

**Wood-Pawcatuck Watershed Association**  
**July 24, 2014**

# **Conserving Tomorrow's Plants & Animals... Today !!**

## **Pollinators**

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State Biologist**

**USDA – Natural Resources Conservation Service**

# NRCS

## Where did we come from?

**The Soil Conservation Service (SCS) was created in 1935 to reverse the devastation caused as a result of the Dust Bowl**



# Today SCS is known as the USDA Natural Resources Conservation Service (NRCS)



# American redstart



# Chestnut-sided warbler



17 day old American kestrel



**Unlike many vertebrate wildlife species which may require large habitat patches to survive, pollinators can make use of small patches.**

**So, what you do in a small backyard is still a contribution to pollinator conservation !!!**

**One out of every 3 mouthfuls of food you eat was mediated by pollinators !**

- **As we manage for pollinators, one key concept related to climate change is that we are planting a wide diversity of species. First, that helps to ensure that pollen and nectar resources are available throughout the growing season.**
- **Second, we don't know how plant species may react to climate change. So, it makes sense to plant a wide diversity of plant species that support wildlife. We assume that at least some plant species will do well in our region.**

# Bumblebee on *Asclepias tuberosa* – Butterfly milkweed



# **FOCUS ON NATIVE BEES**

- **Native bees don't build the wax or paper structures we associate with honey bees or wasps, but they do need places to nest, which vary depending on the species.**
  
- **Wood nesting bees are solitary, often making individual nests in beetle tunnels in standing dead trees. They will also burrow into Sumac, Box elder, Blackberry, Raspberry, Elderberry twigs to lay eggs.**

# European Honeybees on Sumac



# NATIVE BEES

- **Ground-nesting bees include solitary species that construct nest tunnels under the ground.**

**LEAVE SOME OPEN SOIL AREAS, but not so much that there are erosion issues**

- **Cavity-nesting social species-bumble bees-make use of small spaces, such as abandoned rodent burrows, wherever they can find them.**

**LITTLE BLUESTEM and other native grasses also provide nesting for bumbles.**

Monarda (a.k.a., Bergamot, Bee balm) with Goldenrod and Milkweed -- Kittatinny Valley State Park, New Jersey.  
Goldenrod, milkweed often volunteer.





## Plant Selection: Best Bets for New England

### Native wildflowers:

- Lupine
- Beebalm
- Baptisia
- Joe Pye Weed
- Spiderwort
- Mountain Mint
- Penstemon
- Boneset
- Milkweed
- Blazingstar
- Blue lobelia
- Sneezeweed
- Partridge Pea
- Goldenrod
- Hyssop
- Asters



Photos: Eric Mader



## *Penstemon digitalis*- Tall White Beardtongue

- Pollinator value- high
- Bloom time- May to July
- Flower color- White
- Height- 2 to 5 feet
- Wetland Indicator- FAC
- Light requirements- full sun to part sun
- Habitat- low moist areas, prairies, open woodlands
- Soil moisture- dry, moist, wet
- **Value to Beneficial Insects-** native long-tongued bees



## *Symphyotrichum novae-angliae-* New England Aster

- Pollinator value- high
- Bloom time- August to October
- Flower color- purple
- Height- 3 to 6 feet
- Wetland Indicator- FACW
- Light requirements- full sun to part shade
- Habitat- prairie swales, wet meadows, thickets, along stream banks
- Soil moisture- moist
- **Value to Beneficial Insects-** long-tongued bees (bumblebees, honeybees, Miner bees, large Leaf-Cutting bees), bee flies, butterflies, skippers, Short-tongued bees and Syrphid flies



## ***Tradescantia ohiensis*- Ohio Spiderwort**

- Pollinator value-high
- Bloom time-late May to July
- Flower color- purple
- Height- 2-3 feet
- Wetland Indicator- FAC
- Light requirements- full sun to part sun
- Habitat requirements- moist meadows, prairies, thickets
- Water use- low
- Soil moisture- dry, moist
- **Value to Beneficial Insects-** long-tongued bees, especially bumblebees, Halictine bees and Syrphid flies



## *Monarda fistulosa*- Wild Bergamot

- Pollinator Value- very high
- Bloom time- June to July
- Flower color- purple
- Height- 2 to 5 feet
- Wetland Indicator- UPL
- Light requirements- full sun to part sun
- Habitat- open prairies, roadsides, fields, edge of woods or thickets
- Soil moisture- dry to moist
- **Value to Beneficial Insects-** bee flies, butterflies, skippers, hummingbirds moths, long-tongued bees, such as bumblebees, Miner bees, Epeoline Cuckoo bees, large Leaf-Cutting bees, and black bees (*Doufouria monardae*).



## *Eupatorium delphus maculatus*- Spotted Joe Pye weed

- Pollinator Value- high
- Bloom Time- July to August
- Flower color- pink/purple
- Height- 4 to 6 feet
- Wetland Indicator-FACW
- Light requirements- full sun to part sun
- Habitat-low wet grounds, thickets, open woods, stream banks, swamps
- Soil Moisture- moist to wet
- **Value to Beneficial Insects-** honey bees, bumblebees, digger bees, leaf-cutting bees, bee flies, butterflies, skippers, and moths

## Native Milkweeds (*Asclepias* spp.)



James, D.G. 2010. Attraction of beneficial insects to flowering endemic perennial plants in the Yakima Valley. Irrigated Agriculture Research and Extension Center, Washington State University. Unpublished raw data.



Photos: Rod Gilbert & Eric Eldredge

# Clethra – Sweet Pepper Bush highly attractive to bumblebees



- **Insect pollination is critical for the production of many important crops in the United States including: alfalfa, almonds, apples, blackberries, blueberries, canola, cherries, cranberries, pears, plums, squash, sunflowers, tomatoes, and watermelons.**
- **Native pollinators, most importantly wild bees, provide free pollination services and enhance farm productivity and profitability through increased yields and improvements in crop quality.**

## Buzz Pollination by Native Bees

### Example: Cherry tomatoes

When native bees were present,  
the production of Sungold cherry  
tomatoes almost tripled.



Greenleaf, S. S., and C. Kremen. 2006. Wild bee species increase tomato production and respond differently to surrounding land use in Northern California. *Biological Conservation* 133:81-87.

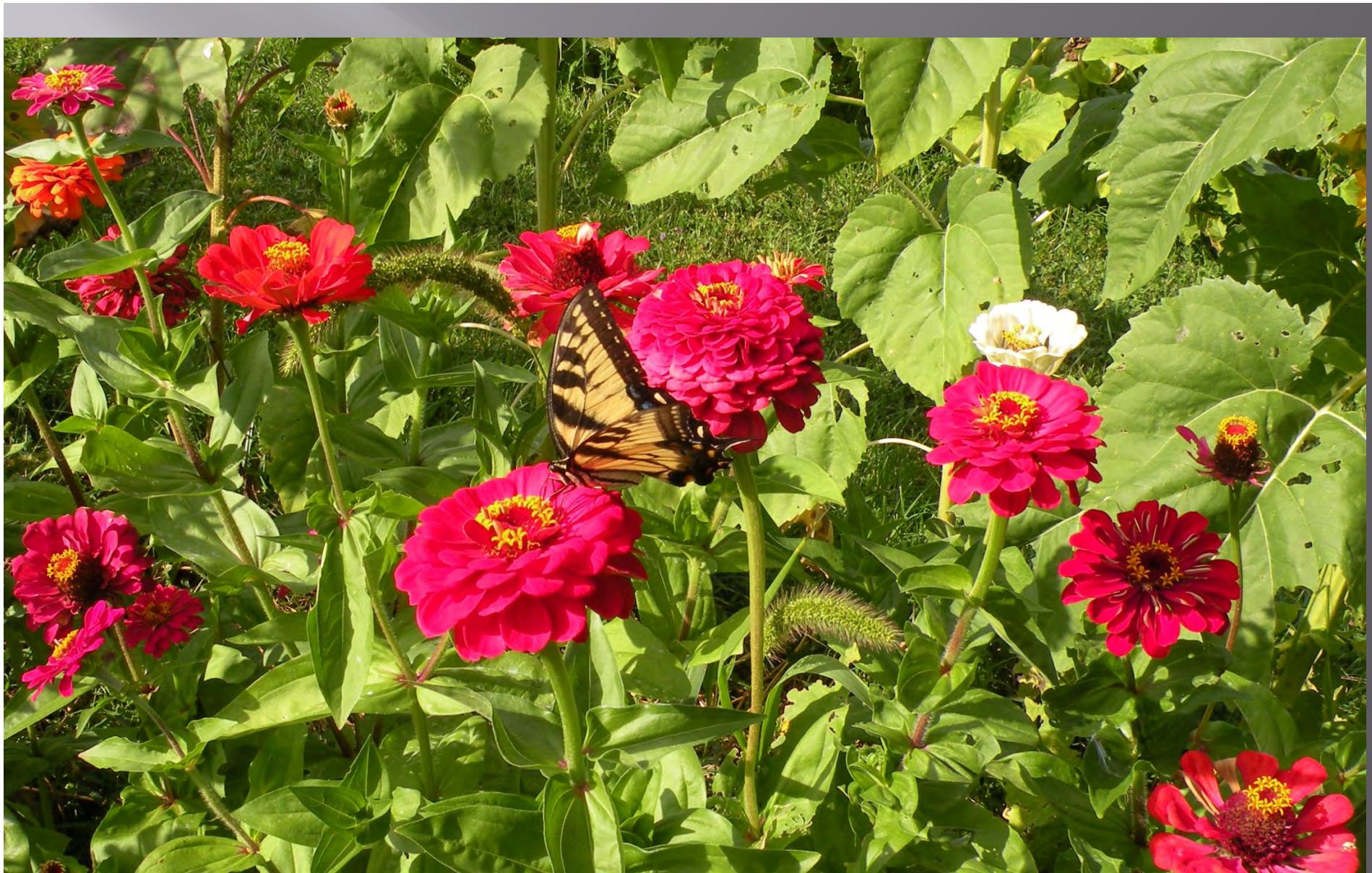
Photos: Burpee; Mace Vaughan

- **Unlike honey bees, bumble bees and other native bees perform buzz pollination (the bee grabs onto a flower's stamens and vibrates its flight muscles, releasing a burst of pollen from deep pores in the anther).**
- **This behavior is highly beneficial for the cross-pollination of tomatoes, peppers, cranberries, and blueberries, among other plants.**
- **Although tomatoes don't require a pollinator to set fruit, buzz pollination by bees results in larger and more abundant fruit.**

- In the absence of rented honey bees, canola growers in Alberta, Canada, make more money from their fields if 30 percent of the land is left in natural habitat, rather than planting it all. This natural habitat supports populations of native bees close to fields and increases bee visits and seed set in adjacent crops.
- Over eighty species of bees pollinate berry crops in Maine and Massachusetts.
- Native pollinators have been shown to nearly triple the production of cherry tomatoes in California.

Some pollinators are avian. This is ruby-throated hummingbird on honeysuckle.





Female Tiger Swallowtail – Master Gardener Plot – New Jersey

# Hedgerows or Windbreaks

- **Creating hedgerows with a wide variety of plants that have overlapping flowering periods will provide bee habitat throughout the growing season and strengthen populations of natural enemies of crop pests.**

# MOWING

- **Mowing can cause direct insect mortality, especially for egg or larval stages that can't avoid a mower.**
- **Ideally, mowing should occur in the fall or winter when flowers have died or are dormant.**
- **Mowing a mosaic of patches over several years is better than mowing an entire site all at once; no single area should be mowed more than once a year.**

## **SNAGS**

- **Keeping dead trees standing provides shelter for native bees. Some solitary bees build nests in abandoned beetle tunnels in snags**

## **RIPARIAN AREAS**

- **Habitat along streams should contain a diversity of plants. Willows, in particular, will nourish bumble bee queens in the spring so that large numbers of workers are available when crops begin to bloom. Maples also produce pollen early in spring.**

**Which set of animals represents the largest group of pollinators ?**

## **BEETLES**

- **Beetles comprise the largest set of pollinating animals, due to sheer numbers. They are responsible for pollinating 88% of the 240,000 flowering plants globally.**
  
- **Beetles were among the first insects to visit flowers and they remain essential pollinators today. They are especially important pollinators for ancient species such as magnolias and spicebush.**

## What is the Xerces Society?



# THE XERCES SOCIETY FOR INVERTEBRATE CONSERVATION

Since 1971, the Society has worked to protect wildlife through the conservation of invertebrates and their habitat.

### Major Programs:

- Endangered species
- Aquatic invertebrates
- Pollinator conservation



\* **Xerces blue butterfly (*Glaucopsyche xerces*), the first U.S. butterfly to go extinct due to human activities**

## Bugs Drive the System

### Wildlife conservation

- ❑ Fruits and seeds are a major part of the diet of about 25% of birds, and many mammals
- ❑ Pollinators are food for wildlife



## Native Bee Diversity

North America: 4,000+ species

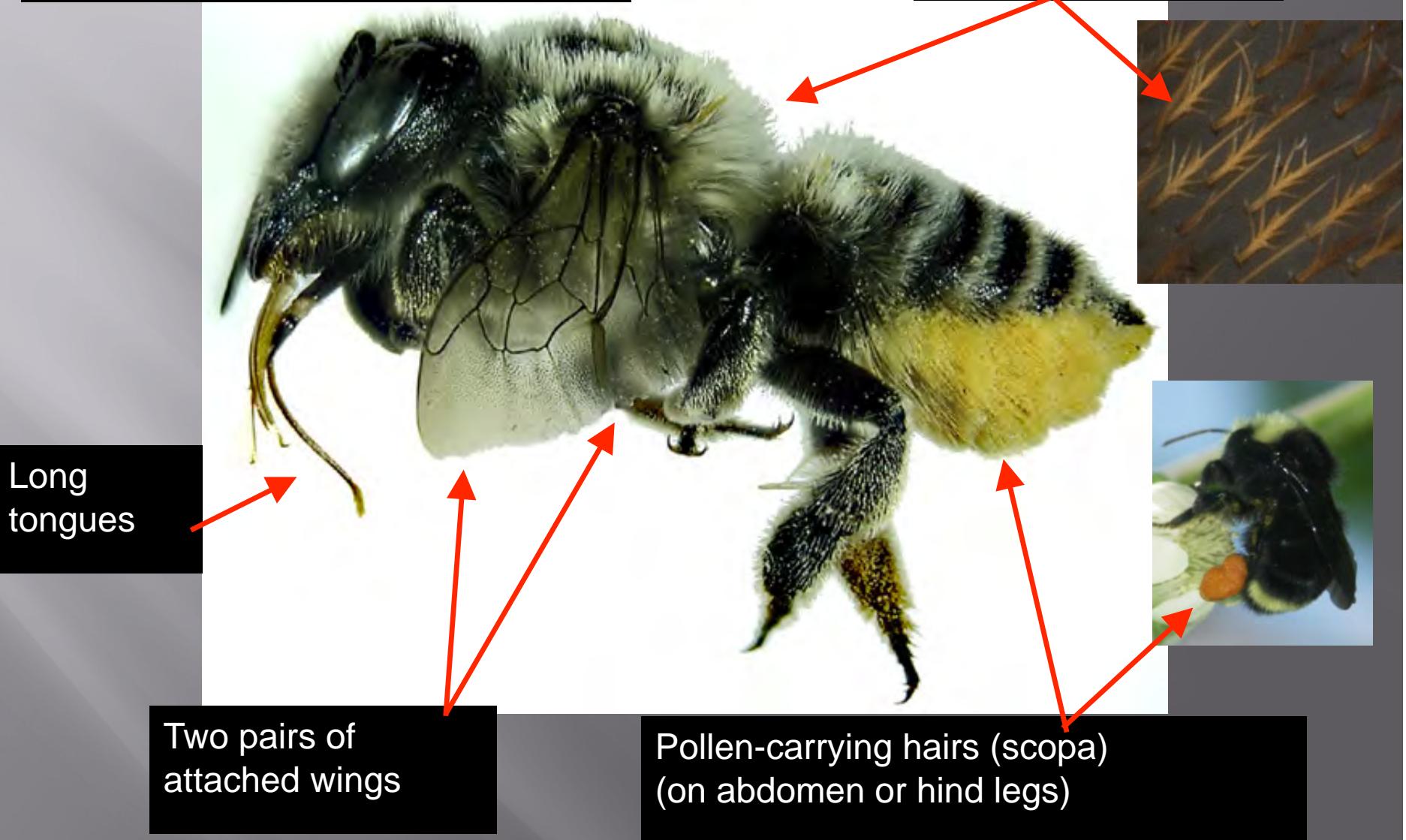


Photo: Edward S. Ross

## Bees: Distinguishing Characteristics

### Characteristics of Bees:

Branched hairs



Photos: Ralph Hozenthal, Mace Vaughan, Laurence Packer

## Bumble Bees (*Bombus* spp.)

### Characteristics:

- Large size, very hairy, robust bodies
- Black and yellow (and orange, brown)
- Pollen basket on hind legs (corbicula)



Pollen basket



Photos: MJ Hatfield , Bruce Newhouse, Eric Mader

## Bumble Bees



- 45 species in U.S.
- Social colonies founded by a single queen
- Colonies last only one season
- Nest may contain 100-300 workers
- Nests in abandoned rodent burrows or under lodged grasses
- Conserve brush piles, un-mowed areas

Photos: Rollin Coville, Elaine Evans

## Identifying Male and Female Bees

### Males

- Smaller than females
- Longer antenna
- No stinger
- Often white or yellow facial hair



### Females

- Larger than males
- Scopa (pollen-carrying hairs on abdomen or rear legs)



Photo: Mace Vaughan

## Identifying Bees vs Flies

### Flies

- One pair of wings
- Short, stout antenna
- Huge round eyes that “meet” in the middle
- No pollen-carrying structures
- Hair usually sparse (except bee mimics)
- Short, sponge-like mouthparts

### Bees

- Two pairs of wings (connected)
- Long antenna
- Skinny, constricted waists
- Pollen-carrying structures
- Usually hairy (except cuckoo bees)
- Long tongues



Photos: Mace Vaughan, Eric Mader

## Identifying Bees vs Wasps

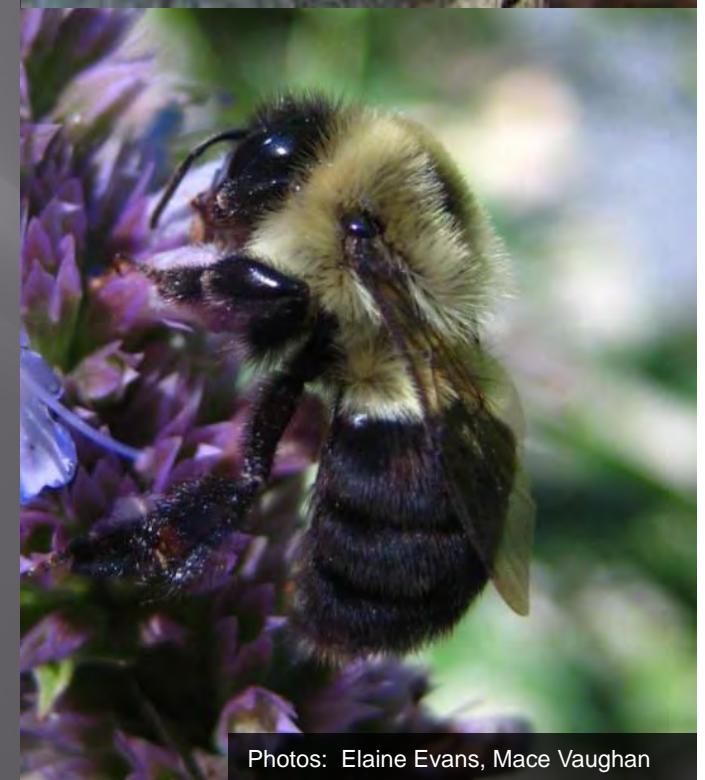
### Wasps

- No pollen-carrying structures
- Body hairs usually sparse and non-branched (shiny hairs)



### Bees

- Pollen-carrying structures
- Usually hairy (except cuckoo bees)
- Branched hairs (not shiny)



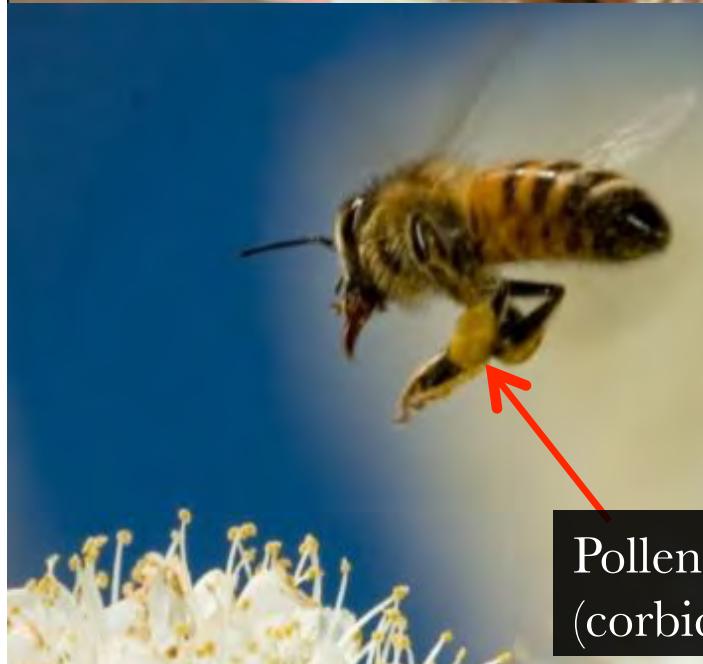
Photos: Elaine Evans, Mace Vaughan

## Honey Bees (*Apis mellifera*)



### Characteristics:

- Medium size and build
- Black and orange-brown coloration
- Only species with hairs on eyes
- Pollen basket on hind leg



Photos: Betsy Betros, USDA/ARS

## Carpenter Bees (*Xylocopa* and *Ceratina* spp.)

### Large Carpenter Bees (*Xylocopa* spp.)

#### Characteristics:

- Large size
- Yellow or black hair on thorax
- Shiny abdomen
- Scopa on hind legs

### Small Carpenter Bees (*Ceratina* spp.)

#### Characteristics:

- Small, slender size
- Dark metallic blue or green color
- Shiny, hairless abdomen
- Scopa on hind leg



Smooth abdomen



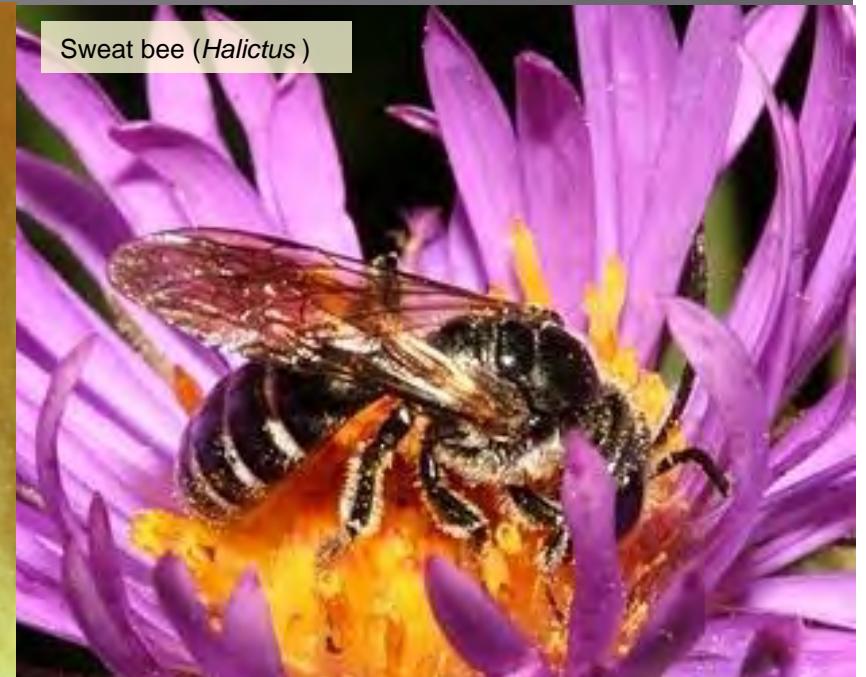
Photos: Gene Barickman, IL NRCS, Rollin Coville

## Small Dark Bees (*Halictus*, *Lasioglossum*, *Hylaeus*)

Yellow-faced bee (*Hylaeus*)



Sweat bee (*Halictus*)



### Characteristics:

- Small size, drab colors (black, brown, dull green or blue)
- Short hairs, some with pale stripes
- Very common
- Some attracted to perspiration

Sweat bee (*Lasioglossum*)



Photos: Edward S. Ross, MJ Hatfield, Rollin Coville

## Green Sweat Bees (*Agapostemon* and *Augochlora* spp.)

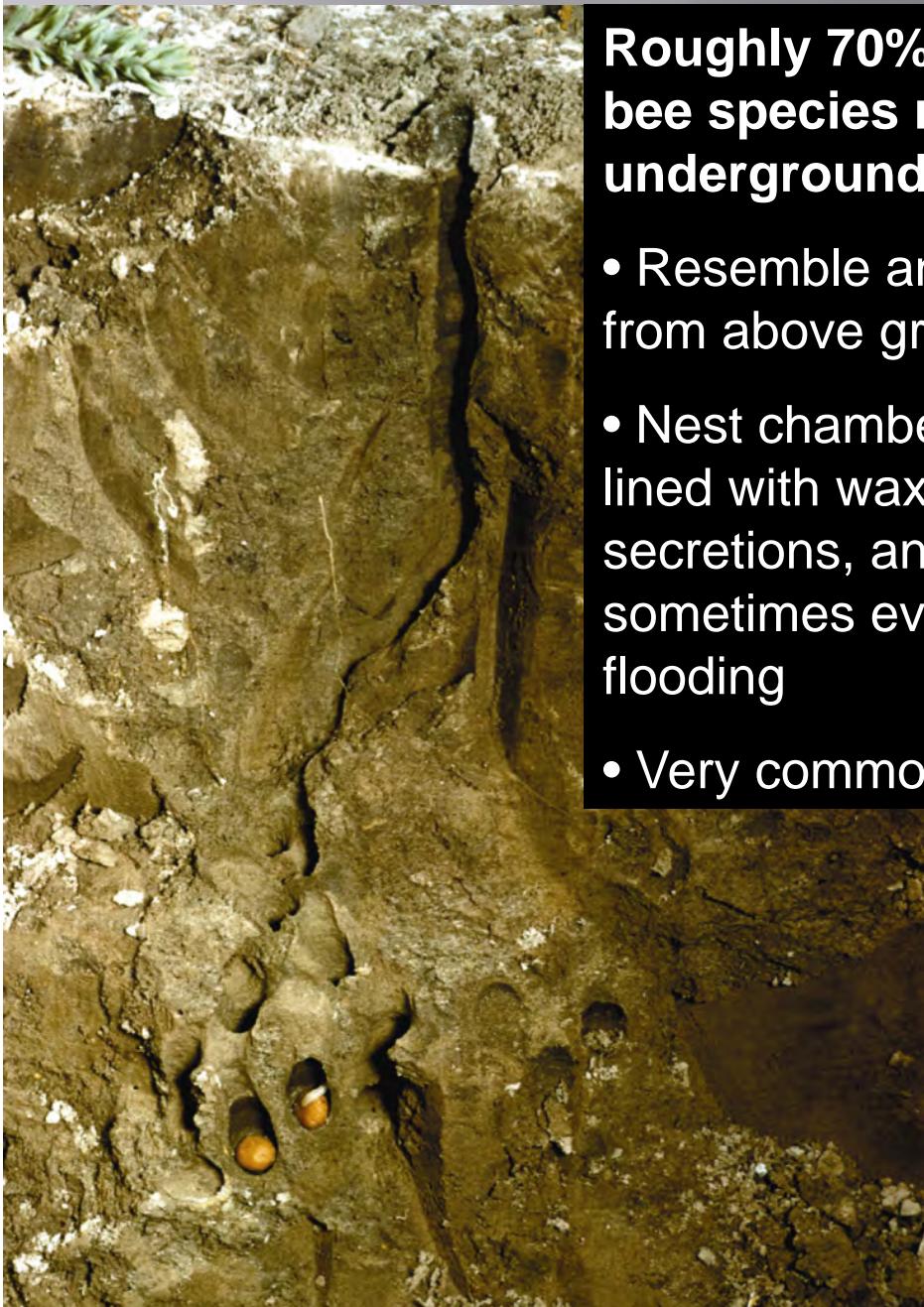
### Characteristics:

- Small size, less hairy
- Bright metallic green
- Some with pale stripes
- Common, generalist visitors
- Some attracted to sweat



Photos: James Cane, MJ Hatfield, Bruce Newhouse, Eileen Miller

## Ground-Nesting Solitary Bees



**Roughly 70% of native bee species nest underground.**

- Resemble ant-nests from above ground
- Nest chambers are lined with waxy glandular secretions, and can sometimes even resist flooding
- Very common bees



Photos: Eric Mader, Rollin Coville, Dennis Briggs

## Wood-Nesting Bees

**Roughly 30% of native species nest in hollow plant stems, or old beetle borer holes**

- Nest tunnel partitions constructed of mud, leaf pieces, or sawdust
- Artificially managed for some crops
- Conserve snags, brush piles



Photo: Edward Ross



Photo: Matthew Shepherd



Photo: Mike Carter

## General Design Considerations

### Design Considerations:

Distance to crops: Small bees may fly less than 500 ft., bumble bees up to 1 mile



Photo: Toby Alexander (VT NRCS)

## General Design Considerations

### Design Considerations:

- Bloom Time Succession: Include at least 3 species in bloom for each season (spring, summer, and fall)



Photo: Eric Mader

## Secondary Design Considerations



### Additional Design Considerations:

Floral Diversity: Bee and butterfly diversity maximized when 15 to 25 flower species are present.

Photo: Eric Mader

## Secondary Design Considerations

### Additional Design Considerations:

Nest Sites: Warm-season bunch grasses, stumps and snags, brush piles, naturally occurring bare ground, artificial nest blocks



Photos: Don Keirstead

## Plant Selection Criteria

- Use only plants with documented value to pollinators
- Avoid species with weed-potential (ex: goldenrod near cranberries)
- No alternate pest/disease host plants (ex: rosaceous plants near tree fruit)



Photos: Mace Vaughan

## Establishing New Habitat: Keys to Success

### The 6 Critical Elements of Establishing New Habitat from Seed:

1. Remove **ALL** perennial weeds prior to planting
2. Do not disturb dormant weed seed
3. Make a clean seed bed/planting area
4. Use appropriate planting technology for the site
5. Plant perennial seed in the fall
6. Manage annual and biennial weeds for two years after planting



Photo: Paul Jepson, OSU-IPPC

## Remove ALL Perennial Weeds Prior to Planting

### For Organic Farms:

- Repeat shallow cultivation (4 to 6 week intervals), or shallow cultivation followed by a smother crop (at least 1 year on previously cropped land)
  - Buckwheat
  - Sudan grass
- Solarization (clear plastic): At least 1 year on previously cropped land
- Horticultural vinegar (expensive)



Photo: Matthew Shepherd

## Post Planting Weed Management

### Second Year:

- Annual weed proliferation
- Control with mowing to prevent flowering (except in annual wildflower plantings!)



Photos: Eric Mader

## **Take Home Messages:**

**Pesticides – Don't spray directly on plants in bloom.**

**Spray at night, and when dry. Or, consider not spraying at all if you're not growing a crop !!!**

# **Take Home Messages:**

**Be Sure to Have a Minimum  
of 3 Species Flowering  
During each of the 3  
Blooming Periods**

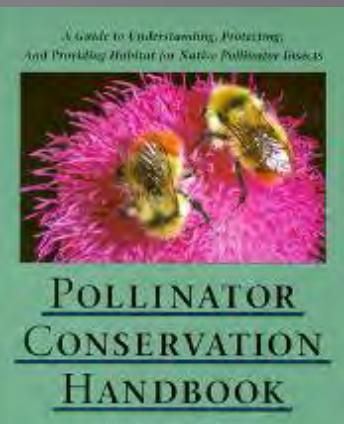
## **Take Home Message:**

**For herbaceous plantings,  
mow once a year only. 8 to  
12 inches high. Ideally,  
mow only one half of site  
each year.**

**Take Home Message:**  
**For woody plantings:**  
**Pussy willow (early)**  
**Elderberry (nesting)**  
**Basswood (many spp visit,  
honeybees)**  
**Meadowsweet -Spiraea  
alba (late)**

# Further Information: the Xerces Society

- Xerces Society publications
- [www.xerces.org](http://www.xerces.org)



# WILD POLLINATORS of EASTERN APPLE ORCHARDS

and how to conserve them



## Further Information: USDA-NRCS

### USDA-Natural Resources Conservation Service

- State and regional Technical Notes
- *Farming for Pollinators* brochure
- Agroforestry Notes
- PLANTS Database
- NRCS Plant Material Centers



### POLLINATOR BIOLOGY AND HABITAT

New England Biology Technical Note      April 2009

Prepared by the USDA NRCS Maine, New Hampshire, Vermont, Connecticut, Massachusetts, and Rhode Island State Offices, the Xerces Society for Invertebrate Conservation's Pollinator Conservation Program, and the University of Maine Cooperative Extension.

#### Introduction

This technical note provides information on how to plan for, protect, and create habitat for pollinators in agricultural settings. Pollinators are an integral part of our environment and our agricultural systems; they are important in 35% of global crop production. Animal pollinators include bees, butterflies, moths, wasps, flies, beetles, ants, bats and hummingbirds. This technical note focuses on native bees, the most important pollinators in temperate North America, but also addresses the habitat needs of butterflies and, to a lesser degree, other beneficial insects.

Worldwide, there are an estimated 20,000 species of bees, with approximately 4,000 species native to the United States. The non-native European honey bee (*Apis mellifera*) is the most important crop pollinator in the United States. However, the number of honey bee colonies is in decline because of disease and other factors, making native pollinators even more important to the future of agriculture. Native bees provide free pollination services, and are often specialized for foraging on particular flowers, such as squash, berries, or orchard crops. This specialization results in more efficient pollination and the production of larger and more abundant fruit from certain crops. Native bees contribute an estimated



Sweat bee (*Agapostemon* sp.). Photo: Toby Alexander, Vermont NRCS.

\$3 billion worth of crop pollination annually to the U.S. economy.

Undeveloped areas on and close to farms can serve as long-term refugia for native wild pollinators. Protecting, enhancing or providing habitat is the best way to conserve native pollinators and, at the same time, provide pollen and nectar resources that support local honey bees; on farms with sufficient natural habitat, native pollinators can provide all of the pollination for some crops.

Pollinators have two basic habitat needs: a diversity of flowering native or naturalized plants, and egg-laying or nesting sites. The Natural Resources Conservation Service (NRCS) can assist landowners with providing adequate pollinator habitat by, for example, suggesting locally appropriate plants and offering advice on how to provide nesting or egg-laying habitat.

# Thank you for listening !

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