- **Raspberries**
- **Apples**
- **Cherry**
- **Plum**

Source: Esther McGinnis

# Bee Pollination Increase Crop Yield too!

- Honey bees, carpenter bees, stingless bees, bumble bees, long-tongued bee, feral bees, social bees, and solitary bees



Sunflowers (*Helianthus annuus* L.)

Wild bees and honey bees ( <i>A. mellifera</i> )	Interactions between wild and honey bees increased the efficiency of pollination up to 5-fold compared to honey bees only.	USA
Africanized honey bees ( <i>A. mellifera</i> )	The average yield of seeds was 43% higher compared to the control.	Brazil
Honey bees ( <i>Apis mellifera</i> L.)	Played a significant role in pollination compared to moths and wind.	Central Darling Downs

# Bee Pollination Increase Crop Yield too!



Oilseed rape ( <i>Brassica napus</i> L.)	Solitary mason bee ( <i>Osmia rufa</i> L.)	Increased fruit set, yield, and the number of seeds per pod by bee density.	Germany
	Honey bees ( <i>A. mellifera</i> )	Increased oil and decreasing chlorophyll content.	Sweden
	Honey bees ( <i>A. mellifera</i> ), and wild bees ( <i>Lasioglossum</i> spp.).	Average yield was increased up to 37.5%.	France



Soyabean ( <i>Glycine max</i> L.)	Honey bees ( <i>A. mellifera</i> )	Yield increase was associated with an increase of the seed number.	Argentina
	Honey bees ( <i>A. mellifera</i> )	Increased yield by 18.09%.	Brazil



# How to Improve Pollination by Bees in your Fruit and Vegetable Gardens



**Create an oasis for pollinators near your fruit and vegetable gardens!**



- **Provide nectar and pollen sources**
- **Provide water**
- **Provide habitat / shelter**
- **Wise pesticide use**

# Provide Nectar and Pollen

- Choose a variety of plants that bloom in succession from early spring through fall
- Incorporate native species into your garden
- Most of non-native cultivars are also beneficial
- Plant in drifts of 3 or more per species







Flower color



Flower structure and shape



Flower odor



Nectar and pollen availability



**Factors influence on bee visitation to flowers**



# Native versus Cultivar (non-native) Flowers

- Mouthparts of pollinators are adapted to structures of native flowers
  - Shallow nectar reserves – asters or milkweeds
    - Smaller bees (sweat bees) or butterflies (hairstreaks) with shorter tongues
  - Deeper nectar reserves – bee balms
    - Longer-tongues bees (bumble bees) and butterflies (swallowtails)



# Order Hymenoptera: Bees, wasps, ants, sawflies

*4,000 species in North American, >250 species in North Dakota*



**Short-tongued bees**  
Andrenidae, Colletidae



Patrick Beauzay, NDSU

**Long-tongued bees**  
Apidae, Halictidae, Megachilidae



Patrick Beauzay, NDSU



# Perennial Flower Examples for Short- & Long-tongued Bees

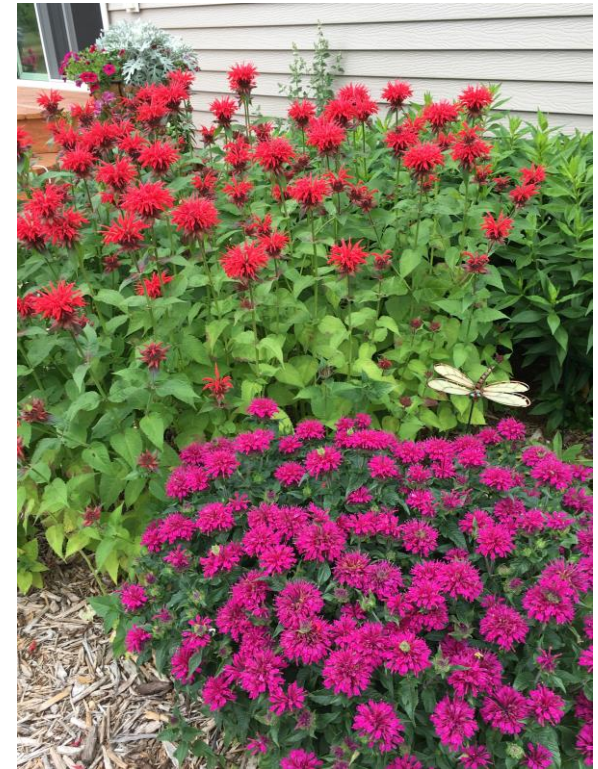
## Short-tongued bees Andrenidae, Colletidae

- Catnip
- Gaillardia
- Hyssop
- Scabious
- Sedum
- Veronica
- Yarrow



## Long-tongued bees Apidae, Halictidae, Megachilidae

- Echinacea
- Heuchera
- Hosta
- Monarda
- Penstemon
- Salvia
- Snapdragon







# SOLITARY BEES 90% of native bees

Howard Ensign Evans, Colorado State University, Bugwood.org

**UGA1476010**



# Family Andrenidae - Mining Bees

- Small (6 mm) to medium (18 mm, few species)
- Several genera and hundreds of species in NA
- Facial fovea (depressions) present with short, velvety hair, sometimes white
- 2<sup>nd</sup> submarginal cell smaller than 3<sup>rd</sup>
- Most are dark with light hair stripes on abdomen
- Appears to carry pollen in its armpit
- Solitary ground nesters, but sometimes gregarious



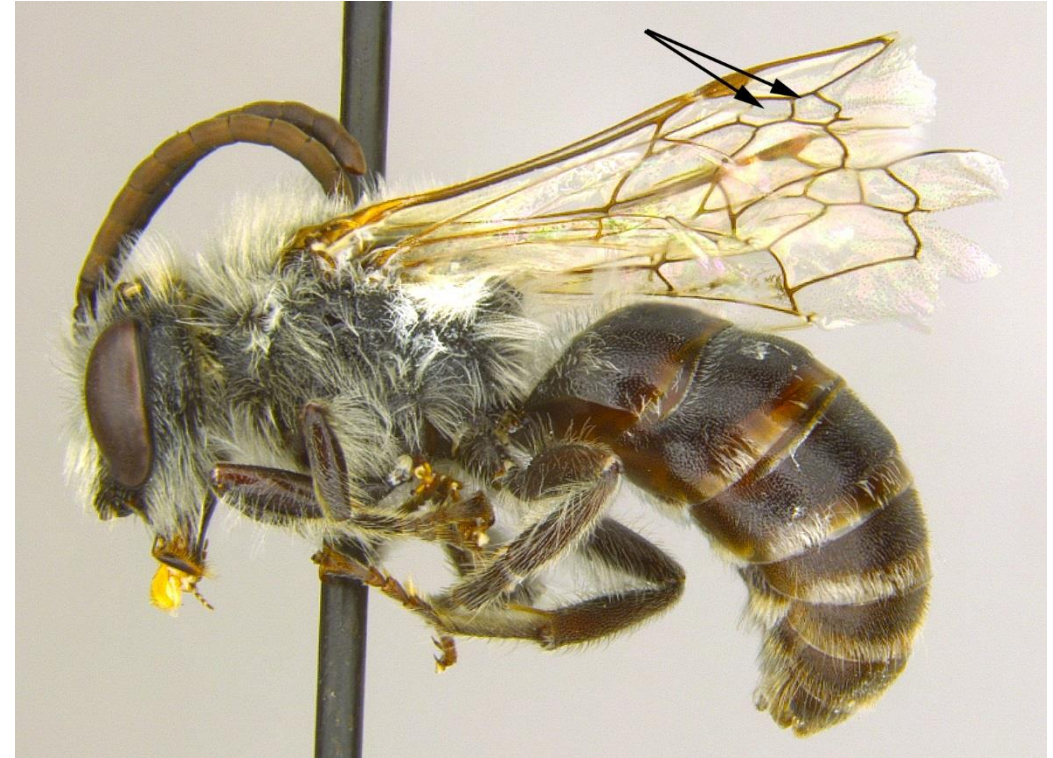
*Andrena* sp.  
Patrick Beauzay, NDSU



*Andrena rudbeckiae*  
Patrick Beauzay, NDSU

# Family Colletidae – Cellophane and Masked Bees

- **Cellophane bees** (*Colletes* spp.)
  - Most are about the size of a honey bee
  - 2<sup>nd</sup> submarginal cell same size as 3<sup>rd</sup>
  - Solitary ground nesting, often gregarious
  - Line their nests with secretion that dries to a cellophane or polyester-like substance



*Colletes inaequalis*  
Patrick Beauzay, NDSU



# Family Colletidae – Cellophane and Masked Bees

- **Masked bees** (*Hylaeus* spp.)
  - Most are quite small, < 8 mm
  - Lack scopae, store pollen and nectar in their crops (a.k.a. ‘honey stomach’)
  - Most have some facial markings, yellow to white in color. Markings variable, even within a species
  - Nest in hollow branches and cavities, some in the ground



Patrick Beauzay,  
NDSU



Patrick Beauzay,  
NDSU

# European Honey Bees: Family Apidae

- *Apis mellifera*
  - Medium size (12-15 mm)
  - Hairy, golden-brown with dark brown legs, hairy eyes
  - Hind tibia with **pollen basket or corbicula**, a bare area surrounded with long hairs to collect pollen
  - Nest in man-made colonies and in open cavities



UGA2116051

David Cappaert, Michigan State University, Bugwood.org



# Bumble Bees: Family Apidae



- *Bombus* spp. - Approximately 19-20 spp. in our area
- Large, robust, hairy black and yellow bees
- Hind tibia with pollen basket
- Buzz pollination

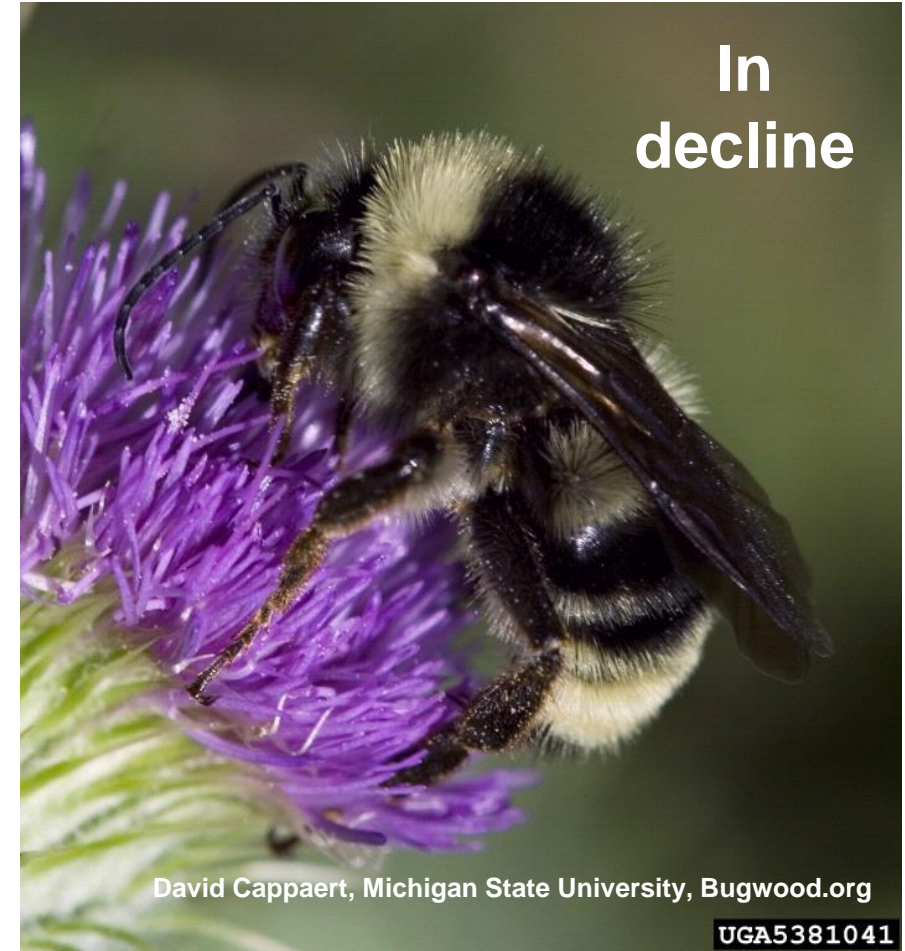




**Common eastern bumble bee**  
*Bombus impatiens*



**Western yellow banded bumble bee**  
*Bombus terricola*



# Long-horned Bees, Digger Bees

## Family Apidae

- Several genera and spp.
  - Males have long antennae
  - Medium 8-16 mm
  - Black body with dense pale or dark hairs
  - Most species are solitary to communal ground nesters
  - The ‘Digger Bees’ sometimes nest gregariously in lawns (prefer dry, sandy soil)



*Melissodes bimaculata*  
Patrick Beauzay,  
NDSU



Patrick Beauzay,  
NDSU



# Leafcutter Bees

## Family Megachilidae

- Collect pollen on hairs located on ventral surface of abdomen
- Cut round pieces of leaves to line nests
- Hole or cavity nesters (natural or man-made)
- 30% of our bees nest in cavities



Patrick Beauzay, NDSU



Kimberly Steinmann, University of California, Bugwood.org

5516401



# Mason Bees

## Family Megachilidae

- ***Osmia* spp.**
  - Small-medium (7-16 mm)
  - Robust body, metallic green-blue with less hairs
  - Some species used commercially
  - Efficient pollinators of many crops
  - Solitary or nest in groups in artificial nesting structures (widely available or build your own)
  - Collect mud to line their nests



# Sweat Bees

## Family Halictidae

- Several genera and MANY species, difficult to identify
- Small to medium (3.5-11 mm), Metallic color or black

*Agapostemon virescens*  
12 mm



*Agapostemon texanus*  
12 mm



*Lasioglossum* sp.  
4-10 mm



All photos by  
Patrick Beauzay, NDSU



# Spring Flowering Perennials

Common Name	Scientific Name	Perennial or Annual	Native	Pollinators
Spring crocus	<i>Crocus</i> spp.	Perennial		B
Grape hyacinth	<i>Muscari</i> spp.	Perennial		B
Siberian squill	<i>Scilla siberica</i>	Perennial		B
American pasqueflower	<i>Pulsatilla patens</i>	Perennial	X	B
Prairie smoke	<i>Geum triflorum</i>	Perennial	X	B
Red columbine	<i>Aquilegia canadensis</i>	Perennial	X	B, BF, H



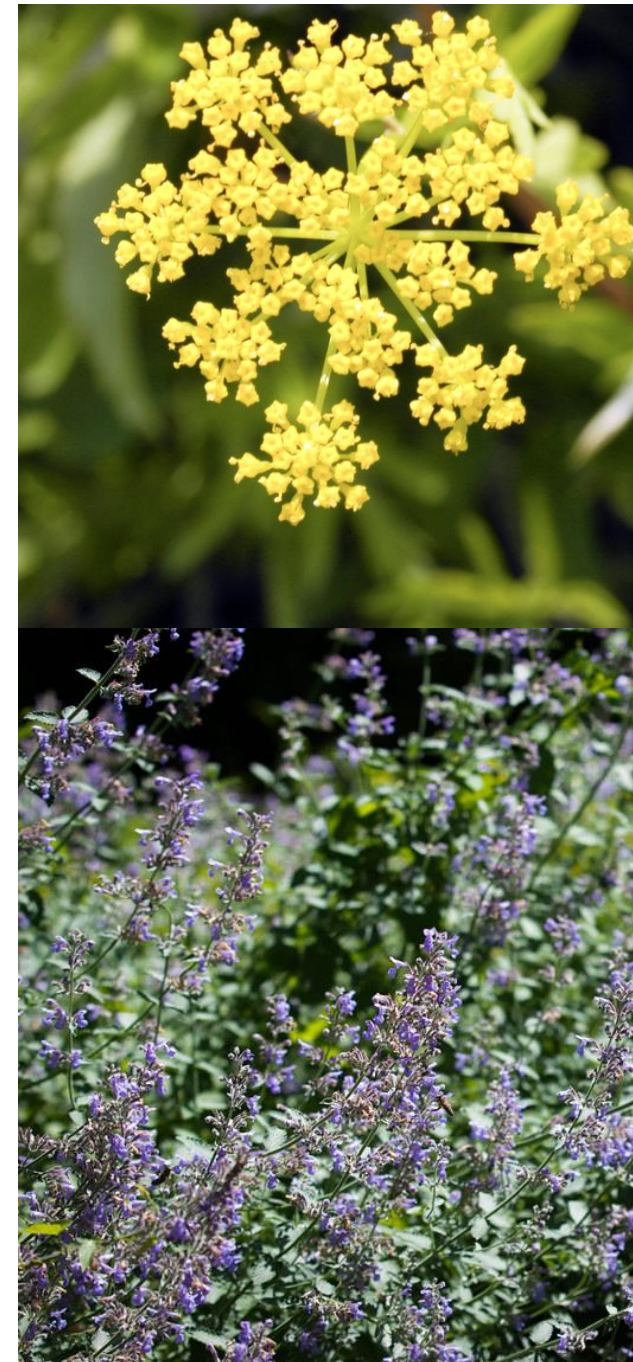
B is for bee; BF is for butterfly and H is for Hummingbird



# June Flowering Perennials

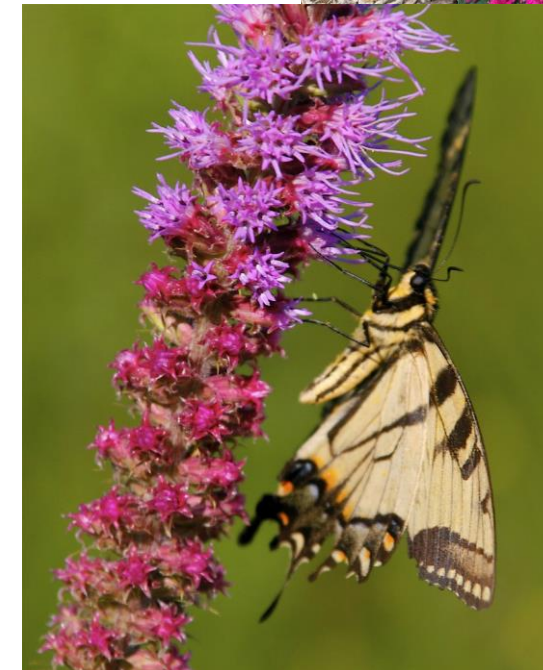
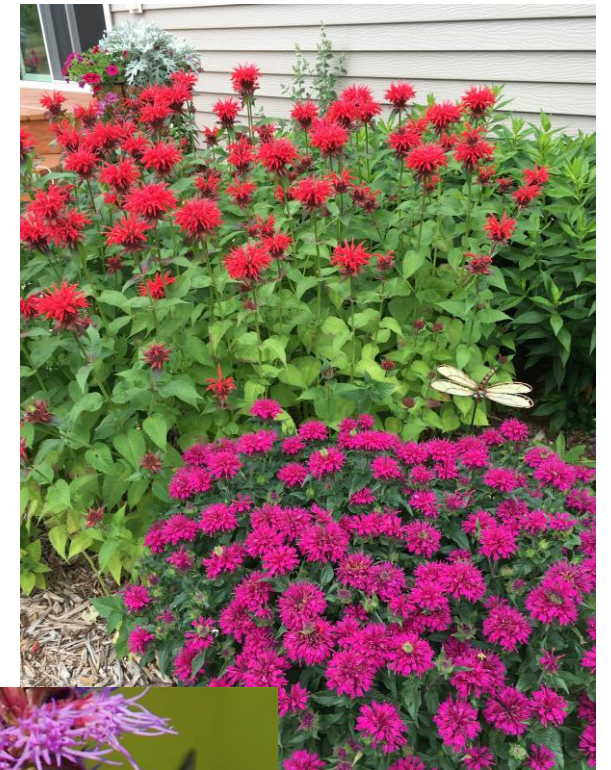
Common Name	Scientific Name	Perennial or Annual	Native	Pollinators
Golden Alexander	<i>Zizia aurea</i>	Perennial	X	B, BF
Butterfly milkweed	<i>Asclepias tuberosa</i>	Perennial		B, BF, H
False indigo	<i>Baptisia</i> spp.	Perennial		B, BF
Catmint	<i>Nepeta x faassenii</i>	Perennial		B
Salvia	<i>Salvia nemorosa</i>	Perennial		B, BF

B is for bee; BF is for butterfly and H is for Hummingbird



# Summer Flowering Perennials

Common Name	Scientific Name	Perennial or Annual	Native	Pollinators
Purple prairie clover	<i>Dalea purpurea</i>	Perennial	X	B, BF
Swamp milkweed	<i>Asclepias incarnata</i>	Perennial	X	B, BF
Black-eyed Susan	<i>Rudbeckia</i> spp. ( <i>R. hirta</i> is native)	Perennial	X	B, BF
Prairie blazing star	<i>Liatris pycnostachya</i>	Perennial	X	B, BF, H
Purple coneflower	<i>Echinacea</i> spp. ( <i>E. angustifolium</i> is native)	Perennial	X	B, BF, H
Bee balm	<i>Monarda fistulosa</i>	Perennial	X	B, BF, H
Anise hyssop	<i>Agastache foeniculum</i>	Perennial (short-lived)	X	B, BF, H
Culver's root	<i>Veronicastrum virginicum</i>	Perennial	X	B, BF
Joe Pye weed	<i>Eutrochium maculatum</i>	Perennial	X	B, BF



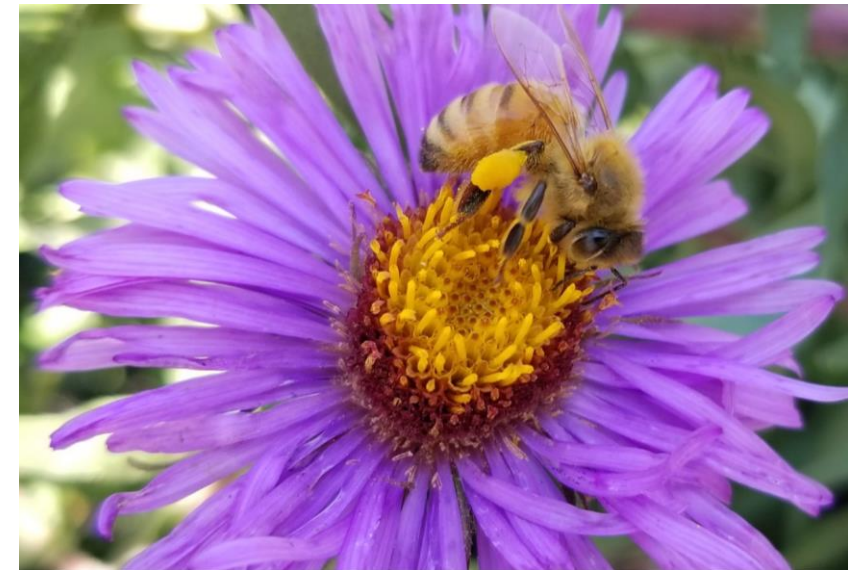
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# Fall Flowering Perennials

Common Name	Scientific Name	Perennial or Annual	Native	Pollinators
Stiff goldenrod	<i>Solidago rigida</i>	Perennial	X	B, BF
Sneezeweed	<i>Helenium autumnale</i>	Perennial	X	B, BF
Tall sedum	<i>Hylotelephium telephium</i> (formerly in the <i>Sedum</i> genus)	Perennial		B, BF
New England Aster	<i>Symphotrichum novae-angliae</i>	Perennial	X	B, BF, H

B is for bee; BF is for butterfly and H is for Hummingbird



# Annuals

Common Name	Scientific Name	Perennial or Annual	Pollinators
Alyssum	<i>Lobularia maritima</i>	Annual	B, BF
Cleome	<i>Cleome hassleriana</i>	Annual	B, BF, H
Cosmos	<i>Cosmos</i> spp.	Annual	B, BF
Egyptian starcluster	<i>Pentas lanceolata</i>	Annual	B, BF
Lantana	<i>Lantana camara</i>	Annual	B, BF, H
Marigold	<i>Tagetes</i> spp.	Annual	B, BF
Sunflower	<i>Helianthus annuus</i>	Annual	B, BF
Verbena	<i>Verbena</i> spp.	Annual	B, BF
Zinnia	<i>Zinnia</i> spp.	Annual	B, BF, H

B is for bee; BF is for butterfly and H is for Hummingbird





# Herbs

Common Name	Scientific Name	Perennial or Annual	Pollinators
Basil	<i>Ocimum basilicum</i>	Annual	B
Borage	<i>Borago officinalis</i>	Annual	B
Chives	<i>Allium schoenoprasum</i>	Perennial	B, BF
Dill	<i>Anethum graveolens</i>	Annual	B, BF
Lavender	<i>Lavandula angustifolia</i>	Annual	B, BF, H
Oregano	<i>Origanum vulgare</i>	Annual	B, BF

**B is for bee; BF is for butterfly and H is for Hummingbird**



# Trees for Boulevard

Common Name	Scientific Name	Tree or Shrub	Native	Pollinators
Honey locust	<i>Gleditsia triacanthos</i>	Tree	X	B
Kentucky coffeetree	<i>Gymnocladus dioica</i>	Tree	X	B, BF, H
Linden	<i>Tilia americana</i>	Tree	X	B, M
Ohio buckeye	<i>Aesculus glabra</i>	Tree		B, H

**B** is for bee; **BF** is for butterfly and **H** is for Hummingbird





# Small Trees / Large Shrubs

Common Name	Scientific Name	Tree or Shrub	Native	Pollinators
Apple	<i>Malus</i> spp.	Tree		B
Chokecherry	<i>Prunus virginiana</i>	Tree	X	B
Crabapple	<i>Malus</i> spp.	Tree		B
False indigo	<i>Amorpha fruticosa</i>	Shrub	X	B
Gray dogwood	<i>Cornus racemosa</i>	Tree or shrub	X	B, BF
Hawthorn	<i>Crataegus mollis</i> and other spp.	Tree	X	B, BF
Nannyberry	<i>Viburnum lentago</i>	Shrub	X	B, BF
Pagoda dogwood	<i>Cornus alternifolia</i>	Tree		B
Plum	<i>Prunus americana</i> and other spp.	Tree	X	B, BF, M
Smooth sumac	<i>Rhus glabra</i>	Shrub	X	B, BF



**B** is for bee; **BF** is for butterfly and **H** is for Hummingbird

# Shrubs

Common Name	Scientific Name	Tree or Shrub	Native	Pollinators
American cranberrybush	<i>Viburnum trilobum</i>	Shrub	X	B
Black chokeberry	<i>Aronia melanocarpa</i>	Shrub		B
Common snowberry	<i>Symphoricarpos albus</i>	Shrub	X	B, BF, M
Dwarf bush honeysuckle	<i>Diervilla lonicera</i>	Shrub	X	B, M
Golden currant	<i>Ribes aureum</i>	Shrub	X	B, BF, M
Honeyberry	<i>Lonicera caerulea</i>	Shrub		B
Juneberry (Saskatoon)	<i>Amelanchier alnifolia</i>	Tree	X	B
Leadplant	<i>Amorpha canescens</i>	Shrub	X	B, BF, M
Ninebark	<i>Physocarpus opulifolius</i>	Shrub	X	B, BF
Prairie rose	<i>Rosa arkansana</i>	Shrub	X	B
Redosier dogwood	<i>Cornus sericea</i>	Shrub	X	B, BF

**B** is for bee; **BF** is for butterfly and **H** is for Hummingbird





# Provide Water Sources

- Bird bath
- Fountain
- Butterfly puddling area
- Water garden
- Pond
- Butterfly feeder

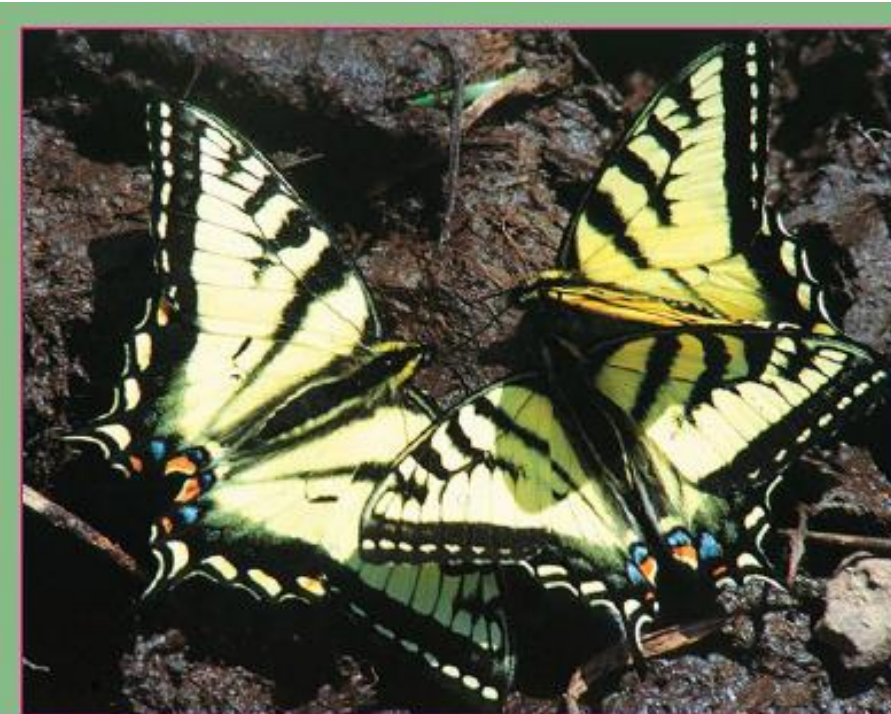
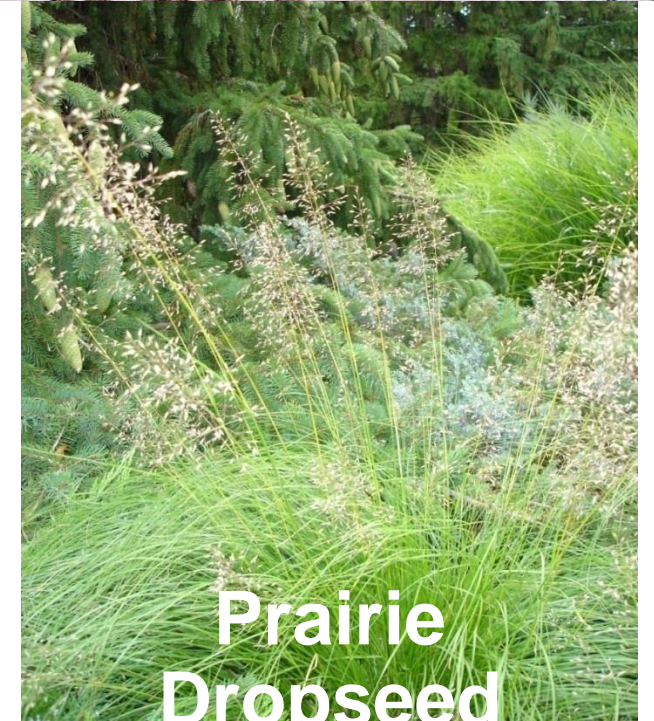
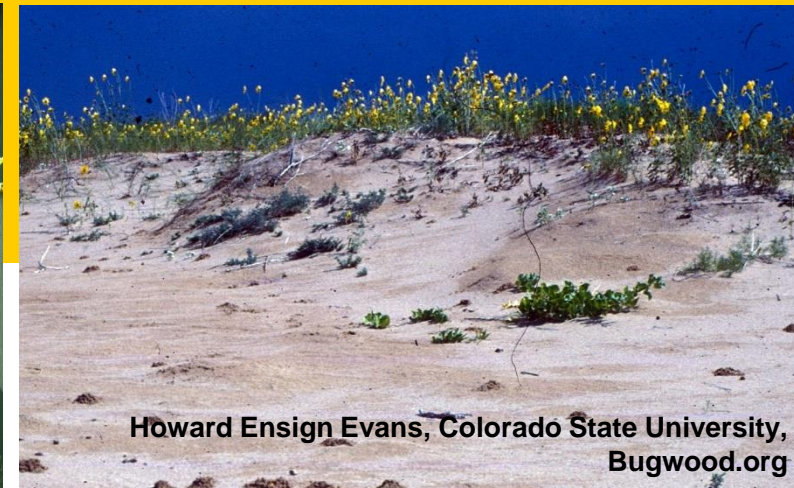


Figure 2. Canadian swallowtails congregate at a mud puddle.  
(Photo by G. Fauske, NDSU)



# Provide Habitat

- Bee houses for Mason bees
- Bare ground for nesting
- Dead trees
- Don't cut down perennials in fall – messy is good!





# Pollinators - Pesticides Use



- 1/3 of honey bee colonies in U.S. are dying including native bees and bumble bees
- Monarchs in decline
- Pesticides – insecticide, fungicide, herbicide



# How to Protect Pollinators from Pesticides



S. Bauer, USDA ARS, bugwood.org

- **Most insecticides are broad spectrum insecticides that kill all insects including bees and pollinators**
- **Use all pesticides in a manner consistent with the label**
- **Look for BEE HAZARD ICON on pesticide labels that can kill bees and other pollinators**



**Toxic to bees**



# What about Pesticides other than Insecticides?



- **Herbicides**

- Generally not a concern for toxicity to bee and other insects
- **Mode of action of herbicides affect plants**
- Could negatively impact their food sources of bees / pollinators



# What about Pesticides other than Insecticides?



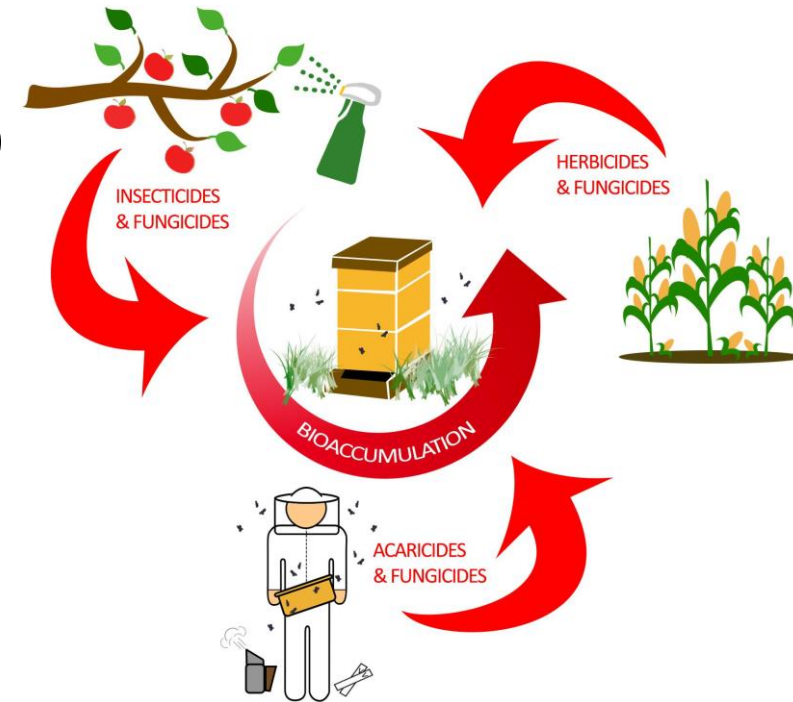
- **Fungicides - Generally not a concern**
  - Captan – larval and pupal mortality
  - Iprodione (Rovral) - larvae die and adult not emerge from puparium
  - DMI fungicides (propiconazole (Propimax, Quilt)) with synthetic pyrethroids (lambda-cyhalothrin (Warrior, Taiga Z)) more toxic to bees than insecticide alone (Pilling and Jepson 1993)
    - Fungicides reduces the ability of bee to detoxify the insecticide (Pilling et al. 1995)
    - Also observed with neonicotinoid insecticides (imidacloprid (Admire, Provado)) (Schmuck et al. 2003)



# Relatively Non-Toxic Pesticides



- **Examples for flowering plants/ornamentals:**
  - **Insect Growth Regulators:**
    - **Diflubenzuron (Dimilin, insect growth regulator)**
    - **Tebufenozide (Confirm, molting disruptors)**
  - **Oils**
    - **Canola oil, garlic oil, mineral oil, neem oil**
  - **Fungicides:**
    - **Captan (fungicide)**
    - **Copper compounds (Kocide, fungicide)**
    - **Sulfur (fungicide)**





# Reducing Impacts of Pesticides on Pollinators

- Gardens should not be treated during flowering, especially peak bloom, to **avoid bee kills**
  - **High chance of Exposure**
- Bees are not actively foraging when:
  - **Late evening** or early morning
  - Temperatures are below 50-55°F, except bumble bees
  - High temperatures cause foraging to begin earlier and continue later than usual





# How to Protect Pollinators from Pesticides

- Do not apply insecticides with a long residual hazard to bees
- Choose the least hazardous insecticide formulation

Granular Solution

Least toxic

Soluble powder

Emulsifiable concentrate

Flowable

Wettable powder

Dust

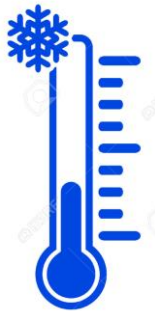


Most toxic



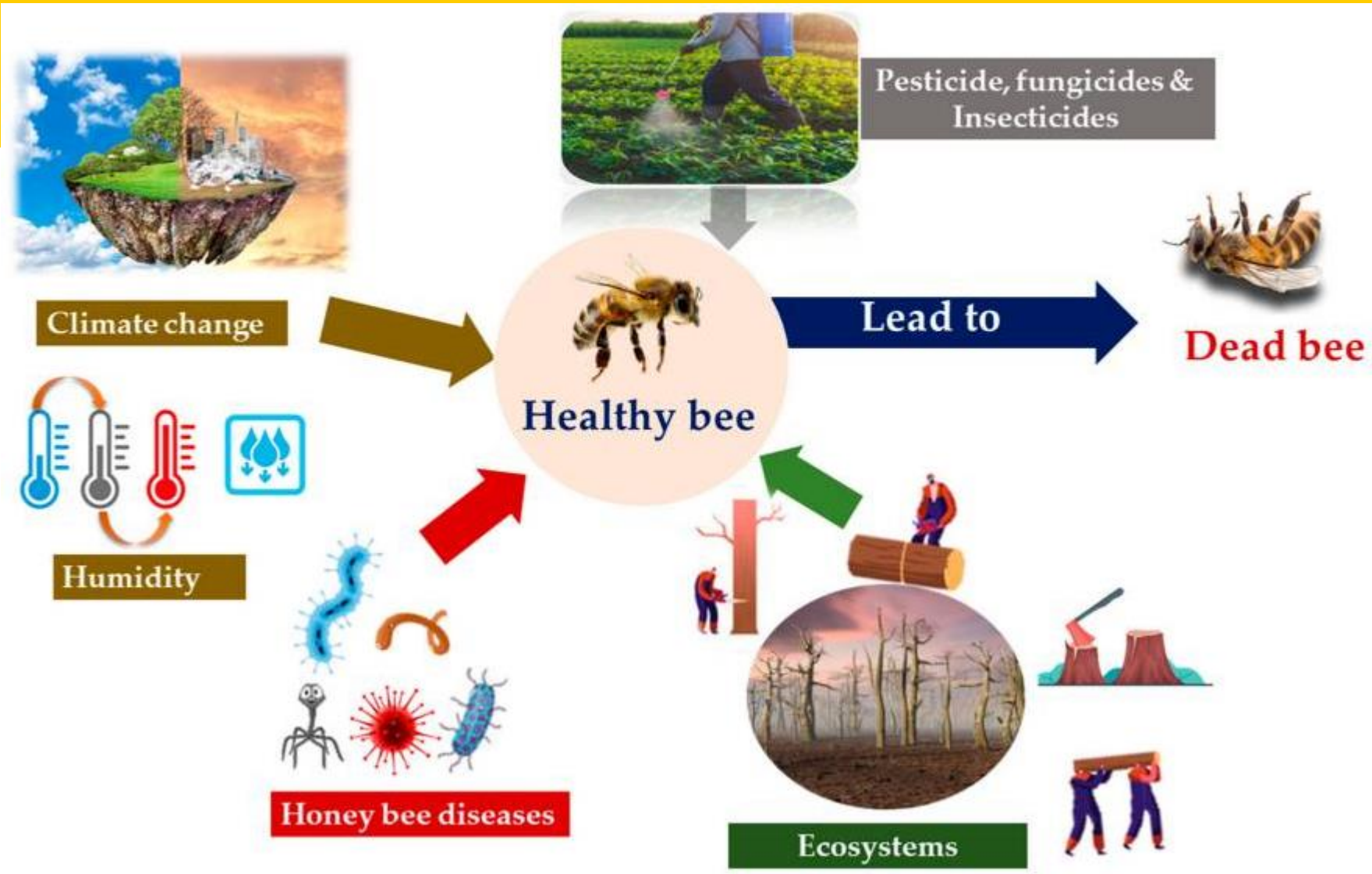
# How to Protect Pollinators from Pesticides

- **Do NOT buy plants treated with systemic insecticides (neonicotinoid) from garden centers**
- **High temperatures cause foraging to begin earlier and continue later than usual**
- **Do not apply insecticides when temperatures are unusually low or on nights when dew is forecasted. Residues will be toxic twice as long to bees**





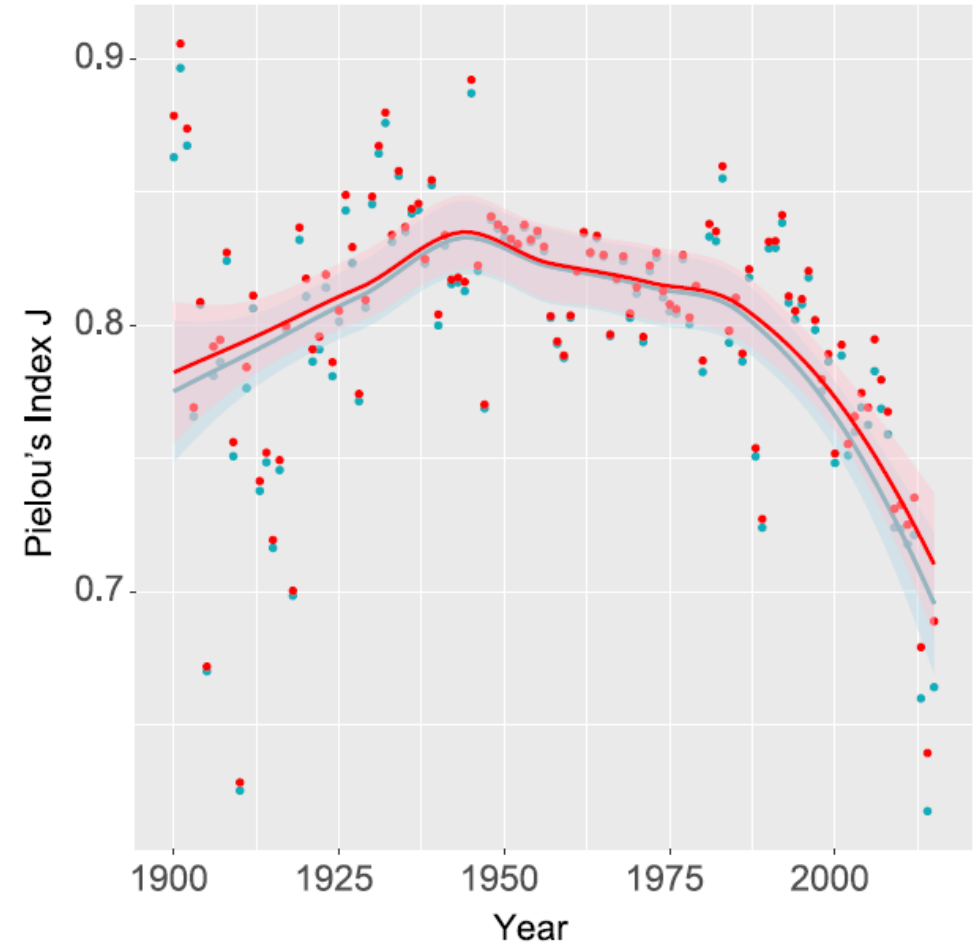
# Challenges to Bees



# Worldwide Decline in Bee Species



- Despite increasing number of specimen records, the number of worldwide recorded bee species is sharply decreasing
- About 25% fewer bee species were found between 2006 - 2015 than before 1990





# Pollinator Extension Resources



**NDSU EXTENSION** EXTENDING KNOWLEDGE » CHANGING LIVES

E1977

## Meet the Rare, Threatened and Endangered Insect Pollinators of North Dakota

David Lowenstein, Consumer Horticulture Extension Educator, Michigan State University  
 Nathaniel Walton, Consumer Horticulture Extension Educator, Michigan State University  
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### Why are some pollinators in decline?

Nectar, pollen and habitat are three major requisites for pollinators. When habitats (for example, natural prairie, residential homes or commercial sites) are lost, pollinators can undergo a rapid decline. Species more susceptible to habitat or food losses because dependent on a few specific host plants in a species' environment. Environmental contamination from using herbicides to prevent flowering or insecticides that are immediately or through time degrades otherwise. One group of insecticides called neonicotinoids seed coating to seeds before planting. Once plants can move systemically throughout the plant and mature. Research suggests that insect pollinators adverse effects, including reduced lifespan and when gathering nectar or pollen from these host plants.

Attracting species that live in a variety of conditions simple as planting multiple types of flowering plant species usually require specific conditions. These bees and butterflies are usually limited to with the right host plants (Table 1). This tip sheet of the rarer pollinators that are poorly known.

**Table 1. List of threatened, rare and endangered pollinators and plants used by adults or larvae**

Pollinator	Host plants
Rusty patched bumble bee <i>Bombus affinis</i>	Hydrangea, locust spotted joe-pye
Yellow-banded bumble bee <i>Bombus terricola</i>	Sweet clover, dog
Poweshiek skipperling <i>Chlorita poweshiek</i>	Prairie dropseed little bluestem, L.
Dakota skipper <i>Hesperia dacotae</i>	Little bluestem, purple coneflower smooth camas,

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E1914

## Insects That Look Like Bees

Everyone knows that bees love to visit flowers, but not everything you see visiting flowers or buzzing around the garden is a bee. In fact, many insects imitate bees to avoid unwanted attention from predators such as birds. Whether you call them "bee mimics," "wannabees" or "yellow stripey things," most of them are beneficial helpers in our yards and gardens. Learning how to identify the insects that look like bees will help smart gardeners know and protect these vital pollinators.

### Flies

Some flies, especially hover flies and bee flies, can be mistaken for bees because their body form, yellow and black color, fuzzy hairs, buzzing sounds and behaviors mimic bees. Flies have only two wings (forewings) because their hind wings are reduced to knoblike balancing organs called halteres (Figure 1, red circles). In contrast, bees have four wings (two forewings and two hind wings).

Flies have large compound eyes that occupy most of the head, while bees have narrow compound eyes on the sides of the head. Most bee-like flies have short antennae, while bees have longer, cylindrical antennae.

Some flies, especially bee flies, are quite hairy and similar to honey bees (Figure 2), bumble bees and other native bees. Flies also hover and move quickly from flower to flower while foraging. Unlike bees, flies do not have a stinger and are not a threat to gardeners.

Hover flies (Family: Syrphidae) (Figures 1 and 3) resemble bees in coloration, behavior and size. Many hover flies are ¼ to ½ inch long and have large heads with reddish or marbled black eyes, two clear wings and yellow-black patterns on the abdomen. Some hover flies are quite hairy, while others are not.

Hover flies buzz like bees and are important pollinators. They use sponging mouthparts when feeding on pollen and nectar. Some hover fly larvae are key predators of soft-bodied insect pests, such as aphids, and provide free biological control of garden pests.

Bee flies (Family: Bombyliidae) (Figure 4) are about ¼ to ½ inch long and have stout bodies covered with yellow, black and/or brown hairs. Some species have transparent wings, while others have wings with dark patterns. The bee fly uses a long proboscis (tongue) for feeding on pollen and nectar in flowers. Because their bodies are hairy, they can carry and transfer a large amount of pollen to flowers.

### Moths

Hummingbird clearing moths or hawk moths (Family: Sphingidae) (Figure 5) are approximately 1 to 1½ inches long, with a robust body. Front wings are narrow, elongated and clear, with a black or brown border and a wingspan of 1½ to 2 inches. These moths look more like hummingbirds than bees.

These moths feed using a long proboscis (tongue) to sip the nectar. At twilight, hummingbird moths often fly from one flower to the next. Flowers that are most attractive to hummingbird moths are light-colored (white), with a strong scent, such as garden phlox.



Figure 1. Hover fly with few hairs. (Veronica Calles-Torrez, NDSU)



Figure 2. European honey bee with many hairs. (Veronica Calles-Torrez, NDSU)



Figure 3. Hover fly. (Veronica Calles-Torrez, NDSU)



Figure 4. Bee fly. (David Caspoert, Bigwood.org)



Figure 5. Hummingbird clearing moth. (David Caspoert, Bigwood.org)

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## Pollinator Preferences for Selected Aster, False Indigo, Bee Balm and Sedum Flowers in North Dakota



Pollinators are crucial for food production, and more than two-thirds of our leading global food crops rely upon or benefit from pollinators. While pollinators love to visit flowers and feed on pollen and nectar, flowers also add beauty to our yards, farms and natural areas.

The recent dramatic decline of pollinators is a worldwide concern. Some of the major causes of pollinator decline are habitat loss, parasitic pests, pesticides, diseases and climate change. However, homeowners can make a difference in pollinator health by planting perennial flowers in their backyards, providing nesting habitat for bees, and using less toxic pesticides when needed.

### Helping Pollinators in North Dakota

North Dakotans want to support pollinators by providing nectar and pollen through planting beautiful flowers in their backyards and farms. Despite the wide availability of many native and ornamental cultivars of perennial flowers, little scientific information is available on whether a flower will be beneficial to pollinators.

Many homeowners are reluctant to plant native species because they are perceived to be less attractive, weedy and more likely to lodge. Consequently, they can have a difficult time selecting perennial flowers that are beautiful in a given setting and will benefit wild bees, bumble bees, honey bees, syrphid flies and butterflies. Having different perennial flowers that bloom throughout the pollinators' life cycle is important, especially when food is scarce for pollinators, such as early spring and early fall.

This Extension pollinator publication will help determine which perennial plants to plant that attract and nourish pollinators such as wild bees, bumble bees, honey bees, syrphid flies and butterflies. Eight perennial native species and 20 perennial ornamental cultivars (Table 1 and Figure 1) were observed for their ability to attract pollinators at two locations in southeastern North Dakota.

The genera of perennial flowers tested were *Baptisia* (wild indigo, false indigo), *Hypochaeris* (tall sedum), *Monarda* (bee balm) and *Symphoricarpos* (aster). Plant hardiness and ornamental landscape potential of these perennials also are discussed.

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E1266 (Revised August 2019)

## Butterfly Gardening in North Dakota



Do you enjoy watching beautiful butterflies fluttering from one colorful flower to the next? If you do, you'll enjoy attracting butterflies to your backyard or garden.

Many people enjoy the delight and wonder of butterflies. Butterflies bring a sense of excitement to a flower garden and are relaxing and uplifting to watch.

Butterfly gardens are a simple and easy way to improve people's quality of life and beautify community or backyard. This publication describes how to get started on creating your special butterfly garden and attract the species of butterflies found in North Dakota.

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### What is a butterfly garden?

A butterfly garden is a garden that attracts and retains butterflies. Butterfly gardens provide a source of nectar and pollen for adult butterflies, and a source of food for their young. The garden should include a variety of plants that bloom throughout the growing season, and a variety of colors and shapes to attract different species of butterflies.

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**NDSU** EXTENSION SERVICE  
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## Bee-utiful Landscapes: Building a Pollinator Garden

Bees are in trouble in the U.S. Native bee species are declining in numbers due to habitat loss and other factors. Approximately one-fourth to one-third of European honey bee colonies in the U.S. also die each year despite the best efforts of their attentive beekeepers.

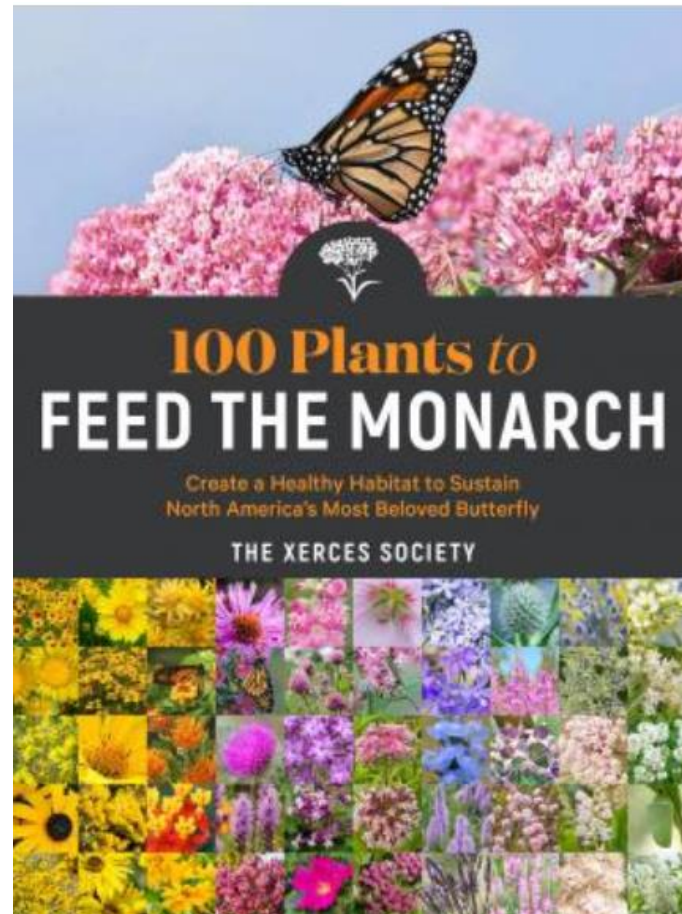
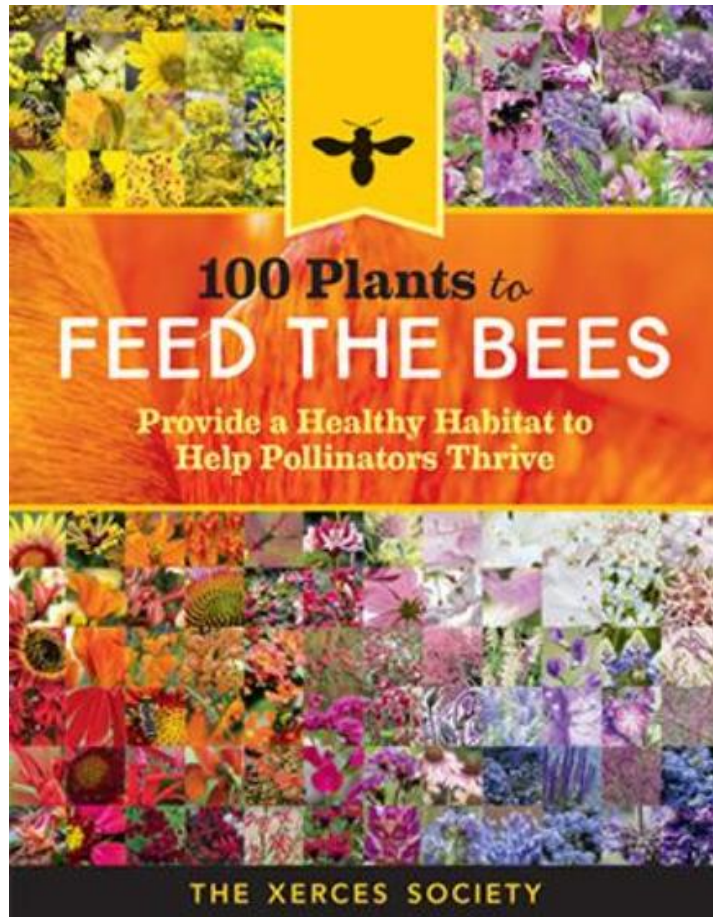
A continued decrease in pollinator numbers will affect our food supply because insect pollination is necessary or beneficial for many fruit, nut and vegetable crops. However, the news need not be dire.

You can have a major impact by providing suitable habitat and nutrition for bees. By planting a pollinator garden, you can turn your yard or farm into an oasis for bees.

This publication will help you identify major pollinators, choose plants that will provide a continuous source of nectar and pollen during the growing season, and safely use pesticides.



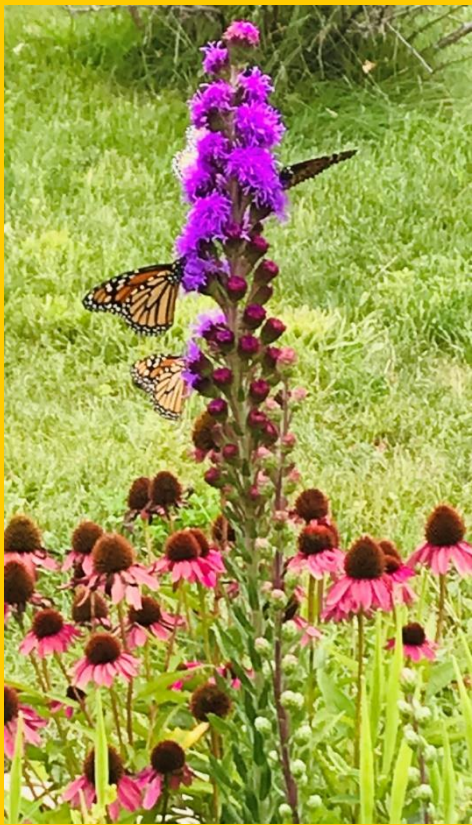
# Pollinator Books



<https://xerces.org/resources>







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