

## Seeing the Invisible: Mutualism and Plant Reproduction



Imagine for a moment that you are in a field of waving grass. At the edge of the field there are trees of all kinds, including maples and crabapples, and in their branches, birds are chirping. Flowers nod in the breeze. Daisies are dotted throughout the field, and blackberries are growing along a small hillside. Everywhere there are birds. It's a tranquil and beautiful spring day. Can you describe how the different plants and animals relate to each other? Do you know how they ensure there will be a new generation of plants and animals beyond themselves? While it may seem invisible at first, what's happening in the field is a complex set of interactions between organisms to ensure the reproduction of the plants that make up the food web.

Our Earth is alive with organisms carrying through their life cycle of birth, reproduction and death. All plants, animals and other living things reproduce, resulting in new offspring or organisms. Sometimes this reproduction is unassisted, such as within bacteria, and sometimes it requires the assistance of others.

Sexual reproduction results in genetically new offspring from the fusion of male and female sex cells. Humans reproduce sexually and their offspring are genetically a combination of their parents' features and DNA. Asexual reproduction produces organisms identical to the parent, which simply

splits in two. Many plants, like onions, potatoes and carrots, reproduce asexually. Some, like blackberries, can reproduce in either way—asexually, by sending shoots into the ground to form new bushes, or sexually, through their flowers. Which way a plant or organism reproduces is the result of the organism's interaction with other organisms, climate and even weather over a long period. Each organism has mastered its individual survival and that of its species, which is why reproduction is an important part of the life cycle for any organism. When reproduction is disrupted, such as through the loss of bees or habitat, a species may struggle to survive, sometimes even becoming extinct.

### ***How It Works***

In angiosperms (the scientific name for flowering plants), the flower is the reproductive organ. All flowering plants are able to reproduce sexually. Hermaphrodite flowers—called perfect flowers—contain both male and female sexual organs. Imperfect flowers contain only male or female sexual organs. Similarly, some plants have both male and female flowers while others have only one. Each plant is a result of unique conditions, remember, so they can be different from each other.

Many flowers smell good and have bright colors to attract the birds, insects, and other animals that will help with pollination. Pollination occurs when pollen (male sex cells) fertilize the ovules (female sex cells) deep inside the flower. While some flowers or even plants can self-pollinate, most need help from weather or animals to do it. Each plant has evolved to maximize efficiency and effectiveness of reproduction.

Nectar is a sugar produced inside flowers that attracts bees and insects—in fact, bees use it to make honey back in their hives. (Beekeepers sometimes grow only one kind of flower so that all the honey the bees make is flavored like that one flower.) When a bee dives deep into the flower it gets covered in pollen, which it will then deposit—hopefully—on the female reproductive organs of the next plant it visits while collecting nectar.

Flowers that rely on the wind for pollination are less likely to be bright colored, or produce nectar or a heavy scent, since they don't need to attract pollinators. For most of these plants, their anther—where the male sex cells are located—hangs outside their flowers. Remember the waving grass in the field? Pollen is easily blown in the breeze from the anther of these plants, which include wheat, corn and maple trees. Have you ever known someone allergic to pollen? In the springtime such allergies can be very cumbersome because there is literally pollen in the air we breathe.

### ***Seeds and Fruit***

When an ovule is fertilized, it divides into different cells, and each fertilized cell becomes a seed. You may have noticed most seeds have a tough outer layer. This is called the seed coat and protects the seed. Inside each seed is an embryo and endosperm—a developing plant and its food source—so that a seed can be planted and immediately have the necessary ingredients to begin growing. The plant uses this food source until it grows leaves for photosynthesis and can produce food on its own.

An ovary of a plant can contain many seeds. A melon, for example, is an ovary with many seeds at its core. As the seeds mature, the walls of ovaries may change in taste and appearance to become attractive to animals. This is important because the animal will free the seeds as it consumes the fruit. Birds regularly eat berries, including the seeds in their protective seed coats. The seeds then pass through the bird's digestive tract and are released in the bird's droppings, often far from the original plant where they were consumed originally. Birds are very important for helping to spread seeds to new places. Similarly, in our example, the field deer may consume the crabapples and deposit crabapple seeds far from where they were consumed.

Did you notice that in the above examples all the organisms benefit from the interactions? Birds get food, for example, and the plant gets to find new ground for growing. Bees get nectar for their honey, and in return, the flowers get fertilized. The system is mutualistic, which means all organisms participating benefit from it.

***Reproduction In Context***

Many scientists study the reproductive habits of plants to better understand how we can improve our food sources. In 2013, scientists found that chemicals like insecticides, used to prevent bug infestation, can actually harm the health of bees. When bees are unwell they do less pollinating, which results in fewer seeds and fruits, actually diminishing our food supply. Once designed to increase a crop yield by protecting the crop from insects, insecticides are now killing the very insects needed to pollinate the crops. Scientists are still studying the process, but the decline of bees worldwide is a global concern.

Name: \_\_\_\_\_ Date: \_\_\_\_\_

1. How can plant reproduction be described?

- A Plants reproduce in only one way.
- B Plants reproduce in a variety of ways.
- C Plant reproduction has no effect on animals.
- D Plant reproduction always involves pollen.

2. What does this passage explain?

- A This passage explains the life cycle of a deer and what happens when that cycle is disrupted.
- B This passage explains sexual reproduction in human beings.
- C This passage explains plant reproduction and its importance.
- D This passage explains what the differences between apples and crabapples are.

3. Some plants need help to reproduce.

What evidence from the passage supports this statement?

- A Some plants rely on bees to spread pollen from one flower to another.
- B Some plants reproduce asexually by sending shoots into the ground to form new bushes.
- C Insecticides are used to prevent bug infestation.
- D Humans reproduce sexually, and their offspring receive traits from both parents.

4. What is the purpose of plant reproduction?

- A to prevent bug infestation
- B to produce nectar
- C to seem invisible at first
- D to create new plants

5. What is this passage mainly about?

- A the similarities between the reproduction of bacteria and the reproduction of blackberries
- B the similarities between birds that eat seeds and bees that gather nectar by flying from one flower to another
- C the different ways plants reproduce and the impact of plant reproduction on other living things
- D the different kinds of trees that are found in fields, including maples and crabapples

6. Read the following sentences: "Our Earth is alive with **organisms** carrying through their life cycle of birth, reproduction and death."

What does the word **organisms** mean?

- A harmful chemicals
- B living things
- C asexual reproduction
- D bright colors

7. Choose the answer that best completes the sentence below.

Plant reproduction is important to animals; \_\_\_\_\_, it is important to plants as well.

- A such as
- B in contrast
- C as an illustration
- D obviously

8. How do birds help spread the seeds of berries?

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9. How do birds benefit from spreading the seeds of berries?

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10. Explain how plant reproduction can affect other living things. Support your answer with an example from the passage.

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## Teacher Guide &amp; Answers

Passage Reading Level: Lexile 1175

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8. How do birds help spread the seeds of berries?

**Suggested answer:** Birds help spread the seeds of berries by eating them and excreting them in a different place.

9. How do birds benefit from spreading the seeds of berries?

**Suggested answer:** The simplest response, stated in the passage, is that birds get food. Students may also take the long view and answer that spreading seeds benefits birds by increasing their future food supply.

10. Explain how plant reproduction can affect other living things. Support your answer with an example from the passage.

**Suggested answer:** Answers may vary, as long as they are supported by the passage. After questions 8 and 9, students should be able to draw on the berries-and-birds example here. In this case, plant reproduction provides food to other living things. Berry seeds are spread by birds eating the berries and excreting their seeds in a different place.