

Prairie Scavenger Hunt: Studying Plant Adaptations

Activity Overview

Students search for certain types of plant adaptations.

Objectives

Students will:

- Understand how a plant's structure can reflect adaptations to its environment
- Be introduced to the structure and function of leaves and roots
- Observe and begin to recognize several prairie plants

Subjects Covered

Science and Art

Grades

K through 8

Activity Time

30 minutes minimum

Season

Late spring, Summer, Early fall

Materials

Small bags (one for each 2-3 students) each including a piece of waxed paper, piece of fur, thin green ribbon, doily or "snowflake" cut paper piece and sandpaper

State Standards

Science: F.4.1, F.4.2, F.4.4, F.8.2, F.8.1, F.8.9, F.12.9

Source

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Background

Water is often limited in the prairie environment. In the summer, relatively low rainfall and high temperatures can make water scarce. Additionally, the frozen water of the winter months is unavailable to plants. As a result, prairie plants have many traits that are believed to be adaptations to these low water conditions.

If a plant has a large root (the water-absorbing surface) relative to its top (the evaporative surface from which water is lost) it is well suited to a dry environment. Many prairie plants achieve this with an extensive root system which either spreads laterally up to four feet in every direction or delves deeply with roots that can extend as far as 7 meters into the ground. Large root systems also help the plant access scarce soil moisture. Reduction in the above ground surface area can be seen in finely divided leaves, slender leaves or in a generally small above ground size. Up to two thirds of a prairie plant's total mass is below the ground.

Plants can also adapt to low water conditions through various mechanisms that reduce evaporation of the above ground portion of the plant. These adaptations include vertical positioning of the blades, rolling of the leaf blades, fuzzy hairs on the leaf, water storage in sticky juices, hard coated seeds and a life cycle that can be completed rapidly in early spring when water is relatively abundant.

The items in the scavenger hunt reflect the several low water adaptations. Waxy leaf surface (waxed paper) Waxy coated leaves retain water and retard evaporation. Similar to how chapstick is used to prevent lips from drying out.

Hairs on leaf surfaces (piece of fur) Hair reflects sunlight, keeps leaves cooler, creates a local high humidity "boundary layer" on leaf surface.

Finely divided leaves (paper doily) Finely divided leaves allow wind to pass, retarding evaporation from the leaf surface.

Narrow, curled leaf (green ribbon) Narrow vertical leaf can curl up retarding evaporation from the leaf surface.

Prairie plants have developed adaptations in response to conditions other than drought, such as competition for space, light, and pollinators, as well as conditions of high wind, grazing and fire. However, the drought-related adaptations are distinctive, varied and relatively easy for students to observe and often parallel adaptations for grazing or fire conditions..

Several prairie plants have rough leaves that are thought to deter predators. A piece of sandpaper in the scavenger hunt bag can represent the rough leaf of a Silphium, sunflower or coneflower. The rough leaf is a good example of how a plant's feature could be an adaptation or could be an artifact of

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another aspect of the plants development and physiology. For instance, large stoma on the leaf surface might cause roughness that is unrelated to predator deterrence.

Note: If you have poison parsnip in the site for this activity, be sure students recognize it before starting.

Activity Description

Divide into groups of 3-4, each group receives a bag. How many different plants you can find that have leaf adaptations represented by the objects in your bag? Trace a leaf, sketch the plant or tie a piece of yarn around it to show others. Be careful not to harm the plant. Regroup and compare findings.

Extensions

- Find example of adaptations to other factors such as competition for space, light or pollinators.
- Create a “perfectly adapted” prairie plant. Build a model of the plant and present it to others. After discussion and examining other students’ work, revise your own plant.
- For each adaptive trait observed, hypothesize a different condition that could have caused the same trait.
- Describe animal adaptations that could have arisen in response to the dry prairie conditions.

Additional Resources

- Egan, D. (2002). Arboretum prairies. Madison, WI. University of Wisconsin-Madison Arboretum.
- Gruchow, P. (1995). The kingdom of grass: An introduction to the prairie world. Available through the Earth Partnership for schools Program.
- Madson, J. (1995). Where the sky began: Land of the tallgrass prairie. Ames, Iowa. Iowa State University Press.

Assessments

- Describe 3 examples of how plant structures are modified due to low water availability and high temperatures.
- How do prairie plants survive drought, high temperatures, and intense sunlight?
- Given the specific adaptations prairie plants have developed in response to low water availability, what kinds of adaptations would you predict plants might develop in response to excess water availability?