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

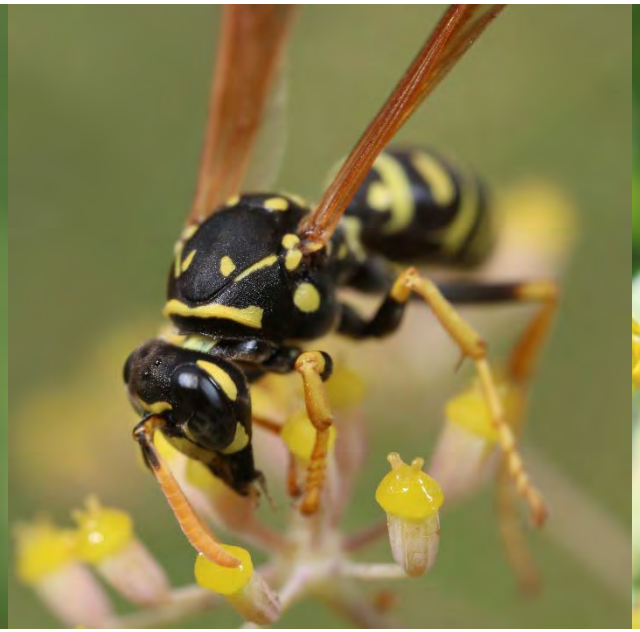
Jason Gibbs
Department of Entomology
Michigan State University

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

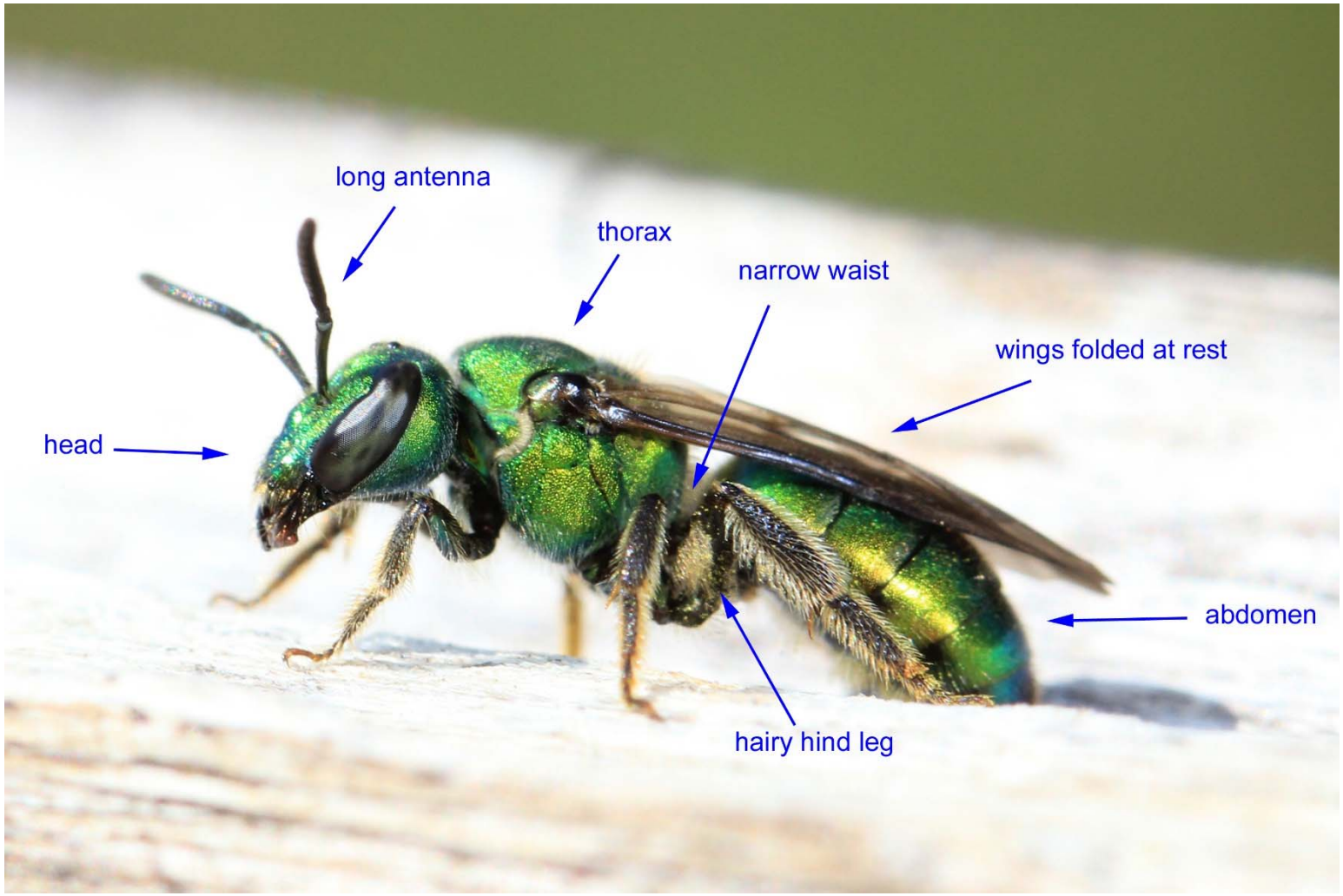
Wasps:

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

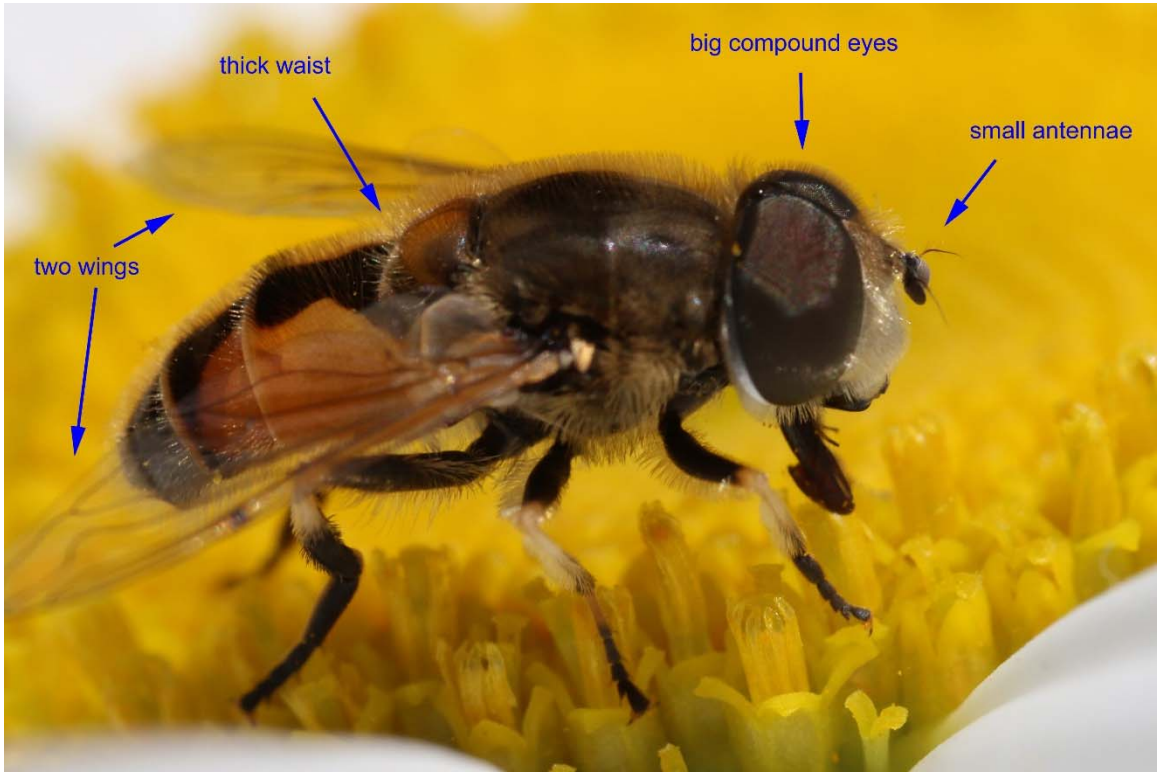
Characteristics of wasps

Similar to bees, except:

1) bodies less hairy;
2) don’t carry pollen

More wasps

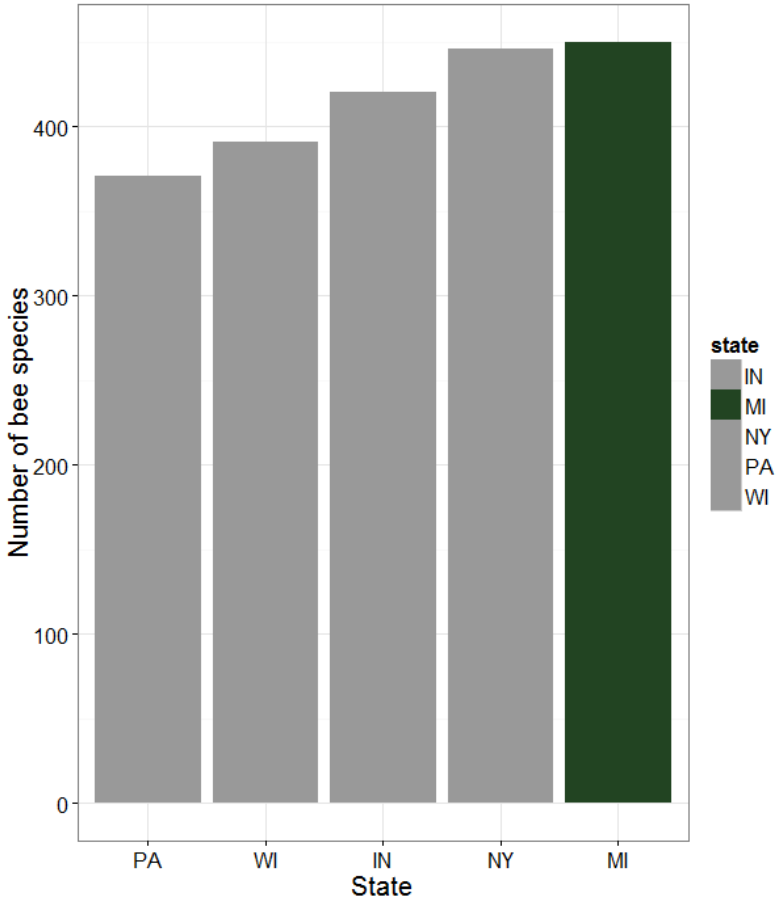
Characteristics of flies



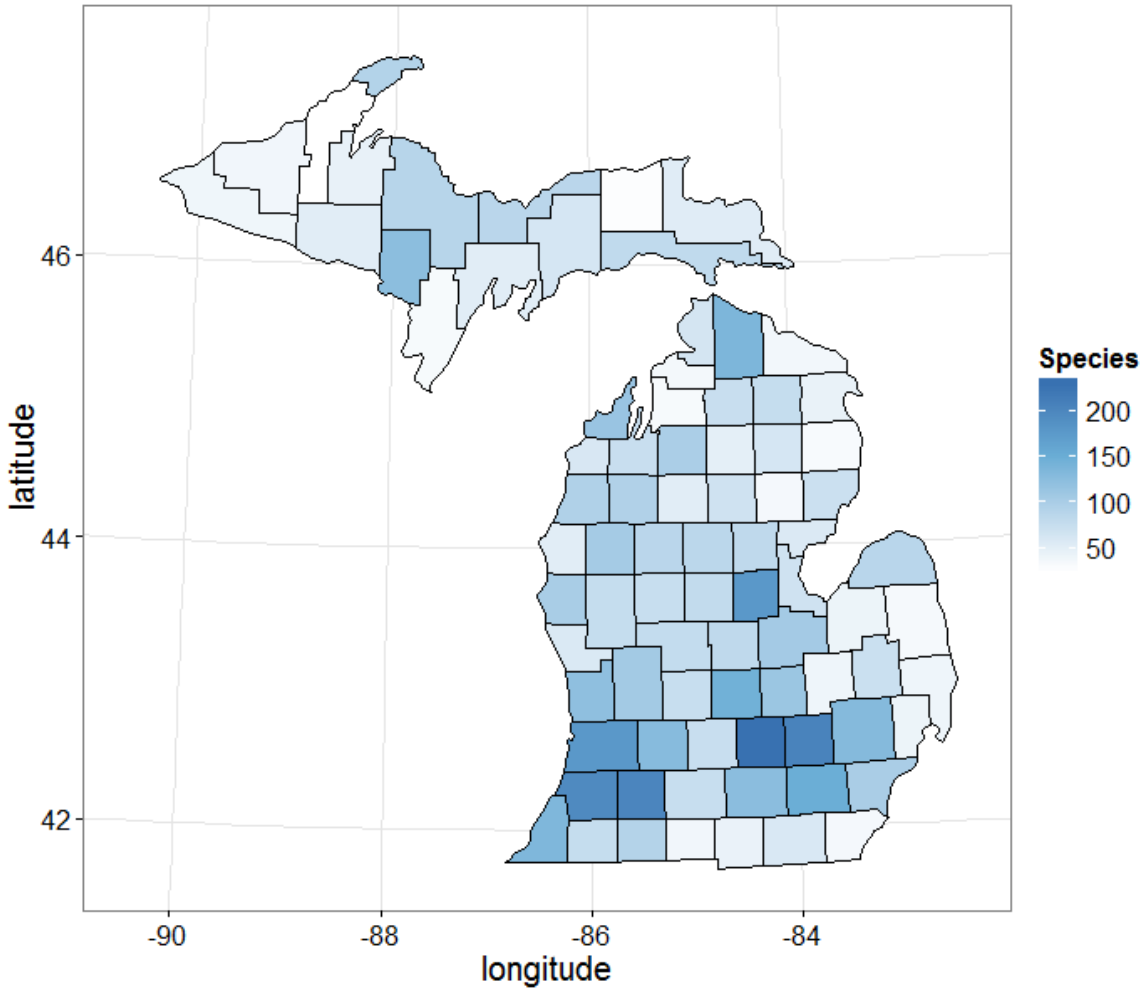
Flies: wasp and bee mimics

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  (R. Jean unpublished data)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)



Bees of Michigan
Most counties poorly sampled



How can I support pollinators in my garden?

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

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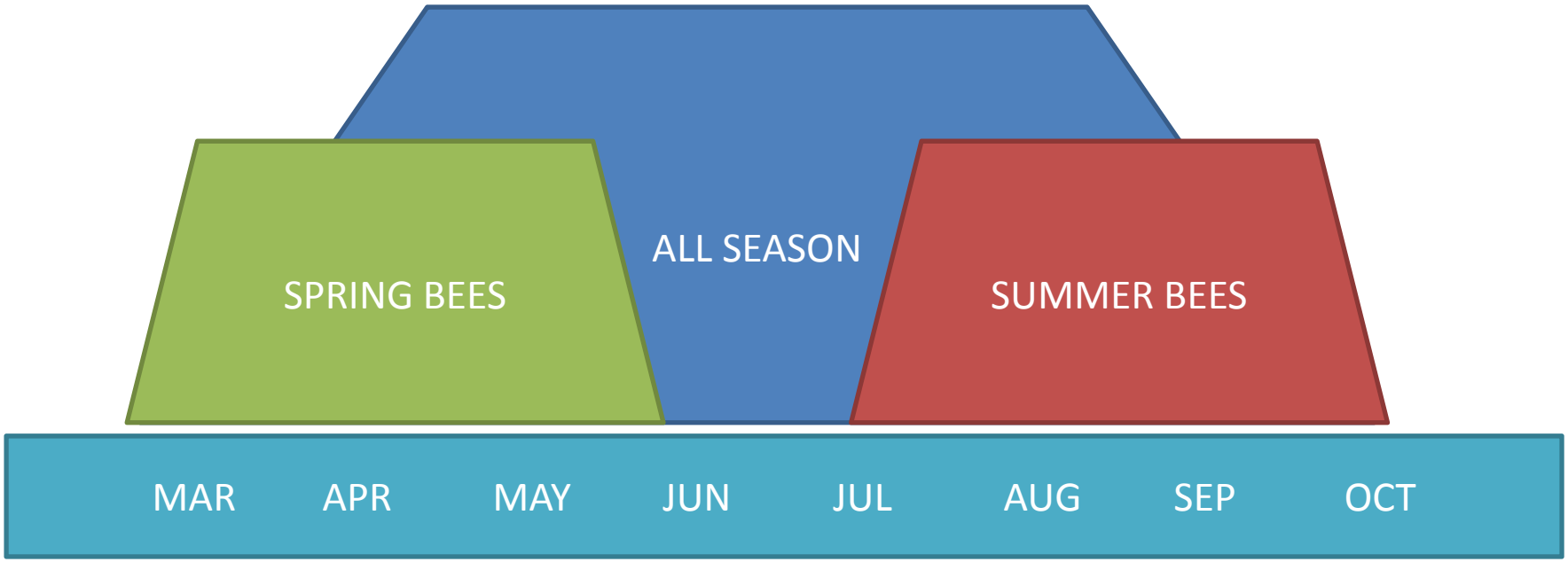
Bees of Michigan - Phenology



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

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www.nativeplants.msu.edu

Tuell et al. 2008

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

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Homes for cavity nesting bees

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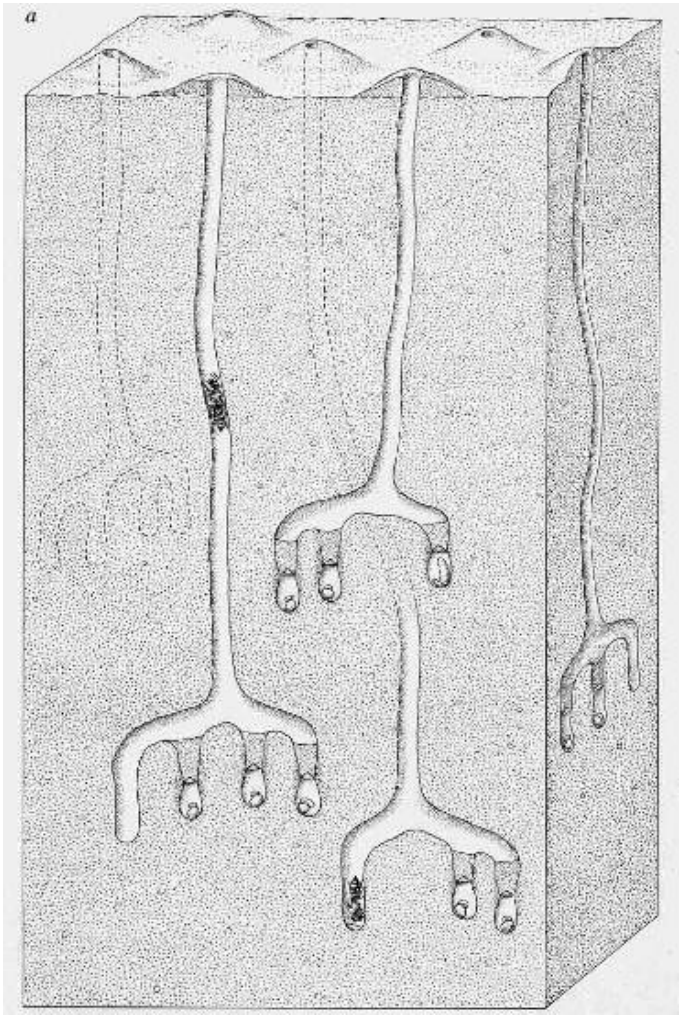
Homes for cavity nesting bees

Homes for cavity nesting bees

Most bees nest in the ground

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

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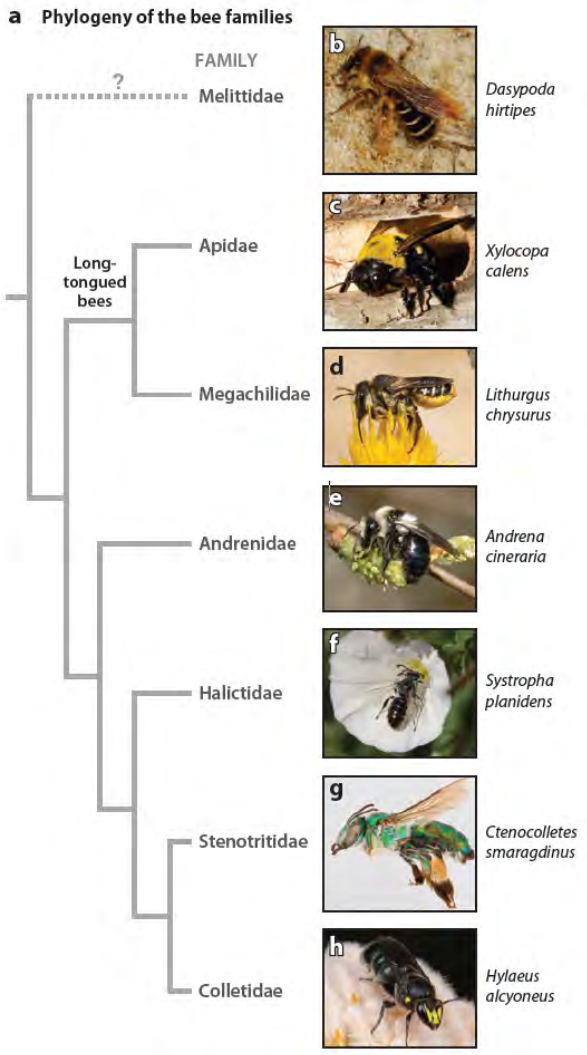
Soil nesting habitat: bee spirals

URBANbees

Bees of Michigan: The families

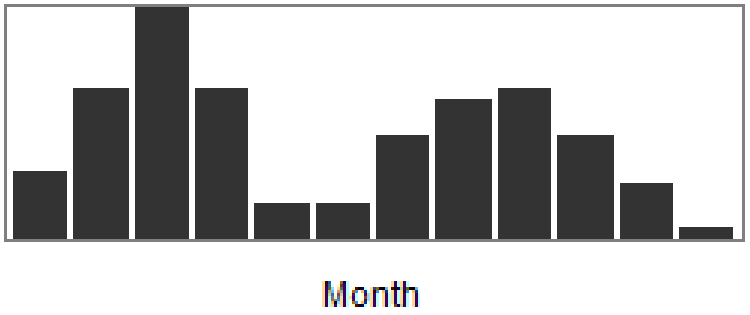
- Bee families in Michigan
  - Andrenidae
    - (e.g., miner bees)
  - Apidae
    - (e.g., honey bees, bumble bees, carpenter bees, squash bees)
  - Colletidae
    - (e.g., cellophane bees)
  - Halictidae
    - (sweat bees)
  - Megachilidae
    - (e.g., leaf-cutter bees, mason bees)
  - Melittidae
 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



Danforth et al. 2013

Miner bees – *Andrena* spp.

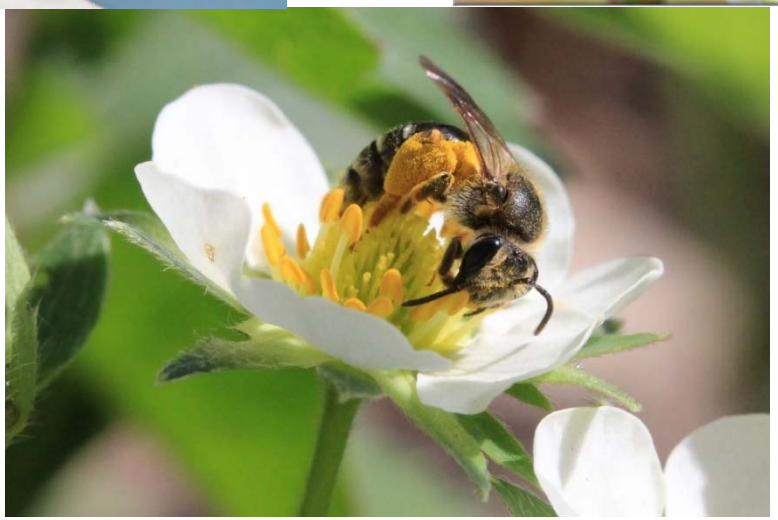
- Richness: ~ 90 spp.
- Floral hosts: generalist & specialists
- Nests: ground
- Biology: solitary



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.

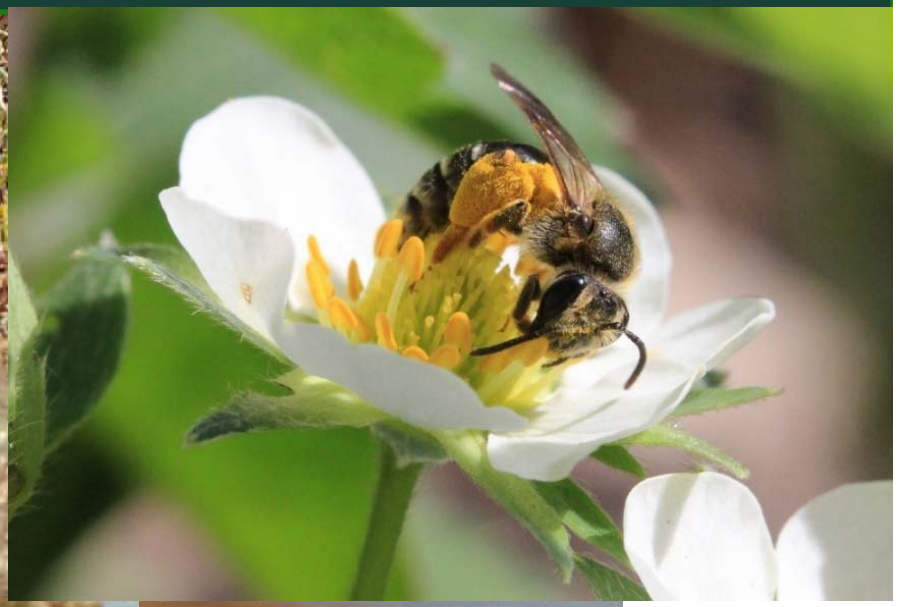
- Important crop pollinators
  - (e.g. apples, cherries, blueberries, strawberries



Digger bee nest

Photos by Zach Portman

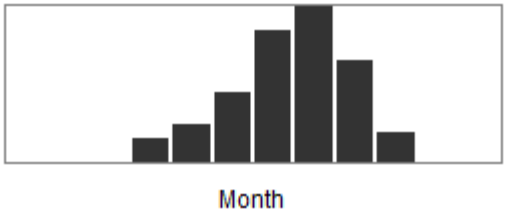
Miner bee nests



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)

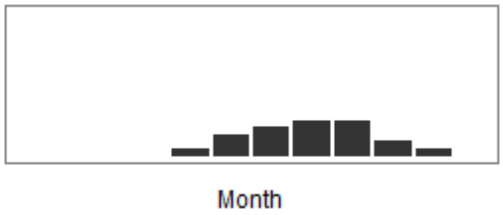
Pseudopanurgus andrenoides (specialist)

Slide 33

GJ1 Gibbs, Jason, 1/18/2016

Miner bee relatives – panurgine bees

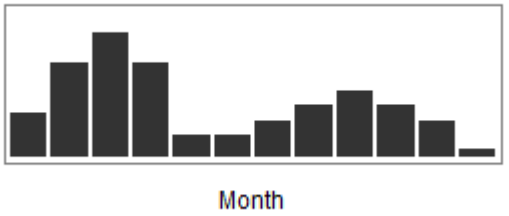
- Richness: *Perdita* 7 spp.
- Floral hosts: specialists
- Nests: ground
- Biology: solitary/communal



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

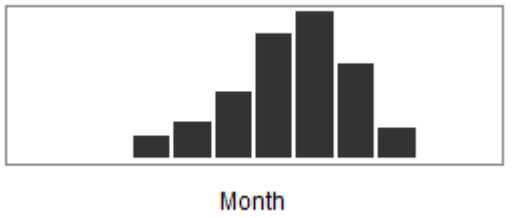
What to plant: willows, red maple, goldenrod, boneset, nodding onion
Also specialists of: purple prairie clover, blueberry, heuchera

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

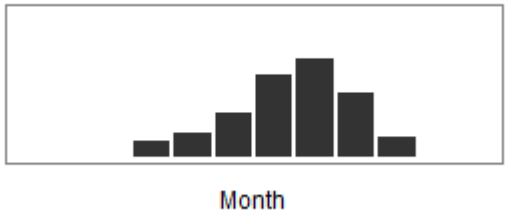


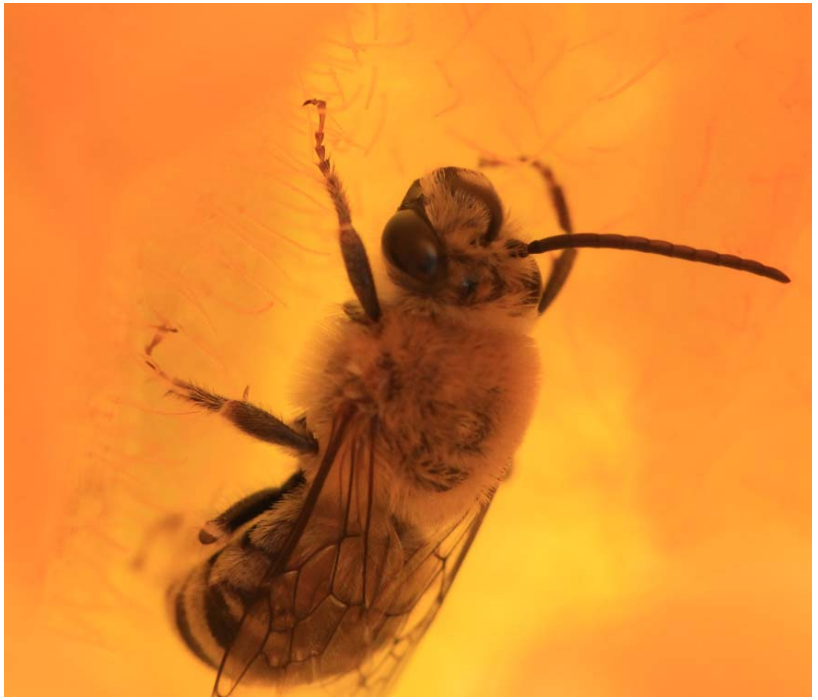
What to plant: sunflower, black eyed susan, coreopsis, cone flower, ironweed, thistle

Melissodes, long-horned bees

Squash bees – *Peponapis pruinosa*

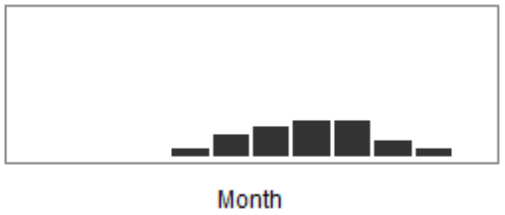
- Richness: 1 sp.
- Floral hosts: specialist (cucurbits)
- Nests: ground
- Biology: solitary
- Unique: males sleep in flowers





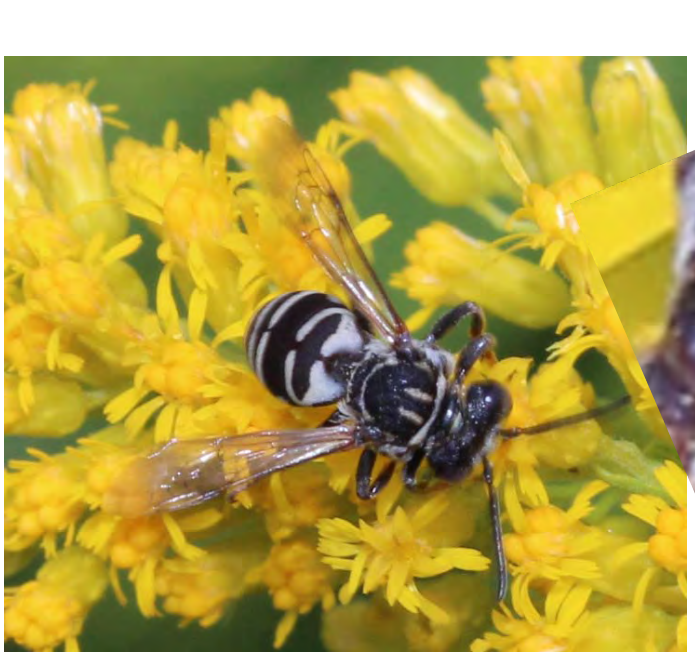
Epeoline cuckoo bees

- *Triepeolus* – 8 spp.
- parasites of apids like *Melissodes*



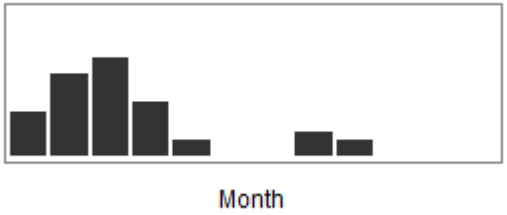
- *Epeolus* – 10 spp.
- parasites of *Colletes*

- “smiley face bees”



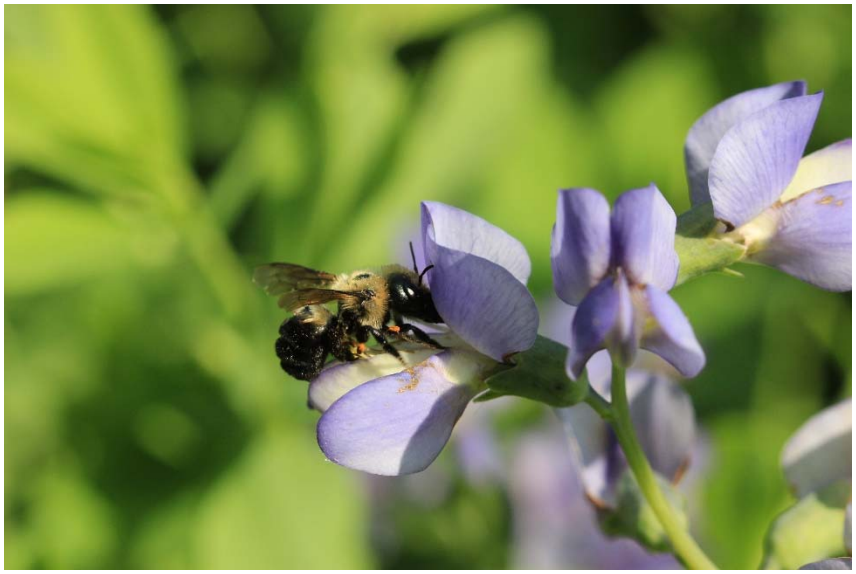
Mason bees – *Osmia*

- 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)

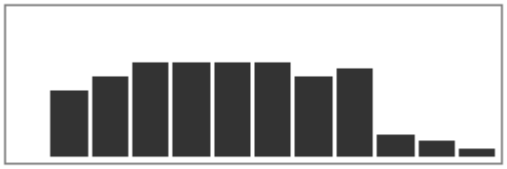
  - Caught 1 male at Kellogg Bird Sanctuary, 16 April 2016
  - Closest records are from Pennsylvania, New York, West Virginia

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

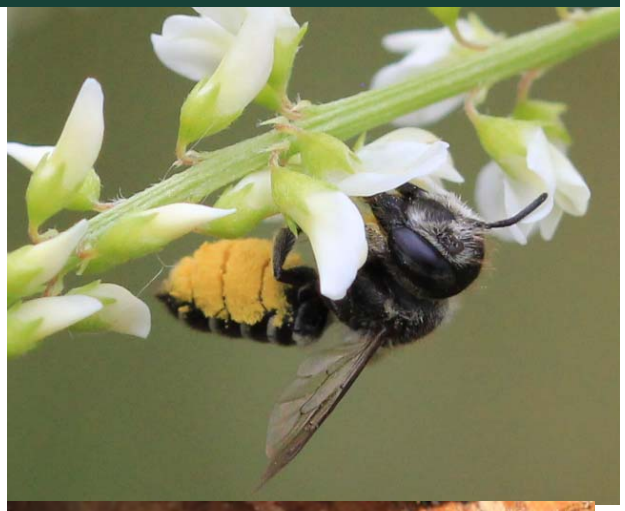


Chelostoma philadelphi

Hoplitis sp.

Leaf-cutter bees

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



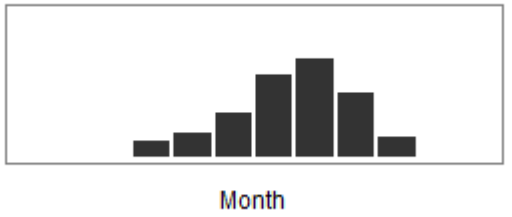
What to plant: milkweeds, baptisia, joe pye weed, Asteraceae, Fabaceae
Also specialists of: composites, campanula

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*



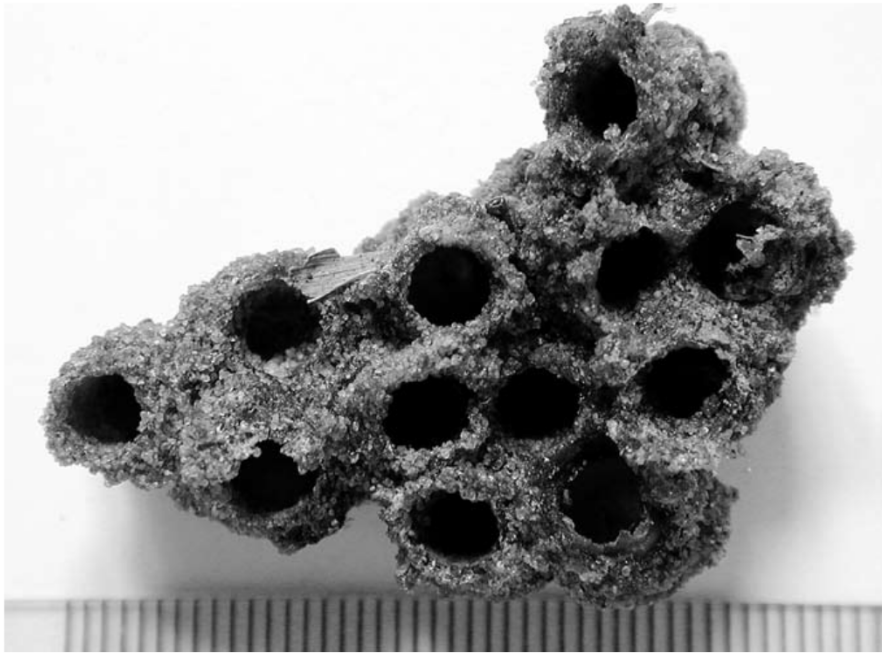
Wool-carder bees - *Anthidium*

- 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



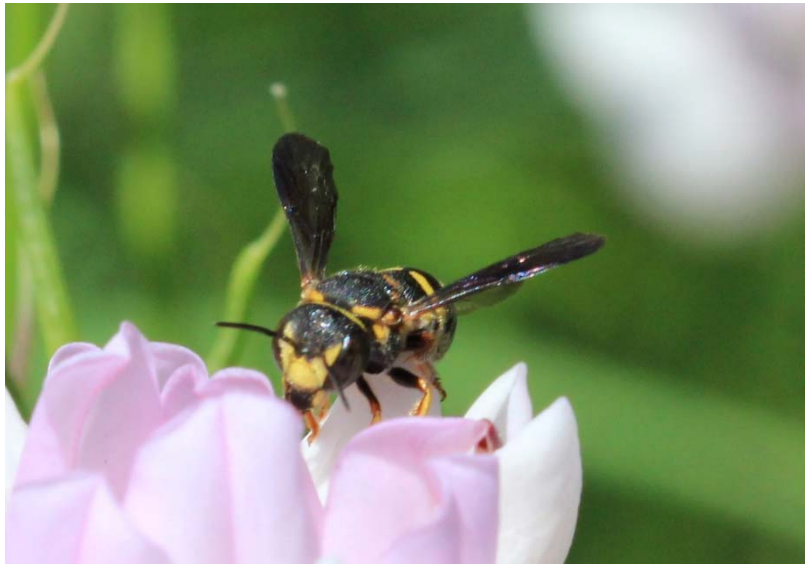
Dianthidium simile nest
(from O'Brien 2008)

Dianthidium simile

Resin bees

Heriades sp. – cavity-nester

Anthidiellum notatum

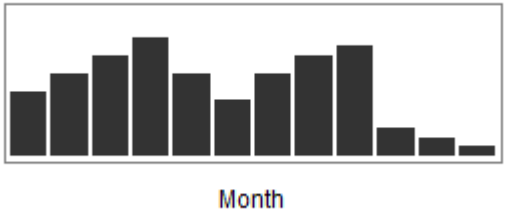


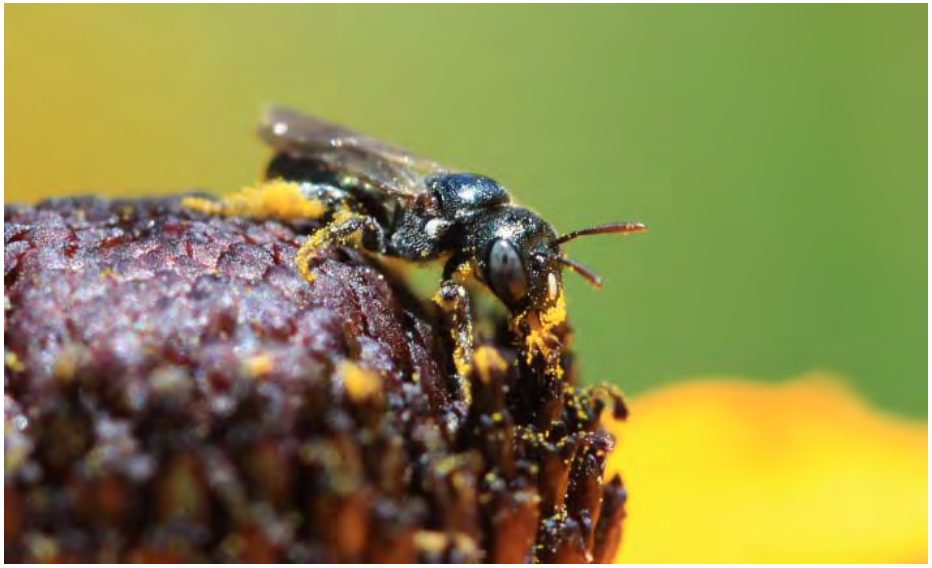
Makes single cells attached to plant stems

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

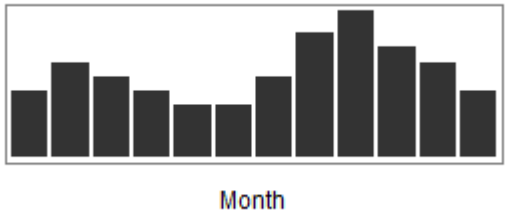




What to plant: black berries, sumac for *Ceratina* nests

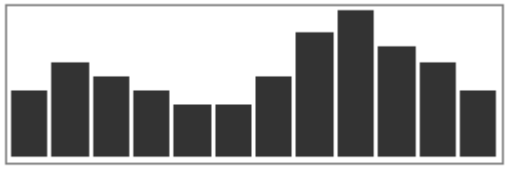
Sweat bees

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



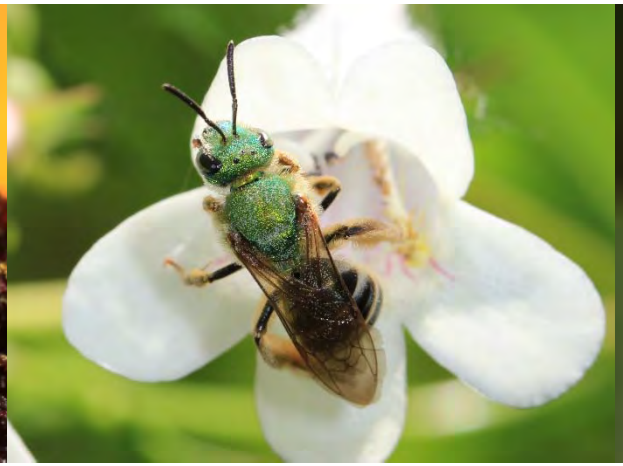
Green sweat bees

- 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



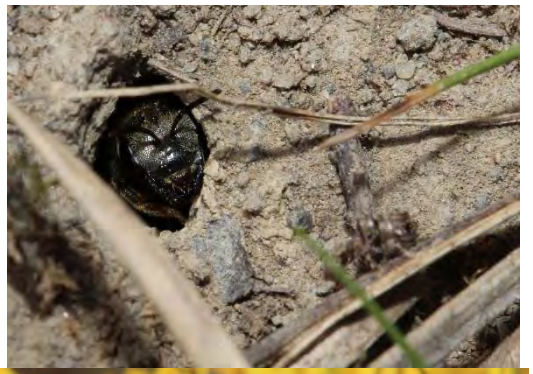
Agapostemon virescens – communal, ground nester

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



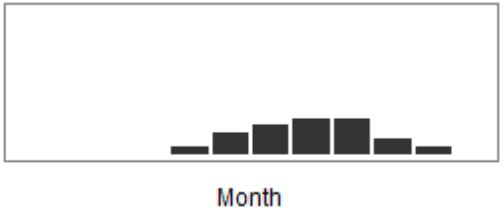
What to plant: willows, composites (pretty much anything!)

The evening primrose sweat bee

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

Giant sweat bee *Dieunomia*

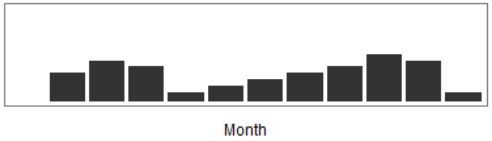
Specialist on Asteraceae (especially *Helianthus*)



Sweat bee nest

Cuckoo sweat bees - *Sphecodes*

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



Oil collector – *Macropis nuda* (Melittidae)

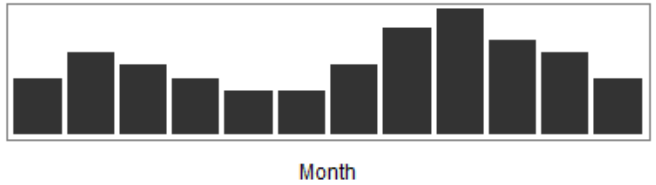
- Specialist on wetland plant *Lysimachia* (yellow loosestrife)
- Oil-collecting
- Last seen in MI in 1940's

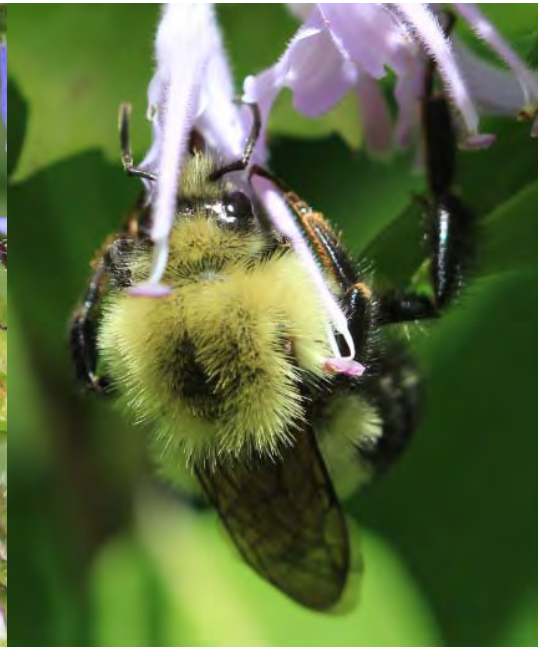
- Cleptoparasite *Epeoloides pilosula* (Apidae)
- Of particular conservation interest

Images by Cory Sheffield

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

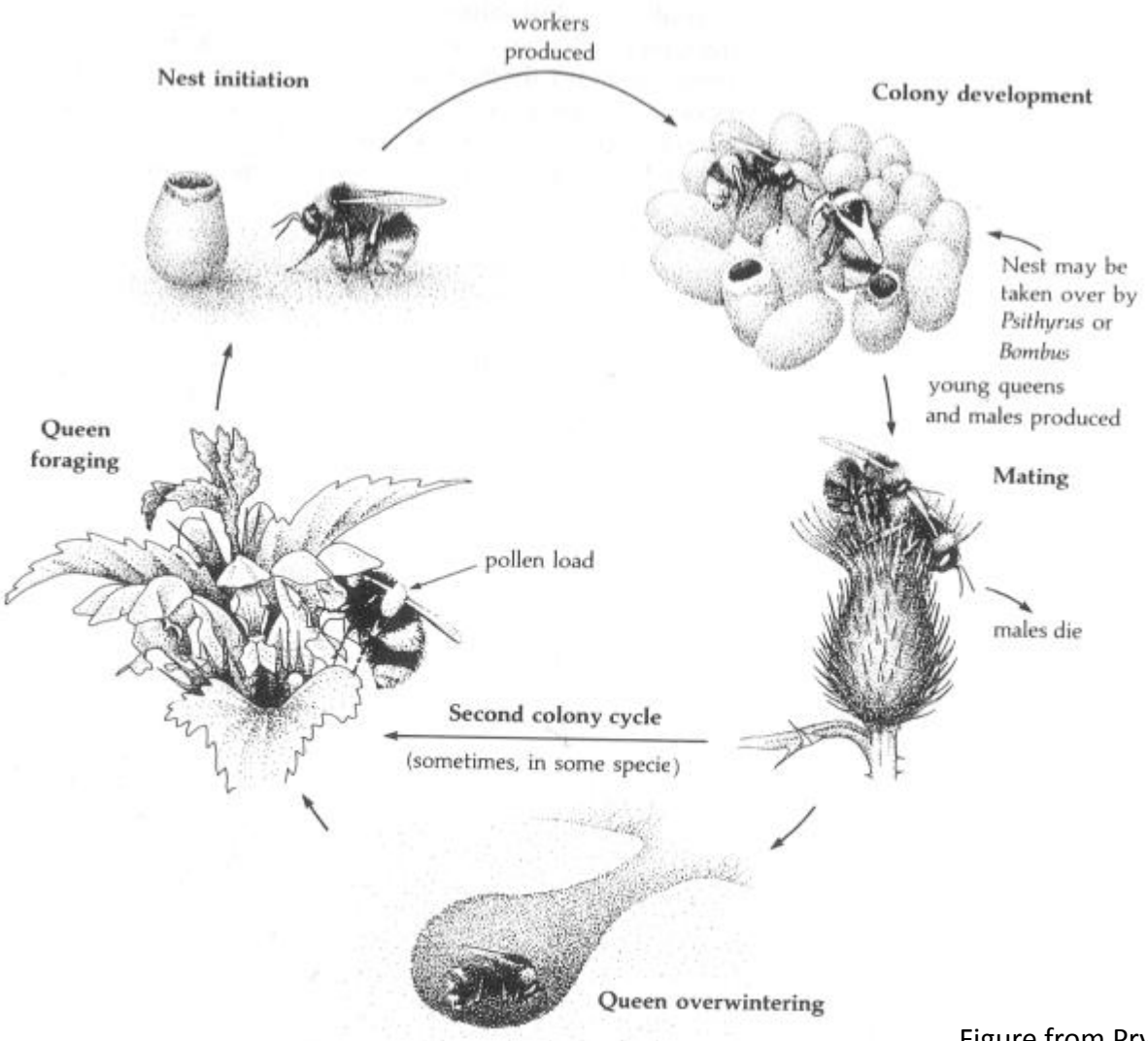


Figure from Prys-Jones & Corbet 1987

Common bumble bees

Bombus auricomus

Bombus bimaculatus

Bombus borealis

Bombus citrinus

Bombus fervidus

Bombus griseocollis

Bombus impatiens

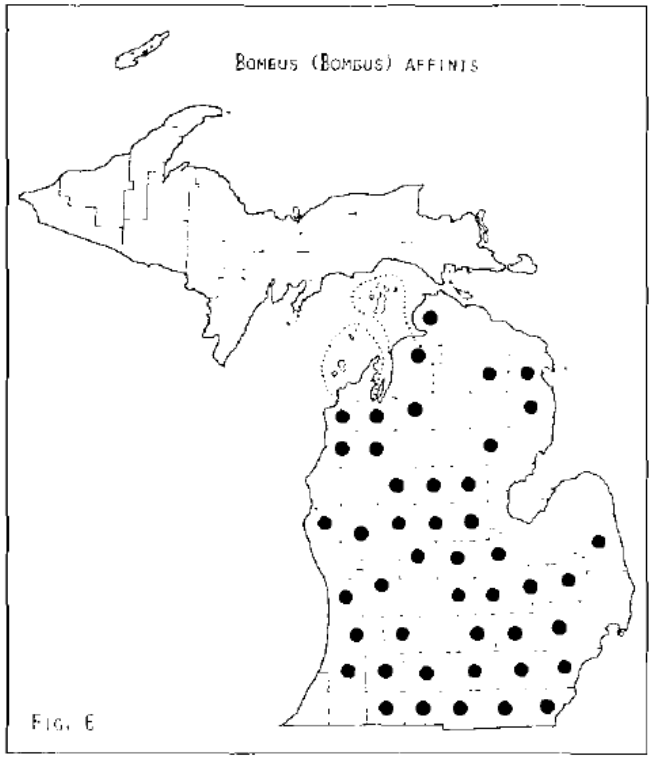
Bombus perplexus

Bombus vagans

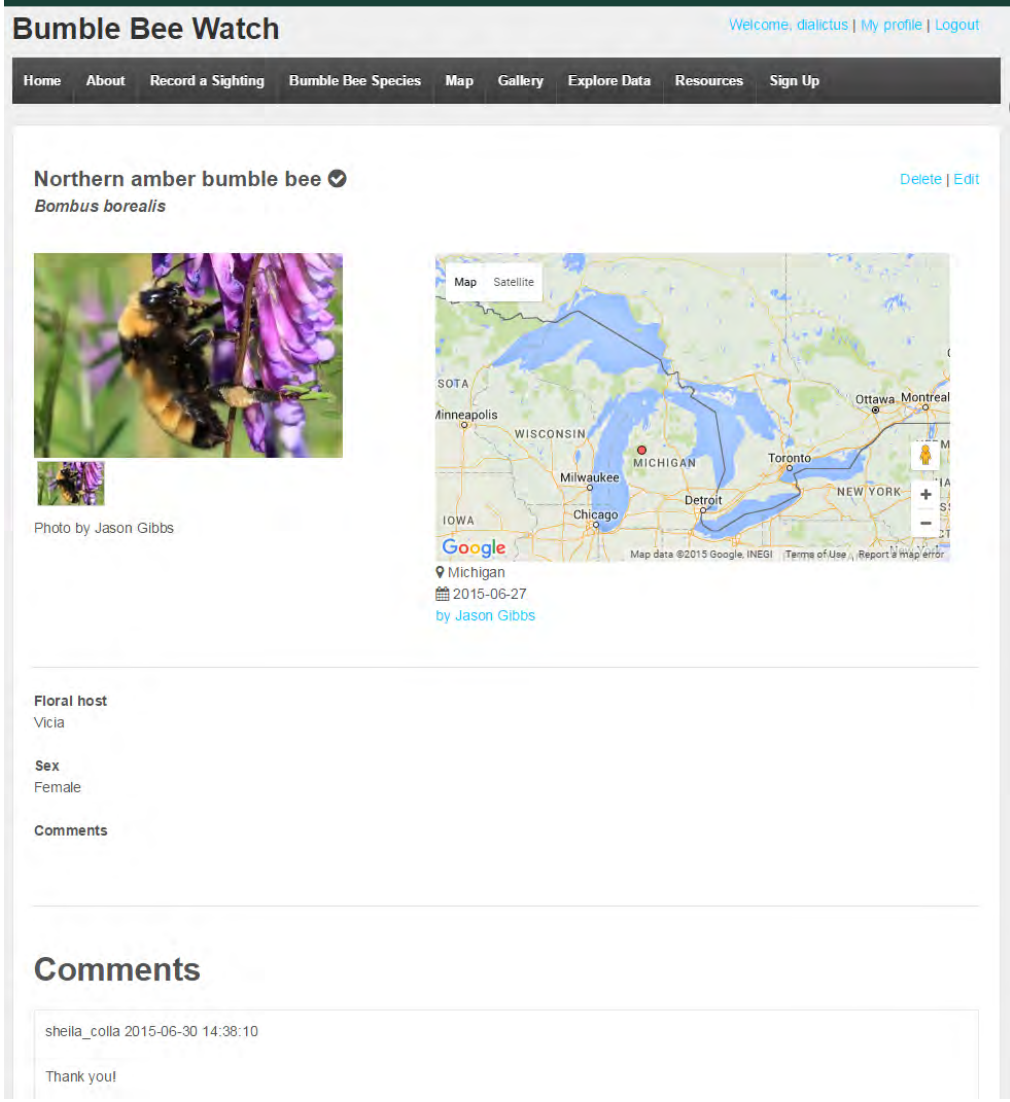
Native bee declines
Rusty-patched bumble bee

Bombus affinis

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

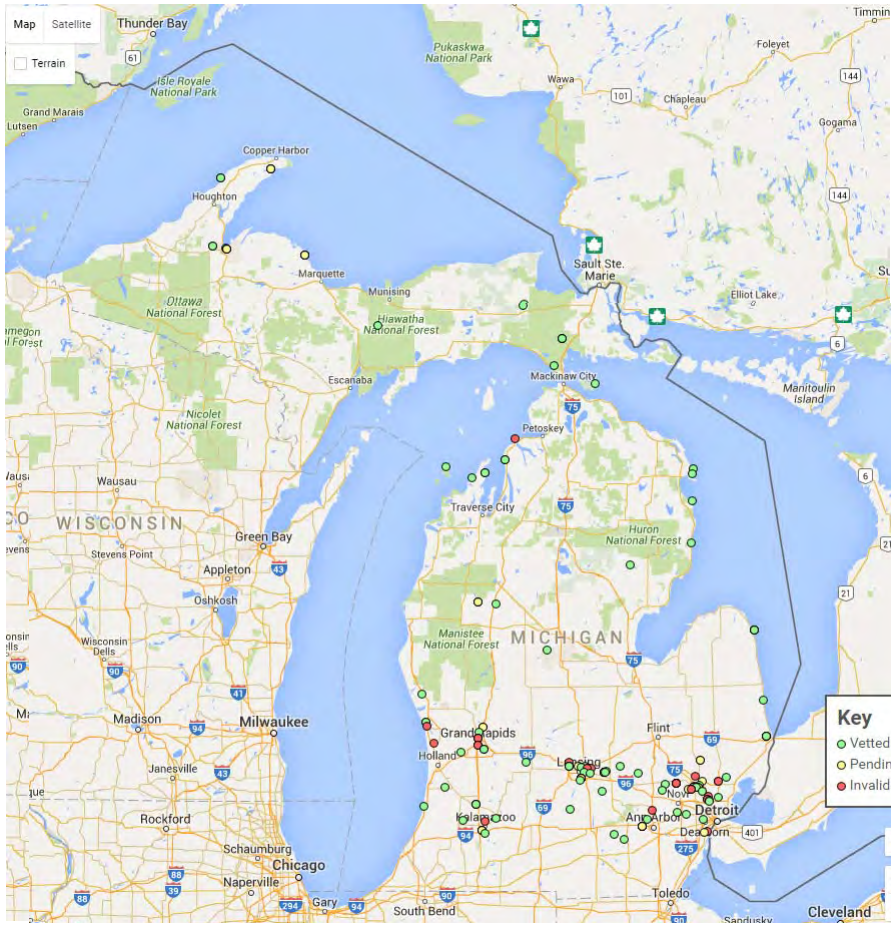


Bumble bee watch



Citizen science projects

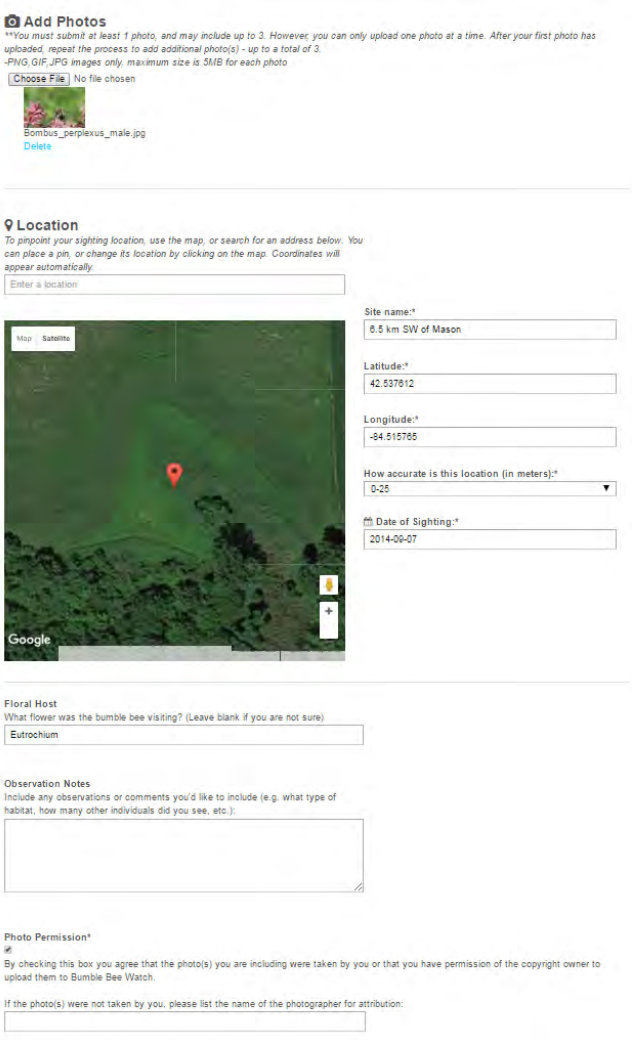
Bumble bee watch: bumblebeewatch.org

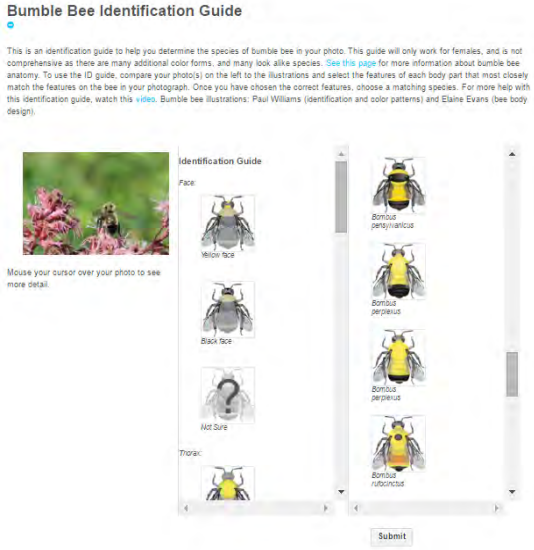


Bumble bee watch

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





Closing points

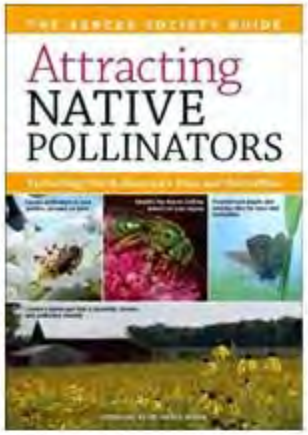
Bees in Michigan are diverse (> 450 species)

Bees could use our help:

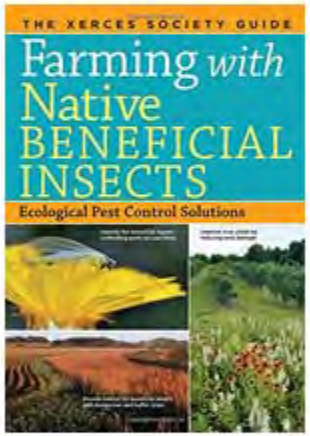
1) Feed them: plant flowers
2) House them: bare soil and bee hotels
3) Don’t kill them: limit and avoid pesticides

Take pictures! and have fun watching them.

Additional resources



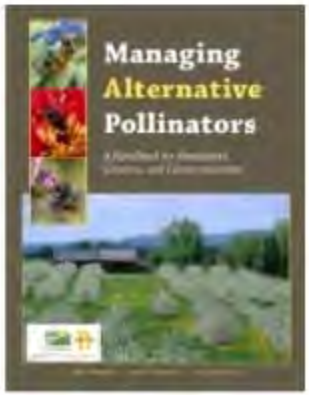
Your local beekeeper groups



Koppert Biologicals for bumble bees
www.koppertonline.com

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

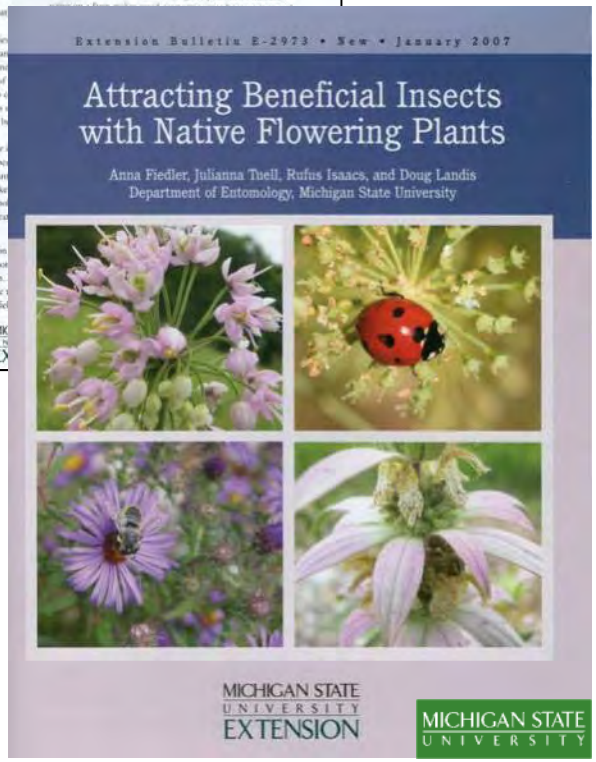
Xerces Society - Farming for Bees
www.xerces.org



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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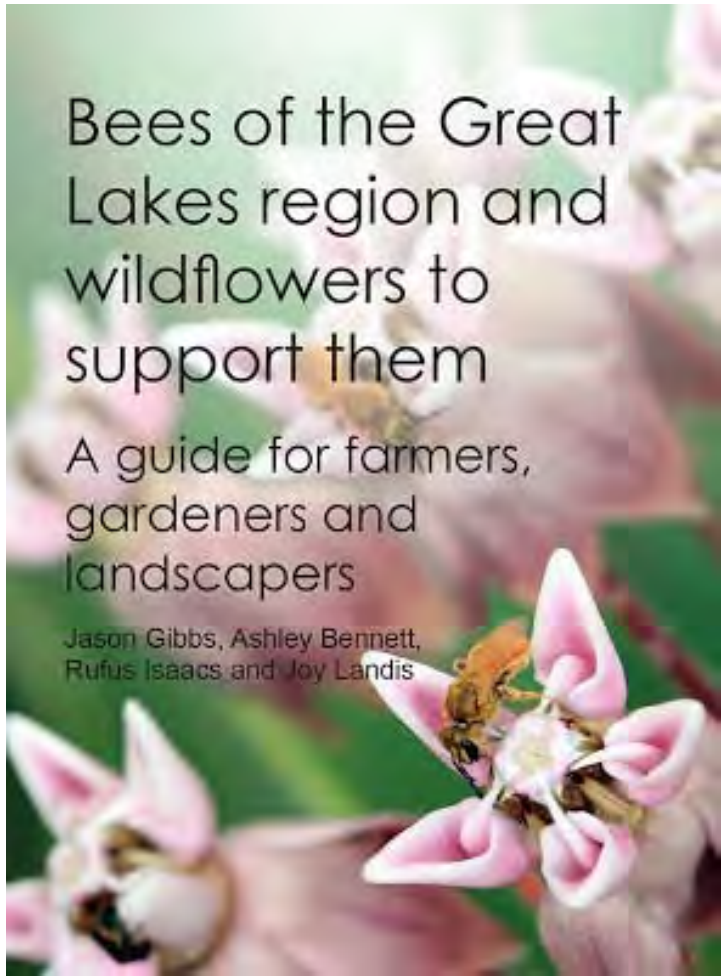

QUESTIONS?