



LESSONS TO GROW BY



Pollinators

This month we are learning about our good garden friends the pollinators. Who are the pollinators? Bees, hummingbirds, moths, bats, butterflies, flies, and beetles are a few notable representatives. Pollinators are animals that help many flowering plants produce their seeds and thus ensure the continued existence of millions of plant species, and in turn, of most animal species, including humans. Each week we will dig into a different pollination-focused topic and provide instructions for engaging, hands-on lessons. By the end of the month we hope your young gardeners will understand the intricate relationship between pollinators and flowering plants and also learn to love, respect, and appreciate these hard-working animals.

Week 4: How can we protect pollinators?

Learning Objectives:

This week kids will:

- Learn about native pollinators and their habitat needs
- Discover reasons why pollinator populations are decreasing
- Explore ways they can help pollinators

Materials Needed for the Week

Activity 1: Be the Bee

- Helping our Pollinator Friends Reading Page
- Chart paper
- Marker
- Timer
- Be the Bee Game Supplies:
 - Simple version: buckets or boxes, paper, and tape (optional: Styrofoam balls or pompoms)
 - Elaborate version: 2-liter bottles, 20-oz. bottles, 6" wooden dowels, Styrofoam balls, construction paper, tape, yellow paint, glitter, 8 oz. drinking cups, turkey basters or water droppers
 - Extend the fun with a DIY bee costume (optional): headband, pipe cleaners, easel paper or large brown paper bag, lunch bag, string, markers

Activity 2: Design a Pollinator Garden

- Drawing paper
- Graph paper (optional)
- Pencils, colored pencils, crayons, or markers
- Old seed catalogs or garden magazines (optional)

Activity 3: Spread the Word

- Poster board and markers or
- Paper and pencils or
- Smart phone or digital camera
- Clay (optional)
- Compost or potting soil (optional)
- Wildflower seeds (optional)

Introduction

Researchers have documented a decline in the populations of many different pollinators, such as bees, over the last few decades. They have linked this decrease in numbers to several factors, including:

- Loss of habitat, resulting in decreasing food supply and disruption of nesting sites due to land development
- Pollution of air, water, and soil
- Misuse of chemicals, such as pesticides, that impacts not only pest insects who are usually their targets but also beneficial insects such as pollinators
- Disease and parasite problems
- Climate change

The good news to share with kids is that there are some very practical ways we can help pollinators in our daily lives. Here are a few ideas:

- Plant a diversity of plants that bloom throughout the growing season at home, school, or community centers. This will provide a continuous supply of pollen and nectar for pollinators.
- Plant native plants that provide shelter and a food source for pollinators in all stages of their life cycles.
- Leave areas of uncut grass or wildflowers to provide shelter for pollinators.
- Avoid using pesticides and herbicides.
- Spread the word to others! Teach your community about the importance of pollinators.

Planting a pollinator garden is a great first step for any family or school. You don't need a lot of space to start a pollinator garden. Even a few containers or buckets of flowers can attract hungry bees and butterflies. To design a pollinator garden, it is important to provide for basic needs of wildlife in your plan— food, water, shelter, and places to rear young. Here are some ideas of what you might want to include:

Food sources (host plants): Pollinating insects in their adult stages generally thrive on flower nectar and/or pollen. Good plants for pollinators include: aromatic herbs (coriander, catnip, mint, parsley, lavender), annual flowers (marigold, phlox, bachelor's button, zinnia, cosmos, salvia), and perennials (bee balm, Shasta daisy, iris, coneflower, lobelia, delphinium). Try to plant a combination that ensures something is blooming at all times during the growing season.

Some insects' larval stages have a penchant for plant leaves. For example, monarch butterfly larvae rely on milkweed foliage; swallowtail butterfly larvae happily munch on parsley and dill.

Another option is to allow a section of your schoolyard to revert to wild grasses, weeds, and wildflowers (e.g., milkweed and Queen Anne's lace).

Water: Butterflies will gather and sip at shallow pools, mud puddles, and birdbaths; bees and wasps can use mud as a home-building material. Mud puddles also provide important minerals for some pollinators.

Sites and materials for nesting and overwintering: Leave cut plant stems exposed, place flowerpots with drainage holes bottom-up on the ground, leave twigs and brush in small piles, create mud puddles, or put out short pieces of string, yarn, or other light fibers. Students can even build nesting structures for certain types of bees and bats.

Another important consideration: Do not use pesticides and herbicides in or around your pollinator garden. Even organic pesticides derived from plants and microbes can be harmful to pollinators as well as pests. Herbicides may wipe out key plants (weeds) that are important food plants for pollinators. Help prevent pest problems by growing a variety of different plants. Diverse plantings are less likely to have severe pest infestations and are more likely to attract pest insects' natural enemies: predatory insects and birds. If certain plants are continually plagued with pests, replace them with less susceptible species or varieties.

Activity 1: Be the Bee

1. Together or independently, read the Helping Our Pollinator Friends reading page. Have your kids complete the reading comprehension questions and then discuss your answers together.

2. Play **Be the Bee**. In Be the Bee, kids pretend to be bees collecting pollen from flowers to take to their hive to feed their young. By altering the number of bees, the movement of the bees, and the number of flowers available, you can demonstrate how environmental and population changes can impact the work of pollinators.



3. Set up the game. Props can be very simple or more elaborate if you have the time and interest.

For a very simple set up:

Simple version supplies: buckets or boxes, paper, and tape (optional: Styrofoam balls or pompoms)

Instructions: Collect 5 to 10 boxes or buckets (or other similar containers). Assign one box/bucket to represent the hive and then decorate the others to represent flowers. Crunch up paper into balls to represent pollen (yellow construction paper works well, but you can use other paper if that is not available). You can also use Styrofoam or pompom balls if available.

For an elaborate set up:

Elaborate version supplies: 2-liter bottles, 20-oz. bottles, 6" wooden dowels (or other sticks), Styrofoam balls, construction paper, tape, yellow paint, glitter, 8 oz. drinking cups, turkey basters or water droppers

Instructions: If you have the time and interest to create a more elaborate set up for your game (making the props for the game could be a separate extension activity) here are some ideas to jazz it up:

Make each flower

- Cut the top off a 2-liter bottle. Cut construction paper into petal shapes and attach them with tape in ring around the edge of the bottle to make it look like a flower. (You can use different colors and patterns of petals for each flower if you really want to get fancy*.)
- Place a 20 oz. bottle in the middle of the 2-liter bottle to represent the flower's pistil. If you want to have your 'bees' collect nectar too, they can fill these with water.
- Push each Styrofoam ball securely on to a dowel. Holding the dowels (like a lollipop on a stick), paint the Styrofoam balls with yellow paint. While the paint is still wet, sprinkle balls with glitter. *This addition is completely optional, but it gives you the opportunity to explore how bees spread pollen unintentionally.***
- Place the ball-topped wooden dowels in the cut-off soda bottle. These represent the flower's stamens with the ball and glitter serving as the pollen that will be collected in the game.



Create a honeycomb for the hive:

Attach six 8 oz. plastic drinking cups to each other with tape. Although the size of the honeycomb can vary, using at least 7 cups will provide enough to give it a "honeycomb" look. Place the honeycomb at your home base or "hive" for your student bees.

Extend the fun: Make a DIY bee costume (optional)

Supplies: headband, pipe cleaners, easel paper or large brown paper bag, lunch bag, string, markers

Instructions for bee costumes: Make antenna by attaching pipe cleaners to headbands. Next, let students decorate a piece of easel paper to serve as wings. After they finish coloring the paper, use a 12" piece of string to cinch the paper in the middle, dividing it into two wings. Then use two 24" pieces of string to make loops for the students' arms so they can wear their wings: At the cinched-up section of the wings, attach the two pieces of string at their middles, so that two pairs of 12" strings hang down on each side. Holding the wings in place on the child's back, bring each pair of strings over and under the child's shoulder. Then tie the strings together in front to hold the wings securely in place. As an addition, you can also use small paper bags and additional string to create "pollen sacs" to attach to their legs. If you plan to have kids collect "nectar" as well, pass out turkey basters or water droppers. These represent a bee's proboscis — its long, slender tongue that is used like a straw to suck up nectar from a flower.



4. Once your props are ready, set your flowers around a large room or yard to represent. Place your pollen in approximately equal numbers in each container. Then place your hive a moderate distance away from your flowers.

5. Play the game. Tell your group that they are going to be "bees" and when the timer starts, they need to go out and collect pollen grains (yellow paper, pompoms or Styrofoam balls) one at a time and bring them back to the hive (also your starting line). You can encourage wing flapping and buzzing to add to the fun.

6. For the first round, give them 30 seconds and at the end of that time count how much pollen they collected and record the results on a piece of chart paper.

7. Return the pollen to the flowers at their original location. Follow up with a few more rounds demonstrating different factors that may impact pollinator populations. You can choose from the following situations (in any order) or devise your own:

To demonstrate loss of habitat: Explain that a new housing development has been constructed in your bees' habitat and remove half of the flowers from the game. Once again give your bees 30 seconds to collect as much pollen as they can. Add your new count to your chart.

To demonstrate disease and parasite problems: Inform your bees that your hive has been infected with varroa mites. These tiny mites attack the bees and weaken them. If left untreated, the mites can lead to the death of the full colony. Ask half of your bees to sit down and not participate in the next round. Give the remaining bees 30 seconds to collect pollen, but ask that they walk instead of run from the flowers back to the hive. After 30 seconds, record the amount of pollen collected. You

can repeat this with the other half of the group, who were "impacted by mites," so that all kids get to actively participate in the round.

To demonstrate misuse of chemicals: Tell your bees that a local homeowner treated their flowerbeds with a pesticide which killed half of your colony. Ask half of your group to sit down and then give the remaining bees 30 seconds to collect pollen. Add your results to the chart. You can repeat this round a second time, switching which half of the kids were impacted by the pesticides so that all kids get to actively participate in this round.

8. Compare the results of each round of the "Be the Bee" Game. Talk about each of the scenarios and discuss how they impacted the bees and the amount of pollen they were able to collect. Discuss what kind of impact decreasing pollinator populations might have on our environment and food systems.

* If you took the time to decorate your flower petals using different colors or patterns, you may also want to discuss if they found themselves visiting some flowers first. Ask, Were their certain colors or patterns that caught your eye in the garden? In nature, for example, bees are attracted to yellow, blue, and purple flowers. Explain to kids that the reason flowers have developed interesting colors, patterns, shapes, and smells is to attract pollinators.

** Glitter Pollen Extension – If you chose to create a more elaborate set up for the game and use glitter on your pollen balls, make sure to take time at the end of the game to have children look around and see where you they find glitter. (Hint – the glitter should be everywhere.) Have them examine the "pistils" from the "flowers." Do they see any glitter inside the 20-oz. soda bottles? Can they find glitter on their hands and clothes? The glitter in bottles represents pollen that made it onto a stigma and pollinated the flower. Use this example to emphasize how the bees help with pollination even though that is not their true objective.

Activity 2: Design a Pollinator Garden

1. Look around your yard, school grounds or a community greenspace and find a place you think would make a great spot for a pollinator garden. It should be in a location that receives at least six hours of full sun each day and does not get trampled on regularly. Remind them a pollinator garden can be as small as a 5-gallon bucket on porch or as big as a meadow.

2. Next, research pollinator species native to your region. Find out what specific plants and habitat features these creatures need to thrive and reproduce. In general, the greater variety of plant types you have (trees, shrubs, perennials, annual flowers, and herbs), the more pollinators you'll attract. Since pollinators have different needs during different life cycle stages, maintaining plant diversity will also make your site more of a full-service oasis. Pollinator.org offers free Ecoregional Planting Guides available at <http://pollinator.org/guides> that are an excellent resource to begin your search.

Younger kids are very visual, so obtaining a wildflower seed catalog or even browsing an online seed or plant catalog can be a great way to get them engaged in planning.

Make a list of plants you could plant to help attract and support your native pollinators. Remember to include plants needed in all stages of a pollinator's life. For example, monarch butterfly larvae (caterpillars) feed exclusively on milkweed.

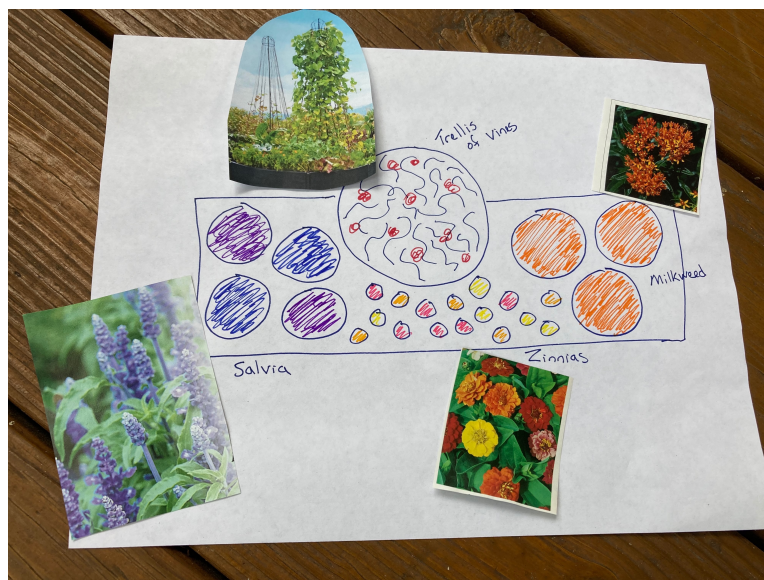
Consider the following when creating your plant list:

- Use as many plants native to your region as possible. Native plants have evolved closely with native creatures and are well-suited to meet their needs. In fact, some pollinator species are entirely dependent on the availability of certain native plants. (Your state's agency of natural resources and/or conservation and native plant societies are excellent resources to tap. They may also have Web sites that offer plant lists and habitat information.)

***Native Plant Note:** Never dig plants from the wild unless the area is slated for destruction and development and you have permission from the landowner. The best source for native plants is a local nursery or native plant association that offer plants that have been grown, not gathered.

- Choose a range of flower shapes and sizes to suit the feeding preferences of a variety of pollinators.
- Include a variety of flowers that bloom throughout the season. By doing so, you will accommodate different pollinators' preferences and provide a sequence of pollen and nectar sources throughout different life cycle stages. For instance, flowering shrubs and trees tend to blossom early in the season, providing nectar or pollen when other food is scarce.

3. Draw up a plan. This can be a simple sketch from a bird's eye view with plants represented as circles of different sizes, or you can challenge older kids to draft a plan to scale. (Graph paper is very helpful if you want to introduce the concept of drawing to scale.) At the end of this packet you can find a plan for a butterfly and hummingbird garden you can share with them for inspiration. Younger kids may enjoy making more of a collage by cutting out pictures of plants from a seed catalog or magazine as shown in the picture below.



Activity 3: Spread the Word

1. Learning about pollinators and creating awareness about how important they are in our world is an important step towards motivating people to protect them. Challenge your kids to think of something they can do to share the knowledge they have gained over the last few weeks of Lessons to Grow By activities with friends, family members and neighbors. Here are a few ideas:

Create a Poster or Brochure

Create a poster or brochure to share with family and friends, at school or at home. They can share a broad message by creating a poster highlighting all the fruits and vegetables we love that rely on pollinators for the cafeteria, or a brochure all about how to start your own pollinator garden to give out to neighbors. Alternatively, they could choose to focus in on specific story, such as a pollinator of the month for a local library display.

Write a Letter or Article

They can write a citizen action article asking your school, local park, or community center to leave a small portion of their property wild and un-mowed to provide habitat for pollinators. If every citizen and business owner let a portion of their property grow wild and un-mowed, it would help create a connecting corridor of plants to provide habitats for the wild and native bees and other pollinators that are in trouble. Or perhaps they could write an article for their school's monthly newsletter or create a pollinator fact section for your community's website.

Share through Social Media

With the help of parents and guardians, use a smart phone or digital camera to inspire people through pictures. Share pictures of pollinators at work. Spotlight local native plants that look beautiful and support pollinators. Highlight delicious-looking meals that use a pollinator-dependent harvest.

2. Looking for a more hands-on garden activity? Make seed balls full of wildflower seeds to give away. Seed balls are small bundles of seeds, clay, and soil or compost designed to promote easy planting. Although seed balls have been around since ancient times, they were rediscovered in the 1930s by the Guerilla Gardening movement as a way to covertly introduce vegetation by simply tossing the seed balls (or, on a large scale, dropping them from an airplane). They are still used today to re-vegetate areas burned by wildfires. On a small scale, seed balls are fun to make and offer an inexpensive way to sow native plants and flowers.

Wildflowers are good choice of seeds for seed balls because in nature they are self-planted and their seedlings are hardy, requiring little care. Seeds of native wildflowers work especially well because they are adapted for your climate, and they also provide a food source for local pollinators. Check out the KidsGardening article at: <https://kidsgardening.org/garden-activities-seed-balls/> for full instructions.

Pollinator Month Wrap Up

As the last week of the pollinator-themed Lessons to Grow By comes to a close, try playing our Pollinator Jeopardy Game to test show off your new smarts at: <https://kidsgardening.org/lesson-plan-pollinator-jeopardy/>.

Digging Deeper

You can use the following resources to dig deeper into this week's lessons:

Books:

Bea's Bees by Katherine Pryor: Follow Bea as she learns about bees and works to make her a community a place they feel welcomed.

Errol's Garden by Gillian Hibbs: In this book Errol learns he does not need a yard to have a garden.

The Thing About Bees: A Love Letter by Shabazz Larkin: A poetic book about why we need bees.

Videos:

Why Protect Pollinators? From the California Academy of Sciences:
<https://www.youtube.com/watch?v=p8uxJnNteNY>

National Pollinator Week from the US Department of Interior:
<https://www.youtube.com/watch?v=9W5myGZCxoQ>

Why Bees Matter? From the Food and Agriculture Organization of the UN:
<https://www.youtube.com/watch?v=oUq6qRZfjIw>

Additional Related KidsGardening Lessons and Activities to Try:

Plant a Butterfly Garden: <https://kidsgardening.org/garden-activities-plant-a-butterfly-garden/>

Pollinator Celebration Meal: <https://kidsgardening.org/garden-activities-pollinator-celebration-meal/>

Create a Butterfly Puddle: <https://kidsgardening.org/garden-activities-create-a-butterfly-puddle/>

Pollinator Journal: <https://kidsgardening.org/garden-activities-pollinator-journal/>

The Pollinator Patch: <https://kidsgardening.org/garden-activities-pollinator-patch/>

Hooked on Hummingbirds: <https://kidsgardening.org/garden-activities-hooked-on-hummingbirds/>

Wonderful Wildflowers: <https://kidsgardening.org/lesson-plan-wonderful-wildflowers/>

Wild for Pollinators: <https://kidsgardening.org/wild-for-pollinators-program/>



Helping our Pollinator Friends

Reading page for Week 4: How can we help pollinators?

Pollinators help us in so many ways. As they gather nectar and pollen for their diet, they move pollen from one flower to another flower. This process, called pollination, helps plants make their seeds. New seeds mean new plants! New plants mean we will continue to be surrounded by these amazing green living things that make oxygen for our air, provide food for our tables, give us shelter, and help keep our soil healthy and our water clean. We need plants and so we need pollinators!

Scientists who study pollinators have noticed that the numbers of pollinators in our ecosystems are decreasing. They think this is due to a number of reasons, including:

- Pollinators are losing their homes! When we clear natural spaces to build houses, businesses, and roads, we are kicking them out of their homes and taking away their food sources. Pollinators need space to build nests and also lots of flowering plants to collect food from.
- Pollution is not good for pollinators! Many of our actions change the chemicals in the air, water, and soil and that can hurt pollinators.

- When we kill what we consider bad insects and pests, we can kill good ones too! Sometimes humans apply sprays called pesticides to kill insects that are damaging our favorite garden plants, crops, or lawn areas and these chemicals can also hurt the pollinators in our environment — even if they are not the insects we are trying to remove.
- Just like us, pollinators can get sick! Although different than the ones that hurt us, pollinators can catch viruses and be impacted by bacteria and parasites just like people.
- Weather is changing. When weather changes over long periods of time it is called climate change. Our planet is experiencing changes in average temperatures and rainfall. This is impacting where many of our pollinators can live and the timing of their life cycles.

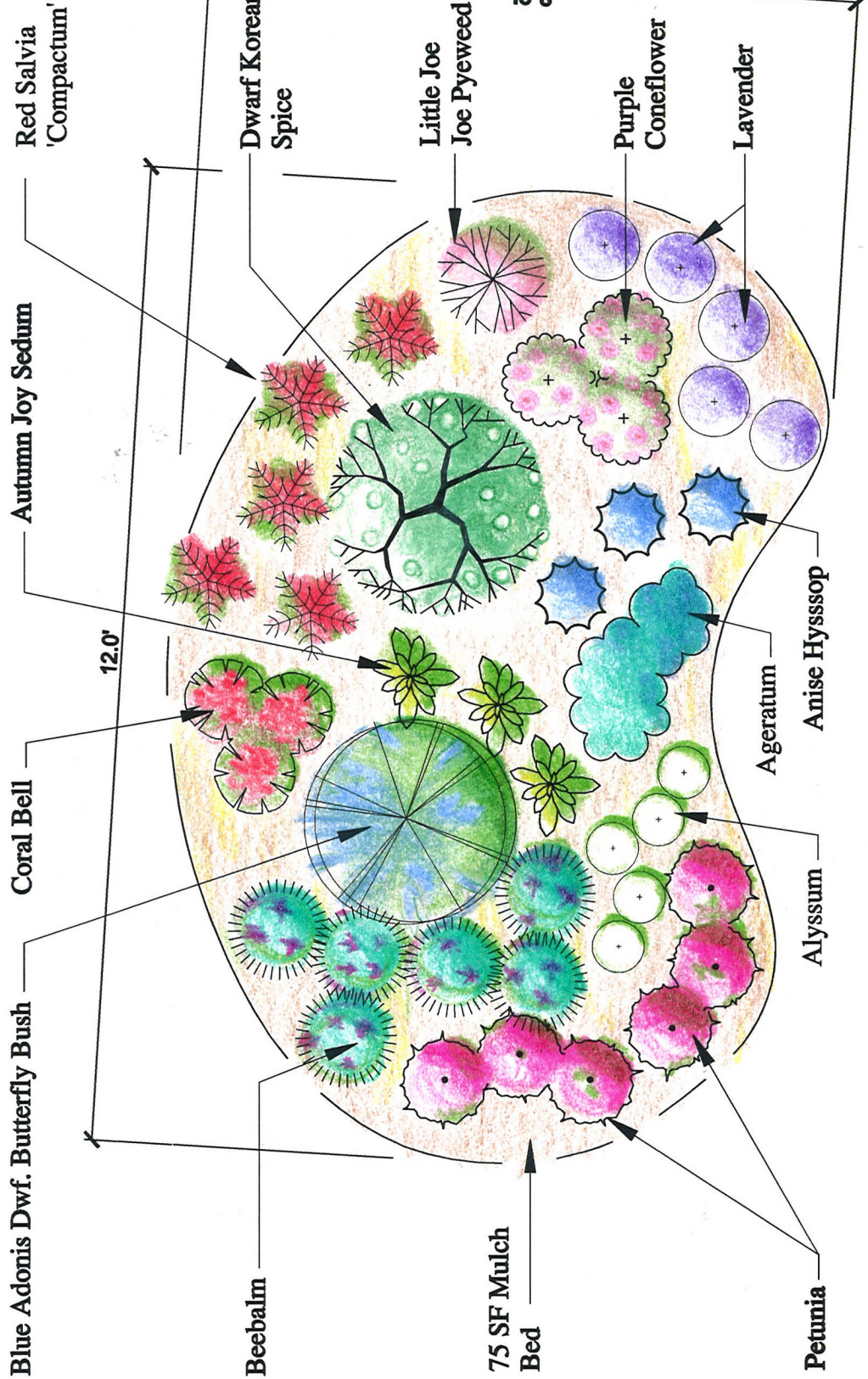
Pollinators are in trouble and if things don't change, plants that rely on pollinators to make their seeds are going to be in trouble too. The good news is that we can help. Here are some examples of ways people can help:

- Add lots of different kinds of blooming plants to your yard. Make sure there are flowers available to be a food source for pollinators from spring through fall. Local pollinators especially like plants that are native to your area.
- Encourage people in your community to leave areas of uncut grass and wildflower patches at homes, in local parks, and in other greenspaces. This will provide homes and food for pollinators. Remember that some pollinators like butterflies might have specific types of plants that they need when they are in their caterpillar forms too.
- Encourage grownups to avoid using pesticides that may hurt our pollinator friends by accident.
- Finally, spread the word! Find ways to teach others about how important pollinators are in our world.

As much as pollinators do for us each day, we need to make sure to remember to help them too!

Reading Comprehension Questions

1. List one of the reasons pollinators are important to humans:
2. The numbers of pollinators in our world is:
 - A. Increasing
 - B. Decreasing
 - C. Staying the same
3. Which of the following is not a reason pollinator population numbers are changing:
 - A. Pollution
 - B. Loss of habitat
 - C. Pesticides
 - D. They are being eaten by birds and other predators in larger numbers
 - E. Disease
4. Why do pollinators need to be able to visit plants with flowers from spring until fall?
 - A. For nectar
 - B. For pollen
 - C. Because they need to eat through the whole growing season
 - D. All of the above
5. How can you help pollinators? List one of the ideas suggested in the reading page or come up with a new idea of your own.



NATIONAL Gardening Association

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Butterfly + Hummingbird Garden

Design by: Susan Littlefield, Horticulture Editor and Paul Simon, Landscape Architect