

PROMOTING NATIVE & BENEFICIAL INSECTS

Get the Dirt: Urban & Small Farm Soil Health Conference

Dr. Laura L. Ingwell, Department of Entomology

Promoting Native & Beneficial Insects

Outline

- What are beneficial insects?
- Strategies to conserve & promote them on our farms
- Available Resources

Special Thanks to John Obermeyer!!





Beneficial Insects

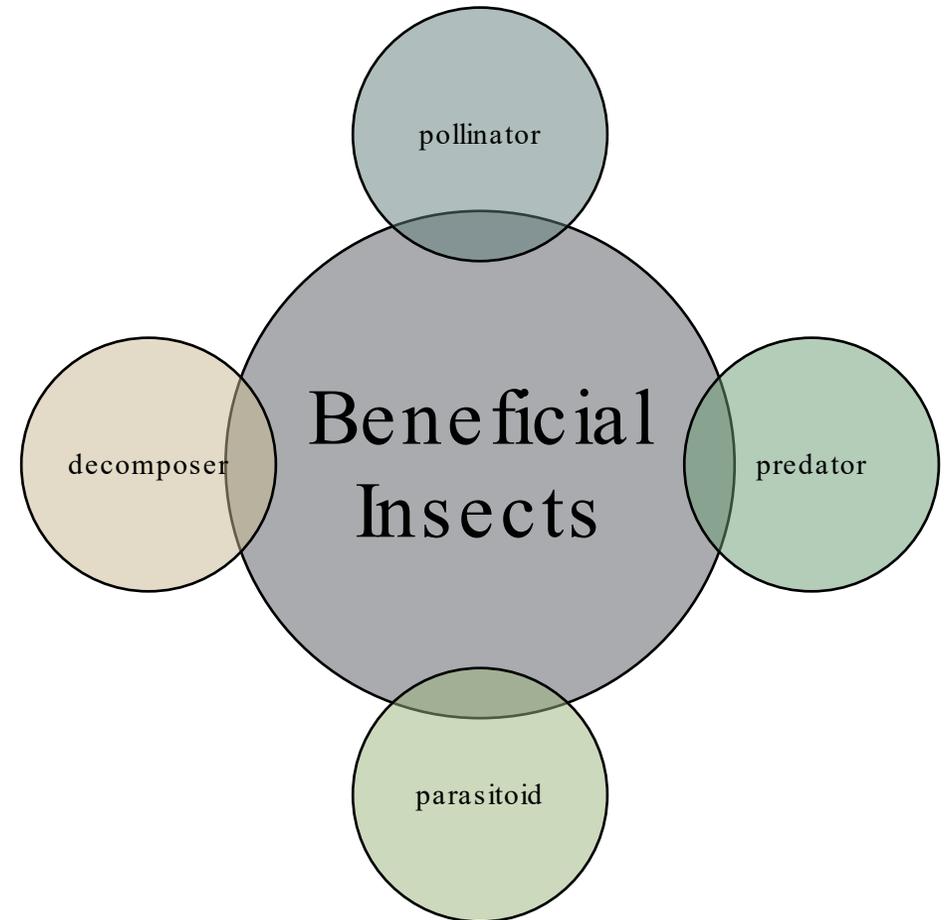
Those that provide a 'benefit' to [our environment]...

Aren't all insects beneficial as they contribute to biodiversity?

What are beneficial insects?

We can place an economic value on their ecological role

- Pollinators contribute to reproduction and gene flow in plant communities, including creating many fruits we enjoy consuming
- Predators eat other organisms/insects and are beneficial when what they eat are deemed as 'pests'
- Parasitoids infect other organisms/insects and are beneficial when they attack what we deem as 'pests'
- Decomposers help breakdown and recycle waste



Pollination

A vibrant field of cosmos flowers in various colors including pink, purple, yellow, orange, and white. A black butterfly with white spots is perched on an orange flower, illustrating the process of pollination.

- Maintains genetic diversity ensuring fruit and seed production
 - Wildflowers, Shrubs, and Trees

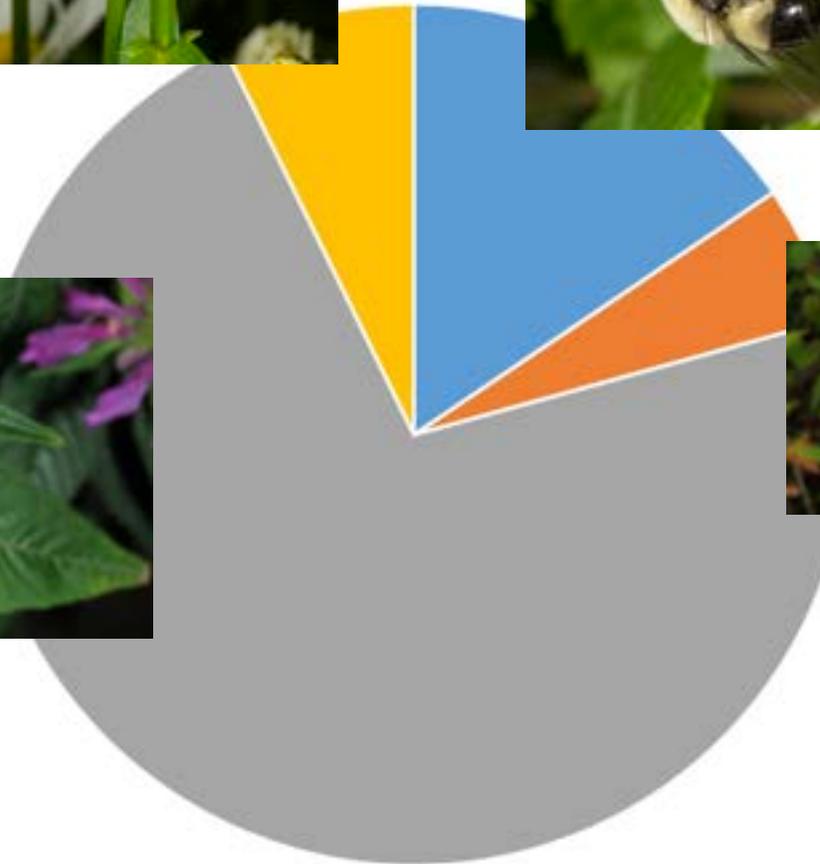
Pollinators

Pollinator Community in Indiana

2% of bee species non-native
(including honeybees)



Species



■ bees ■ butterflies ■ moths ■ other

Pollinators - Bees

- There are many important insect pollinators, but bees are a key group!
- These include the honeybees, bumblebees, squash bees, mason bees, and other solitary bees.



Pollinators - Bees

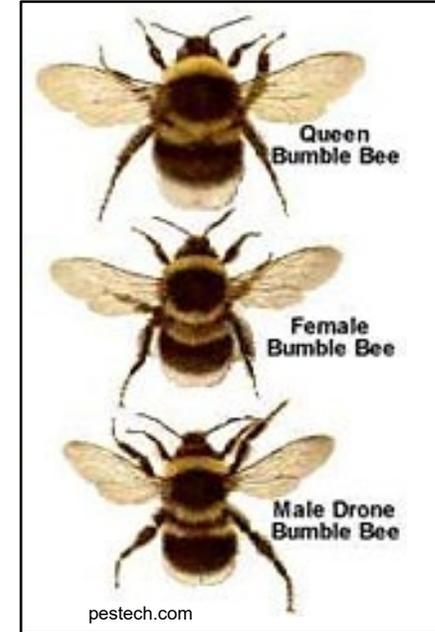
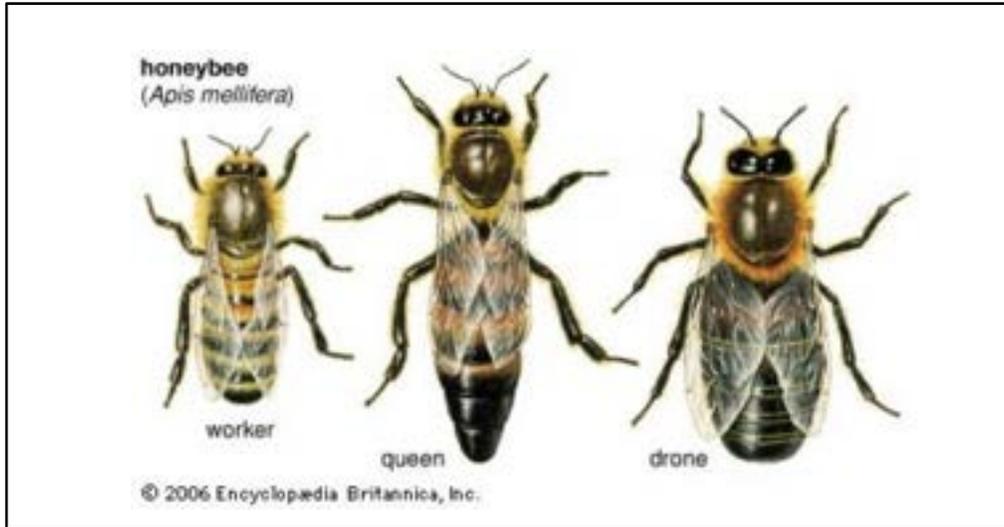
Key differences

- **“Social” versus solitary bees:**
 - Reproductive division of labor
 - Cooperative brood care
 - Overlapping of generations
- **Colony size**
- **Foraging habits**
- **Habitat (nest sites)**



Pollinators – Honey vs. Bumble

The “social” bees



Caste	Honeybee ¹	Bumblebee ²
Queen	1	1
Workers	10,000 - 50,000	up to 400
Drones	100 - 500	0 - 50

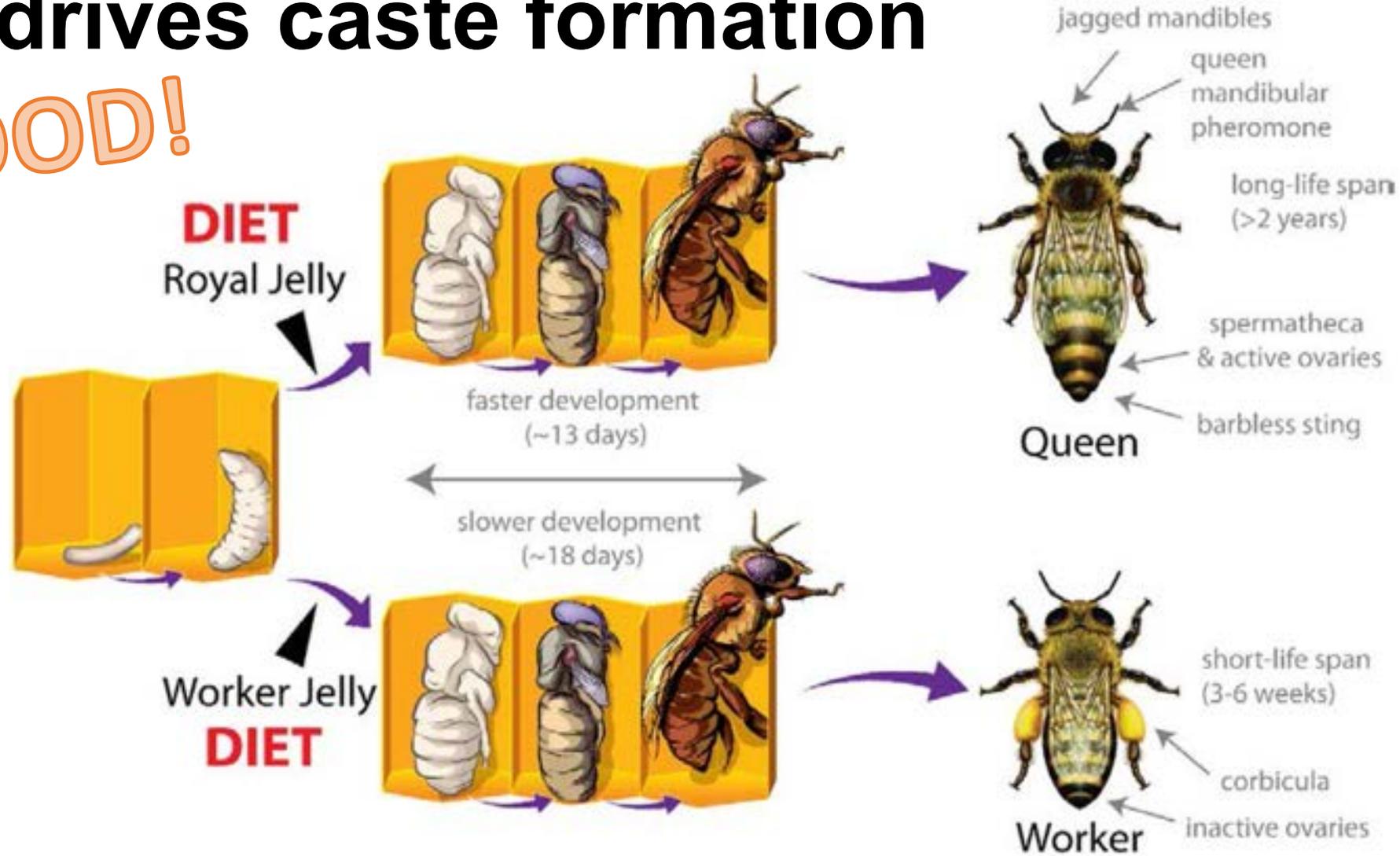
¹Queen stings repeatedly, workers only once, drones not at all.

²Queen & workers can sting repeatedly, drones not at all.

Pollinators - Bees

drives caste formation

FOOD!





Pollinators - Bees

Solitary bees

- No division of labor.
- Nest sites often in stems or the ground.
- Colonies are small.
- Rarely sting!



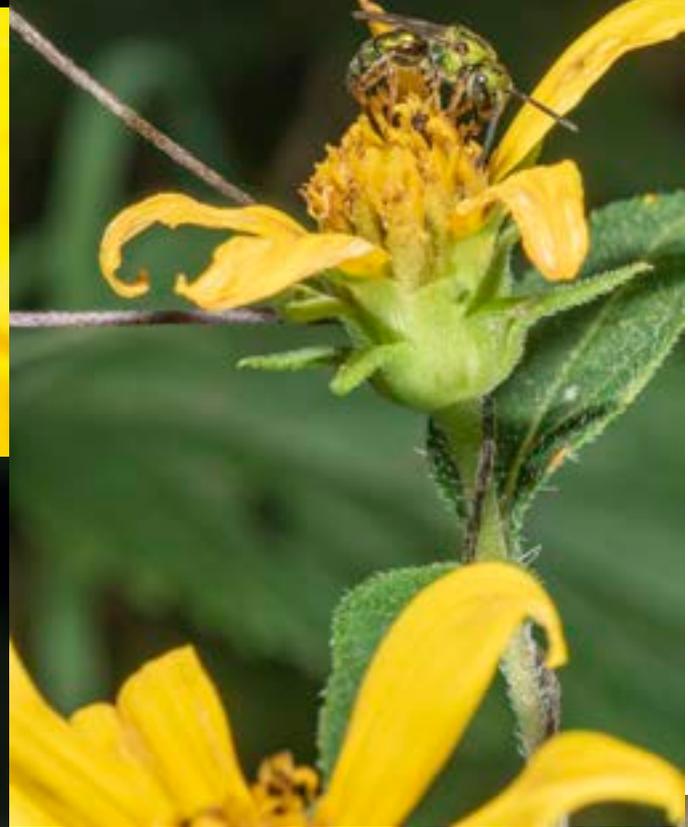
Digger Bee Exiting Nest Hole



**Leafcutter bee
gathering nest
materials**



Pollinators - Bees



Halictid Bees

Squash Bee

Carpenter Bees

Resin Bee

Bumble Bees

Honey Bee

Pollinators - Wasps

Wasp on Dill



Scoliid Wasp



Paper Wasps



Pollinators - Flies

Bee Fly



Mosquito



Syrphid Flies



Blow Fly



Pollinators – Butterflies

Scarlet Peacock



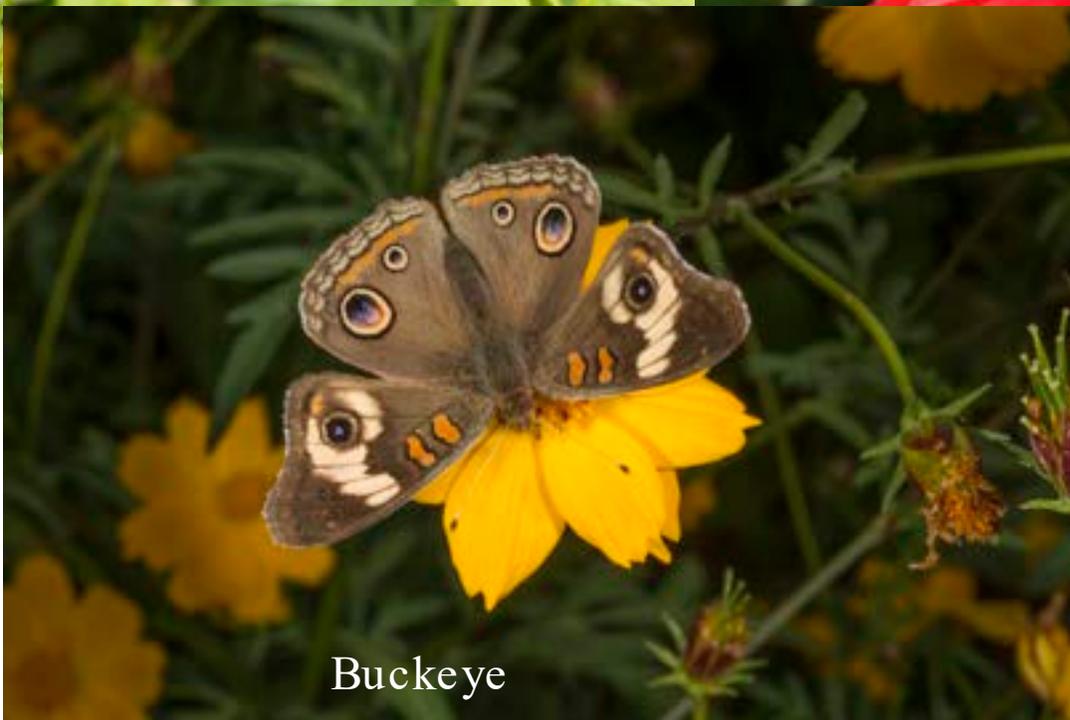
Monarch



Cabbage White



Buckeye



Painted Lady



Pollinators – Moths

Polyphemus moth



Imperial moth



Hummingbird Clearwing

Ragweed flower moth



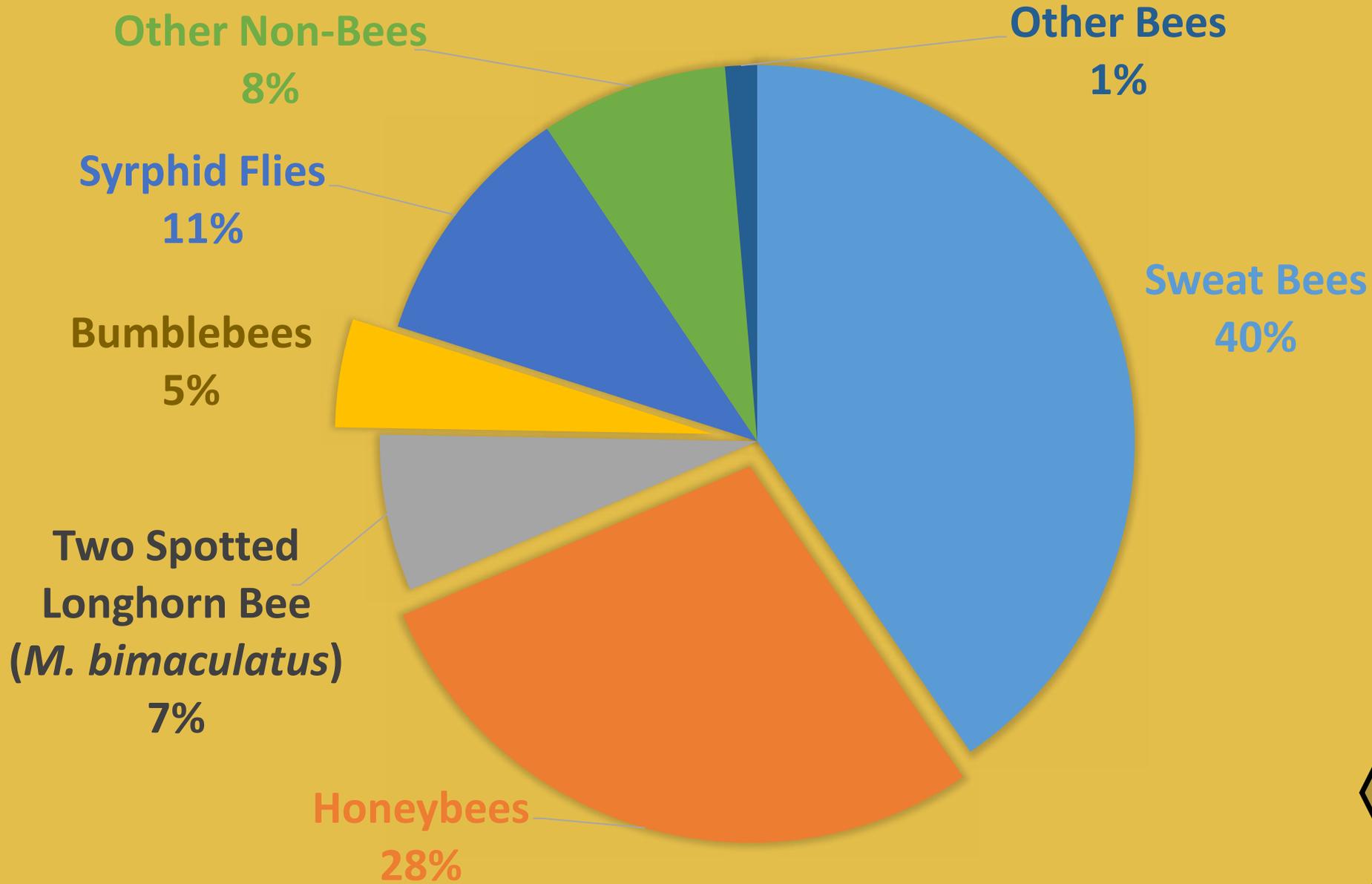
Tobacco hornworm adult



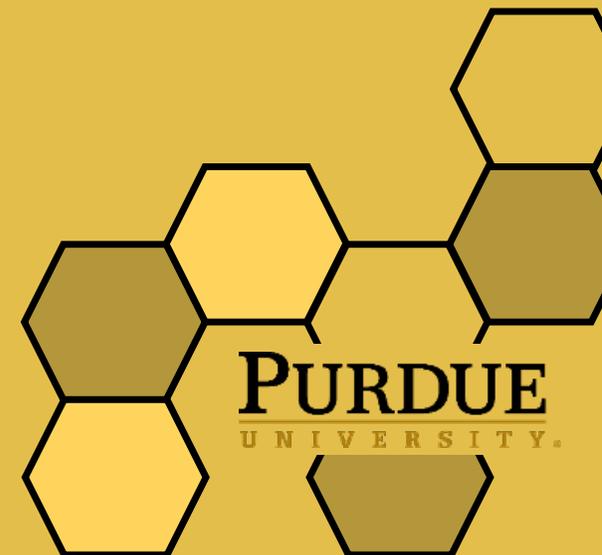
Luna moth

© Tom Jantscher 2010

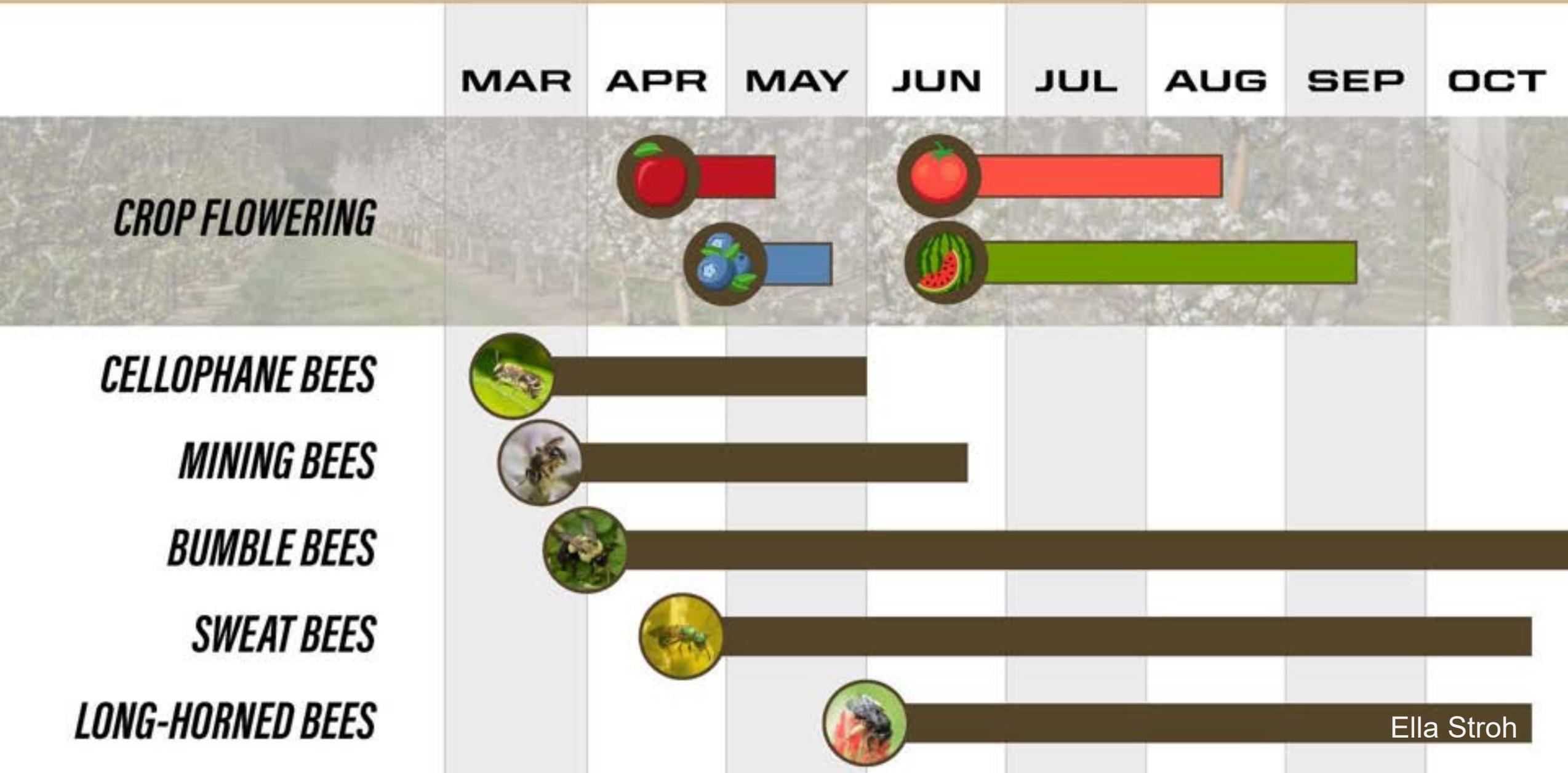
FLOWER VISITATION BY POLLINATOR GROUP



Jacob Pecenka



ACTIVITY PERIODS OF COMMON WILD BEES



Predation













Soldier Beetle



Fire fly



Ground Beetle





Parasitism











Decomposition



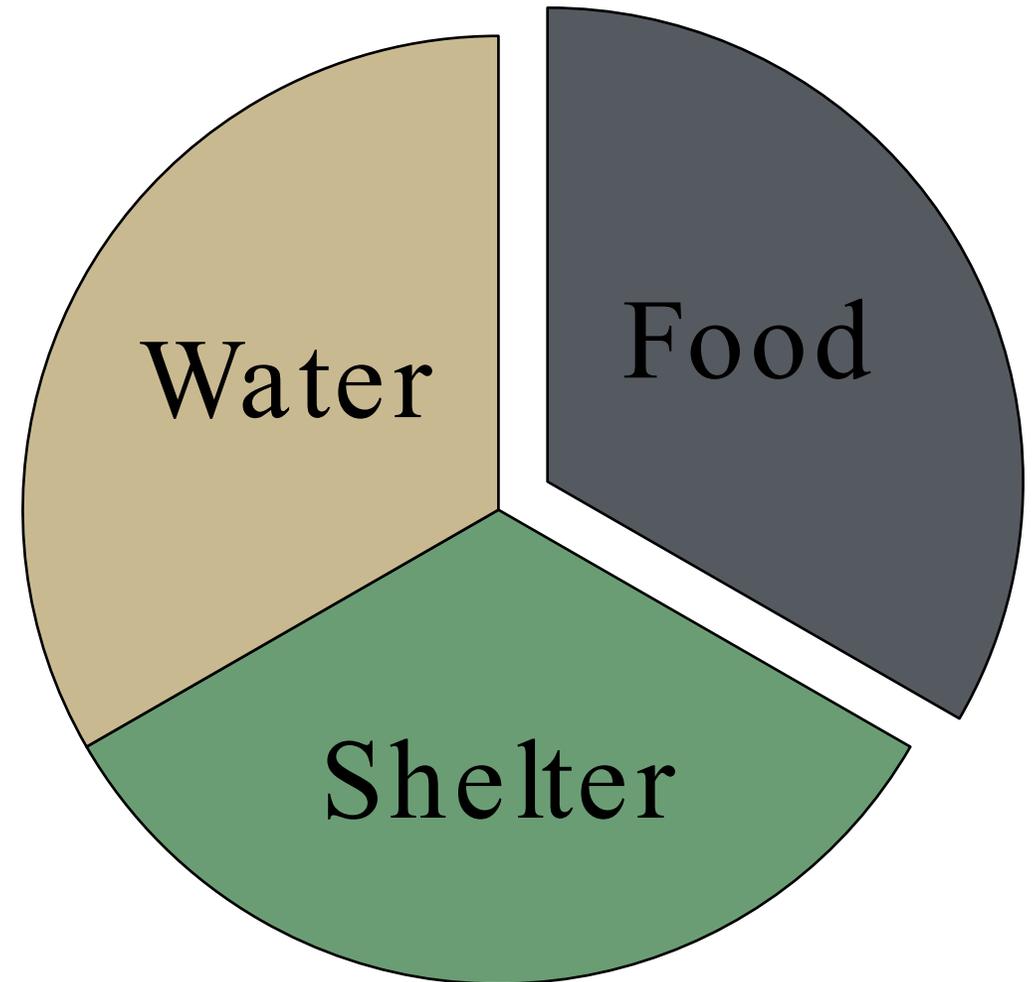




Promoting Native & Beneficial Insects

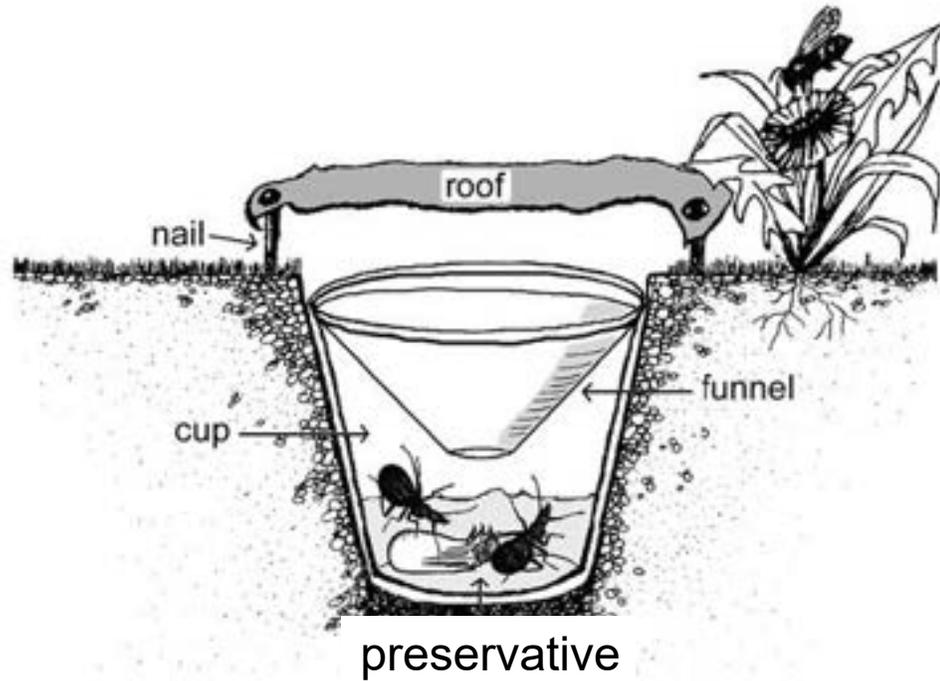
Outline

- What are beneficial insects?
- Strategies to conserve & promote them on our farms
- Available Resources



What can you do?

Monitor the diversity in your habitat



What can you do?

- **Plant ‘useful’ flowers, not just ornamental ones:**
 - Use native flowers if you can
 - Include a range of colors, shapes, and flowering times
 - Incorporate pollen and nectar producers
- **Tolerate “messy” plant stands/stems**
 - Add additional habitat, like “bee hotels” during the season
- **Consider how flowers/mixes are managed:**
 - Pesticides
 - Mowing/Burning



Spring Hill Nurseries



Supporting Diverse Bees with Native Plants

What we found

Number of estimated bee species supported, based upon 3 years' worth of bee collections.



What we found



Supporting Biocontrol with Garden Plants

Hosted a high abundance of natural enemies



Douglas' Aster
Symphiotrichum subspicatum



Canada Goldenrod
Solidago canadensis



Yarrow
Achillea millefolium



Farewell to Spring
Clarkia amoena



Pearly Everlasting
Anaphalis margaritacea

Hosted a high ratio of natural enemy to herbivore abundance



Douglas' Aster
Symphiotrichum subspicatum



Pearly Everlasting
Anaphalis margaritacea



Yarrow
Achillea millefolium



Oregano
Origanum vulgare



Catnip
Nepeta cataria

Hosted a high diversity of parasitoids



Pearly Everlasting
Anaphalis margaritacea



Farewell to Spring
Clarkia amoena



Canada Goldenrod
Solidago canadensis



Douglas' Aster*
Symphiotrichum subspicatum



Yarrow*
Achillea millefolium

Hosted a high diversity of predators



Farewell to Spring
Clarkia amoena



Canada Goldenrod
Solidago canadensis



Douglas' Aster
Symphiotrichum subspicatum



Pearly Everlasting
Anaphalis margaritacea



Oregon Sunshine
Eriophyllum lanatum

Photos: Douglas' Aster - Jen Hayes; Canada Goldenrod - LaAnn Locher; Yarrow - Jen Hayes; Farewell to Spring - Jen Hayes; Pearly Everlasting - Jen Hayes; Oregano - Neil Bell; Catnip - Jen Hayes; Oregon Sunshine - Gail Langellotto

What can you do?

Provide high quality food



Wildflowers

Plant Information = 🌿 Pollinator Connection = 🐝

Common Name	Latin Name	Plant Information 🌿												Pollinator Connection 🐝								
		Sun			Soil Moisture					Height	Flower Color	Bloom Time	Hard to Find	Ephemeral	Bee	Beetle	Butterfly /Moth	Fly	Hummingbird	Wasp	Special Notes	Pollinator Magnets
		Full Sun	Part Shade	Shade	Wet	Wet Mesic	Mesic	Dry Mesic	Dry													
sweet flag	<i>Acorus calamus</i>	X	-	-	X	X	-	-	-	2'-3'	green	spring	-	-	-	X	-	-	-	-	-	-
nodding wild onion	<i>Allium cernuum</i>	X	X	-	-	-	X	X	X	1'-2'	pink	summer	-	-	X	-	-	-	-	-	-	-
rue anemone	<i>Anemonellalthalictroides</i>	X	X	X	-	X	X	X	-	1'	white	spring	-	-	X	-	-	-	-	-	-	-
columbine	<i>Aquilegia canadensis</i>	X	X	X	-	-	X	X	X	1'-3'	red-yellow	spring	-	-	X	X	-	-	X	-	-	-
goat's beard	<i>Aruncus dioicus</i>	X	X	-	-	X	X	-	-	4'-6'	white	spring	-	-	X	X	X	-	-	-	dusky azure host	*
wild ginger	<i>Asarum canadense</i>	X	X	X	-	-	X	X	X	<1'	maroon	spring	-	-	-	-	-	X	-	-	-	-
marsh milkweed	<i>Asclepias incarnata</i>	X	-	-	X	X	X	-	-	3'-4'	pink	summer	-	-	X	X	X	-	-	-	monarch host	*

What can you do?

Provide shelter



Heather Holm

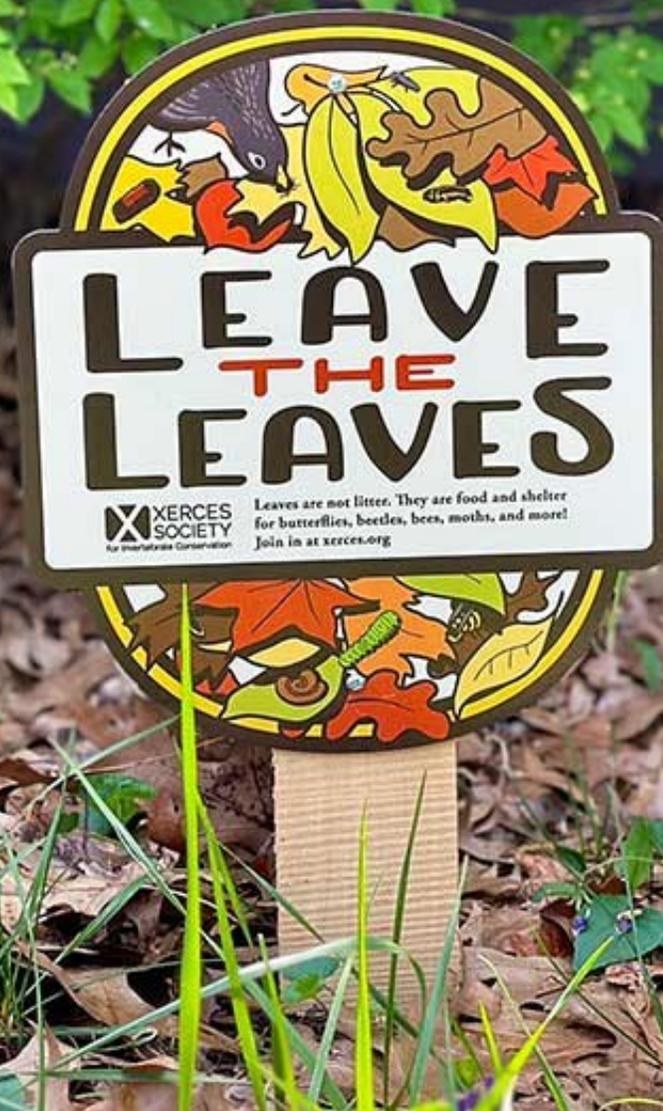


Xerces Society

Bee Responsible!



Xerces Society



Insect Hedgerows (wildbeeproject.com)



Alternative Food



Weeds



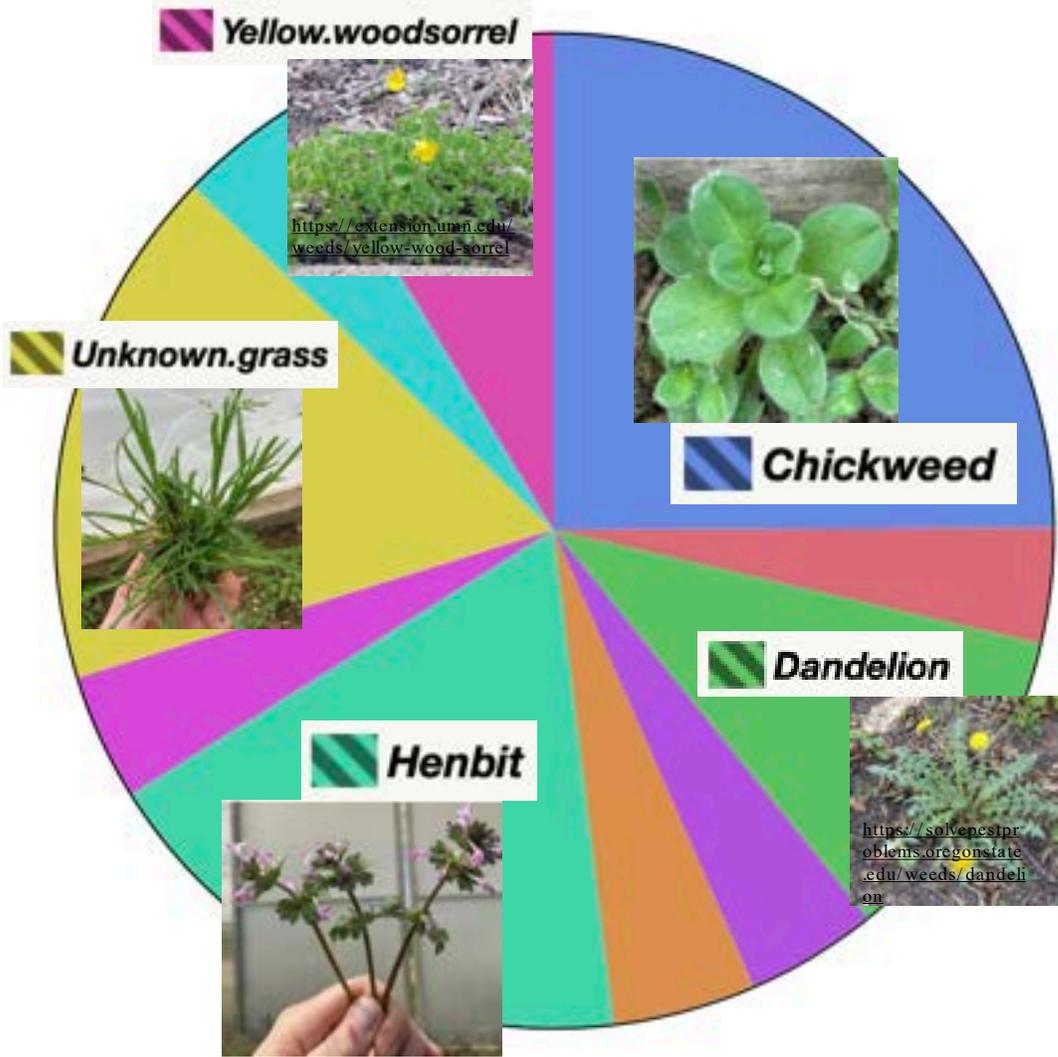
Companion Plants



Insectary Strips



Weed Abundance in High Tunnels



- weedID
- Chickweed
 - Clover
 - Dandelion
 - Hairy.bittercress
 - Hairy.crabgrass
 - Henbit
 - ladysthumb
 - Unknown.grass
 - witchgrass
 - Yellow.woodsorrel

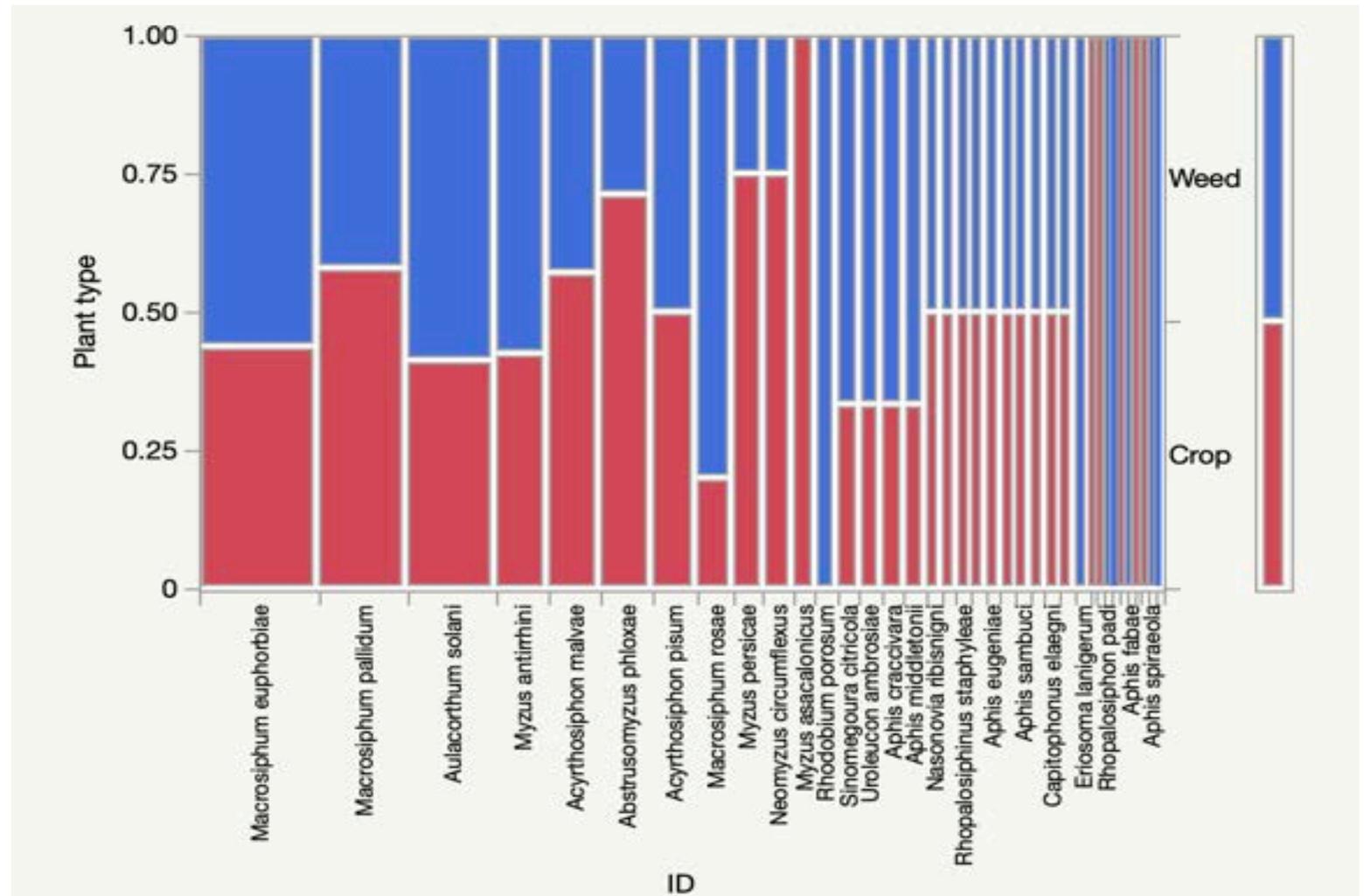


Amantha Wilgen

weedID



Are weeds serving as green bridges to crops?



M. euphorbiae



<https://petehillmansnaturephotography.wordpress.com/potato-aphid-macrosiphum-macrosiphum-euphorbiae/>

M. pallidum



https://influentialpoints.com/Gallery/Macrosiphum_pallidum_pink_wild_rose_aphid.htm#text=Macrosiphum%20pallidum%20is%20most%20commonly%2C%20Geum%2C%20and%20Potentilla

A. solani



<https://bugguide.net/node/view/1569323>

Specialist aphids on weed hosts



Aphis spiraecola



Rhodobium porosum

Illinoia azaleae

Erisomalangerium

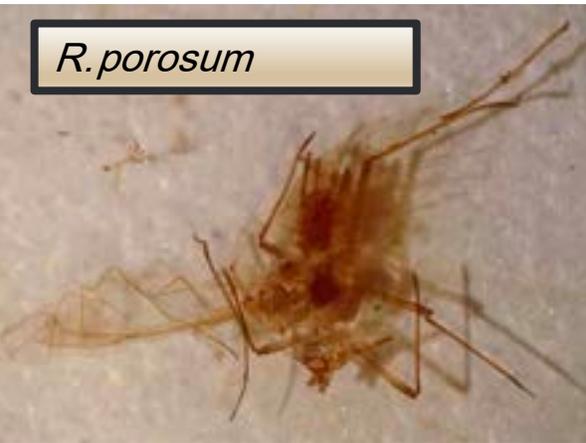
Yellow sorrel

Bindweed

Sow thistle

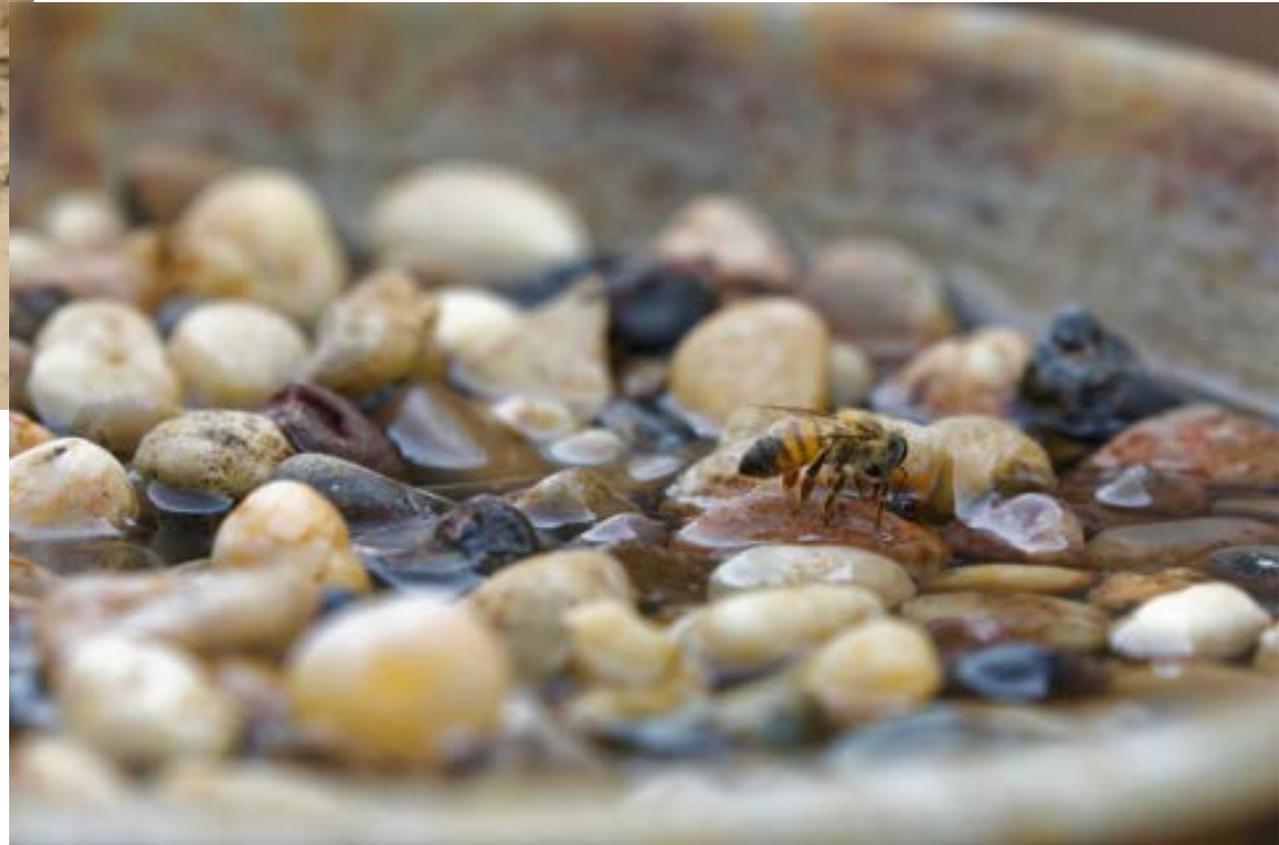
Prickly lettuce

Morning glory



Photos by Isabela Arias

Insect watering habitats/stations



Take-home

- Diversity is always good!
- Perennial habitat provides food and shelter
- Flowers benefit more than just pollinators
- Choose native plants when possible
- Exposed areas of soil/sand/thin mulch for nesting
- Structural complexity



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4-H AND YOUTH

BEEKEEPING

EXOTIC INVASIVE PESTS

FIELD CROP INSECTS

FRUIT INSECTS

HOUSEHOLD AND STRUCTURAL
INSECTSLANDSCAPE AND ORNAMENTAL
INSECTS

NEMATOLOGY

POLLINATOR PROTECTION

PUBLIC HEALTH

SPECIALTY CROPS

STORED PRODUCT PESTS

TURFGRASS INSECTS

URBAN AGRICULTURE

POLLINATOR PROTECTION

- Protecting Pollinators in Home Lawns and Landscapes ([Web](#) | [📄](#))
- Protecting Pollinators in Fruit and Vegetable Production ([Web](#) | [📄](#))
- Protecting Pollinators Tips for Commercial Agricultural Pesticide Applicators ([Web](#) | [📄](#))
- Protecting Pollinators in Agronomic Crop Production ([Web](#) | [📄](#))
- Best Management Practices for Indiana Pollinator Habitat ([Web](#) | [📄](#))
- Recommended Indiana-Native Plants for Attracting Pollinators ([Web](#) | [📄](#))
- Why Should We Care About Pollinators? ([Web](#) | [📄](#))
- Biology and Control of Varroa Mites in Bee Hives ([Web](#) | [📄](#))
- The Complex Life of the Honey Bee ([Web](#))
- The Complex Life of the Honey Bee - Spanish Version([📄](#))
- 2020 Indiana Solar Site Pollinator Habitat Planning Scorecard ([📄](#))
- Protecting Honey Bees from Area-wide Insecticide Applications ([Web](#) | [📄](#))
- Identifying Wild Bees As Pollinators of Indiana's Specialty Crops ([Web](#) | [📄](#))



WILDFLOWERS FOR BENEFICIAL INSECTS: A Guide for Fruit and Vegetable Growers

<i>Achillea millefolium</i> Common Yarrow	<i>Amoglossum atriplicifolium</i> Pale Indian Plantain	<i>Asclepias syriaca</i> Common Milkweed	<i>Asclepias incarnata</i> Swamp Milkweed	<i>Ceanothus americanus</i> New Jersey Tea	<i>Coreopsis palmata</i> Plains Coreopsis	<i>Dalea purpurea</i> Purple Prairie Clover	<i>Doellingeria umbellata</i> Flat-topped Aster
<i>Erigeron strigosus</i> Daisy Fleabane	<i>Eryngium yuccifolium</i> Rattlesnake Master	<i>Eupatorium perfoliatum</i> Common Boneset	<i>Euphorbia corollata</i> Flowering Spurge	<i>Euthamia graminifolia</i> Grass-leaved Goldenrod	<i>Helenium autumnale</i> Sneezeweed	<i>Helopsis helianthoides</i> False Sunflower	<i>Monarda fistulosa</i> Wild Bergamot
<i>Parthenium integrifolium</i> Wild Quinine	<i>Pycnanthemum tenuifolium</i> Slender Mountain Mint	<i>Pycnanthemum virginianum</i> Virginia Mountain Mint	<i>Ratibida pinnata</i> Yellow Coneflower	<i>Rudbeckia hirta</i> Black-eyed Susan	<i>Rudbeckia subtomentosa</i> Sweet Black-eyed Susan	<i>Solidago rigida</i> Stiff Goldenrod	<i>Symphotrichum lanceolatum</i> Panicked Aster
<i>Symphotrichum lateriflorum</i> Calico Aster	<i>Sym. novae-angliae</i> New England Aster	<i>Tradescantia ohioensis</i> Ohio Spiderwort	<i>Verbena hastata</i> Blue Vervain	<i>Verbesina alternifolia</i> Wingstem	<i>Vernonia gigantea</i> Tall Ironweed	<i>Veronicastrum virginicum</i> Culver's Root	<i>Zizia aurea</i> Golden Alexanders

■ Full sun, dry soil
 ■ Full sun, medium soil
 ■ Full sun, moist soil

Marion County SWCD

BENEFICIAL INSECTS FOR FRUIT AND V

Enhancing habitat that adjoins fields with native flowering plants will attract two critical ecosystem services: pest insect population control and pollination. This page provides information on common beneficial insects and their predator/prey relationships.

BENEFICIAL INSECT	PREY OR HOSTS OF M
Green Lacewings (family Chrysopidae) 	Eggs laid on long stalks a
Brown Lacewings (family Hemerobiidae)	Eggs laid singly on buds,
Ladybird Beetles (Ladybugs)	Both adults and larvae a
Syrphid Flies (Flower/Hover Flies) 	Subfamily Syrphinae only
Long-legged Flies, <i>Condylostylus</i>	Mites, thrips
Tachinid Flies 	Parasitic, females lay egg
Soldier Beetles, <i>Chauliognathus</i> 	Larvae search for prey in
Ground Beetles, <i>Harpalus</i> , <i>Poecilus</i>	Eggs laid in soil, both adu
Plant Bugs, <i>Plagiognathus</i> 	Eggs laid in new growth
Assassin Bugs, <i>Zelus</i>	Both adults and nymphs
Damsel Bugs, <i>Nabis</i>	Colorado potato beetle la
Spined Soldier Bug, <i>Podisus</i>	European corn borer, fall looper, corn earworm, Co
Braconid Wasps	European corn borer, arm
Potter and Mason Wasps 	Most nest in cavities abo
Yellowjackets, <i>Vespula</i> , <i>Dolichovespula</i> 	Pear psylla, fall webworm
Paper Wasps, <i>Polistes</i> 	Cabbage looper, hornwor
Scoliid and Thynnid Wasps 	White grubs (scarab bee
Jumping, Wolf, Orbweaver Spiders	Cucumber beetles, flea b

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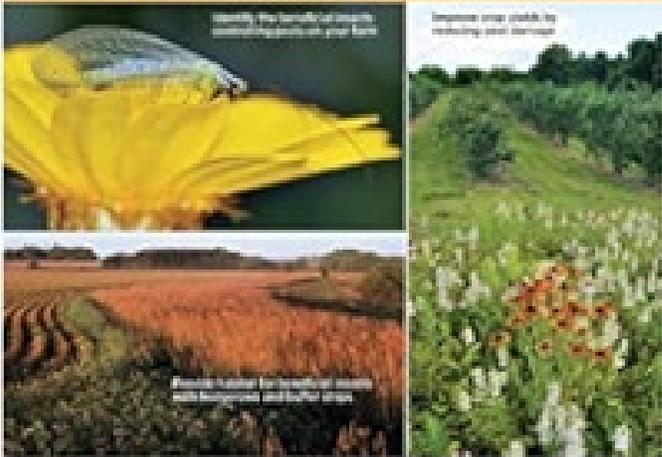
BENEFICIAL INSECTS FOR FRUIT AND VEGETABLE GROWERS

Green Lacewings Family Chrysopidae	Brown Lacewings Family Hemerobiidae	Ladybird Beetles (Ladybugs)	Syrphid Flies (Flower Flies)	Long-legged Flies <i>Condylostylus</i>	Tachinid Flies
		 	 		 
Soldier Beetles <i>Chauliognathus</i>	Ground Beetles <i>Harpalus</i> , <i>Poecilus</i>	Plant Bugs, <i>Plagiognathus</i>	Assassin Bugs, <i>Zelus</i>	Damsel Bugs, <i>Nabis</i>	Spined Soldier Bug, <i>Podisus</i>
 	 		 		 
Braconid Wasps	Potter and Mason Wasps Subfamily Eumeninae	Yellowjackets <i>Vespula</i> , <i>Dolichovespula</i>	Paper Wasps, <i>Polistes</i>	Thynnid and Scoliid Wasps	Jumping, Wolf, and Orbweaver Spiders
	 	 	 	 	 

THE XERCES SOCIETY GUIDE

Farming with Native BENEFICIAL INSECTS

Ecological Pest Control Solutions



Managing Alternative Pollinators

A Handbook for Beekeepers, Growers, and Conservationists

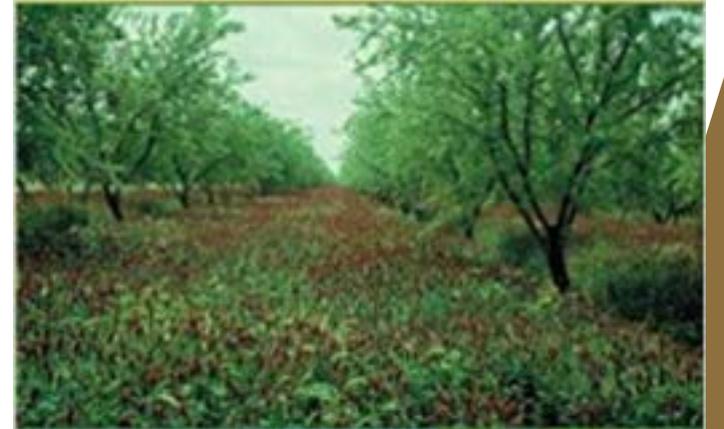


An Identification and Native Plant Forage Guide

HEATHER HOLM *Author of Pollinators of Native Plants*

MANAGE INSECTS On Your Farm

A Guide to Ecological Strategies



Miguel A. Altieri and Clara I. Nicholls with Marlene A. Fritz



Extension

Have fun with stem-nesting mason bees!



Thank You!

lingwell@purdue.edu

Photo: E. Y. Long