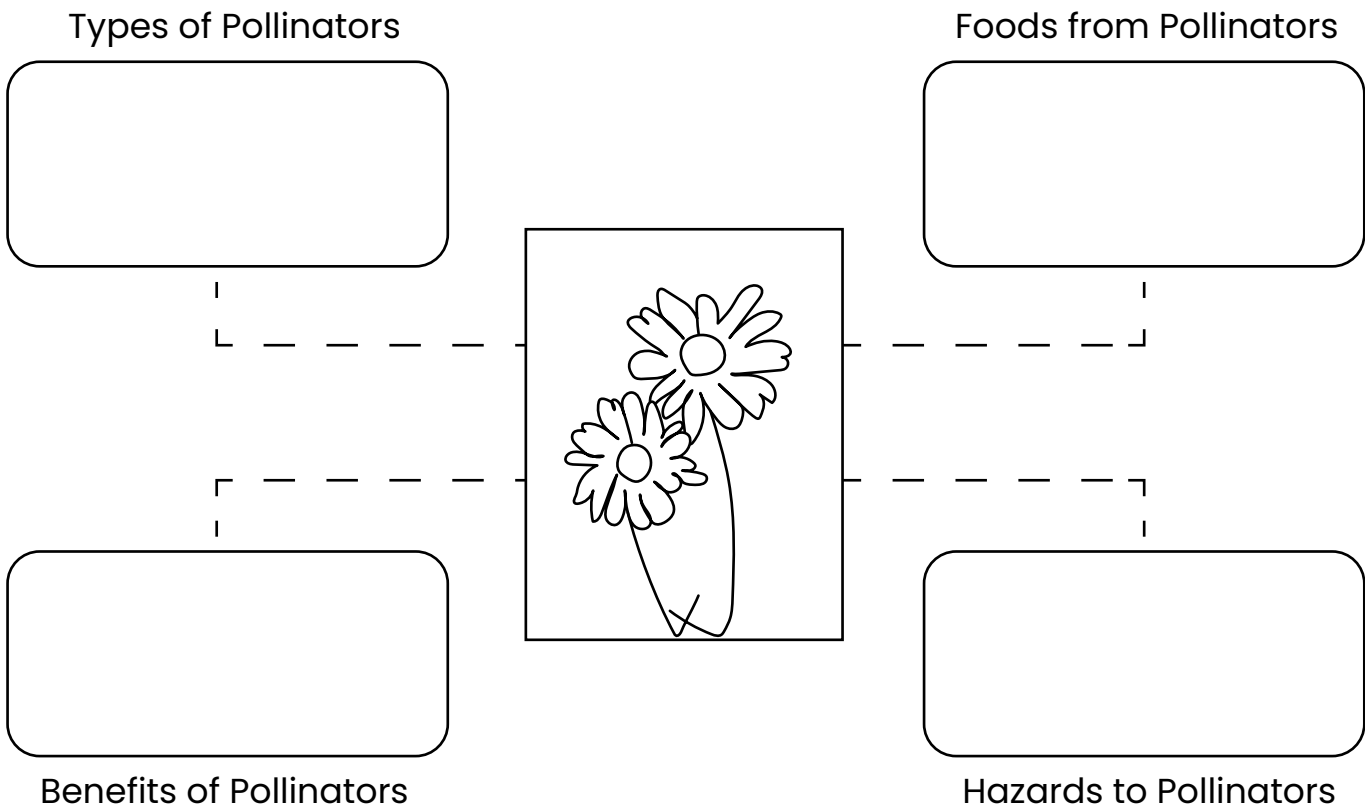


Why are pollinators important elements in an ecosystem?

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1. Look at the poster picture. Discuss with a partner what you observe in the picture.
2. What benefit do you think the bee gets from the bluebonnet? Does the bluebonnet get any benefit from the bee? List the evidence you find in the poster image that might support your claim?

3. Conduct research to complete the graphic organizer below.



Pollinators and Bluebonnets—Exploring nature’s interactions.

Image Information: The poster image depicts an interaction between a bee and a bluebonnet flower. Bluebonnets are profusely abundant across most of the southwestern United States. The flowers look like old time hats worn by women on the prairie, hence their name. In the early spring their flowers provide a supply of nectar and high-quality pollen that native bees can readily access. Bluebonnet flowers contain the reproductive parts of the plant. The pollen fertilizes the ova, producing seeds that are released from the plant.

Question: *Why are pollinators important elements in an ecosystem?*

Possible Student Answers: What benefit do you think the bee gets from the bluebonnet? Students may be aware that the bluebonnet flowers provide nectar and pollen that bees use for energy and food to feed their young. Does the bluebonnet get any benefit from the bee? Answers may include the idea that pollen is transferred by the bee from one bluebonnet flower to another enabling cross-pollination that fertilizes other flowers and increases genetic diversity. Evidence from the poster image might include pollen grains on the bee body; the full pollen sac (called the corbicula) on the bee’s hind leg; the feeding bee positioned on the open flower.

- **Types of pollinators:** bees, hummingbirds, bats, butterflies, moths, wasps, flies, insects
- **Food from pollinators:** fruits (apples, blueberries, avocados), vegetables (peas, pumpkin, squash, cucumbers) chocolate, coffee, nuts (almonds, cashews, pecans), and spices (basil, sage, lavender, rosemary)
- **Benefits of pollinators:** fertilization of flowers; maintain genetic diversity of plants, increased production of seeds, production of honey
- **Hazards for pollinators:** insecticides, climate change, loss of habitat, lack of native flora being planted, invasive plants, parasites

Interesting Info: It should be noted that the bluebonnet florets (the individual flowers) have a small white patch on their upper portion that is especially attractive to bees. The spot changes color as the flower ages, from white to a reddish-purple. This change coincides with a change in the quality and quantity of the pollen in the flower. This is beneficial to both the bee and the bluebonnet. The bees, focused on the white spotted florets where the fresh, sticky pollen is, carry the more fertile pollen to other bluebonnet florets which are dependent on that fresh pollen for reproduction. Recent research [Schaal and Leverich] has shown that bees can collect over 150 times more pollen from the white-spotted florets than the purple-spotted ones. The fresh pollen produces more seeds and ensures more abundant blossoms the following season.

Support the Phenomena:

NGSS Science and Engineering Practices #6 – Constructing Explanations: In K-2, students **make observations to construct an evidence-based account** for natural phenomena; In 3-5, students **construct an explanation** of observed relationships **and identify evidence that support it**; In 6-8, students **construct an explanation based on evidence** using their own experimental models; In 9-12, students **apply evidence to provide explanation of phenomena** consistent with scientific ideas, principles, and theories.

Materials: Grades K-8: Collect actual specimens (or images) of flowers (such as lily, tulip, coreopsis, sunflower, primrose) that have very distinct structures (such as stamen, pistil, petals, stem). Collect images of honeybees, bumblebees, hummingbirds, butterflies (ideally with pollen attached or feeding on flowers).

- In K-2, have students observe and record what they notice about the flowers and the pollinators. Focus on collecting their observations (similarities and differences among the flowers and the pollinators) and record that as their evidence. Students should recognize that flowers and pollinators have specialized structures (not needing to name them) that help them reproduce. Pollinators have specialized structures that help them feed on the flowers and transfer pollen.
- In 3-5, have students make detailed observations and take notes describing the similarities and differences they observe in the flowers and pollinator specimens. Students should investigate how the pollinators transfer pollen. From their investigation, they should create explanations of how the structures of the flowers and those of the pollinators support their survival.
- In 6-8, students make detailed observations of the flowers and pollinators and conduct research to explain how the unique structures in both aid in their survival. Students then devise their own device that mimics that action of the pollinators to artificially pollinate different flowers.
- In 9-12, students research the environmental hazards that adversely impact local pollinators and propose solutions to mitigate those effects. Students should investigate multiple solutions and provide data to support their claim as to which solution is most effective.

More information: To learn more about bluebonnets, visit the **Lady Bird Johnson Wildflower Center**. To learn more about pollinator habitat management, visit **Xerces Society for Invertebrate Conservation**.