

Michigan Bees: Honey, Native, Wild, Invasive or Wannabees



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What are bees?

- Bees are vegetarian digger wasps
- Most wasps are predators or scavengers





But...three species of
bee in the genus
Trigona are obligately
necrophagous!

The good, the bad and the ugly



Bees:

Most important pollinators
Rarely sting



Wasps:

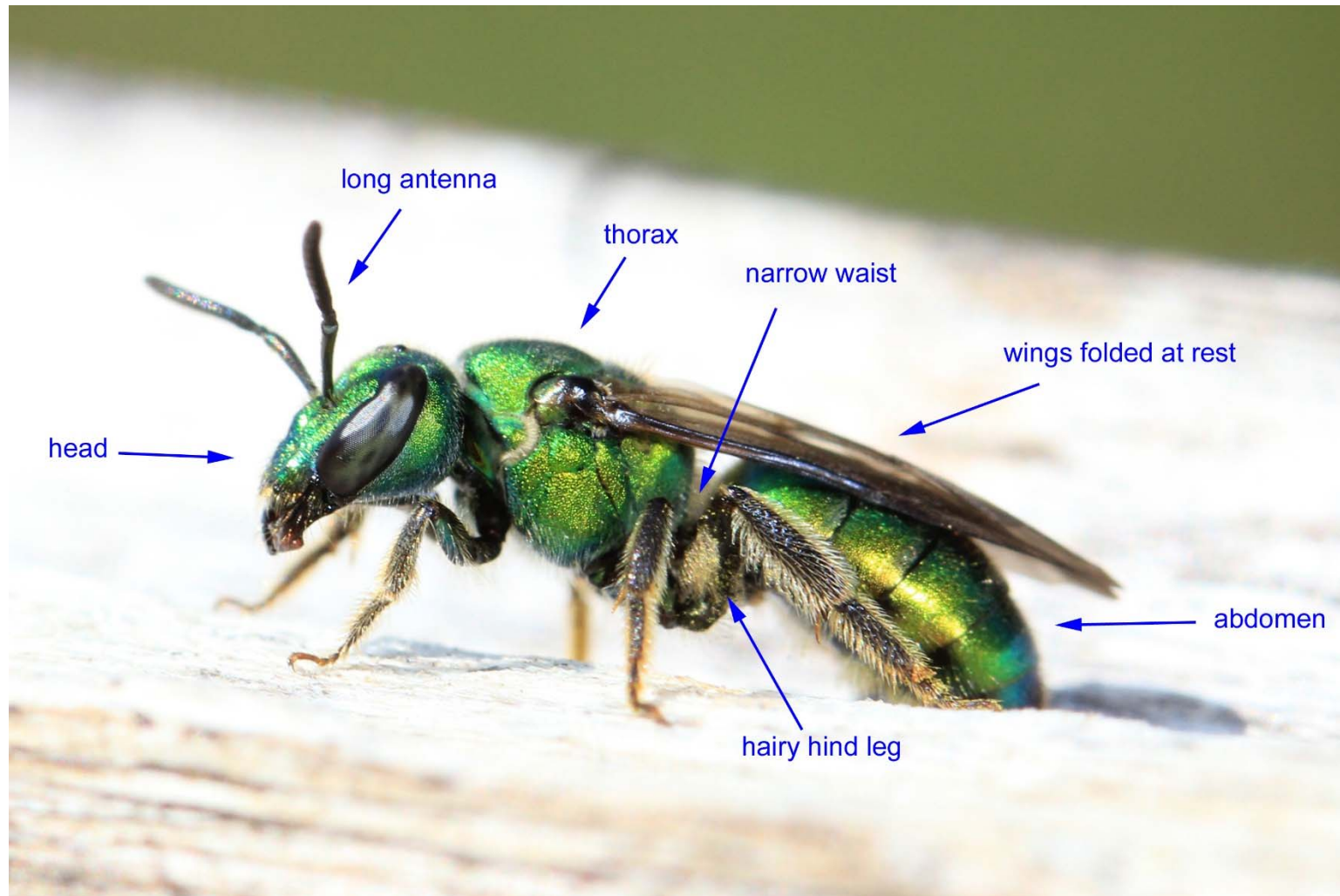
Predators and parasitoids
Sometimes sting



Flies, beetles, moths:

Pollinators
Predators and parasitoids
Sometimes plant pests

Characteristics of bees



Characteristics of bees



Characteristics of bees: pollen



pollen



Characteristics of bees: color

Black



Striped



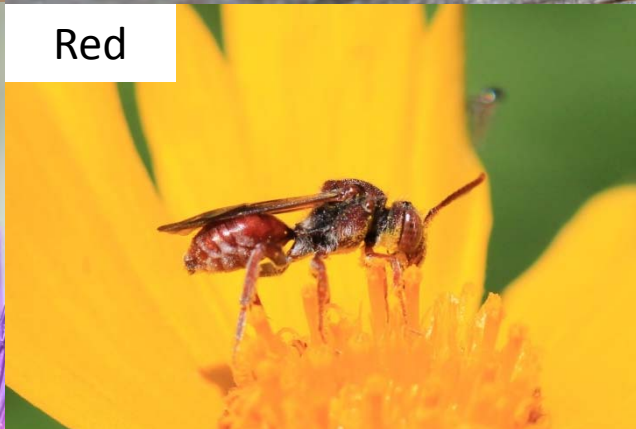
Yellow and black



Green



Red



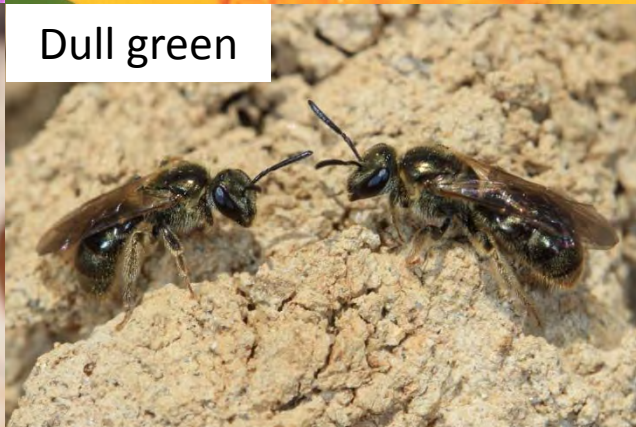
Pale yellow



Blue



Dull green



Brown



Honey bees

Orange to brown, usually with striped abdomen

Smooth back leg

Only bee in USA with advance social behaviour

Only one to make lots of honey

Only bee to die after stinging



Characteristics of wasps

Similar to bees, except:

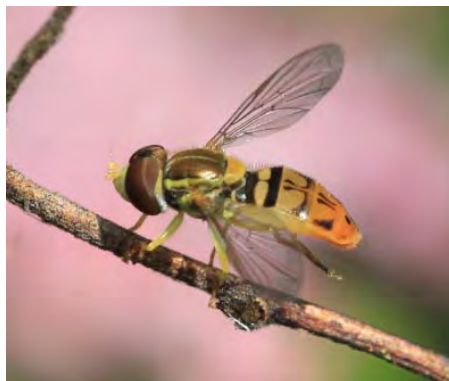
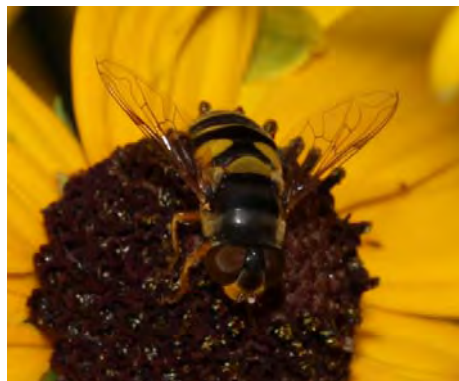
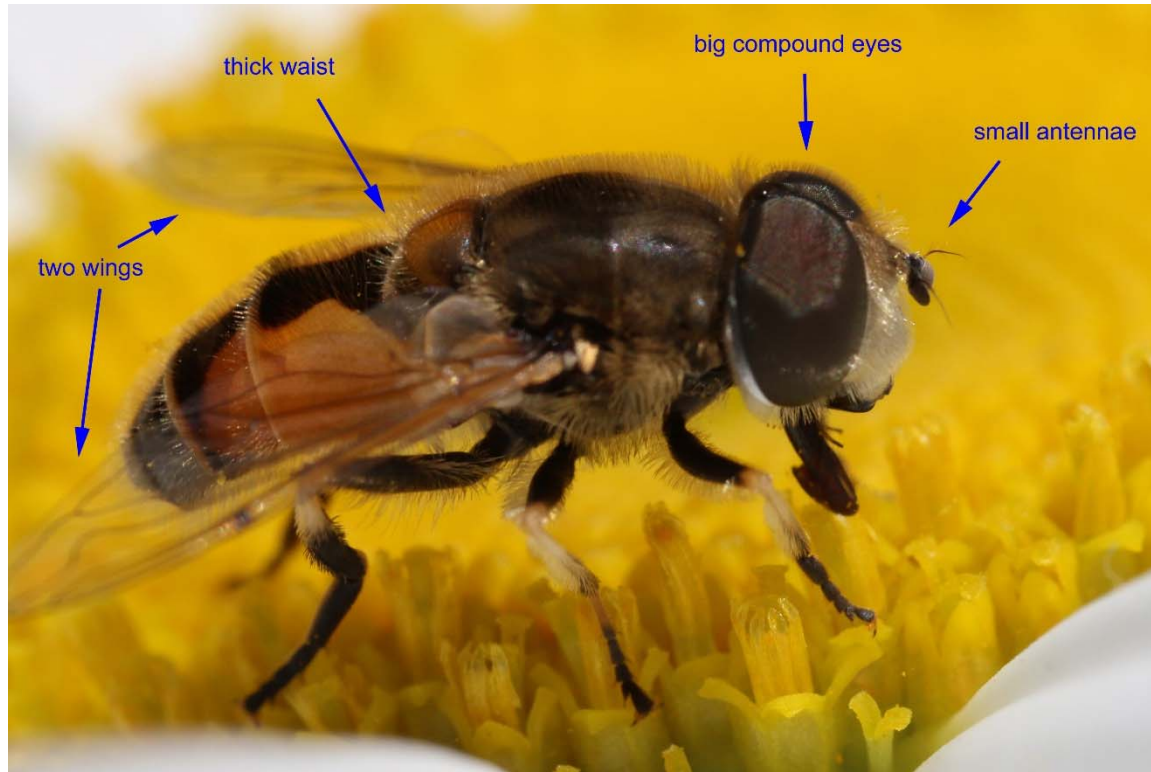
- 1) bodies less hairy;
- 2) don't carry pollen



More wasps



Characteristics of flies

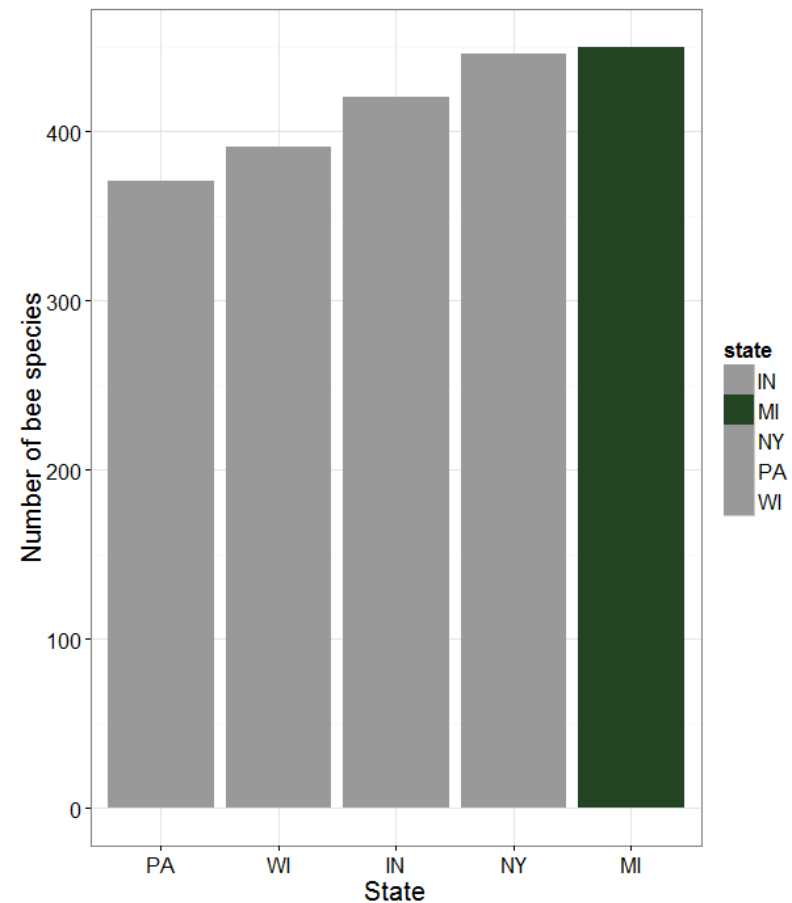


Flies: wasp and bee mimics



Bees of Michigan: Comparison to other states

- **Michigan: 450**
(minimum)
- **Indiana: 420**
(R. Jean unpublished data)
- **Wisconsin: 391**
(Wolf & Ascher 2009; Scott et al. 2011)
- **Pennsylvania: 371**
(Donovall & vanEngelsdorp 2010)
- **New York: 446**
(Scott et al. 2011)

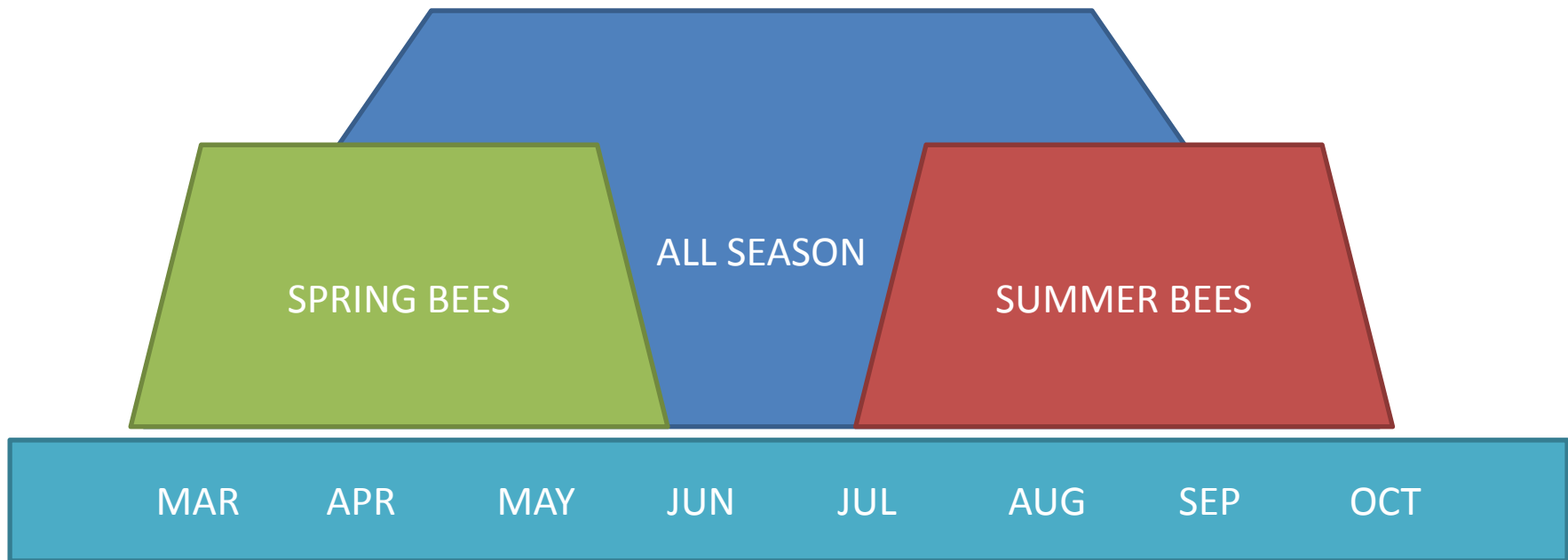


How can I support pollinators in my garden?

1. Feed them
2. House them
3. Don't kill them



Bees of Michigan - Phenology



Miner bees
Cellophane bees
Mason bees
Cuckoo bees

Bumble bees
Sweat bees
Carpenter bees

Leaf-cutter bees
Squash bees
Long-horned bees
Wool-carder bees

Season-long bee-attractive native flowers

Native plant	Approximate Bloom Period						
	Apr	May	Jun	Jul	Aug	Sep	Oct
willow, <i>Salix</i> spp.							
black chokecherry, <i>Aronia melanocarpa</i>							
wild cherry, <i>Prunus</i> spp.							
American elder, <i>Sambucus canadensis</i>							
silky dogwood, <i>Cornus amomum</i>							
golden Alexanders, <i>Zizia aurea</i>							
common ninebark, <i>Physocarpus opulifolius</i>							
beardtongue, <i>Penstemon hirsutus</i>							
late figwort, <i>Scrophularia marilandica</i>							
swamp milkweed, <i>Asclepias incarnata</i>							
Culver's root, <i>Veronicastrum virginicum</i>							
yellow coneflower, <i>Ratibida pinnata</i>							
nodding wild onion, <i>Allium cernuum</i>							
meadowsweet, <i>Spiraea alba</i>							
yellow giant hyssop, <i>Agastache nepetoides</i>							
horsemint/spotted beebalm, <i>Monarda punctata</i>							
Missouri ironweed, <i>Vernonia missurica</i>							
cup plant, <i>Silphium perfoliatum</i>							
pale Indian plantain, <i>Cacalia atriplicifolia</i>							
boneset, <i>Eupatorium perfoliatum</i>							
blue lobelia, <i>Lobelia siphilitica</i>							
pale-leaved sunflower, <i>Helianthus strumosus</i>							
Riddell's goldenrod, <i>Solidago riddellii</i>							
New England aster, <i>Aster novae-angliae</i>							
smooth aster, <i>Aster laevis</i>							

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



Homes for cavity nesting bees





Homes for cavity nesting bees



Homes for cavity nesting bees



What is a Bee Hotel?

A bee hotel is a structure that provides a safe place for bees to nest. It is made of wood and contains many small holes of different sizes. Bees use these holes to lay their eggs and raise their young. Bee hotels are used to help bees survive in areas where there are few natural nesting sites.

Why are bees important?

Bees are important because they pollinate many of the plants we eat. Without bees, many of our favorite fruits and vegetables would disappear. Bees also play a role in the production of honey and other bee products.

Gardening for Bees

Your garden can be a haven for our bee friends!

For more information visit: www.nativeplants.msu.edu

Bees need our help!

Bees are essential to our food system. Gardening for bees will help them survive and can help prevent further decline by providing a safe nesting habitat for them.

Give a bee a home

Native Michigan native bees are solitary bees, digging individual nests in soil. Solitary bees are very gentle and do not defend their nests. You can attract many solitary bees to your garden by providing blocks of wood with holes drilled in them, bundles of bamboo, or cardboard boxes. Examples of nests are on display in this garden.

Providing bees with food diversity

Adult bees need the nectar and pollen from many different flowers to survive. They need to visit many different flowers to get all the nutrients they need. Planting a variety of flowers in your garden will provide bees with the food they need to survive.

Introduction to native bees

There are more than 400 species of bees in Michigan, over 4,000 in North America, and 20,000 worldwide. Some bees are very rare and some are very common. Some bees are very important to our food system.

Bumble bees

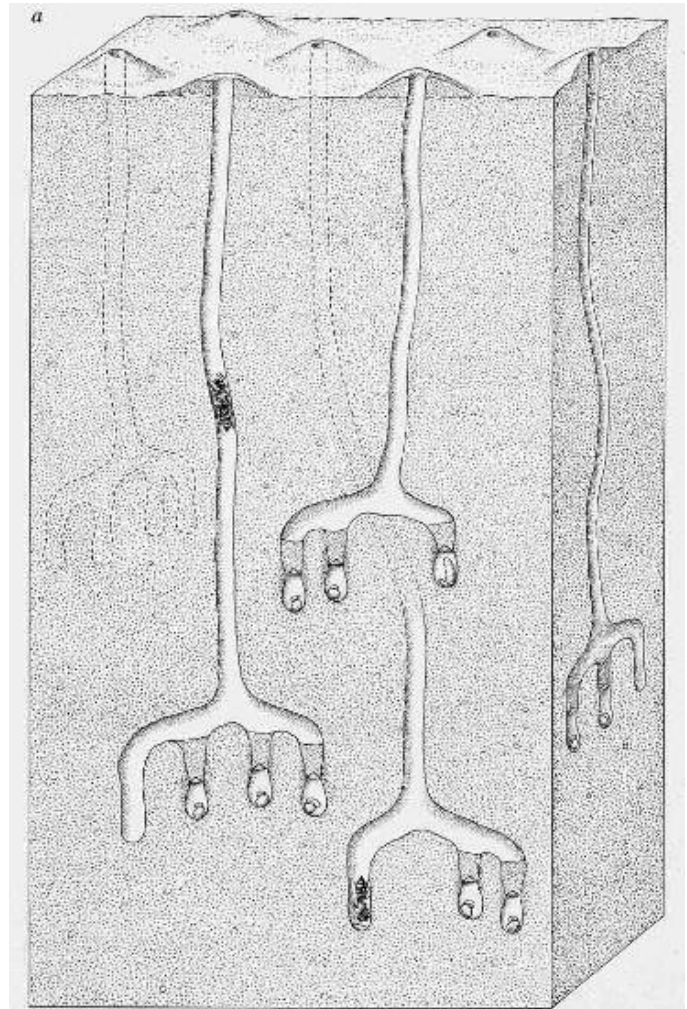
Bumble bees are very important to our food system. They are very gentle and do not defend their nests. They are very important to our food system because they pollinate many of the plants we eat.

What is pollination?

Pollination is the process by which pollen is transferred from the male part of a flower to the female part. This process is essential for the production of many fruits and vegetables. Bees play a key role in pollination by carrying pollen from one flower to another.

Most bees nest in the ground

Nest in soil between a few inches up to 3 feet or more down.



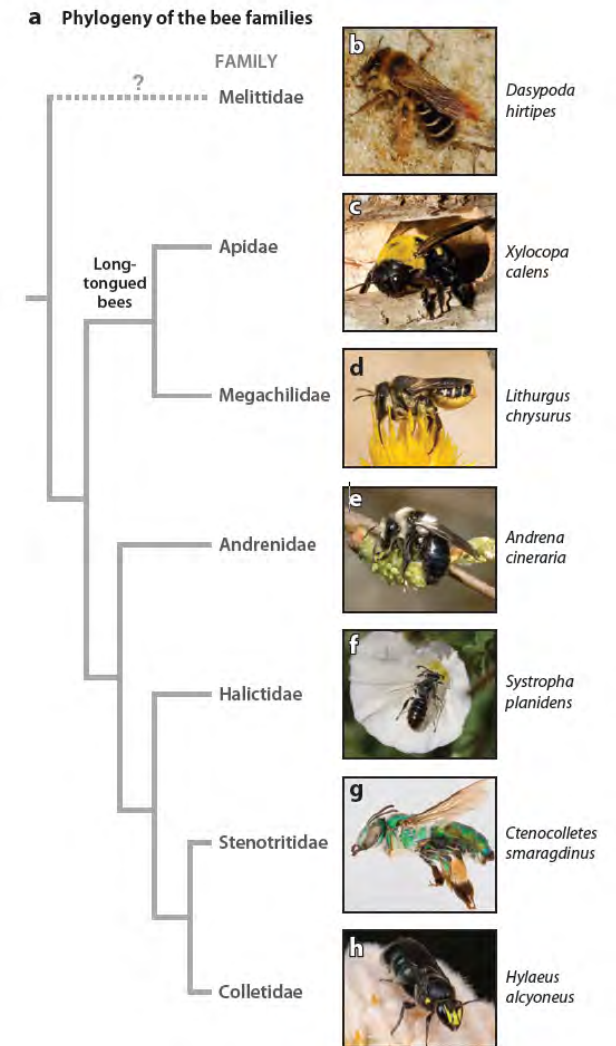


Soil nesting habitat: bee spirals



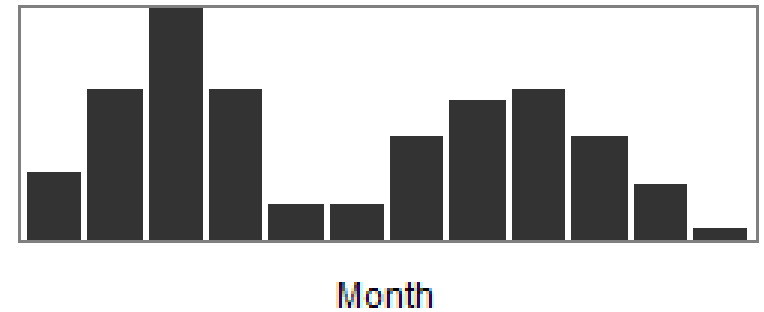
Bees of Michigan: The families

- Bee families in Michigan
 - Andrenidae
 - (e.g., miner bees)
 - Apidae
 - (e.g., honey bees, bumble bees, carpenter bees, squash bees)
 - Colletidae
 - (e.g., cellophane bees)
 - Halictidae
 - (sweat bees)
 - Megachilidae
 - (e.g., leaf-cutter bees, mason bees)
 - Melittidae
 - (oil-collecting bees)



Miner bees – *Andrena* spp.

- Richness: ~ 90 spp.
- Floral hosts: generalist & specialists
- Nests: ground
- Biology: solitary



What to plant: willows, chokeberry, red maple, hawthorn, goldenrod, asters
Also specialists of: spring beauties, Virginia waterleaf, blueberry, sunflower, black eyed susan, geranium, dogwood, ragwort

Miner bees – *Andrena* spp.

- Important crop pollinators
 - (e.g. apples, cherries, blueberries, strawberries)



Digger bee nest



Photos by Zach Portman

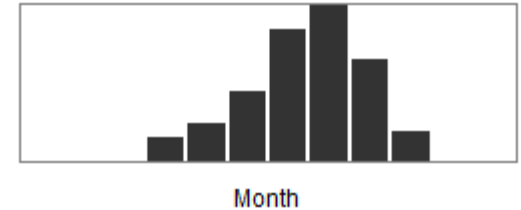
Miner bee nests



Nest photos by D.L. Briggs

Miner bee relatives - panurgines

- Richness: *Calliopsis* (2 spp.), *Pseudopanurgus* (4 spp.)
- Floral hosts: generalist or specialists
- Nests: ground
- Biology: solitary



What to plant: goldenrod, asters



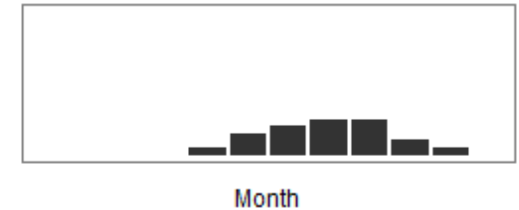
Calliopsis andreniformis (generalist)



Pseudopanurgus andrenoides (specialist)

Miner bee relatives – panurgine bees

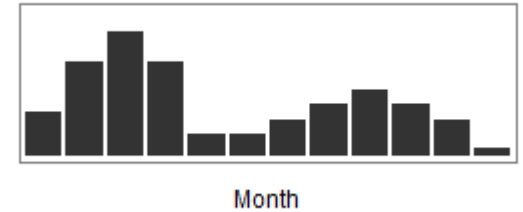
- Richness: *Perdita* 7 spp.
- Floral hosts: specialists
- Nests: ground
- Biology: solitary/communal



What to plant: goldenrod, horsemint, ground cherry

Nomada cuckoo bees - *Nomada*

- Richness: ~ 40 spp.
- Biology: cleptoparasites
- Host bee: mostly *Andrena*



Cellophane bees – *Colletes* spp.

- Richness: ~ 20 spp.
- Floral hosts: generalist & specialists
- Nests: ground
- Biology: solitary

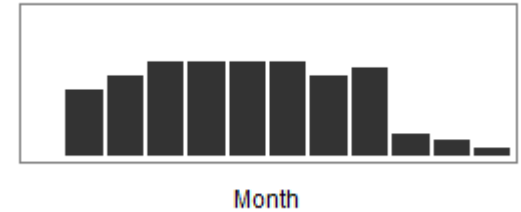


Nest photo from
Sommeijer et al. 2013

What to plant: willows, red maple, goldenrod, boneset, nodding onion
Also specialists of: purple prairie clover, blueberry, heuchera

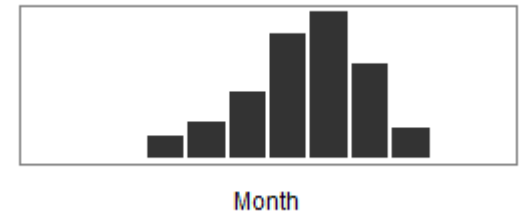
Masked bees - *Hylaeus*

- Richness: ~ 15 spp.
- Floral hosts: generalist & specialists
- Nests: cavities
- Biology: solitary
- Unique: carry pollen internally



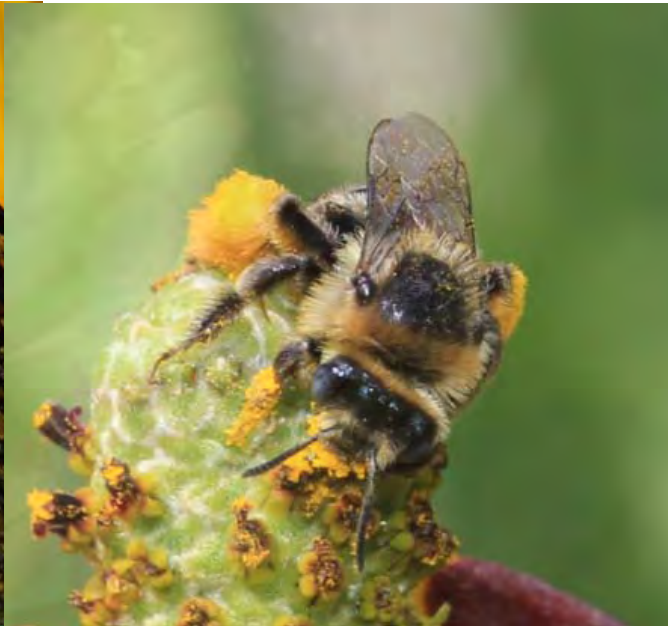
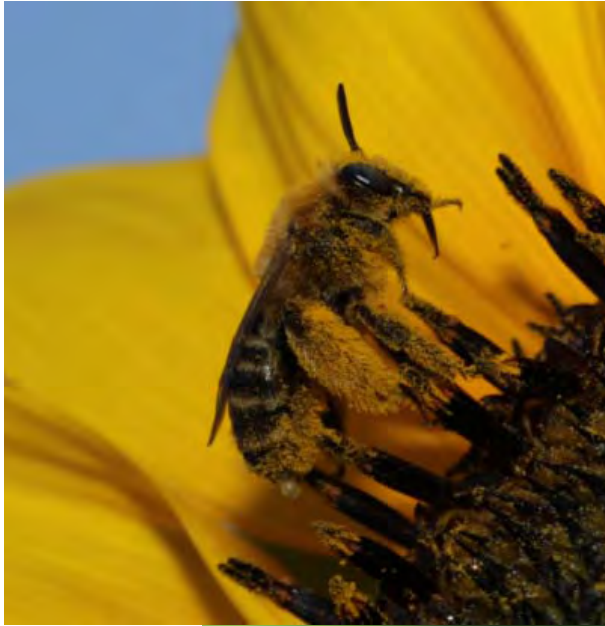
Melissodes, long-horned bees

- Richness: ~ 15 spp.
- Floral hosts: composite specialists
- Nests: ground
- Biology: solitary



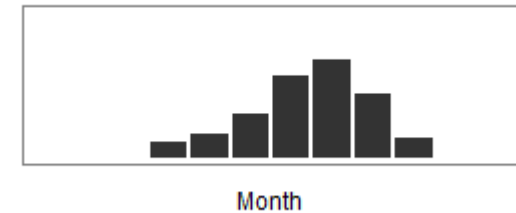
What to plant: sunflower, black eyed susan, coreopsis, cone flower, ironweed, thistle

Melissodes, long-horned bees



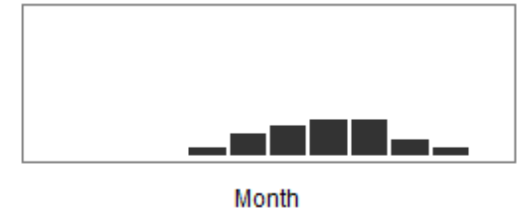
Squash bees – *Peponapis pruinosa*

- Richness: 1 sp.
- Floral hosts: specialist (cucurbits)
- Nests: ground
- Biology: solitary
- Unique: males sleep in flowers



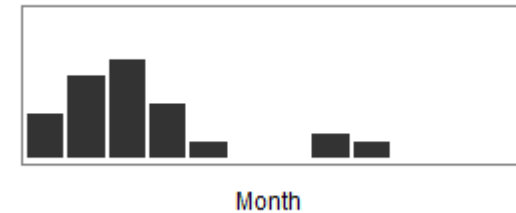
Epeoline cuckoo bees

- *Triepeolus* – 8 spp.
- parasites of apids like *Melissodes*
- *Epeolus* – 10 spp.
- parasites of *Colletes*
- “smiley face bees”



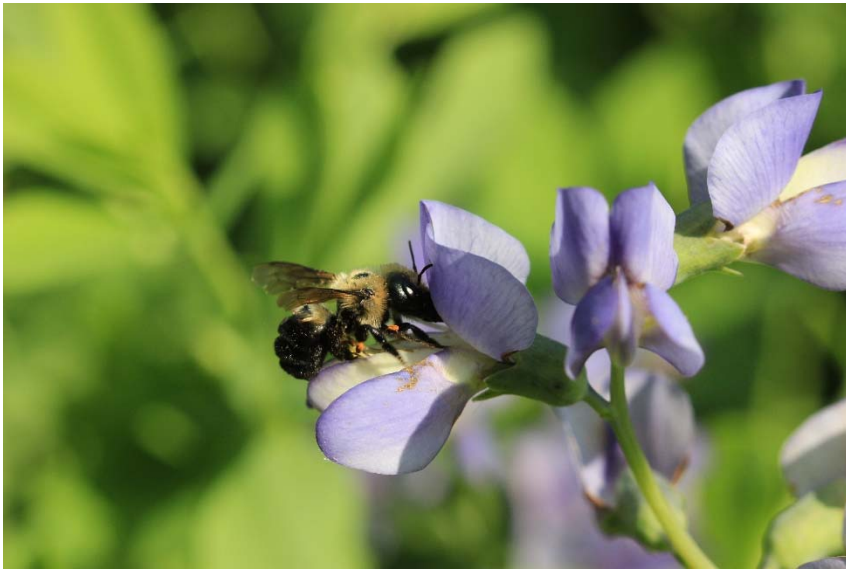
Mason bees – *Osmia*

- Richness: ~ 24 spp.
- Floral hosts: generalist & specialists
- Nests: cavities & ground
- Biology: solitary



- Some species are used as managed pollinators of spring orchard crops

Mason bees – *Osmia*



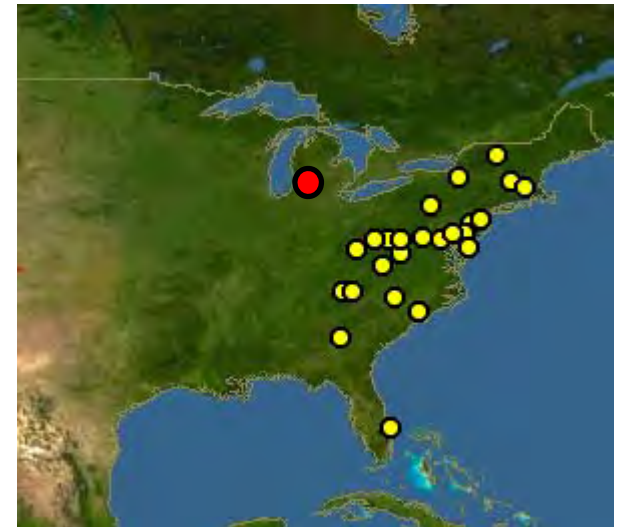
What to plant: willows, butterfly weed, baptisia, cherry
Also specialists of: composites, blueberry, penstemon

New mason bee in Michigan

- New state record
 - Exotic mason bee *Osmia taurus* Smith
 - Closely related to *O. cornifrons* (also exotic)
- Caught 1 male at Kellogg Bird Sanctuary, 16 April 2016
- Closest records are from Pennsylvania, New York, West Virginia



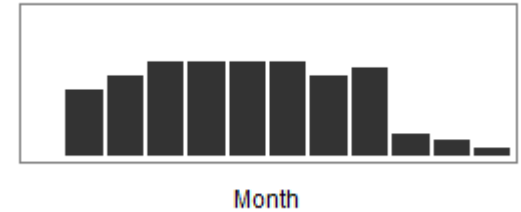
Photo by Clay Bolt



J. Gibbs, unpublished data

Mason bees – *Hoplitis* & *Chelostoma*

- Richness: *Hoplitis* (5 spp.), *Chelostoma* (1 sp., but probably 3!)
- Floral hosts: generalist & specialists
- Nests: cavities
- Biology: solitary



Chelostoma philadelphi



Hoplitis sp.

Leaf-cutter bees

- Richness: ~ 26 spp.
- Floral hosts: generalist & specialists
- Nests: cavities & ground
- Biology: solitary



What to plant: milkweeds, baptisia, joe pye weed, Asteraceae, Fabaceae
Also specialists of: composites, campanula

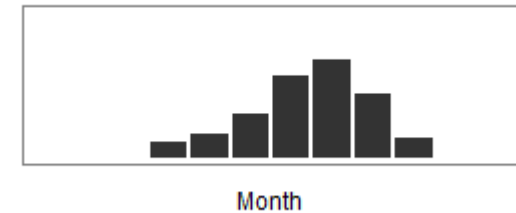
Leaf-cutter bees

Use cut or masticated leaf pieces in nest construction



Cuckoo leaf-cutter bees - *Coelioxys*

- Richness: 11 spp.
- Biology: cleptoparasites
- Host bee: *Megachile*



Wool-carder bees - *Anthidium*

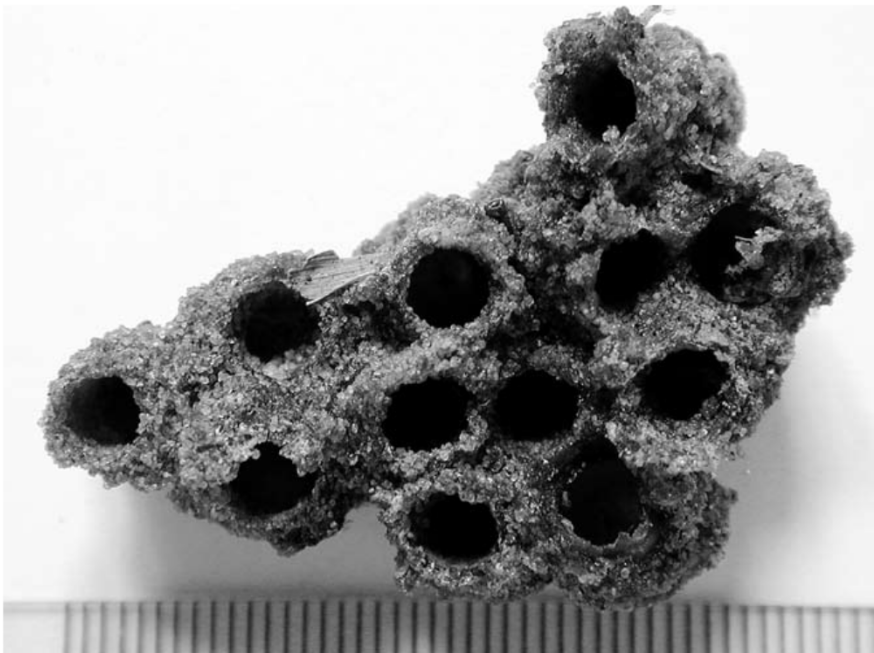
- Richness: 4 spp.
- Floral hosts: generalist & specialists
- Nests: cavities & ground
- Biology: solitary



What to plant: *Vicia* in sandy areas, near lakes

Resin bees

- Nests made of plant resins
- Includes *Dianthidium simile*, *Anthidiellum notatum* and *Heriades* (4 spp.)
- Solitary



Dianthidium simile nest
(from O'Brien 2008)



Dianthidium simile

Resin bees

Anthidiellum notatum



Makes single cells attached to
plant stems

Heriades sp. – cavity-nester

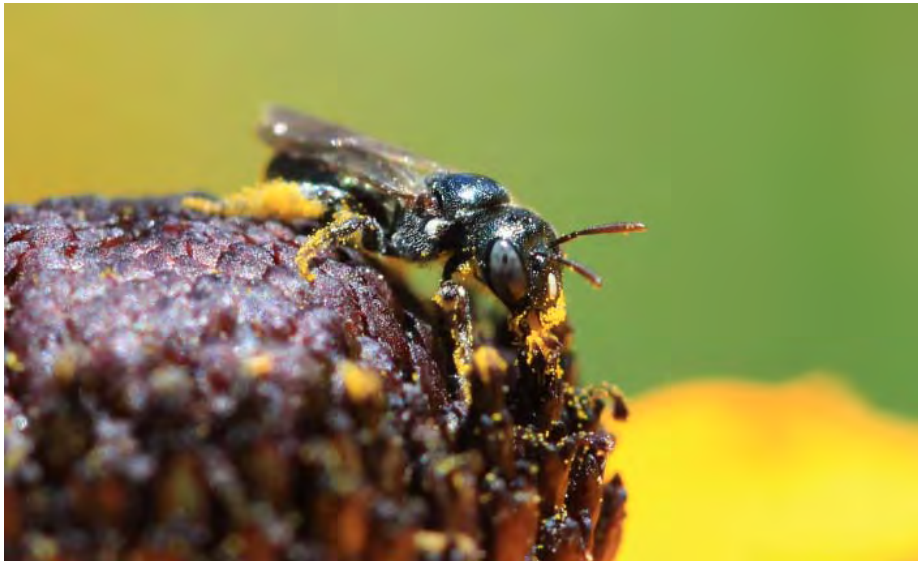
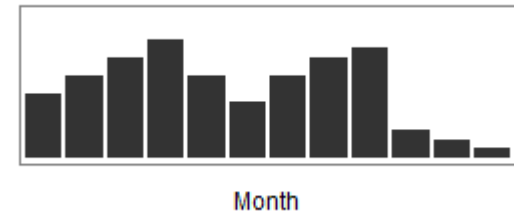


Stelis sp. – cuckoo bee



Carpenter bees, giant and dwarf

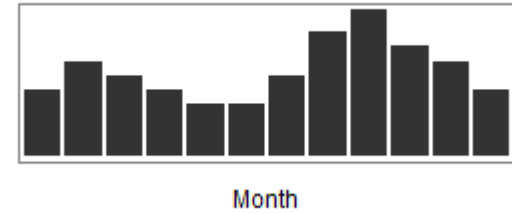
- Richness: *Xylocopa virginica*, *Ceratina* – 4 spp.
- Floral hosts: generalist
- Nests: wood or stems
- Biology: solitary/subsocial



What to plant: black berries, sumac for *Ceratina* nests

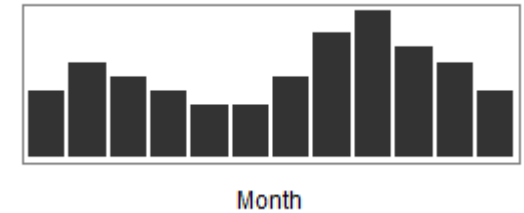
Sweat bees

- Richness: ~ 120 spp.
- Floral hosts: generalist, few specialists
- Nests: mostly ground, few in rotting wood
- Biology: solitary/communal/social



Green sweat bees

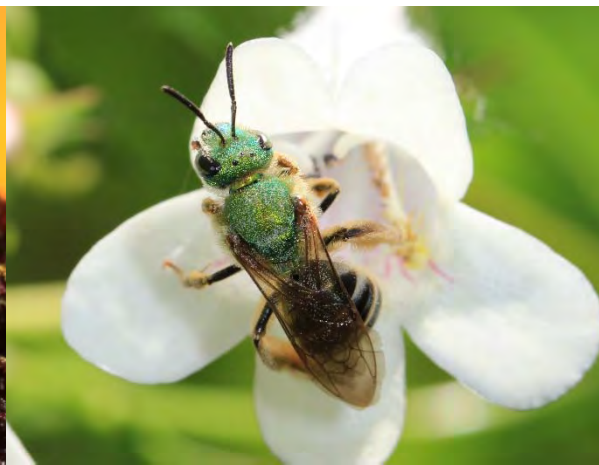
- Richness: 8 spp.
- Floral hosts: generalist – plant a diversity of flowers!
- Nests: mostly ground, *Augochlora* in rotting wood
- Biology: solitary/communal/social
- Genera: *Agapostemon*, *Augochora*, *Augochlorella*, *Augochloropsis*



Augochlora pura - solitary, wood nester



Augochlora aurata – social, ground-nester



Agapostemon virescens – communal, ground nester



Agapostemon male

Dark sweat bees

- Richness: 88 spp.
- Floral hosts: generalist, few specialists
- Nests: mostly ground, a few in rotting wood
- Biology: solitary/communal/social/social parasites
- Genera: *Halictus* (4 spp.), *Lasioglossum* (84 spp.)



Social parasite



What to plant: willows, composites (pretty much anything!)



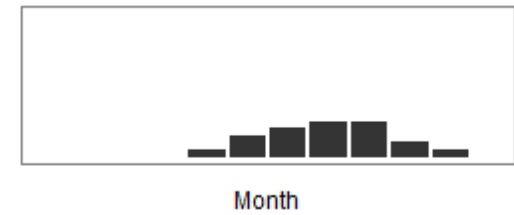
The evening primrose sweat bee

- New record for Michigan
- Matinal/crepuscular
- Specialist on *Oenothera*



Giant sweat bee *Dieunomia*

Specialist on Asteraceae (especially *Helianthus*)

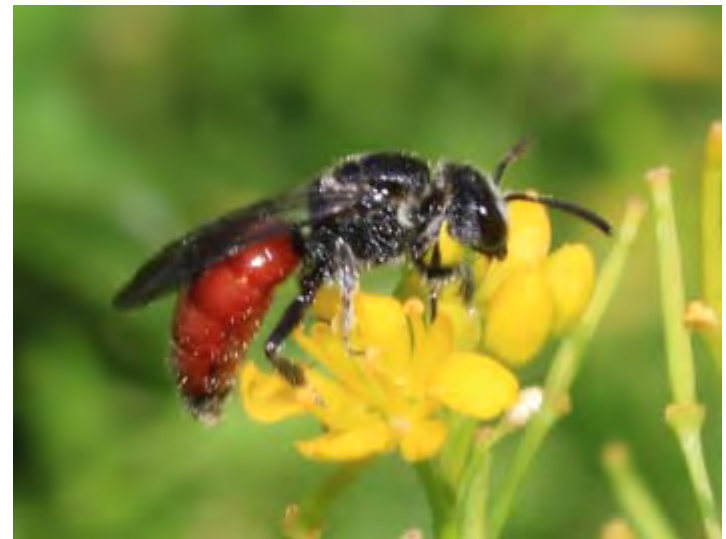
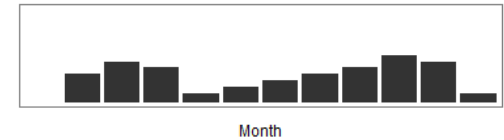


Sweat bee nest



Cuckoo sweat bees - *Sphecodes*

- Richness: 20 spp.
- Floral hosts: visit for nectar only
- Biology: cleptoparasites



Oil collector – *Macropis nuda* (Melittidae)

- Specialist on wetland plant *Lysimachia* (yellow loosestrife)
- Oil-collecting
- Last seen in MI in 1940's

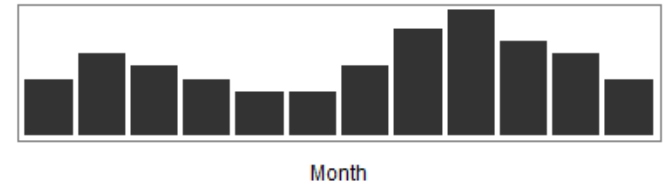


- Cleptoparasite *Epeoloides pilosula* (Apidae)
- Of particular conservation interest



Bumble bees - *Bombus*

- Richness: ~ 19 spp.
- Floral hosts: generalist
- Nests: rodent burrows, bunch grass, cavities
- Biology: social/social parasites
- What to plant: bee balm, golden rod, penstemon, vicia, composites, lobelia, baptisia, etc. – need bloom from April to October



Bumble bee life cycle

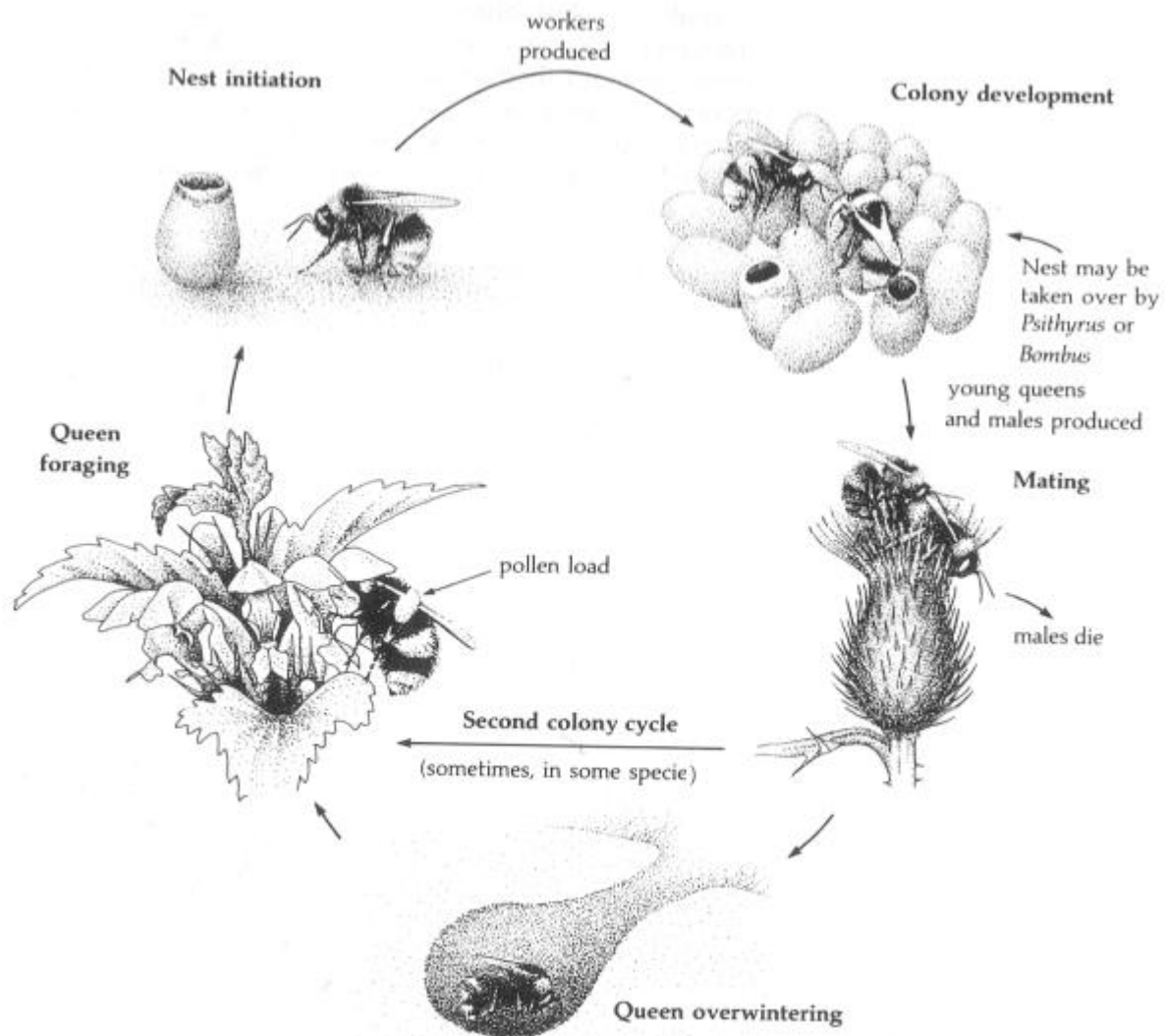


Figure from Prys-Jones & Corbet 1987

Common bumble bees



Bombus auricomus



Bombus bimaculatus



Bombus borealis



Bombus citrinus



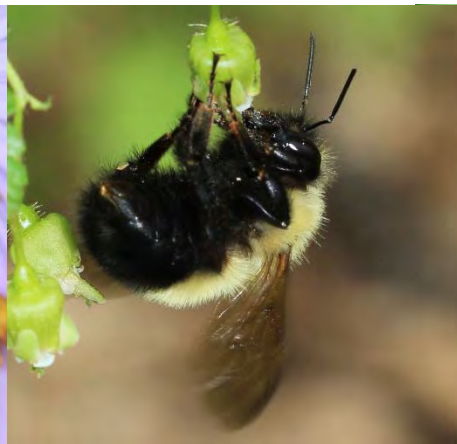
Bombus fervidus



Bombus griseocollis



Bombus impatiens



Bombus perplexus



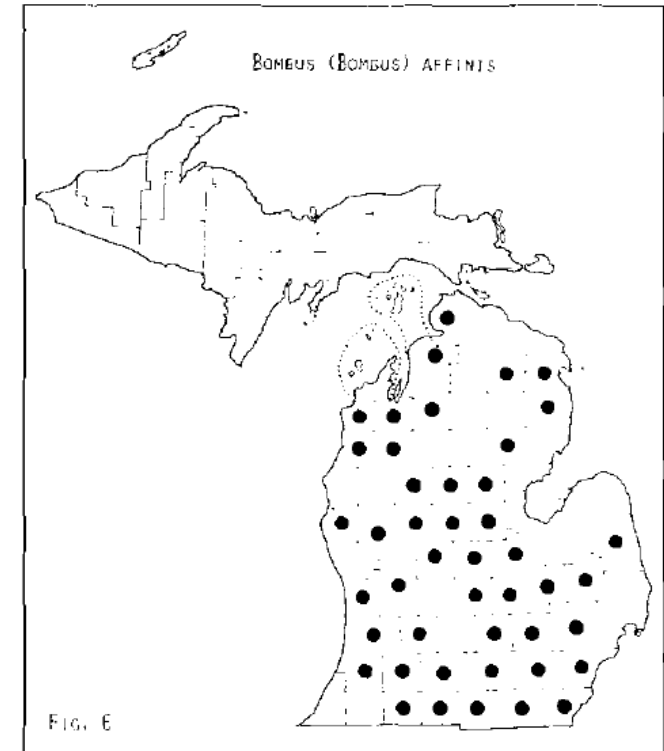
Bombus vagans

Native bee declines

Rusty-patched bumble bee

Bombus affinis

- in severe decline
- not seen in MI since 1999
- still present in WI, MN, IL, ON



Bumble bee watch

Bumble Bee Watch

Welcome, dialctus | My profile | Logout

Home About Record a Sighting Bumble Bee Species Map Gallery Explore Data Resources Sign Up

Northern amber bumble bee *Bombus borealis*

Delete | Edit



Photo by Jason Gibbs



Michigan
2015-06-27
by Jason Gibbs

Floral host
Vicia

Sex
Female

Comments

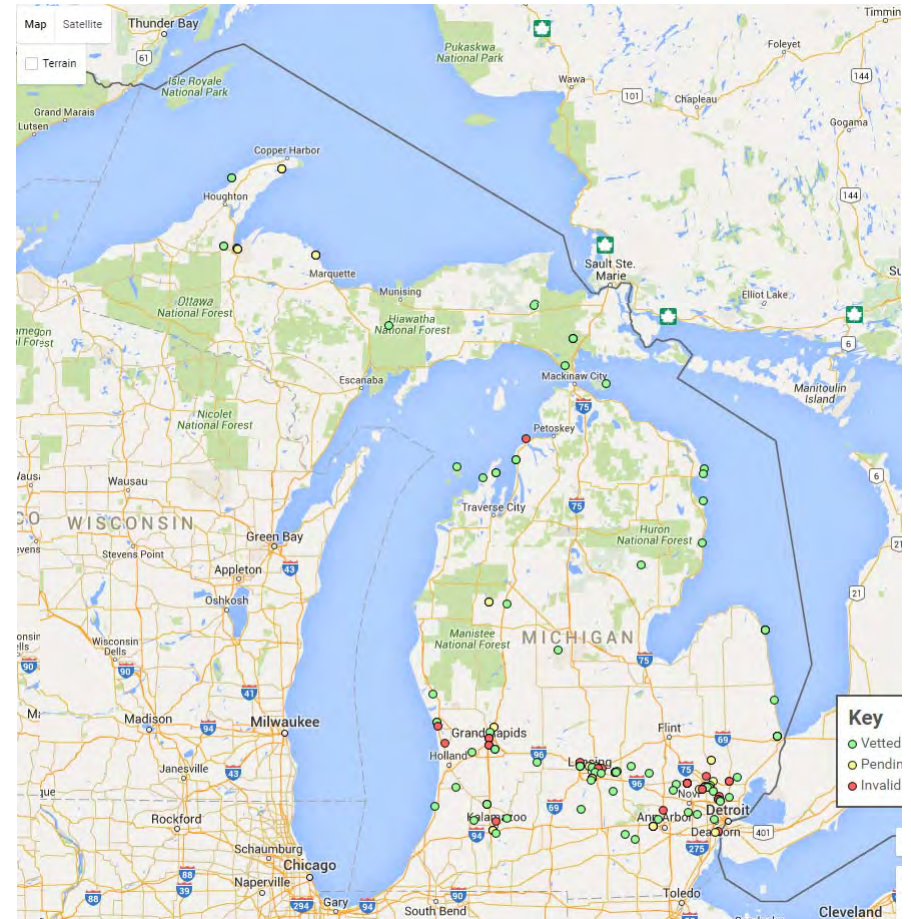
Comments

sheila_colla 2015-06-30 14:38:10

Thank you!

Citizen science projects

Bumble bee watch: bumblebeewatch.org



Bumble bee watch

bumblebeewatch.org

- 1) Add photo
- 2) Pick location from map
- 3) Provide date
- 4) Floral record
- 5) Other notes?
- 6) Permission to display
- 7) Use guide to guess ID
- 8) Wait for verification



Add Photos

**You must submit at least 1 photo, and may include up to 3. However, you can only upload one photo at a time. After your first photo has uploaded, repeat the process to add additional photo(s) - up to a total of 3.
-PNG, GIF, JPG images only, maximum size is 5MB for each photo

No file chosen



Bombus_perplexus_male.jpg

[Delete](#)

Location

To pinpoint your sighting location, use the map, or search for an address below. You can place a pin, or change its location by clicking on the map. Coordinates will appear automatically.



Site name:*

Latitude:*

Longitude:*

How accurate is this location (in meters):*

Date of Sighting:*

Floral Host

What flower was the bumble bee visiting? (Leave blank if you are not sure)

Observation Notes

Include any observations or comments you'd like to include (e.g. what type of habitat, how many other individuals did you see, etc.):

Photo Permission*

#

By checking this box you agree that the photo(s) you are including were taken by you or that you have permission of the copyright owner to upload them to Bumble Bee Watch.

If the photo(s) were not taken by you, please list the name of the photographer for attribution:

Bumble Bee Identification Guide

This is an identification guide to help you determine the species of bumble bee in your photo. This guide will only work for females, and is not comprehensive as there are many additional color forms, and many look alike species. See this page for more information about bumble bee anatomy. To use the ID guide, compare your photo(s) on the left to the illustrations and select the features of each body part that most closely match the features on the bee in your photograph. Once you have chosen the correct features, choose a matching species. For more help with this identification guide, watch this video. Bumble bee illustrations: Paul Williams (identification and color patterns) and Elaine Evans (bee body design).



Mouse your cursor over your photo to see more detail.

Identification Guide

Face:

Yellow face

Black face

Not Sure

Thorax:

Bombus pennsylvanicus

Bombus perplexus

Bombus perplexus

Bombus rubrostris

Closing points



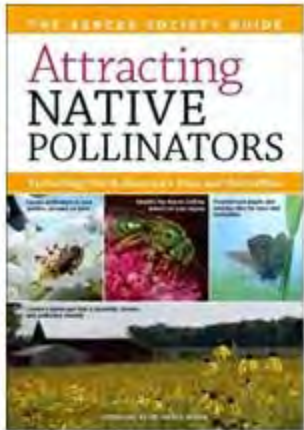
Bees in Michigan are diverse (> 450 species)

Bees could use our help:

- 1) Feed them: plant flowers
- 2) House them: bare soil and bee hotels
- 3) Don't kill them: limit and avoid pesticides

Take pictures! and have fun watching them.

Additional resources



Your local beekeeper groups



Koppert Biologicals for bumble bees
www.koppertonline.com

MSU Native Plants Website:
www.nativeplants.msu.edu

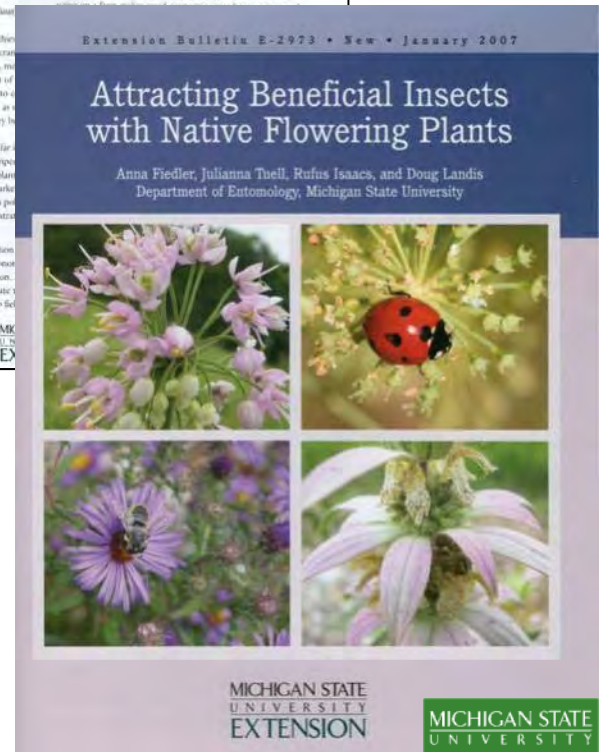
Xerces Society - Farming for Bees
www.xerces.org



USDA – NRCS and FSA Programs to pay for bee conservation practices

MSU Extension Publications

E2985



E2973

Additional resources

MSU Extension Publications

E3314



MSU Extension bulletin E3314

By David Smitley, Michigan State University Department of Entomology; Diane Brown and Erwin Elsner, Michigan State University Extension; Joy N. Landis, Michigan State University IPM; Paula M. Shrewsbury, University of Maryland Department of Entomology; and Daniel A. Herms, The Ohio State University Department of Entomology

Introduction

For the past 30 years or more, most tree care professionals, landscapers, urban foresters and many informed property owners have been managing destructive insects by minimizing pesticide use and encouraging predators and parasites that naturally keep pests under control. This approach is referred to as Integrated Pest Management (IPM), and it includes using Best Management Practices (BMP) for preserving beneficial insects. In most states, landscape professionals must attend educational classes on pesticide safety and best management practices to receive their pesticide applicator license, a requirement for purchasing restricted use pesticides. Minimizing pesticide use along with implementing other IPM practices protects water resources from pesticide runoff, minimizes the exposure of people, pets and wildlife to pesticides, and provides stable long-term pest control instead of the frequent boom and bust pest cycles associated with preventive use of broad-spectrum pesticides.

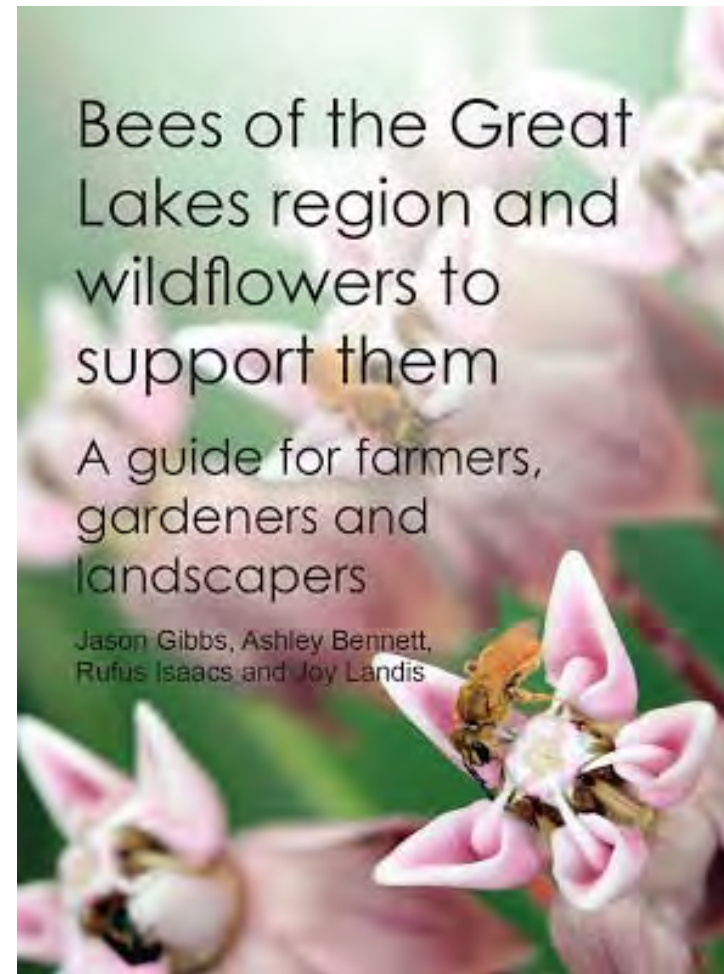
The primary reason tree care professionals and property owners use pesticides is because of the devastating impact of invasive pests from Europe and Asia. Invasive pests multiply and sometimes completely destroy species of North American plants for two reasons: (1) our North American plants may lack

natural defenses (resistance) to invasive pests from Europe or Asia, and (2) invasive pests populations may build rapidly because we do not have the right predators and parasitoids to control them as in their native habitat.

Emerald ash borer, Japanese beetle and hemlock wooly adelgid are currently some of our most destructive invasive insects. Homeowners, business property owners and cities sometimes choose to use a pesticide to protect roses, ash, hemlock and other trees and shrubs susceptible to invasive insects. However, when insecticides are used for invasive pests, they may impact pollinators and other beneficial insects and mites, including predators and parasitoids that keep plant pests under control. This publication is designed to provide best management practices for protecting a few valuable plants from invasive pests while minimizing the impact on pollinators and beneficial insects. Note: When using any pesticide mentioned in this bulletin, read the label instructions and be sure the product is registered for use in the state where it is being used.

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E3282



Bees of the Great Lakes region and wildflowers to support them

A guide for farmers, gardeners and landscapers

Jason Gibbs, Ashley Bennett, Rufus Isaacs and Joy Landis

QUESTIONS?

