CANADIAN WILDLIFE FEDERATION

20+ minutes

Pollination Puzzles

Learning Objectives

Students will be able to:

- Identify biotic and abiotic pollination agents.
- Identify some ways that plants have adapted to attract or favour specific pollinators.

Method

Many seed-producing plants have adapted to attract or, at least favour, certain pollinating agents. Students decipher clues to match flower cards with pollinator agents.

Materials

- Copies of Plant and Pollinator Agent Cards

Background

Not all plants are seed-producing plants (spermatophytes) but those that are fall into two major groups: flowering plants and conifers. Of the more than 230,000 known species of plants worldwide, about 200,000 are flowering plants and another 500 are conifers.

Most seed producing plants require pollination in order to reproduce. Yet, pollen cannot move on its own. Different types of plants depend on different biotic and abiotic agents to bring male pollen to meet the female egg cells.

- **Biotic** (living) pollinators, do about 80 percent of the work. Insects such as bees, butterflies and beetles are the most important biotic pollinators and, in Canada, animals such as hummingbirds also get in on the act.
- **Abiotic** (non-living) agents such as wind and water are important pollinators for some types of plants. Grasses, corn and some trees, such as pines, rely on the wind to transfer pollen. These plants produce huge amounts of pollen to maximize the chance for pollination to occur. Water, the least common way to move pollen, is mostly used by aquatic plants.

There are also some plants that can self-pollinate (a process called **autogamy),** while others must cross-pollinate (**syngamy**) to produce viable seeds.

- In autogamous plants, pollen moves from the male to the female part of the same flower or the same plant and then fertilizes an egg cell.
- In syngamous plants, seeds are produced only when pollen from one plant combines with the eggs of a different plant of the same species.

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Through time, seed-producing plants have adapted and specialized to take better advantage of particular pollination agents. These adaptations include:

- **Colour** - Most flowers use specific colour combinations in their petals to capture the pollinator's interest. Different types of animals see colour differently and have different preferences. Many petals also incorporate patterns such as stripes to lead an insect into the flower where the pollen is waiting.
- **Shape -** Flower shape plays a big role in determining which species of pollinator can get to where the nectar is stored. Open, broad flowers provide a "landing pad" for butterflies, while trumpet-shaped flowers cater to hummingbirds that can hover while they poke their long, thin beaks deep into blossoms. The twisted form of the snapdragon
  favours tiny insects that can penetrate small spaces.
- **Scent** - The smell of flowers can also lure pollinators. Butterflies tend to be attracted to flowers with the weakest scent, while nocturnal moths are attracted to those with heavy scents. Some flowers, such as the red trillium, smell downright foul to attract flies by mimicking the colour and smell of a fly's favourite food — rotting meat.
- **Timing -** Some flowers open only at night and are light-coloured to better attract nocturnal pollinators. The flowers of some orchids, though open in the day, only produce scent at dusk when their pollinators are active. While some pollinators can get food from a diversity of plant species, others are very specialized and rely on one.

Activity

1. Discuss biotic and abiotic pollination agents and their importance to plants. Point out some of the ways that plants have adapted to attract pollinators.
2. Give a "plant" card or "agent" card to each student and give them a minute or two to study the picture and the information on each card.
3. Allow students to circulate in the room and try to locate their partner. Those with plant cards should try to locate the correct pollinating agent, while the agents should try to locate their matching plant.
4. Once all pairs have found each other, reconvene as a group. Pairs should share and discuss why they think they have found the correct match and how the adaptations of their plant contribute to pollination success. Correct matches are as follows:

    - Raspberry Flower and Native Bee
    - Columbine and Hummingbird
    - Red Trillium and Fly
    - Corn and Wind
    - Goldenrod and Beetle
    - Milkweed and Butterfly

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Variations

- Carry out the activity as described above but give an entire set of cards to each student or group of students and have them match plants to pollinating agents based on the clues on the cards. Have students discuss why they think they have found the correct matches and how the particular adaptations of the plants contribute to pollination success.

Extensions

- Have students design a hypothetical flower and a matching pollinator that would be well adapted to it.
- Have students create a radio, TV or magazine advertisement to attract the right pollinators on behalf of a particular plant.
- Have students discuss possible threats to pollinators and what happens to the natural cycle of plant renewal if there are fewer pollinating organisms to do the job.
- Pair classes of older students with a class of younger students who are also studying plants to assist in reading and discussion.
- Have students conduct different components of this activity on different days. Have students learn about the plant component on the first day and about pollinators on the next day. On day three, they could match plants and pollinators as an assessment of their learning.

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