

# BUG VARIETY SHOW

All about the fascinating world  
of insects & entomology

Dr. Lauren Des Marteaux



Agriculture and  
Agri-Food Canada



**ESSEX COUNTY NATURE**  
*Essex County Field Naturalists' Club*

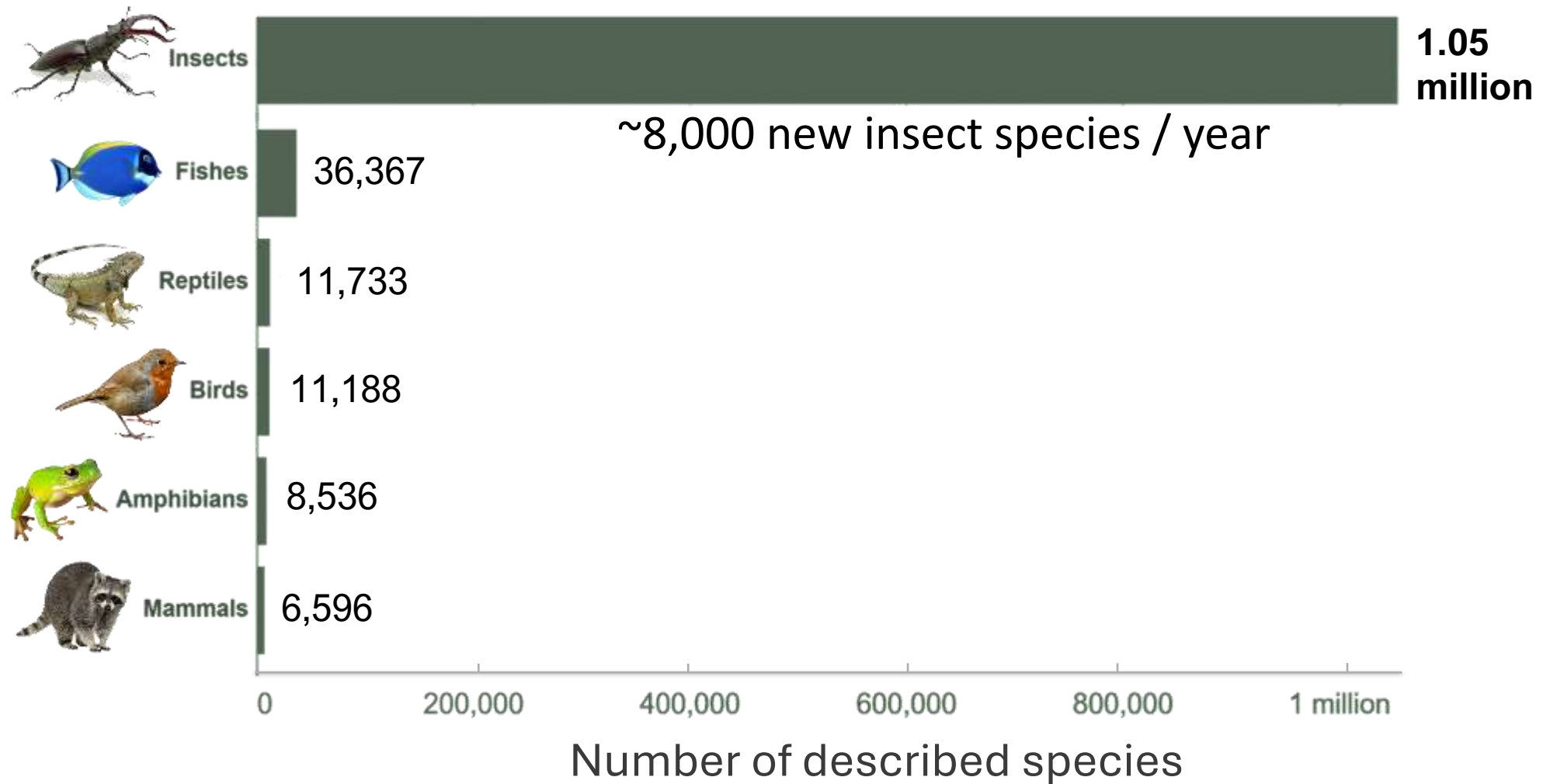


# Tonight's roadmap

- Why insects are fascinating & important
- Who I am / how I got here
- What I do as an entomologist in Essex County
- Insect ID & resources
- How to be a friend to bugs (and meet one!)



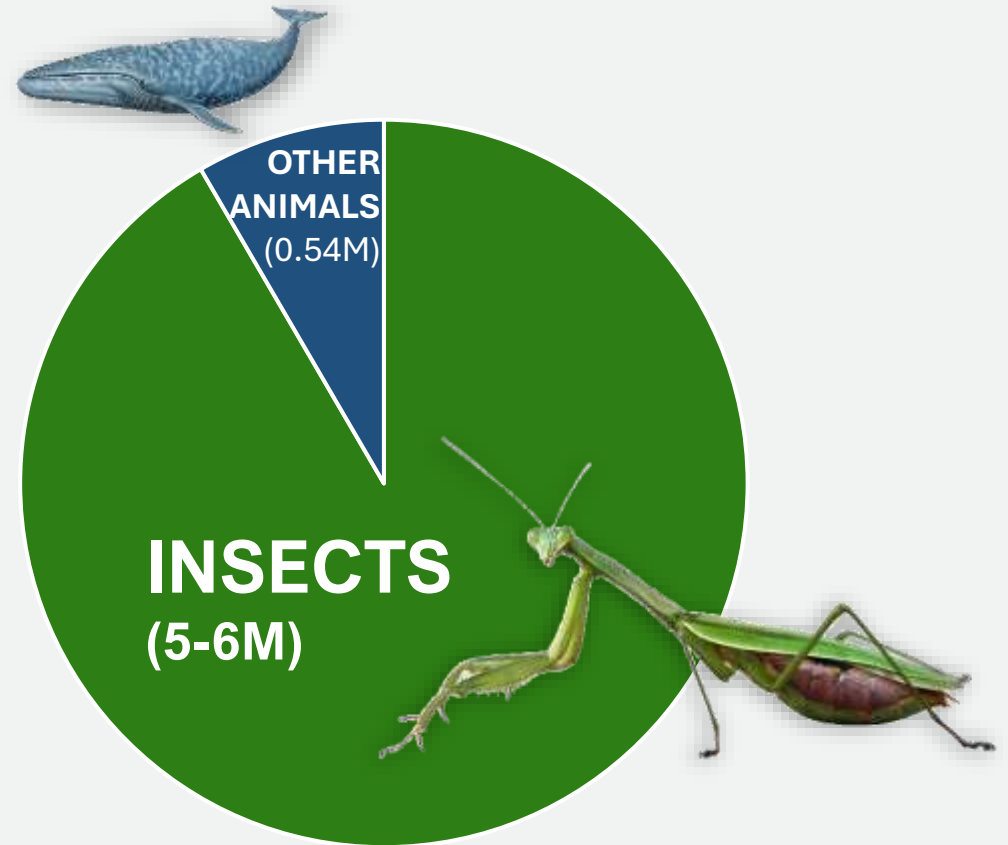
# Animal biodiversity



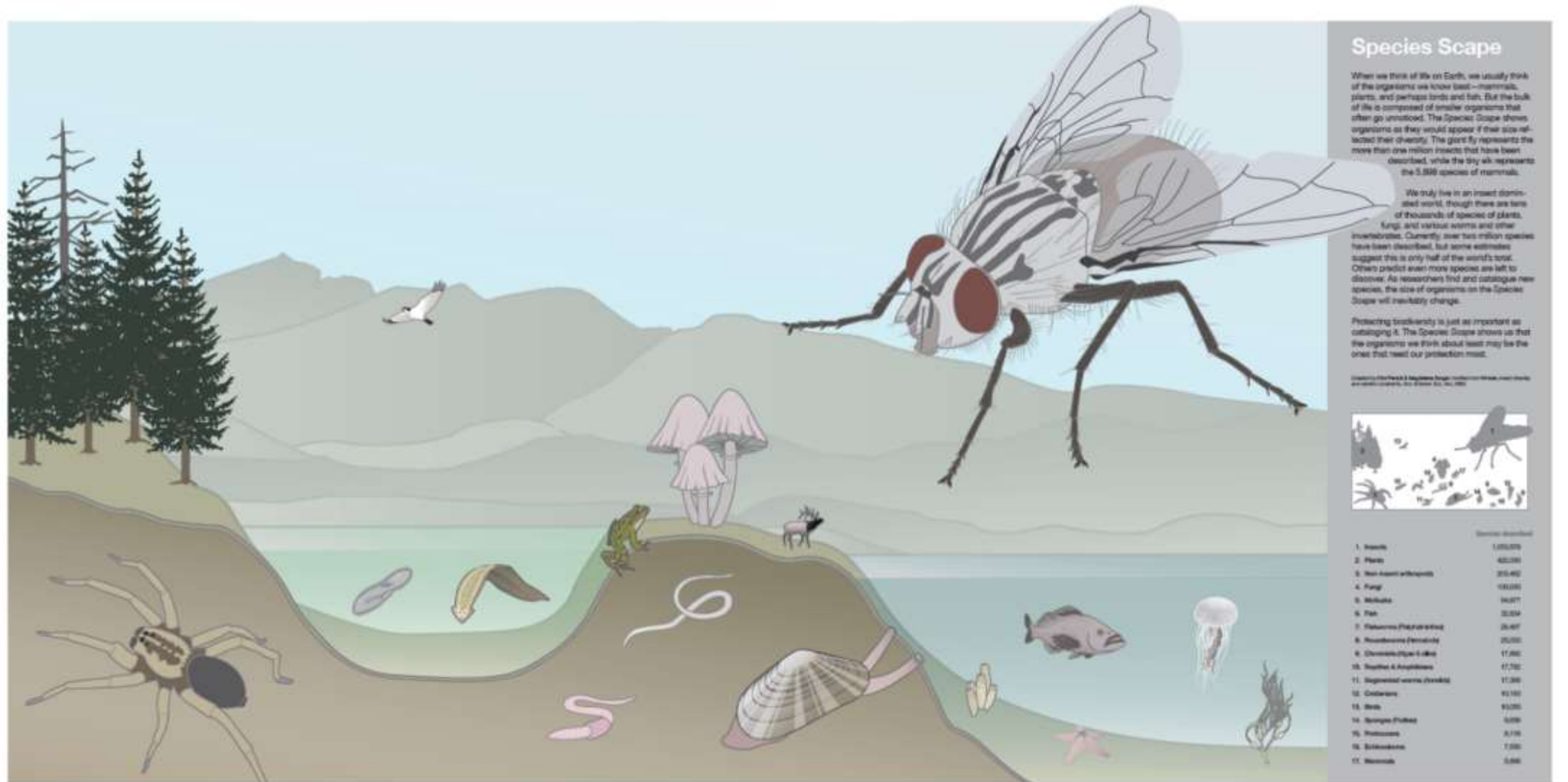
~80% of insect species still undescribed



Estimate: 5-6M species  
Insects = >90% of all animals



# Insects = most biodiversity



# Diverse in beauty



# Diverse in beauty



# Diverse in beauty



The Royal Palace of Brussels  
Work by Jan Fabre



×1.4 M  
Green jewel  
beetles



# Diverse in sneakiness



# Diverse in size



The stick insect *Phoebasticus chinensis* is just over 2 ft long



This *Titanus giganteus* longhorn beetle was about 9.5" long



Photo: Dider Descouens 2011

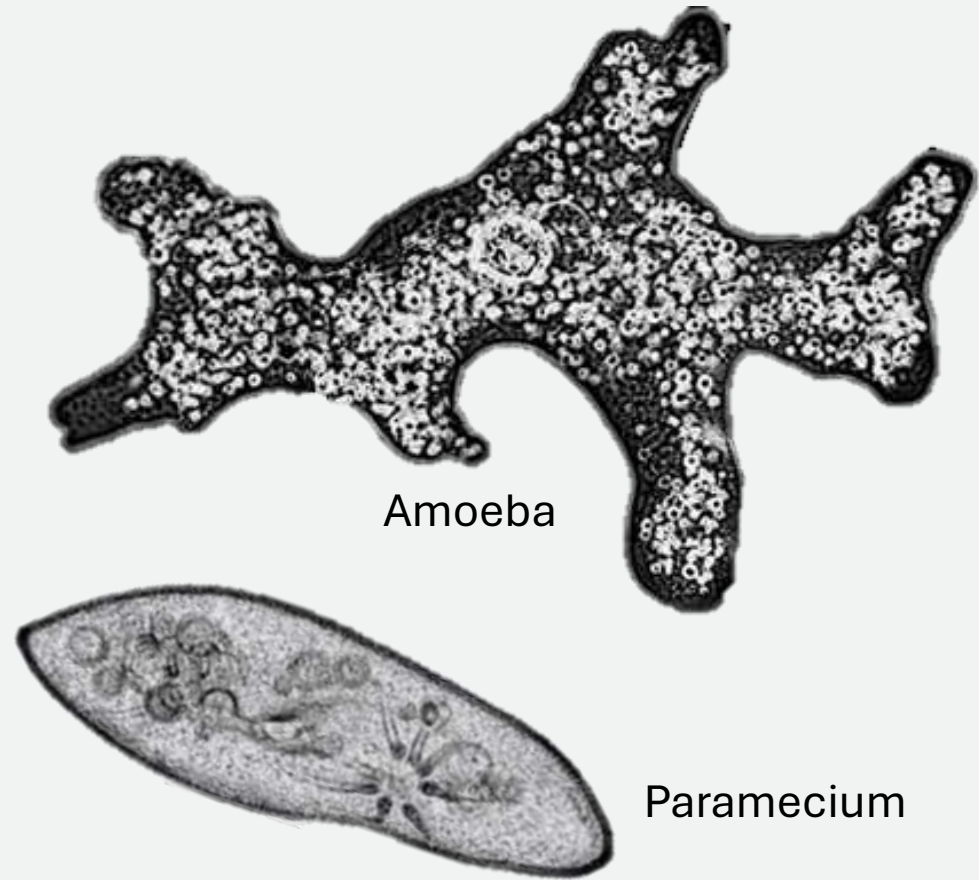
Grubs of Rhinoceros & Goliath beetles are among the heaviest, reaching ~228 g!

# Diverse in size

Some fairyflies (wasps)  
are ~0.14 mm long



Human hair



Amoeba

Paramecium

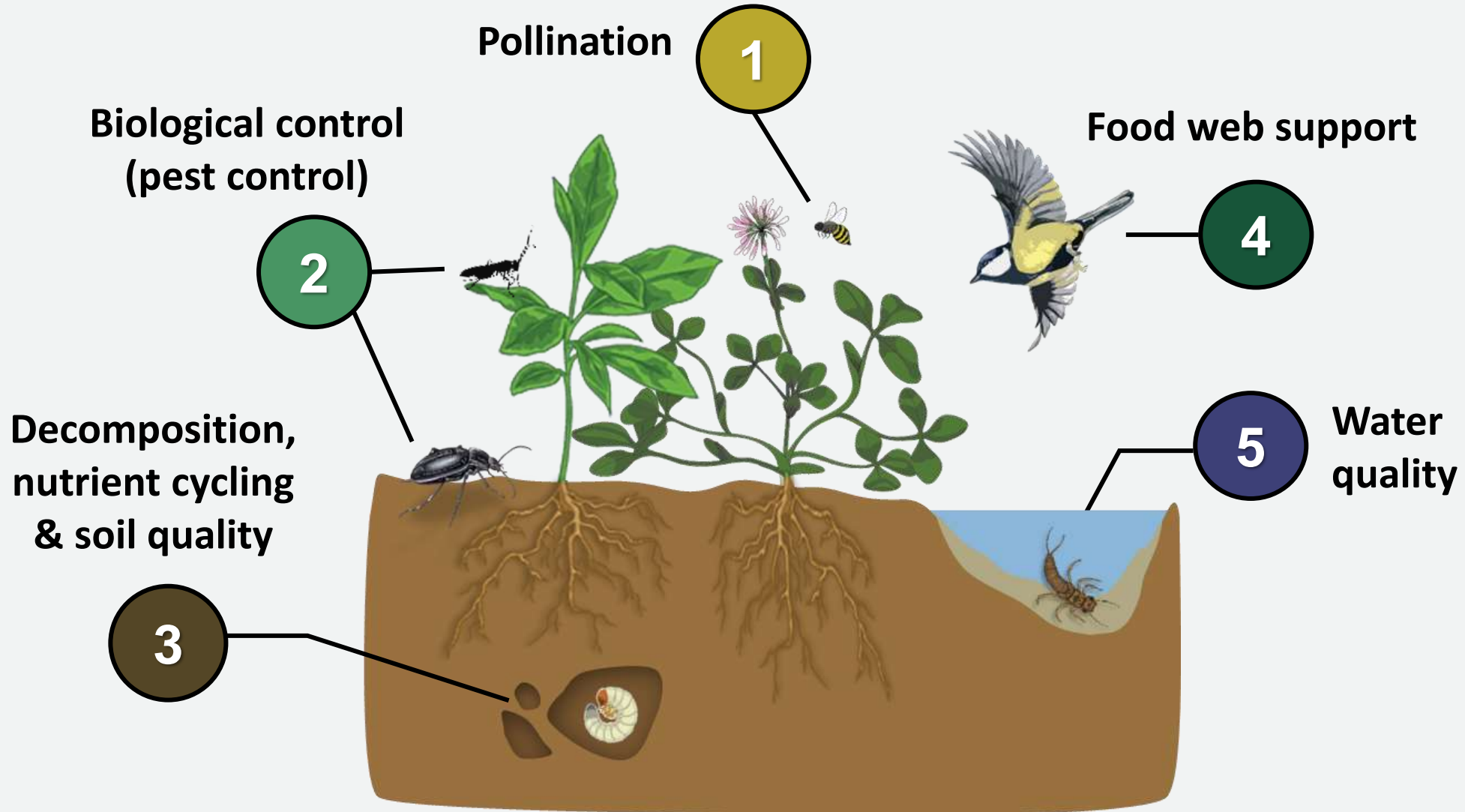
# Diverse in size



# Diversity in cuteness!



# Importance of insects



# Quiz: Pollinators



# Quiz: Pollinators



## 2. Pest control

- Few insects are pests
- Many natural enemies (predators / parasitoids)
- For every pest, there are multiple enemies



Natural enemies of soybean aphid

(Up to 400 species in Ontario!)

# 3. Decomposition / nutrient cycling

## Soil arthropods:

- Decompose organic matter
- Promote microbial growth
- Maintain soil structure & hydration



**SPRINGTAILS**

Up to 100K / m<sup>3</sup> soil



**MITES**

Up to 1M / m<sup>3</sup> soil



**SPIDERS**



**ANTS**



**BETLES**



**MILLIPEDES**



**ISOPODS**



**FLY LARVAE**



**CENTIPEDES**

Combined, up to 1K / m<sup>3</sup> soil

# 4. Supporting the food chain

Insect biomass: ~10,000,000,000,000,000,000

- 10 quintillion insects at a given time, or **1.3B / human**



**BIRDS**



# 5. Improving water quality



**STONEFLIES**



**MIDGES**



**MAYFLIES**



**CADDISFLIES**



**BLACKFLIES, MOSQUITOES**



# Who I am / how I got here



B.Sc. Hons. Zoology  
(2004-2009)

Thesis: How isopods degrade leaf litter via microbes



# Who I am / how I got here



M.Sc. Environmental Biology  
(2009-2012)

Thesis: Swede midge overwintering biology



# Who I am / how I got here



Ph.D. Physiology & Biochemistry  
(2013-2017)

Thesis: Ion & water balance during insect chill coma

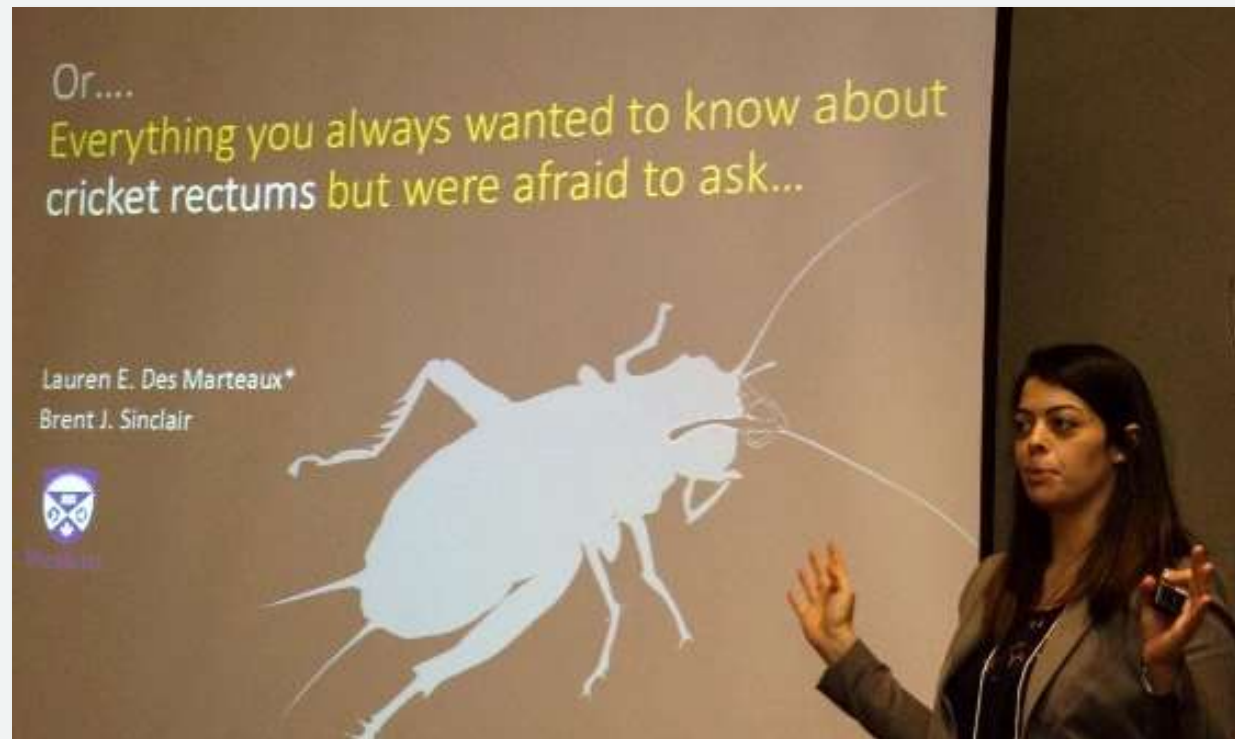


# Who I am / how I got here



Ph.D. Physiology & Biochemistry  
(2013-2017)

Thesis: Ion & water balance during insect chill coma



# Who I am and how I got here



Postdoc – Freeze tolerance of malt flies  
(Czech Republic, 2017-2019)



# Quiz: Insect cold tolerance

**What is the lowest temperature an insect is known to survive?**

- A. 0°C
- B. -10°C
- C. -40°C
- D. -100°C
- E. -270°C**



*Polypedilum vanderplanki* (sleeping midge)  
Survives from -270°C to +102°C  
Survives loss of 97% body water

# Insect cold tolerance



The malt fly (*Chymomyza costata*)

How do their  
cells survive it?



**Warm-acclimated larva**

**Doesn't survive freezing**

**~60% die at -5°C**

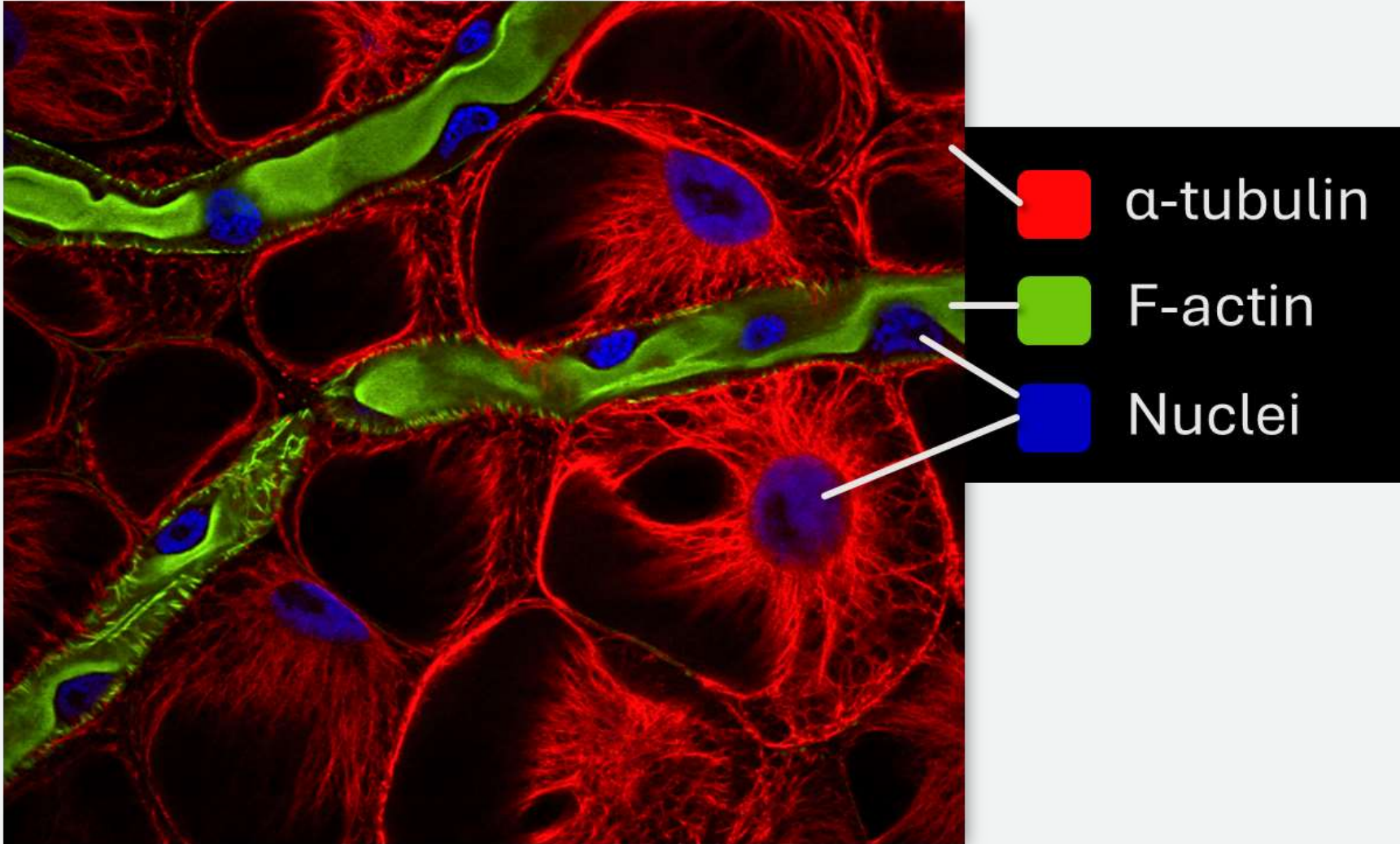


**Cold-acclimated larva**

**Extremely freeze tolerant**

**~42% survive in LN<sub>2</sub>, -196°C**

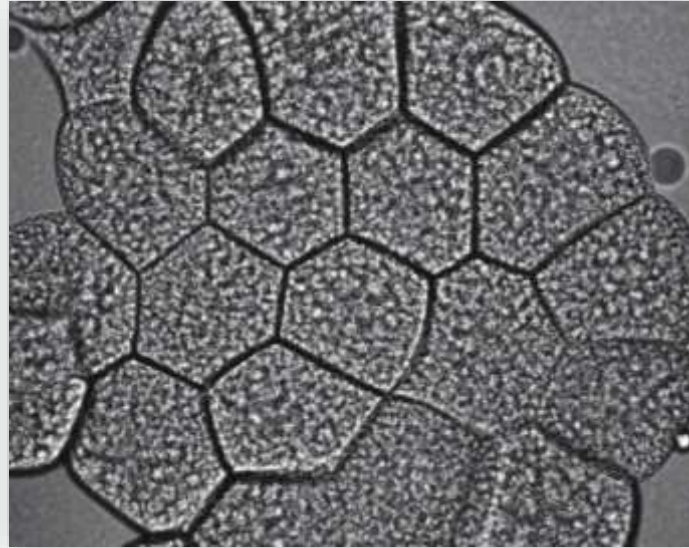
# Insect cold tolerance



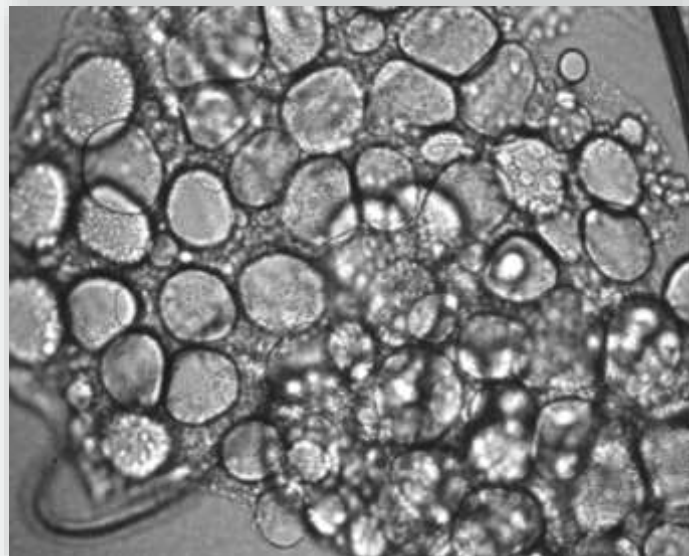
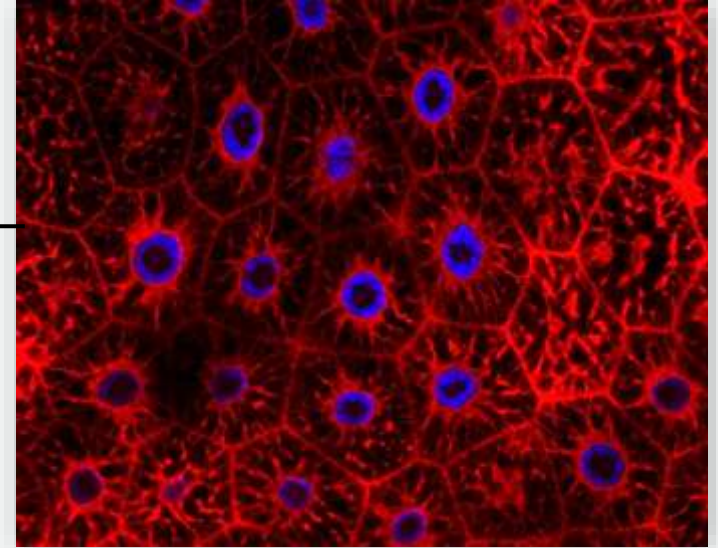
# Insect cold tolerance



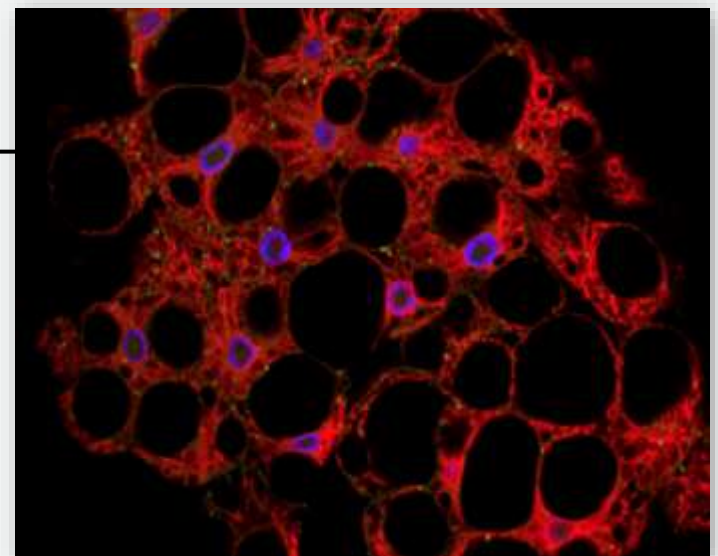
Warm-acclimated larva



18°C



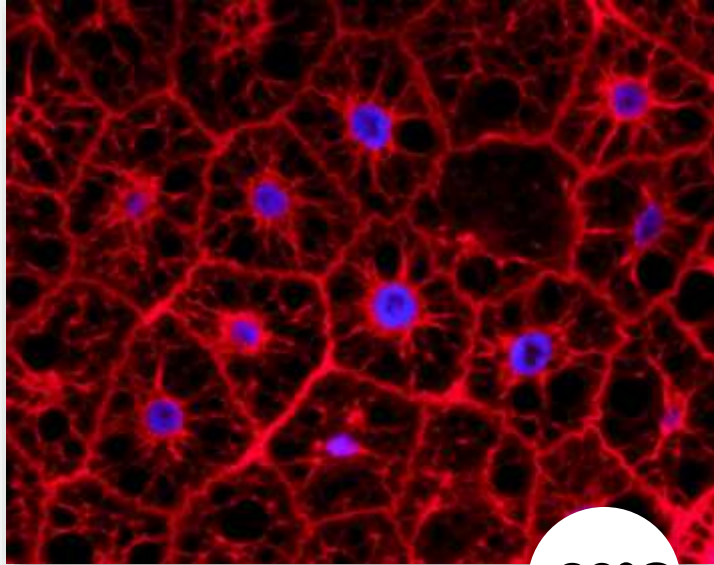
-20°C



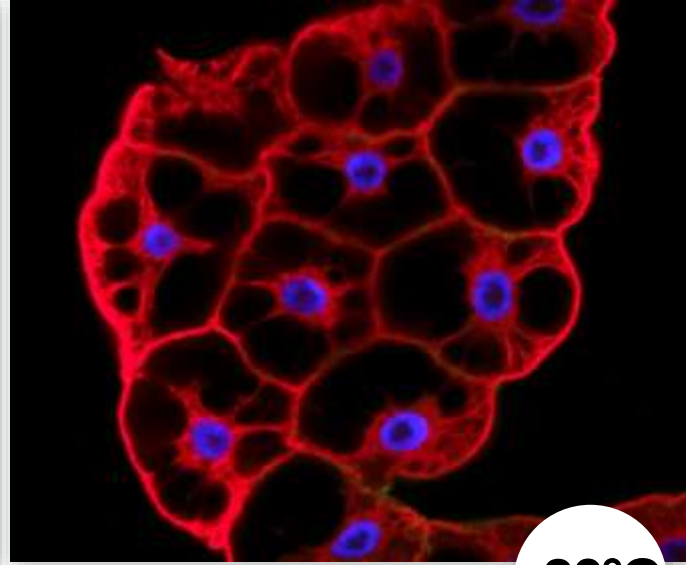
# Insect cold tolerance



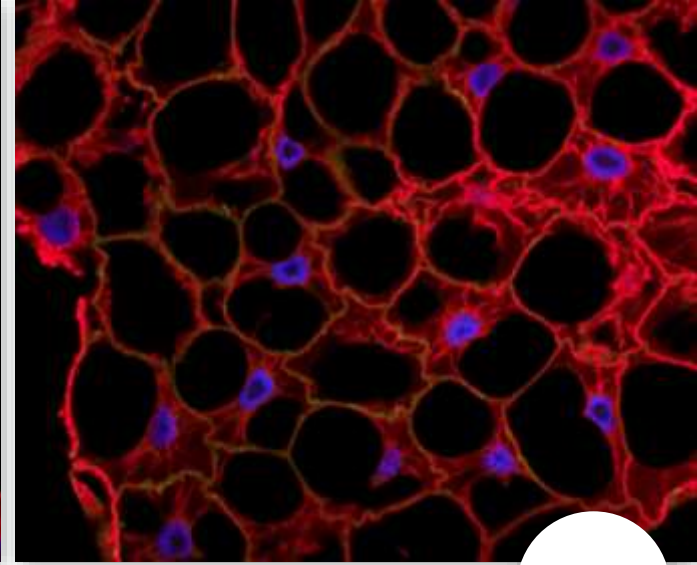
Cold-acclimated larva



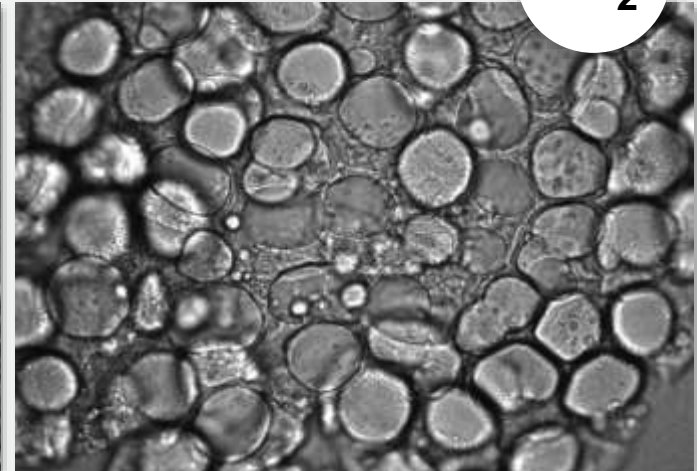
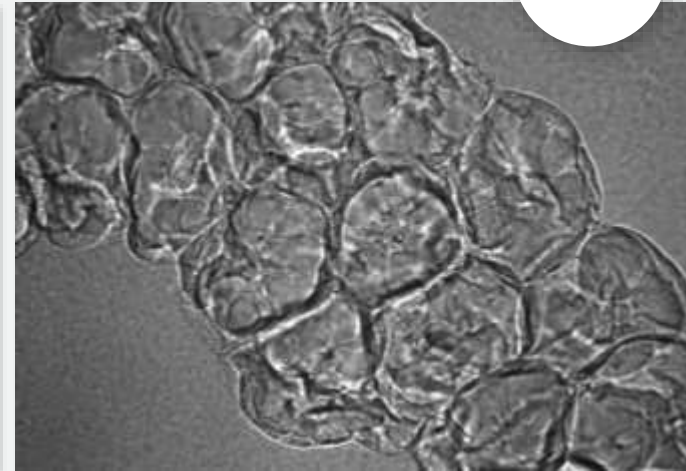
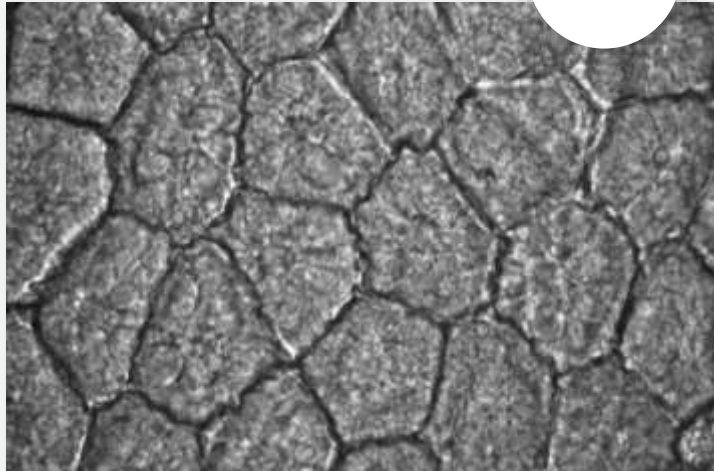
-20°C



-30°C



LN<sub>2</sub>



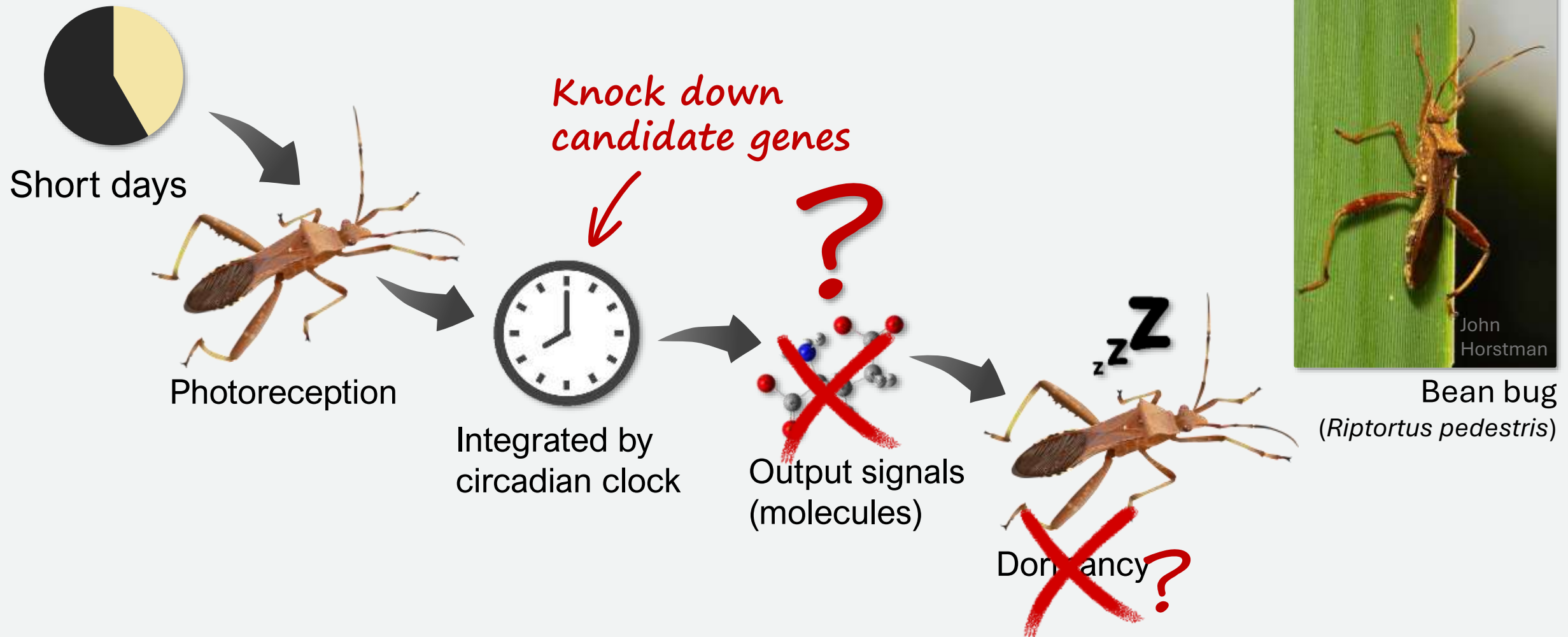
# Who I am and how I got here



Postdoc - Insect circadian rhythm  
(Japan, 2019-2020)



# Insect circadian rhythm



# Who I am and how I got here



Agriculture and  
Agri-Food Canada

Field Entomologist, Harrow  
(2020 – present)



# Entomology professions

- Agriculture
- Apiculture
- Behaviour
- Biological control
- Biomechanics
- Conservation
- Curation (museum)
- Development
- Ecology
- Forensics
- Forest
- Evolution
- Genetics
- Medical
- Morphology
- Neuroscience
- Paleontology
- Pathology
- Pest management
- Physiology
- Populations
- Taxonomy/systematics
- Veterinary
- ... etc!



# Current projects

## CONSERVATION / BIODIVERSITY



1. GenARCC
2. Living Labs Ontario

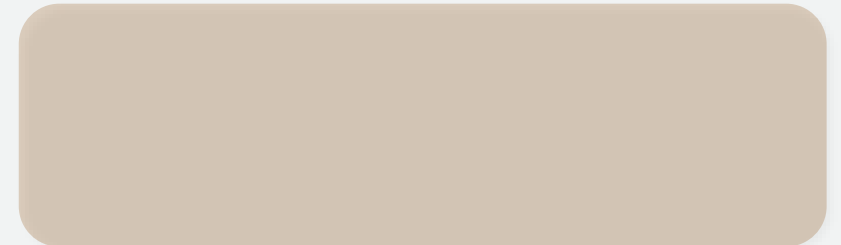
## PEST MONITORING



## SUSTAINABLE PEST MANAGEMENT

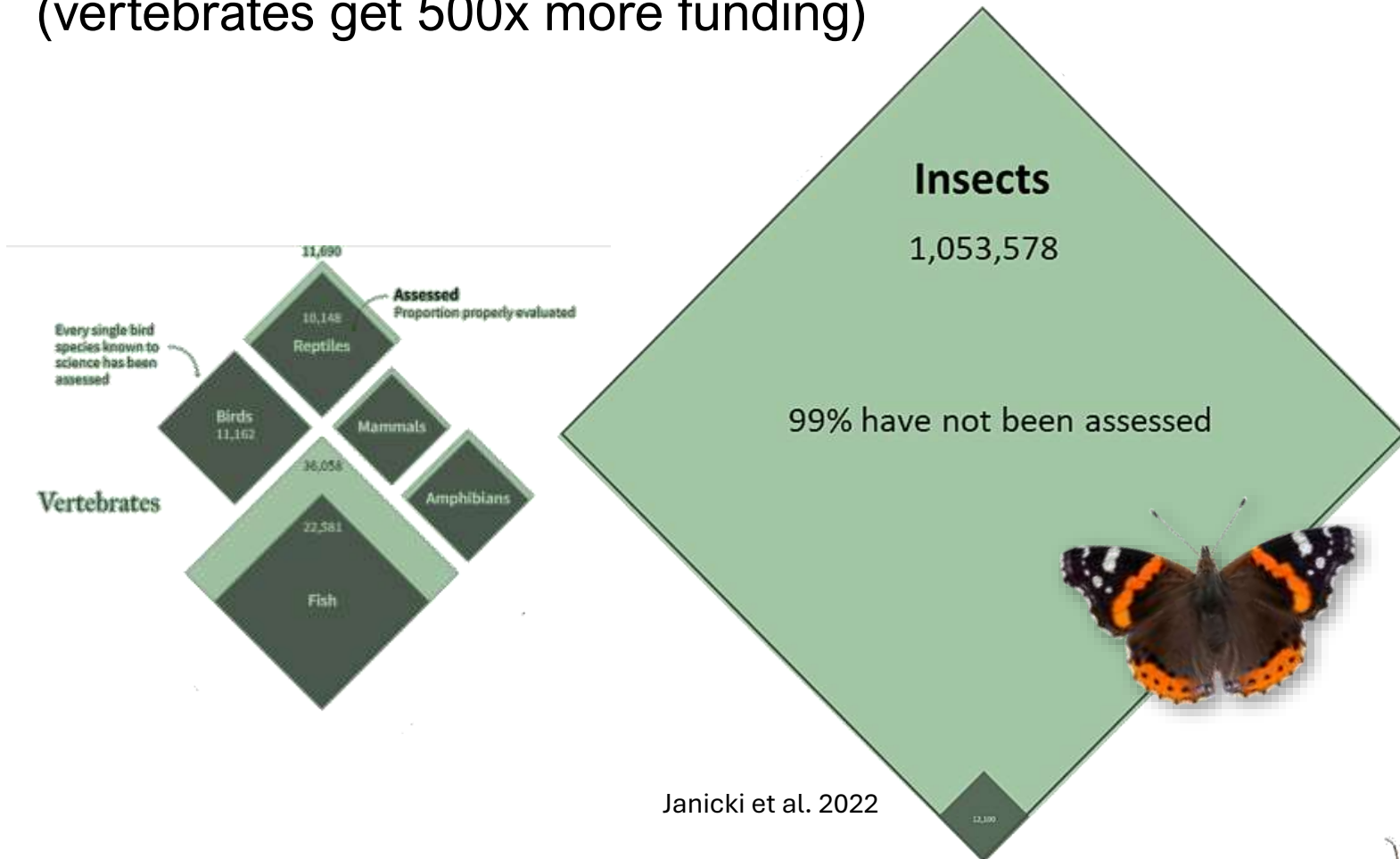


## SYSTEMATICS TOOLS



# Insects are declining

Conservation status known for **<1%** of insect species  
(vertebrates get 500x more funding)



Janicki et al. 2022



# GenARCC

## Leveraging museums

The Canadian National Collection of Insects, Arachnids, and Nematodes (CNC)

- Among 5 largest collections in the world
- ~ 18 million specimens
- > 150,000 described species



Canadian National Collection, Ottawa Canada



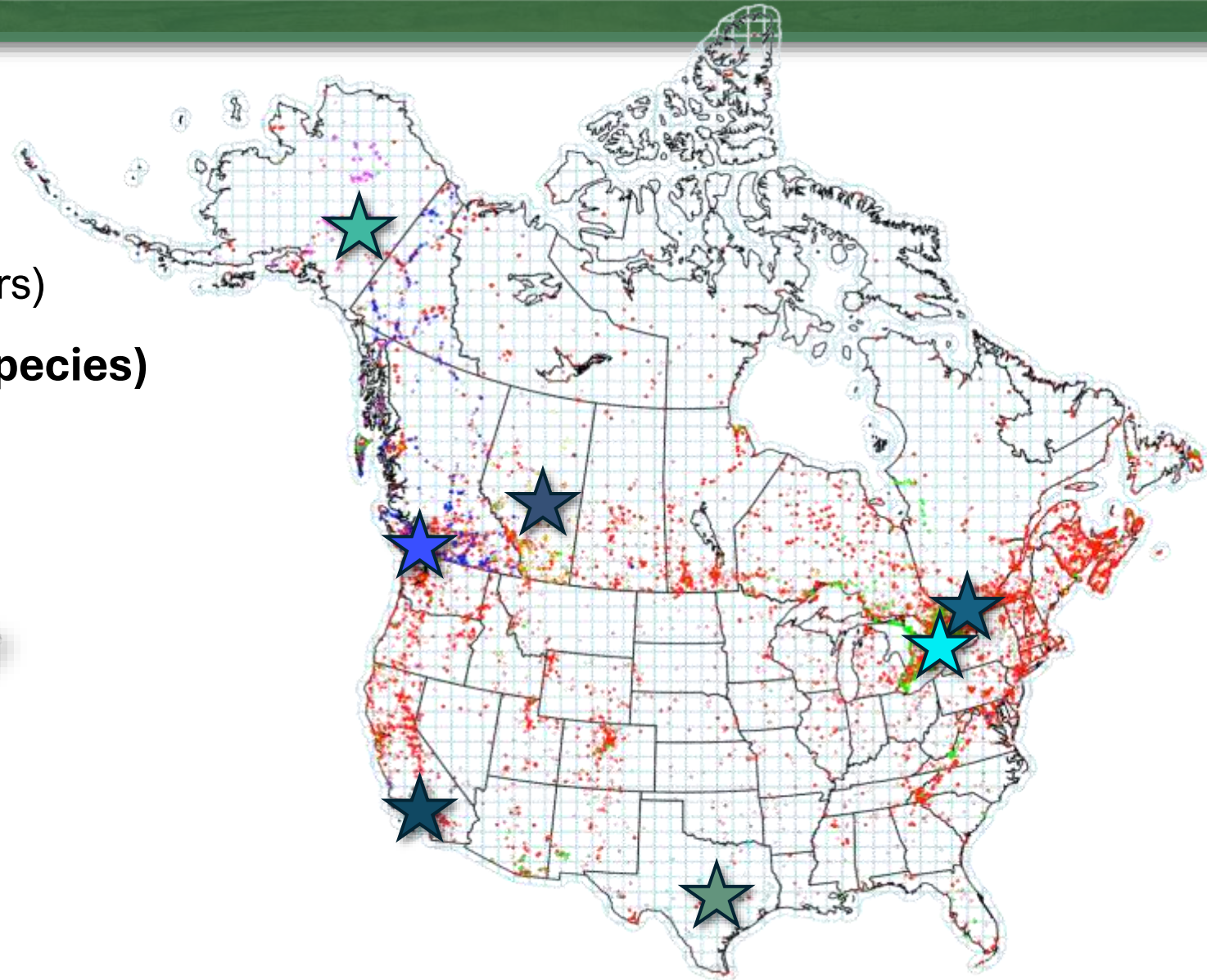
National Museum of Natural History, Washington USA.  
Chip Clark 2008

# GenARCC

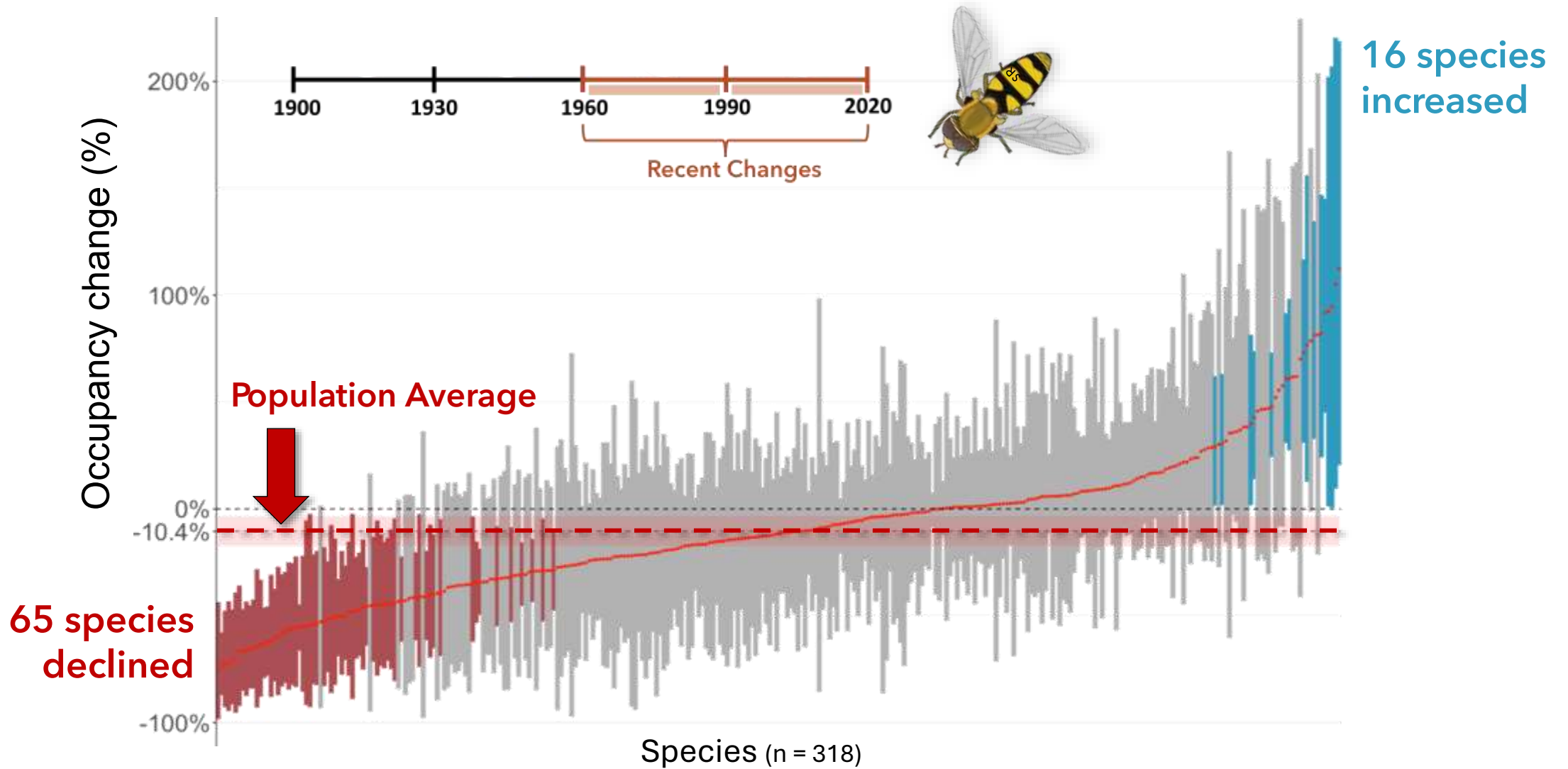
- Digital hoverfly records from 7 North American collections
- Records from 1900-2020 (120 years)
- Filtering → **138,112 records (318 species)**



Adam Duchesne, M.Sc.

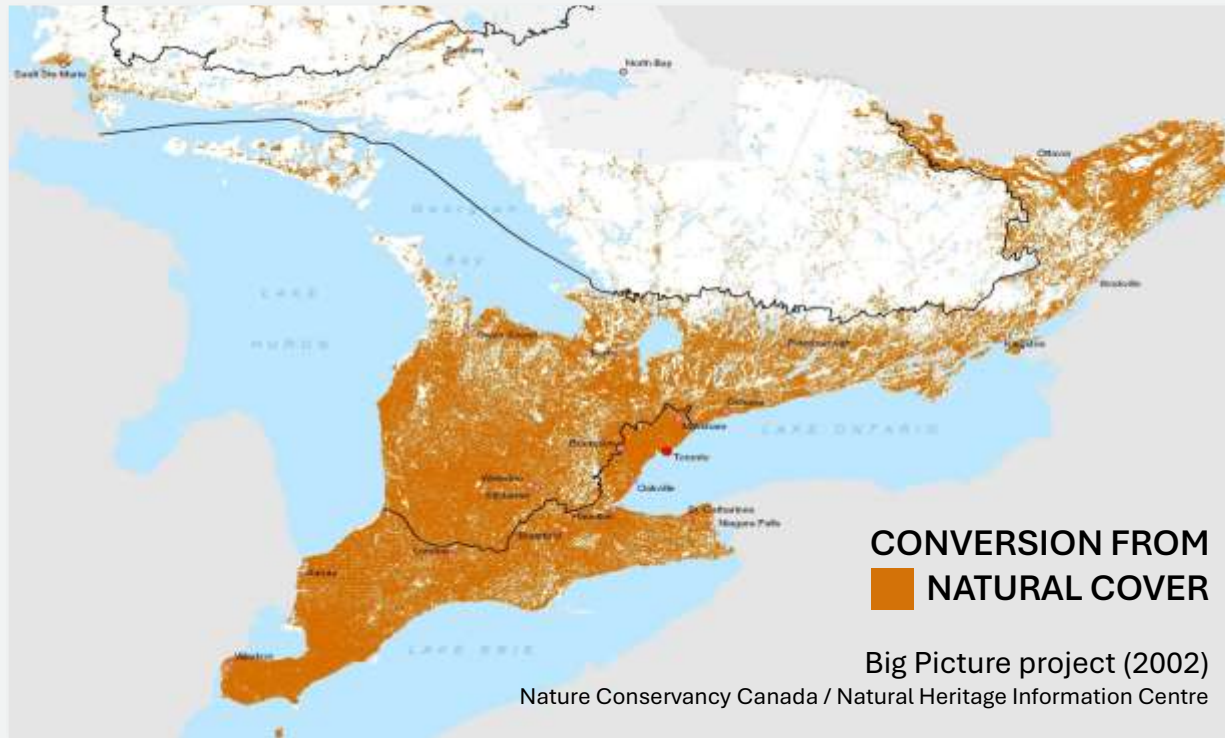


# GenARCC



# Living Labs Ontario

Agricultural intensification is a major driver of insect declines



**% FARMLAND BY COUNTY**  
Essex: 80%, Chatham: 91%

# Living Labs Ontario

## Prairie strips

- Mix of native grasses & forbs
- Restoration option for marginal land
- Many ecological benefits!  
(Carbon storage, erosion control etc.)



How effectively do prairie strips improve insect communities on Ontario farms?



Iowa State University 2025

# Living Labs Ontario



Measure insect community **before** vs **after** strips added



+ Control sites (no strips)

# Living Labs Ontario

## **Malaise trap (for flying insects)**

1. Flying insect hits central wall
2. Insect guided upwards
3. Ethanol trap!

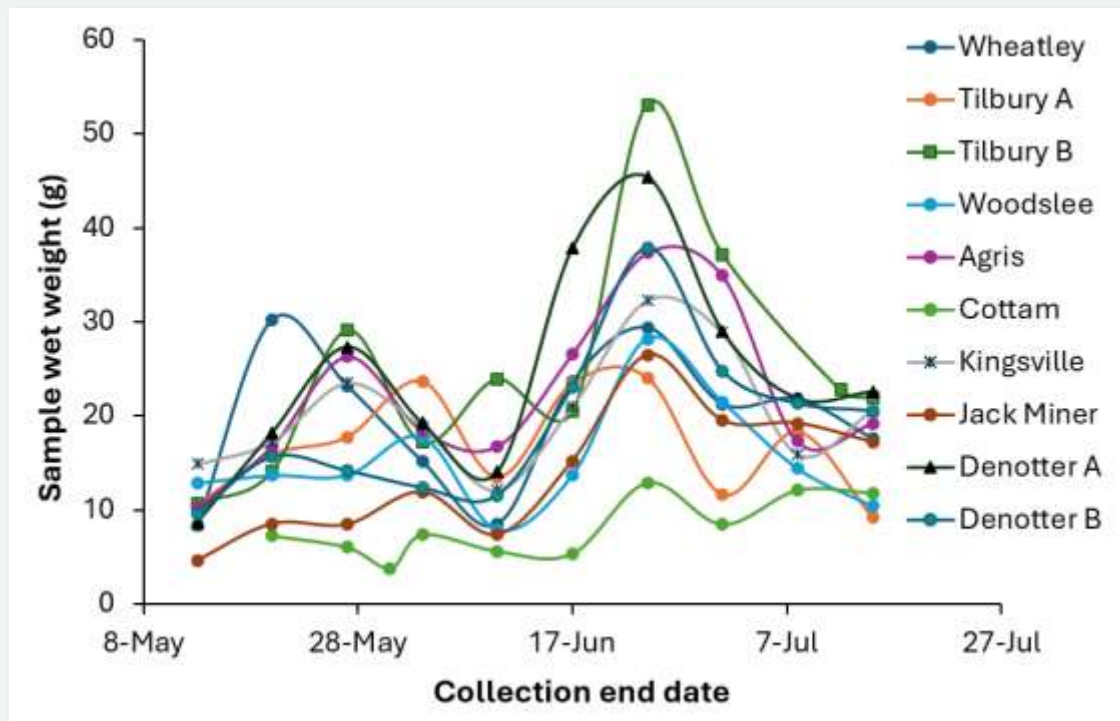
Sampling 3 days/week  
(10 weeks, May – July)



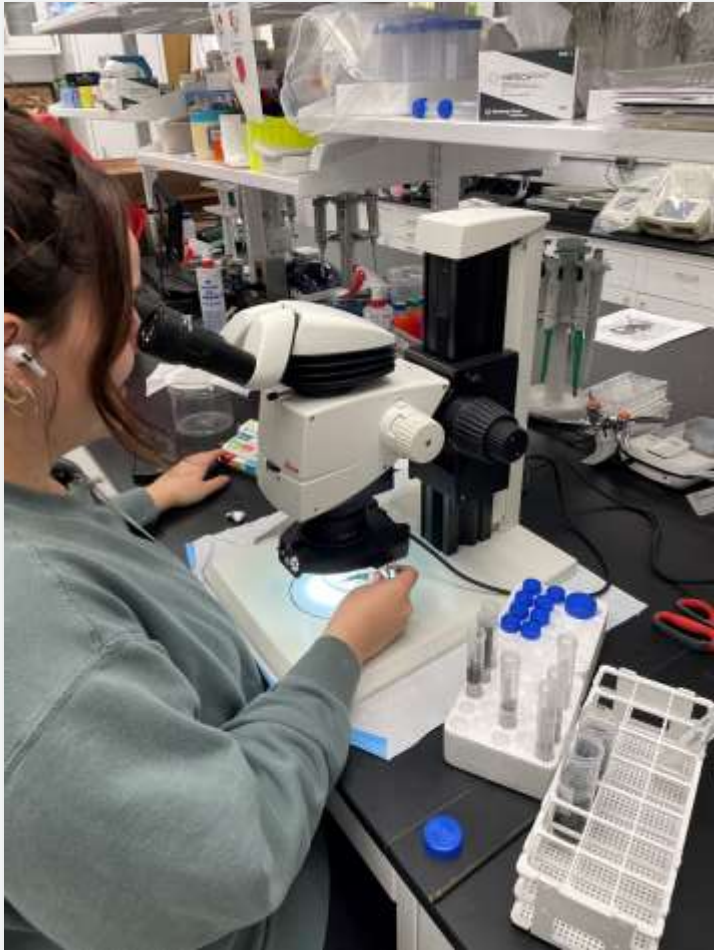
# Living Labs Ontario

## 2024 sampling

- 100 bulk samples
- **~320,000 insects**
- **4,640 species** (based on DNA)



# Living Labs Ontario



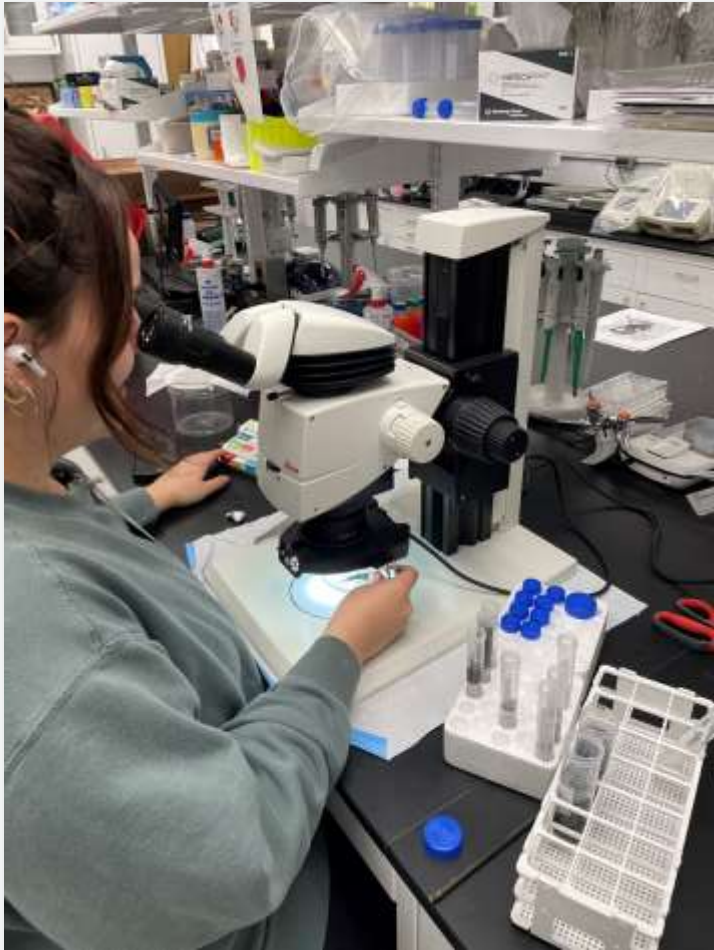
## Mia's tasks

- Sort/count all insects in each sample
- Pin, label, ID, count pollinator species
- Count natural enemies



- Felt scale (Eriococcidae):  
*Acanthococcus missouri*
- 1<sup>st</sup> vouchered specimen for Canada

# Living Labs Ontario



## Mia's tasks

- Sort/count all insects in each sample
- Pin, label, ID, count pollinator species
- Count natural enemies



- Eulophid wasps  
(*Sympiesis* or *Pnigalio*)
- Natural enemies of leafminers

# Current projects

## CONSERVATION / BIODIVERSITY



1. GenARCC
2. Living Labs Ontario

## PEST MONITORING



3. Biovigilance for spotted lanternfly

## SUSTAINABLE PEST MANAGEMENT



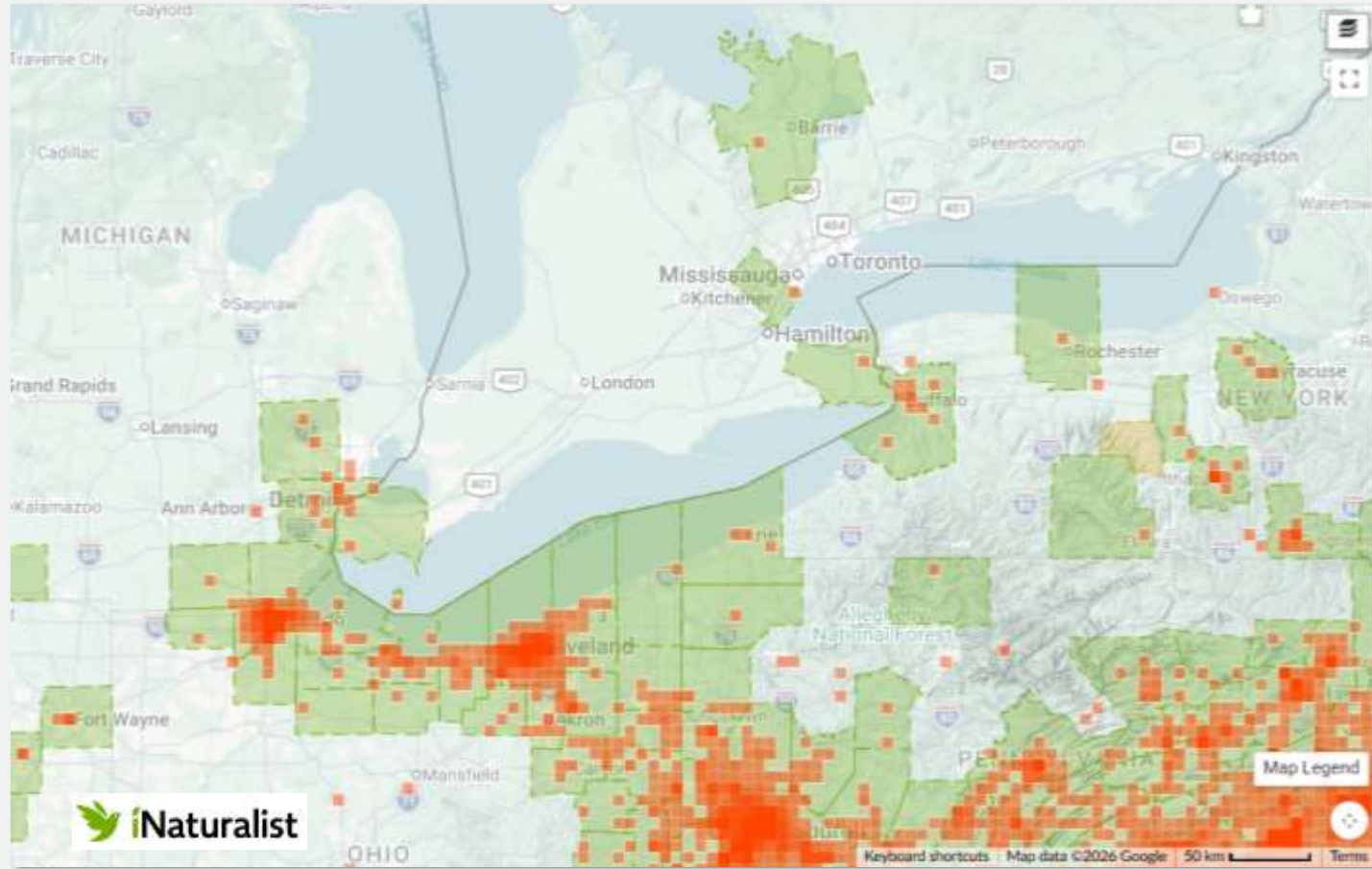
## SYSTEMATICS TOOLS



# Pest monitoring – spotted lanternfly



# Pest monitoring - spotted lanternfly



# Current projects

## CONSERVATION / BIODIVERSITY



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## SUSTAINABLE PEST MANAGEMENT



4. Reducing impacts of cereal leaf beetle in Ontario wheat
5. Biocontrol for striped cucumber beetle & bacterial wilt disease

## SYSTEMATICS TOOLS

# Managing cereal leaf beetle

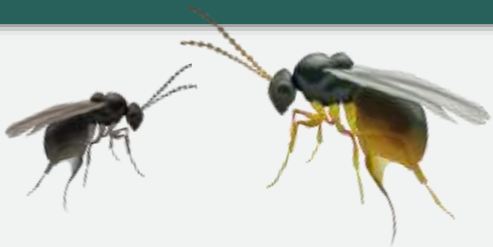


# Managing cereal leaf beetle

Find resistant wheat varieties



Natural enemies  
(what's going on?)



*Tetrastichus julis*



Two new species for Canada

# Current projects

## CONSERVATION / BIODIVERSITY



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## PEST MONITORING



3. Biovigilance for spotted lanternfly

## SUSTAINABLE PEST MANAGEMENT



4. Reducing impacts of cereal leaf beetle in Ontario wheat
5. Biocontrol for striped cucumber beetle & bacterial wilt disease

## SYSTEMATICS TOOLS



6. Systematics of gall midges in Ontario

# Gall midges: a black box

## Cecidomyiidae

- Tiny flies (1-3 mm)
- Some pests, some predators
- 6,000 species described
  - **Estimate: 300,000 to 1.8 million species**



Photo: Hallvard Elven 2019



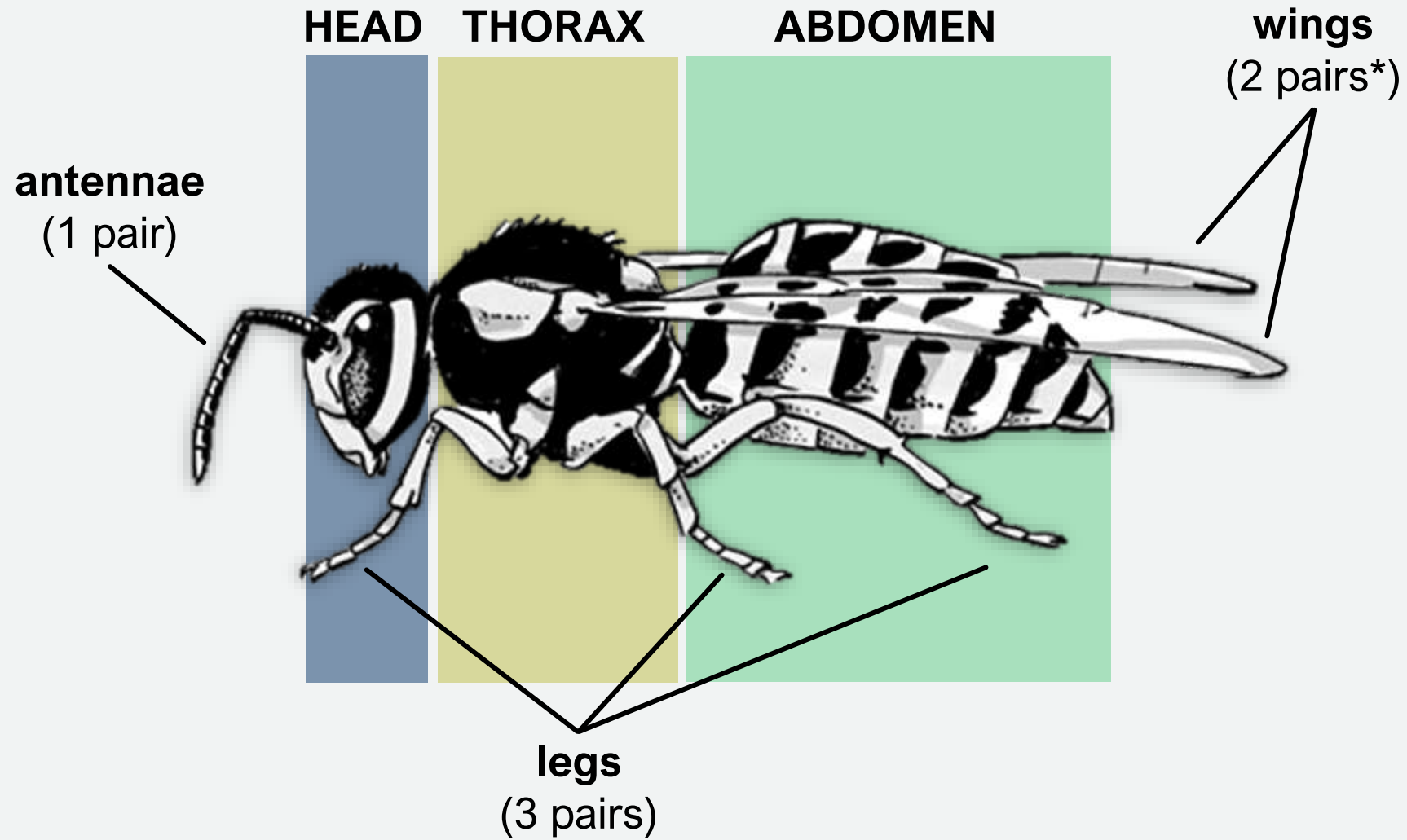
Photo: Rsbernard 2015

# Insect identification

“What insect is this?”



# Insect identification (adult)



Quiz: Is it an insect?

**NO: Millipede**



# Quiz: Is it an insect?

**NO: Tick**



Quiz: Is it an insect?

**YES: Stink bug**



Quiz: Is it an insect?

**NO: Isopod**



Quiz: Is it an insect?

**NO: Spider**



Quiz: Is it an insect?

**YES: Beetle**



Quiz: Is it an insect?

**NO: Centipede**

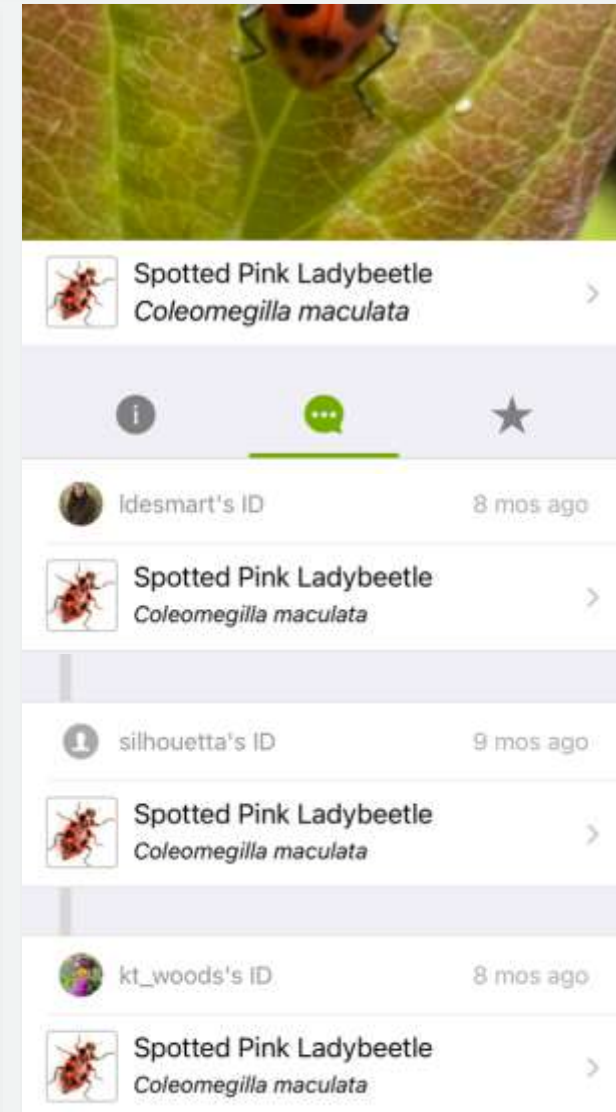
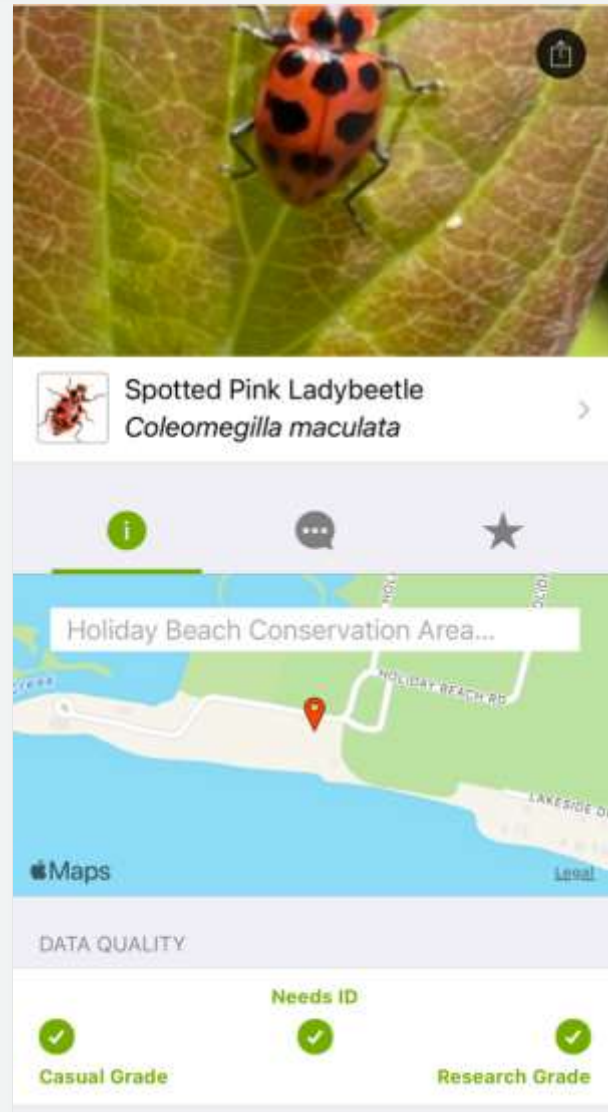


Quiz: Is it an insect?

**YES: Crane fly**



# Insect identification resources



# Insect identification resources



**INSECT**

## Rough Hermit Beetle

*Osmoderma scabra*

✓ You observed it on Jul 19, 2022

**ABOUT**

*Osmoderma scabra* is a species in the family Scarabaeidae ("scarab beetles"), in the order Coleoptera ("beetles").

(Source: Wikipedia)

Navigation icons: menu, camera, notifications.

**RANGE MAP**

A map of North America with a grid overlay. A green shaded area indicates the distribution of the Rough Hermit Beetle, primarily in the eastern and central US. A location pin with a camera icon is placed in the eastern US. The map is labeled 'NORTH AMERICA' and 'SOUTH AMERICA'. A legend is visible at the bottom left.

**LEGEND**

Navigation icons: back, camera, location, notifications.

**TAXONOMY**

- Kingdom Animalia  
Animals
- Phylum Arthropoda  
Arthropods
- Class Insecta  
Insects
- Order Coleoptera  
Beetles
- Family Scarabaeidae  
Scarabs
- Genus *Osmoderma*  
Typical Hermit Beetles
- Osmoderma scabra*  
Rough Hermit Beetle

**INATURALIST OBSERVATIONS**

Nearby  
89

Worldwide  
2,048

**SEASONALITY**

Navigation icons: menu, camera, notifications.

**SEASONALITY**

A line graph with months on the x-axis (J, F, M, A, M, J, J, A, S, O, N, D) and a y-axis representing frequency. The data points show a sharp peak in July (J) and a secondary peak in August (A).

**SIMILAR SPECIES**

Three circular images of different beetle species: Hermit Flower Beetle, Broad-necked Root Borer, and Osmoderma eremita.

Hermit Flower Beetle   Broad-necked Root Borer   *Osmoderma eremita*

Navigation icons: menu, camera, notifications.

# Insect identification resources

**BugGuide** Identification, Images, & Information For Insects, Spiders & Their Kin For the United States & Canada

Home | Guide | ID Request | Recent | Frass | Forums | Donate | Help

**Clickable Guide**



**Welcome to BugGuide.Net!**



Photo © Joyce Gross



Placed by [v\\_heloy](#) 59 seconds ago in [Plateumaris rufa](#)



Placed by [oneounah](#) 18 minutes ago in [Phytocoris suavis](#)



**All Abuzz About Bugs!**

We are an online community of naturalists who enjoy learning about and sharing our observations of insects, spiders, and other related creatures.

We enjoy the opportunity to instill in others the fascination and appreciation that we share for the intricate lives of these oft-maligned creatures.

**Our Mission**

Using the best resources we have access to, we are creating a knowledgebase to help each other and the online community.


BugGuide.net

Taxonomy | Browse | Info | Images | Links | Books | Data

Home » Guide » [Arthropods \(Arthropoda\)](#) » [Hexapods \(Hexapoda\)](#) » [Insects \(Insecta\)](#) » [Beetles \(Coleoptera\)](#) » [Polyphaga](#) » [Series Cucujiformia](#) » [Longhorn and Leaf Beetles \(Chrysomeloidea\)](#) » [Longhorn Beetles \(Cerambycidae\)](#) » [Cerambycinae](#) » [Clytini](#) » [Megacyllene](#) » [Amorpha Borer \(Megacyllene decora\)](#)

**Species *Megacyllene decora* - Amorpha Borer**

[Classification](#) · [Synonyms and other taxonomic changes](#) · [Explanation of Names](#) · [Size](#) · [Identification](#) · [Range](#) · [Season](#) · [Food](#) · [Internet References](#) · [Works Cited](#)



**Classification**

- Kingdom [Animalia \(Animals\)](#)
- Phylum [Arthropoda \(Arthropods\)](#)
- Subphylum [Hexapoda \(Hexapods\)](#)
- Class [Insecta \(Insects\)](#)
- Order [Coleoptera \(Beetles\)](#)
- Suborder [Polyphaga](#)
- No Taxon ([Series Cucujiformia](#))
- Superfamily [Chrysomeloidea \(Longhorn and Leaf Beetles\)](#)
- Family [Cerambycidae \(Longhorn Beetles\)](#)
- Subfamily [Cerambycinae](#)
- Tribe [Clytini](#)
- Genus [Megacyllene](#)
- Species [decora \(Amorpha Borer\)](#)

**Synonyms and other taxonomic changes**

*Megacyllene decora* (Olivier) 1795  
 numerous synonyms due to this species' variability

**Explanation of Names**

*decora* (L). 'elegant' (1)

**Size**

12-25 mm (2)

**Identification**

Extremely variable

**Singing Insects of North America (SINA)**

[Thomas J. Walker](#), founder of SINA    [Teresa Marie Yawn](#), editor, webmaster

[Crickets](#) | [Katydids](#) | [Cicadas](#) | [Home](#) | [Help](#)

The primary goal of this website is to help users identify all species of crickets and katydids from America north of Mexico. The males of most species in these two taxa make loud, persistent calls that attract sexually ready, conspecific females. Because the songs are loud and species specific they are usually an easy means of identifying the caller. They also facilitate field and laboratory studies of many sorts.

Secondary goals of this site are to attract amateur and professional biologists to the study of singing insects and to provide them helpful information and access to relevant literature.




orthsoc.org/sina/index.htm

# Being a friend to bugs



Márton Zsoldos



**Native plants, flowering at different times**

**Leave some leaf litter / ground undisturbed until nighttime temps of 10°C**

- 70% of bees overwinter / nest in the ground



Will Parson

# What to plant?

**POLLINATOR PARTNERSHIP**  
CANADA



**Canada Planting Guides**

## Ontario



**Lake Erie Lowlands**



**Manitoulin Lake Simcoe**



**Algonquin Lake Nipissing**



**L'écovégion Des Basses Terres Du Lac Érié**

## DEVELOPING LANDSCAPE PLANTINGS THAT PROVIDE POLLINATOR HABITAT

WHETHER YOU ARE A FARMER of many hectares, land manager of a large tract of land, or a gardener with a small lot, you can increase the number of pollinators in your area by making conscious choices to include plants that provide essential habitat for bees, butterflies, moths, beetles, hummingbirds and other pollinators.

**FOOD:**  
Flowers provide nectar (high in sugar and necessary amino acids) and pollen (high in protein) to pollinators. Fermenting fallen fruits also provide food for bees, beetles and butterflies. Specific plants, known as host plants, are eaten by the larvae of pollinators such as butterflies.

- Plant in groups to increase pollination efficiency. If a pollinator can visit the same type of flower over and over, it doesn't have to relearn how to enter the flower and can transfer pollen to the same species, instead of squandering the pollen on unresponsive flowers.
- Plant with bloom season in mind, providing food from early spring to late fall. (see Bloom Periods pp. 16-19)
- Plant a diversity of plants to support a variety of pollinators. Flowers of different colour, fragrance, and seasons of bloom on plants of different heights will attract different pollinator species and provide pollen and nectar throughout the seasons.
- Many herbs and annuals, although not native, are very good for

pollinators. Mint, oregano, garlic chives, parsley and lavender are just a few herbs that can be planted. Old-fashioned similes, cosmos, and single sunflowers support bees and butterflies.

- Recognize weeds that might be a good source of food. For example, dandelions provide nectar in the early spring before other flowers open. Milkweed is a host for the Monarch butterfly.
- Learn and utilize Integrated Pest Management (IPM) practices to address pest concerns. Minimize or eliminate the use of pesticides.

**SHELTER:**  
Pollinators need protection from severe weather and from predators as well as sites for nesting and roosting.

- Incorporate different canopy layers in the landscape by planting trees, shrubs, and different-sized perennial plants.
- Leave dead snags for nesting sites of bees, and other dead plants and leaf litter for shelter.
- Avoid applying thick layers of mulch that are hard to dig through.
- Build low boxes to encourage solitary, non-aggressive bees to nest on your property.
- Ground nesting bees are also attracted to lawns and short grass areas, especially if there is a south-facing slope.
- Leave some areas of soil uncovered to provide ground nesting insects easy access to underground tunnels.
- Group plantings so that pollinators

can move safely through the landscape protected from predators.

- Include plants that are needed by butterflies during their larval development.

**WATER:**  
A clean, reliable source of water is essential to pollinators.

- Natural and human-made water features such as running water, pools, ponds, and small containers of water provide drinking and bathing opportunities for pollinators.
- Ensure the water sources have a shallow or sloping side so the pollinators can easily approach the water without drowning.

Your current landscape probably includes many of these elements. Observe wildlife activity in your farm fields, woodlands, and gardens to determine what actions you can take to encourage other pollinators to feed and nest. Evaluate the placement of individual plants and water sources and use your knowledge of specific pollinator needs to guide your choice and placement of additional plants and other habitat elements. Many changes by many individuals can positively impact the pollinator populations in your area. Watch for - and enjoy - the changes in your landscape!

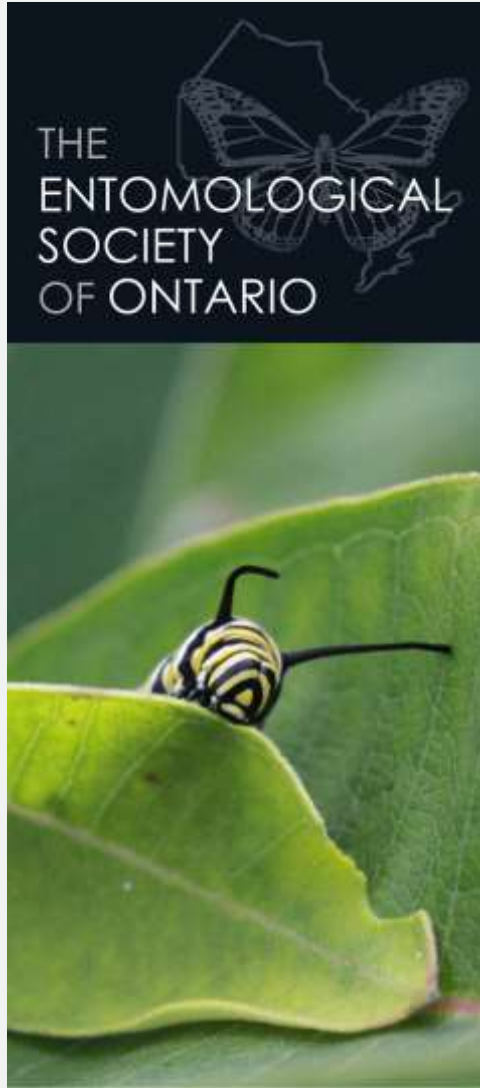
**CAUTION LAND MANAGERS:** Remember that pesticides are largely toxic to pollinators. Extreme caution is warranted if you choose to use any pesticide. Strategically apply pesticides only for problematic target species.

12

SELECTING PLANTS FOR POLLINATORS



# Entomological Society of Ontario



## Established in 1863

- Bi-annual newsletter
- Annual meeting
- Fund outreach events
- Contests (e.g. BugEye)
- Social media



The New  
ESO Newsletter is here!

Volume 30, Issue 2  
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