

Living Coast Discovery Center Field Trip Resource Packet

Perfect Pollinators

In this packet you will find lessons and resources related to your Living Coast field trip. The first two activities are intended to bookend your trip, followed by additional resources.

Career Focus: Botanist

I study plants and their physiological processes, such as photosynthesis, their evolutionary history and the relationships between plants and with their environment. I also focus on the usage, development, classification, and monitoring of plant life. I also conduct research to enhance crops, develop medicines, clean up contaminated sites and even power cars.

Table of Contents

| | |
|--------------------------|---|
| Seed Dissection..... | 2 |
| Student Pollinators..... | 5 |

Other Resources

| | |
|-------------------------------|----|
| Flower Parts Worksheet..... | 8 |
| Pollinator Activity Book..... | 10 |
| Kids Helping Pollinators..... | 19 |
| Useful Links..... | 21 |

Seed Dissection

Lesson Objectives:

- Students will be able to describe how the seed and seed coat function to help the plant embryo grow
- Students will be able to explain how humans benefit from seed structure

Standards:

- **2.LS2.2.** Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants

Materials:

- Dried beans (lima or pinto work best)
 - 2/student – one dried, one soaked overnight
- Lab sheet
- Magnifying glasses (a cell phone camera will work too!)
- In-shell nut or seed like peanut or sunflower seed (for teacher demo, optional)

Outline:

Review with students by asking them what they already know about plants – parts of a plant, what a plant needs, how they grow, etc.

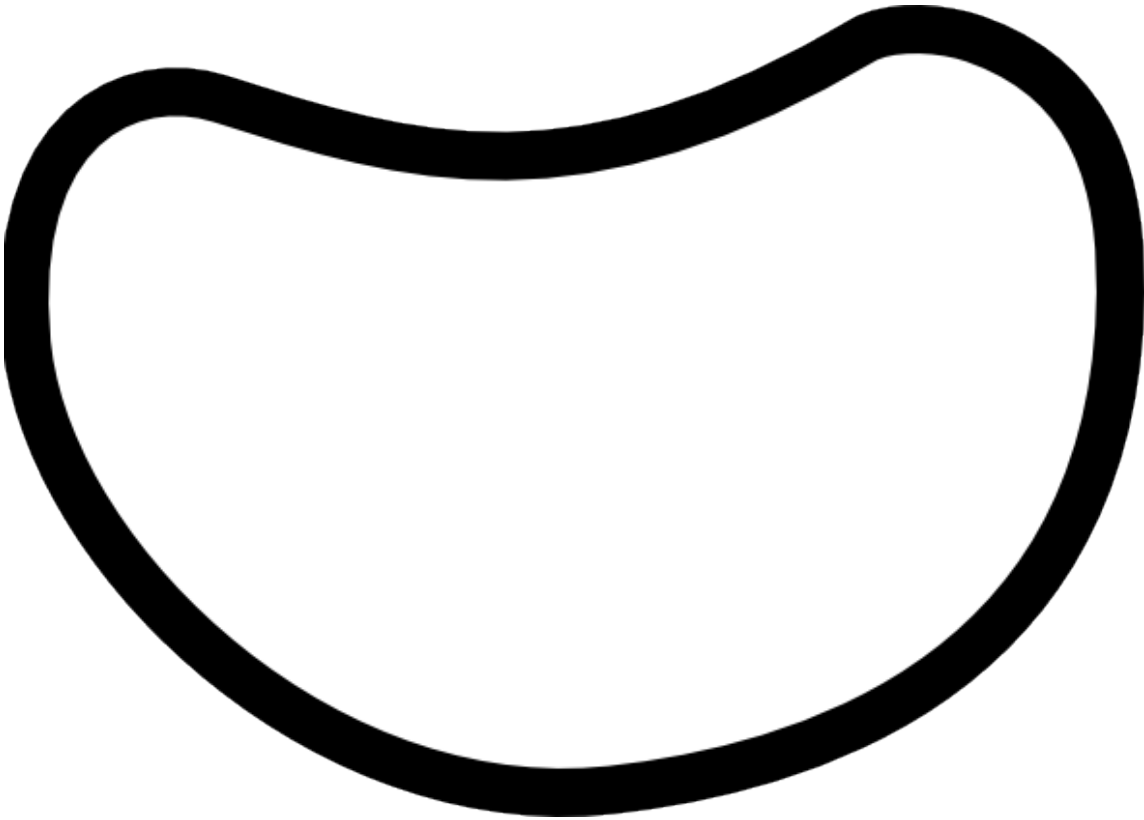
Distribute a worksheet and bean to each student. Have them fold the worksheet in half on the line. Tell students to draw within the bean outline label “dry bean” what they think is inside the bean. Distribute a soaked bean to each student. Show them how to peel off the outer skin and set it aside. Ask them what the skin does for the seed – it protects the seed just like their skin.

The seed will now begin to open. Warn students that what they are looking for is very fine and the same color as the seed. Look carefully between the two seed halves to find the tiny embryo plant. It will consist of a thick root and two flattened leaves with veins. Have students use magnifiers (can borrow a parent’s cell phone camera) to examine the small plant. Help them to find details. Have them turn over to the other half of their worksheet labeled “wet seed” and draw what they saw inside their seed. Compare the two drawings. Were their predictions correct?

Ask students if they think every seed has a tiny plant (many may think that only their example beans have them) If possible, show students an in-shell nut/seed like a peanut or sunflower seed. Tell them that baby plants live off of material inside a seed until they grow into a big plant and can make food for themselves. People and animals eat seeds and get nourishment from them just like the baby plant would.

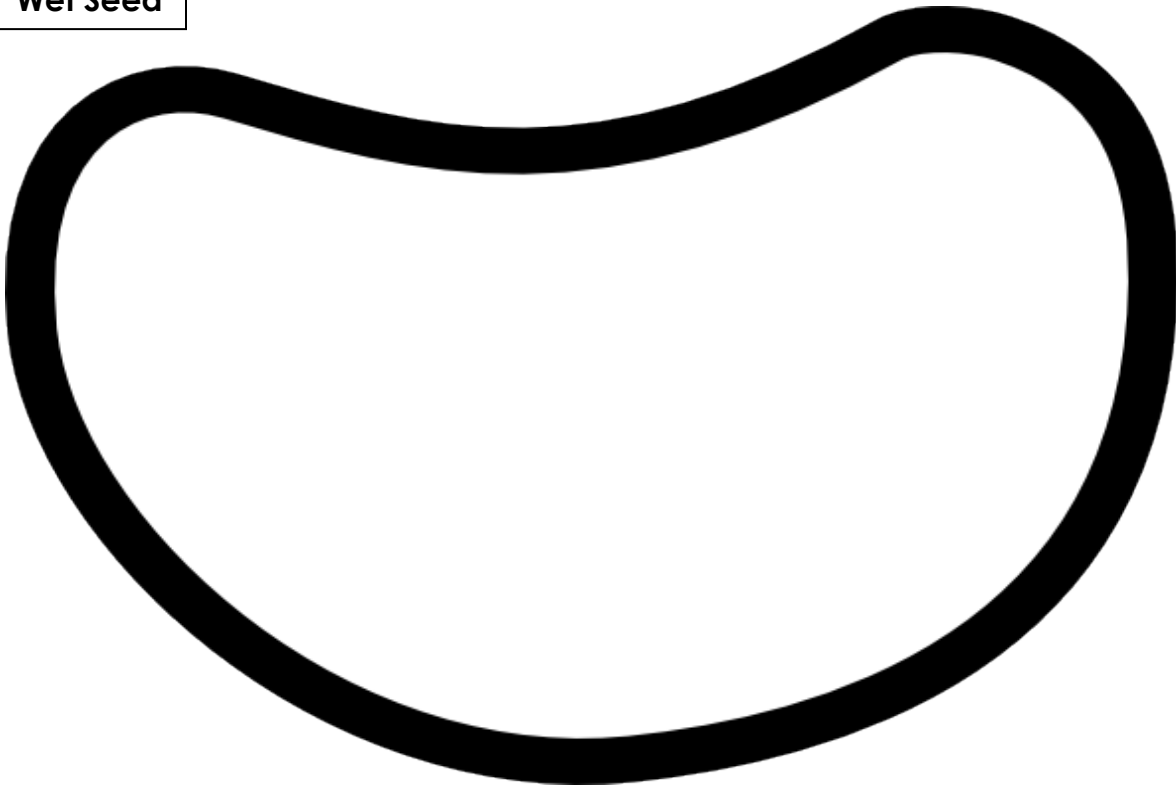
Worksheets:

Dry Seed



_____ fold here

Wet Seed



Student Pollinators

Lesson Objectives:

- Describe the complimentary relationships between pollinators and the plants they pollinate
- Identify adaptations that flowers have developed to encourage pollination

Standards:

- **2.LS2.2.** Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants

Materials:

- Preference questions sheet
- Paper and pencil/crayons/markers

Outline:

Have a discussion with the students and have them remember information that they learned on the field trip – document it on a whiteboard.

Explain that you're trying to determine which animal would make the best pollinator for the trumpet flower. Have your students study the pictures while you provide the following background:

- The trumpet flower is red in color, has an upside-down "tube" shape, has no "landing" spot, and has little fragrance.
- Hummingbirds have a poorly developed sense of smell; are attracted to the colors red, pink, orange, and yellow; "hover" at, rather than land on, their flowers; and have a long bill and tongue.
- Honeybees have a short proboscis, cannot see red, must land and crawl, and are attracted to sweet fragrances.



Ask the students questions about what pollinator would be best for this flower (Is the honeybee or the hummingbird more likely to access the nectar? Is the shape of this particular flower more appropriate for a honeybee or a hummingbird? Which pollinator would be more attracted to the flower's color? Would a honeybee be lured by the trumpet flower's scent? Is there a place for a honeybee to land? Which animal would make the best pollinator for the trumpet flower?)

Remind students that flowers are designed to attract pollinators with specific tastes and attributes. Have your students answer the questions on the "Preference Questions" Worksheet.

Have students pair off, and trade their "Preference Questions" sheets with their partner. Then have each of them draw simultaneously their partner's "designer flower." Encourage students to be creative with their flower design. For example, one might design a flower that is black, triangular in shape, smells like fresh-baked brownies, and provides pizza as a reward. Have each pair present their "designer flowers" to the class.

Extension: Tell them to think up and draw a fictional pollinator-plant pair. (For example, a flower that smells like Swiss cheese would likely attract a rodent pollinator.) Remind students that the goal is to get the animal to pick up the pollen and carry it to another plant of the same species. Have them list the attributes of the plant that attract the pollinator and the mechanism or mechanisms by which the pollinator carries the pollen to the next plant

Worksheets:



Preference Questions:

1. What is your name?

2. What is your favorite color?

3. What is your favorite shape?

4. What smells good to you?

5. What is your favorite snack?

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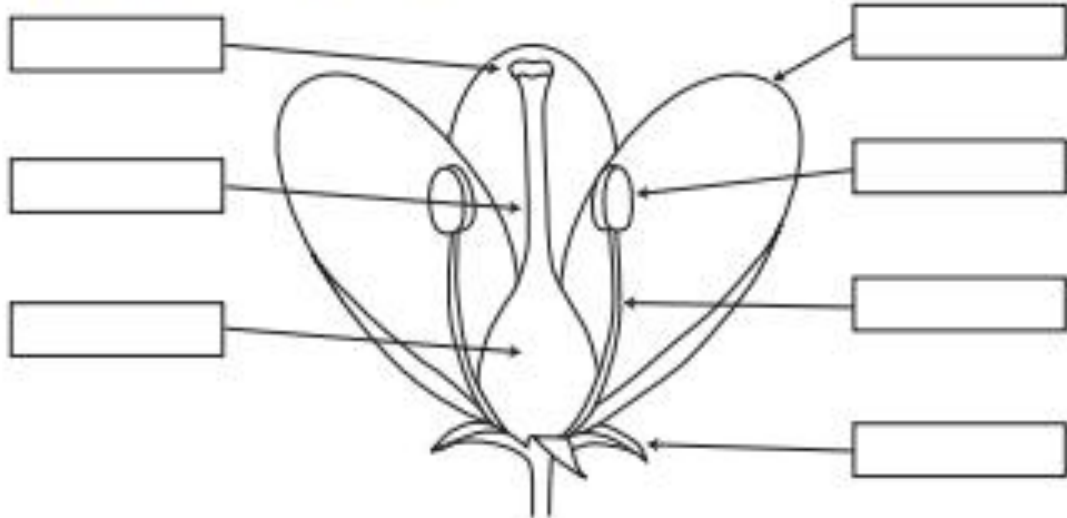
Flower Parts Worksheet

Review worksheet about the parts of a flower and pollination

Name: _____

Flower Parts & Pollination Worksheet

Fill in the boxes with the name of the flower part from the words in the box below. Color the petals red, the sepals green, and the pollen yellow.



anther filament stem ovary petal sepal leaf style stigma twig

How Pollination Works

Fill in the blanks.

1. For plants to make seeds, the pollen from the _____ of one flower needs to fertilize the ovule of another flower.
2. The seeds are produced in the flower's _____, at the base of the pistil.
3. A variety of critters collect pollen and nectar to feed themselves and their young. These critters also carry pollen from one flower to another and are called _____.
4. Name at least four critters that might be pollinators:



Pollinator Activity Book

Coloring sheets, word puzzles and information about pollinators

The Bee and the Flower

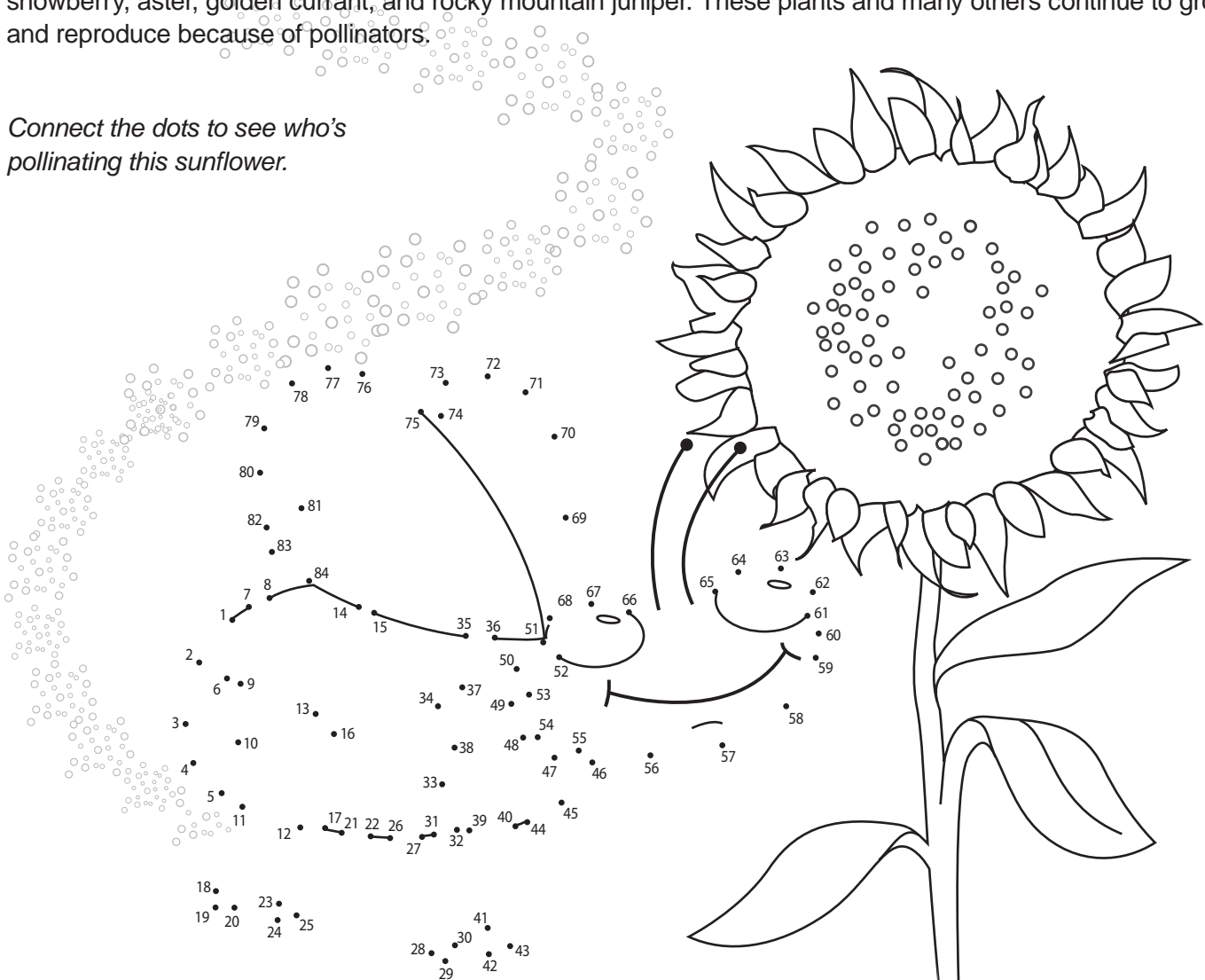
Pollen is a fine to coarse powder made by plants. The pollen consists of grains carrying male cells. Pollination happens when the pollen is moved to a female part of a flower. Most flowering plants rely on nature to move this pollen around. Without pollination, most flowering plants could not produce fruit or seeds.

The Pollinated

Many plants rely on bees, butterflies, hummingbirds, bats, moths, flies, and beetles to move the pollen around (pollination). We call special plant helpers, like bees, "pollinators"! Pollinators visit flowers to collect pollen or the sweet liquid called nectar. As they visit the flowers, the pollinators brush against the reproductive parts of the flower, dropping the pollen from another flower they recently visited. About three-quarters of the world's flowering plants and many of the food crops eaten in North America depend upon pollinators. No pollination would mean no apples, blueberries, strawberries, chocolate, almonds, melons, peaches, pumpkins, or many of the other important foods we love to eat each day. We would also not have plants that are used for medicine to make us feel better.

Certain plants that live in Montana actually attract pollinators! Some of these plants include American plum, sunflower, blue elderberry, purple coneflower, chokecherry, columbine, yucca, cherry tree, huckleberry, snowberry, aster, golden currant, and rocky mountain juniper. These plants and many others continue to grow and reproduce because of pollinators.

Connect the dots to see who's pollinating this sunflower.



The Pollinators

Bees – Bees include bumblebees and honeybees. Bees prefer blue or yellow flowers, like sunflowers, and flowers that smell sweet.

Butterflies – Butterflies taste with their feet! Butterflies like flowers that are red, yellow, or orange, like the color of the purple coneflower's center. Smell doesn't matter to butterflies; they rely more on seeing than smelling to find nectar.

Hummingbirds – To survive, many hummingbirds must eat twice their body weight in nectar each day! Hummingbirds are attracted to orange, yellow, or red flowers, like the color of the red columbine. Like most birds, hummingbirds do not have great smell features, so they don't care what the flower smells like.

Bats – Some bats travel more than 1,000 miles every spring. Bats like flowers that are large and white or pale in color. Some bat-pollinated flowers are open only at night. Bats pollinate many fruit crops, including bananas!

Moths – What is the difference between a moth and a butterfly? Generally, the moth only flies at night and has multiple shapes of antennae. The butterfly flies during the daylight and has knobs at the ends of its wiry antennae. Both are attracted to sweet-scented flowers that are typically large and white or pale in color, including desert plants like the yucca.

Flies – Flies can be found on flowers of many colors, usually those that give easy access to nectar. Montana-grown cherries are an example of a plant that flies help pollinate.

Wasps – Although wasps are not vital for pollination in Montana, they still help pollinate the fruit we eat, such as figs and huckleberries.

Beetles – Beetles are the oldest pollinators on earth and pollinate many of the most primitive flowering plants, such as the aster. Beetles are typically attracted to flowers that are white or green and have a wide opening.

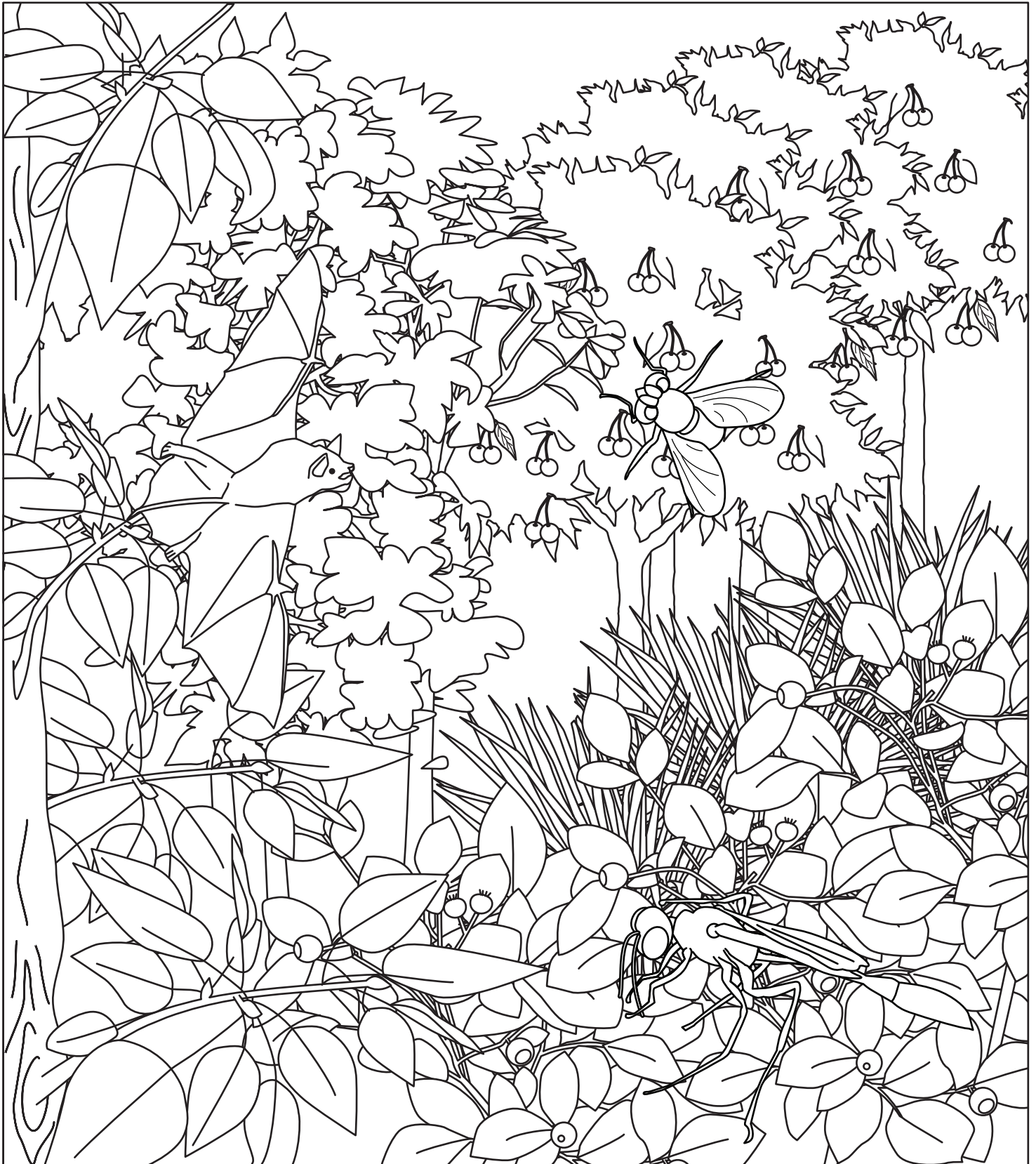
Draw a line from each pollinator to the kind of plant it likes.

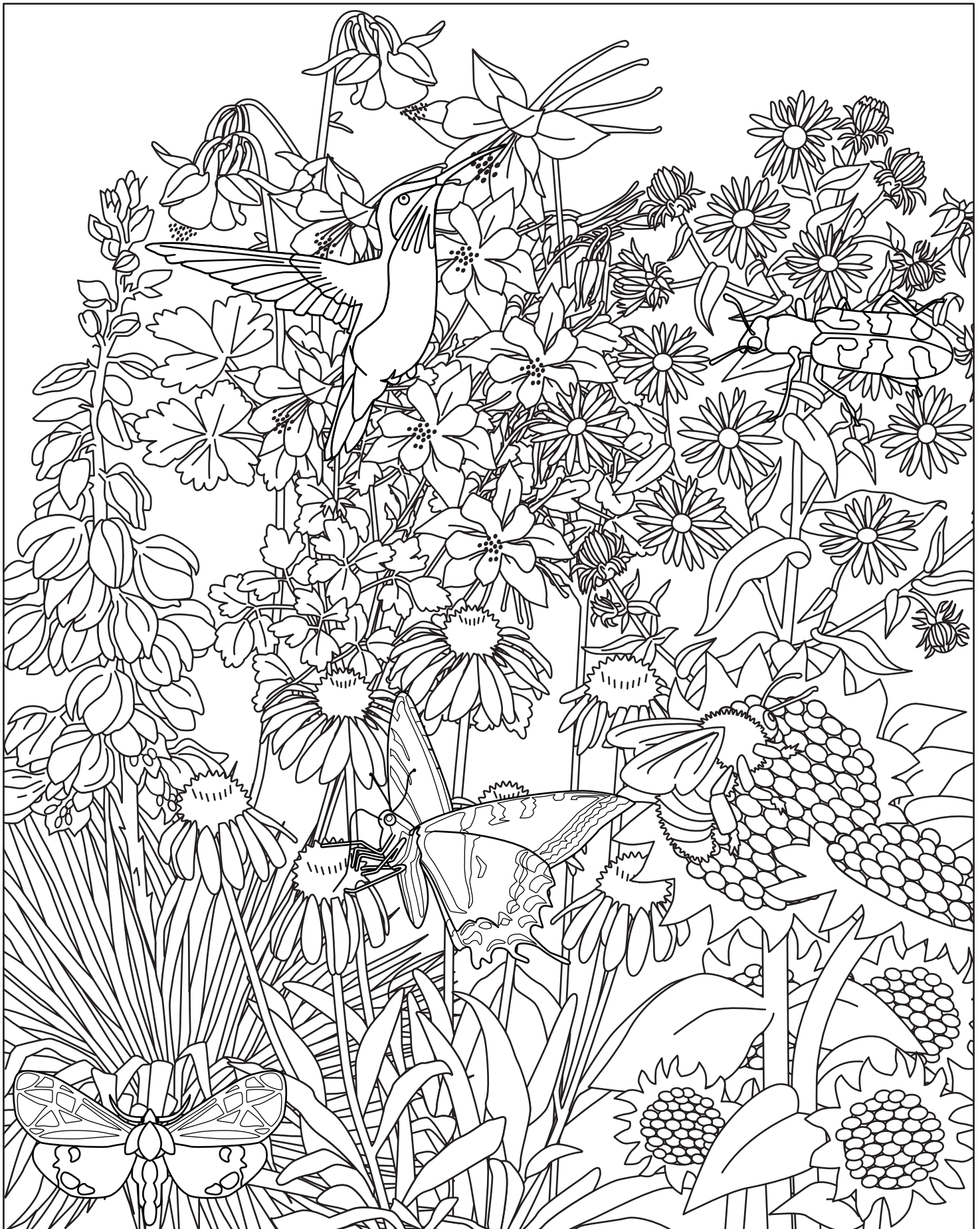
Labels for pollinators: butterfly, wasp, bee, beetle, hummingbird, bat, moth, fly.

Labels for plants: sunflower, purple coneflower, aster, red columbine, banana tree, cherry tree, huckleberry, yucca.

Where Are the Pollinators?

Look through the pictures on pages 4 and 5 to see if you can find all the hidden pollinators. Find a bee, butterfly, hummingbird, bat, moth, fly, wasp, and beetle! When you find them, color them in.





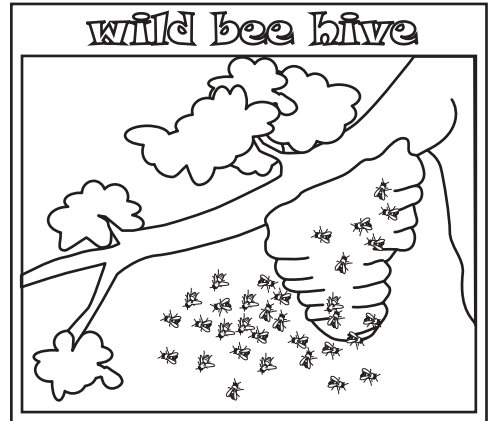
The Pollen, the Bee, and the Hive

Honeybees are fuzzy and carry an electrostatic charge that makes pollen grains stick to their bodies. Some types of bees actually carry pollen in a tiny basket located on their hind legs.

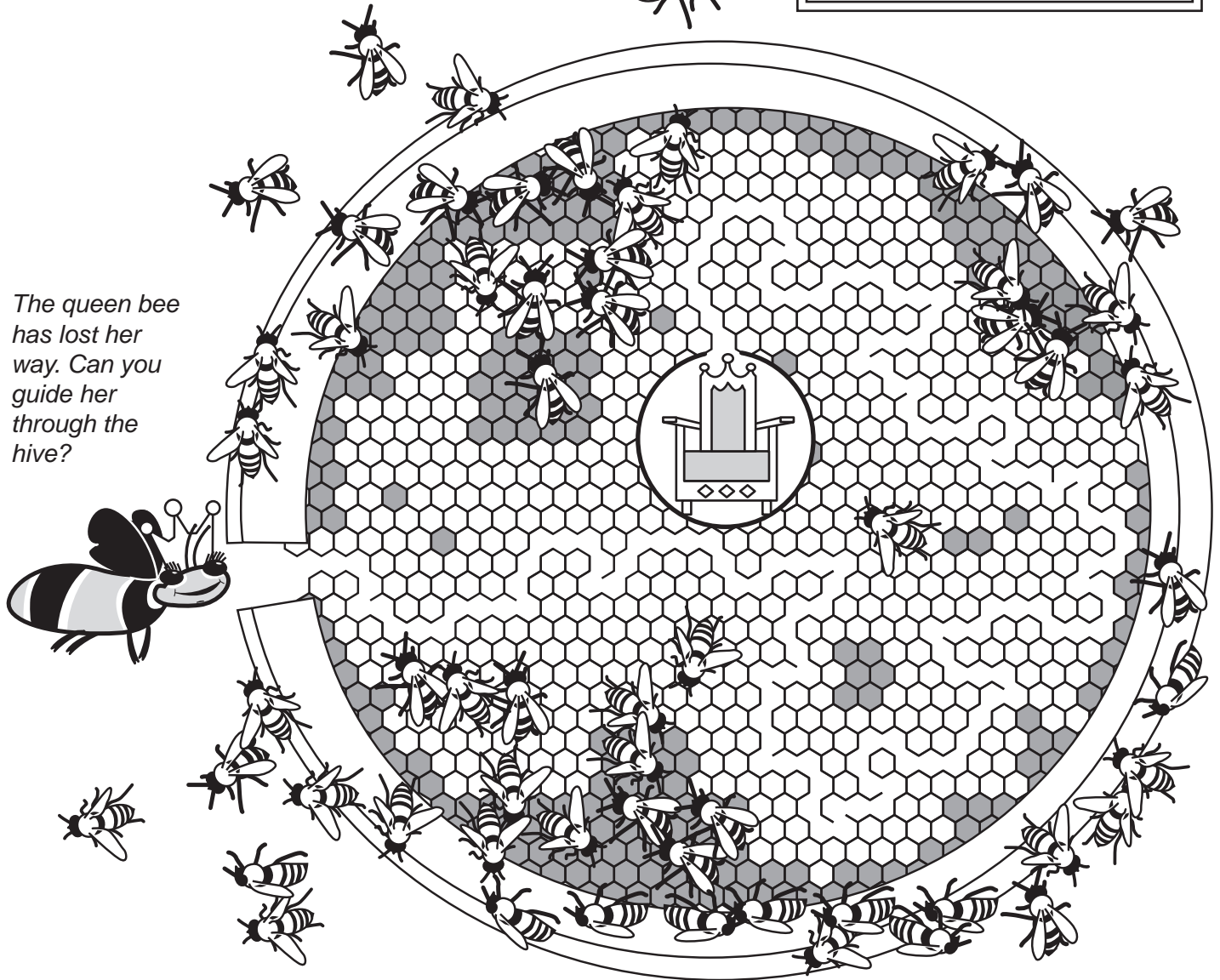
Wild bees live in hives that usually have only one entrance. The hives are made up of wax called honeycombs that store honey and house the baby bees, or larva. Bees have many different jobs. Some work inside the hive while others work outside. A beehive has one queen bee that creates all the baby bees and is served by hundreds of male bees and thousands of female worker bees that clean the hive, feed the larva, and gather the pollen.

Did You Know?

- There are 20,000 known species of bees.
- Honeybees are the only insects that produce food for humans.
- Bees fly an average of 13 to 15 miles per hour.
- Queens will lay almost 2,000 eggs a day at a rate of 5 or 6 a minute.
- Between 175,000 and 200,000 eggs are laid per year.



The queen bee has lost her way. Can you guide her through the hive?



The Disease that Makes Bees Disappear

Many bees are getting sick, and scientists are studying possible causes of the illness so, in the future, bees will be better protected. The disease, called "Colony Collapse Disorder" (CCD), has led to the disappearance of many bees from beekeepers' colonies.

How do beekeepers know when their bees are getting sick?

- There are not many adult bees left in a hive.
- There is no build-up of dead bees in the hive (infected bees just disappear).
- Other bees are not trying to steal food left in a hive.

CCD happens very quickly. Over a few days or weeks, most of an infected colony's 40,000 or so worker bees leave and die in the field. Only a queen bee and some newly emerged young bees remain alive. This is a serious problem, not just for the bees but for all of us, because pollination by honeybees is essential to grow fruit, nut, and vegetable crops around the world. When the honeybees die, our food supply is decreased.

There is no answer to what causes CCD. Some ideas about possible causes include exposure of the bees to chemicals, infectious germs or viruses, colony stress, or problems with the biological development of the species.

What we can do to help? We can increase pollinator-friendly habitat in our backyards by growing the right plants!



Unscramble the words on the left and match them with the "bee" words on the right.

- | | |
|----------|----------|
| nequeu | honey |
| cposelal | queen |
| hyone | worker |
| eeasdis | collapse |
| eadd | disease |
| nyocol | field |
| dielf | plant |
| vihe | hive |
| lapnt | colony |
| erwkor | dead |

Pollinators Are Important

In Montana, native trees, shrubs, forbs, and grasses can, with the proper mix, provide a continuous source of nectar and pollen needed by pollinators and other beneficial insects. The Natural Resources Conservation Service (NRCS) and the Farm Service Agency (FSA), both agencies of the United States Department of Agriculture (USDA), encourage the planting of native pollinator-friendly plants that:

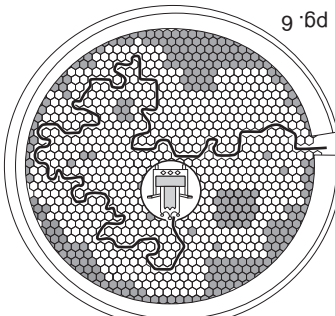
- Provide habitat and winter cover for insects
- Help suppress undesirable weed seeds
- Provide some biological control of insect and disease pests
- Reduce the risk of soil erosion
- Provide food and shelter for native wildlife species

Preservation of pollinators is supported by both NRCS and FSA in selected conservation programs.

pg. 8

pg. 7

nequeu = queen
 cposelal = collapse
 hyone = honey
 eeasdis = disease
 eadd = dead
 nyocol = colony
 dielf = field
 vihe = hive
 lapnt = plant
 erwkor = worker



pg. 3

pg. 2

sunflower
 purple coneflower
 aster
 red columbine
 banana tree
 cherry tree
 huckleberry
 yucca

Answer Keys:



Kids Helping Pollinators

Five things kids can do to help pollinators!

Stennett S. Heaton © 2001 California Academy of Sciences



Gulf fritillary butterfly



5 Things Kids Can Do To Help Pollinators

1. **Be kind to your pollinator friends.** Pollinators like bugs and birds are small and fragile. It's easy for people to hurt them. Be gentle and quiet when they are near!
2. **Look, but don't touch!** When you see a butterfly, bee, beetle, or hummingbird outside, look, but don't touch! Pollinators won't hurt you if you leave them alone and are nice to them.
3. **Don't use poison sprays.** Bug your family to stop using poison sprays in your house and garden. This poison kills bad bugs, but it hurts pollinators too. Bug your family to buy ORGANIC fruit and vegetables. These are grown without poison sprays, so they keep pollinators safe and happy.
4. **Keep pollinators' homes safe.** And help make habitat for pollinators. Take care of a garden. Plant some flowers. When you find a bug in your house, gently take it outside to its natural habitat.
5. **Bug someone!** Bugs and pollinators are fun and interesting. Teach your family and friends about these important animals. Teach them to say "Thanks Bugs!" You can "bee" an expert! ★



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Jo-Ann Ordano © California Academy of Sciences

Bumblebees harvesting.



Dr. Lloyd Glenn Ingles © California Academy of Sciences

Hummingbird and thistle

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Useful Links

Climate Kids:

Website from NASA with climate science information and activities for kids.

<https://climatekids.nasa.gov/>

Climate Science Alliance:

San Diego-based climate science info, including 10 ways to help with Climate Change

<https://www.climatekids.org/resources>

Outdoor Family Fun with Plum

App from PBS Kids providing families with challenges to complete outside by exploring nature in their yard or neighborhood.0

<https://pbskids.org/apps/outdoor-family-fun-with-plum.html>

Butterfly LiveCam

Visit the Safari Park's Butterfly house through their live butterfly cam:

<https://www.bing.com/videos/search?q=san+diego+zoo+safari+park+butterfly+cam&docid=608017719768346364&mid=B8D22C1F37C1729D3234B8D22C1F37C1729D3234&view=detail&FORM=VIRE>

Bee Facts

Bee facts from SD Zoo Global

<https://kids.sandiegozoo.org/index.php/animals/bee>