# PLANNING YOUR POLLINATOR GARDEN

**Teacher**:

**Grade Level(s):** 3rd-6th

**Time:** 2 lessons, 1 hour each

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| **Next Generation Science Standards:** | **3-LS4-3**. Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all. **3-5-ETS1-1**. Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost. **3-5-ETS1-2**. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem. **MS-ETS1-1**. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions. |
| **Enduring Understandings:** | **ESS3.C** Societal activities have had major effects on the land, ocean, atmosphere, and even outer space. Societal activities can also help protect Earth's resources and environments. |
| **Content Objective:** | Students will use online resources and articles to answer questions about pollinators. Students will vote on a location and plant species for a pollinator garden at their school. Students will collectively write a letter to the school principal and staff asking to use that space and explaining the benefits to having a pollinator garden. |

| **Vocabulary** | **Materials** |
|---|---|
| Monarch Butterflies, Queen Butterflies, Migration, Habitat, Life Cycle, Perennial, Annual **Words may be dependent on student-generated questions** | Scientific Journals, Computers Articles: *Pollination: A Wild Transaction* and *Pollination and Environmental Change* Butcher paper for group storyboards (optional) Letterhead (optional), Voting Cards (optional) |

| **Seasonality**: This lesson will work throughout the year, however, constructing and planting a pollinator garden may do better during warmer seasons (Autumn, Spring). | | | | |
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| Monsoon July-Sept. | Autumn Oct.-Nov. | Winter Dec.-Feb. | Spring Mar.-Apr. | Dry Summer May-June |

**Day 1: Engage:** Think of a pollinator. Imagine you *are* that pollinator. What would your home look like? Where would you get your food from? Where would you feel safe? Where would you lay eggs? Draw and discuss.

**Explore**: Today we will be researching all about pollinators. The goal of this lesson is to prepare ourselves and our school for a pollinator garden plot!

Hand out the articles *Pollination: A Wild Transaction* and *Pollination and Environmental Change*. In pairs, have students read *one* of these short articles to their partner while their partner listens. Have students

circle and discuss any words that are unfamiliar to them. Have each student explain the main idea of the short article that they *listened* to. Discuss findings and themes as a class.

Ask the class to think about two additional questions that they now have as a result of reading those articles. Have students write these questions down in their journals.

**Explain:** Today we will go to the computer lab to research answers to the questions we just wrote down in our journals. We will also take notes on other aspects of building and caring for a school pollinator garden. This research will help us vote on a good location for a school pollinator garden, as well as learn what plant species should go into the garden.

**Day 2: Elaborate**: Once students have had time to complete this research and answer their questions, bring the class together to do a final recap of student questions and answers and to share information about what pollinators and plants need from a habitat. Discuss as a class.

Go outside! Ask students to work in pairs to search for a good location for the school's pollinator garden. Bring the class together and, using a whiteboard or piece of butcher paper, draw out the school and its open spaces. Use these tools to create a storyboard of where might be the best location for the pollinator garden. Ask student pairs to share their findings, mark their ideas on the class map, and explain why they feel that is the best location for a pollinator garden.

*What species should we plant*? Create categories on the board for: food sources (or plants), water sources, shade, protection, and more. Have students raise their hand and fill in the details using the notes they recorded in the computer lab. Create a complete plan detailing the best way that the pollinator garden can be constructed. Take a vote to determine the final location and plant species.

**Evaluate**: Ask student pairs to draw an example of a pollinator garden that will work well for their school, as well as an example of a garden that will *not* work well for the school *or* be a good place for pollinators to live. Share and discuss.

1) **Additional Evaluation Activity**: Once a detailed storyboard is complete, guide the entire class through creating a formal letter to school principal and staff asking to use that space. Type up the completed letter for the class and send it to the school's principal and staff.
    a. The letter needs to have a heading and introduction, as well as:
        i. Topic sentence
        ii. Four or more supporting detail sentences
        iii. Transitional words and phrases that connect ideas from sentence to sentence
        iv. Three or more pollination vocabulary words used correctly in context
        v. Closing sentence
    b. Create a response letter for the class based off of what the principal says. Have students edit and/or respond to this letter if need be.

# Pollination and environmental change

## Threatened partnerships?

Careful observations – spanning time and space – alert scientists and policymakers to important changes in our environment. Vigilant beekeepers were the first to identify recent crashes in honeybee populations. Volunteer birders have tracked changes in avian pollinators through annual Christmas bird counts. Yet many of the most important pollinators for desert plants go unmonitored. They need your help!

### Insecticides:

Chemical insecticides provide humans with unblemished produce and manicured landscapes, but can have deadly consequences for pollinators. Even if chemicals don't kill insects directly, non-lethal doses affect bee foraging, learning, and colony immune function. Insecticides also affect bat and bird pollinators that rely on insects for protein.

### Climate change:

Climate change may cause current high-elevation habitats and the pollinators living there to vanish from the Sonoran Desert. The seasonal timing of life events is likely to change for many species, creating mismatch between pollinator migration and the timing of flower production.

### Invasive species:

Invasive plant species, such as wind-pollinated buffelgrass, can outcompete pollinator food plants. Invasive grasses create continuous blankets across the landscape, removing bare ground nest sites for many native desert bee species. Non-native honeybees compete with native pollinators and could reduce native species diversity in some locations.

### Habitat degradation:

Loss of predictable water sources in the desert could impact pollinators. Honeybees, for example, depend on constant water supplies to keep hives at the right ambient temperature. Loss of desert water sources could impact the locally adapted endemic bee species, as well.

Honeybees inside saguaro.
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Desert water source.
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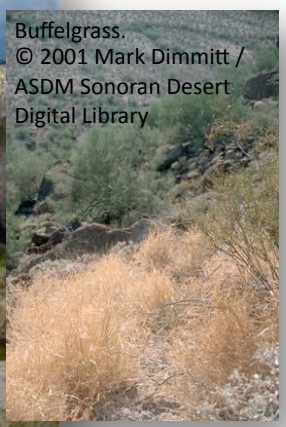

Buffelgrass.
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# Pollination: A wild transaction

## How does it work, and who participates?

When animals assist stationary plants with reproduction, the interaction is mutually beneficial to both partners. Plants pay pollinators for their transportation efforts with nutritious rewards (sugary nectar or protein-rich pollen). Are bugs, birds, and bats aware of this evolutionary deal? In fact, most are likely unwitting participants that passively detach pollen grains from their bodies while rooting around floral structures for food.

## Pollination is a dirty job!

A careful look at the bodies of insect and vertebrate pollinators often reveals a golden glow. Researchers have combed bumble bees to remove their sticky cargo and discovered that, on average, a single individual is covered with nearly 10,000 pollen grains! Among the vertebrate pollinators, furry bats deliver a greater proportion of the pollen they pick up from flowers than do feathered birds. Slippery feather structures and active preening allow hummingbirds to shake off much of their hitchhiking pollen load.

## Sonoran Desert specialists:

Some desert pollinators do perform their services actively. The yucca moth is one such example. Females use specialized mouth parts to transfer pollen between yucca flowers. Some of the seeds resulting from this active fertilization will become food for the moth's larval offspring.


## Not all pollinators are equal:

Considered the queen of pollination, the European honeybee is not actually the best pollinator in many areas. Honeybees can outcompete native pollinators but may not pollinate native plants like mesquite trees as well as the natives do. Honeybees fail to provide the buzz pollination that many flowers require. They also forage earlier in the daytime and steal plant rewards before native pollinators are active.