

Pollinator Gardens Supplemental Curriculum: ESSENTIAL INFORMATION FOR TEACHERS

Insect and Pollinator Information

ANATOMY *Insects* (including butterflies, flies, beetles, bees, dragonflies, ants, and many others) are characterized by six (6) legs, three (3) body parts [**HEAD, THORAX, and ABDOMEN**], a hard **EXOSKELETON** and **COMPOUND EYES**. Most insects have a pair of **ANTENNAE** and two (2) pairs of wings.

Spiders are NOT insects, but like insects and are **ARTHROPODS** (jointed legs, hard outer layer). They have eight (8) legs, compound eyes, an exoskeleton and two (2) body parts [**HEAD and CEPHALOTHORAX**]. Some spiders have **URTICATING HAIRS** which they will throw at a predator when attacked. This defense stings the predator's eyes and temporarily blinds it.

Insects grow by **MOLTING**, shedding their old exoskeleton and growing a new, larger one. When they have just molted, and before the new exoskeleton hardens, insect bodies are soft and vulnerable.

Insects also go through **COMPLETE METAMORPHOSIS**. Life cycle stages are **EGG, LARVA, PUPA** and **ADULT**. Butterflies, bees and beetles are insects whose larval forms are distinctly different from the adult form. Insects whose larval form resembles the adult go through **INCOMPLETE METAMORPHOSIS**. Crickets and cockroaches go through incomplete metamorphosis.

BEHAVIOR Insects can be herbivorous or carnivorous. Some insects are pests to humans: mosquitoes feed on mammalian blood, aphids and scale insects infest our gardens and wasps produce a nasty sting.

But many more insects are incredibly beneficial to humans: bees, beetles and butterflies pollinate our gardens and crops, making possible such foods as chocolate, honey, nuts and most fruits; some insects are decomposers, helping to breakdown dead material; and other insects, like ladybugs and praying mantis, feed on pest insects. Even mosquitoes and many other insects are food for other animals.

Flowers have adapted various attributes (**color, scent, shape, size**) to attract certain pollinators such as bees, butterflies and hummingbirds. These pollinators sip sweet **nectar** from the flower, collect **pollen** and carry this pollen to the next flower of the same species (or in some cases, the pollinator moves the pollen within the same flower), thus fertilizing the flower.

Vocabulary

- **Adapt** – To grow and change in response to environmental conditions.
- **Adaptation** – Special body features or behaviors that help a creature survive in its environment.
- **Biodiversity** – The diverse variety of life forms: the different plants, animals and micro-organisms; and the Eco-systems they form. Usually considered at three levels: genetic diversity, species diversity and ecosystem diversity.
- **Carnivores or Secondary Consumers** – These animals don't eat plants, but feed on animals that do eat plants.

- **Decomposer** – An animal that breaks down dead or decomposing plant materials, thus recycling important nutrients and returning them to the environment.
- **Ecosystem** – A dynamic system of plant, animal and micro-organism communities and non-living components interacting as an ecological unit.
- **Endangered** – Animal or plant species in danger of extinction throughout all or a significant portion of their range due to one or more causes, including loss of habitat, over-exploitation, competition or disease.
- **Environment** – The complex web of inter-relationships between living organisms and non-living components, which sustain all life on earth.
- **Fauna** – All of the animals found in a given area.
- **Flora** – All of the plants found in a given area.
- **Food Web** – A group of interlinked food chains. In addition to herbivores, omnivores and carnivores, the food web also contains scavengers and decomposers, so that no available source of energy is ever allowed to go to waste.
- **Habitat** – A place where an animal or plant lives which provides food, water, shelter and space for survival.
- **Herbivores or Primary Consumers** – Animals that eat primarily plants.
- **Metamorphosis** – The process of change from young to adult in which the young is very different from the adult.
- **Migration** – The seasonal, usually two-way and goal-oriented movement from one place or habitat to another to avoid unfavorable climatic conditions and/or to seek more favorable energetic conditions.
- **Native** – Indigenous to and dwelling within a specific area for an entire lifespan.
- **Nectar** – A sugary fluid produced by flowers to attract animal pollinators.
- **Petals** – Colorful flower parts that surround the floral reproductive structures.
- **Pistil** – The name for the collective female floral reproductive parts including the stigma, style and ovary.
- **Pollen** – A collective name for pollen grains. Pollen bears sperm for plant reproduction.
- **Pollen Tube** – Tube formed after germination of the pollen grain. It carries the male reproductive information to the ovule.
- **Pollinated** – The condition of the flower in which the female parts of a flower have received pollen transferred from the male parts of the same flower, or another flower of the same species, resulting in the production of seeds and fruits.
- **Pollination** – The spreading of pollen from the male parts to the female parts of a flower of the same species, resulting in the production of seeds and fruits.
- **Pollinator** – An animal that carries pollen from the male parts of flowers to the female parts, fertilizing plant “eggs” with plant “sperm.”
- **Primary Producers** – All food chains begin in green plants (“primary producers”) with a process called photosynthesis. Energy from the sun lands on plants and is collected by chlorophyll. With this energy plants can then make sugar and oxygen, food for other animals.
- **Seed** – The part of the fruit of a plant which is capable of growing (germinating) and producing a new plant.
- **Stamen** – The name for the collective male floral reproductive parts, including the anthers and filaments.
- **Threatened** – Species, subspecies or varieties likely to become endangered within the foreseeable future throughout all or a significant portion of their range, without special protection and management efforts.

Pollinator Gardening Supplemental Curriculum: Science

Level: 3rd-5th and higher grades

MY MUNCHING MOUTHPART



Objective: *Students will understand that insects can be categorized by the different type of mouthparts that they have. The mouthpart gives us clues to what and how the insect eats.*

Materials: Photo of an ice cream cone, 5-6 paper plates, 5-6 straws (some of these should be cut in half so that they are ½ length, the others should be long enough to reach the bottom of the bottles), 3-4 small drink cups with lids (with slits for straws), 3- 4 long neck plastic bottles (a soda bottle will work), foods for the activity: peanut butter, crackers, honey or jelly, juice or water.

Vocabulary to review: Habitat, prey, predator, Mouthparts: chewing, sucking/piercing, lapping/ sponging.

Procedure:

1. Introduce the idea of mouthparts and how they help us eat.

-- What mouthparts do **people** have? Teeth and tongue.

Hold up (a picture of) an ice cream cone. How would a person eat this? Lick the ice cream with your tongue. Bite and chew the ice cream and cone. Suck the melted ice cream from the bottom of the cone. Are there other ways you could eat ice cream? Suck it up through a straw (milk shake).

Question: What mouthparts do **insects** have?

Answer: It depends on the insect. The type of mouthpart an insect has helps determine what the insect eats. Insects specialize on certain types of food. There are 3 major categories of insect mouthparts: **chewing, sucking/piercing and lapping.**

2. Activity: Practice and explore with insect mouthparts.

Set out a table with "insect foods."

Food A: Juice in small cups with lids.

Food B: A small amount of juice in the soda bottles.

Food C: Paper plate with a little bit of honey or jelly on it.

Food D: Paper plate with a little peanut butter holding a couple of crackers up on edge.

Assign students to one of 4 groups of insects. Each insect group will get one "insect mouthpart" to try to eat their food. They will have to determine which of the foods they will be capable of eating, and eat only that food. Insects and "Mouthparts" are:

Group A: **Bee** (sucking/piercing): Allowed only to use **straws (1/2 length)**

Group B: **Butterfly** (sucking): Allowed only to use **straws (long)**

Group C: **Fly** (lapping): Allowed only to use **tongue**

Group D: **Caterpillar** (Chewing): Allowed only to use **teeth.**

CA Science Content Standards: (1st, 2nd) Life Sciences 2a-d [plants and animals meet their needs in different ways, inhabit different environments and have different physical features to help them thrive],
(3rd, 4th) Life Sciences a,c,d (3rd) and 2a-c & 3a-d (4th) [adaptations in structure improve chance for survival, plants are an important part of most food chains, plants and animals have different structures, organisms can change their environment which has effects on other organisms, ecosystems have living and non-living parts, animals and plants are dependent upon each other, there are many beneficial microorganisms].

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MY MUNCHING MOUTHPART (continued)

Once the group has its mouthparts, they should put their hands/arms behind their backs and go for the food!

Ask the groups questions to promote concepts:

Fly, can you chew leaves? Butterfly, can you lick flowers? Caterpillar, can you drink juice from the cup? Bee, can you chew?

3. Discuss.

-- What other insects can you think of with each type of mouthpart? [Students may mention mosquito, spider (piercing); ant, grasshopper, cockroach (chewing).]

-- Talk about why it is important to have different mouthparts:
Insects eat different things.

Different mouthparts allow different insects to *specialize* on different parts of plants, or different parts of the same plant. (ie. One flowering bush may have butterflies sucking nectar from the flowers, bees sucking nectar and collecting pollen, aphids piercing the leaves to get the sweet juice inside, and a caterpillar or beetle chewing on the leaves)

Some insects are good for the garden, while others are bad and cause damage to the plants. These are called *pests*. We need to be sure to have plants in the garden that provide food for insects that are good.

Some of these "beneficial" insects eat pest insects. Ladybugs, spiders, praying mantis and lacewing are all good for the garden because they eat pests.

CA Science Content Standards: (1st, 2nd) Life Sciences 2a-d [plants and animals meet their needs in different ways, inhabit different environments and have different physical features to help them thrive],

(3rd, 4th) Life Sciences a,c,d (3rd) and 2a-c & 3a-d (4th) [adaptations in structure improve chance for survival, plants are an important part of most food chains, plants and animals have different structures, organisms can change their environment which has effects on other organisms, ecosystems have living and non-living parts, animals and plants are dependent upon each other, there are many beneficial microorganisms].

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Pollinator Gardening Supplemental Curriculum: Language Arts

Level: 1st/2nd , 3rd-5th and higher



Pretend Pollinators

Objective: *Students will use knowledge of local pollinators including: their role in the garden, habitat and eating habits, to create an imaginary pollinator. Students will write a story about the*

Materials: A copy of activity sheet “my Pollinator.”
Optional: images of various pollinators and pollinated plants.

Vocabulary to review: pollinator vocabulary: insect, flower, pollen, nectar, fertilize, mouthpart, seed, petal.

Procedure:

Review what students have learned about pollinators and their role in a healthy garden. Review what students know about physical attributes of actual pollinators. You may want to look at images of pollinators, paying attention to: shape of body, wings, legs, mouthparts; size; and color. Also review what students know about pollinated plants, where their pollen and nectar are found, and their shape and color.

Students should then design their own pretend pollinator. The teacher should give students criteria by which to design. Students should write answers to the following questions:

- What does your pollinator eat?
- How does it eat?
- What colors is it attracted to?
- How big is it?
- What special body features does it have?
- Where does it live?
- What are its predators?

Students should draw and color their pollinator. **Younger students** may answer these questions on the “My Pollinator” page. **Older students** can use these questions as a base for a short essay about their pretend pollinator.

CA Language Arts Content Standards 1st/2nd : Reading 1.0 (sight words, fluency); Writing 1.0 (focused writing, group ideas, use descriptive words); Language Conventions 1.0 (use complete sentences).

CA Language Arts Content Standards 3rd-5th : Writing 1.0-1.1 (write clearly and coherently to develop a central idea, using supporting details); [4th] 1.7 (use reference materials); 2.0-2.2 (Write descriptive narratives)

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Name: _____

Pollinator Partnership
Pretend Pollinators story

My Pollinator

I am _____'s pollinator.

My name is _____.

I am a _____.

I eat _____ and _____.

I live in _____.

I can _____ and _____.

I help the garden because _____

_____.

I like to _____

_____.



POLLINATOR NEEDS: WHO NEEDS POLLINATORS?

Objective: Students will understand that habitats satisfy plant and animal needs. People and animals (specifically pollinators) have similar basic needs, including: shelter, food, water and warmth. Students will explore the garden to see how it is meeting the habitat needs of pollinators.

Location: Start inside, move into the garden

Materials: large dry erase board/ poster paper with markers, access to a building with roof, door, windows, water, kitchen, (optional: snacks)

Vocabulary and ideas to review: Habitat, Needs v. Wants (how are these similar? different?), pollinator, flower, nectar, pollen, fertilization, flower parts (petal, stamen, pistil), ecosystem

Procedure:

1. Discuss Needs.

-- Ask: What are things that people NEED to survive?

[hint: Direct students to go beyond "I want a video game."]. Start a list on the board.

--Things people NEED to live should fit into these categories:

1. Shelter/protection- a place to live, doors, clothes-to protect us from weather;

2. Food;

3. Water;

4. Warmth-sunshine and light.

Write these and students' ideas on the board.

-- How about animals? What do they NEED to survive? Probably some of the same things that people need!

Create a third list on a separate sheet of paper. Be sure to emphasize **Shelter, Food, Water and Warmth.**

A good habitat provides for all of these NEEDS for its inhabitants.

-- What animals live in the garden?

Introduce/review the idea that many animals here are pollinators.

2. Explore the garden. Students should search for specific ways in which the garden satisfies the NEEDS of pollinators.

-- Students should be given a list of questions to explore/answer in the garden. Think about the NEEDS of pollinators. How does this garden meet those needs:

-Do you see any pollinators? If not, where do you think they are?

-Is there water nearby?

-Where could pollinators hide? Is it safe here? What would make it safer for pollinators?

-What can they eat here?

-How does the garden provide for warmth?

-Is there sun?

- Students may sketch what they find, or take notes.

CA Science Content Standards: (3rd, 4th) Life Sciences a,c,d (3rd) and 2a-c & 3a-c (4th)

[adaptations in structure improve chance for survival: different structures, organisms can change their environment which has effects on other organisms, ecosystems have living and non-living parts, animals and plants are dependent upon each other], Earth Sciences 4 [the sun changes position throughout the day]

(6th-8th) Life Sciences and Ecology [organisms exchange nutrients within ecosystems, evolution, structure of plants and animals are complementary]

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Pollinator Gardening Supplemental Curriculum: Science
Level: 3rd-5th , 6th-8th and higher

POLLINATOR NEEDS: WHO NEEDS POLLINATORS? (continued)

3. *Bring ideas back to the group.* Discuss.
Compare findings and ideas.

Emphasize that pollinators are important to the garden so we must be sure to create a habitat that serves the needs of these creatures, so that they will continue to help the garden to flourish.

4. *Tie pollinators into people's needs.*

-- Pollinators are important to people because they help us meet our need of food.

-- We need pollinators in order to pollinate flowers and grow foods like chocolate, oranges, bananas, apples and nuts.

-- Have a pollinator-inspired snack (fruit, peanut butter, nuts, juice, etc). The garden provides not only the pollinators with a good habitat, but helps people as well!

Extension 1: [Language Arts] Have students come up with ideas of how to better serve the needs of pollinators. How could they attract more pollinators to the garden? What could they provide? Change? Draw or write about their ideas.

Extension 2: [Science] Students visit another habitat and explore to find out how it satisfies the needs of its inhabitants. How is this different from the school garden? What different inhabitants does it attract? Different pollinators?

CA Science Content Standards: (3rd, 4th) Life Sciences a,c,d (3rd) and 2a-c & 3a-c (4th)

[adaptations in structure improve chance for survival: different structures, organisms can change their environment which has effects on other organisms, ecosystems have living and non-living parts, animals and plants are dependent upon each other], Earth Sciences 4 [the sun changes position throughout the day]

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