

Getting to the Root of the Matter



LEVEL: Grades 4-6

SUBJECTS: Science, Language Arts

AZ ACADEMIC STANDARDS: R-F3, R-E2, W-F1, W-F4, W-F5, W-E5, SC04-S1C1, C2, C3, C4, S2C1, 2C2, S4C1, C3, C4; SC05-S1C1, C2, C3, C4, S2C2, C1, S3C2, S4C1; SC06-S1C1, C2, C3, C4, S2C1, C2, S4C1

MATERIALS

For each group of 3-4 students: Four 8 oz. Styrofoam cups, a Styrofoam tray, tablespoon, waterproof marker, paper, potting soil, water, four different types of seeds soaked in water overnight (grass, bean, tomato, and radish seeds are good choices), pictures of different types of roots.

VOCABULARY

minerals, erosion, ecosystems, fibrous root, taproot, germinate

RELATED LESSONS

If it Smells Good, is Edible and Attracts Wildlife, Then it's a Practical Garden!
Where do they Go?
Don't Wait, Just Propagate!
Let's Make Stew
How do Plants Make Food?
Survival of the Fittest
This Can't be a Plant
Soggy Seeds
Plant Seedling
Plants, Plants and More
Plants

SUPPORTING INFORMATION

Plants use roots for several reasons, all of which are connected to each other. They anchor the plant in the soil, provide support, and

absorb necessary water, nutrients, and minerals from soil (or other growing mediums). Plants have many different root structures. As a seed germinates, the first part to emerge is the primary root. It anchors the plant and begins to absorb water and minerals so the shoot can develop. Some plants have a fibrous root system. You can identify these by a network of branching root-lets and root hairs appearing off the primary root. These networks can be extensive, which makes them particularly good at holding on to soil particles and in helping to prevent erosion. These types of roots support many types of ecosystems such as dunes and maritime forests. Grass has this type of fibrous root system. Grasses usually grow on wide, flat plains. These grass roots help hold the soil in place. Have you ever tried to pull grassy weeds out of the ground? The soil clings to the roots in a large clump. Without a cover of grass, soil may wash away in floods or blow away in dust storms. Another type of root is a taproot. An alfalfa plant has one main root or a taproot. Like a drill looking for water, the taproot digs in to the ground. It may grow down 15 ft. in a single season. When soil near the surface of the ground is dry, the taproot of the alfalfa is able to grow downward fast so that it can absorb the water deep in the ground. In most roots, tiny hairs are the bridges between the root

BRIEF DESCRIPTION

Roots anchor plants in place and transport minerals and water necessary for plant survival. They also hold soil in place, preventing erosion and protecting ecosystems.

OBJECTIVES

1. Students will compare tap and fibrous roots.
2. Students will grow four types of plants, observe roots, and write observations.
3. Students will identify which types of roots prevent soil erosion better.

ESTIMATED TEACHING TIME
3 weeks

SUPPORTING INFORMATION (cont'd)

and the water and dissolved nutrients in the soil. These root hairs provide a huge surface area for absorbing water and nutrients.

Definitions: *minerals*: an inorganic substance found naturally in the earth that plants can use as a nutrient
erosion: a wearing away of the earth
ecosystem: a community of plants and animals and the environment with which it is interrelated
fibrous root: a shallow root with many small branches
taproot: one main root of a plant
germinate: to start developing or sprout from a seed

GETTING STARTED

Groups of 3-4 students, and soak seeds in water overnight before experiment begins.

PROCEDURES

1. Discuss with students what the purposes of the roots of plants are. Show them the pictures of different types of roots. Discuss how these pictures are similar or different.
2. Explain that they will conduct an experiment to demonstrate or test the holding power of roots of various plants (grass, beans, tomatoes, and radishes, or whatever seeds you have provided).
3. Have one person from each group get the materials: Four 8 oz Styrofoam cups filled ½ inch from the top with potting soil, a tray, and a waterproof marker to label the cups with their names. The teacher should then go around and distribute one of each seed to the groups. The directions for planting depth should be followed from the seed packets. Plant one seed in each cup. Gently water the seeds. Maintain the soil moisture by adding one

tablespoon of water to each cup everyday. Cups should be kept in a well lit spot so that germination is successful.

4. Once seeds have been planted, have each group predict which plant roots will hold soil best. Each group's prediction should be recorded on a separate log or you could keep a class log of predictions.
5. After three weeks, have students gently pull each plant out of its soil. Make sure they note and log the difficulty each plant presents as they try to pull it from its cup. Students should also observe and log the amount of soil clinging to each plant's roots. A sketch of each plant's root system could also be done with this step.
6. Have students compare the size and shape of each plant's root system and log their findings.
7. Have students compare their results with their original predictions. Have them log which roots held more soil and conclude what that tells you about the types of plants that would best prevent erosion (roots with many branches- fibrous roots).

EVALUATION OPTIONS

1. Students can write a hypothesis or prediction about which plant's roots will hold soil best.
2. Students can write a report about each plant's roots, including: difficulty pulling plant from the cup, amount of soil clinging to each plant's roots, a conclusion about each plant's ability to prevent erosion, and compare their conclusion to their original prediction.
3. Present an oral report to the class.
4. Create four colorful drawings of each plant and its root system to display in the classroom.

EXTENSIONS AND VARIATIONS

1. Students may try planting the same seed at different depths to determine if that affects the plant's root system.
2. Students may try varying the amount of water used for each plant to see if that affects root systems.
3. Students can try planting different numbers of seeds in each cup to determine how that may affect the root systems of plants.

RESOURCES

1. Gibbons, Euell. *Stalking the Wild Asparagus*. McKay, 1978.
2. Kite, Patricia L. *Gardening Wizardry for Kids*. Barron's Educational Series, Inc., 1995.
3. Suzuki, David. *Looking at Plants. A Book of Things to See and Do*. Warner Books, New York, 1985.

CREDITS

1. *Project Food Land and People Resources for Learning*. 2000
2. Abruscato, Joseph. Fossaceca, Joan. Hassard, Jack. Peck, Donald. *Holt Science*. 1986.

EDUCATORS' NOTES

CURRICULUM DESIGN

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