

Crossing the Continents

“X is for Xeriscaping”



OBJECTIVE: Students will learn about the conservation efforts of water through xeriscaping, or landscaping and gardening, using drought resistant plants. Students will learn about pollination and how many organisms, such as butterflies, bees and hummingbirds are pollinators for plants. Students will focus on water usage, drought conditions, and how xeriscaping is one method for using less water when growing plants. Finally students will decide on which drought-resistant plants are best in a region to plant when planning a mini-butterfly garden.

PURPOSE: To educate students on current water usage, drought conditions and xeriscaping efforts for conserving water when growing plants. Students will see how pollination works after planning and growing a mini-butterfly garden using region-specific, drought resistant plants.

VOCABULARY: Xeriscaping, Pollination, Pollinators, Pollen, Conservation, Water Conservation, Drought-Resistant Plants, Butterfly Garden, Annuals, Perennials, DNA, Genetic Diversity, Blights, Viruses, Resistant Gene, Die-offs, Threatened, Endangered, Extinction

TIME NEEDED: 1 - 1.5 hours (30-45 minute Class Prep, Background Research and Garden Planning; 60 minute Lab Activity, with 2 minutes a day observations 4 times a week for 3 weeks)

TEACHER PREP and BACKGROUND RESEARCH:

1. Get approval from administrator for planting a garden on school campus and where, as well as place supply order (see materials below) or find a donor willing to support financially a small mini-butterfly garden. Finally, visit the following website and watch the following video prior to showing the class.

<http://www.wikihow.com/Create-a-Butterfly-Garden>

-AND-

https://www.youtube.com/watch?v=Dudsa4LU9_w

“How to Make a Hummingbird Feeder” - 3:47 min

CLASS PREP and BACKGROUND RESEARCH:

1. Ask students to write down on a piece of paper or a sticky notes what they think the word “Conservation” means. Then ask them to turn the paper over and ask them to write down silently what they think “Conservation of Water” means. Then have student’s pair up with another student and pair-share with each other what they wrote down.
2. Next, in a class setting or in small groups, have students volunteer to share what they learned from each other or if there are any questions about what conservation might mean. Go over the closest answers with the class as examples. Discuss next what conservation of water might mean? Does your particular region where you live deal with limited water resources? In what ways? Why or why not?

3. Then, ask students what they think about the life of a butterfly? Have students ever caught a butterfly? What about the life of a bee? What experiences have students had with these insects? Have students discuss their answer first with a classmate, limiting the discussion to one minute per student, and switching to allow the other a chance to speak as well for one minute.
4. Finally, have students watch the video on Monarch Butterflies, and discuss together as a class afterwards what happened to the butterflies, and why. Allow students to discuss their solutions to the question, “What should we be doing to help species now before they go extinct?”
<https://www.youtube.com/watch?v=h06zkEG7a4k>
“Why 90% of Monarch Butterflies Died” (almost 3 min)
5. Read the Introduction section below together as a class and pay particular attention to the vocab terms “Xeriscaping”, “Drought”, “Pollinators”, and “Genetic Diversity”. Ask students what does it mean to xeriscape and how would that help with water conservation during a drought? What are pollinators in your region and what are they pollinating? Finally, why would plants need to be pollinated by another of the same species, or type, of plant? Why is it good for plants within the same species to mix DNA?
6. Finally, have students look up pictures on their IPADS or on a computer of butterflies commonly found in your area and print pictures of them. Hang them in a central area of the classroom along with their Species name and Common name, for students to later identify with when observing these colorful visitors to your soon-to-be planted, Mini Butterfly Garden.

INTRODUCTION:

Xeriscaping is landscaping and gardening that reduces or eliminates the need for supplemental water from irrigation. Furthermore, planting using native plants is a more sustainable and low maintenance solution for areas facing water shortages, such as California, which is facing one of the longest and worst droughts in the history of the state. Plants that grow naturally in an area have adapted to the surrounding soil, moisture, climate, and temperature

changes between seasons and are ideal to use when planting region-specific gardens. They usually use less water and are also resistant to pests and won't necessarily need the use of chemical fertilizers. For instance, the table below lists some native plants to the southern-most part of California severely affected by the Great California Drought. These plants can be used to plant a nicely landscaped garden that will still attract pollinators, such as bees and butterflies, and actually require much less maintenance, while still appearing beautiful.

PLANTS NATIVE TO SAN DIEGO -

California fuchsia	
Purple three-awn	
Desert willow	
Fairy duster	
Coastal sagebrush	

About 50 percent of the water we use in our homes is used to water our grass and outdoor plants. Using xeriscape-planting techniques, water use can be cut in half. This helps to conserve water, which is the whole idea. When it comes to planting flowers to attract beautiful butterflies, it does the community a huge service to be traditional by researching, which species of drought-resistant plants are native to the region, and which ones make the most colorful flowers for attracting pollinators. A pollinator can be a species of insect, like a bee or butterfly, or a bird, like the hummingbird, that is attracted by the smell or beauty of a flower, and lands on the flower in order to drink the sweet nectar of that flower. What happens next is the pollinator involuntarily pollinates, or transfers pollen, from one flower to another when landing. Pollinators are extremely important for species of plants to transfer

genetic material, or DNA, found in the pollen from a flower. Every flower species has its own set of DNA, with slight genetic differences, or mutations, that actually need to reach other flowers of the same species. Pollen is sticky, and can have microscopic hooks, or barbs attached to it, so that it will attach to the legs or body of a traveling insect or bird and drop off at a later time when it touches another flower. If plants did not do this transferring of pollen within the same species, then viruses, or “blights” - plant sicknesses, can easily wipe out an entire species, causing die-offs, due to lack of genetic diversity, that is, every member in a plant species would have the same genes and that isn’t ideal for survival. It’s good to mix things up a bit in order to create something called genetic diversity. That way, one plant might have a resistant gene to an illness and be able to survive against a plant illness and carry that species forward into the future, to create stronger and healthier versions of that plant species.

NAMES:

_____ Date: _____ Period _____

“Fairy God-Mother’s Water-Wise, Mini-Butterfly Garden:
Xeriscaping the Future of Pollination, from Planning to Planting”

LAB ACTIVITY:



Host Plants

Butterfly gardening involves planning your garden to entice, sustain, and promote a species of butterfly. A sample garden plan is shown in Figure 1 below. Flowers of similar colors planted closely together are more enticing to butterflies. Also, choosing to plant a variety of nectar-producing plants with the aim of providing flowers in bloom throughout the season is the end goal. This way, butterflies will visit continuously throughout the year. It is especially important to have flowers in mid to late summer, when most butterflies are most active.

Annuals, or flowers that live only one season, from seed to blossom, can still be wonderful butterfly plants because they bloom continuously through the season, providing a steady supply of nectar. Perennial plants, on the other hand, live for more than two years, and require less maintenance, such as coneflowers, lilac, butterfly weed, and asters.

You can further supplement the garden's flower nectar with a homemade feeder. Make one from a small upside-down jar, and drill a small hole in the center of the lid and plug it with cotton. Fill the jar with a solution of one part sugar to nine parts water and attach colored fabric petals to the lid. Hang your feeder in a tree near your garden and observe how many butterflies visit. To see a list of butterflies common to your area, click on the following link and simply click on the state that you live in.

<http://www.butterflywebsite.com/atlas/index.cfm>

Finally, butterflies start out as eggs and you will need to provide food for their larval, caterpillar forms as well. Most caterpillars feed on leaves; although some develop on the flowers or seeds. Assigning student groups to research local butterfly species to see what their larval caterpillar forms eat is a good pre-lab assignment to ensure that your garden will indeed attract adult butterflies in the end. The following website provides a wealth of information on butterflies, their preferred nectar food source and the host plants of their larvae caterpillar forms.

<http://www.butterflywebsite.com/butterflygardening.cfm>

MATERIALS (per class): 5 gallon bag of potting soil; 20-25 types of Region-Specific seeds or seedlings of drought-resistant plants and flowers known for attracting/feeding butterflies, larvae and caterpillar forms of butterflies and other pollinators - 5-6 different colors; Location of mini-butterfly garden and map of what and where to plant - see Figure 1 below and visit the links above in the Introduction for a list of plants native to your region; 5 gallon bag of small pebbles, wood chips, or mulch, any color; 4-5 large rocks or small boulders; thick black plastic liner or tub for small pond - 50 cm X 50 cm; 1 gallon bag sand; 3 or 4 foot stone slabs or slates for walking path; hummingbird feeder and hanger (optional) - glass or plastic water bottle with a screw on cap, 2 aluminum cans, screwdriver, a pair of scissors, a 1/8 sized drill or a medium sized nail, 5 minute epoxy and 30-60 cm long wire; and finally a water source such as a hose or a faucet, preferably already outdoors to minimize spills when transporting water.

HYPOTHESIS: If we create a mini-butterfly garden-using native, drought-resistant plants specific to our region, then we predict that we will attract _____(choose any number) different kinds of pollinators to our garden (Ex: Monarch Butterfly, Swallowtail Butterfly, Bee, Hummingbird, etc....) over a 3 month growing period. (You can choose however long you would like to record visiting species - it depends on the school year and local growing seasons.

PROCEDURE:



FIGURE 1

1. Group students into 4 groups of 4 students each. Announce that each student group will be in charge of $\frac{1}{4}$ section of the garden, from planning to plant.
2. Group #1 will be in charge of the upper side of the garden and will receive plants #1-5 in Figure 1 above. Group #2 will be in charge of the middle section of the garden and will receive plants #6-11 in Figure 1 above. Group #3 will be in in charge of the left side of the garden, plants #12, 13, and 15-19, and Group #4 will be in charge of the right side of the garden, plants #20-24, including plant #14.
3. Review with each group the overall plan of the garden layout and hand out seeds or seedlings according to number.

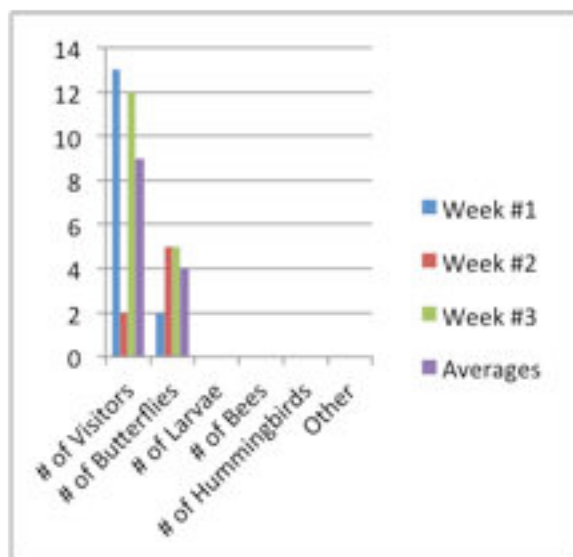
4. Allow each group to choose what they would like to use for ground cover in their section of the garden (i.e. small pebbles, mulch or wood chips, sand, or larger rocks/boulders). Also, each group must leave space for the walkway, which will be made up of 3-4 stone slabs or slate.
5. Finally, head to the garden area, and have students use paper and lay down a numbered piece of paper for each spot where the flowers will be planted, as well as where the stone slabs will be laid down for the pathway. If placing a small pond then makes sure to designate where that will be as well.
6. Begin creation of the garden. Each student group should receive 1 gallon of potting soil (a plastic milk jug with the top cut off serves as a great soil transporter and as a watering container for later). A water source should be nearby. Have students begin planting their designated plants according to the instructions on the seed packets, or research done beforehand. Make sure to water and to pack down the soil firmly afterwards.
7. If creating a small pond, lay sand down first in a 5 cm deep layer, then lay thick black plastic lining above that. This will help with irrigation and evaporation of any condensation build-up that can lead to mold problems in the garden. See video below for a good example of how to line a small pond. Finally, place the tub if using one over that and fill halfway with water. The idea is to create a water source for the butterflies and hummingbirds, and one that is shallow enough to drink from. You may line it with small pebbles or even larger boulders if you wish.
<https://www.youtube.com/watch?v=ErPo52g427o>
8. If making a hummingbird feeder, check out the link below for easy directions and placement in the garden.
https://www.youtube.com/watch?v=Dudsa4LU9_w
9. Using the Data Table below, print and hand out to each group. Explain that each group will be in charge of a different day of the week. Their mission will be to observe the garden for 2 minutes each day and to record number and type of visitors to the garden. Make sure to make enough copies for each group to record a new set of data each week (Ex. Group #1 observes each Monday for 3 weeks - make sure to print 3 copies of the Data Table, one for each Monday observed). This data can then be later entered into a spreadsheet and graphed to show trends over time. Use the attached spreadsheet example to enter data and to create a graph.

DATA TABLE:

GROUP # _____ /Week # _____

NAMES of
Observers: _____

Butterfly Garden Visitors - Day of the WEEK DATE: _____	Type of Visiting Species (can include pictures if easier)	# of Individuals who visited	Notes and observations (Ex: We observed Garden for 2 minutes; saw a strange green beetle)
Butterfly			
Bees			
Hummingbirds			
Butterfly larvae/caterpillars			
Other			



INTERPRETING DATA:

Number of Visitors:

- 1) Which group recorded the most visitors to your garden? Why do you think this is?
- 2) Which day attracted the most visitors? Why do you think this is?
- 3) Which week attracted the most visitors? Why do you think this is?
- 4) Which part of the garden attracted the most visitors? Why do you think this is?
- 5) Out of the many kinds of pollinators, which was the most sighted? Butterflies, Bees, Hummingbirds, or others? Why do you think this is?

ANALYSIS:

- 6) What importance does a food source play in the success of a butterfly garden?
- 7) What role does location, both of the garden itself and of the flowering plants; play in the success of a butterfly garden?
- 8) What do you think would happen if there were no gardens to pollinate? Would it affect humans? Why or why not?

VOCABULARY REVIEW:

- 9) What does the word “Conservation”, mean to you? What does the phrase, “conservation of water” mean to you?
- 10) After performing this lab, is there a pattern that pollinators, such as butterflies, bees, and hummingbirds, follow when pollinating? Did you notice any interesting, odd behaviours, or repetitive movements from these

pollinators when they were visiting your garden? What do you think they were doing?

*BONUS QUESTIONS:

- 11) Many countries have reported mass die-offs of bees and butterflies due to pesticides, sickness, and other health-related reasons. What do pollinators do for humans? What would happen if these types of pollinators died-off here in your region where you live? In the United States?
- 12) What solutions or other conservation methods could humans come up with between countries that would help ensure the survival of these species of pollinators? What could you do right here where you live?

SUMMARY CONCLUSION: Please write a 3-5-sentence paragraph using at least 5 of the words from the word bank below. Try to describe what happened during this lab according to your data and what you learned from your data.

WORD BANK:

Xeriscaping, Pollination, Pollinators, Pollen, Conservation, Water Conservation, Drought-Resistant Plants, Butterfly Garden, Annuals, Perennials, DNA, Genetic Diversity, Blights, Viruses, Resistant Gene, Die-offs, Threatened, Endangered, Extinction
