

POLLINATOR PARTNERSHIP

POLLINATOR GARDENS AND HABITAT PROGRAM CURRICULUM AND ACTIVITIES



The Pollinator Partnership - 423 Washington St, 5th Floor - San Francisco, CA 94111-2339 - (415) 362-1137 - info@pollinator.org

POLLINATOR PARTNERSHIP

423 Washington St., 5th Fl.
San Francisco, CA 94111
t 415.377.9245
info@pollinator.org
www.pollinator.com

Dear Teacher:

Gardens are wonderful educational resources! P2 is pleased to provide this supplemental curriculum packet as one way to enrich classroom education through a butterfly and pollinator garden. It includes exercises to expand on and enforce what students have learned about butterfly and pollinator gardens, pollinators, other insects, their relatives and biodiversity.

Included are:

- **Lesson plans** for activities relating to insects, ready to integrate into subject areas across the elementary and middle school curriculum, including language arts, math and science
- **Extension ideas** for home
- **Background information** for the teacher
- **California State Content Standards** correlation

The lessons are divided into levels, though *any lesson may be adapted to a different level* should you deem it appropriate:

- pre-K/Kindergarten
- 1st/2nd grade, (adaptable for 3rd-5th grades)
- 3rd-5th grades
- 6th-12th grades, (adaptable for 3rd-5th grades)

We hope this curriculum packet will be useful to you and we appreciate any and all feedback you may have. **Please take 5 minutes to fill out and return the feedback form included in the packet to:**

**Pollinator Partnership
423 Washington Street, 5th Floor
San Francisco, CA 94111**

Thank you for your invaluable support and encouragement for the P2 Pollinator Gardening program! Teachers are our most valuable resources.

Warm Regards,

The Bug People at P2



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POLLINATOR PARTNERSHIP

Pollinator Partnership's Pollinator Gardens and Habitat Program

The *BUZZ* about P2's Pollinator Gardening Program started in 2000 with the establishment of our first school garden at Charles Drew Elementary in Bayview/Hunter's Point. Since then, the Pollinator Partnership has created important pocket habitats and unique outdoor classrooms in various settings across the San Francisco Bay Area. From local schools to senior centers, from hospice to community centers, Pollinator Gardens are an opportunity to enhance the urban habitat of people and pollinators while providing living laboratories for learning and exploring. Opportunities for learning abound as the seasons and inhabitants develop throughout the year.

Working closely with teachers, students, administrators, neighbors and community members, as well as a wide variety of local and national organizations, Pollinator Partnership creates usable garden spaces for people and pollinators to share. Our gardens vary in size and complexity based on the geography and resources of each school. P2 is also an active member of the San Francisco Green School Alliance. Following is a list of gardens created through P2's Gardening Program:

2000

- ♣ Charles Drew E.S., San Francisco

2001

- ♣ Visitation Valley M.S., San Francisco
- ♣ Tenderloin Community School, San Francisco
- ♣ Guadalupe School, San Francisco
- ♣ On Lok Senior Center, San Francisco
- ♣ Laguna Honda Hospice, San Francisco
- ♣ Chinatown Community Children's Center, San Francisco
- ♣ Las Americas Childcare Center, San Francisco
- ♣ Alvarado E.S., San Francisco

2002

- ♣ Sun Shine Garden E.S., South San Francisco
- ♣ Leo J. Ryan C.D.C., South San Francisco
- ♣ Bryant E.S., San Francisco

- ♣ St. Francis Pre School, Novato
- ♣ The Jewish Home, San Francisco
- ♣ St. Anne's Home, San Francisco
- ♣ Nob Hill Health Care Center, San Francisco
- ♣ Walden Hills Boys Group Home, San Francisco

- ♣ Marin Academy, San Rafael

2003

- ♣ 21st Century Academy, San Francisco
- ♣ Randall Museum, San Francisco
- ♣ Oakland Zoo Education Area

2004

- ♣ Eden Housing/Fuller Gardens, San Leandro
- ♣ San Mateo Medical Center

Coming Soon

- ♣ Haven C.D.C., Menlo Park
-

Funding for Butterfly and Pollinator Gardening comes from a variety of sources including P2 Membership and charitable donations from individuals, companies and foundations.

Pollinator Partnership
423 Washington Street, 5th Fl.
San Francisco, CA 94111
(415) 362-1137
fax (415) 362-3070
info@pollinator.org
www.pollinator.org





TEACHING GUIDE INTRODUCTION

The overriding theme of the curriculum is to instill in the young generation curiosity, amazement and caring for pollinators of all kinds. These creatures are essential components to every ecosystem on earth and play a vital role in ensuring a plentiful food source for humanity. The Pollinator Partnership encourages the young generation to become stewards for pollinators and all biodiversity protection.

The material in this packet offers exercises to introduce and expand on topics related to butterfly and pollinator gardening, including:

- **How to maintain and get the most out of a pollinator garden through ecologically friendly practices**
- **Physical and social attributes of butterflies and other pollinators**
- **The importance of these creatures in the production of food and other plant products common in everyday use**
- **The vital role organisms such as insects play in ecosystems**



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 Gardens Supplemental Curriculum
OVERVIEW OF ACTIVITIES**



Subject	Lessons and Activities	Activity Sheets Included	Age Level	Lesson Objective
Science	<input type="checkbox"/> The Food Web	Yes (game cards)	1 st /2 nd and higher	Students will begin to understand the nature of biodiversity by building a food web. They will observe how all living things are connected within an ecosystem.
Science	<input type="checkbox"/> Pollinator Habitats	Yes, Also: <i>The Habitat Song</i>	1 st /2 nd and higher	Students will understand that habitats satisfy 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.
Science	<input type="checkbox"/> Pollinator Needs: Who Needs Pollinators?		3 rd -5 th , 6 th -8 th	Students will understand that habitats satisfy 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.
Science	<input type="checkbox"/> What Can We Do about Garden Pests?		1 st /2 nd , 3 rd -5 th	Students will learn the basics behind non-toxic pest control. They will be able to name and recognize a few beneficial insects, as well as some common garden pests. And students will explore how to make the garden more appealing to beneficial insects while discouraging pests.
Science	<input type="checkbox"/> My Munching Mouthparts		1 st /2 nd , 3 rd -5 th	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.
Science	<input type="checkbox"/> Garden Scavenger Hunt	Yes	1 st /2 nd , 3 rd -5 th	Students will practice identification and investigation skills while searching for specific garden features such as plant parts and animals.
Language Arts	<input type="checkbox"/> My Garden Bug Book	Yes	Pre-K/K, 1 st /2 nd	Use insects to practice listening, reading and writing skills.
Language Arts	<input type="checkbox"/> Pretend Pollinators	Yes	1 st /2 nd , 3 rd -5 th and higher	Use knowledge of local pollinators including their role in the garden, habitat and eating habits, to create an imaginary pollinator. Write a story about the creature.
Language Arts	<input type="checkbox"/> Dear Pollinator (or Dear Neighbor)		3 rd -5 th , 6 th -8 th and higher	Students will practice letter composition and point of view writing. Using knowledge of pollinators and their needs, write a letter to a pollinator expressing the benefits of the garden and inviting it to visit. Or write a letter to a garden neighbor, from a pollinator's point of view, expressing the need to take care of the garden.
Language Arts	<input type="checkbox"/> Pollinator Alphabet Book		1 st /2 nd , 3 rd -5 th	As a class, students will produce a pollinator alphabet book.
Language Arts	<input type="checkbox"/> Bug Puzzles	Yes (2 levels of difficulty)	1 st /2 nd , 3 rd -5 th	Review insect vocabulary and facts through various language arts games and puzzles.

**Pollinator Gardens Supplemental Curriculum
OVERVIEW OF ACTIVITIES**



Math	<input type="checkbox"/> Garden Math (Pre-K/K)	Yes	Pre-K/K	Use concrete images of insects, insect relatives and flowers in math problems.
Math	<input type="checkbox"/> Garden Math (1st/2nd)	Yes	1 st /2 nd	Use concrete images of insects, insect relatives and flowers in math problems.
Math	<input type="checkbox"/> Buggy Garden Math Sheets	Yes (2 sheets for each age group)	Pre-K, 1 st /2 nd	Use insects, spiders and other familiar animals in concrete math problems, while reviewing numbers of body parts. Students will be able to distinguish between insects and insect relatives.
Math	<input type="checkbox"/> Buggy Word Problems	Yes	1 st /2 nd , 3 rd -5 th	To practice attentive listening skills and apply them to math words problems. Use insects, spiders and other familiar animals to create and solve word problems.

Pre-K/K	1 st /2 nd	3 rd -5 th	6 th -8 th and higher
Language Arts <ul style="list-style-type: none"> • My Garden Bug Book Math <ul style="list-style-type: none"> • Garden Math • Buggy Garden Math Sheets 	Science <ul style="list-style-type: none"> • The Food Web • Pollinator Habitats • What can we do about Garden Pests? • My Munching Mouthparts • Garden Scavenger Hunt • Seed Study Language Arts <ul style="list-style-type: none"> • My Garden Bug Book • Pretend Pollinators • Bug Puzzles • Pollinator Alphabet Book Math <ul style="list-style-type: none"> • Garden Math • Buggy Garden Math Sheets • Buggy Word Problems 	Science <ul style="list-style-type: none"> • The Food Web • Pollinator Habitats • Pollinator Needs • What can we do about Garden Pests? • My Munching Mouthparts • Garden Scavenger Hunt • Seed Study Language Arts <ul style="list-style-type: none"> • Pretend Pollinators • Bug Puzzles • Dear Pollinator • Pollinator Alphabet Book Math <ul style="list-style-type: none"> • Buggy Word Problems 	Science <ul style="list-style-type: none"> • The Food Web • Pollinator Habitats • Pollinator Needs Language Arts <ul style="list-style-type: none"> • Pretend Pollinators • Dear Pollinator

Pollinator Gardening Supplemental Curriculum: Science

Level: 1st/2nd and higher grades



THE FOOD WEB

Objective: *Students will begin to understand the nature of biodiversity by building a food web. They will observe how all living things are connected within an ecosystem.*

Materials: large open area in which to build the web, animal and plant cards (1 per student, pictures and facts included, glue these to index cards), 1-2 large balls of yarn or other string

Vocabulary to review: ecosystem, biodiversity, food web, predator, prey, habitat, decomposers (recyclers), nutrients, population, endangered, extinct

Procedure:

-- Introduce the idea of **ecosystem** and **biodiversity**. All living things are connected within an ecosystem.

-- Ask for examples of **predator/prey** relationships in an ecosystem (ie. bird/spider, spider/ladybug, ladybug/aphid, aphid/flower, flower/dirt, dirt/dead bird).

-- Talk about how some things in the ecosystem eat the **waste** products of other things (worms, millipedes eat rotting vegetable matter, scavengers eat dead animals), which in turn ends up back in the soil in the form of nutrients for plants. *There is no waste in nature!*

-- **Build a class food web.**

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.*



1. Each student will get an animal or plant card. The card will say what this organism eats/needs to survive and what eats/preys upon the organism.
2. Review the rules of the game: do not pull on the string, do not let go of the string unless the teacher tells you to. Hold onto your own card, and hold it so that everyone can see what organism you are.
3. Choose one student to start. She will read her card, saying what organism she is, and what she eats. Holding onto the end of the string, she will pass the remaining string to one of her "prey" (an organism she eats).
4. The next student (the "prey") will do the same: read their card, hold the string and pass the remaining string onto a "prey". There are now 3 students connected by the string.

Note: With younger students, the teacher may want to pass the string for the students.

CA Science Content Standards: Life Sciences 2 [plants and animals meet their needs in different ways, and have predictable life cycles], Experimentation 4 [make predictions based on observed patterns].

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THE FOOD WEB (continued)

5. Continue to pass the string until all students are connected by the “food web,” many will be connected more than once. Discuss what the students see as they look at the web. **(With younger students, this can be the end of the activity.)**

Extension 1:

- Demonstrate how all living things are connected in the ecosystem, and what happens if an organism is endangered or goes extinct. Read an ecosystem scenario (included, or make up your own), about one organism that dies out (ex. grasshopper).
- The “grasshopper” student will let go of the string at their point. Animals that eat the grasshopper will lose a food source. If this is their only food, they will die. They drop the string. Continue with the chain of reactions.
- What does the web look like without some of these organisms? Discuss how organisms are connected within the ecosystem.

Extension 2: Have students write about or draw a food web.



CA Science Content Standards: Life Sciences 2 [plants and animals meet their needs in different ways, and have predictable life cycles], Experimentation 4 [make predictions based on observed patterns].

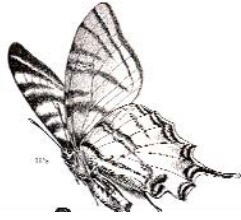
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Butterfly

Eats:

- Poppy nectar
- Fruit (apples, bananas)

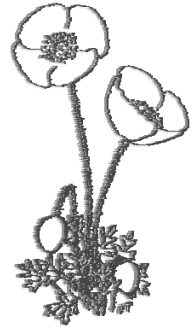


California

Poppy (nectar)

Needs:

- Nutrients from the soil (Compost)
- Water



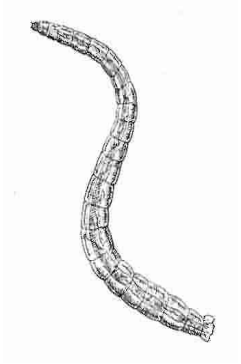
Worm

Eats:

- Fruit (apples, bananas)
- Grass

Produces:

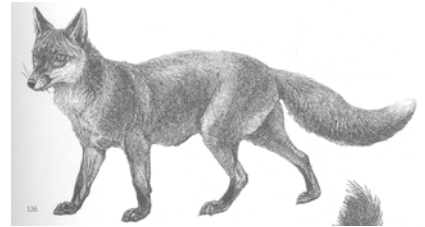
- Compost



Fox

Eats:

- Hawk
- Mouse
- Tarantula
- Butterfly
- Berry



Cockroaches

Eat:

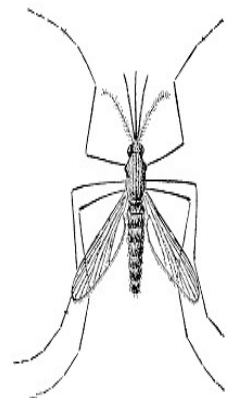
- Fruit
- Compost



Mosquito

Eats blood from:

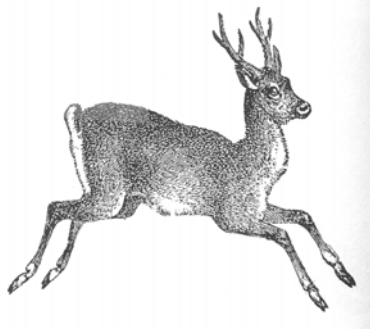
- Deer
- Raccoon
- Rabbit
- Mouse



Deer

Eats:

- Poppy
- Wild Rose
- Grass



Wild Rose

Needs:

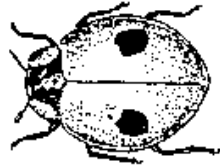
- Nutrients from the soil (Compost)
- Water



Ladybug

Eats:

- Aphid



Praying Mantis

Eats:

- Aphid
- Grasshopper



California Native Grass

Needs:

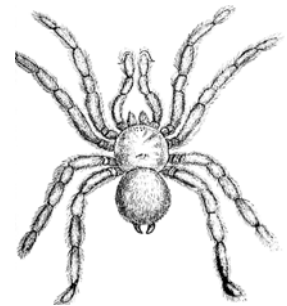
- Nutrients from the soil (Compost)
- Water



Tarantula

Eats:

- Mouse
- Cockroach
- Worm
- Butterfly
- Grasshopper



Bee

Eats:

- Nectar from:

poppy, wild rose, berry

Produces:

- Honey



Aphid

Eats:

- Wild Rose leaves
- Poppy
- Berry leaves



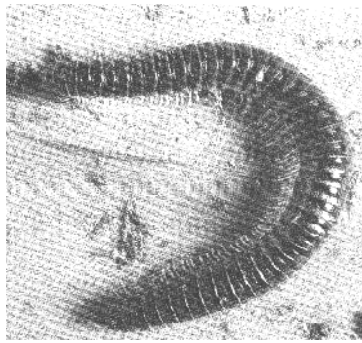
Millipede

Eats:

- Grass
- Compost
- Fruit (apples, bananas)

Produces:

- Compost



Raccoon

Eats:

- Praying Mantis
- Millipede
- Butterfly
- Berry
- Cockroach
- Worm
- Fruit



Grasshopper

Eats:

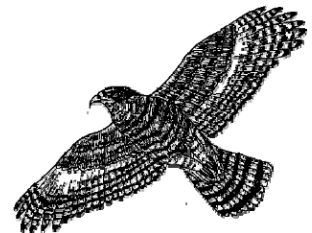
- Fruit
- Grass



Hawk

Eats:

- Mouse
- Butterfly
- Spider



Bear

Eats:

- Fox
- Hawk
- Mouse
- Berry
- Honey



California Blackberry

Needs:

- Nutrients from the soil (Compost)



Mouse

Eats:

- Berry
- Fruit
- Grass



Compost (dirt)

When these things die, they decompose and "feed" the dirt:

- All animals:* bear, raccoon, mouse, hawk, deer, millipede
- All insects:* bee, praying mantis, butterfly, aphid
- All plants:* berry, grass, poppy, rose



Compost (dirt)

When these things die, they decompose and "feed" the dirt:

- All animals:* bear, raccoon, mouse, hawk, deer, millipede
- All insects:* bee, praying mantis, butterfly, aphid
- All plants:* berry, grass, poppy, rose



Pollinator Gardening Supplemental Curriculum: Science

Level: 1st/2nd and higher



POLLINATOR HABITATS

Objective: *Students will understand that habitats satisfy 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 to the garden

Materials: (optional) pictures of various things found in a people habitat (ex: clothes, water, roller skates, food, sun, radio, car), large dry erase board/ poster paper with markers, map-making materials (crayons, pencil, paper, ruler)

Vocabulary and ideas to review: Habitat, pollinator, flower, nectar, pollen, flower parts, shelter, ecosystem

Procedure:

1. **Discuss people and animal needs.**

-- Have students look at pictures of various objects (or write words on the board—see materials list for ideas).

-- Ask: **Which things do people NEED to live? What can people live without?**

[hint: Direct students to go beyond “I need a video game to live.”].

--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.

-- How about animals? What do they NEED to survive?

Probably some of the same things that people need! **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, like bees, butterflies, hummingbirds, beetles and other bugs.

2. **Explore the garden habitat.** As a class, explore the garden for ways that it meets the needs of pollinators. Ask:

-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?

3. Students will use the **Garden Habitat activity sheet** to look for things that make the garden a good habitat for a specific pollinator.

--Students should choose a pollinator that they have seen in the garden. Use the Garden Habitat sheet to draw or write how the garden meets the needs of THEIR pollinator.

CA Science Content Standards: (1st, 2nd) Life Sciences 2 [Predictable life cycles: plants and animals meet their needs in different ways, inhabit different environments, need water food and light], Experimentation 4 [make predictions based on observed patterns, record observations, describe relative positions of objects, follow oral instructions].
(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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Pollinator Gardening Supplemental Curriculum: Science
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POLLINATOR HABITATS (continued)

Language Arts Extension:

Create an ad directed toward your pollinator, telling it why the garden is a good habitat for it.

Geography Extension:

Have students draw a map of the garden, showing garden features that are designed to provide Shelter, food, water and warmth.

Music Extension:

Listen to or sing "Habitat Song" by Bill Oliver (words included with activity sheets)



CA Science Content Standards: (1st, 2nd) Life Sciences 2 [Predictable life cycles: plants and animals meet their needs in different ways, inhabit different environments, need water food and light], Experimentation 4 [make predictions based on observed patterns, record observations, describe relative positions of objects, follow oral instructions].
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Habitat (Have to Have a Habitat) [printed with permission]
by Bill Oliver, from the album *Have to Have a Habitat*

(loosely follows the tune and beat of the 1960's "Lollipop.")

(chorus) **Habitat, habitat, have to have a habitat
Habitat, habitat, have to have a habitat
Habitat, habitat, have to have a habitat.
You have to have a habitat to carry on!**

(chorus)
1 The ocean is a habitat,
a very special habitat
it's where the deepest waters at
it's where the biggest mammal's at
it's where our future food is at
it keeps the atmosphere intact.
The ocean is a habitat that we depend
on.

(chorus)
2 The forest is a habitat,
a very special habitat
it's where the tallest trees are at
it's where a bear can scratch her back
(ch-ch-ch-ch-ch-ch)
it keeps the ground from rolling back
renews the oxygen in fact.
The forest is a habitat that we depend
on.

(chorus)

3 The river is a habitat,
a very special habitat
it's where the freshest water's at
for people, fish and muskrat
but when the people dump their trash
the river takes the biggest rap.
The river is a habitat that we depend
on.

(chorus)

4 People are different than foxes and
rabbits
Effect the whole world with their bad
habits
Better to love it while we still have it
Or rat ta-tat-tat, our habitat's gone

(chorus)

Bill Oliver, "Mr. Habitat," writes and performs environmental songs for children and adults across the United States. He is available for school performances. His music (sample MP3s and CDs) and lyrics are available at www.MrHabitat.net

Other contact information:

MrHabitat@aol.com

(512) 477-7227

(800) 492-1520

Name: _____

What is your pollinator? _____

How does the garden give **SHELTER**, **FOOD**, **WATER** and **WARMTH** to your pollinator? Draw or write about what you find.

SHELTER

FOOD

WATER

WARMTH

Is this garden a good **HABITAT** for your pollinator? _____

Pollinator Gardening Supplemental Curriculum: Science

Level: 3rd-5th, 6th-8th and higher



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 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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Pollinator Gardening Supplemental Curriculum: Science

Level: 3rd-5th and higher grades



WHAT CAN WE DO ABOUT GARDEN PESTS?

Objective: *Students will learn the basics behind non-toxic pest control. They will be able to name and recognize a few beneficial insects, as well as some common garden pests. And students will explore how to make the garden more appealing to beneficial insects while discouraging pests.*

Materials: For non-toxic garden spray: (Chili Spray) hot chili and water, (Garlic Spray) garlic, water and molasses

Vocabulary to review: Pest, beneficial, toxic, non-toxic, organic, pest management, ecosystem

Procedure:

1. Introduce the idea of pests.

What is a pest? *Something that is not wanted in the garden. Pests can eat/damage plants in the garden.*

Ask for examples of pests. (answers may include: insects-aphids, caterpillars, ants, wasps, potato bug; mold on leaves; other animals such as snails, slugs, mice or rats; fungus)

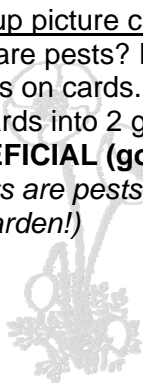
Hold up picture cards of insects. Which ones are pests? Read descriptions of insects on cards. Ask class to categorize the cards into 2 groups: **PESTS** and **BENEFICIAL (good) INSECTS**. (*Not all insects are pests, some are very helpful in the garden!*)

PEST INSECTS	BENEFICIAL (good) INSECTS
Aphid, wasp, cockroach, potato bug, ant, scale insect, some caterpillars (though these can turn into butterflies, which are good for the garden)	Ladybug, praying mantis, lace wing, bee, butterfly, beetle

2. Which pests are in this garden? (You can go on a pest hunt, to look for pests in the garden.)

Ask students how you might get rid of pests? *Poison, pull out plant that is infected, find something to kill the pest or make it go away, encourage good insects that eat pests, keep garden free of trash.*

3. Which good insects are in the garden? Talk about ways to encourage beneficial insects: grow plants that provide food or habitat for beneficial insects.



CA Science Content Standards: (1st, 2nd) Life Sciences 2 [Predictable life cycles: plants and animals meet their needs in different ways, inhabit different environments, need water food and light], Experimentation 4 [follow oral instructions, use magnifiers to observe and describe]. (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, different structures, organisms can change their environment which has beneficial or detrimental 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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WHAT CAN WE DO ABOUT GARDEN PESTS? (continued)

4. Introduce the concepts of toxic and non-toxic.

Toxic sprays: kills a pest by poisoning it, but it can also kill good things in the garden, like beneficial insects and some plants.

Non-toxic spray: won't hurt beneficial insects or plants because it uses natural materials to chase the pests away (doesn't usually kill them). Non-toxic sprays are often made with a mild and biodegradable detergent or dish soap, basil, garlic, chili, or other smelly or spicy items.

5. Practice good pest control techniques.

-- Make non-toxic spray for use in the garden.

Chili Spray

Blend ½ cup of hot chili with 2 ½ cups of water. Strain. Spray the chili water on leaves of infected plants.

Garlic Spray

Blend 3 garlic cloves in blender with 2 cups water. Strain, keeping the liquid. Add more water to make 1 quart of concentrate. Add 1 part of the concentrate to 5 parts water. Spray on the leaves of infected plants.

Other things to try:

--Mix ½ tablespoon of mild detergent or dish soap into 1 gal of water before watering plants, or spray this on leaves (to keep aphids away).

-- Go around the garden and practice pest control by hand.

If you see a pest, remove it physically from the garden.

Pick off dead flower heads or leaves.

Remove leaves with scale or aphids.

Encourage good insects to come to the garden to do pest control for you!

Extension 1: Pest survey. Go around garden to count the number of pests you can find. Classify by type of pest, and bring information back to the group.

CA Science Content Standards: (1st, 2nd) Life Sciences 2 [Predictable life cycles: plants and animals meet their needs in different ways, inhabit different environments, need water food and light], Experimentation 4 [follow oral instructions, use magnifiers to observe and describe]. (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, different structures, organisms can change their environment which has beneficial or detrimental 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: 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 1/2 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: Science

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



Garden Scavenger Hunt

Objective: *Students will practice investigation and identification skills while searching for specific garden features, such as plant parts and animals.*

Materials: One copy per child of the garden Scavenger Hunt handout.

Vocabulary to review: Plant parts: flower, stem, leaf, root, trunk, branch. Flower parts: petal, stamen, pollen. Other concepts: budding, blooming, dying.

Procedure:

Review **vocabulary and concepts** with the class.

Introduce **rules** for the scavenger hunt: **set boundaries, a timeline, an audio or visual**

signal to bring students back to a central area, and standards on how to behave in the garden*.

*Students should **observe** plants and plant parts with eyes and ears, they may touch, but **do not pick or collect things in the garden!**

Students may work on scavenger hunt in small groups or individually.

To conclude, bring the class back together and discuss what students found.

CA Science Content Standards: (1st, 2nd) Life Sciences 2d,f [variation exists within populations, fruit and flowers are associated with reproduction], Investigation 4a,b (1st) [compare objects, draw representative pictures, record observations].
(3rd-5th) Life Sciences 2a,d (3rd) and 2a,b & 3a-c (4th) [plants and animals have different structures, ecosystems have living and non-living parts, animals and plants are dependent upon each other, there are many beneficial microorganisms]. Investigation 5e [collect data, make predictions].

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Walk in the garden and find these 8 *things*. Draw a picture of each *thing*. Write answers to the questions. Happy hunting!

Name _____

DRAW:

FIND:

1. A flower that is blooming. What color is it?

2. A pollinator. What kind is it? Why is it here?

3. Something that smells good. What does it smell like? Why?

4. Something a pollinator likes to eat. Do you like to eat it? Why or why not?

A flower that is blooming.

A Pollinator

This smells good.

Pollinator likes to eat this.



FIND:

5. 3 different shaped leaves. Why are the leaves different?

6. Something that is LIVING. How can you tell it is alive?

7. Something that is NOT LIVING. How can you tell it is not a living thing?

8. Something that SHOULD NOT be in the garden. Why is it here?

DRAW:

3 different shaped leaves

This is LIVING.

This is NOT LIVING.

Should not be in the garden.

Pollinator Gardening Supplemental Curriculum: Language Arts
Level: Pre-K/K, 1st/2nd



My Garden Bug Book

Objective: *Use insects to practice listening, reading and writing skills.*

Materials: “My Garden Bug Book” (a copy for each student), crayons

Vocabulary to review: various insect names

Procedure:

The teacher should have ready a copy of My Garden Bug Book for each student.

Students can color the pictures and trace the names of the garden creatures.
Read the book together as a class.
Practice the book at home.

The Garden Bug Book emphasizes the eating habits of various insects and other animals found in the garden.



CA Language Arts Content Standards: Reading 1.0 (high frequency words, match oral and printed words, follow instructions); Listening and Speaking 1.0 (listen and respond, listen attentively, ask questions, use descriptive words)

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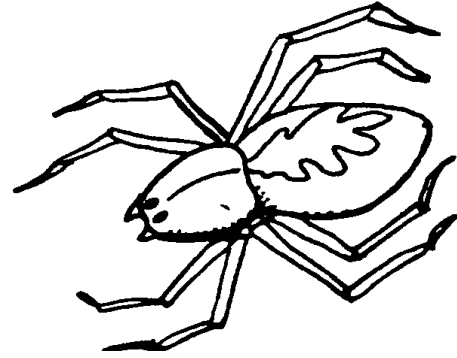
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My Garden Bug Book



By _____

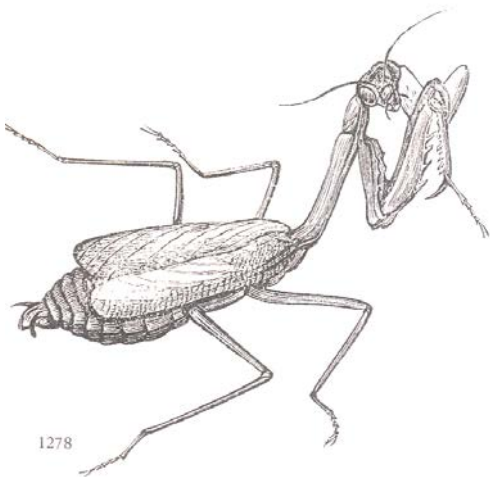
Spider



I eat aphids
and flies.

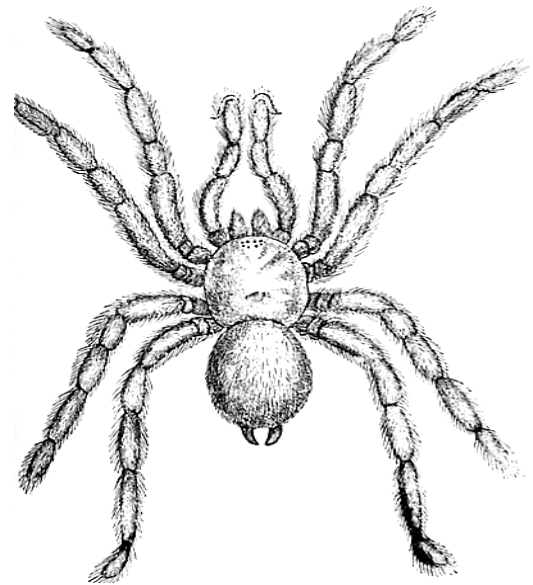
Cut

Praying Mantis



I eat aphids.

Tarantula



I eat crickets. I
am an arachnid.

Wasp



**I eat fruit. Be
careful, I can
sting!**

Ants



**We eat
anything!**

Cut

Aphid



I eat leaves.

Butterfly



**I drink nectar.
I help flowers by
leaving pollen
behind.**

Bees



**We collect pollen.
We make honey.**

Which bugs are
good for the
garden?

Cut

Ladybug



**I eat aphids.
I help flowers.**

Which bugs are
bad for the
garden?

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 creature.*

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: _____

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 Gardening Supplemental Curriculum: Language Arts

Level: 3rd-5th, 6th-8th and higher



Dear Pollinator (Dear neighbor)

Objective: *Students will practice letter composition and point of view writing.*

Materials: none

Vocabulary to review: any pollinator vocabulary previously learned

Procedure:

Using knowledge of pollinators and their needs, each student will:

- 1) **Write a letter to a pollinator** expressing the benefits of the garden and inviting it to visit. For example: "Dear Mr. Bee, Please come to our garden because . . . Love, _____ "

Ideas that student can include:

- There is a lot of nectar in the flowers for you to eat.
- You can find water and shelter in the garden.
- There are a lot of children who would like to meet you.
- There are no pesticides in our garden.

- 2) Or **write a letter to a garden neighbor**, from a pollinator's point of view, expressing the need to take care of the garden.

For example: "Dear neighbor, I am a butterfly that lives in the garden at _____ school. I am very beautiful, . . . You can help me by _____. . . Love, Ms. Butterfly"

Ideas that students can use include:

- Don't use pesticides, because it can hurt me.
- Plant more flowers so I will visit your yard to eat.
- You can look at me and enjoy me, but please don't catch me.



CA Language Arts Content Standards: Writing 1.0 (write clearly and coherently to develop a central idea); [3rd] 2.3 (letter writing); [5th] 2.4 (write persuasive letters)

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Pollinator Gardening Supplemental Curriculum: Language Arts

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



Pollinator Alphabet Book

Objective: As a class, students will produce a pollinator alphabet book that can be shared with each other or younger children.

Materials: One sheet of paper for each letter of the alphabet, given to individual or groups of students. List of pollinators and pollinated plants.

Vocabulary to review: See list below.

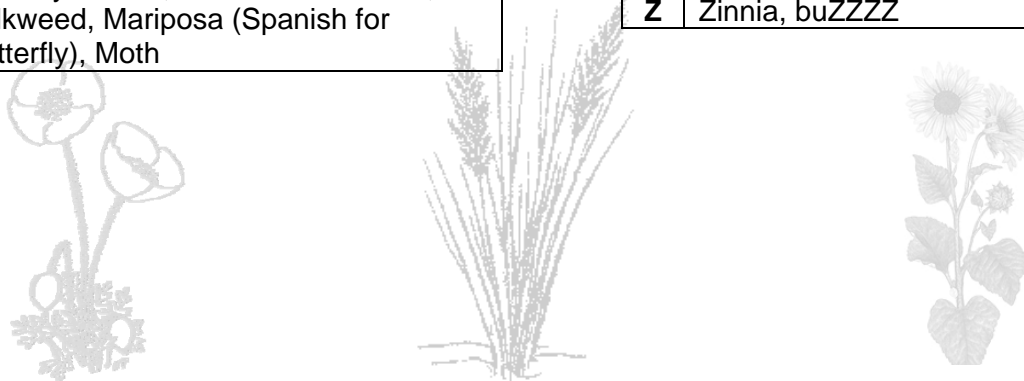
Procedure:

Each student or small group of students will create one or more pages for the class Pollinator Alphabet Book. There should be one page for each letter of the alphabet. Collect pages. Assemble into a book. Share with a younger class, or read as a class.

Possible Pollinator words to use in Alphabet Book (includes pollinating species, plants and flowers, foods that are dependent on pollinators, and pollinator garden concepts.)

A	Apple blossom, almonds, Antennae
B	Bee, Bat, Beetle, Butterfly, Buckeye (butterfly or tree)
C	Colorful, Cherries, Caterpillar, Chrysalis
D	Darkling Beetle, Dove, Dragonfly
E	Egg, Entomologist
F	Flower, Farasha (Arabic for butterfly), Fly
G	Garden
H	Hummingbird, Honeysuckle, Hudel (Chinese for butterfly), Honey
I	Insect
J	Juice-apple/orange
K	Kiwi
L	Lavender, Larvae, Lupine
M	Monkey Flower, Mexican Sunflower, Milkweed, Mariposa (Spanish for butterfly), Moth

N	Nectar, Native Plants
O	Oranges
P	Pollen, Pumpkin, Petals, Painted lady, Pesticide
Q	Quiet
R	Resting Place, Red (attracts hummingbirds)
S	Sunshine, Spider, Sage, Squash, Strawberry
T	Tiger Swallowtail butterfly, Thistle
U	Under leaves, Under story (in the rainforest)
V	Viceroy butterfly
W	Water, Weed, Wasp, Wind, Wing
X	eXtinct, eXcellent
Y	Yarrow, Yellow (attracts bees)
Z	Zinnia, buZZZZ



CA Language Arts Content Standards: Reading 1.0 (practice reading strategies and word recognition, vocabulary and concept development)

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Pollinator Gardening Supplemental Curriculum: Language Arts

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



Bug Puzzles

**Puzzles: Crossword Puzzle
Buggy Word Search
Cryptogram**

Use these Bug Puzzles to reinforce language arts skills (reading, spelling, problem solving) and terminology and ideas associated with insects and insect relatives. To learn about insects, students need to become familiar with the terms used to describe their lifestyle and habits.



CA Language Arts Content Standards: Reading 1.0 (word recognition, match oral and printed words)

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Name: _____

Bug Puzzles



Search for these bug words in the puzzle below:

BUGS **DIRT** **LEGS** **BEETLE** **ANT**
APPLE **FLY** **BEE** **HEAD** **EYES**
ABDOMEN **THORAX** **BUTTERFLY**

B	U	G	S	T	S	U	E	P	Y	C
E	P	B	T	H	F	A	Y	R	A	O
E	T	E	I	O	D	B	E	O	P	V
B	A	E	P	R	I	D	S	T	P	E
S	N	T	C	A	R	O	N	S	L	D
O	P	L	E	X	F	M	R	G	E	I
F	H	E	A	D	L	E	G	S	P	R
S	D	N	N	I	Y	N	M	X	E	T
P	B	U	T	T	E	R	F	L	Y	O

Unscramble the letters to make **BUGGY** words!

TNA = _____

TEBEEL = _____

GBSU = _____

DEPRIS = _____

WOLFER = _____

EBE = _____

YFL = _____

GWIN = _____

Name: _____

Bug Puzzles (Answers for Teachers)

BUGS
APPLE
ABDOMEN

DIRT
FLY

LEGS
BEE
THORAX

BEETLE
HEAD

ANT
EYES
BUTTERFLY

B	U	G	S	T	S	U	E	P	Y	C
E	P	B	T	H	F	A	Y	R	A	O
E	T	E	I	O	D	B	E	O	P	V
B	A	E	P	R	I	D	S	T	P	E
S	N	T	C	A	R	O	N	S	L	D
O	P	L	E	X	F	M	R	G	E	I
F	H	E	A	D	L	E	G	S	P	R
S	D	N	N	I	Y	N	M	X	E	T
P	B	U	T	T	E	R	F	L	Y	O

TNA = ant

TEBEEL = beetle

GBSU = bugs

DEPRIS = spider

WOLFER = flower

EBE = bee

YFL = fly

GWIN = wing

Name: _____



Garden Puzzles

Search for these garden words in the puzzle below:

APHID
POLLEN
WATER

FLOWER
LEAF
PETAL

CATERPILLAR
BEE
FRUIT

SUN
NECTAR
SPIDER

N	P	W	I	A	T	N	S	O	L	D	C
E	O	A	M	E	A	K	T	F	E	S	T
C	A	T	E	R	P	I	L	L	A	R	P
T	E	E	R	N	H	D	B	O	F	L	K
A	W	R	J	A	I	O	T	W	I	S	N
R	B	O	P	P	D	A	D	E	S	P	Y
P	O	L	L	E	N	H	F	R	U	I	T
R	M	A	S	T	K	F	A	M	S	D	A
E	S	U	N	A	P	C	L	B	E	E	T
H	Y	M	E	L	O	T	S	F	L	R	W

Unscramble the letters to make GARDEN words!

RTID = _____

LEPLON = _____

STANPL = _____

DEPRIS = _____

WOLFER = _____

SPAW = _____

TAWER = _____

WROG = _____

Name: _____

Garden Puzzles (Answers for Teachers)

**APHID
POLLEN
WATER**

**FLOWER
LEAF
PETAL**

**CATERPILLAR
BEE
FRUIT**

**SUN
NECTAR
SPIDER**

N	P	W	I	A	T	N	S	O	L	D	C
E	O	A	M	E	A	K	T	F	E	S	T
C	A	T	E	R	P	I	L	L	A	R	P
T	E	E	R	N	H	D	B	O	F	L	K
A	W	R	J	A	I	O	T	W	I	S	N
R	B	O	P	P	D	A	D	E	S	P	Y
P	O	L	L	E	N	H	F	R	U	I	T
R	M	A	S	T	K	F	A	M	S	D	A
E	S	U	N	A	P	C	L	B	E	E	T
H	Y	M	E	L	O	T	S	F	L	R	W

RTID = dirt

LEPLON = pollen

STANPL = plants

DEPRIS = spider

WOLFER = flower

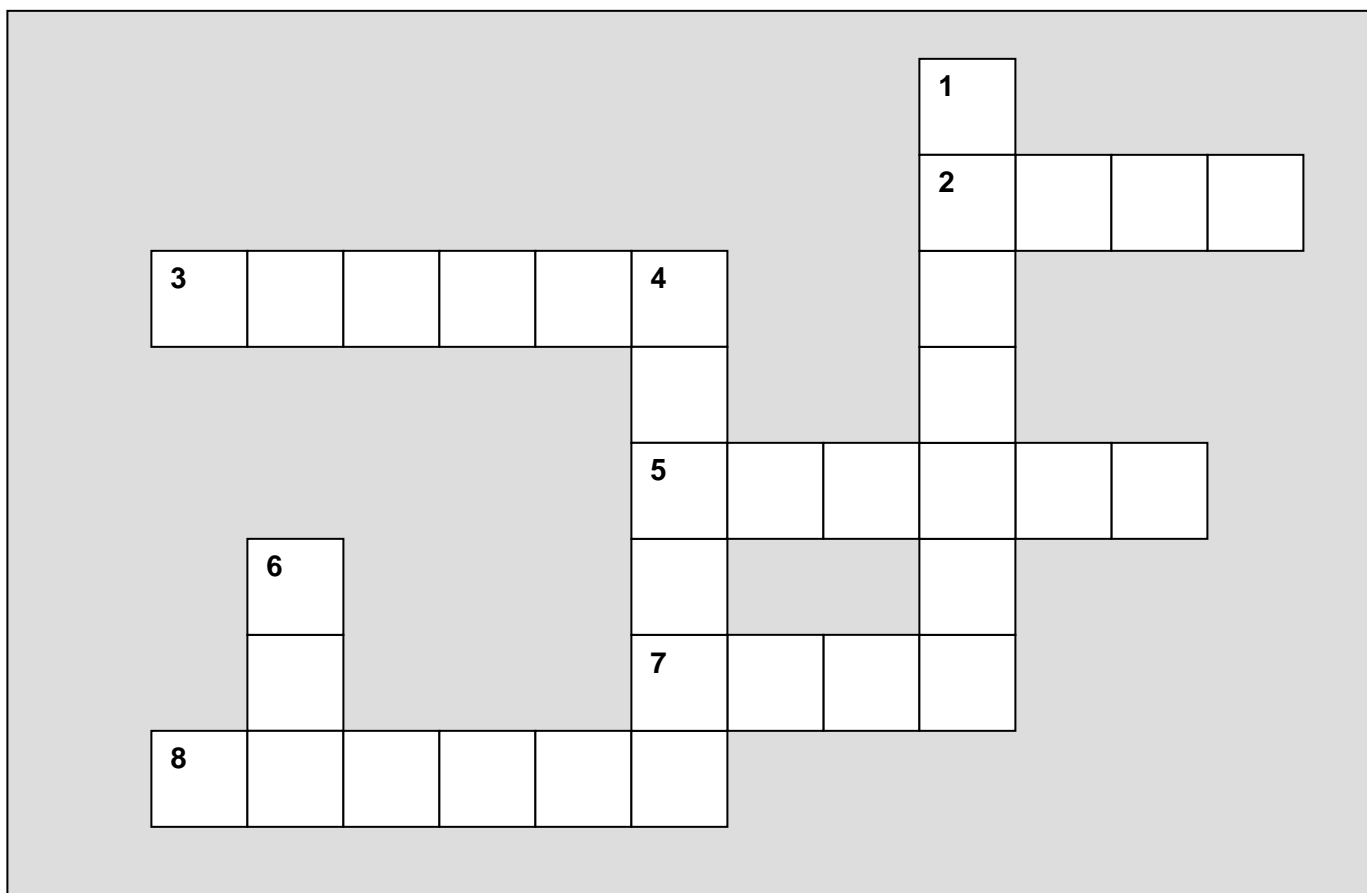
SPAW = wasp

TAWER = water

WROG = grow

Name: _____

BUG CROSSWORD PUZZLE



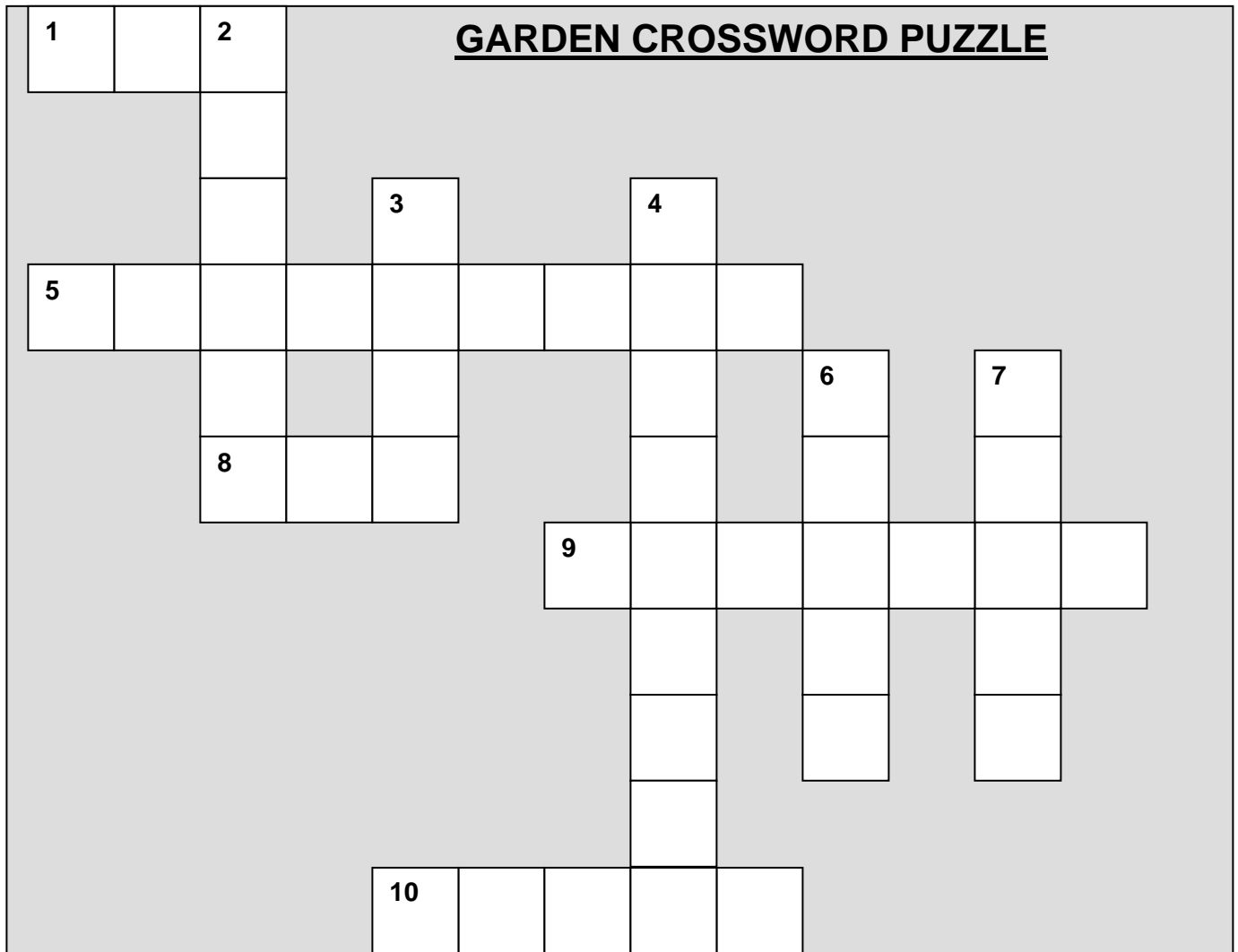
Clues

1. This part of a plant has nectar in it.
2. Insects have 6 _____.
3. Be careful! A bee or wasp _____ when it is angry!
4. This animal has 8 legs.
5. This animal has 3 body parts.
6. A busy garden insect.
7. Insects have compound _____.
8. Butterflies and bees like to eat this. Yum!

Answers

BEE	NECTAR	FLOWERS	SPIDER
EYES	LEGS	INSECT	STINGS

Name: _____



Clues

- 1. Plants need water and _____ to grow.
- 2. Many pollinators like to drink this from flowers.
- 3. A flower must be pollinated for a _____ to grow.
- 4. Pollinators are needed to _____ the garden.
- 5. This pollinator loves to flutter around flowers!
- 6. Nectar tastes _____ ! Yum!
- 7. This is the colorful part of a flower.
- 8. Hummingbirds love this color flower.
- 9. Many pollinators are _____.
- 10. Bees use pollen to make _____.

Answers

HONEY	SUN	NECTAR	SEED	BUTTERFLY
POLLINATE	SWEET	RED	INSECTS	PETAL

Pollinator Gardening Supplemental Curriculum: Math

Level: Pre-K/K



Garden Math (Pre-K/K)

Objective: Use concrete images of insects, insect relatives and flowers in math problems.

Materials: Copy of big and small flower templates for each student, crayons, access to the garden.

Vocabulary to review: Insect, spider, leg, antennae, exoskeleton, molting, compound eyes

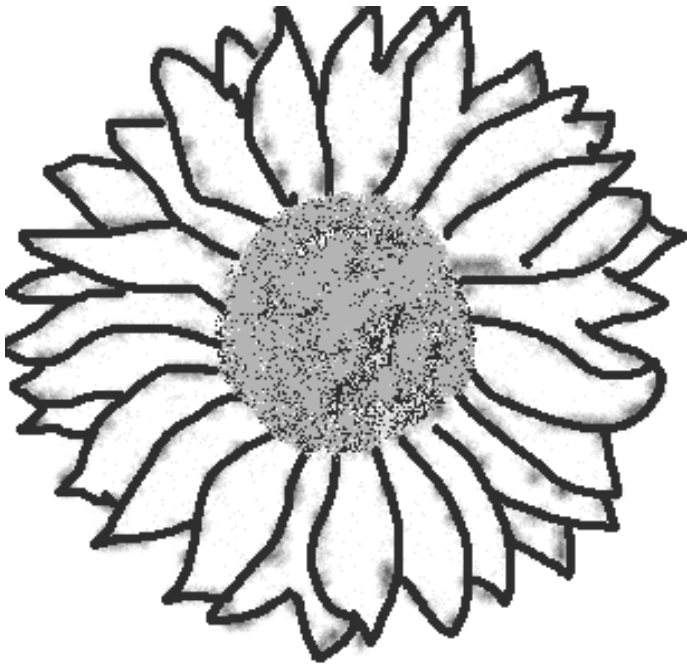
Procedure:

Give students two blank paper flowers to record their findings (see templates below). Students will walk around the garden and

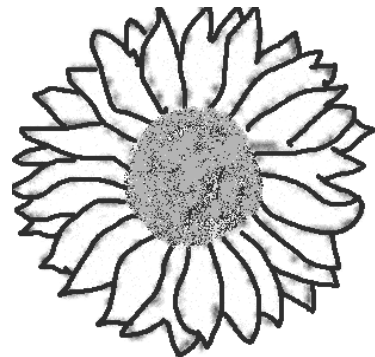
look for real flowers (look, don't pick). They should find one BIG (bigger than their little finger) flower and one SMALL (smaller than their little finger) flower. Students should then decide what color it is and color their paper flowers accordingly (color the BIG paper flower like the BIG real flower, and the SMALL paper flower like the SMALL real flower).

Extension: Create a class graph comparing flower colors and sizes, or where the flowers were found in the garden.

BIG



SMALL



CA Mathematics Content Standards: Algebra 1.0-1.1 (identify, sort and classify objects by attribute); Measurement 2.0 (identify common objects in environment and describe features); Statistics 1.0-1.2 (collect information about objects in environment, record results using objects, pictures or graphs, describe patterns by referring to size and color)

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Pollinator Gardening Supplemental Curriculum: Math

Level: 1st/2nd



Garden Math (1st/2nd)

Objective: Use concrete images of insects, insect relatives and flowers in math problems.

Materials: scratch paper and pencil or crayons

Vocabulary to review: petal

Procedure:

Students will compare flowers by their number of petals. Students will walk around the garden and look for flowers (look, don't

pick). Find 3 flowers and count their petals. Record what color each flower is. Bring your information back to the group for comparison.

Extension 1: Graphing and comparison of number of petals. (see example below)

Extension 2: Create a class graph comparing flower colors.

Color one box for each flower with that number of petals.

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more than 6 petals 6 petals 5 petals 4 petals

Which group has the most? _____

CA Mathematics Content Standards: Number Sense 2.1 (addition facts), Algebra 1.0 (create and solve word problems), Statistics 1.2 (represent compare data in a graph)

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Pollinator Gardening Supplemental Curriculum: Math
Level: Pre-K/K, 1st/2nd



Buggy Garden Math Sheets

Objective: Use insects, spiders and other familiar animals in concrete math problems, while reviewing numbers of body parts. Students will be able to distinguish between insects and insect relatives.

Materials: copies of Buggy Garden Math sheets for each student. [There are 2 sheets each for: Pre-K/K and 1st/2nd]

Vocabulary to review: Insect, insect relative (bug), spider, leg, antennae, exoskeleton, molting, compound eyes, flower, petal

Procedure:
Do Buggy Garden Math sheets as a whole class or individually.

Review what students know about insects and insect relatives:

- How are insects different from other animals?
- How are spiders different from insects?
- Insect body parts, names and numbers

One concept that these activity sheets emphasize is the differences between insects and other animals, specifically, the fact that insects have six legs, while other animals have different numbers of legs.



CA Mathematics Content Standards K: Number Sense 1.0 (understand simple addition), Algebra 1.1 (count, compare and sort objects)

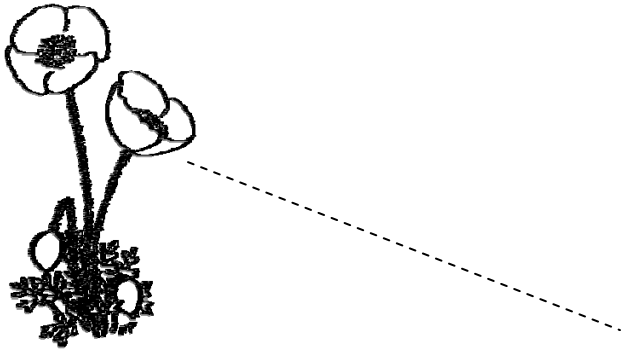
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Pollinator Partnership
Buggy Garden Math Pre-K/K

How many flowers are there?



3



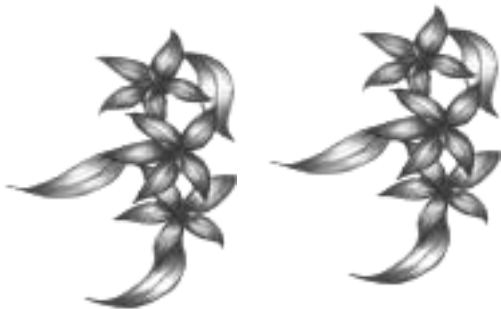
2



1



4



2

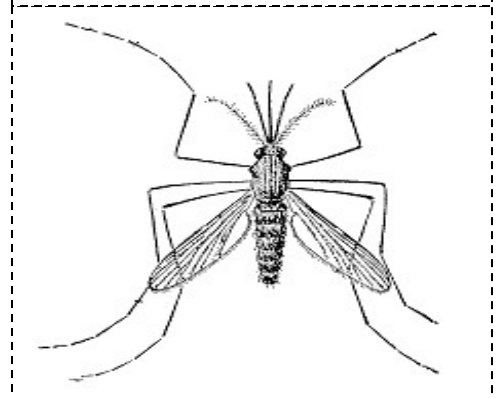
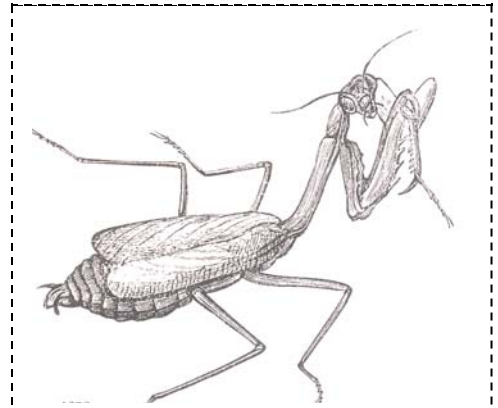
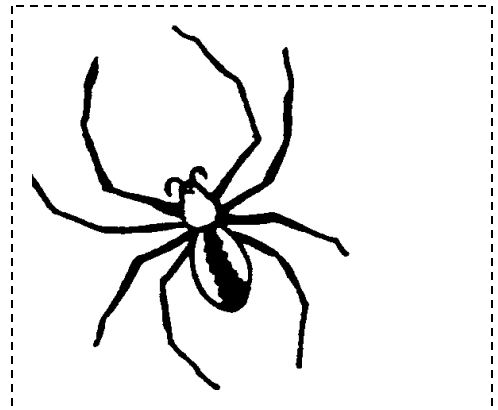


6

Name: _____

Color, cut and paste the garden creatures into the correct box.

I have 6 legs.	I have 6 legs, too.
----------------	---------------------





I have 8 legs.

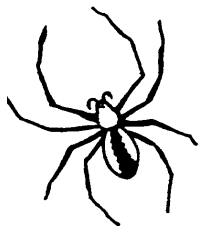
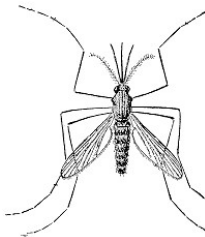
I have 2 legs.



Name: _____


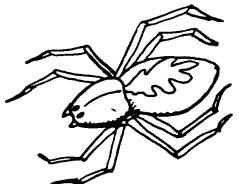
How many **LEGS** in all?
Count the **legs** to find the answers. Write the numbers.



 +  _____ + _____ = _____

 +  _____ + _____ = _____

 +  _____ + _____ = _____

 +  _____ + _____ = _____

 +  _____ + _____ = _____

 +  _____ + _____ = _____

Hint: How many legs do insects have?
How many legs do spiders have?

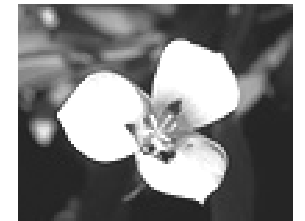
Name: _____

ODD Number of petals

EVEN number of petals

1. Color, cut and paste the flowers below into the correct box.

2. Are there more ODD flowers or EVEN flowers? _____





Buggy Word Problems

Objective: *To practice attentive listening skills and apply them to math words problems. Use insects, spiders and other familiar animals to create and solve word problems.*

Materials: Teacher's Bug Story to read, or copy for students to read. *Buggy Word Problems* sheet for each student (included), overhead projector or white/black board (optional)

Vocabulary to review: see Buggy Math vocabulary

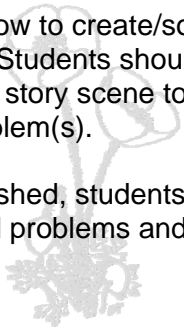
Procedure:

Review with students how to listen for important details in a story. Students will be drawing pictures of what they hear in the story, so they will need to be prepared with active ears, sharpened pencils, and a copy of the Buggy Word Problems sheet. Depending on the level of the students, the teacher may decide to draw on an overhead or white/black board while the story is being read.

Teacher should read the Bug Story to the class, asking that students draw/write down important information as they hear it. They should be recreating the story on paper as they hear it.

Review how to create/solve a math word problem. Students should then use their recreated story scene to write their own word problem(s).

When finished, students may exchange their word problems and try to solve each other's.



CA Mathematics Content Standards: Number Sense 2.1 (addition facts), Algebra 1.0 (create and solve word problems)

CA Language Arts Content Standards: Listening and Speaking 1.0 (listen attentively, follow simple 2-step directions)

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Name: _____

Read or listen to the story. Draw a picture of the story as you read it. Listen for important information.

The Lady Bug and the Spider

In the garden there was a little red lady bug. She was very pretty. She had 6 black spots on her wings. And Lady Bug was an insect, so she had 6 legs.

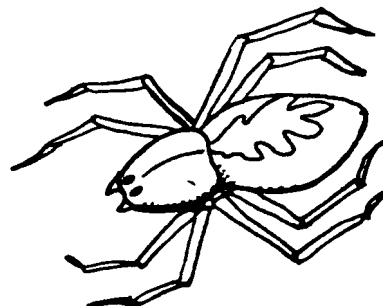
Lady Bug was also very helpful in the garden. She liked to eat tiny green bugs called aphids. Aphids were bad pests in the garden. Her 2 little wings helped her fly around the garden, chasing aphids.

One day, Lady Bug flew by a yellow garden flower. She sat down to rest in the shade of the flower. "I'm so very tired from chasing aphids all morning," she said.

All of a sudden, a yellow garden spider sat down beside her! Spider was hiding in the flower and spinning his web to catch aphids. "Hello, Lady Bug!" he said, waving his 8 legs. "You are under MY flower. The aphids here are MINE! Go find your own flower!"

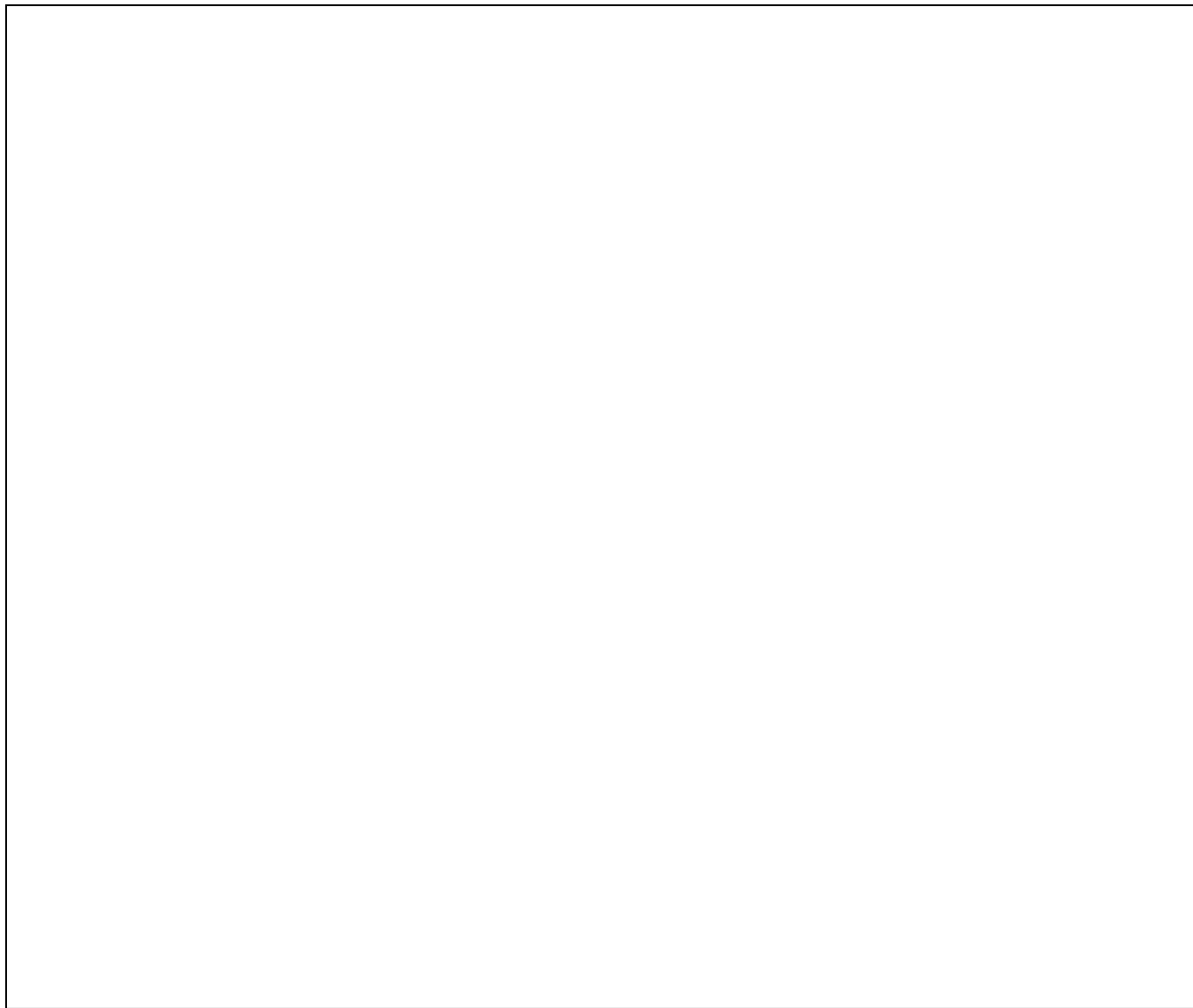
"Oh, Spider," said Lady Bug, "I don't want your aphids. I can find my own. I just want to rest. I will help the garden later."

Spider said, "OK, you can rest in the shade of my flower. But I am going to go eat MY aphids. And I am helping the garden too! Good bye."



Name: _____

**Read or listen to the story. Draw a picture of the story as you read it.
Listen for important information.**



Write a math word problem about the story.
