This Rocks! – 5th Grade
Day Session

Purpose:

- To provide a fun and exciting learning experience
- To explore geology and earth science in a woodland setting
- To encourage children to consider the impact, positive and negative, that humans can have on their environment

Science Standards of Learning Addressed:

1. See specific activity descriptions

Outline:

Opening (~30 mins) – Welcome, Introductions, Policies and Guidelines
Ready to Rock

Station Rotations + Lunch (~2.25 hours) –

1. Rock Sandwich
2. Earthwalk
3. Boom! Boom!

Large Group (~45 mins) – Stop! Erosion!

Closing (~30 mins) – Sharing and Review from the Day
Campfire Story

Take Home:

Outdoor School Brochure
Brethren Woods Summer Brochure
Birdseed and Pinecone Birdfeeder Instructions (Fall Season)
Wildflower Seeds and Planting Guide (Spring Season)

Follow-up Activities:

Activity Sheet
Teacher Evaluation

Ready to Rock

Science Standards of Learning Addressed –

1. 5.1 – The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which
   - items such as rocks, minerals, and organisms are identified using various classification keys.
2. 5.7 – The student will investigate and understand how Earth's surface is constantly changing. Key concepts include
   - identification of rock types;
   - the rock cycle and how transformations between rocks occur.

Supplies – Rock samples, rocks and minerals chart

Activity –

1. Ask students to identify the three types of rocks, name examples of each type, and discuss how those rock types are formed.
   a. Sedimentary Rocks – formed by the action of water, wind, or organic agents that compacts sediments or particles into rocks.
      - Limestone
      - Sandstone
      - Conglomerate
      - Shale
   b. Igneous Rocks – formed from cooling magma either inside (intrusive) or outside (extrusive) the Earth's crust
      - Intrusive – Granite, Gabbro
      - Extrusive – Obsidian, Pumice, Basalt
   c. Metamorphic Rocks – formed when heat, pressure, or chemical action changes a sedimentary or igneous rock
      - Slate
      - Marble
      - Schist
      - Gneiss
2. Pass around examples of several kinds of rock for students to touch and look at.

Rock Sandwich

Science Standards of Learning Addressed –

1. 5.1 – The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which
   - models are constructed to clarify explanations, demonstrate relationships, and solve needs.
2. 5.7 – The student will investigate and understand how Earth's surface is constantly changing. Key concepts include
   - identification of rock types;
   - Earth history and fossil evidence;
   - the basic structure of Earth's interior;
   - changes in Earth's crust due to plate tectonics;
   - weathering, erosion, and deposition.

Supplies – White, grain, and Wheat crackers, Fluff, Chocolate Chips, Marshmellow Crème, table knives, spoons, paper plates, rock samples, rocks and minerals chart

Activity –

1. Review with students the layers of the Earth (inner core, outer core, mantel, crust). Explain that in this activity we will be focusing on the crust layer. A lot of different layers exist in the crust of the Earth.
2. Divide the group into pairs. Explain that we will use a story to demonstrate how layers of soil and rocks formed on the earth. As you discuss each rock, refer to the rocks and minerals chart and pass around rock samples for students to look at.
3. Pass around hand sanitizer so that each student can cleanse their hands. Check with teachers and/or students to make sure that there are no students with peanut allergies.
4. The base to build our layers upon is the plate. Imagine this is igneous bedrock. Give each pair a plate.
5. Imagine there is a river flowing over this bedrock carrying with it some white sand. Where the water flowed more slowly, the sand deposited. Over the years, it becomes cemented together to form white sandstone. Give each pair a white cracker to place on the bedrock plate.
6. One day, there was a major flood that swept across the sandstone, leaving tons of rocks, mud, and some big boulders. Ask the participants to spread fluff and chocolate chips (mud and rocks) and chocolate chunks (big boulders) over the white bread. This mixture turns into a kind of sedimentary rock that is known as conglomerate.
7. The water flows more slowly as time passes. It carries small bits of rock particles called silt. Over the years, the silt accumulated and hardened to

form shale rock. Add a layer of grainy wheat crackers to represent shale rock.

8. This was the end of the Ice Age, the glaciers started to melt, and the oceans rose and covered the layers of rocks. At the same time, some living creatures died, and their skeletons lined the ocean floor. Over the years, this calcium-rich rock floor became limestone. Spread some marshmallow crème on the shale to represent a layer of limestone.
9. Pretend that there is a bad drought; some of the rock is exposed to the wind. Erosion takes place. Strong winds blow toward the mountain. As it swirls against mountainside, it leaves behind small rock particles or brown sand. Over many years, this sand becomes sandstone. Add wheat cracker to represent the sandstone.
10. Ask participants to cut the sandwich into half, and share it with their partner. Sometimes rock layers slide, shift, and bend. What happens to the layers when your rock sandwich bends?
11. Ask participants to review what each part of the sandwich represents and "test" each other before they eat their "real life" sedimentary rock formation! Ask the participants: How did you and your partner work together?

Add-On: Earth Apple

1. Ask students: What do you think is inside the earth? Is it hollow? Is it filled with water like the ocean? Is it filled with air like what we breathe in?
2. Cut the apple in half. Explain that the earth is a lot like an apple. Both are round.
3. Examine the apple closely. The thin layer of the apple skin around the apple is like the thin crust around earth. Look how thin the skin/crust is in relation to the whole apple/earth.
4. Both the apple and earth have a core. Both of them have a thick layer between the core and the skin or the crust. This is called the mantel.
5. Look at the core. You should see some hollow space surrounding the seeds and surrounded by a harder shell. This is similar to the earth's inner core (solid particles) and outer core (liquid particles).
6. Review the different layers of the earth with students.

Earthwalk

Science Standards of Learning Addressed –

1. 5.1 – The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which
   - estimates are made and accurate measurements of elapsed time are made using proper tools.
2. 5.4 – The student will investigate and understand that organisms are made of one or more cells and have distinguishing characteristics that play a vital role in the organism's ability to survive and thrive in its environment. Key concepts include
   - traits of organisms that allow them to survive in their environment.
3. 5.7 – The student will investigate and understand how Earth's surface is constantly changing. Key concepts include
   - identification of rock types;
   - Earth history and fossil evidence;
   - changes in Earth's crust due to plate tectonics;
   - weathering, erosion, and deposition;
   - human impact.

Supplies – See specific earthwalk options

Background –

Design an earthwalk experience using activities below that are appropriate for the size of the group, time limit, and area of camp being used.

Activity –

1. Explain that the group is going on an earthwalk. An earthwalk is similar to a hike, but along the way we'll stop to look around and do some activities. Remind everyone to keep alert!
2. Set some ground rules including staying on the path (unless otherwise instructed) and staying together as a group. Ask an adult leader to take up the rear. Please do not allow students to play on any of the cooperation course elements.
3. Possible activities and items of interest:
   a. I Feel the Earth Move – Explain that the earth is moving all the time. It is rotating around the sun and spinning around on its axis every 24 hours. How can we measure or notice that the earth is moving from here on earth? Ask students to put a rock on the shadow of the basketball court pole. How far will the earth move during their hike? Ask each student to get a small rock and mark where they think the shadow will be when they return. Explain that the pole is acting in a similar way to a sundial that people use to tell time.

b. Rock Hunt – Invite students to pick up small rocks and compare them to the rocks in the rock sample box. Using the rock samples as a key, can they identify the rocks that they picked up?
c. Fossil Hike – Stop at a spot where there are lots of rocks. An old streambed or place where natural, uncrushed rock is exposed might be a good spot. Look for fossils of shells, bugs, leaves, small fish, or aquatic life. Fossils tell us what the land was like in this area thousands of years ago. Ask the group if anyone has ever seen a dinosaur fossil. Where did they see it? *(in a museum, on vacation, on television, etc.)* Share and discuss any fossils found.
d. Earth's Layers – Challenge students to figure out the different layers of an exposed bank. Ask students which layers they think are the oldest and youngest. Why?
e. Terrific Trees –
    - Sassafras Tree (three shapes of leaves, let kids smell a leaf);
    - Red Bud Tree (heart-shaped leaf, bud colors);
    - Tulip Tree/Yellow Poplar (two names, leaf shape);
    - Red Maple Tree (leaf shape, stem color);
    - Evergreens (needles, # of needles in a bundle).
f. Organisms – Invite students to name some of the organisms that live in the ecosystem at camp. Ask students what traits or characteristics those organisms might have that allow them to survive in camp's environment.

Boom! Boom!

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   - models are constructed to clarify explanations, demonstrate relationships, and solve needs.
2. 5.7 – The student will investigate and understand how Earth's surface is constantly changing. Key concepts include
   - the basic structure of Earth's interior;
   - changes in Earth's crust due to plate tectonics.

Supplies – Clear bottles 6-8" tall with a long neck, baking soda, vinegar, food coloring, liquid dish soap, shovel

Activity –

1. Explain that a volcano explosion is one way in which heat escapes from the earth. It acts like a safety valve. The mantel *(the layer in the earth that is between the core and the crust)* is underneath a volcano. There are pockets of gas and magma *(hot liguidlike mixture of rock material)* in the mantel. As heat builds up, the gas expands and pressure builds up and finally causes an eruption. A tea kettle heating up is one easy example/model of how this works.
2. Explain that in this activity we are going to build a model of a volcano.
3. Help students get into 5 groups of 4-6 students in each.
4. Give each group a bottle. Ask the participants why they think the bottle is like a volcano. *(Inside the bottle is the magma chamber, the neck is the pipe, and the opening is the crater.)*
5. Now have them place a spoonful of the baking soda, a small squirt of liquid dish soap, and several drops of food coloring into the bottle.
6. Give each group a trowel or shovel and have them dig a hole deep enough to cover half of the bottle. Place the bottle in the hole. Cover the hole around the bottle and make a hill-like structure around the bottle. Explain that the great force of the magma "pushes" the land up around the crater, making a hill or mountain.
7. When each group is ready, gather around one volcano at a time to erupt them and observe together what happens.
8. Pour the vinegar (equal amount of the baking powder) into the bottle. What happens when a volcano erupts? *(The mixture of ingredients sets off a chemical reaction. Baking soda and vinegar react to produce carbon dioxide gas. The gas in the magma chamber produces pressure and moves up and eventually out of the volcano.)*
9. Magma that flows out of the volcano is called lava. What happens to the lava as it cools on the slope of a mountain? *(It hardens and changes to igneous rock.)*
10. Ask participants, "Have you ever seen a volcano in person or on TV? What do you remember about it? How is it different than the model?"
11. Take time to review by asking, "What have you learned about volcanoes? How have observation and discussion of a model helped you visualize what a real volcano might look like?"
12. Take time to rinse out the glass jars to get ready for the next group. Students should also work together to fill the holes they dug back in and return the site to its original state. Students may want to wash their hands in the bathrooms before their next station.

Stop! Erosion!

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   - models are constructed to clarify explanations, demonstrate relationships, and solve needs.
2. 5.7 – The student will investigate and understand how Earth's surface is constantly changing. Key concepts include
   - weathering, erosion, and deposition;
   - human impact.

Supplies – Dirt, watering can, 1 plastic tub per group, boxes of toothpicks, 5-10 tongue depressors per group, 1 roll of tape per group

Background –

When rainwater falls to the ground, it generally does one of three things. It may evaporate into the atmosphere as water vapor (eventually, this water vapor may condense into a cloud and rain back down again). It may percolate down through the soil into large underground reservoirs of water, called ground water. Or, rainwater may also simply roll off the land into streams, which roll down into larger bodies or water, such as rivers or lakes. These may in turn drain into the ocean.

As rainwater flows downhill, it often flows over and through soil. On its way, it may filter through spaces in and around soil particles, plant roots, and other organic matter. This process actually slows the flow of water and allows a great deal of it to soak into the soil. Plants absorb some of this water, and a good deal of it will eventually percolate down into the ground water. Most plants hold a considerable amount of soil in place with their roots, though if water is moving fast enough, or for a long enough period of time, it will wear away almost anything; plants, soil, and so on.

This process of wearing away is called erosion. Water, wind, glaciers, earthquakes, and volcanoes are all forces that contribute to erosion. These forces may erode soil, coastlines, rock, etc. A good example of natural erosion is the Grand Canyon, where millions of years of the Colorado River running over layer after layer of soil and rock have contributed to the great canyon we see today.

Some human actions, if unchecked, can tremendously speed up the erosion process. Removal of plants for agriculture, livestock, or development loosens the soil and allows most of it to run into streams and rivers. Also, the less permeable (able to let water pass through) a surface is, the faster water runs off of it. So, rain hitting asphalt or concrete will move downhill much faster than rain hitting soil full of plant roots and air pockets. The faster water moves down off these surfaces, directly or through sewer drains, the greater power it has to erode stream- or riverbanks, and the greater the amount of soil it carries away

with it. Therefore, the more land that is paved and the more permeable surfaces (fields, forests, etc.) that are replaced with buildings, parking lots, roadways, etc., the faster rainwater rolls into streams and rivers, and without mechanisms present to slow it down, the more soil is eroded into the water.

One of the problems associated with high levels of erosion is a great loss of rich, productive soil. Since the top layer of soil is generally the richest in nutrients, most plants cannot survive without enriching the soil with additional fertilizers after it is gone. When super-rich fertilizers (especially synthetic ones) run off into streams, they can cause water pollution problems. Severe erosion of any sediment (such as soil or organic matter) into streams also diminishes water quality and harms many aquatic organisms. For example, oysters, submerged grasses, and other organisms in the Chesapeake Bay have experienced incredible population declines partially due to the effects of suspended particles from soil runoff.

To reduce the amount of soil eroding into streams, local governments (and others) have developed Best Management Practices (BMPs). Examples of BMPs include:

- Promoting native plant cover in landscaping
- Replanting areas cleared by logging
- Monitoring water that enters and leaves logged or other disrupted areas, to identify areas with erosion problems
- Planting terraces on steep slopes
- Creating catch basins (basins that fill up like ponds and drain very slowly to slow water down and catch sediments) and planting trees around them
- Leaving green or replanting zones in riparian (on or near the banks of a waterway) areas

Activity –

1. Ask participants, “How does water behave when it rains? Where does it go? What are some effects it has? Which way does it go? What happens to different surfaces when it rains?” Have them list different surfaces and the effect of rain on those surfaces.
2. Tell participants that they are going to take part in an experiment to explore soil erosion and how to reduce it, but before they do that they will need to understand the concept of soil erosion.
3. Ask students, “What is soil erosion?” Discuss the concept, including how water wears down or washes away the soil. Ask, “What other forces contribute to erosion? *(wind, surf, glaciers).* What substances can be eroded? *(rock, soil, concrete, wood, almost any other solid).* What are some examples of erosion? *(the way a river cuts into a bank, the way the Grand Canyon was formed, the way dirt gathers alongside a road, etc.)”*
4. Break into small groups of 6-8 members. Each group is charged with researching a way to keep a mound of dirt from falling.
5. Give each group a plastic pan with dirt and have them make a mound in the middle.

6. Give each group various materials to help them stop the erosion process (see supplies above).
7. Give groups a few minutes to discuss, and 15-20mins to create a means to stop the soil from eroding down into the pan.
8. When everyone has assembled an erosion control system, walk around with a watering can and sprinkle water on each of their projects.
9. Ask participants to compare the height of their mounds after the "rain," to measure the depth of the deepest amount of water outside the mound, and to determine the "quality" of the water (by looking at its color).
10. Based on the following three criteria, have them determine which of the projects successfully contained the erosion best:
    - Change in mound height and/or shape (the greater the change, the more erosion occurred)
    - Amount of water escaping the mound (the more water escaping, the greater the likelihood for erosion)
    - Quality of water escaping (the dirtier the water, the greater the evidence of erosion)
11. Ask each group to guess why their experiments may or may not have worked. Either way, what did they learn about soil erosion?
12. Ask participants to think of other ways to control erosion. What might slow water's flow? What might keep soil in place? How would planting a tree or a number of trees affect the movement of soil?