Module 10:

Beneficial Insects and Pollinator Protection

LSU AgCenter Home Gardening Certificate Course

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What is a Beneficial Organism?

1. In agriculture and gardening, a beneficial organism is any organism that benefits the growing process, including insects, arachnids and other animals, plants, bacteria, fungi, viruses, and nematodes.
2. Beneficial organisms include those that pollinate crops, produce useful products, kill harmful organisms, recycle waste, maintain soil health, etc.

What is a Beneficial Organism?

3. Insects, spiders, predatory mites, and other arthropods are considered beneficial when they eat arthropods that humans consider undesirable.
4. Over 97 percent of those usually seen in the home landscape are either beneficial or are innocent bystanders.
5. Managing our yards as habitat for beneficial arthropods is a great way to minimize pest problems, often greatly reducing or eliminating the use of pesticides.

Categories of Beneficials

1. Predators - capture and eat other organisms such as insects or mites. Predators include spiders, mites, nematodes and insects. Over 100 families of spiders, mites, nematodes and insects contain species that are predaceous, either as adults, immatures or both.

The Predators - Spiders

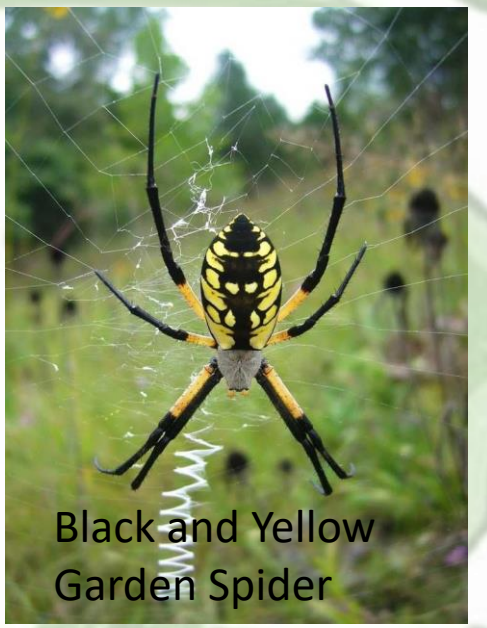
- Most spiders observed in the open during the day are not likely to bite or cause lasting harm if they do bite you. Spiders whose bites might require you to seek medical attention spend most of their time hidden.
- Spiders are arachnids, not insects. They have 8 legs and 2 body parts. They lack wings and antennae.
- Spider families vary by body shape, web type, hunting or other behavior, and the arrangement and relative size of their eyes.

The Predators - Spiders

- All spiders are predators, and most feed on insects caught in a web.
- Others, such as jumping spiders and wolf spiders, are active hunters relying on excellent vision to kill their prey.
- Crab spiders, another commonly encountered group, ambush their prey.

The Predators - Spiders


Zebra Jumping Spider


Black and Yellow Garden Spider


Northern Crab Spider


Wolf Spider


Triangulate Cobweb Spider


Orb Weaver Spider

The Predators – Predatory Mites

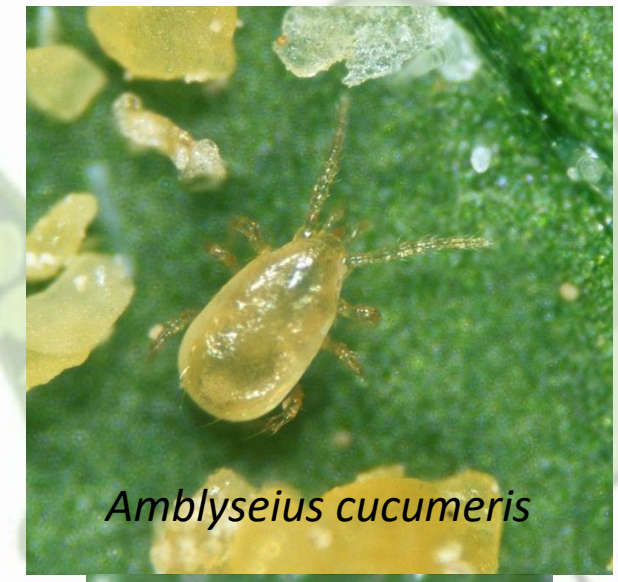
- Predatory mites are not insects but are related to spiders and ticks (Arachnida).
- They consume dozens of related spider mites daily.
- They look almost identical to and are about the same size as spider mites.
- They have a shiny, unspotted, more pear-shaped body, and longer legs that enable them to move much faster than spider mites (can’t see all this with naked eye).
- They are commercially available.

The Predators – Predatory Mites

- Predatory mites feed primarily on all life stages (eggs, nymphs, and adults) of a wide array of spider mites, as well as other plant-feeding mites such as rust mites and bulb mites.
- They also feed on the eggs and immature stages, such as crawlers and nymphs, of insects like thrips, whiteflies, and scale insects.
- The adults of some species feed on pollen, honeydew, fungi, and leaf sap.

The Predators – Predatory Mites

Phytoseiulus persimilis



Amblyseius cucumeris

Neoseiulus californicus

The Predators – Nematodes

- Beneficial nematodes are microscopic round worms that feeds on over 200 kinds of soil dwelling insects.
- They feed on insects in their larval and pupal stage primarily in the soil; been known to attack pests above ground in all stages also.
- Nematodes move within moist soil and enter a suitable host through natural openings.

The Predators – Nematodes

- Insectivorous nematodes have an ally, an internal bacterium they carry with them.
- Once inside the larvae, the nematode excretes bacteria that starts to feed and multiply, killing the host within a few days.
- The nematodes feed on the bacteria and degraded host tissues.
- The nematodes multiply and develop within the insect host before leaving to hunt for more food.

The Predators – Nematodes

Steinernema carpocapsae

A healthy white grub larva next to a darker one infected with the nematode *Heterorhabditis bacteriophora*. *Heterorhabditis* controls: Beet Armyworm, Cucumber Beetle, Leafminer, Thrips, Ticks, and more.

Steinernema controls: Armyworm, Cutworm, Vine Weevil, Cockroaches, Corn Earworm, Leafminers, Flea Beetles, And More

The Predators – Insects

- Predatory insects eat many pest insects and are an important part of a natural control program for the home garden.
- The most common insect predators are in the beetle (Coleoptera), true bug (Hemiptera), lacewing (Neuroptera), wasp (Hymenoptera), and dragonfly (Odonata) orders, as well as some flies such as flower fly (Diptera).
- Predatory insect larvae and adults feed on all stages of mites and insects.

Some Common Insect Predators

Ladybird Beetles

- There are many species of ladybird beetles that vary in size, color and pattern.
- Dome-shaped, often brightly colored adults, also known as “ladybugs” and ladybird beetles, range in size from 1/16 to 3/8 of an inch long.

Some Common Insect Predators

Ladybird Beetles

- Colors are highly variable and include orange, black, pink, or yellow.
- Spots may or may not be present.
- Predaceous both as larvae and adults, and feed chiefly on aphids. They also eat scale insects and mealybugs.
- 350 species in North America


Two-Spotted


Spotted


Spotless


Ashy-Gray

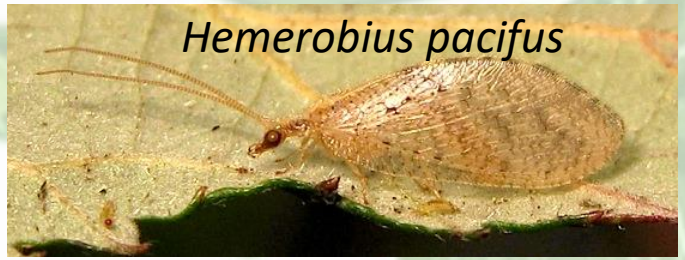
Some Common Insect Predators

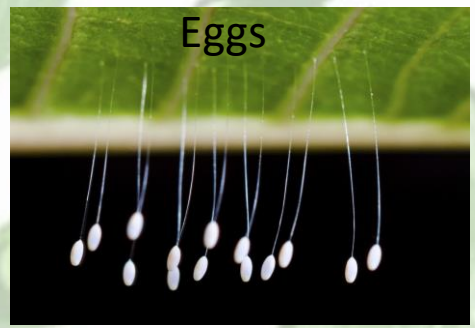
Lacewings

- Common species of lacewings include two green lacewing species, *Chrysoperla carnea* and *Chrysopa oculata*, and one brown lacewing species, *Hemerobius pacifus*.
- Lacewing eggs are white and laid singly or in groups on long stalks on the underside of leaves or branches.


Chrysoperla carnea


Chrysopa oculata


Hemerobius pacifus


Eggs

Some Common Insect Predators

Lacewings

- Green lacewing larvae feed on insect pests, adults feed on pollen and nectar. Both larvae and adult brown lacewings feed on insects. Pests eaten by lacewings include aphids, spider mites, whiteflies thrips, leafhoppers, scales, mealybugs, psyllids, small caterpillars and insect eggs.

Some Common Insect Predators
Minute Pirate Bugs

- Minute pirate bugs (*Orius* spp. & *Anthocoris* spp.) are tiny (one-eighth to one-quarter inch long) black and white insect.
- Adults and larvae feed on thrips, mites, insect eggs, and any kind of insect that they can catch.

Some Common Insect Predators

Bigeyed Bugs

- Big-eyed bugs (*Geocoris* spp.) are aptly named insects that are about one-eighth inch long, black and white, with silvery wings and large, bulging eyes on the sides of the head.
- Big-eyed bugs are important predators of chinch bugs (with which they are often confused).
- They also feed on small caterpillars, mites, insect eggs, and any other insect that they can catch and subdue.
- Adults are commonly found on flowers.

Some Common Insect Predators

Assassin Bugs

- Assassin bugs feed on a wide variety of pests ranging from small ones like aphids to larger ones like caterpillars.
- They may either stalk their prey, or wait for an insect to come near, then suddenly attack with their dagger-like, piercing-sucking beak, repeatedly stabbing their prey.
- There are over 160 species of assassin bugs in North America.
- Large species will bite humans as well as their prey.

Some Common Insect Predators

Praying Mantids

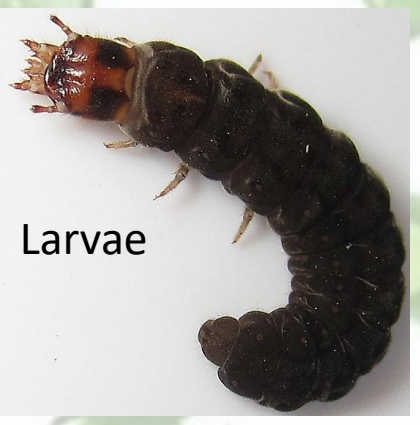
- Adults are 2-4 inches long and green, brown or yellow in color.
- Mantids (*Mantis* spp.) have an elongated thorax and grasping forelegs, which they use to hold their prey while they eat.
- Eat virtually any insect they can catch.

Eggcase

Some Common Insect Predators

Soldier Beetles

- Soldier beetles (*Cantharis* spp.) are colorful insects, often black or brown with a red, yellow or orange head and thorax.
- They are elongate and flat with long threadline antennae.
- The larvae are covered in dark bristles.
- There are 468 North American species.
- Adults feed on pollen and nectar and prey on many soft-bodied insects.
- Larvae are highly predaceous soil-dwellers feeding on insects, snails, slugs, millipedes, earthworms, caterpillars, maggots and insect eggs.



Some Common Insect Predators

Ground Beetles

- Most are shiny brown, black, or blue-black insects ranging in size from one quarter to over one inch long, with long legs and long antennae.
- Ground beetles have prominent jaws used to kill caterpillars (including armyworms, cutworms, and grubs) and other insects, as well as small snails and slugs.
- Both adults and larvae are primarily nocturnal predators.

Larvae

Some Common Insect Predators

Hover Flies

- Hover Flies are also known as Syrphid Flies or Flower Flies.
- Adults (0.3-0.6”) may be brightly colored, and many resemble wasps and bees.
- Adults frequent flowers over which they hover before landing to feed on nectar and pollen (their only food source).
- The larvae of most species are predaceous feeding on aphids, scales, thrips and other small soft-bodied insects.

Categories of Beneficials

2. Parasitoids - are insects that parasitize other insects. The immature stages of parasitoids develop on or within its host, eventually killing it. Parasitoids may attack all stages of their host (eggs, larvae, nymphs, pupae, adults). Adult parasitoids serve mainly to transport their offspring to new hosts. Two major groups of parasitoids are parasitic wasps and tachinid flies.

Some Common Insect Parasitoids

Parasitoid Wasps

- Most insect parasitoid wasps are host-specific.
- There are hundreds of species of parasitoid wasps.
- The most commonly noticed ones are the larger Braconid and Ichneumonid wasps. Many other parasitoid wasp species are much smaller, only a few millimeters long.

Some Common Insect Parasitoids

Parasitoid Wasps

- The wasps typically have a larval stage that feeds on the inside of the host insect, and the larvae slowly devour the host, which eventually dies.
- Some of the wasps emerge to pupate on the outside of the host, others develop into pupae inside and emerge from the host as adults.
- An adult parasite can lay eggs in hundreds of host individuals.

Some Common Insect Parasitoids

Parasitoid Flies

- The tachinids are the most important parasitoid flies.
- There are over 1300 different species of tachinid flies in North America.
- Adult tachinid flies measure anywhere from 1/3″ to 3/4″ long.
- Most tachinids are endoparasites - the developing larvae (maggots) feed within their hosts.

Some Common Insect Parasitoids

Parasitoid Flies

- Some adult female tachinid lay eggs on leaves to be eaten by caterpillars, others insert eggs or maggots directly into the host, and still others attach eggs or maggots to the outside of the host.
- Eggs consumed by the host or inserted by the mother hatch into maggots inside the victim.
- Eggs affixed to the skin of prey hatch and the maggots bore into the body of the host.
- Safely inside, the maggots complete their development, consuming their host as they grow.

Categories of Beneficials

3. Pollinators - include honeybees, leafcutter bees, other wild bees, butterflies, moths and other insects that visit flowers to feed on nectar and pollen. Pollinators transfer pollen within and between flowers of the same species (pollination) which is essential to seed and fruit production for plants.

Some Common Insect Pollinators - Bees

- Bees are the most important and efficient pollinators,
- Bees rely solely on protein and carbohydrates found in pollen and nectar.
- As they travel in search of food, pollen sticks to the very fine, short hairs that cover their bodies and legs and is transferred from flower to flower.
- North America has more than 5,000 species of native bees, 90 percent of which lead solitary lives.
- Bees are unique – only insects that actively gather large amounts of pollen to feed themselves.

Some Common Insect Pollinators

Honeybees

- Introduced to North America in the late 1600s.
- These social bees can forage up to five miles from their hive in search of nectar and pollen and are highly effective pollinators.

Some Common Insect Pollinators

Carpenter Bees (Large & Small)

- Chew nesting galleries in solid wood, stumps, logs and dead branches or in soft pithy wood.
- Can sting but not aggressive
- Food is pollen and nectar

Ceratina cockerelli

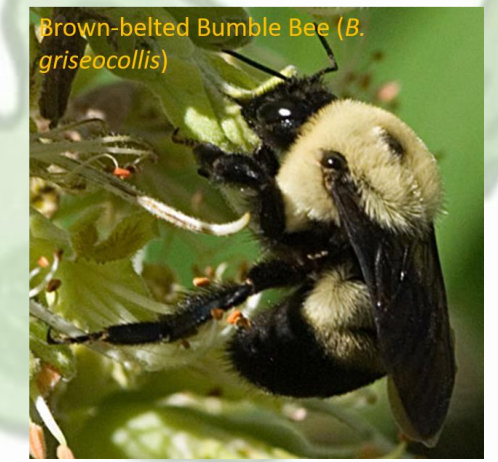
Southern Carpenter Bee
(*Xylocopa micans*)

Eastern Carpenter Bee
(*Xylocopa virginica*)

Some Common Insect Pollinators

Bumble Bees (*Bombus* sp.)

- Size – ¾” to 1 ½”
- Feed on pollen and nectar
- Pollen basket (corbicula) on their hind legs
- Not usually aggressive but have a painful sting
- Hairy abdomen



Some Common Insect Pollinators

Sweat Bees

- Sweat bees are a large and very diverse group. Usually 0.12”-0.40” long
- Usually more numerous than all other bees except honeybees.
- They feed on nectar and pollen and provide a store for each egg they lay.
- Very important pollinators for wildflowers and crops

Lasioglossum nymphale

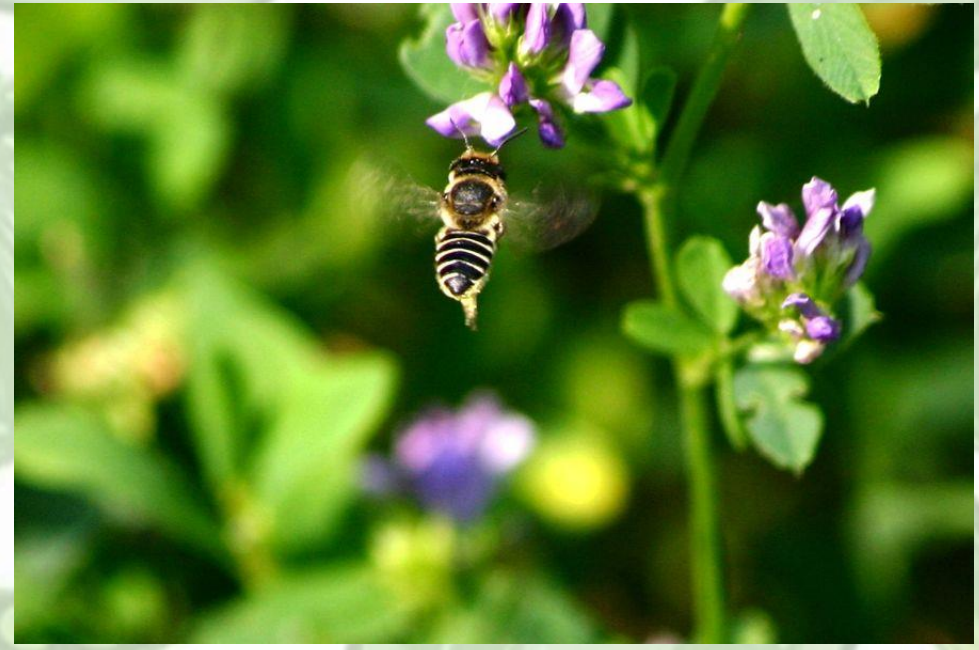
Halictus poeyi

Sphecodes heraclei

Some Common Insect Pollinators

Leafcutting Bees

- From 5mm to 20 mm, solitary
- Use almost any cavity for a nesting site
- Cut ¼” to ½” circular pieces of leaves to construct nests
- Each nest cell has 1 egg and pollen balls
- Important pollinators of wildflowers, fruits and vegetables



Some Common Insect Pollinators - Wasps

- In addition to being highly beneficial predators of insect pests such as caterpillars and flies, wasps are also pollinators.
- Many species take advantage of the quick energy nectar and pollen can provide.
- Because their slender bodies have fewer hairs than bees, wasps aren’t quite as effective at pollination but they can still pass pollen along from one plant to another.

Some Common Insect Pollinators

Mason Wasps (*Zethus* spp.) and Potter Wasps (*Eumenes* spp.)

- Solitary, 3/8” to 3/4” long
- Masons use abandoned burrows or vegetable matter for nests.
- Potters use mud
- Insectivorous – Use lepidopteran larvae to feed their young – Beneficial
- Adults feed on pollen and nectar - Pollinators


Zethus slossonae


Eumenes smithii

Some Common Insect Pollinators

Paper Wasps (*Polistes* spp.)

- Nests are made of wood pulp and saliva
- Feed on caterpillars, adult insects, and nectar

European Paper Wasp (*Polistes dominula*)

Red Paper Wasp (*Polistes carolina*)

Some Common Insect Pollinators – Butterflies

- There are about 17,500 species of butterflies in the world, and around 750 species in the United States
- Butterflies have excellent vision and are thus drawn to bright colors, including reds and oranges.
- Butterflies especially rely on native wildflowers for nectar and as caterpillar host plants.

Some Common Insect Pollinators – Butterflies

- Blooms that provide good landing areas, such as flat-topped clusters or flowers with wide petals, make feeding easier.
- Having long legs and a proboscis, or feeding tube, a butterfly's body may never actually touch the flower it's resting on. But its wings still brush against and collect pollen, especially when hanging onto down-facing blooms.

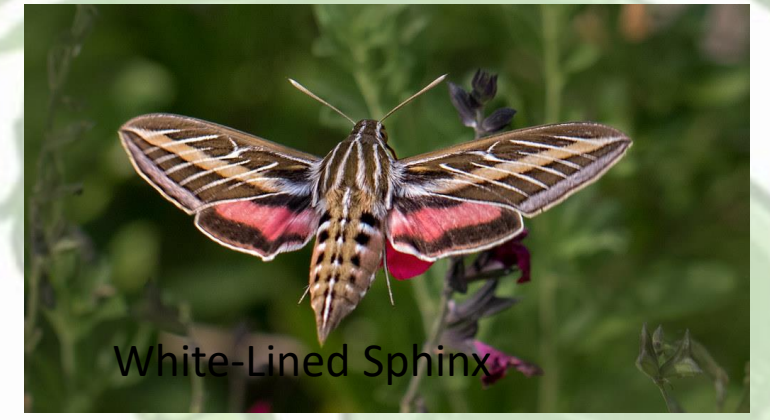
Some Common Insect Pollinators – Butterflies

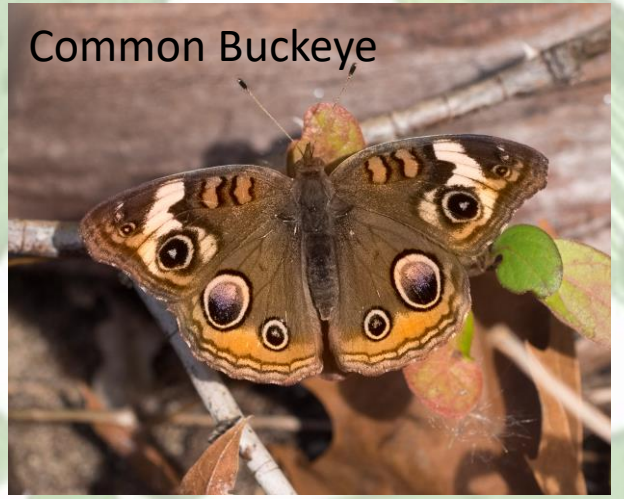
Some Common Insect Pollinators – Moths

- There are some 160,000 species of moths in the world, compared to 17,500 species of butterflies. In the United States, there are nearly 11,000 species of moths.
- When it comes to pollinating late afternoon or evening bloomers moths, are very effective.
- Although most moths are only active after dusk, diurnal moths feed during the daytime.
- Their bodies may not have direct contact with flowers but pollen does collect on a moth's quickly beating wings as they feed, just as with butterflies.

Some Common Insect Pollinators – Moths


Luna


White-Lined Sphinx


Common Buckeye


Peach Tree Borer


Hummingbird Moth


Narrow-Bordered Bee Moth


Carolina Sphinx

Some Common Insect Pollinators – Flies

- Flies can transport large amounts of pollen, which they often pick up from nectar-producing flowers.
- They prefer shallow, open flowers with readily accessible nectar droplets. Flies generally have sponging mouthparts, which vary in length and limit which flowers different species will visit.

Some Common Insect Pollinators – Flies

- They are drawn to umbelliferae (carrots, celery/celeriac, parsnip, and parsley), brassicaceae (cole crops, mustards, and Asian greens), rosacea (strawberry, raspberry, and blackberry), and alliaceae (onions, leeks, and chives), many of which also happen to be unattractive to bees.
- Flowers that produce a putrid odor, like rotting meat , carrion, dung, humus, sap and blood are fly-pollinated.

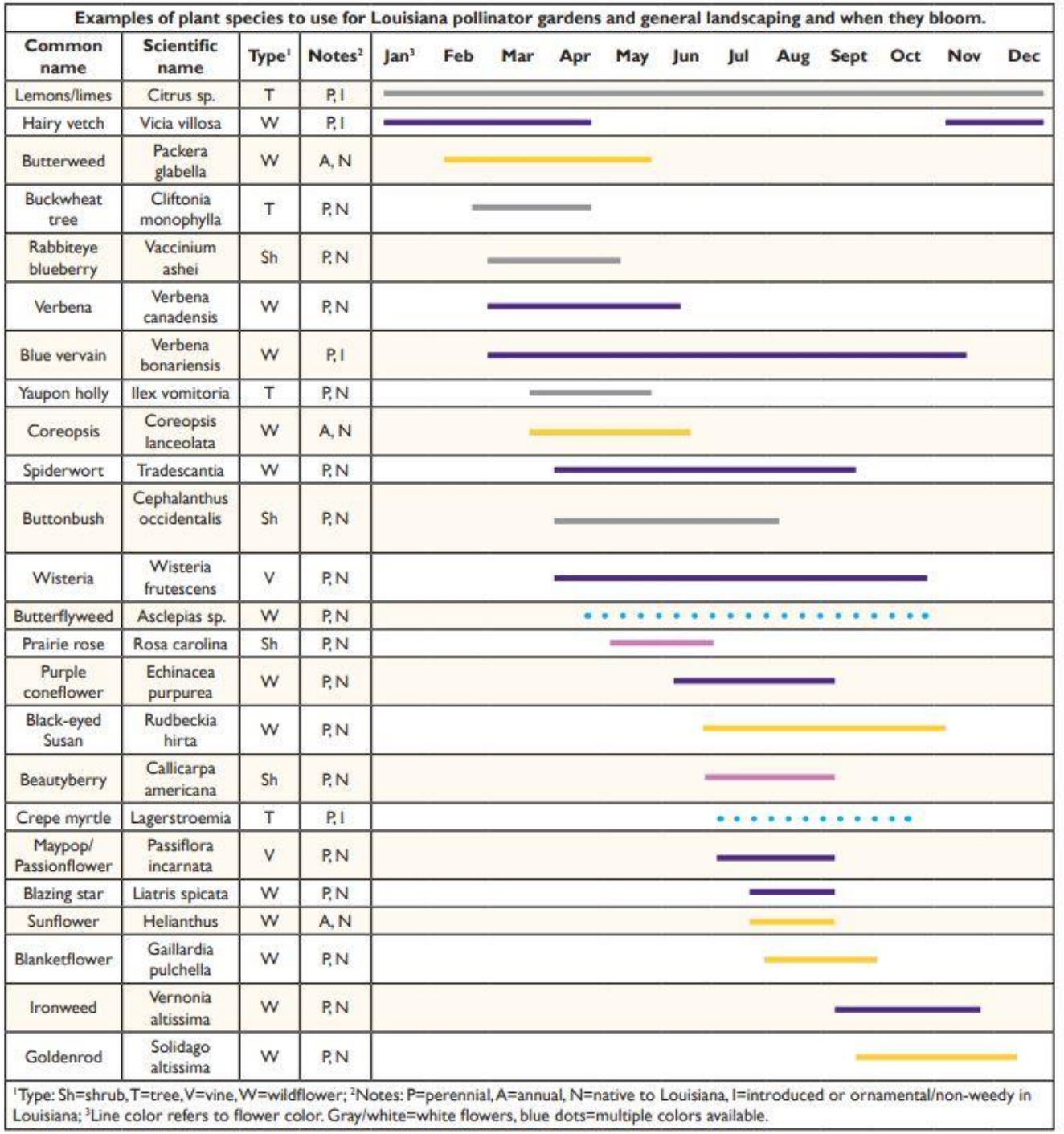
Some Common Insect Pollinators – Flies

How can we make our backyards more pollinator friendly?

1. **Provide food all year.** Plant combinations of native flowers that will bloom spring, summer, and fall. Grass lawns are deserts for bees, with no food value. Convert lawn to wildflowers or delay mowing to allow weeds to bloom. Plant host plants for pollinator larvae.
2. **Provide safe nesting sites.** Maintain areas with bare, well-drained soil. Some bees need mud for nest building, so provide water if none is nearby. Make or buy nesting houses.
3. **Protect pollinators from pesticides.** Avoid use of chemical herbicides and pesticides in your garden. If necessary, apply at night or very early before pollinators become active.

Provide Food

- Provide pollinator plants
- Wide range of bloom times best
- Not treated! Nursery plants may be treated with neonicotinoids!
- Natives or heirlooms best
- New hybrids are low in pollen content
- Up to 90% of pollen in summer comes from crape myrtles (Florida study)



Examples of plant species to use for Louisiana pollinator gardens and general landscaping and when they bloom.

Common name	Scientific name	Type[1]	Notes[2]	Jan[3] Feb Mar Apr May Jun Jul Aug Sept Oct Nov Dec
Lemons/limes	Citrus sp.	T	P, I	
Hairy vetch	Vicia villosa	W	P, I	
Butterweed	Packera glabella	W	A, N	
Buckwheat tree	Cliftonia monophylla	T	P, N	
Rabbiteye blueberry	Vaccinium ashei	Sh	P, N	
Verbena	Verbena canadensis	W	P, N	
Blue vervain	Verbena bonariensis	W	P, I	
Yaupon holly	Ilex vomitoria	T	P, N	
Coreopsis	Coreopsis lanceolata	W	A, N	
Spiderwort	Tradescantia	W	P, N	
Buttonbush	Cephalanthus occidentalis	Sh	P, N	
Wisteria	Wisteria frutescens	V	P, N	
Butterflyweed	Asclepias sp.	W	P, N	
Prairie rose	Rosa carolina	Sh	P, N	
Purple coneflower	Echinacea purpurea	W	P, N	
Black-eyed Susan	Rudbeckia hirta	W	P, N	
Beautyberry	Callicarpa americana	Sh	P, N	
Crepe myrtle	Lagerstroemia	T	P, I	
Maypop/ Passionflower	Passiflora incarnata	V	P, N	
Blazing star	Liatris spicata	W	P, N	
Sunflower	Helianthus	W	A, N	
Blanketflower	Gaillardia pulchella	W	P, N	
Ironweed	Vernonia altissima	W	P, N	
Goldenrod	Solidago altissima	W	P, N	

[1]Type: Sh=shrub, T=tree, V=vine, W=wildflower; [2]Notes: P=perennial, A=annual, N=native to Louisiana, I=introduced or ornamental/non-weedy in Louisiana; [3]Line color refers to flower color. Gray/white=white flowers, blue dots=multiple colors available.

Provide Shelter

- Leave some bare ground for ground nesting bees (70% of natives)
- Stable, slightly mounded areas with good drainage (along a fence?)
- Provide woody habitat for wood nesting bees (30% of natives)
- Mulch can be both good and bad!
- Reserve some areas for woody, dead material

Provide Water

- Build a bee waterer!
- Add stones, marbles or pebbles to prevent drowning
- Refill and clean weekly
- Rough textured surfaces best for access

Avoid Pesticides

- Bees feed pollen to brood
- Pesticides can be concentrated in pollen
- “10 Foot Rule”
- Can cause:
  - Compromised immunity
  - Shortened lifespan
  - Impaired memory
  - Delayed larvae development
  - Gut microbe disruption

Resources

- Xerces Society: https://www.xerces.org/pollinator-resource-center
- Native Plant Initiative of GNO: https://www.npi-gno.org/
- Pelican Greenhouse: https://neworleanscitypark.com/events/pelican-greenhouse-plant-sales
- Green-Light NOLA: http://www.greenlightneworleans.org/rainbarrels
- Monarch Watch Waystations: https://monarchwatch.org/waystations/index.html
- GreenBridges: https://www.herbsociety.org/explore/hsa-conservation/greenbridges-initiative/greenbridges-initiative.html
- The Green Project: https://www.thegreenproject.org/salvage-store
- www.lsuagcenter.com
  - Composting: https://www.lsuagcenter.com/portals/communications/publications/publications_catalog/lawn%20and%20garden/backyard%20composting
  - Pollinators: https://www.lsuagcenter.com/topics/lawn_garden/master%20gardener/pollinators

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