2017

Prairie Roadshow

Tallgrass Prairie Center

PRAIRIE ROADSHOW

Overview
Students learn about the importance of prairie plants -- **especially prairie roots** -- in Iowa roadsides.

Objectives:
- Draw life-size prairie plants with an emphasis on underground growth.
- Describe the important services prairie roots provide in roadsides and other landscapes.
- Explain how prairie roots provide these services.

Subjects Covered:
Science, Mathematics

Grades: 4-5

Group size: Any, though floor and wall space may be a limiting factor. If group is small, students may draw more than one plant.

Activity Time: 30-45 min.

Season/Location:
Any/Inside

Materials:
- Roll of craft paper or newsprint and masking tape
- Markers, crayons and/or colored pencils
- Yardstick, tape measures or othe r measuring device
- Prairie root display or banner, if available
- Books, posters and images showing prairie plants and root structures

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BACKGROUND

Most travelers on Iowa's roads and highways rarely pay attention to the roadsides. After all, what's so interesting about a ditch? Well those unnoticed roadsides serve an important purpose: They collect rainwater running off fields and the road itself, then channel that **runoff** to the nearest stream or river. Think about what would happen to the fields and roads if rainwater had nowhere to go after a storm!

While you might see water moving through the ditch after a big storm, most of the time it's moving along the ground, hidden under grass and other vegetation. That roadside vegetation is important because it holds the soil in place while water moves through the ditch. Without roadside plants, soil would **erode** and wash into streams and rivers, eventually causing a build-up in waterways called **sedimentation**. The vegetation also keeps some of the runoff ***in*** the ditch, by slowing its movement and allowing it to soak into the soil (**infiltrate**). This helps prevent flooding.

Because the job of roadside vegetation is so important, Iowa's road crews are careful to plant the most suitable grasses and flowers for reducing runoff and erosion. Plants with ample above-ground growth provide good soil cover, catching raindrops before they hit the ground and slowing surface runoff. But it's the plants' *below-ground* growth that does the bulk of the work!

Plants with *large*, *perennial*, *roots* anchor ditch soil in place year-round, and creates pathways for rainwater and snowmelt to infiltrate. What kind of vegetation provides the best above-and below-ground protection for our roadsides? ***Iowa's native prairie vegetation!***

VOCABULARY

Erosion: Movement of soil or sediment by water, wind or ice.
Infiltration: The movement of water into the soil.
Perennial: Living for many years.
Runoff: Water that flows across the landscape, potentially carrying soil and pollutants with it.
Sedimentation: A buildup of silt in waterbodies.

TEACHER PREPARATION

- Gather materials.
- Prepare to project images (www.tallgrassprairiecenter.org/curriculum_images).
- This prairie roots illustration may be useful for younger students.
- If necessary, review Resources and Appendix to familiarize yourself with Iowa's native prairie plants, ecosystem services and the role of roadside vegetation.

ACTIVITY

1. Introduce the activity by asking the questions posed in the Background. For example: Do you pay attention to roadsides? What do ditches do for us? What would happen if they didn't exist?
2. Encourage students to think about these questions and brainstorm answers with a partner or small group. Guide and enhance the discussion with illustrations and images, as well as a root display or banner.
3. Tell the students they are going to turn a portion of a school hallway into a roadside prairie with the hall being the road and the walls being the roadside. Students will create a prairie roadside by drawing life-size prairie plants on craft paper or newsprint and posting on the wall.
4. Using books, web links and/or projected images, students familiarize themselves with roadside prairie plants. To keep the focus on the plant roots, call attention to the root display or banner, and/or images that depict prairie roots' size and structure. Have students note the differences in root "architecture," e.g., fibrous roots, tap roots, corms and rhizomes. Discuss how these differences might affect the plants' survival and growth.
5. Give each student a 10-12' length of paper and a yardstick or tape measure. Students will roll out their paper on the floor, measure to find the halfway point and draw a horizontal line (ground level). Other measurements may be recorded and converted to different-sized units in the same measurement system.
6. Students may now draw a prairie plant – both the above- and below-ground portions. (If there's not enough floor space for each student to create his own drawing, students can work in teams.) Use measuring devices to make sure relative length of root and height plant are correct.
7. Because the focus of this activity is the roots, continue to discuss the role of roots in the roadside. Can the students think of creative ways to depict the roots' ecosystem services (erosion prevention/rainfall infiltration) in their drawing?
8. Post drawings in hallway. (A classroom wall will work as well.) If ceilings aren't high enough, fold drawing, and hang with ground-level at floor level. Roots will extend onto hallway floor.

ASSESSMENTS

Educators should ask questions during and after the activity to check for understanding. Questions are included in the Activity (above) and here:

1. What would happen to soil in the ditch if plants weren't there?
2. What makes a plant good at preventing erosion and allowing water to infiltrate? Explain your answers.
3. Why do highway and road crews plant prairie in the ditch?

EXTENSIONS

1. Diverse plant communities attract diverse animal communities. Have the students think about the organisms that live underground in a prairie. From vertebrates (like ground squirrels) to earthworms and fungi, these organisms aerate the soil and improve its absorbency by convert decaying plant material into rich humus. As students add these organisms to their picture, have them discuss the organisms' role in the prairie food chain and how their presence enhances ecosystem services.
2. Roadsides aren't the only places designed to capture rain runoff. What are some other examples? (Grass waterways in crop fields, raingardens, bioretention ponds.) Have students brainstorm and discuss landscapes in which native prairie could provide important ecosystem services, then use online research to determine if prairie is currently being planted in these landscapes. Report findings to the class.

RESOURCES

The World Beneath Your Feet:
https://secure.iowadot.gov/lrtf/docs/WorldBeneath.pdf
The Amazing Diversity of Root Forms:
http://www.botany.wisc.edu/zedler/images/Leaflet_15_jan_17.pdf
Incorporating Prairies into Multifunctional Landscapes:
https://www.nrem.iastate.edu/research/STRIPs/files/publication/2011-02-incorporating-prairies-multifunctional-landscapes.pdf
Roadsides for Wildlife:
http://www.dnr.state.mn.us/roadsidesforwildlife/index.html
Put Down Some Roots (Be sure to see the back side of this poster for more information.):
http://files.dnr.state.mn.us/assistance/nrplanning/community/roadsidesforwildlife/putdownroots_poster.pdf
Prairie Roots (Scroll down the page to March 2009 Newsletter link):
http://www.iowadnr.gov/Conservation/Prairie-Resource-Center
Iowa Living Roadway Trust Fund:
http://www.iowadot.gov/lrtf/

STANDARDS

4-LS1-1 Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.
4.MD.A.1 Solve problems and conversion of measurements from a larger unit to a smaller unit.
5-LS2-1 Develop a model to describe the movement of matter among plants, animals, decomposers, and the enviroment.
5-ESS3-1 Obtain and combine information about the ways individual communities use science ideas to protect the earth's resources and the environment.
5.MD.A.1 Convert like measurement units within a given measurement system.

APPENDIX

A: Prairie Roots - Ecosystem Services

Prairie Roots lesson plans created by the Tallgrass Prairie Center
with funding from the Iowa Living Roadway Trust Fund.

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ECOSYSTEM SERVICES OF PRAIRIE ROOTS

Superior erosion control

The dense network of roots under prairie vegetation is exceptionally efficient at holding soil in place. These perennial roots are year-round soil "anchors." This is particularly notable in a state dominated by annual row crops, where topsoil lacks adequate protection much of year, and has almost no protection during the rainy, spring season.

Soil loss from agricultural fields, urban sites and other settings can be reduced by strategically placing prairie in the landscape.

Increased rainfall and runoff infiltration

Healthy, diverse root communities improve soil structure, adding underground air spaces and absorbent organic matter. This makes the soil under prairies act like a sponge. As a result, water more easily soaks into the soil rather than flowing across the landscape. This reduces flooding and keeps sediment out of waterways.

Between rainfall events, the absorbent soil slowly releases water to the large prairie roots.

Reduced nutrient pollution

Nutrient pollution refers to the contamination of surface water by excess fertilizer, particularly nitrogen and phosphorus. Nitrogen makes it way to rivers and lakes in water leaching though the soil; phosphorus enters water bodies attached to soil particles. Crop fields are especially prone to nutrient loss in the spring because annual crops are not yet growing.

Perennial prairie roots begin growing in early spring and are able to take up excess nitrogen leaching through the soil from crop fields higher on the landscape. Prairie roots reduce phosphorus pollution by helping to control soil erosion.

Invasive weed control

The soil underneath a mature prairie is filled with a tangle of prairie roots. The "architecture" of these roots is diverse, including fibrous and tap roots; course and fine roots; deep and shallow roots; bulbs, corms, stolons and rhizomes. A dense and diverse prairie root system leaves little space and few niches for invading weeds to establish.

Carbon sequestration

The removal and long-term storage of carbon – usually CO2 – from the atmosphere is known as carbon sequestration. Through photosynthesis, plants convert atmospheric CO2 into food. Some is released through respiration and decay, but much more is stored.

Prairie plants are especially adept at storing carbon, locking up large amounts in their roots. When the roots die, microorganisms move some of the carbon to the soil where it stabilizes, remaining below ground for hundreds of years.