FONTENELLE FOREST

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Agents of Change

Pre- and Post-Trip Activity Suggestions

5th & 6th

Welcome to the natural world of Fontenelle Forest and Neale Woods Nature Centers! Below is a guide to pre and post field trip activities that you can do with your students either indoors or on your school grounds. These activities will greatly enhance your students' field trip experience and are also a lot of fun! We look forward to your students' arrival and are excited to provide them with a fun and educational experience. If you have any questions, please call us at 402-731-3140.

The following activities meet NE State Science Standards: SC 5.1.1, 5.4.2, 5.4.4, 8.1.1, 8.2.1.e, 8.4.2, & 8.4.4

NE Language Arts: LA 5.1.6, 5.2.1a, 5.3.1, 5.3.2, 5.3.3, 6.1.6, 6.2.1a, 6.3.1, 6.3.2, 6.3.3

1) Erosion by Water

Adapted from the NRCS booklet, Soil Does More Than Get You Dirty

Question: How does soil move from one place to another?
Time: 45 minutes, Outdoor activity
Student Outcome: Students will observe the interaction between soil and water and sod and water. They will be able to explain the similarities and differences found in these two situations.

Directions:

a. Divide class into research teams of 3-5 students per team.
b. Each team needs:
   - Two paper plates: one with two cups of soil on top and the other with a six inch square piece of sod. *Note: These samples need to be from the surrounding environment to make this relevant. Do not use a potting mix since its origin may not be local.*
   - A large piece of white paper (e.g. butcher paper) under each sample.
   - Two cups with eight ounces of water in each
   - Pen
c. This experiment is messy, so prepare for clean-up.
d. Each research team will pour water from two feet above the soil sample. Use your pen to mark the splatter spots on the white paper.
e. Each team now pours the second cup of water from two feet above the sod sample. Use your pen to mark the splatter spots on the white paper.

Discussion:
Compare the results from each research team.
Did the results surprise you?

What variables may contribute to erosion by water?
How does this compare to the actual environment?

Extensions: This can be observed during or after a rainstorm in an area around your school. Most likely, the environment has been altered enough to see the results of erosion somewhere on your school's property. Have your students be soil scientists and search for possible research sites. This will undoubtedly lead to discussions of land use. You may even find it helpful to bring in a guest speaker from the county extension office or the city offices to discuss this issue of erosion.
Math Extensions: You can have the students calculate the area covered by the splatter. Is the area covered by the loose soil splatter larger or smaller than the area covered by the sod square splatter?

2) Erosion by Wind
Adapted from the NRCS booklet, Soil Does More Than Get You Dirty

Question: How does soil move from one place to another?
Time: 25 minutes, Outdoor activity
Student Outcome: Students will observe the interaction between soil and wind.

Directions:

Note: This experiment works best in a controlled environment such as the classroom. However, it is messy so you may want to move outdoors. Just keep in mind that the wind in this experiment is controlled by the students, so a calm day is best.

a. Divide class into research teams of 3-5 students per team.
b. Each team gests a blow dryer, a tarp and a bucket of soil.
   These samples need to be from the surrounding environment to make this relevant. Do not use a potting mix since its origin may not be local.
c. Have each team dump their soil onto the tarp. At this point you could choose all different landscapes or all the same. For example, one team could have a hill while another has a level landscape. Landscapes are created by adjusting the tarp.
d. Stand at one end of the tarp and turn the blow dryer on. Experiment with the different speeds of the dryer.

Discussion:
What happens to the soil?
Does the speed of the wind affect the soil movement?
What variables played a role in the experiment?
How does this compare to the actual environment?

Extensions:
Discussion of loess soil and its origin is certainly a great tie-in, especially with the proximity of this unique landform.

Quick fact: The Loess Hills region stretches from Westfield, Iowa in the north to Mound City, Missouri in the south. Loess topography exists in the extreme eastern portions of Nebraska along the Missouri River Valley, particularly near the cities of Brownville, Rulo, Plattsmouth, Fort Calhoun and Ponca. The hills are usually no more than 200 feet above the Missouri River bottoms.

3) Edible Aquifer
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Objective: To understand how pollution gets into groundwater and how pumping can cause water table declines and increased subsidence (sinking) of the land.

Materials Needed:
Clear drinking cups (12 oz or bigger)
Crushed ice
Vanilla ice cream
Clear soda pop
Mini chocolate chips/crushed cookies/graham crackers
Drinking straws
Food coloring

Background: What is an aquifer?
An aquifer is any rock or sediment with spaces that hold water, and through which significant quantities of water move. The water contained in these underground spaces is called ground water. Ground water is withdrawn from wells to provide water for everything from drinking water for the home and business, to water to irrigate crops, to industrial processing water. Examples of aquifers include: sand and gravel layers; fracture systems in brittle rocks; and fracture systems or solution cavities in easily dissolved rocks, such as limestone. Aquifers have connected pores or open fractures through which fluid may flow. As an analogy, consider a glass filled with crushed ice and soda pop, with a straw in it. The ice is equivalent to the sand and gravel aquifer; the soda pop is like the ground water that flows around and between the "grains," and the straw is like a well. It can be used to "pump" water out of the aquifer.

Activity:
1. Construct your aquifer by filling a clear plastic cup half full with crushed ice. This represents the gravels that hold groundwater.
2. Add enough soda to just cover the ice. The soda represents groundwater.
3. Add a layer of ice cream (packed pretty tight) to serve as a “confining layer” over the aquifer. In nature, the confining layer is made of impermeable materials such as clay or caliche that impede the movement of water into and out of the aquifer.
4. Add a layer of mini chips or crushed cookies on top of the ice cream. This represents the soil horizon.
5. Add a couple of drops of food coloring to the top of the soil. This represents contamination. Discuss the possible sources of the contamination.
6. Using a drinking straw, drill a “well” into the center of your aquifer.
7. Slowly begin to pump the well by sucking on the straw. Watch the decline in the water table.
8. Watch as food coloring gets sucked into the well area and eventually enters the groundwater. Also watch how the area around the well starts to sink, which represents subsidence.
9. Recharge your aquifer by slowly adding more soda, which represents a rain shower. In some places, artificial recharge is used to replenish aquifers. This is accomplished through pumping, or injection, of water into wells where it replenishes the aquifer directly or through the spreading of water over the land surface where it can seep into the ground. Artificial recharge is done to replenish the ground water supply when rains are heavy in order to preserve water for later use or, in the case of injection wells, to dilute or control the flow of contaminated ground water
10. Review what you have learned as you enjoy eating your edible aquifer

4) Build Your Own Watershed
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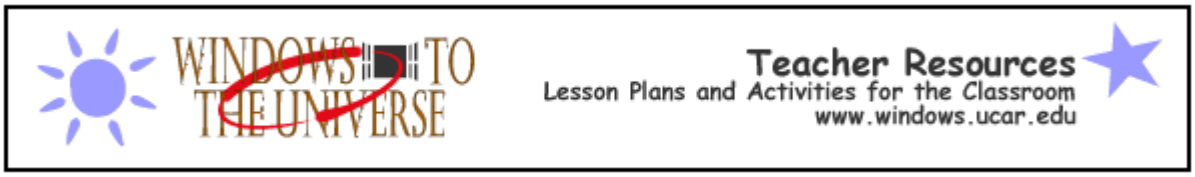

Grade level: Grades 4-8

Time: 10 minutes prep time, 30-40 minutes class time

Student Learning Outcomes:
- Students will be able to define the concept of a watershed
- Students will be able to identify watersheds in a model landscape
- Students will be able to explain that water quality is affected by what is upstream
- Students will be able to explain the usefulness and the limitations of their models

National Standards Addressed:
- 5-8: Content Standard A: Science as Inquiry
- 5-8: Content Standard D: Earth and Space Science: Structure of the Earth System
- 5-8: Content Standard F: Science in Personal and Social Perspectives

Materials:

For each group of four students:

- Aluminum tray (A turkey roasting pan works well.)
- White plastic garbage bag (large enough to enclose the tray)
- Newspaper or other assorted 'building materials' (such as styrofoam pieces)
- Spray bottle filled with blue colored water
- Two permanent markers (different colors)
- Paper
- Pencil

For the class:

- Red food coloring (one large bottle)
- Cotton balls (one for each group)
- One pair of rubber gloves
- A cup or bowl

Preparation

1. Saturate cotton balls with red food coloring and place in cup or bowl until needed. Wear gloves to avoid coloring your hands.
2. Gather images that illustrate the paths of rivers and the shape of watersheds. If possible, find examples from your region. Aerial photographs work well, and so do topographic maps (if students are familiar with those). It is also nice to have an example of a hydrological map of your area (with all the waterways and water bodies marked) and a map of a large area (i.e. your country) to examine watersheds at different scales.

Teacher Directions

1. To introduce students to the idea of watersheds, show photographs and maps of various landscapes. Discuss how the shape of the land affects how water travels through it. Illustrate how rivers and streams are connected within a watershed and how highlands separate watersheds. Consider having students work in pairs or small groups to come up with a common definition of watershed.
2. Students work in pairs or small groups to make their model watershed following the instructions below.
3. After they have made their models and sprayed them with water to understand where the rivers and lakes form, visit each group and place a cotton ball saturated with red dye into the landscape explaining that it represents something that releases pollution into the environment. (This is the last step of the student directions below.) Instruct students to make it rain again and see where the pollution travels.
4. Because of the simplicity of the materials, student groups might devise improbable landscapes - things that might not happen in nature. At the conclusion of the activity, you may choose to facilitate a brainstorm about how these models are, and are not, like the real world. (The other major difference is that the surface of these model landscapes is impermeable so there is no possibility of groundwater.)

Student Activity Directions

1. **Map the rivers, lakes, and stream:** As a group, make a map that shows the locations of rivers in one or more watersheds. You will make a three-dimensional model that matches this map.
2. **Make a model of the shape of the land:** Arrange crumpled newspaper in the aluminum tray to represent the shape of the landscape in the location of your map. This is a model of a landscape with hills, valleys, and connections between them.
3. **Add the surface of the land to your model:** Place the tray and newspaper inside the plastic bag. In this model, the plastic represents the surface of the land. Adjust the shape of the bag to match the shape of the land surface that you need so that rivers flow as they do on your map.
4. **Draw the waterways on your model:** Think about rain falling in your model watershed. Where would the rainwater go? Where would rivers and streams form? Would there be any waterfalls? Where will the water form lakes or ponds? Draw the locations where you think rivers and lakes would form with a permanent marker.
5. **Draw the boundary of a watershed on your model:** Using a different color of permanent marker, draw the boundary of the largest watershed in your model. Also draw the boundary of a smaller watershed within the larger watershed. Mark a spot where you would like to live. Mark a spot for your school.
6. **It's time for some rain!** Use the spray bottle to 'rain' on the top of your highest 'mountain.' Continue raining until the water forms streams, rivers, and lakes.
7. **Your instructor will introduce a land use change to your model.** How did this land use change impact the lakes, streams, and rivers? How do you feel about the location of your house?

Suggested Extensions

- Research your own watershed.
- Take a field trip through a local watershed.
- Measure water quality in a local stream, pond, or lake. Be sure to consider all the factors upstream that may influence the water quality.
- How does this model work the same as what it represents?
- How does this model work differently from what it represents?
- What are the strengths of this model? The weaknesses?
- How does this model compare and contrast with what it represents?"*
  **From Understanding Models in the Earth and Space Science*
  Steven W. Gilbert and Shirley Watt Ireton - 2003 NSTA Press

Make Your Own Sedimentary Rock

Objective: To learn what makes up sedimentary rock, what its uses are, and to make a small creation of sedimentary rock to take home.

Grades: 5th-6th
Time: Research and writing—appx. 1 hour. Collecting and making rock—appx. 45min.
Materials: For research--books about rocks and geology, internet, paper, pencils
For activity—clear jars, pebbles, sand, twigs, leaves, and Epsom salts (from drugstore)

Procedure: Explain that Nebraska was once covered by a large sea. Underneath our present day layer of soil and sand is limestone, a type of sedimentary rock. Have students work in small groups to research sedimentary rock. They should be able to tell what types of sedimentary rock there are, how they were formed, and some uses we have for them. (Great resources to help with this are listed below.)

Have students share their findings with the class.

This activity is taken from Geology Rocks: 50 Hands-on Activities to Explore the Earth by Cindy Blobaum For this activity, make sure each child has a clear jar. Take students outside to collect items (listed above) for their own sedimentary rock. (Teacher will provide the Epsom salts, which act as a natural glue.) Students will place these items in the jar; then the teacher will add ¼ cup Epsom salts and water, leaving 2 inches of space at the top of the jar. Put the lid on and shake. (You may want to make predictions of what order items will settle.) Students will watch as their items (sediments) settle. Check each hour. After 24 hours when everything has settled, carefully pour the water out of the jar and let the layers dry completely. This is your very own sedimentary rock.

Suggested Resources:

www.KidsGeo.com Geology for Kids
This website has lots of great diagrams, videos, even songs and games, to explain geology.

Blobaum, Cindy. Geology Rocks: 50 Hands-on Activities to Explore the Earth. Charlotte, VT. Williamson Publishing, 1999

Allen, Nancy Kelly. Limestone and Other Sedimentary Rocks: Rock It! New York, NY. The Rosen Publishing Group, Inc., 2009