The Ecology and Conservation of Metro Detroit's Bees: Protecting Wild Pollinators in Your Own Backyard

Caleb Wilson

Photo: Gary Miller

A little bit about me

B.S. Environmental Sciences

M.S. Biology

What is a bee?

Bees are vegetarian wasps

Photo: Chad Eggleton

Photo: Chad Eggleton

Photos by: USGS Bee Inventory and Monitoring Lab

Photo: Joseph Ferraro

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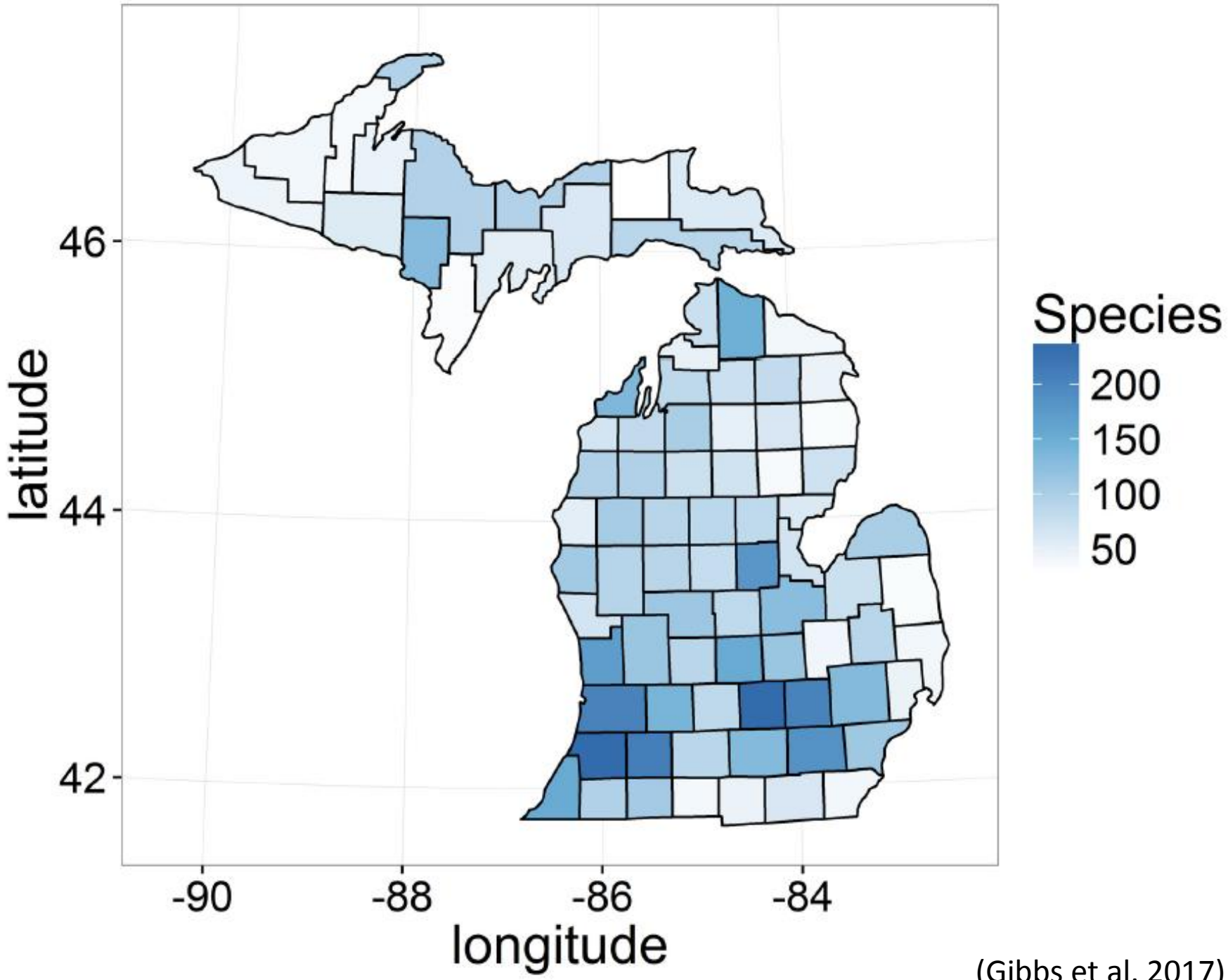
Bee Diversity

- 20,000+ species worldwide and growing
- ~4,000 species in North America
- 2,792 vertebrate species in N.A.
- 465 bee spp. in Michigan



(Gibbs et al. 2017)

Honey bees

- 1 species--(*Apis mellifera)*
- not native to North America

Bumble bees

- 20 species in MI; all native
- <50 in North America
- 250 worldwide

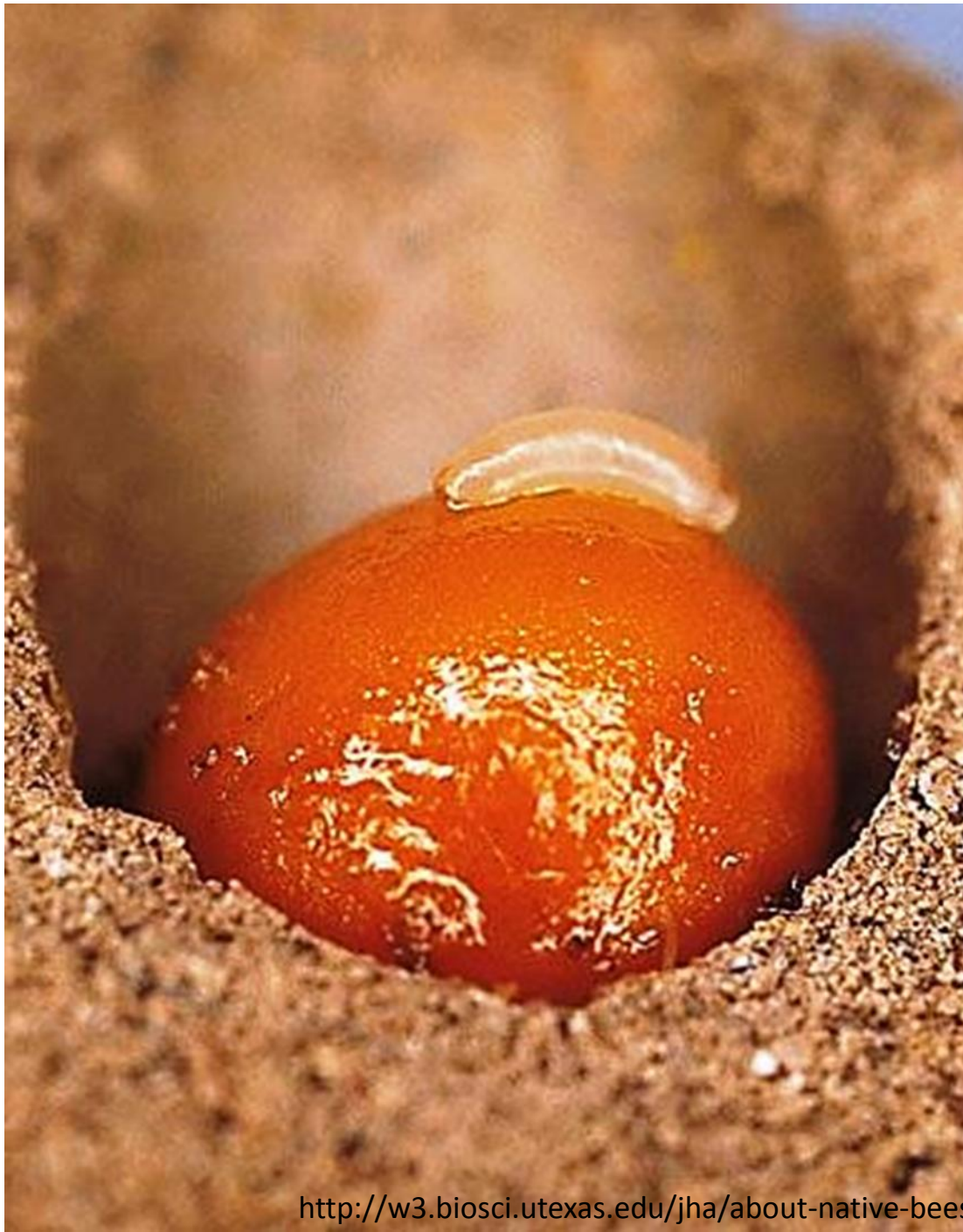
Photos: Joe Wilson

Mistaken identities

Bees	Wasps	Flies
Thorax and abdomen separated	Narrow waist; obvious separation	Thick waist; separation unclear
Robust	Skinny	In between
Very hairy	Few if any hairs	Very little hair
Four wings--folded	Four wings--parallel	two wings--folded
Stout legs; few spines	Long thin legs with spines	Thin legs; no spines
Eyes on side of head	Eyes on side of head	Eyes very large—often touching

Myth #1: All bees make honey

- Most bees **do not** produce honey
- Honey bees – 25 – 60lbs of honey per season
- Stingless bees in the tropics: very small amounts
- Bumble bees – “nectar pots”
- All others: pollen balls for eggs




https://i.ytimg.com/vi/_Mnq--ENmzU/maxresdefault.jpg

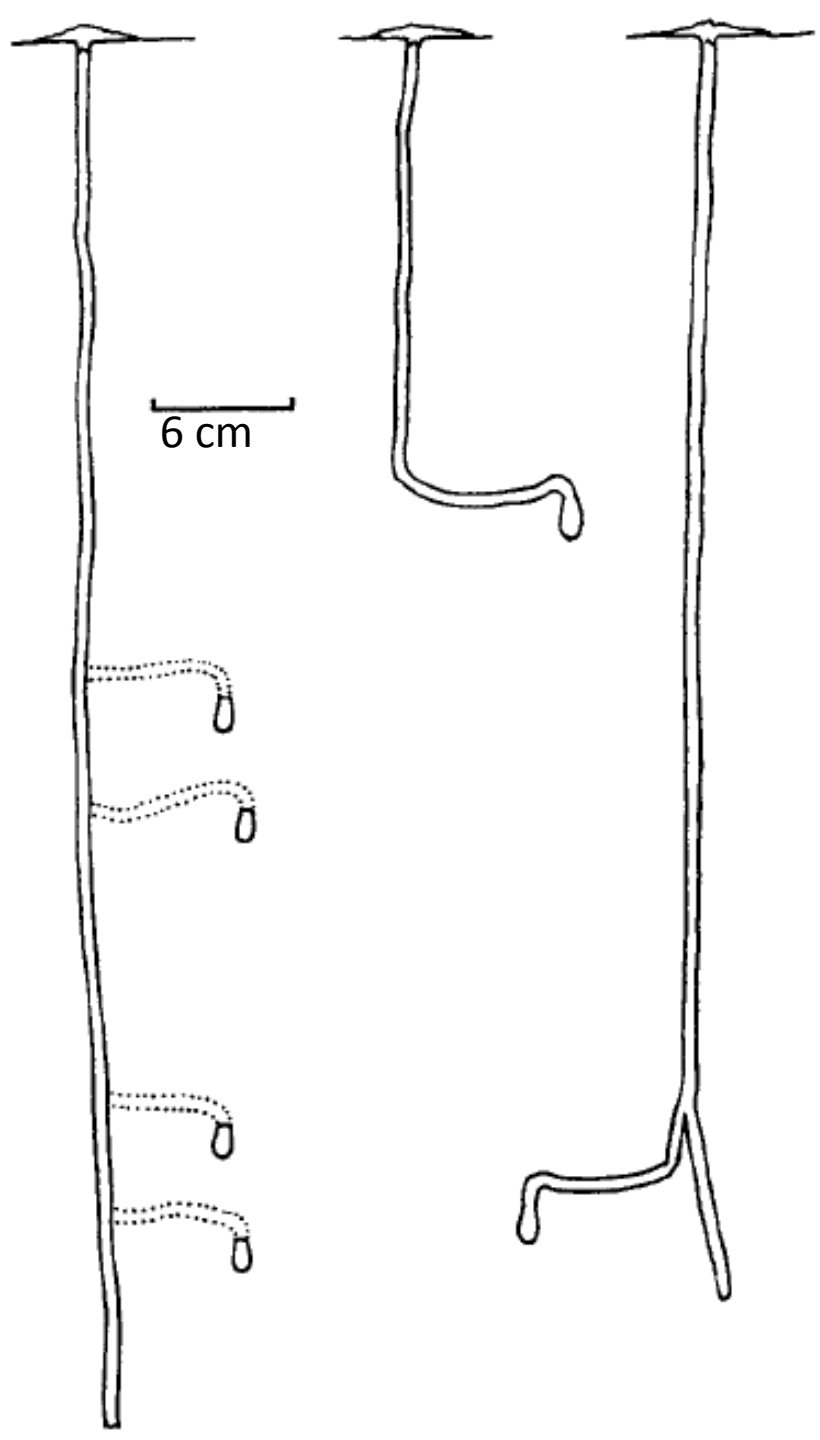
Myth #2: All bees live in hives

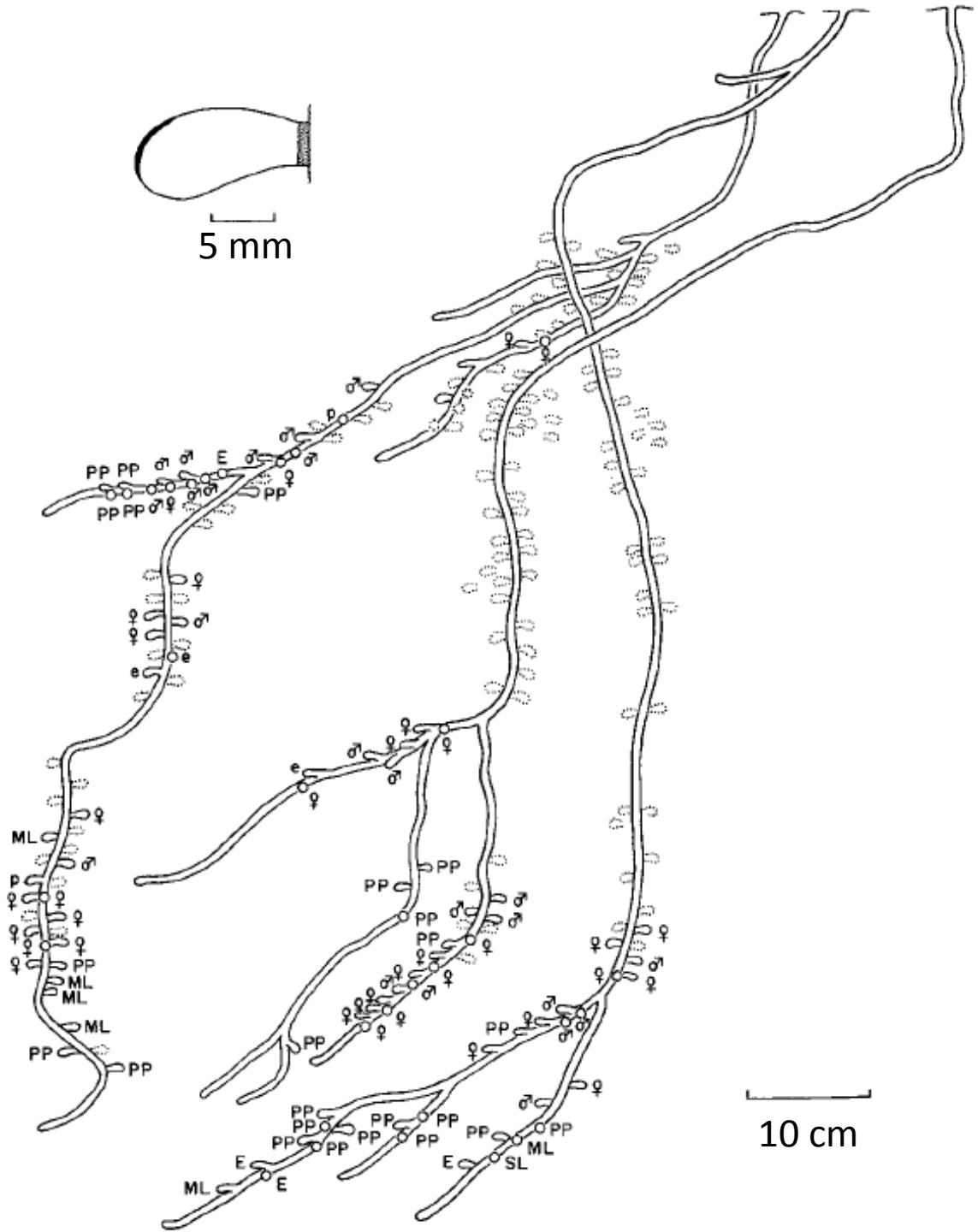
- Most bees are solitary
- ~70% of bees live in burrows
- ~30% are cavity nesters
  - Wood
  - Preexisting cavities (often lined with leaves, resin, mud, pebbles, etc.)
  - Reeds/stems of dead plants

https://bugguide.net/node/view/1089984/bgimage

http://www.bwars.com/bee/megachilidae/osmia-bicornis

https://www.ars.usda.gov/pacific-west-area/logan-ut/pollinating-insect-biology-management-systematics-research/docs/blue-orchard-bee/





(Michener 2007)

Myth #3: Bees are aggressive

Wasps = carnivorous = aggressive behavior

Bees = pollen feeding = docile (with exceptions)

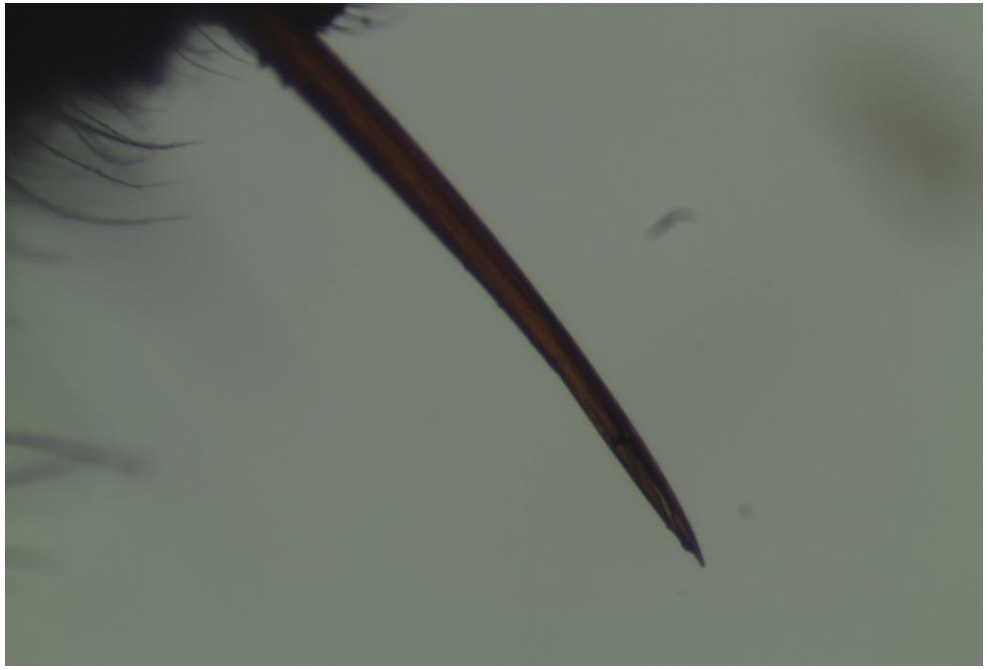
https://www.whatsthatbug.com/2013/03/31/spider-wasp-with-wolf-spider-in-australia/

Myth #4: Bees die when they sting you

Only females can sting!

Honey bee

All others



Myth #5: All bees are hardworking

- Bees have nest parasites!

Photo: Gary Miller

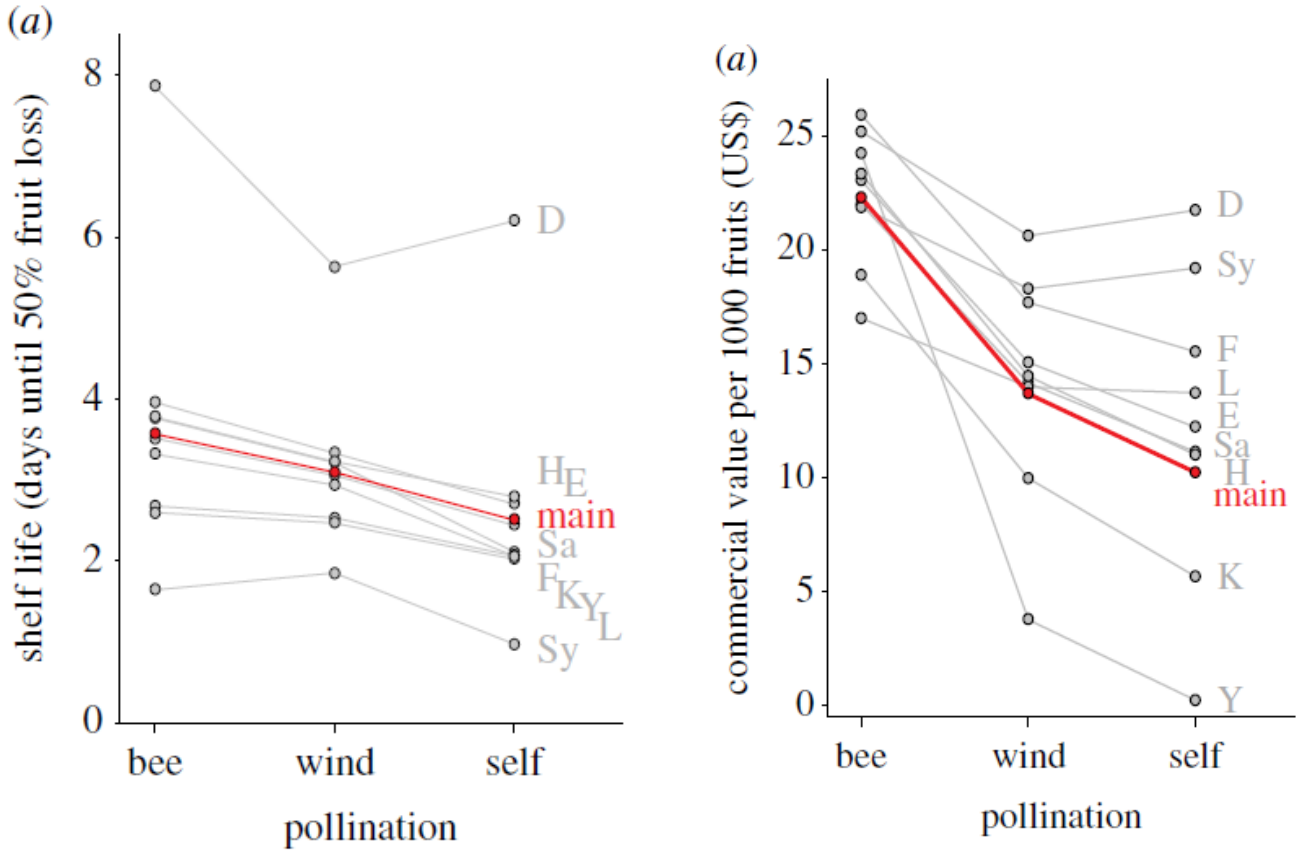
Photo: Joe Wilson

http://www.restoringthelandscape.com/2014/02/native-bee-spotlight-cuckoo-bees.html

https://commons.wikimedia.org/wiki/File:Megachile_sp._(Leafcutter_bee)_(8176838130).jpg

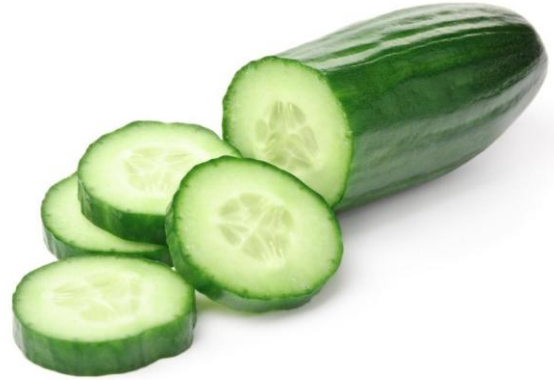
Why should we care?

- Agriculture
  - Worldwide pollinator services 215 billion dollars in food production
  - 35% of global crop production
  - Improved shelf life and fruit quality
  - Alfalfa production for raising cattle



Klatt et al. 2014





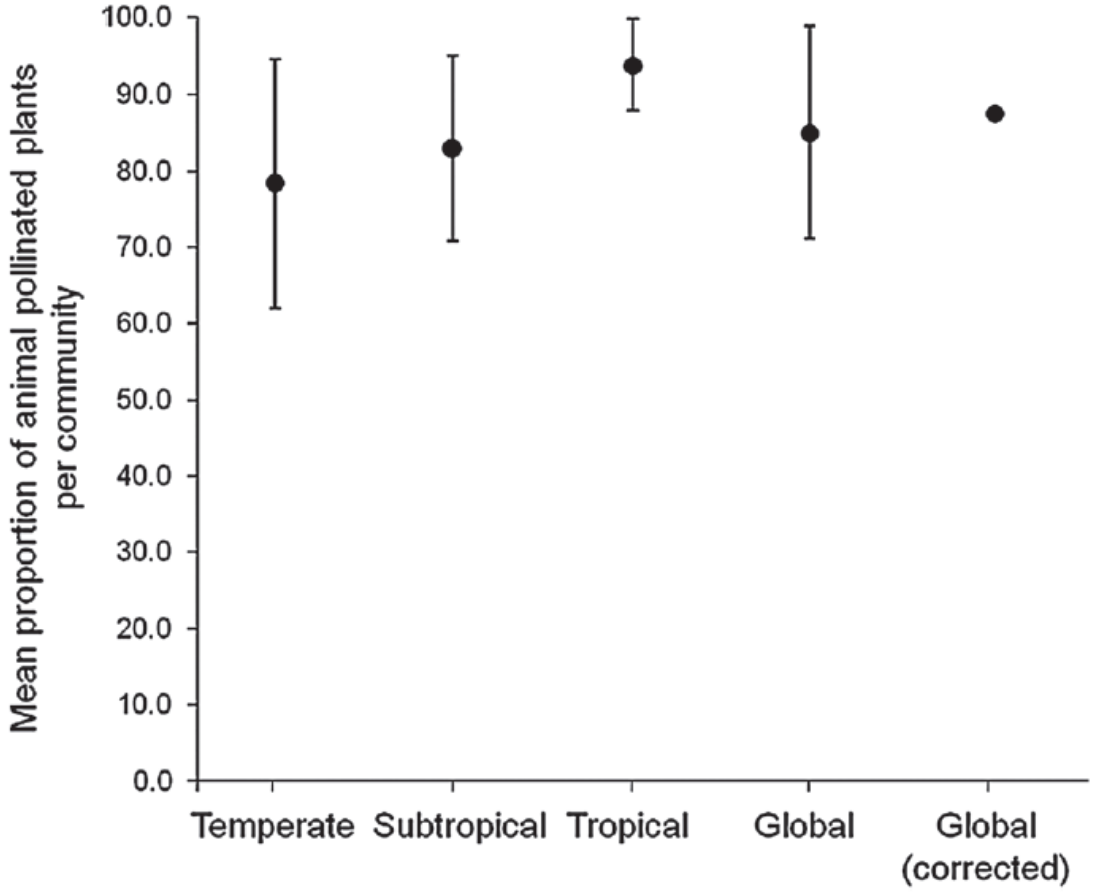






The importance of pollinators

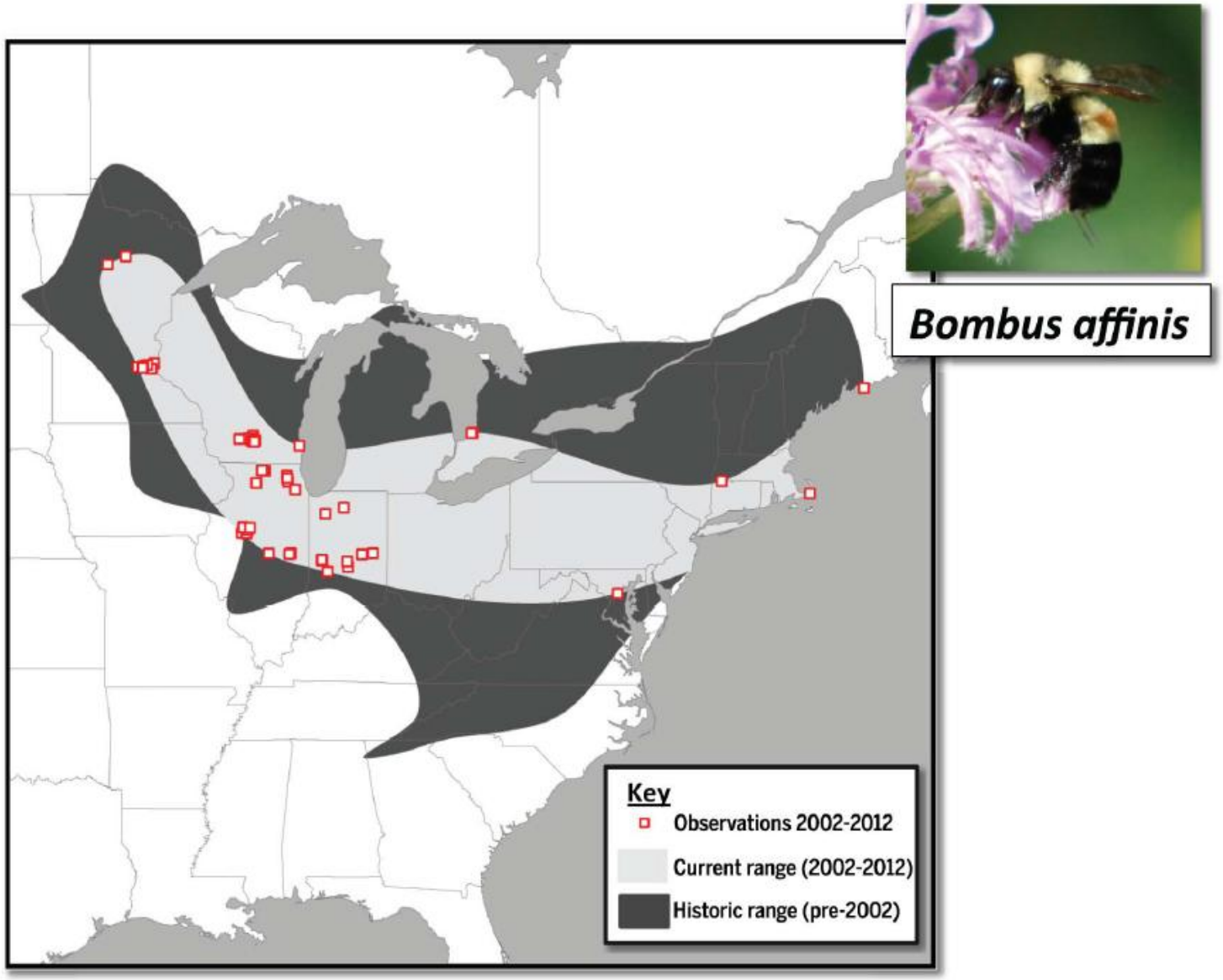
- Animal pollination required for 85% of all angiosperms
- Majority of tropical tree species
- Plant diversity & community resilience



Ollerton et al. 2011

Knowns and unknowns

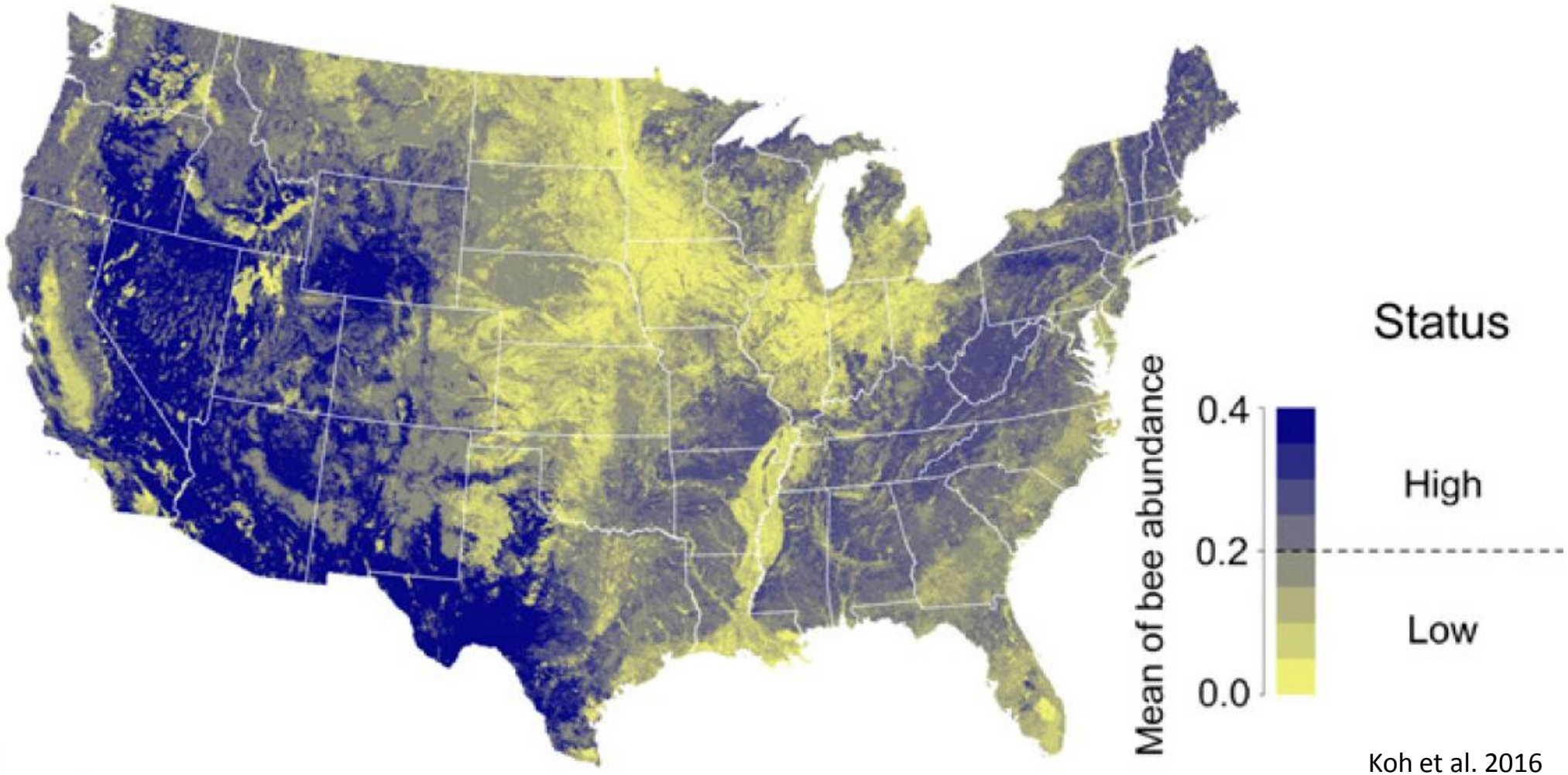
- Honey bee die-offs still steep
- Bumble bees believed to be in decline
- Other wild bees unknown



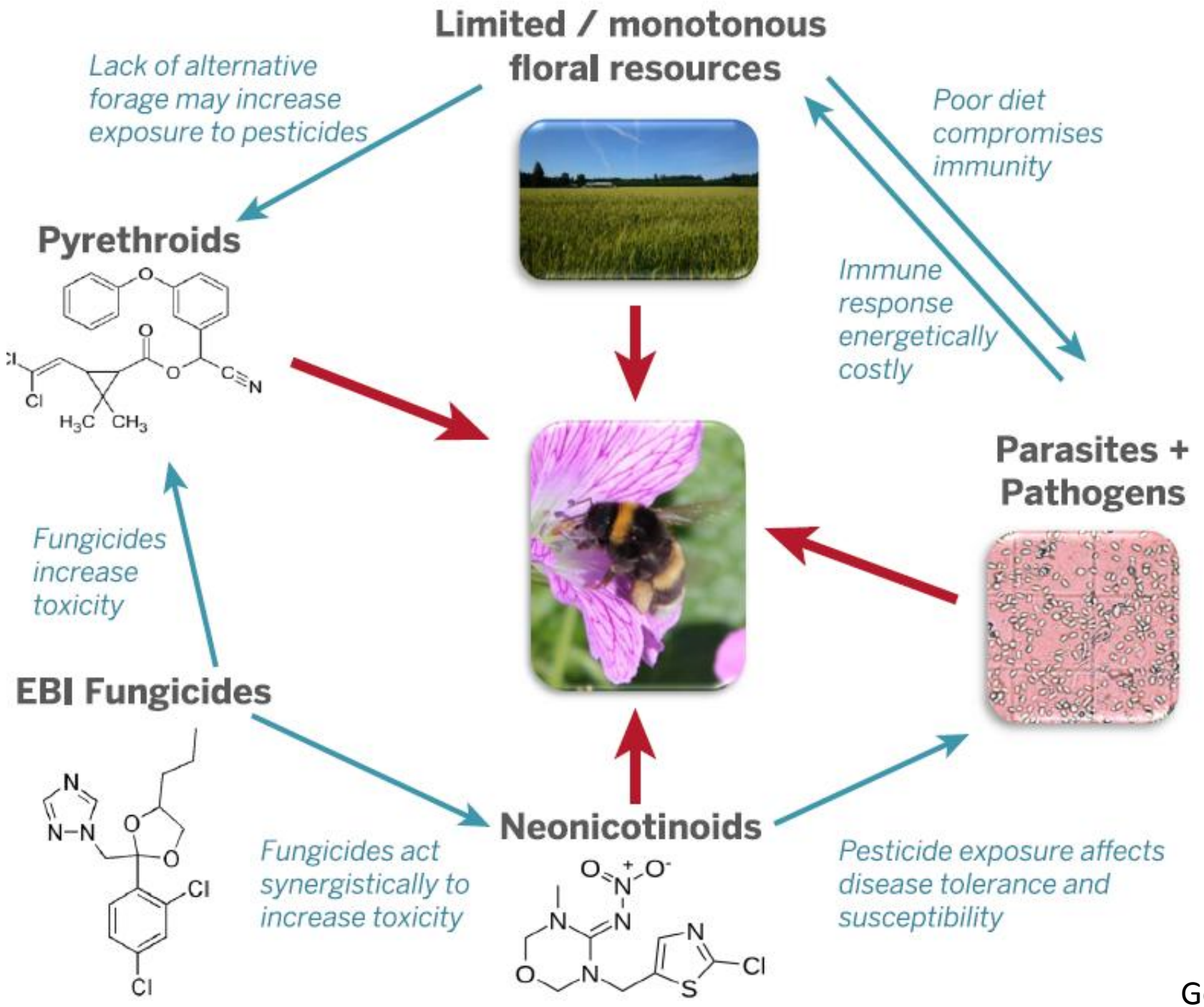
Goulson et al. 2015

Bee declines

- 2008 – 2013 decline over 23% of U.S. land
  - Mismatch between supply and demand—39% of dependent cropland in U.S.



Koh et al. 2016



Goulson et al. 2015

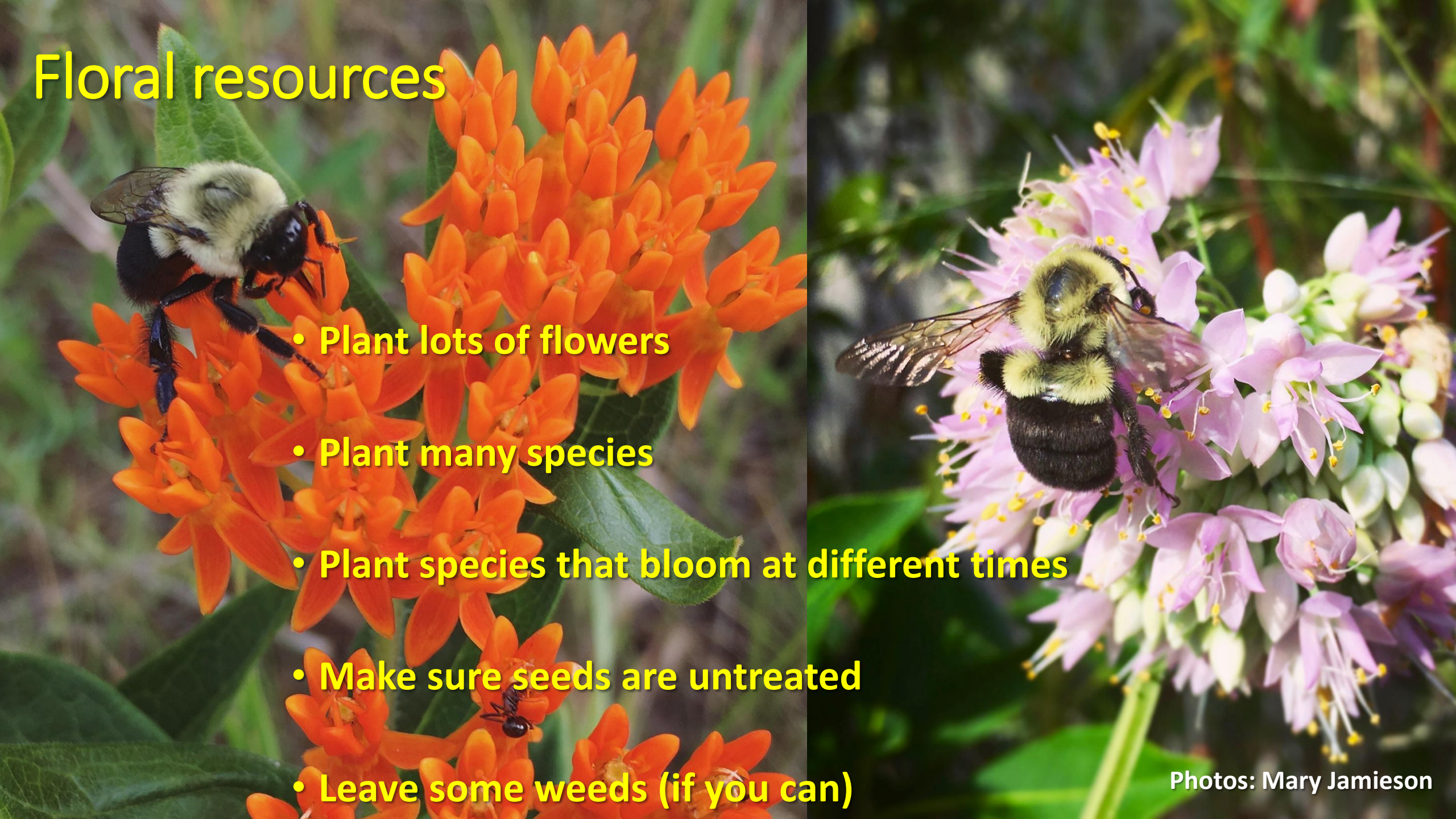
What do bees need & how you can help

- **All bees need:**
  - **1: Flowers**
  - **2: Nesting substrate**

Photo: Chad Eggleton

Floral resources

- Plant lots of flowers
- Plant many species
- Plant species that bloom at different times
- Make sure seeds are untreated
- Leave some weeds (if you can)



Photos: Mary Jamieson

Scientific Name	Common Name
Achilla millefolium	Yarrow
Asclepias tuberosa	Butterfly Weed
Aureolaria flava	Smooth False Foxglove
Heliopsis helianthoides	False Sunflower
Liastris aspera	Rough Blazingstar
Lupinus perennis	Wild Lupine
Monarda fistulosa	Wild Bergamot
Monarda punctata	Horse Mint
Oenothera biennis	Common Evening Primrose
Oligoneuron rigidum	Stiff Goldenrod
Penstemon digitalis	Foxglove Beard Tongue
Penstemon hirsutus	Hairy Beard Tongue
Pycnanthemum virginianum	Common Mountain Mint
Rudbeckia hirta	Black-eyed Susan
Silphium terebinthinaceum	Prairie Dock
Solidago nemoralis	Old-field Goldenrod
Solidago speciosa	Showy Goldenrod
Symphyotrichum laeve	Smooth Blue Aster
Symphyotrichum lanceolatum	Panicled Aster
Symphyotrichum novae-angliae	New England Aster
Tradescantia ohiensis	Common Spiderwort
Verbena stricta	Hoary Vervain
Veronicastrum virginicum	Culver's Root
Zizia aurea	Golden Alexander

http://www.mnppa.org/

MNPPA

MICHIGAN NATIVE PLANT PRODUCERS ASSOCIATION

Nesting substrate

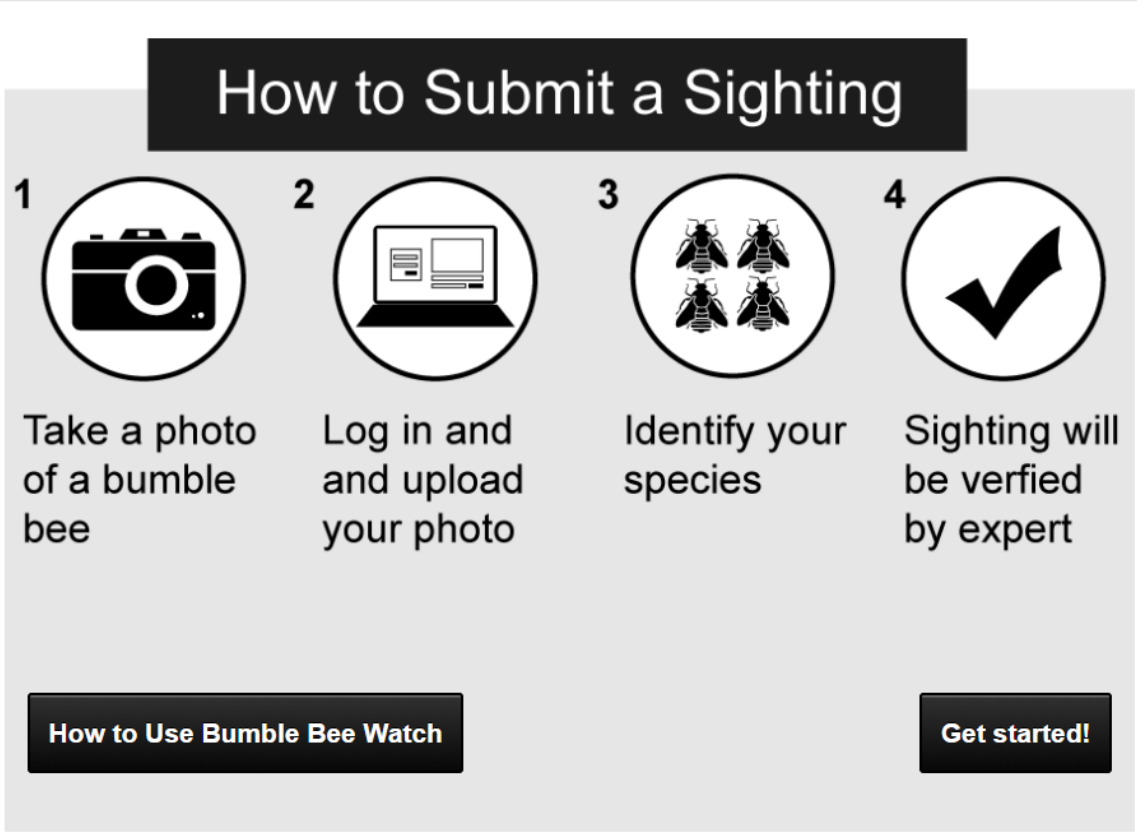
- Leave bare patches of soil
- Leave decaying woody vegetation alone
- Build a “bee hotel”
- Undisturbed sites

Management decisions

- Limit pesticide use
- Reduce mowing/raise mowing height
- Don’t buy honey bee hives

Citizen Science

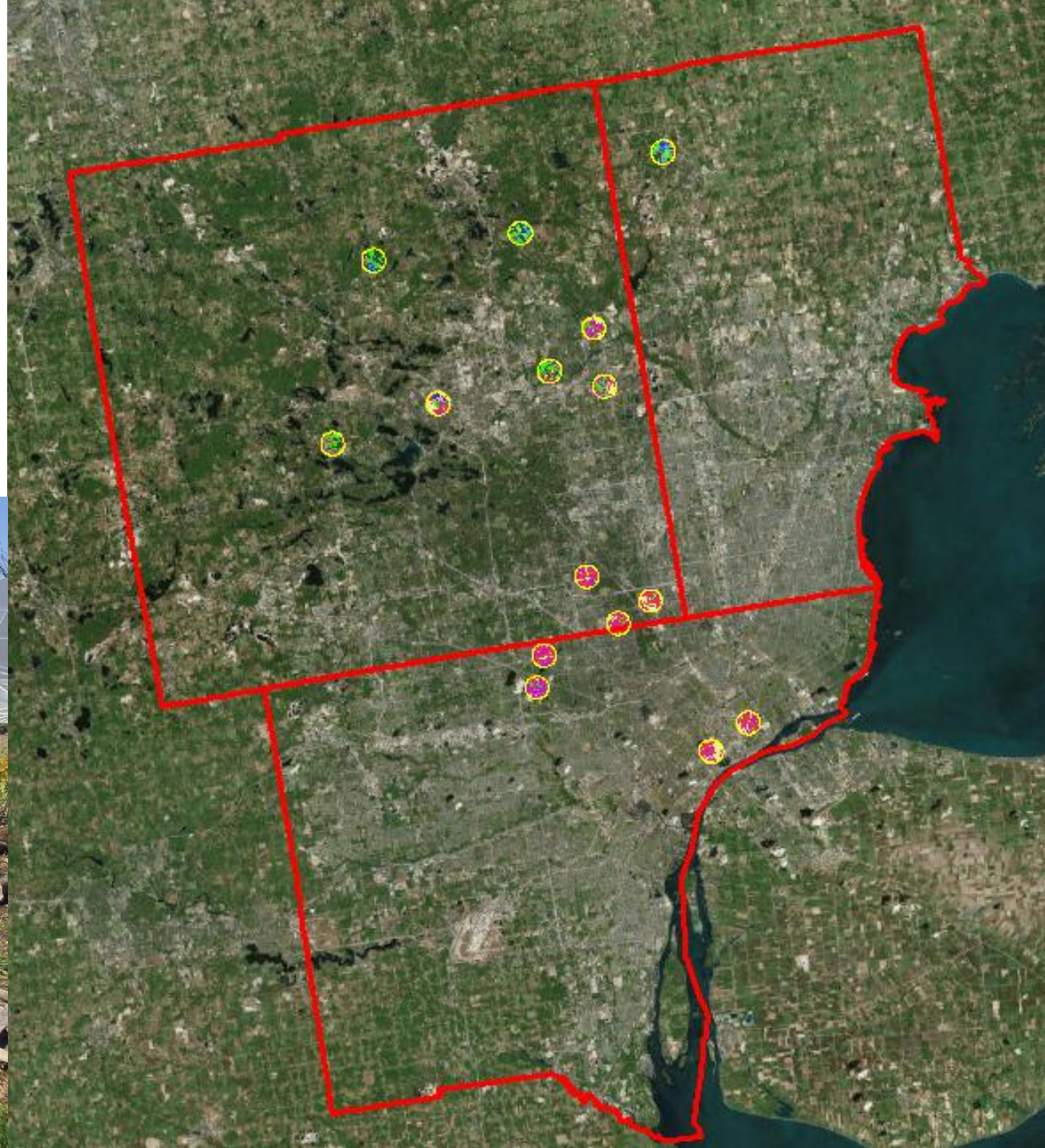
- Lists available: https://xerces.org/citizen-science/



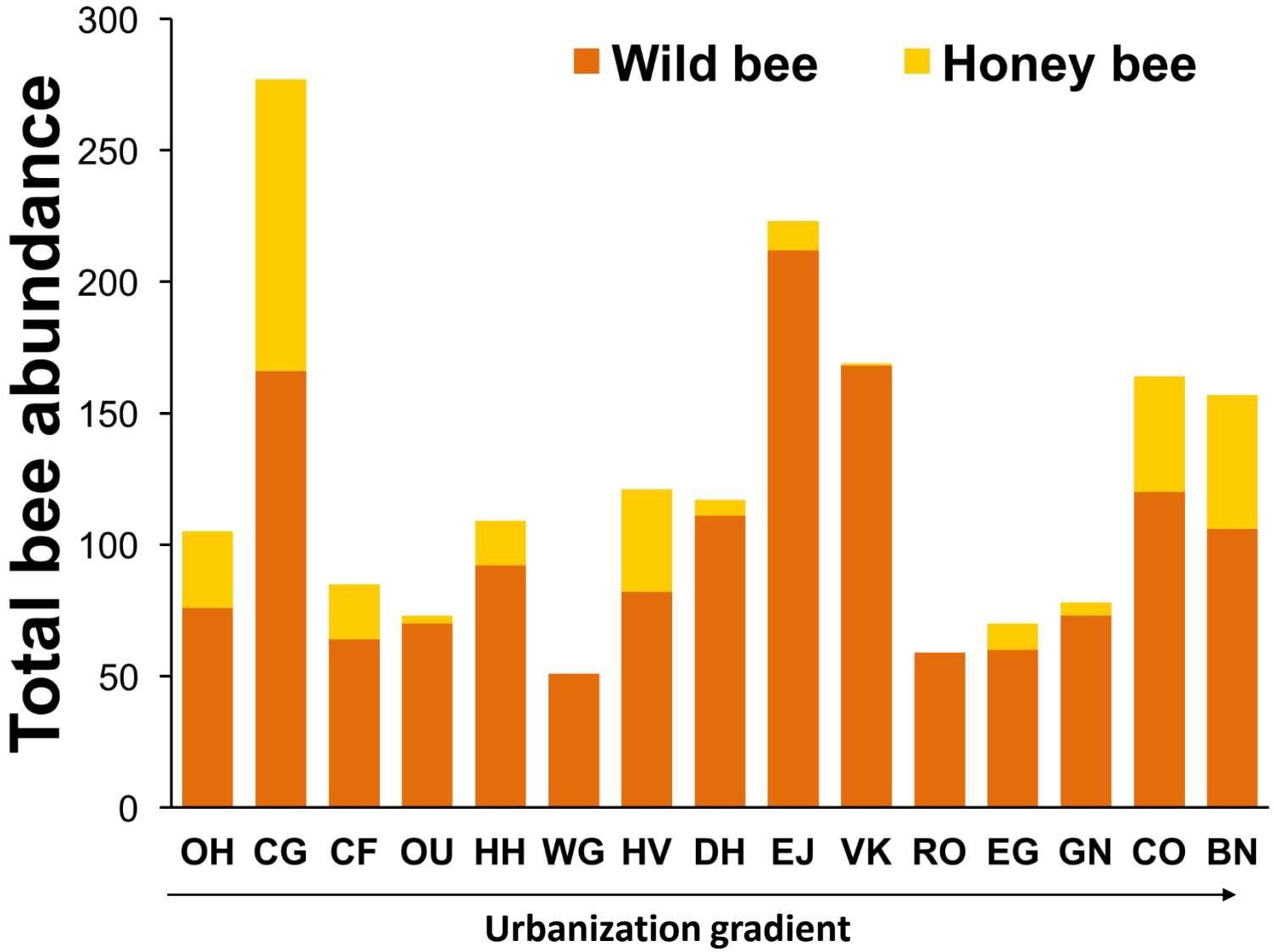
My research

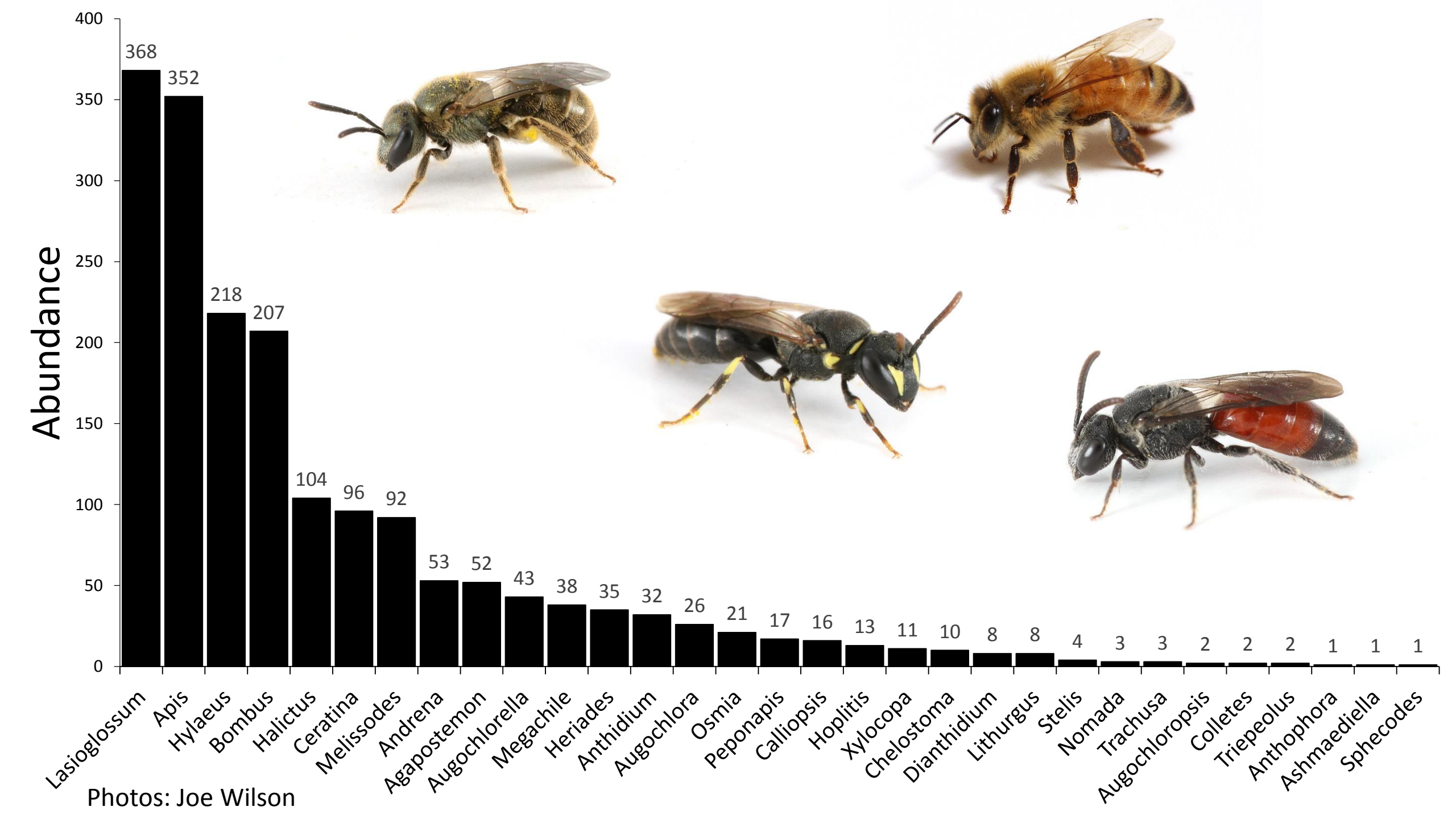
- Urban environments – potential refuges

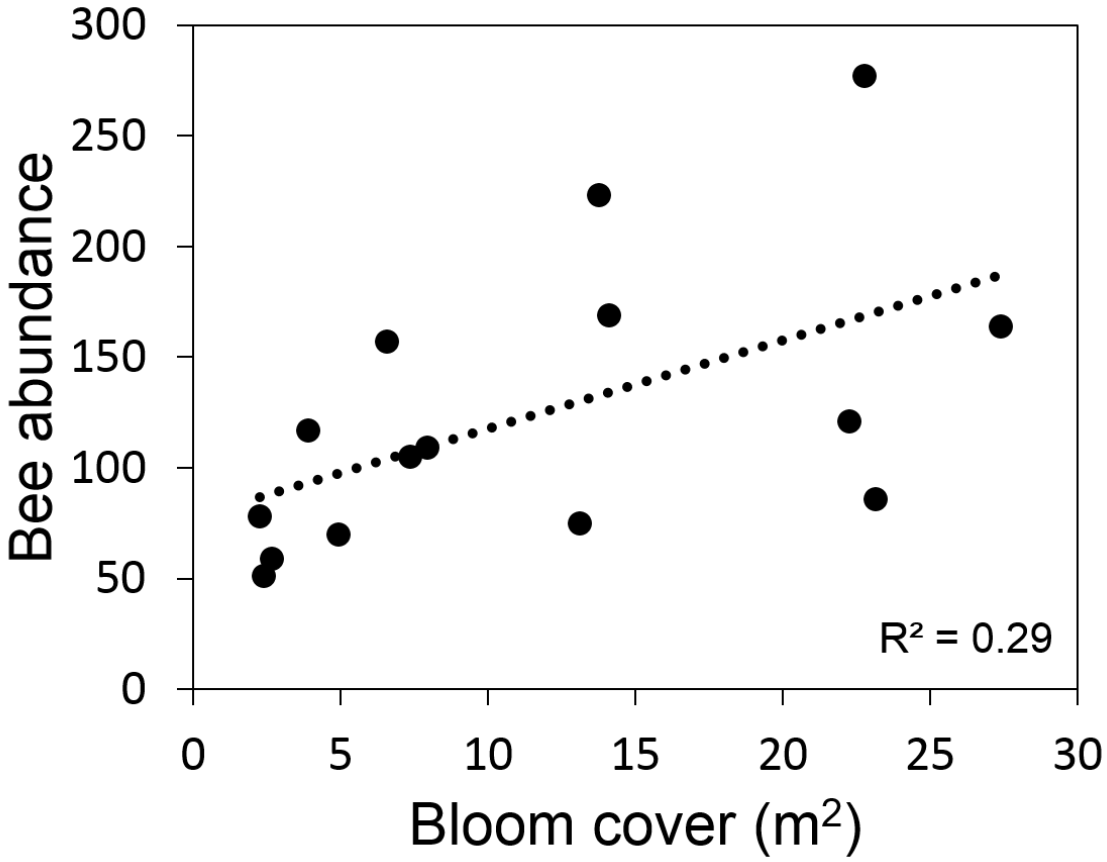
- 15 farms in the Tri-county area

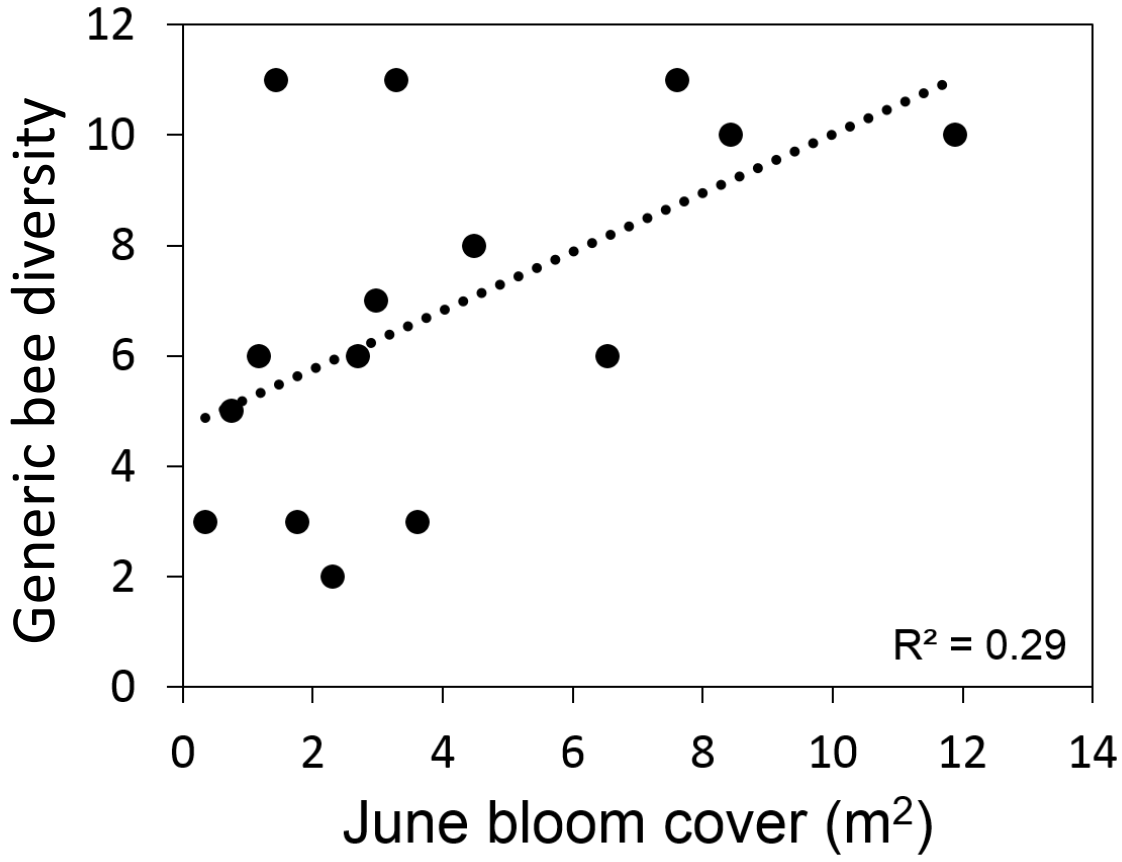


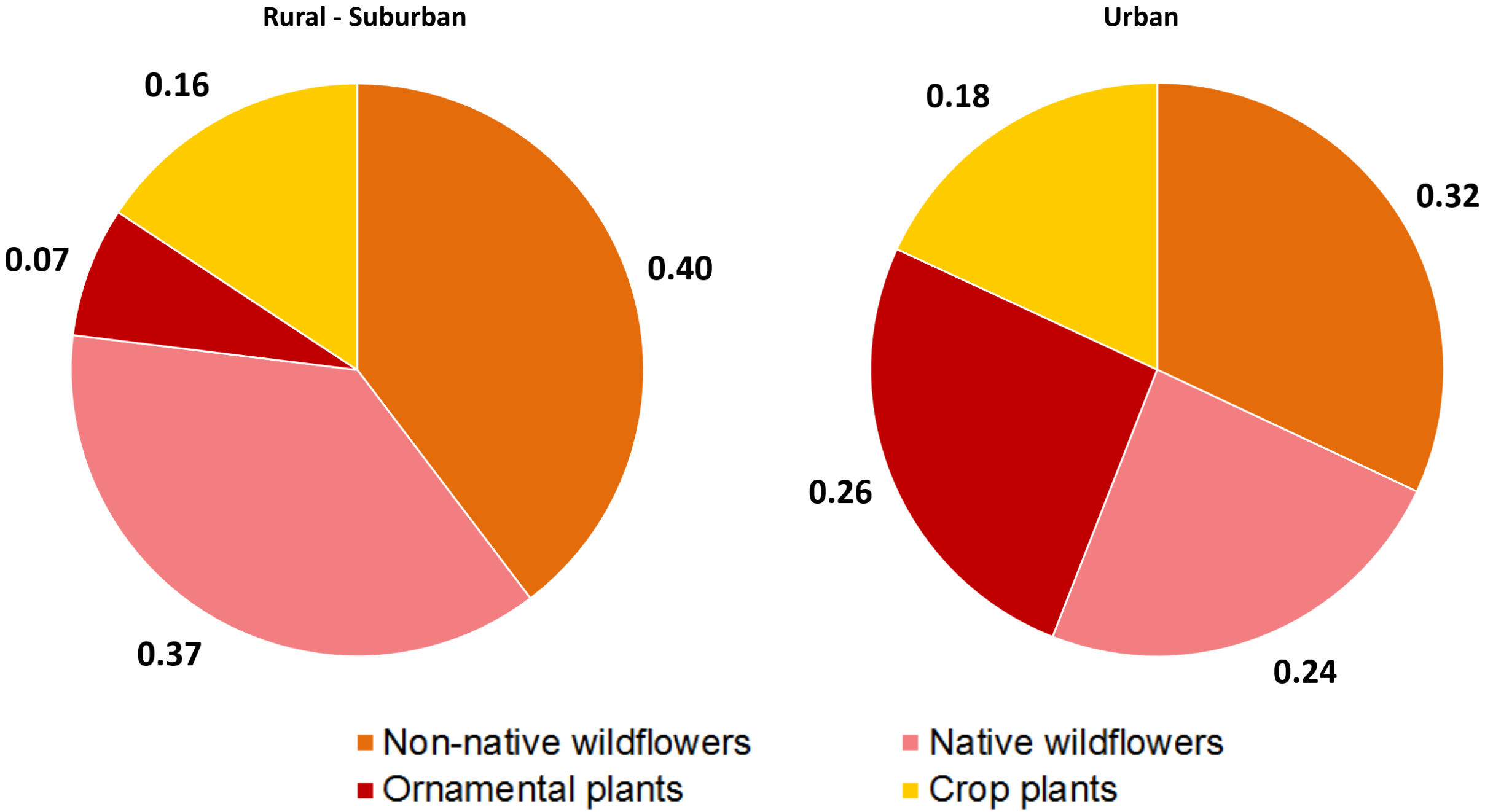
What we've found so far…




Abundance
400
350
300
250
200
150
100
50
0
368
352
218
207
104
96
92
53
52
43
38
35
32
26
21
17
16
13
11
10
8
8
4
3
3
2
2
2
1
1
1
Lasioglossum
Apis
Hylaeus
Bombus
Halictus
Ceratina
Melissodes
Andrena
Agapostemon
Augochlorella
Megachile
Heriades
Anthidium
Augochlora
Osmia
Peponapis
Calliopsis
Hoplitis
Xylocopa
Chelostoma
Dianthidium
Lithurgus
Stelis
Nomada
Trachusa
Augochloropsis
Colletes
Triepeolus
Anthophora
Ashmaediella
Sphecodes
Photos: Joe Wilson

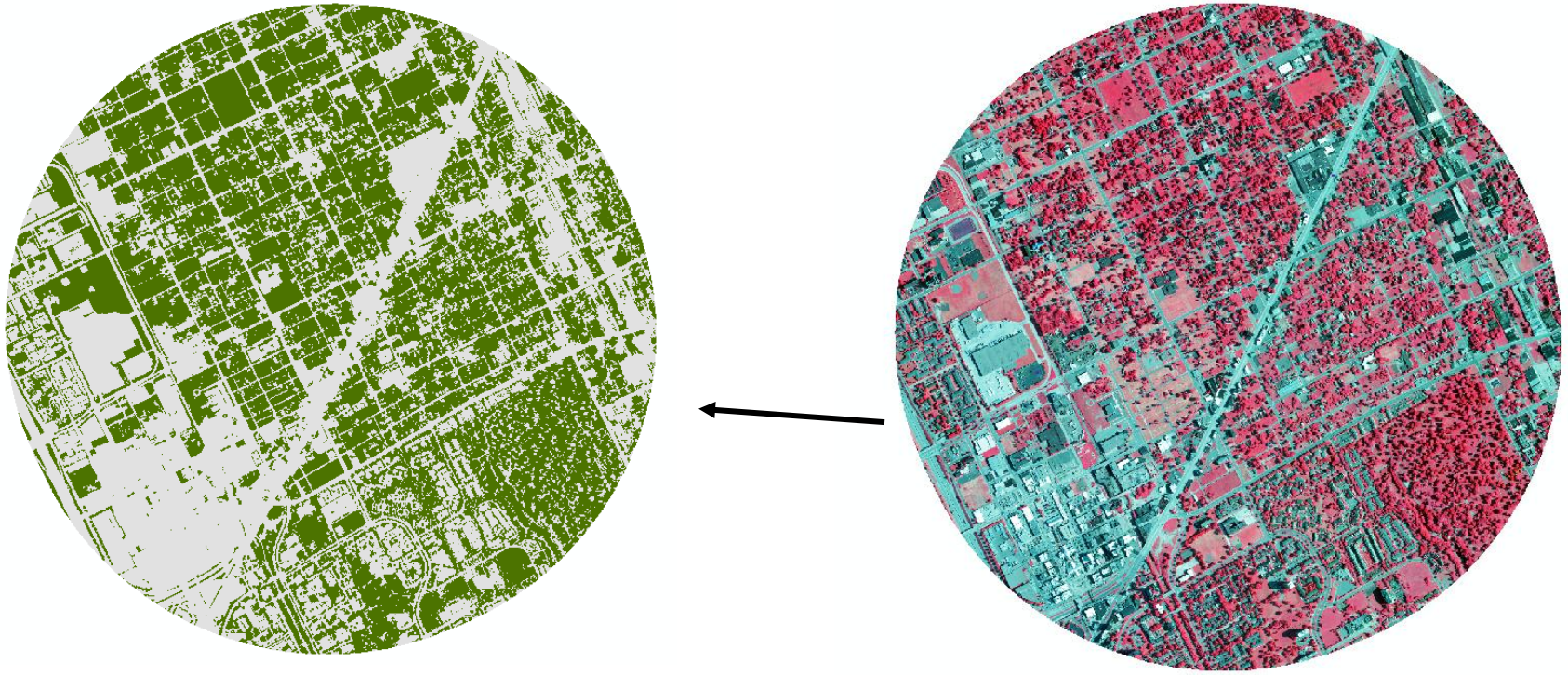

Bee abundance
300
250
200
150
100
50
0
0
5
10
15
20
25
30
Bloom cover (m2)
R² = 0.29


Generic bee diversity
12
10
8
6
4
2
0
0
2
4
6
8
10
12
14
June bloom cover (m2)
R² = 0.29

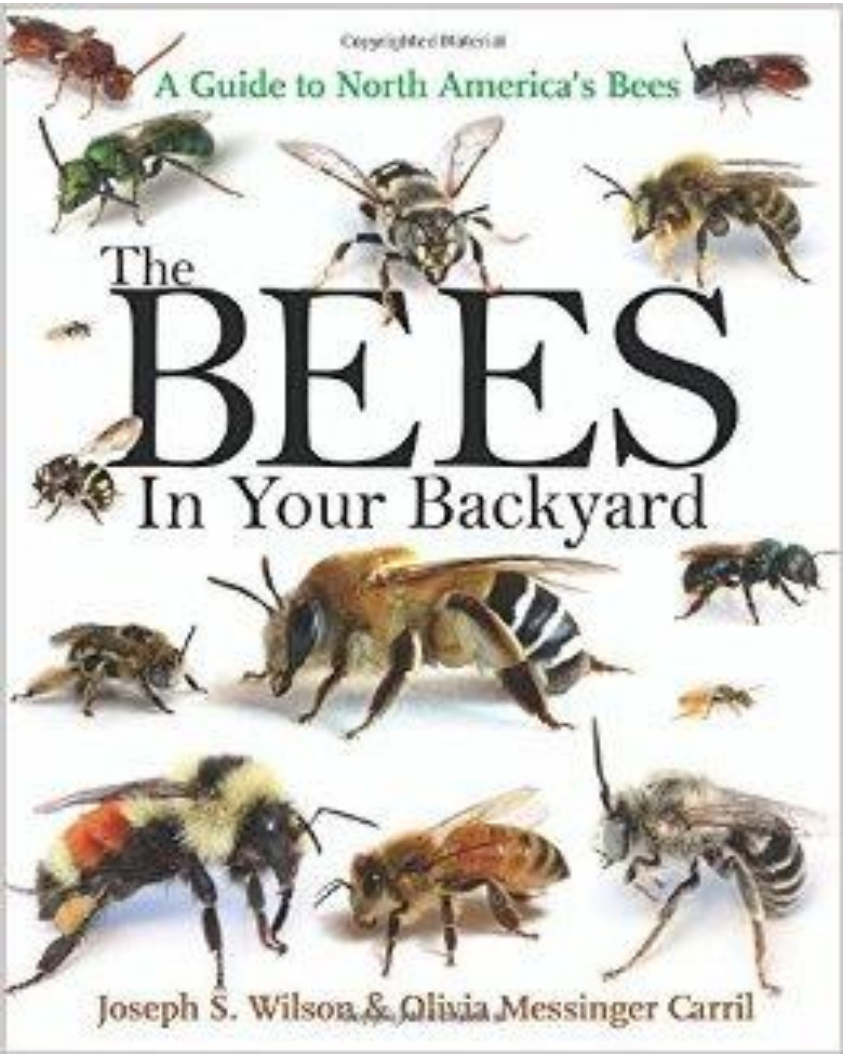

Rural - Suburban
0.16
0.07
0.40
0.37
Urban
0.18
0.32
0.26
0.24
Non-native wildflowers
Native wildflowers
Ornamental plants
Crop plants

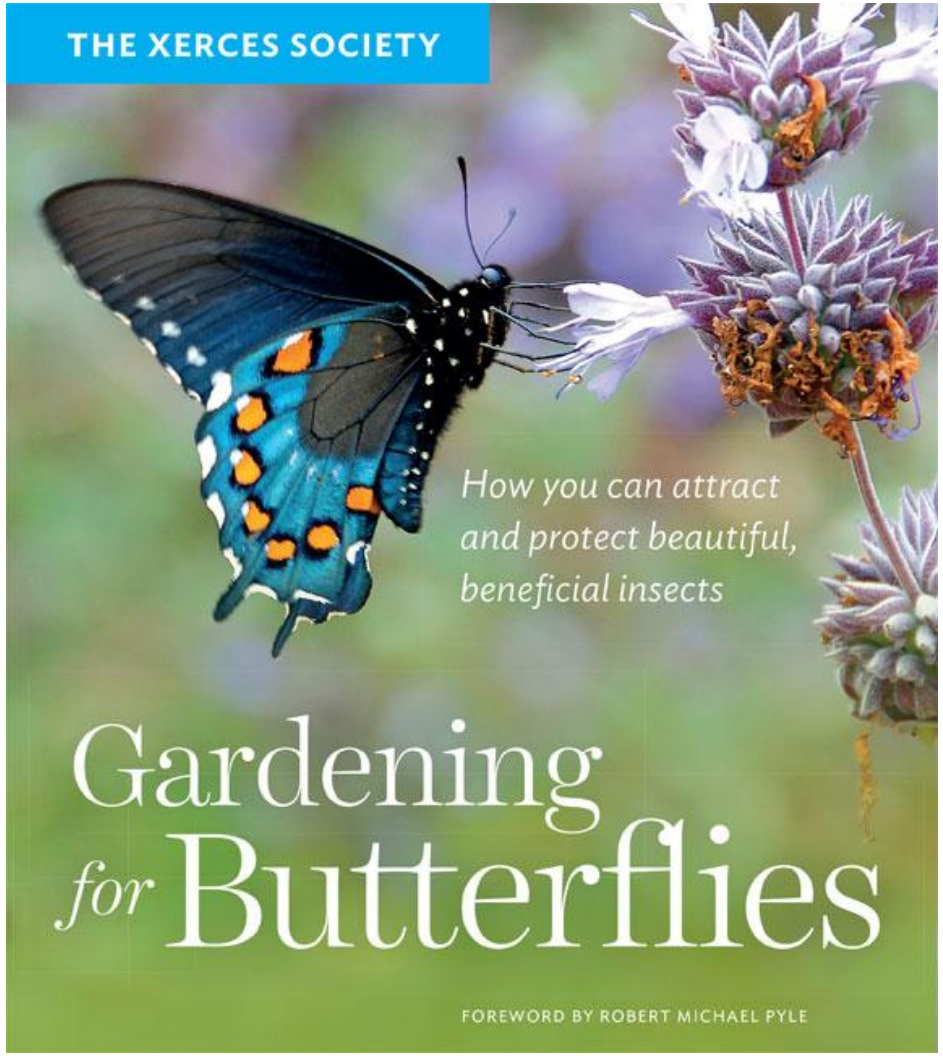
Going forward

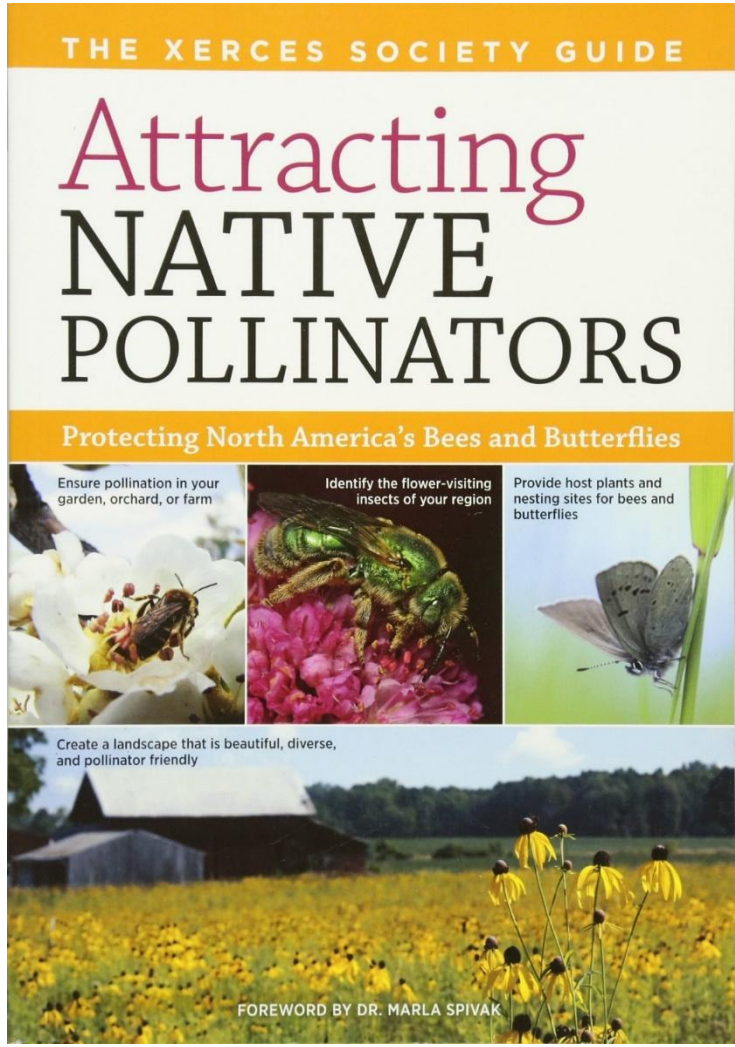
- Bee & plant identifications
- Additional geographical analysis
- Species trait analysis
  - Body size
  - Nesting strategy
  - Floral preference
  - Native status



Books


A Guide to North America's Bees
The
BEES
In Your Backyard
Joseph S. Wilson & Olivia Messinger Carril


THE XERCES SOCIETY
How you can attract and protect beautiful, beneficial insects
Gardening for Butterflies
FOREWORD BY ROBERT MICHAEL PYLE


THE XERCES SOCIETY GUIDE
Attracting NATIVE POLLINATORS
Protecting North America's Bees and Butterflies
Ensure pollination in your garden, orchard, or farm
Identify the flower-visiting insects of your region
Provide host plants and nesting sites for bees and butterflies
Create a landscape that is beautiful, diverse, and pollinator friendly
FOREWORD BY DR. MARLA SPIVAK

A BENEFIT DINNER SUPPORTING

Pollinator Conservation

HOSTED BY

Six Rivers Land Conservancy **AND**
Oakland University Student Farmers

join us for an evening of

ART & SCIENCE

TUESDAY, FEBRUARY 20 AT 6-9PM

THE MEETING HOUSE

www.beediversity.info/events

Questions?

Photo: Chad Eggleton