

Wild Bee Pollination



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Troy Garden Club

Outline

- What is a bee?
- Importance of bees
- Common bees in Michigan
- Status of bees in North America
- Bee conservation
- Planting a bee-friendly garden
 - plant characteristics
 - nesting materials



What is a bee?

A close relative of ants and wasps.



Social wasps (often mistaken for bees)

- Use wood pulp and saliva (= paper) to construct nests.
- Nests may be open or covered by layers of paper for insulation.
- Nests may be arboreal, in or on manmade structures, or underground.



Social wasps (often mistaken for bees)

- Unlike honey bees, no food storage.
- Larvae fed mainly on insects collected by workers.
 - Important for biological control of other insects.
- Often aggressively defend colony.
- Remove colony if located in a high traffic area or if it is a threat to human safety, otherwise, please leave them alone.



What is a bee?

A vegetarian wasp!

- Like ants and wasps:
 - Provide for their young.
 - Forage within range of nest.
- Unlike ants and wasps:
 - Feed their young exclusively on pollen and nectar.
 - Adapted for pollen movement.
 - Flower constancy.

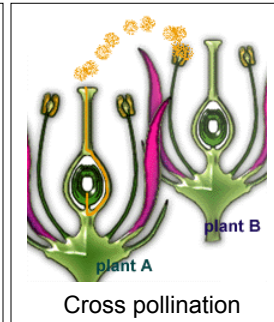


How do bees pollinate flowers?

- Branched hairs and electrostatic forces help pollen stick to their bodies.
- Pollen is moved from male to female flowers parts, within or between different flowers through the same forces.



Self pollination



Cross pollination

Bees pollinate 80% of flowering plants,
food for us and for wildlife!



Some crops pollinated by bees:



Over 20,000 species of bees in the world and nearly 400 species recorded in Michigan.



Kinds of bees and their lifestyles



- ground nesting bees
 - bumble bees
 - miner/digger and long-horn bees
 - sweat bees
- wood nesting bees
 - carpenter bees
- cavity nesting bees
 - mason bees
 - leafcutter bees
 - yellow-faced bees
- cleptoparasitic bees
- honey bees

Ground nesting bees



bumble bees



digger/miner bees



long-horn bees



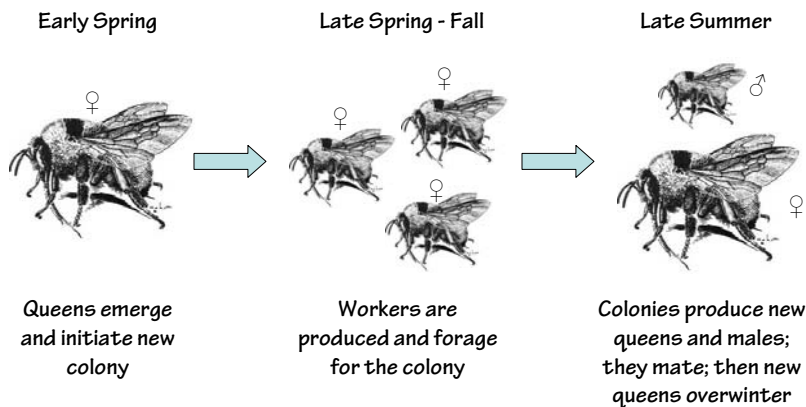
sweat bees

Ground nesting bees: bumble bees

- Native to North America.
- 2nd most important crop pollinator globally.
- Visit many different flowers.
- Social, producing annual colonies initiated by queens in early spring.
- Nest in abandoned rodent burrows or other insulated cavities in the ground.
- Commercially reared colonies now available.



Bumble bee lifecycle



**Common bumble bee species:
differentiated by the amount of yellow abdominal hair**



Bombus citrinus
abdomen all black



Bombus impatiens
first segment yellow



Bombus bimaculatus
1st segment all yellow,
2nd segment partial yellow



Bombus griseocollis
1st segment all yellow,
2nd segment partial yellow



Bombus vagans
1st & 2nd segments
all yellow



Bombus fervidus
all but the last
segment yellow

Two bumble bees that have become rare:

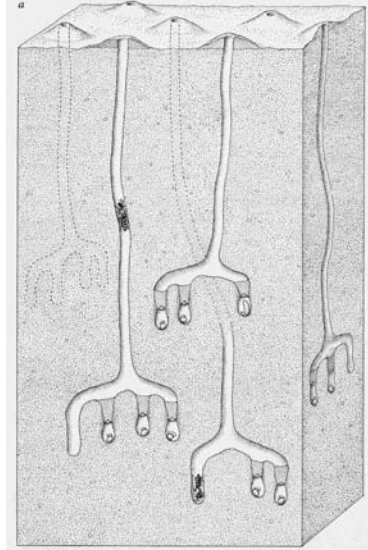
- *Bombus affinis* (rusty patch bumble bee)



- *Bombus terricola* (yellow-banded bumble bee)



Ground nesting bees: miner/digger, long-horn, and sweat bees



Mining/digger and long-horn bees

- Small to large bees with very hairy hind legs.
- Some have very long antennae.
- May visit many different flowers, or will collect pollen from only a few related plant species.
- Solitary, usually one generation produced per season.



Andrena
spp.



Peponapis
pruinosa

Sweat bees

- Diverse group, three size/color combinations:
 - Medium-sized, brown, with or without stripes
 - Small bronze/golden metallic
 - Small to medium, metallic green
- Visit many different flowers.
- Most nest in soil; some in soft wood.
- Solitary and social species; some produce several generations per season.



Halictus sp.



Lasioglossum sp.



Agapostemon spp.

Wood nesting bees: carpenter bees



Carpenter bees

- Two distinct types:
 - large (often mistaken for bumble bee queens).
 - Small (metallic blue).
- Visit many different flowers.
- Nest in wood or pithy stems.
- Considered solitary, but there is some overlap in generations.



Xylocopa virginiana



Ceratina sp.
Photo: J. Evans

Cavity nesting bees: mason, leafcutter, and yellow-faced bees

Osmia lignaria
orchard mason bee



Photo: S. Bambara



Megachile spp.
leafcutter bees



Hylaeus sp.
yellow-faced bee



Mason and leafcutter bees

- Carry pollen on the underside of their abdomen.
- Solitary, but will nest in large aggregations.
- In nature, nest in beetle galleries in wood or pithy stems; some will readily nest in man-made straws.
- Mason bees use mud to cap off nest cells; leafcutter bees use pieces of leaves to form capsule-like chambers.



Osmia lignaria
Orchard Mason Bee
Photo: S. Bambara



Megachile sp.

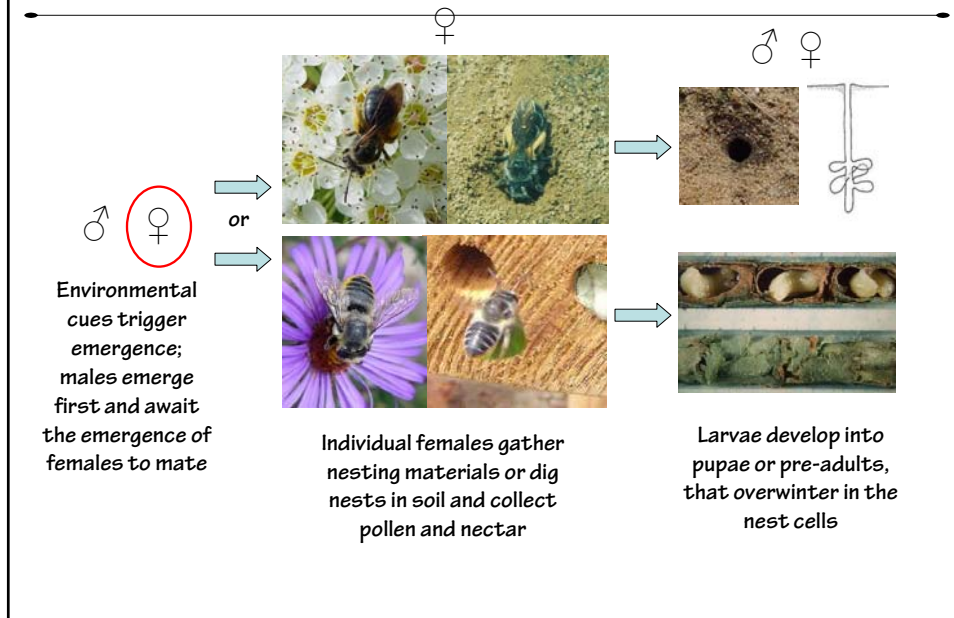
Yellow-faced bee

- Small wasp-like bee with yellow markings on both males and females.
- No external pollen carrying structures, stores pollen internally in a crop.
- Solitary, nest in pithy stems of *Rubus* or *Rosa* stems.
- Lines nest cells with bits of wood pulp and a cellophane-like material.
- Found on many different flowers.



Hylaeus sp.

Solitary bee lifecycle



Cuckoo Bees (a.k.a. Cleptoparasitic): lay eggs in the nests of other bees, do not collect pollen

Sphecodes sp.



Nomada sp.



Coelioxys sp.



Triepeolus sp.



Honey bees



- Important bee worldwide.
- Not native to the Americas.
- First brought by European settlers in 1600s for honey and wax production.
- Feral colonies once abundant.
- Now the primary crop pollinator.
- Provides annual crop pollination worth \$ 14.6 billion in US.

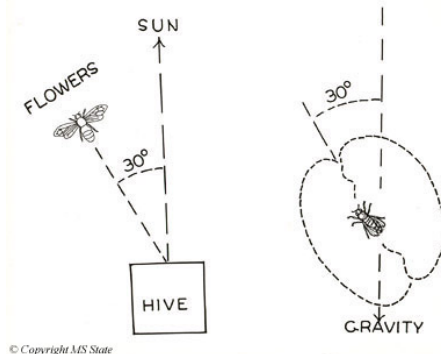
Honey bees

- Many subspecies.
 - Original subspecies adapted to temperate climates.
 - Introductions of others have occurred repeatedly.
 - African subspecies introduced in Brazil (1950s).
 - “Africanized” bees (a.k.a. killer bees)



Honey bee “waggle dance”

- Honey bees have a unique recruitment behavior called the “**waggle dance**” to alert other foragers to a food source *between 35-80 meters away from the colony.*



Honey bees and crop pollination

- Nests have been made portable.



Thousands of honey bee hives are trucked all across the country each year to follow crop bloom.

Some crops pollinated by honey bees in N. America

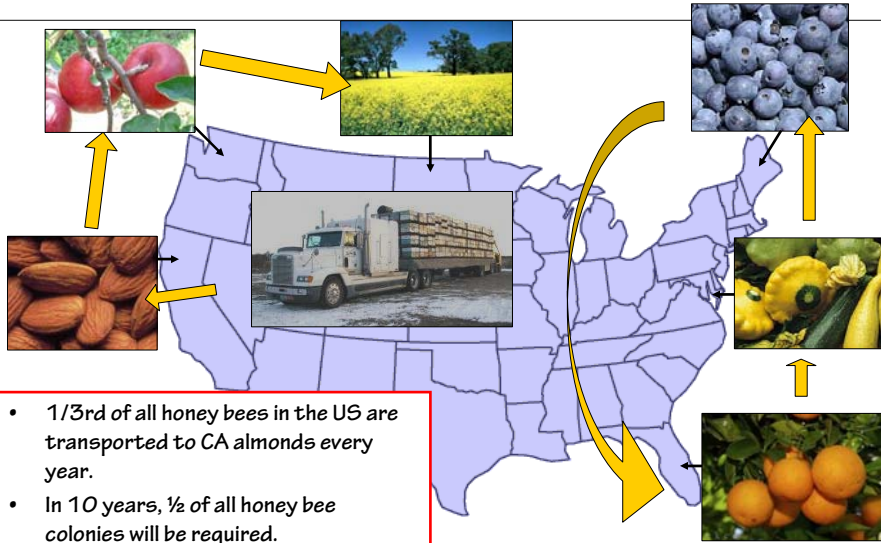


Demise of feral colonies in part due to the Varroa mite, accidentally introduced in the 1980s

many hobby beekeepers have quit because of the difficulty in managing this pest

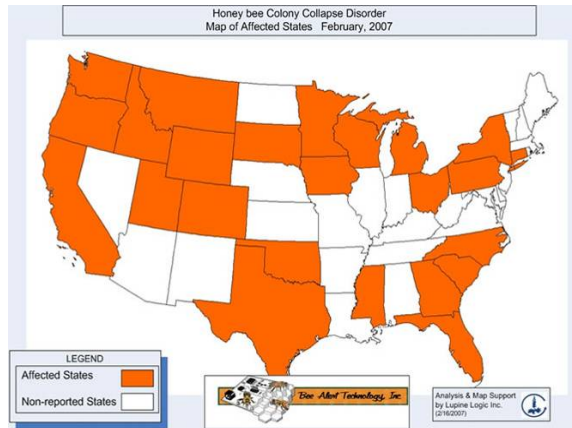


Migratory beekeeping and modern monocultures



The current plight of bees

- Colony Collapse Disorder (CCD).
 - migratory honey beekeepers reported disappearing bees beginning in 2006



Colony Collapse Disorder

- A convergence of problems that add up to CDD:
 - stresses due to migratory beekeeping practices
 - poor nutrition
 - increased exposure and transfer of diseases and parasites
 - increased levels of miticides in wax to combat mites
 - stresses due to modern agricultural practices
 - use of insecticides that have unknown effects on memory
 - mass-flowering monocultures with low floral diversity

None of these by themselves cause CCD.

Effects of CCD on the average consumer

- Hive rentals have increased in most states.
- Increasing cost of food?



The current plight of bees

- Colony Collapse Disorder (CCD).
 - migratory honey beekeepers reported disappearing bees beginning in 2006
- Four once common bumble bee species have become extremely rare (2 in the east, 2 in the west).
 - thought to be caused by diseases spread by commercially reared colonies

Once common bumble bees now rare



The Washington Post
Signs of Decline: First Honeybees, Now Bumblebees
<http://www.washingtonpost.com/archive/local/localnews/2008/08/07/AR200808070523.html>
By Adrian Higgins, *The Washington Post*
Thursday, August 7, 2008; Page H01

The honeybees seem to be bucking the trend and thriving for the moment, at least in my garden. So I have stopped watching them at work and turned my attention to the native bees. The honeybee came over from the Old World, but there are more than 3,500 species of indigenous bees, from the pesky carpenter bee, which buzzes you in April as it starts to tunnel into your woodwork, to the tiny sweat bee, which alights on your arm to take a sip of perspiration. If you look closely and it's the right species, you can see that it shimmering in iridescent green.

Of all the native bees, the bumblebee is the cuddliest. All right, you wouldn't want to hug one (it will sting if really threatened), but the bumblebee is quite content to let you watch it work, buzzing from flower to flower in search of pollen and nectar.



Bombus affinis



Bombus terricola

The current plight of bees

- Colony Collapse Disorder (CCD).
 - migratory honey beekeepers reported disappearing bees beginning in 2006
- Several once common bumble bee species have become extremely rare.
 - thought to be caused diseases spread by commercially reared colonies
- Status of other bees in North America?
 - not enough baseline data for both managed and wild bees (National Academy of Science Report in 2007)
 - pollinator conservation should be a high priority including providing pollinator habitat

Bee Conservation

Historical landscapes in southern Michigan were amenable to pollinators

Prairie



Oak savanna



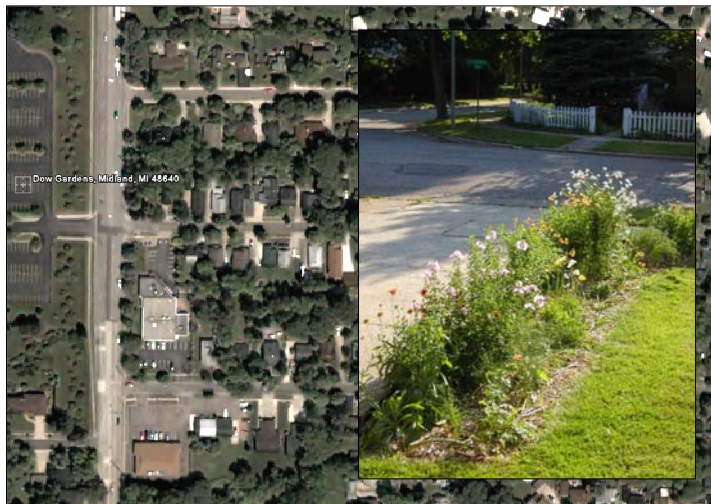
Remnants remain, but are few and far between = habitat fragmentation.

Habitat fragmentation

- Planting gardens with native flowers provides corridors of native habitat for bees and other beneficial insects.



Modern Urban/Suburban Landscapes



- houses
- paved areas
- lawns
- swimming pools
- pesticides
- diversity of flowering plants

Advantages of native perennial plants in the urban landscapes

- Enhance native biodiversity
- Can be used to re-create imperiled habitats
- Are adapted to local climate

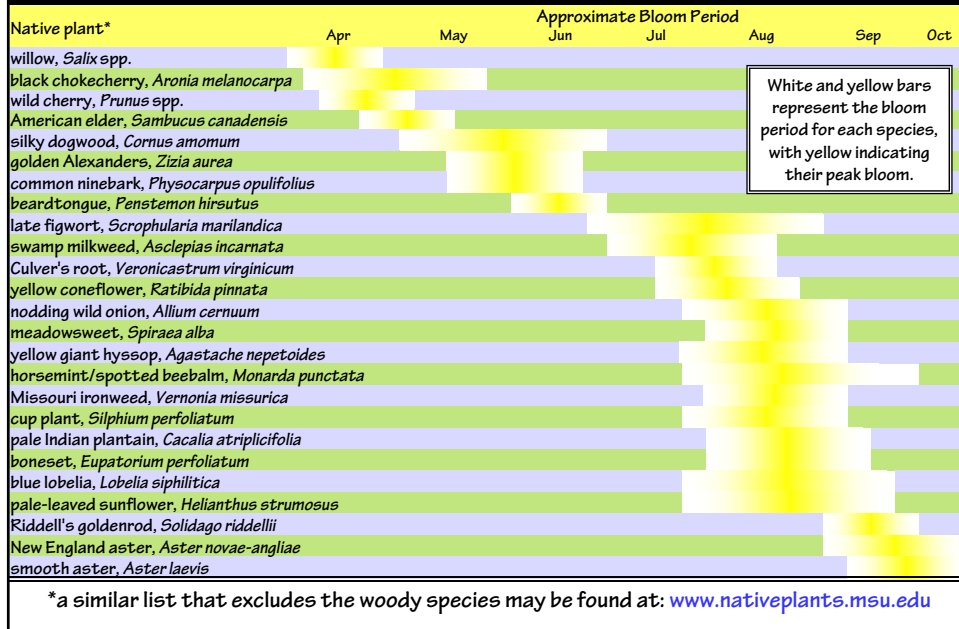


Key concepts in gardening for Native Bees

- Select native plants grown from locally collected seed or woody material:
 - visit and ask questions at a native plant nursery
- Plant a variety of flowering trees, shrubs, and herbaceous plants:
 - with a variety of different flower colors and shapes
 - that bloom at different times throughout the growing season
- Plant flowers in clumps of the same species.
 - larger patches = more bees!

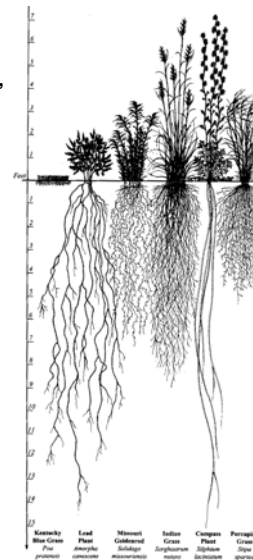


Season-long bee-attractive native floral resources



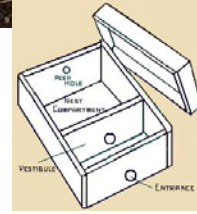
Native grasses for use in meadow-style plantings

- Provide structural support for wildflowers.
- Fill in gaps between wildflowers early in establishment, decreasing weed pressure.
- Have root systems of different depths that complement wildflowers
- Examples:
 - Canada wild rye (*Elymus canadensis*)
 - Little blue stem (*Andropogon scoparius*)
 - Switch grass (*Panicum virgatum*)



Heidi Natura,
Conservation Research Institute

Providing nesting opportunities



Providing a fresh water source

pond



birdbath



Bees and Insecticides

- Only apply insecticides when bees are not active (e.g. at night or after a plant is finished blooming)
- Use bee-safe insecticides.
- Avoid using insecticides altogether!



Summary of bee-friendly gardening practices

- Plant a variety of native woody and herbaceous flowers with a variety of bloom periods.
- Plant flowers in clumps of the same species.
- Provide nesting resources for stem nesters and bumble bees.
- Provide a clean water source.
- Avoid using insecticides.



A small patch of bee-friendly habitat is better than none!



Resources

- Native Plants for Beneficial Insects Website:
www.nativeplants.msu.edu
- Michigan Native Plant Producers:
www.mnppa.org
- Xerces Society: www.xerces.org
- North American Pollinator Protection Campaign:
www.nappc.org

