

Un-BEE lievable Pollinators



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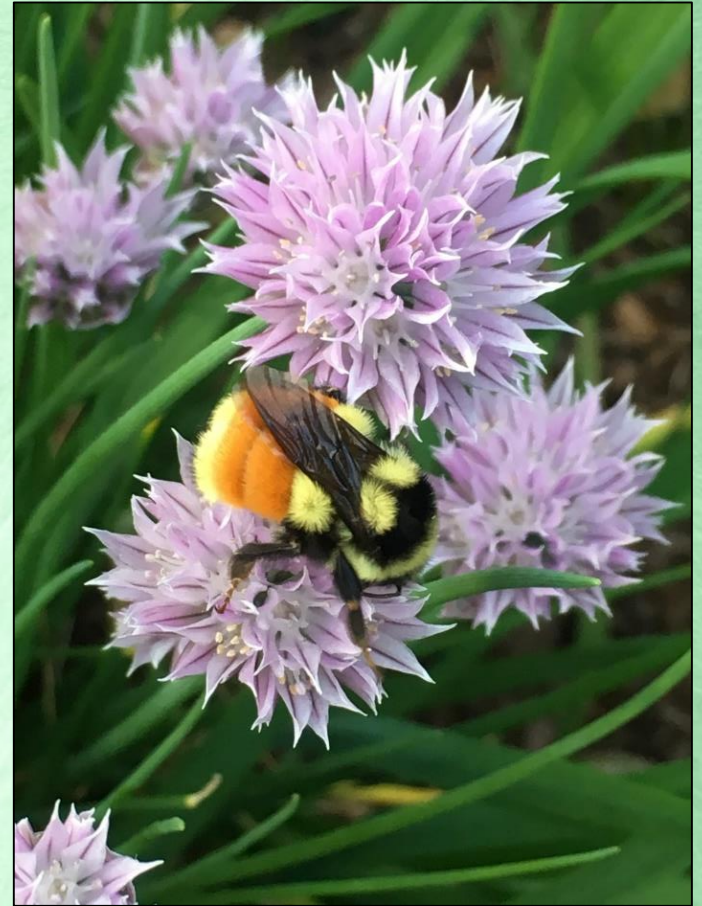
Pollinators Are Stressed

Pollination mediated by animals (insect, avian, mammal) or other factors (wind, water)

US pollination by honey bees approx. \$19 billion crop value - by other insect pollinators, \$10 billion (in 2010)

Stressors:

- Habitat Loss (conversion, fragmentation, agricultural intensification/monocultures)
- Diseases, Parasites, Viruses, Disorders (colony collapse)
- Pesticides (direct contact, avoidance of treated crops)
- Climate change (geographical shifts)



Non-Bee Insect Pollinators

Unique Benefits

Non-bee pollinators tend to deposit less pollen per flower visit, but visit more frequently

Provide pollination 'insurance' – are more adaptable to land use changes than bees

- Use resources from a diverse landscape (cover, alternative food sources, etc.)

Flies are second to bees for pollination - Some fly species commercially reared for pollination services

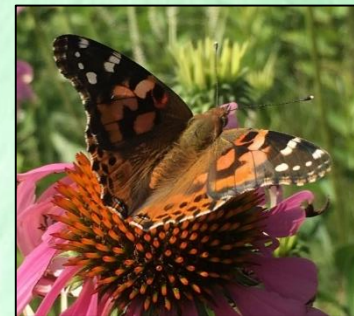
Some provide pest control services to commercial growers (syrphids, tachinids, etc.)

For many insects, their value as pollinators is yet to be determined

Flies



Butterflies & Moths



Beetles



What Are We Doing?

Habitat plantings provide pollen, nectars, attracted prey, refuge & reproduction sites for beneficial insects.

Objective: Evaluate the effectiveness of annual & perennial habitat hedges to attract pollinators & other beneficial insects to growing areas to support biological control of common greenhouse, high tunnel & nursery pests.



Habitat is Happiness

Established habitat hedgerows of (mostly native) annual plants (approx. 10 x 3ft '30 ft²')

Some harvestable annual habitat plants (to attract consumer attention)

Transplants & direct seed (to provide floral resources all season)

Primarily observed for syrphids & other pollinators that provide pest management

Also observed perennials in established display gardens during bloom periods

Collected data 1x month

Year 1 of at least 3 more(maybe more!)



Annual Habitat Hedge Choices



Indian Blanket



Wild Cosmos



Zinnia



Plains Coreopsis



Sweet Alyssum



Blue Cornflower



Sunflower



Marigold

Examples



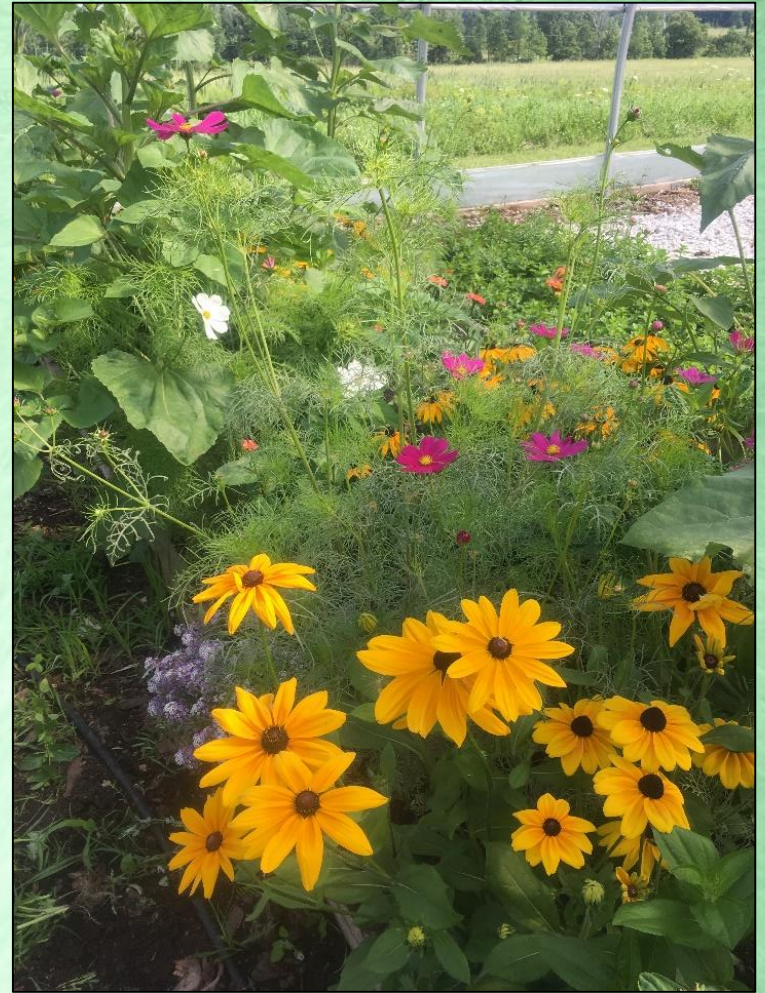
Raised Bed Outside



Beds in Ground Outside

Examples

Raised Bed Inside

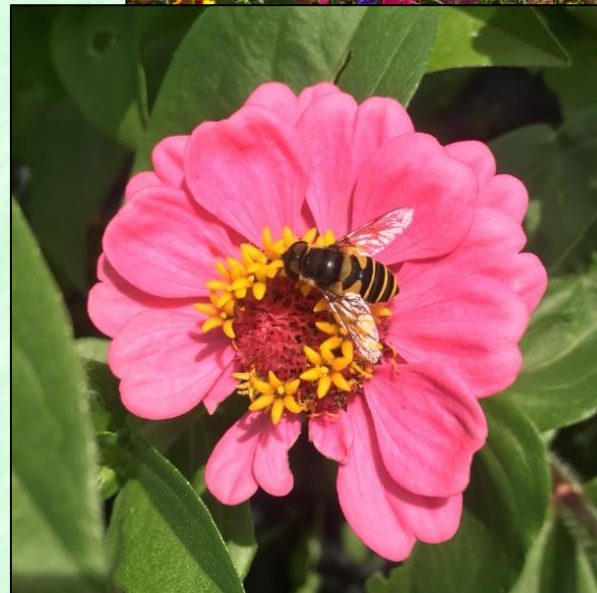


Outside Cut Flower Garden

What Did We See?

A lot of visitors were observed!

Of particular interest: Syrphids (87%),
Orius (11%), several species of lady
beetles (2%) & many, many others.



Syrphid Flies 101

Diptera - Syrphidae Family: Hoverflies, Flower flies, Syrphid flies

Over 6,000 species in 200 genera described

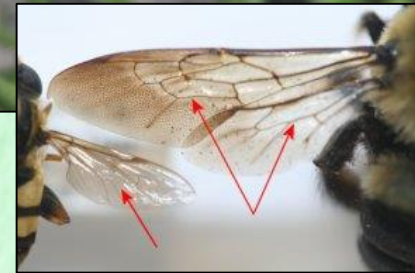
Adults feed on pollen & nectars

- Important pollinators (more so than bees in some systems – high latitudes, elevation)
- Many are effective pollinator due to hairy bodies, others not so much

Mimic bees/wasps to scare off predators

- 1 pair wings (bees have 2 pairs)
- Mostly short bristle-like antennae (bees have long)

Larvae (maggots) that feed on insects, decaying matter, fungi or bacteria



Fly



Bee

Syrphid Life Cycle

Many overwinter as pupa in litter layers

Adults emerge in spring & seek nectar &/or sugary aphid honeydew (poop)

Suck nectars & absorb pollens along with it (need proteins for egg laying & sugars for flight energy)

Lay eggs near aphid colonies

Several generations per year

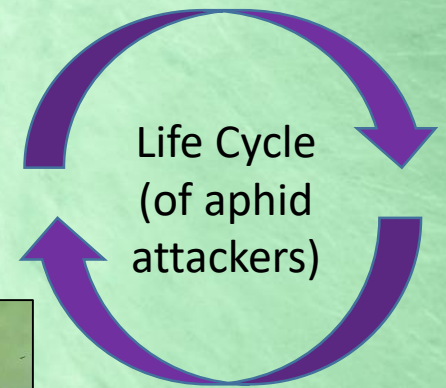
Many adults active April-November

Flowering plants encourage early establishment & overwintering

Adult



Egg



Larva (3 stages)



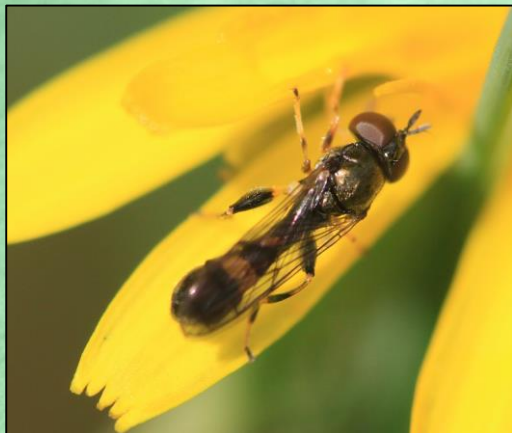
Pupa



Syrphid Diversity

- ★ aphids
- ★ decaying matter

Neoscia sp.



Toxomerus sp.



Allograpta obliqua



Mallota posticata



Eristalis tenax (Drone fly)



Melanostoma mellinum



Chrysotoxum sp.



Rat tail maggot

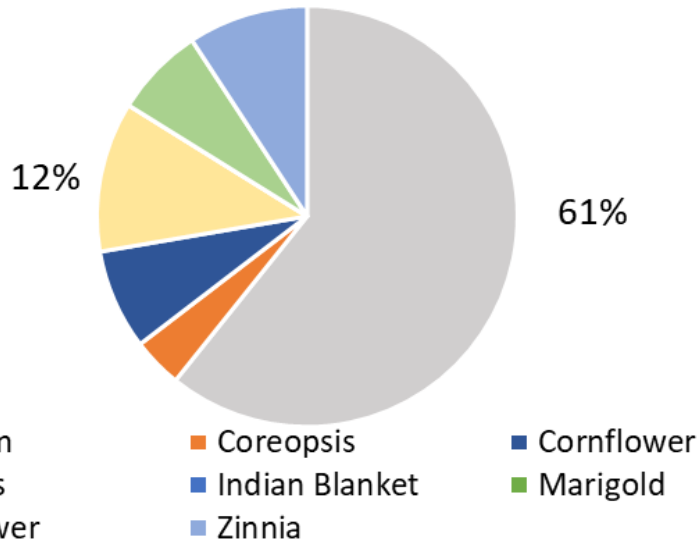
What Did We See?

Over 260 syrphids observed on annual plantings

Alyssum most attractive followed by cosmos.



Syrphids Within Habitat Hedges



What Did We See?

Over 130 syrphids on observed perennials

5- 10%

Anise hyssop



Liatris (Gayfeather)

> 11%



Yarrow

Astibles



Echinacea purpurea
(purple coneflower)



Dendratherma 'Rhumba' Mum

Rudbeckias
(coneflowers/black
eyed susans)

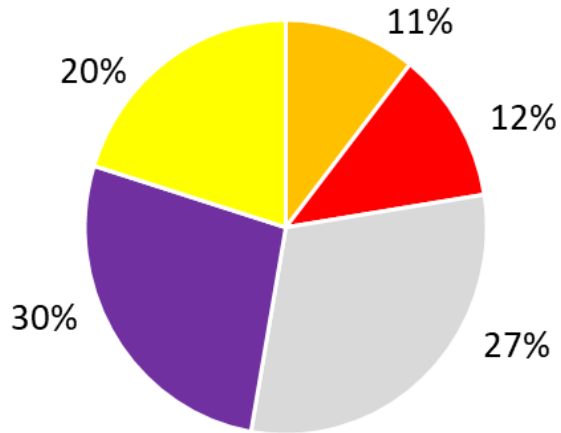


Coreopsis
(Moonbeam)



What Did We See?

Colors Attractive to Syrphids



■ Orange ■ Red/Pink ■ White ■ Purple/Blue ■ Yellow



What Else Did We See?

Pollinator killers -
Jagged Ambush Bugs
(on mountain mint)



Poecilanthrax tegminipennis



Bombylius major

Tachinid Flies - Parasites
of caterpillars & beetles



Parasitized Japanese Beetles by Tachinid fly
Zinnias (fyi JB really likes zinnias)

Bee Flies (Bombyliidae) – some larvae
feed on moth larvae, others flick eggs
into ground bee nests where larvae
feed on ground bees/wasps (bad for
other pollinators)

Project Highlights

Established a link between educators, farm managers & students from a local academy that assisted with planting of habitat hedges & data collection



Produced consumer awareness signs & brochure (in folder) to educate about importance of habitat for all pollinators



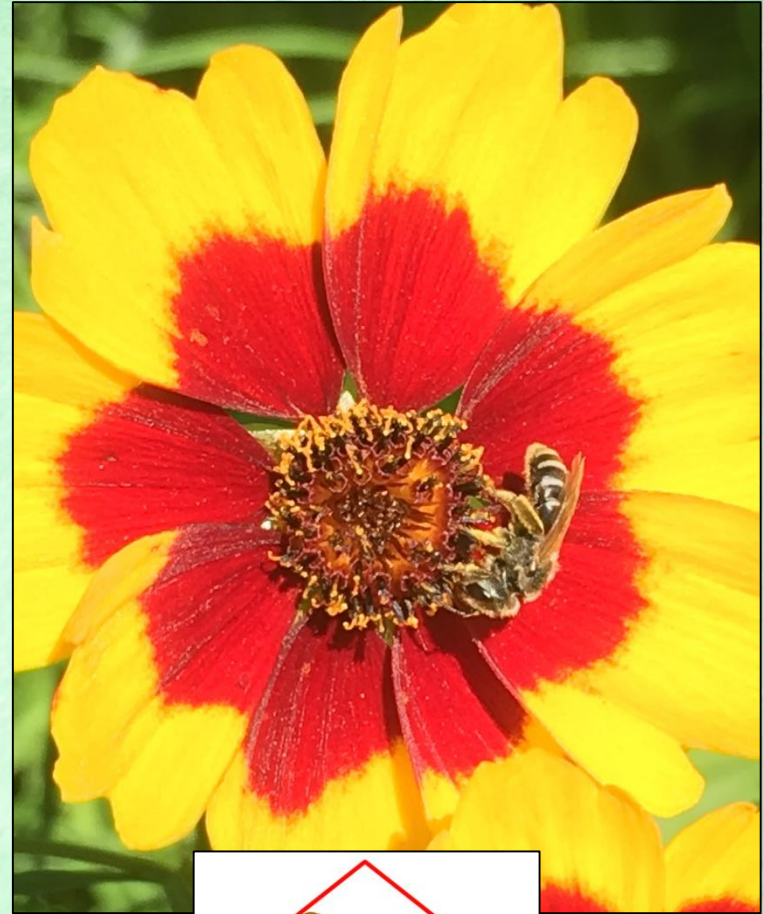
Bee-lieve in the Cause

Bring in beneficial insects to nurseries that attack pests to help avoid the use of chemical insecticides

Focus on diverse habitat plantings of that bloom all season long & all day

Protect pollinators from direct pesticide exposure:

- Treat plants that are/when least attractive
- Long before bloom time with systemics
- Early or late in day (when bees not foraging)
- Select least toxic chemistries (consult your supplier!!!)
- Read directions & apply at correct rates



Pollinator Resources

Attracting Beneficial Insects with Native Flowering Plants: <http://www.canr.msu.edu/nativeplants/uploads/files/E2973.pdf>

Bees and Pesticides: An Overview: <https://gpnmag.com/article/bees-and-pesticides-an-overview/>

Field Guide to the Syrphidae of Northeastern North America:

<http://www.canacoll.org/Diptera/Staff/Skevington/Syrphidae/Syrphidae.htm#General>

Flower Flies (Syrphidae) and Other Biological Control Agents for Aphids in Vegetable Crops:

<http://anrcatalog.ucanr.edu/pdf/8285.pdf>

Grow Wise Bee Smart – Best Management Practices for Bee Health in the Horticultural Industry: <http://growwise.org/wp-content/uploads/2017/01/HRI-Pollinator-BMPs-January2017.pdf>

NRCS Planting Guides for Native Pollinators:

<https://www.nrcs.usda.gov/wps/portal/nrcs/detail/plantmaterials/technical/publications/?cid=stelprdb1044847>

Pesticides & Pollinators: Greenhouse Production Perspective:

[http://www.mapyourshow.com/mys_shared/cultivate17/handouts/RaymondCloydPresentationPesticidesandPollinatorsGreenhouseProductionPerspectiveJuly152017%20\[Compatibility%20Mode\].pdf](http://www.mapyourshow.com/mys_shared/cultivate17/handouts/RaymondCloydPresentationPesticidesandPollinatorsGreenhouseProductionPerspectiveJuly152017%20[Compatibility%20Mode].pdf)

Pollinator-Friendly Plants for the Northeast United States:

<http://agriculture.vermont.gov/sites/ag/files/pdf/apiary/wildflower%20picture%20guide%20and%20info.pdf>

Pollinators, Neonicotinoids and Greenhouse Production: <https://ag.umass.edu/greenhouse-floriculture/fact-sheets/pollinators-neonicotinoids-greenhouse-production>

Pollinator Partnership: <http://pollinator.org/>

Protecting Bees and Other Pollinators from Pesticides (EPA): <https://www.epa.gov/pollinator-protection>

Selecting Plants for Pollinators (Northeast): <http://pollinator.org/PDFs/Adirondack.rx2.pdf>

Xerces Society Northeast Region: <http://xerces.org/pollinators-northeast-region/>

Sullivan & Skinner. 2018. Un Bee-lievable Pollinators. Tri-State Greenhouse IPM Workshops: ME, NH, VT. University of Vermont, Entomology Research Laboratory, <http://www.uvm.edu/~entlab/>

Questions ?



Thank You!

Special thanks to Allen Bro's Farm, Full Circle Gardens, Paquette Full of Posies, Red Wagon Plants, & The Hildene for collaborating on this project.

<http://www.uvm.edu/~entlab/>

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