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# Underground Prairie

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## Activity Overview:

Students build a full-sized model of a prairie plant's roots.

## Objectives:

- Students will
- Create a prairie root model
- Learn about the structure and function of plant roots
- Gain a better understanding of soil ecology, flora and fauna

**Subjects Covered:** Science and Art

**Grades:** 3 through 8

**Activity Time:** 1-2 hours

**Season:** Any

## Materials:

Construction materials such as thread, pipe cleaners, yarn, fabric, raffia, pom-poms, crepe paper, paper clips, twist ties, burlap twine, wire and scissors

## State Standards:

### Science:

Communicate results (C.4.6)

Discover how organisms meet their needs (F.4.1)

Investigate how organisms respond to internal/external cues (F.4.2)

Find connections among living and non-living things (F.4.4)

Investigate structure & function of organisms (F.8.1)

Show organism's adaptations (F.8.2)

Show organism's place in ecosystems (F.8.8)

Evaluate functions of a cell (F.12.1)

Find connections between functions of cells and organisms (F.12.4)

## Background

Perhaps the most striking view of the prairie is the one we never see. Underneath the unassuming soil surface is an enormous, dense forest of prairie roots. The roots interlace throughout the soil, creating a complex and biologically active world. The roots are frequently twice as large as the above ground portion of prairie plants. Think about inverting the prairie and doubling its size and you begin to gain a sense of what lies below the soil surface.

In addition to the roots, there is a complex collection of flora and fauna nested in some of the most rich and fertile soil on earth. The broadly branched and deep taproots annually slough off and regenerate approximately 50 to 80 percent of their root mass. This root matter adds a tremendous amount of organic matter to the soil, contributing to the extremely high soil fertility. It is said that on any acre of prairie there was more total weight in soil organisms below the ground than there was in a bison herd above ground.

In this activity, students create full-sized models of prairie plant roots. (You may wish to provide a maximum root length for the room.) By attaching the roots to the classroom or assembly room ceiling, the room is then transformed into an underground prairie.

## Activity Description

1. Spread out and extend your arms at shoulder height. Imagine that your arms are resting on the ground and that you are a prairie plant. The part above your shoulders represents the above-ground part of the plant; the rest of your body representing the roots below ground.
2. Choose a plant from the "Prairie Plant Roots" descriptive list on the following pages. With the materials supplied, you are to create a full-sized model of the root system of that plant. Try to represent all features of the root as accurately as possible. When finished, attach a name identification label to your root.
3. Attach your root model to a coat hanger and hang from a line, or drop ceiling, high enough to walk (or dance) through the roots. Some students play instruments while the rest form a 'conga line' through the hanging roots.

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## Creating an Underground Prairie (cont.)

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### Extensions

- Add models of other organisms that inhabit the underground portion of the prairie. These may include:
  - prairie dog
  - badger
  - black-footed ferret
  - mole
  - thirteen-lined ground squirrel
  - other rodents
  - snakes
  - other reptiles
  - soil insects and other soil organisms
- Do further research on root information about a specific plant.
- Students can try to grow seedlings of their plant and record root growth over time. What is the ratio of root biomass to above-ground biomass change over time, if any?

### Additional Resources

- Brown, L. (1979). *Grasses—An identification guide*. New York: Houghton Mifflin.
- Curtis, J.T. (1959). *Vegetation of Wisconsin*. Madison, WI: University of Wisconsin Press.
- Kirt, R.R. (1995). *Prairie plants of the Midwest: Identification and ecology*. Champaign, IL: Stipes Publishing Co.
- Runkel, S.T. & Roosa, D.M. (1989). *Wildflowers of the tallgrass prairie—The Upper Midwest*. Ames, IA: Iowa State University Press.
- Prairie Enthusiasts' Website: <http://www.prairie.pressenter.com/>
- Soil Science Society of America's comprehensive website has a wealth of resources, lessons and links. <https://www.soils.org/lessons/resources/>

### Assessments

- Students can make presentations on their root models and describe the plant's unique adaptations related to the root structures.
- Write short narratives describing their plant's root system and how it may aid in a prairie plant's survival.
- Ensure student root models are accurately constructed and identified.

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## Creating an Underground Prairie: Prairie Roots

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Adapted from *Where the Sky Began*, by John Madsen, Houghton Mifflin Company, 1982, Boston

### **Compass Plant or Prairie Dock**

These have deep, heavy rootstocks that drive far into the earth to subsoil moisture supplies. The tap root of an old plant may be as thick as a person's wrist just below the surface of the earth. Although it may be less than an inch in diameter only three feet down, this main root may drive almost 14 feet into the prairie earth (see illustrations).

### **Blazing Star**

The drought-resistant western blazing stars, such as dotted button snakeroot, may penetrate as much as 16 feet. Professor John Weaver of the University of Nebraska found that a plant might have few lateral rootlets until an extreme depth is reached, and then it fills the soil with small, silvery-white rootlets.

A less drought-resistant eastern blazing star, the large button snakeroot, has a root system that may extend only two feet into the soil.

### **Prairie Rose**

Although not really a forb, the "half-shrub" prairie rose has a mighty root system; the roots of one older plant were found to extend almost straight down for 21 feet.

### **Purple Coneflower**

This has a thick fleshy taproot that is almost unbranched and may reach eight feet into the prairie soil.

### **Purple Prairie Clover**

In the first two feet of soil, this plant has relatively few absorbing roots and rootlets but the root systems often extend downward almost six feet and branch widely at the lowest levels. This is a legume so its roots contain small nitrogen-fixing nodules.

### **Leadplant**

Leadplant's ten feet long roots are so strong that the pioneer plow points were said to make a sharp snapping sound when they tore through them. It was nicknamed the prairie shoestring (see illustration).

### **New Jersey Tea**

Also called redroot, this plant was the champion bane of the pioneer plowmen. Its huge burl-like rootstocks defied many a breaking plow and ox team. The roots are about 12 inches long and one-half to one inch thick; contorted and knotty. The pioneer nickname "rupture root" just about says it all.

### **Grasses: Big Bluestem, Indian Grass and Switch Grass**

Grasses produce an extremely dense mat of lateral roots and rootlets. The majority of growth is usually in the first five feet of soil and can reach down beyond ten feet.

### **Prairie Violet**

Prairie violets have very shallow root systems, which grow entirely in the top foot or two of the soil.

### **Prairie Sunflower**

The deep roots can extend five to ten feet down but the majority of the lateral root growth is in the top couple of feet. The plant spreads through underground rhizomes.



from Seasons of the Tallgrass Prairie, Carol Larrow, William Morrow & Co, 1980

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