



# NATIVE POLLINATORS

*Who are they and are they important?*

*Compiled by Jim Revell,  
Bedford Extension Master Gardener*

# Reproduction – *the goal*

One goal of all living organisms, including plants, is to create offspring for the next generation.

One method for plants to accomplish this is by producing seed.



**Pollen** – a fine-to-coarse yellow dust or powder – *“bears a plant’s male sex cells and is a vital link in the reproductive cycle.”*

USDA Forest Service

# Pollination

*“The act of transferring pollen grains from the male anther of a flower to the female stigma.”*

USDA Forest Service

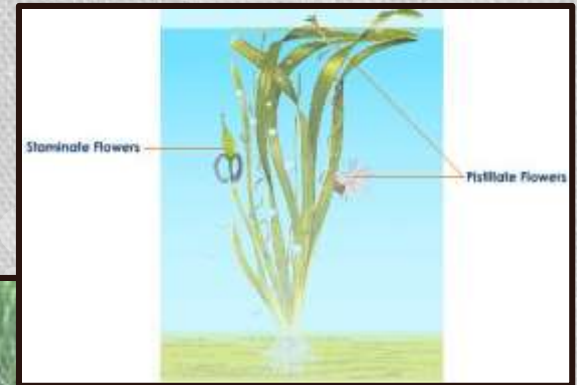
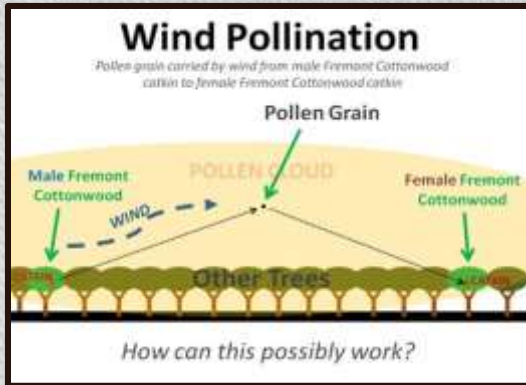
## Pollinator Methods:

ABIOTIC: Without involvement of organisms

BIOTIC: Mediated by animals

- Pollination is usually an unplanned event due to an animal’s activity on a flower
- It is calculated that one out of every three or four mouthfuls of food or drink consumed is provided by pollinators
- More than 150 food crops in the U.S. depend on pollinators; this includes almost all fruit and grain crops (*see Handout, “List of Pollinated Foods” by Pollinator Partnership*)
- **80% or more of all plants worldwide (including food crops) are pollinated by animals (biotic pollination)**
- Of the  $\leq 20\%$  abiotic method
  - 98% are pollinated by wind
  - 2% are pollinated by water
- $\pm 200,000$  species of animals around the world act as pollinators
  - Of the  $\pm 200,000$  about 1,000 species are vertebrates (birds, bats, small mammals)

# Abiotic Pollinators: Wind | Water



**Left:** Diagram of how **Wind Pollination** works; picture of windblown pollen from male cone of a Lodgepole Pine.

**Right:** Diagram of how **Water Pollination** works; Seagrasses (marine angiosperms / flowering plants) have adapted to aquatic environments allowing for pollination, seed formation and germination in water.

# Biotic Pollinators

- **Biotic Pollinator** - *the vector by which pollen is transferred*
- They visit flowers for...
  - FOOD
    - Nectar – energy source that powers growth/reproduction
    - Pollen – protein, fats, vitamins, minerals
  - SHELTER
  - “DATING” or MATING SITE
  - NEST-BUILDING SUPPLIES



- **“Native” Biotic Pollinators – defined as:**
  - Oxford Dictionary:
    - “Born in a specified place or associated with a place by birth, whether subsequently a resident there or not”
  - Federal Native Plant Conservation Committee:
    - “A native species is one that occurs naturally in a particular habitat, ecosystem or region of the United States and its territories or possessions, without direct or indirect human actions”

# Native Biotic Pollinators

*Major players and “minor leaguers”*

## I. Major Vectors (pollinators):

- A. BEES** – considered to be the “champions” of the pollinators
  - 1. Bumble Bees
  - 2. Mason Bees
  - 3. Squash / Gourd Bees
  - 4. Sweat Bees
  - 5. Leafcutter Bees
  - 6. Mining / Digger Bees
  - 7. Longhorn Bees
  - 8. Carpenter Bees

**B. FLIES** – likely 2<sup>nd</sup> to Bees

**C. BEETLES** – considered the “oldest” group of pollinators

**D. BUTTERFLIES** – the “aristocrats” of the pollinators

## II. Minor Vectors (pollinators):

- A. MOTHS**
- B. BIRDS**
- C. BATS**
- D. ANTS**
- E. WASPS**

# A Brief Look at Minor Vectors

## • MOTHS

- Most are active nocturnally
- Important pollinator of tobacco; night-blooming flowers (typically white/pale, visible in moonlight); orchids (Morgan's Sphinx/Hawk Moth)

## • BIRDS

- Important pollinators of wildflowers worldwide; 2,000 bird species/pollinators
- In U.S., Hummingbirds (18 species in U.S.) are key to wildflower pollination

## • BATS

- Most are active nocturnally; typically pollinate night-blooming flowers
- >300 species of fruits depend on bat pollination

## • ANTS

- Crawl into/on flowers seeking nectar; may dislodge pollen grains; in general, not an effective pollinator

## • WASPS

- Fig Wasps are responsible for pollinating 1,000 species of figs



Clockwise from top left: **Virginia Ctenuchid Moth** on Milkweed; **Hummingbird** in Fluvanna Co., VA; **Ant** drinking from Passion Flower; **WV Mountain Fig Wasp**; **Long-nosed Bat**

# Major Native Pollinators – Bees

- As a group, the most effective pollinators
- 4,000 native species in the U.S. ( $\pm 21,000$  species worldwide)
- $\pm 140$  species in Virginia
- Divided into two groups
  - Ground-nesting
  - Cavity-nesting
- **Identification:**
  - Typically fuzzy (carries electrostatic charge), allows pollen grains to adhere to body
  - Range in size 1/8" – 1" long
  - Varying colors - brown/black to metallic green or blue; may include stripes of red, white, yellow

- **Nesting:**
  - $\frac{3}{4}$  of N.A. species are solitary
  - Each female produces offspring in her own nest (one generation per year)
  - Materials used include waxy material they produce, mud, leaves/small pebbles mixed with resin from tree sap
- **Considered to be “pollen magnets”**
  - Only group specialized in collecting pollen and nectar
  - Varying tongue lengths determine flowers they source
  - Most have specialized pollen-carrying structures
    - Scopa – made of thick plumose setae located on hind legs and/or abdomen
    - Corbicula – “pollen basket” on hind legs



# Major Native Pollinators – Bees (continued)

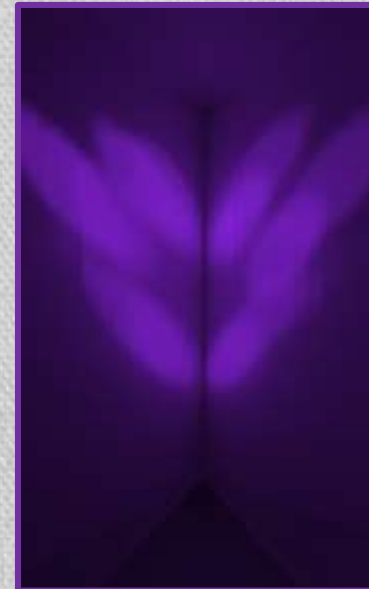
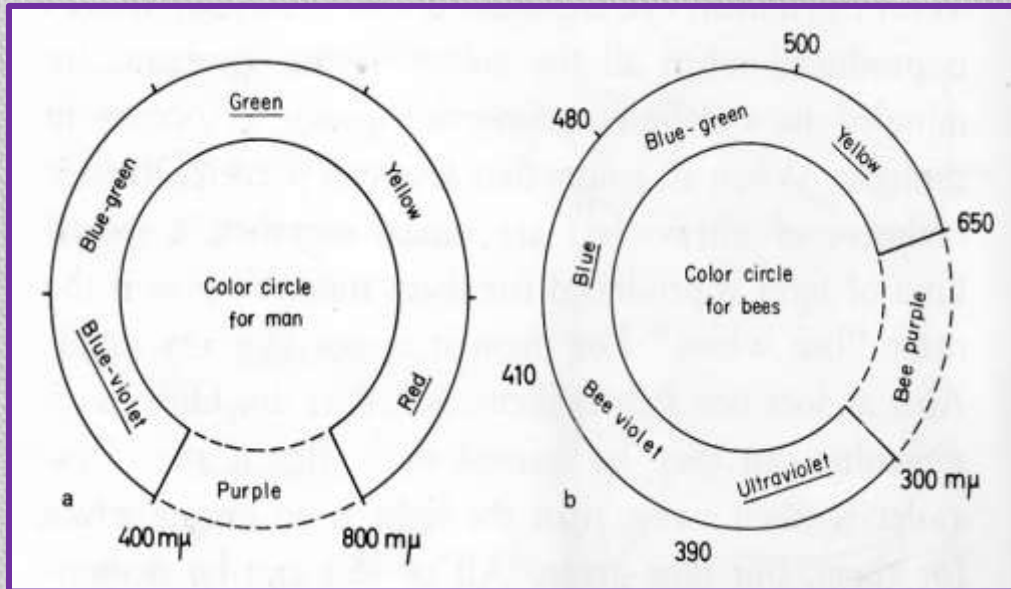
- **Bees tend to focus on one kind of flower** (assuring pollen transfer to another flower of same species)
- Colors / types of flowers typically visited:
  - Bees see ultraviolet colors (UV colors act as “nectar guides”); can’t see red
  - Prefer blues, purple, white, orange, yellow
  - Bees can smell (flowers with delicate to strong sweet scents are good nectar producers)
  - Generally sturdy, irregular-shaped to flat flowers with some type of landing platform
  - Nectar is usually stored in small narrow floral tube
  - Flowers generally open during daylight



Clockwise from top: **Sweat Bee**, Alexandria, VA; **Bumble Bee (*Bombus bimaculatus*)** queen on Lupine flowers and **Alfalfa Leafcutter Bee (*Megachile rotundata*)** gathering pollen from Queen Anne’s Lace, Blandy Experimental Farm, Boyce, VA (photos by T’ai Roulston, Research Associate Professor, UVA)

# Bee “Nectar Guides”

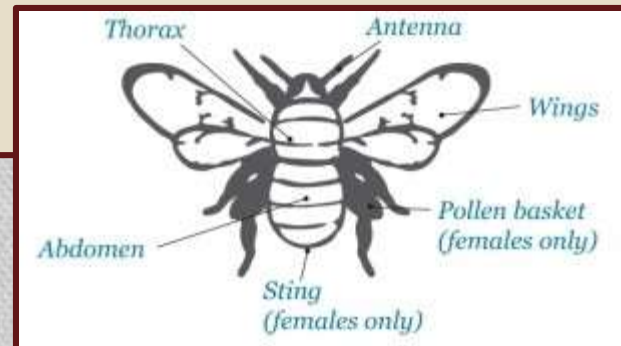
- Excerpt from Jessica Rath’s blog and article “A Better Nectar – Bee Purple” shows “immersive light work based on bee vision, created in collaboration with Aeolab multimedia programmer Elisa Co.”
- **Bee perception of color is the ultraviolet spectrum, omitting red completely**
- Bee world is filled with broad range of purples, yellows, aqua-blues
- Bee vision is filled with rhythms created by breaks in pattern, rather than human-perceived “objects”
- “Bee Purple” (below right) applies “custom digital programming design to Dr. Anne Leonard’s photographs of flower nectar guides”



# Major Vectors: Bumble Bees (*Bombus* spp.)

- 47 species in North America
- Only true social native bee in U.S.
- 2011 study found 96% decline in past century
- **Nesting:**
  - Small colonies, usually nest underground (rodent burrows, human-made cavities, i.e., upside down flower pots, under boards)
  - Mated queens overwinter (state of hibernation), “grow” colonies in spring
- Populations vary subject to climate conditions, parasites and predators
- Do not store surplus honey

- **Identification:**
  - Generally chunky stout bodies with black/yellow color combinations
  - **Abdomen** black or yellow and hairy, **distinguishes it from Carpenter Bees** (black shiny near hairless abdomen)
  - Foraging Bumble Bees have large pollen basket on each third leg
  - Queens generally 2x as large as workers and males
  - Queens have a pointed abdomen with stinger (males have no stinger and tip of abdomen is rounded)



# Major Vectors: Bumble Bees (continued)

## • Bumble Bees in Virginia:

- **Bombus affinis** (aka the “Rusty-patched Bumble Bee;” in major decline since 1990; per the Genetic Literacy Project, 8/24/2015, the *Bombus affinis*, not seen on the East Coast since 2009, and thought extinct, was recently spotted in a VA park ~50 miles from D.C. →
- **Bombus auricomus**
- **Bombus bimaculatus**
- **Bombus fraternus**
- **Bombus griseocollis**
- **Bombus impatiens**
- **Bombus pennsylvanicus pennsylvanicus**
- **Bombus sandersoni**
- **Bombus terricola** (aka the “Yellow-banded Bumble Bee; range has declined drastically since 1990)
- **Bombus vagans vagans**
- **Bombus fervidus fervidus**



Clockwise from top L: **Bombus auricomus** on Penstemon, **Bombus bimaculatus** and **Bombus griseocollis** (photos by T'ai Roulston, Research Associate Professor, UVA / Curator, State Arboretum of VA) and **Bombus fervidus** on Bleeding Hearts (photo by Rosemary Malfi), Blandy Experimental Farm, Boyce, VA

# Major Vectors: Bumble Bees (continued)

- Essential for a healthy environment
- Generalist in feeding habits (feeds Feb-Nov); a key pollinator of crops and wildflowers across the U.S.
- **Important pollinator of blueberries and tomatoes**
- Performs “**buzz pollination**” – grabs pollen producing structure in jaws and vibrates with her wings to loosen pollen grains
- An effective **alternative to labor-intensive manual pollination** of greenhouse-grown tomatoes, sweet peppers and strawberries due to “buzz pollination,” and the fact they can forage in cooler temperatures and unfavorable weather conditions (early morning, early spring, lower light levels, light rain)

- Bumble Bees are **sold commercially to greenhouse growers** (especially tomato growers)
- Tomato pollen does not loosen easily; each blossom must be vibrated, thus need “buzz pollination” to ensure pollination

Below L, **Bumble Bee on greenhouse tomato** plant (photo by Alexandra Tursi 4/17/2012); below R, close-up of **Bumble Bee on tomato blossom** (photo published in online “Old Drone” 5/18/2011)



# Major Vectors: Mason Bees (*Osmia* spp.)

- >45 species in U.S. and Canada
- Also known as Metallic Leafcutting Bee, Blue Orchard Bee
- **Identification:**
  - Most are metallic blue or green, at times with a brassy or golden tint
- **Nesting:**
  - In cavities of stems and dead wood (pre-existing tunnels made by emerging beetles)
  - Human-made nesting holes, i.e., drilled holes in boards, paper straws
  - Females build cells containing an egg, pollen and nectar, sealing the cell with mud
  - Emerges in spring as an adult
- **Behavior:**
  - Active during spring and summer
  - Generally more active in morning
- Mason Bees do not produce honey

- Likes Penstemon, Chokecherry, Hawthorn and Serviceberry; can visit up to 60,000 flowers in its lifetime
- 250 Mason Bees can pollinate an acre of apple trees

Below L, **Mason Bee on fruit tree blossoms** (photo [www.pollinatorparadis.com](http://www.pollinatorparadis.com)); below R, **Mason Bee (*Osmia collinsiae*)**, Blandy Experimental Farm, Boyce, VA, photo by T'ai Roulston, Research Associate Professor, UVA / Curator, State Arboretum of VA



# Major Vectors: Squash / Gourd Bees (Apidae family)

- Most important flower specialist in agriculture
- **Two genera:**
  - Peponapis (most widespread, *Peponapis pruinosa*)
  - *Xenoglossa*
- Research has shown when Squash Bees are in abundance, Honey Bee visits are reduced
- **Nesting:**
  - Likes sandy soil; may nest in gardens where pumpkins, squash, gourds are grown
  - Solitary, ground-nesting bees may be found nesting close together
- Females forage on flowers of squash, pumpkins, gourds (sole source of pollen)
- Carries pollen dry in a brush of hairs on hind legs

- **Behavior:**

- Early risers, in pumpkin patch <dawn
- Often sleeps (by noon) in wilted or closed flowers

Squash Bees clockwise L to R: Male/female, Blandy Experimental Farm, Boyce, VA, photo by T'ai Roulston, Research Associate Professor, UVA; photo by Dr. Tammy Horn, article in The American Chestnut Foundation; photo by Nancy Adamson, Monticello Heritage Harvest Festival; and, **Long-horned Squash Bee**, photo by Rollin Coville, article featured in Eastern Sierra Audubon Society, Sept-Oct 2014



# Major Vectors: Sweat Bees (Halictidae family)

- Sweat Bees get their name from the fact they occasionally land on people to lick up salty human sweat
- 1,000 species in the U.S., Canada and Central America
- 80 species of Cuckoo Bees (Halictid family, Sphecodes genus) known in U.S. and Canada
- **Nesting:**
  - Some species form loose colonies, others are solitary
  - Nest underground in compacted soil (in sunny areas not covered by vegetation)
- **Behavior:**
  - Generally active in spring and summer
  - Forage for pollen in early morning and nectar for “afternoon tea”
  - Can sting if caught in clothing
- Collects pollen with bristly, dense yellow hairs on hind legs



From top down: **Metallic Green Sweat Bee**, photo by Ocean Diver for Backyard Science, 3/10/2015; **Metallic Sweat Bees** on Green-headed Coneflower, photo by Alonso Abugattas, “Capital Naturalist,” Washington, D.C., 6/16/2015; **Cuckoo Bee (Sphecodes genus)**, photo by Tom Murray, Great Pollinator Project



# Major Vectors: Leafcutter Bees (Megachile spp.)

- 242 species in North America
- **Identification:**
  - Vary in size but average size of a honey bee
  - Black and furry; abdomen is particularly hairy and is used to collect/transfer pollen
- **Nesting:**
  - Most are solitary but some form informal colonies
  - Nest in dead trees, branches or stem cavities (size of a pencil); some nest underground, other use tunnels of emerging beetles
  - Female cuts circular leaf sections to line nest chambers (shaped like thimbles placed end-to-end, each one holding an egg)
  - Female kneads “bee loaf” of pollen, nectar and saliva for each chamber
  - Seals chambers with chewed leaves
  - Adult males and females emerge in spring; male’s lifespan short after mating
- **Behavior:**
  - Aggressive, combative in nature

- **Very good pollinators** – favor Blanket Flowers, Sunflowers, Asters, blueberries, onions, carrots, alfalfa

Clockwise from upper L: **Leafcutter Bee** “work in progress,” photo by Bernhard Plank, wikicommons; **Megachile campanulae**, Blandy Experimental Farm, Boyce, VA, photo by T’ai Roulston, Research Associate Professor, UVA; **Leafcutter Bee damage** on rose bush; **Megachile brevis**, Blandy Experimental Farm, Boyce, VA, photo by T’ai Roulston



# Major Vectors: Mining / Digger Bees (Anthophora spp.)

## • Identification:

- Range in size (honey bee to smaller)
- Robust and black; female has black face
- Larger Digger Bees are furry and usually darker in color than honey bees

## • Nesting:

- Nests underground, sandy soil to compacted soils
- “Solitary” bee – female digs individual burrow to raise young
- Female stocks each cell of burrow with pollen and nectar; egg deposited in food mass
- May nest close together when soil conditions favorable
- Adults emerge early spring or summer

## • Behavior:

- Usually most active in mornings
- Considered a nuisance by some when large numbers fly close to the ground
- Generally non-to-moderately aggressive
- Sting is very mild, may go unnoticed until several minutes later

- Collects pollen with special hairs on hind legs

Clockwise below L: **Mining Bee**, The Beekeepers (serving DC, MD, VA); **Mining Bees nest in clay soil**, NCSU; **Mining Bee on apple blossom**, photo by Nancy Adamson, Monticello Heritage Harvest Festival



# Major Vectors: Longhorn Bees (*Melissodes* spp.)

- >100 species known in U.S. and Canada
- Important pollinators of watermelons and commercially grown Sunflowers
- **Identification:**
  - Robust, covered with short dense hairs
  - Extended mouth parts
  - Male's antennae are nearly half the length of its body
- **Nesting:**
  - Solitary females dig burrows in open-to-lightly vegetated flat ground
  - Each cell contains pollen bale and single egg
- **Behavior:**
  - Active spring to summer
  - Biology and behavior are little known except for a few species
  - Females sleep in underground nests, males cluster on stems (settling in at dusk)
  - Females can sting, but generally only if bothered too much



Counter-Clockwise from top L: **Longhorn Bee, *Melissodes denticulata*** and ***Melissodes desponsa*** (loading up with purple thistle pollen), Blandy Experimental Farm, Boyce, VA, photos by T'ai Roulston, Research Associate Professor, UVA; photo depicting **male identification keys** from *Diadasia*, 3/20/2012; ***Melissodes agilis*** (multiple males on guara stem), photo by Kathy Keatley Garvey, 7/28/2014

# Major Vectors: Carpenter Bees (*Xylocopa* spp.)

## • Identification:

- Resemble Bumble Bees in size and appearance (large, black/yellow), but top of abdomen is mostly hairless and shiny black vs. Bumble Bees' hairy abdomen
- Males have whitish spot on face; females sport metallic black or blue-black wings

## • Nesting:

- Females are solitary in nest-building
- Nests in frame buildings (doors, roof eaves, windowsills, shingles, rafters), fences, telephone poles, dead trees
- Bores ½-inch round hole into wood (against grain) to ~1 inch deep, then at right angle, tunnels into grain of wood (they don't eat the wood)
- Creates 6-8 chambers, fills each with "bee bread" (pollen/nectar) and egg, then seals chamber
- Young adults hibernate in tunnels in winter
- Adults are active in April-May (males first to appear), then again briefly late summer
- They clean out and re-use old tunnels

## • Behavior:

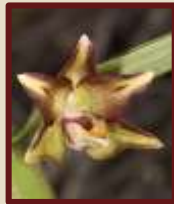
- Males unable to sting; females not prone to stinging but may if provoked
- Males hover near nests, will harass other flying insects or people who venture into their territory
- Can "rob" nectar by creating slits near base of flower (in blueberry flowers, this may limit amount of pollen that can be deposited on flower stigmas)



L to R: Eastern Carpenter Bee on blackberry flower, Blandy Experimental Farm, Boyce, VA, photo by T'ai Roulston, Research Associate Professor, UVA; Carpenter Bee, The Beekeepers serving DC, MD, VA

# Major Native Pollinators – Flies (Order Diptera)

- Considered 2<sup>nd</sup> to Bees as pollinators
  - Not as efficient individually in transporting pollen, but vast numbers can make up the difference
- 120,000 known species in the Order Diptera, including gnats, midges, no-see-ums and diverse other flies
- **Best known are Hoverflies** (aka Syrphid Flies, Flower Flies, Drone Flies)
  - 6,000 species worldwide (the most numerous of pollinating flies)
  - In some Ag systems (orchards), they out-do native bees in pollinating apples, mangoes, peppers
  - Flowers such as the Orchid species *Epipactis veratrifolia* mimic alarm pheromone of Aphids to attract Hoverflies
- **Respond to Nectar Guides**
- **Bee Flies** (Bombyliidae family)
  - 5,000 known species
  - Solitary; feed on pollen/nectar



- **Identification:**
  - Not as hairy as bees
  - Some mimic bees, i.e., Syrphid or Flower Flies, but distinguished, having only one pair of wings
- **Flies visit >1,100 species of flowers**
  - Potential to pollinate at each visit
  - May pollinate some of same crops and flowers as bees
  - As a whole, are “**generalist**” pollinators (photo below, Virginia Flower Fly on Yarrow), but often are drawn to:
    - Small flowers that bloom under shade
    - Grow in seasonally moist habitats
    - Pale, dull-to-dark brown or purple
    - Flecked with translucent patches
    - Putrid smell (carrion, blood, dung)
    - Funnel-shaped or complex traps



# Major Native Pollinators – Flies (continued)



Top Row L to R: **Bee Fly** on Flame Azalea, VA farm; **Hoverfly** on Calendula, photo by Lisa Connors, Rockbridge Co., VA, halcyonnature blog, 7/2/2013; **Yellowjacket Hoverfly, *Milesia virginiensis***, Roads End Naturalist, 7/10/2015

Bottom Row L to R: **Bee Fly, *Bombylius major***, photo by David Bodenham, The Conservation Biologist; **Syrphid Fly**, Long Branch Nature Center, Arlington, VA, photo by Alonso Abugattas, "Capital Naturalist;" **Hoverfly**, Boston University blog for "Bio-aerial Locomotion" freshman course, BU College of Engineering

# Major Native Pollinators – Beetles (Order Coleoptera)

- **Largest group of pollinators** due to volume in numbers
  - Not as efficient individually in transporting pollen, but vast numbers make up the difference
  - Their type of pollination is called “mess-and-soil”
- >30,000 species found in N.A.
- Globally, responsible for pollinating 88% of the 350,000 flowering plants
- In the U.S. and Canada, **52 plant species are pollinated by Beetles**
- Important pollinators of Magnolias and Spicebush
- Active late spring / early summer
- In many species, both larvae and adult stages feed on flower pollen
- Research shows beetles are **capable of seeing colors**
- Some beetles have a bad reputation due to damaging plant parts

- **Flowers typically visited include:**
  - Bowl-shaped with sexual organs exposed
  - Colors of white/dull white, green
  - Open during the day
  - Moderate nectar producers
  - Strong scent / fruity smell
  - Large solitary flowers (Magnolias) or clusters of small flowers (Goldenrod, Spirea)



Delta Flower Beetles, *Trigonopeitastes delta*.  
photo by Greg Dodge, 7/28/2014, Nature Watch,  
Durham, NC

# Major Native Pollinators – Beetles (continued)



Top row L to R: **Margined Leatherwing Soldier Beetles** mating while pollinating Dogbane; **Click Beetles** inside Sessile Trillium flower; **Chafer Beetles** on Maple-leaf Viburnum, photos by Alonso Abugattas, Capital Naturalist, 6/20/15; **Flower Longhorn Beetle**, *Typocerus* sp., photo by Greg Dodge, 7/28/2014, Nature Watch, Durham, NC

Bottom row left and center: **Soldier Beetles** (“**Pennsylvania Leatherwing**”), *Chauliognathus pennsylvanicus*, photos by Lisa, 9/10/2012, Virginia Living Museum; Bottom row far right, **Long-horned Locust Borer Beetle** on Goldenrod, photo by Alonso Abugattas, Capital Naturalist, 6/20/2015



# Major Native Pollinators – Butterflies (Order Lepidoptera)

- 600+ species in the U.S.
- See Handout “Butterflies of Virginia”
  - Lycaenidae (Gossamer Wings)
  - Pieridae (Sulphurs & Whites)
  - Papilionidae (Swallowtails)
  - Nymphalidae (Brush Foots)
  - Herperiidae (Skippers)
- Not major pollinators of food crops
- Do not feed or actively gather pollen, but activity contributes to pollination
- Monarch Butterflies have lost 167M acres of habitat in N.A. since 1996
- Lifespan of adults <1 week to 9 months
- **Identification:**
  - Antennas look like “golf clubs;” two antennas with chemoreceptors (located on the “club” part of the antenna) enable a sense of smell
  - Have long, coiled tube-like tongues (acts like a straw)
  - Lack a frenulum, thus fly more gracefully

- **Behavior:**
  - Active during the day
  - Love warm, sunny, windless weather
- **Flowers typically visited** (visits a broad array of flowers):
  - Brightly colored (including red; **butterflies can see red**)
  - **Respond to Nectar Guides**
  - Offer a good landing platform
  - Range from odorless to sweet scent
  - Good nectar producers
  - Open during the day



Eastern Tiger Swallowtail, Papilionidae,  
VIRGINIA STATE INSECT (designated 1991), photo  
by Luther C. Goldman, U.S. Fish & Wildlife Service

# Major Native Pollinators – Butterflies (continued)



*Lycaenidae*



*Pieridae*



*Papilionidae*



*Nymphalidae*



*Pieridae*



*Hesperiidae*

Top Row L to R: **Red-Banded Hairstreak**, *Lycaenidae*, photo by Matthew O'Donnell, at Meadowwood Special Recreation Area, Fairfax Co., VA; **Orange Sulphur on Asters**, *Pieridae*, Polinizador's Blog; **Eastern Tiger Swallowtail**, *Papilio glaucus*, photo by Kim Hosen, Woodbridge, VA, Prince William Conservation Alliance

Bottom Row L to R: **Monarch**, *Nymphalidae*, photo by James Shelton, Dutch Gap Conservation Area, Chesterfield Co., VA, 8/26/2015; **Cabbage White**, *Pieridae*, Polinizador's Blog; **White-checked Skipper**, *Hesperiidae*, Bill's Lepidoptera Photos, Maymont Park, Richmond, VA

# Urgent – Action Needed!!!

- **Pollinators are in decline** worldwide (due to loss of habitat, increased use of pesticides, climate change)
- **Biodiversity is threatened** (monoculture in agriculture)
- **Global food webs are in danger** (80% or more of all plants worldwide, including food crops, are pollinated by animals (biotic pollination))
- Research shows **Honey Bee viruses can be transmitted to other bee species** (more studies are being done to discover the full impact of this issue)

***What can you and I do? ▶▶▶▶***

# What can you and I do?

1. **Increase plant diversity**, even in your own backyard
  - a. Bees need continuous succession of flowering plants
  - b. Have blooming plants during food crop growing season
2. **Fill in the gaps** – identify flowering gaps in your landscape and plant to fill
3. **Plant en masse** when possible (10 vs. 1 plant)
4. **Choose native and heirloom plants** whenever possible

## 5. **Utilize Sound Pesticide Management**

(note, what do these terms have in common - - homicide, suicide, genocide, miticide, fungicide, insecticide, pesticide - - “icide” meaning “to kill”)

- a. Know your pests – select specific vs. broad spectrum pesticides
- b. Always choose least toxic first
- c. Read labels carefully
- d. Spray responsibly
- e. Reduce use or don't spray at all

# What can you and I do?

## 6. “Build it (habitat) and they will come”

### a. Use cover crops

- 1) Summer Mix – Buckwheat, Mustard, Sunflowers, Cowpeas
- 2) Fall Mix – Peas, Vetch, Clover, Oats

### b. Choose specific plants to attract pollinator specialists, i.e., squash and pumpkin plants attract Squash Bee

### c. Provide nesting sites

- 1) Remember, 70% of bee species nest underground
- 2) Leave patches or mounds of sunny bare ground
- 3) Don't discard all dead stems, limbs, branches, logs
- 4) Leave patches of undisturbed grassy areas
- 5) Recent research indicates soil temperatures and softer ground impact nesting endeavors

### d. Irrigation – in time of drought, water

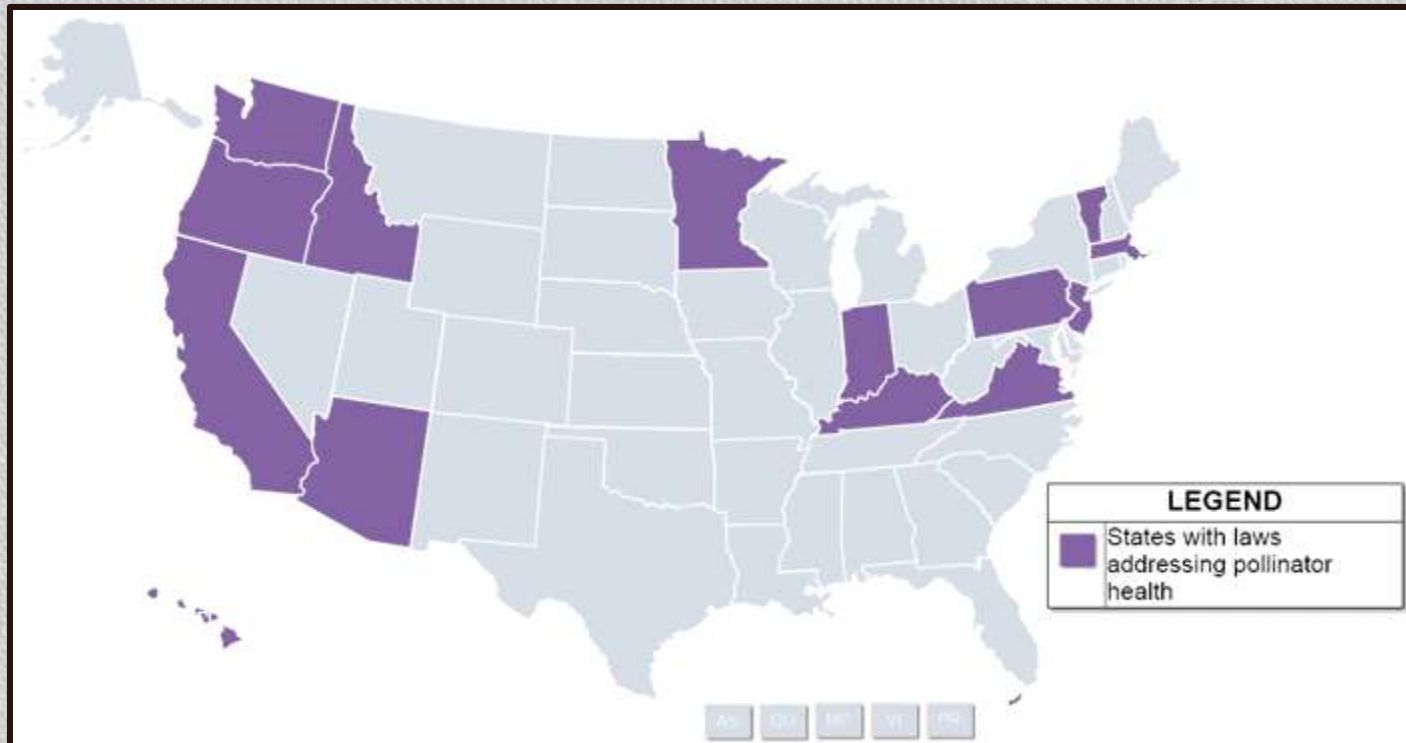


# National Conference of State Legislatures

## Pollinator Health, January 14, 2015

[www.ncsl.org/research/environment-and-natural-resources/pollinator-health.aspx](http://www.ncsl.org/research/environment-and-natural-resources/pollinator-health.aspx)

- Virginia is one of at least 14 states that have enacted legislation relating to the health of bees and other pollinators, with legislation generally in one of five categories: research, pesticides, habitat protection, awareness and beekeeping.
- Virginia is one of only six states (with KY, MA, OR, WA and CA) that have enacted legislation in recent years to study issues related to pollinator health (including pesticide use, the beekeeping industry and Colony Collapse Disorder).



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BEES



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- Slide 31: Clip Art of bee



# Handouts

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