Program Title: Geology: Our Rockin' Earth

Suggested Grade Level: 5th

Maximum Group Size Per Day: 45 students (plus chaperones)

Overview

The Earth is constantly changing and evolving. These changes occur through natural processes such as plate tectonics, weathering, and erosion, while other changes are caused by human actions. By studying Earth's dynamic geologic makeup and rock cycle, students will understand the forces and processes that create Earth's various landforms and develop an appreciation for the importance of geology in people's lives. As human and environmental impacts are evaluated, stewardship behaviors that support a healthy world will be explored and practiced.

Objectives

Following the park experience and classroom activities, the students will be able to

1. name the three major rock categories and explain the rock cycle;
2. describe the theory of the geologic processes that created the Appalachian Mountains;
3. identify examples of weathering and erosion and describe the impacts on landforms;
4. determine the relationships between area geology and living organisms, including people;
5. describe how Shenandoah National Park protects geologic resources and list three ways people can help protect and conserve resources.

Virginia Science Standards of Learning Addressed:

<u>Strand: Earth Patterns, Cycles, and Change</u>

5.7 The student will investigate and understand how the Earth's surface is constantly changing. Key concepts include

- a. The rock cycle including the identification of rock types;
- b. Earth history and fossil evidence;
- d. Plate tectonics (earthquakes and volcanoes);
- e. Weathering and erosion;
- f. Human impact.

Background Information

There are four main layers of the earth – the *crust, mantle, outer core*, and *inner core*. The crust is Earth's outer layer composed of solid, rocky material. If the Earth were compared with an apple, the crust would be as thin as the apple's skin. The mantle is the middle layer made of a soft, solid material (like butter left out on the dinner table). The mantle is very hot and under tremendous pressure. The outer core, which begins more than 1,800 miles beneath the surface, is hot molten liquid. Scientists think this is rich in iron and nickel. The movement of this liquid probably causes Earth's magnetic field. The inner core, also mostly iron and nickel, is squeezed solid due to extreme high pressure.

Scientists believe that the Earth is approximately 4.6 billion years old. Its geology is constantly changing, being restructured and reformed through natural phenomena and also by human impact. The modern theory of *plate tectonics* (formerly called continental drift) states that the outer crust of the Earth is separated into several "plates," some containing continents, which move slowly, but continually. The constant movement of the mantle layer causes the overlying plates to crack and move. Geologists generally agree that there are 6-8 large plates and a number of smaller ones.

There are three main types of plate boundaries: *convergent, divergent*, and *transform*. Tectonic activity, such as earthquakes and volcanoes, often occurs along these boundaries.

A *convergent* boundary occurs when plates move towards one another. Their collision (convergence) causes folding and uplifting of rocks. Mountain ranges can form through *subduction* as one plate slides beneath the other or by *uplift* of the plate boundaries at the collision area. Volcanoes can form when the subducted plate melts deep in the Earth and the molten rock rises as *magma* to the surface.

A *divergent* boundary occurs when plates pull apart (diverge) from each other. A *rift zone* is formed causing the Earth's crust to thin and form a rift valley. If the plates continue to pull apart, magma will rise through the rift forming new crust.

A *transform* boundary occurs when plates slide laterally past one another. Friction from this movement along plate boundaries can create earthquakes. As the plates move relative to one another, the crust is stretched, compressed, or sheared along the boundaries. A tremendous amount of strain builds up. When the strain finally reaches the breaking point and is suddenly released, the crust breaks, the rocks are displaced, and violent shaking of the earth occurs.

The Earth is undergoing continuous change through the formation, weathering, erosion, and reformation of rock. This process is called the rock cycle. There are three main types of rocks: *igneous, sedimentary*, and *metamorphic*.

Rock deep within the Earth encounters temperatures high enough to make it melt. This liquid stage is called *magma*. *Igneous rock* is formed when the magma cools and

solidifies. Magma forms *volcanic* rock when it is forced to the surface and cools. Magma forms *granitic* rock when it cools beneath the Earth's surface.

As rocks are *weathered* (broken down into smaller pieces) and *eroded* (moved to new locations), the rock fragments (sediments) build up in layers. The combined weight of the layers along with other pressures within the Earth causes the layers to compact. The tiny spaces between rock fragments fill with natural cementing agents. Mineral grains in the rock may grow and interlock. Thus *sedimentary rock* has been formed. Sedimentary rock is also formed under water when shells and skeletons of sea creatures accumulate on the ocean floor. Over a long period of time, these sediments compact and harden to form rock. *Fossils* are most often found in sedimentary rock.

Sedimentary and igneous rocks can be altered by the tremendous pressures and high temperatures associated with the movement and collision of tectonic plates. *Metamorphic rock* is formed under these extreme conditions. Ultimately, any of the rock types may again return to a hot, molten state deep in the Earth, thus completing the rock cycle.

Studying geology helps people to understand how today's geological formations were created and to predict future changes. Geologists often take a "core sample" by drilling into a rock formation and pulling out a layered specimen of the rocks to determine a timeline of geologic events for that area. The consequences of natural events and human activity can be better analyzed with knowledge of the underlying rock formations. Through this understanding, a student may develop a new sense of respect for our environment and a new commitment for the responsible, caring, and protective behaviors of good citizenship and environmental stewardship.

Visiting a National Park

The mission of the National Park Service is to preserve and protect the natural and cultural resources of the nation for all people to enjoy. It is important for today's park visitors to practice good stewardship ethics and behaviors in order to pass these unique natural and historical treasures on to future generations in an *unimpaired* condition.

We recommend following **Leave No Trace** (LNT) principles when going on a field trip. There are seven LNT principles:

- Plan Ahead and Prepare
- Travel (and Camp) on Durable Surfaces
- Dispose of Waste Properly
- Leave What You Find
- Minimize Campfire Impacts
- Respect Wildlife
- Be Considerate of Other Visitors

Following these principles and park rules will help make your park visit a safe, successful learning experience while also caring for park resources.

Vocabulary

- **basalt** – rock formed from solidified lava
- **compression** – a force that squeezes or pushes together the Earth's crust
- **convergent boundary** – a convergent boundary occurs when plates move towards one another
- **crust** – thin, rocky, outer layer of the Earth
- **divergent boundary** – a divergent boundary occurs when plates pull apart (diverge) from each other
- **erosion** – the movement of rocks by processes such as gravity, running water, waves, moving ice, and wind
- **earthquake** – a shaking or trembling of the crust of the Earth
- **fault** – a crack in the Earth's crust along which the rocks on either side have moved
- **fold mountains** – mountains made of crumpled and folded layers of rock
- **geology** – the science dealing with the physical and historic nature of the Earth
- **igneous rock** – rock formed when melted rock material cools and hardens
- **inner core** – a layer of the Earth, mostly iron and nickel, that is squeezed solid due to extreme high pressure
- **lava** – magma that reaches Earth's surface and cools
- **magma** – hot molten rock deep below Earth's surface
- **mantle** – the layer of the Earth's interior immediately below the crust
- **metamorphic rock** – rock formed under heat and pressure by changing a pre-existing rock
- **minerals** – solid material of Earth's crust with a definite chemical composition
- **outer core** – a layer of the Earth which begins more than 1,800 miles beneath the surface and is hot molten liquid
- **plate tectonics** – a scientific theory that Earth's crust is made of moving plates
- **rift** – an elongated opening or split in the crust of the Earth located where the earth is pulling apart by tension (divergence)
- **rock** – a naturally formed solid in the crust made up of one or more minerals
- **rock cycle** – rocks changing from one into another in a never-ending series of processes
- **sedimentary rock** – rock made of bits of matter joined together
- **shear** – a force that twists, tears, or pushes one part of the crust past another
- **subduction** – one plate sliding beneath the other
- **tension** – a force that stretches or pulls apart the earth's crust
- **transform boundary** - a transform boundary occurs when plates slide laterally past one another
- **uplift** – a raising of land above the surrounding area
- **volcano** – a vent in the earth's crust through which molten rock (lava), rock fragments, gases, and ash, are ejected from the earth's interior
- **weathering** – breaking down rocks into smaller pieces by mechanical and chemical processes such as ice wedging, root wedging, acid rain

Materials
Collection of pocket-sized rocks (enough for 1 per student), pipe-cleaners, plastic eyes, paints, hard-boiled eggs, poster board, paper, pencils, permanent markers, glue, clay, dough, or wooden blocks, bread (white, wheat, and grain), peanut butter, raisins, nuts, honey, marshmallows, jelly, candy worms, large, clear plastic straw or sections of plastic PVC tubes, class-size number of chocolate cream-filled cookies

Pre-Visit Activities

Prior to beginning the Geology unit study, have the students take the Geology **Pre-Visit Assessment**. Record the class scores on the **Pre-Visit/Post-Visit Score Sheet**. Begin the unit study. Incorporate as many of the following pre-visit activities as possible into your lesson plan to prepare the students for their park field trip. For more fun geology activities see *Good Character, Good Stewards: Caring for the World Around Us* at http://www.nps.gov/shen/forteachers/upload/edu_steward_geology_rocks.pdf

1. **Motivational Activity**
   Bring to school a collection of pocket-sized, interesting rocks – at least one for each student. Have each choose one he/she likes or is drawn to, hold it, and get comfortable with it. Ask students to share what it is about the chosen rock that tells
   - how it is unique,
   - why it was chosen, and
   - how it reminds the student of himself/herself, i.e., it is colorful, smooth, has a happy feeling, is jagged, light-weight, tough, sparkly.

   Brainstorm why rocks are important in our lives. What are some things we use them for? Have students start a journal by first drawing their "special rock," naming it, and writing about it using personification techniques. This rock should be carried back and forth between home and school and may be a pretend "friend" in future journal entries. For example: "Rocko had a difficult 'beginning' – he/she was formed by…, We went to the football game yesterday..."

   At the end of the unit, these personal rocks might be decorated with paint, glitter, plastic eyes, pipe-cleaner legs, and used either as a present for a parent, a paperweight, or as a "pet" and decorative reminder of the unit of study.

2. **Vocabulary Activity Suggestions**
   a. Play the bingo-like game called "Rocks" Bingo (game card and teacher page attached). Make copies of game cards and have each student randomly write in vocabulary words to fill in each box. When everyone has a game card ready, begin calling out vocabulary terms. As each term is called, players should cover the correct term on his/her card from a supply of pebbles or small stones. Play until someone achieves "ROCKS."

   b. Write a short list of vocabulary words on the blackboard. Have students close their eyes while you or a selected student erases one. Then see who can correctly identify, spell, and write the missing word. You might ask for the

definition before allowing the word to be written. This is good for a 5-10 minute time-filler.

c. Have students work in groups to act out a term from the vocabulary list while their peers try to identify and spell the word.

d. Play “I’m Thinking of a Word” (variation of “Twenty Questions”). Student leader should provide only “yes” and “no” answers until the word is guessed correctly.

3. **Read and Discuss**
   The Magic School Bus – Inside the Earth and *The Magic School Bus Blows Its Top!*

4. **Use A Hard-Boiled Egg To Illustrate The Layers Of The Earth**
   See “All Cracked Up,” *Project Earth Science: Geology* or “Our Earth,” *Delta Science Module II – Earth Science: Earth Movements*. First, gently tap the egg on a hard surface to create several cracks in the shell. Using a marker, outline enough of the cracks so that there are eight large "plates.” Carefully cut the egg in half lengthwise and make a dot in the center of the yolk with the marker. The shell represents the Earth's crust, the outlined cracks the tectonic plates, the egg white the mantle, the yolk the outer core, and the dot the inner core. Discuss the fact that the real tectonic plates on the Earth's crust actually move, causing geological phenomena such as earthquakes and volcanoes.

5. **Rock Cycle**
   Have the students create a diagram or poster illustrating and correctly labeling the parts of the rock cycle. Post on bulletin boards or around the classroom.

6. Discuss weathering and erosion and the effect geology has on plants, animals, and people.
   a. Take a brief walk around the school to observe and discuss weathering (rocks that have changed in place as a result of mild-flowing water, lichen, acid rain, ice or root wedging) and erosion (rocks that have been moved by machines, people, animals, fast-flowing water).

   b. Ask “Do plants and animals depend on geology for anything?” (Rocks weather and erode and become part of the soil, providing plants with necessary minerals. Rocks provide homes for animals. Rocks can prevent or slow down erosion and provide protection.)

   c. Discuss “Do people depend on geology for any resources?” (People depend on fossil fuels - oil, coal, and natural gas. Rocks weather and erode, adding minerals and nutrients to enrich soil for farming. People use many metals such as aluminum, iron, copper, and gold. Many types of rock are used as construction and building materials.)

7. Leave No Trace Principles: Suggested Activities for "Travel on Durable Surfaces" and "Be Considerate of Other Visitors"

To prepare for your field trip to Shenandoah National Park, share with your students the mission of the National Park Service. Explain that the mission is to protect and preserve the natural and cultural treasures of the nation for present and future visitors to enjoy. Lead them to understand that they can help protect the beauty and natural resources of Shenandoah National Park by using good environmental stewardship practices.

a. Introduce the *Leave No Trace* principle of "Travel on Durable Surfaces." Take the students outside and walk on the sidewalk or through the playground and ask if they can tell where their footsteps were. Next have them walk through a grassy area and ask if they can tell where they had walked. Observation will show them that more impact has been done to the grass than the harder, durable surface. Walking on stones, following an established trail, or staying on a sidewalk provide the least impact to the natural resource.

   Next, divide the class into teams of 3-4 students and give each team a short loop of rope tied into a circle. Each team should have a leader, a recorder with paper and pen, and "explorers." Establish boundaries and have the teams find a natural area and place their loop of rope on the ground.

   The teams should explore the area inside their loop of rope, counting and identifying the number of living organisms they can find. Pictures may be drawn and each unique plant or animal can be tallied and counted.

   Gather the teams to share their findings. Ask them what would happen to the living things they found if something travels over the area. Students should understand that every place on earth contains living organisms, and that they should walk on trails and durable surfaces whenever possible.

b. Introduce the *Leave No Trace* principle of "Be Considerate of Other Visitors." As you read an interesting, captivating story, have one student (or another teacher) rudely interrupt concentration by walking in and loudly talking on their cell phone, blatantly ignoring any stares from the offended parties and flaunting loud colors and rude behaviors. Later, ask the students how they felt about this behavior and whether they think it would intrude on a quiet walk in the woods or trying to study.

   Have the students brainstorm a list of rules and behaviors to follow on the trip to the national park that is considerate of other visitors and helps keep plants, animals, and themselves safe. The students could create and perform short skits to demonstrate and discuss good and bad park behavior. By following these Leave No Trace principles, they can help preserve both the integrity of the national park's resources and the great experience visitors might have.

8. Begin final preparation and planning for the class field trip to Shenandoah National Park. Review appropriate dress and practice proper field trip behavior and exploration skills with students. Have students write letters to their parents informing them about the time and date, appropriate dress, personal needs, and behaviors expected for the field trip.

Shenandoah National Park Field Trip

The in-park program will generally take a minimum of 2 hours. Plan for adequate travel time from your school to meet the ranger(s) at the scheduled time and location in the park. For an effective learning experience, please remember the following:

- Bring enough competent chaperones to assist on the field trip. The park requires 1 adult for every 10 students.
- Review appropriate dress and behavior for the field trip and remind students they will still be in school while at the park. Sturdy shoes are important due to the rocky, uneven trails used for this program.
- Before arriving at the park, have the students divided into groups of 15 or fewer and assign chaperones to groups. Provide nametags for all participants, including adults.
- Provide a snack break prior to the in-park program.
- Be prepared to present a short, 5-minute introduction at the program site in the park to bridge the classroom lessons with the park experience. Assist rangers as needed.
- Plan for lunch. School groups are welcome to picnic in the park after the program. Picnic areas offer picnic tables and restrooms, but there are no shelters for inclement weather.

Post-Visit Activities

Following your field trip to Shenandoah National Park, incorporate as many of the following post-visit activities as possible into your lesson plan to conclude the unit of study. Give the students the Geology **Post-Visit Assessment.** Record the class scores on the **Pre-Visit/Post-Visit Score Sheet**. Complete the **Program Evaluation Form.** Return the program evaluation, pre/post-visit score sheet, and any other student work to:

Shenandoah National Park
3655 US Hwy 211 East
Luray, VA 22835
Attention: Education Office

1. Simulate Plate Tectonics

a. Students can use clay, dough, or wood block models to simulate typical tectonic plate movement and the resulting landforms: *uplift* – plates crash into one another (*converge)* creating mountains; *subduction* – one plate slips under another causing folding of the upper layers; *divergent* – plates drift apart (*diverge)* and separate causing rifts; and *transform fault* – plates slip laterally past each other causing earthquakes. See “Plate Tectonics,” *Project Earth Science: Geology* and *Delta Science Module ll – Earth Science: Earth Movements.*

b. A fun option is to use chocolate, cream-filled cookies to simulate the three types of tectonic plate boundaries. The upper chocolate cookie represents the tectonic plate while the creamy filling represents the buttery consistency of the upper mantle. Have students remove the upper chocolate cookie and break it into two pieces, then replace the broken pieces on top of the creamy filling.

   With the upper cookie pieces still resting on the filling, have students follow these steps:
   - Pull the broken pieces apart to simulate a *divergent* plate boundary. This is caused by *tension.*
   - Slide the pieces laterally to simulate a *transform (sliding)* plate boundary. This is caused by a *shear* force which causes the two sides of the crust to tear, twist, or push past each other.
   - Push the pieces together to simulate a *convergent* plate boundary. This is caused by *compression*, and might result in the rising up of the upper cookie pieces (simulating the crumpling and "folding" formation of a mountain range) or one "plate" *subducting* beneath the other into the creamy filled "mantle." The heat and pressure caused by this *convergent* collision would cause some degree of *metamorphism* of existing rock.

   Allow the students to eat their "geologic formations."

2. **Create A "Sedimentary Rock Sandwich" And Core Sample Of Earth Layers**
   See "Peanut Butter and Jelly Geology" at:
   http://wwws.aimsedu.org/aims_store/Peanut-Butter-and-Jelly-Geology-p-4350.html

   Have several sets of materials available and coverings for individual desks. Read the following story sequence and have students simulate the history of various geological formations by building layered sandwiches.

   - **First layer** - white bread

White sand erodes from upper rocks and is transported by rain, melting snow, and gravity into a flowing stream to the foot of a mountain. The sand is carried along the stream into a river that eventually widens, causing the flow of the water to slow down. This allows the white sand to drift slowly to the bottom. Over many years, this sand becomes cemented together forming a layer of white sandstone.

   - **Second layer** - chunky peanut butter, chocolate chip chunks, raisins

A hurricane passes through the area, bringing torrential rains and wind. Trees, rocks, dirt, and gravel erode into the water and cover the white sandstone.

   - **Third layer** - wheat bread

Over many years, the river erodes brown silt particles from the land and carries them downstream. Again, the velocity of the water slows as the river widens and the silt gradually drops to the bottom. This eventually forms a sedimentary rock called shale.

- **Fourth layer** – jelly

Meanwhile, glaciers are melting on the Earth causing the ocean to rise and cover the area. Millions of tiny marine organisms and shells line the ocean floor. After many years, the ocean recedes and shells have cemented together forming a layer of rock called limestone. Many fossils can be found in this layer.

- **Fifth layer** - candy worms or fish as the fossilized animals

- **Sixth layer** - dark bread

Finally, a layer of brown sand is blown over the entire area. There has been a severe drought and mighty winds have sandblasted large, brown boulders with small bits of rocks. In time, this layer will become brown sandstone.

The geology sandwich is now complete! Have students pretend to be geologists and use a clear plastic straw or a section of small-diameter plastic pipe to take a "core sample" of the layers. Have the students examine the core and identify the layers. Relate this to real core samples that help determine the composition and historical sequence of the Earth's formation.

Review the concept of plate tectonics. Have students cut or break their sedimentary sandwich in half and simulate two plates colliding (convergent boundary). Relate this crumpling and folding to the formation of mountains (such as the Appalachians).The heat and pressure resulting from the collision cause the rocks to change through metamorphism. Encourage students to also simulate divergent and transform boundaries with their sandwich halves.

Ask students to visualize the interior layers of mountains, describing how the order of layers can change. They may take a core sample after each "geological event" and compare the results. Conclude by having the students illustrate, label, and explain the new concepts learned in their journals before eating their geological formations.

3. **Slow Down Erosion!**

Erosion by water and wind can cause damage to natural features and human communities. There are ways to slow down erosion and your class can help! Have students locate an area at school or in the city that is barren of vegetation. After getting approval to work on the site, have the students plant grass, trees, or flowers in that area. For a hillside, build rock-lined terraces with raised rows of dirt to help slow run off from the rain. Trees will slow the speed of the wind; rocks and plant roots will help anchor the dirt. Students might clear a trail and use pebbles to create a walkway through what will become a new green space for visitors to use.

4. **Class Discussion**

a. Remind the students that the Earth is constantly changing and evolving. Geological change can occur very slowly, as in the formation of sedimentary rock

or the weathering of exposed rocks. Change can also occur suddenly, as in a landslide or an erupting volcano. Review how animals, plants, and people use and depend on geologic resources. Ask the students how geologic change can affect living things. How important is geology to living things?

b. Ask "Now that you realize how important geology is to living things, can you imagine life without geology?" We all live on land that is made of rocks and geologic features and depend on many geologic resources. Ask the students if they think human actions can affect the land and geology. Examples include the mining of metals and coal; drilling for oil and natural gas; farming; using geologic materials for construction; moving earth and rock for the development of homes, stores, and cities; and damming rivers. Remind the students that geologists think it took millions of years to create these resources. Are these resources that we depend on replaceable? If not, how long before the resources are used up?

c. Ask the students if people should care about geologic resources. Have the students brainstorm ways people can help conserve and protect resources for the future. Examples include recycling aluminum and other metals to reduce mining; using energy-efficient transportation and machines to reduce oil, gas, and coal consumption; following good farming practices to reduce erosion and soil loss; and reducing waste to conserve resources. Introduce the term *stewardship* and have students discuss the reasons why people should conserve resources and protect the land and the environment.

5. Portfolio Activity

Use the attached **Geology Portfolio Page** for an end-of-the-unit portfolio activity. You may use this as a unit final evaluation, confirmation of student learning, or portfolio page. Below is a suggested rubric. Provide each student with a copy of the worksheet and encourage creative writing and thoughtful input. If possible, send copies of the completed worksheets, artwork, and writing to the Shenandoah National Park Education Office.

NUMBER		**Points possible**	**Student totals**
#1 – 2 (20 points each)	**Facts And Knowledge - with explanations**	**40**	
#3 – 4 (20 points each)	**Expression of Behaviors**	**40**	
#5 (20 points)	**Environmental writing**	**20**	
	Total points	**100**	

Unit Assessment

1. Observe and document student interaction, discussion, behavior changes, skits, and written work;
2. Evaluate dioramas, posters, journals, and involvement based on effort and correct number of pre-determined and posted criteria;
3. Assess the attached Geology Unit pre- and post-tests;
4. Utilize the portfolio rubric to evaluate concluding journal activity

Going Further

1. Have the students research the timeline of major geological events leading to the earth's features of today. This should include scientific data regarding plate tectonics and the creation and causes of local (or worldwide) land formations. Assign posters, dioramas, or a large bulletin board for display. Have the students conduct research to find facts about each rock type and their formation and label them accordingly.

2. Using plaster of Paris, have students create fossils and display them on a table for all to see. They might use leaves, bones, or tools. Spray the plaster of Paris with cooking oil before you place the "fossil." Have students write creative stories about their fossil and how it was "formed in history."

3. Have students act out the rock cycle. Divide the class into 3 groups: *igneous, metamorphic*, and *sedimentary*. Students can act out the formation of the different rock types. Costumes can be created to represent rock types or conditions such as red flame-type material for magma. One student in each group can act as the "radio announcer" or "story-teller" to describe the conditions and changes taking place in their sequence. Groups might create a "rap" or song to accompany their drama and the sequence could be performed for other grade levels. **Option:** present the musical play "Geology Rocks!" See http://www.badwolfpress.com/geology.htm

4. Have students organize a recycling program in the school. Use the proceeds to create a rock garden in the school courtyard or in a local park that has been trampled down and misused. Display a variety of rock types and have students label them for all to enjoy. Plant a variety of bushes to attract wildlife and beautify the area. Create a cascade of water flowing over hard rocks. Have students simulate the creation of a waterfall or mountain spring.

References and additional activities

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Shenandoah National Park Education Program

Geology Pre-Visit Activity
"ROCKS" Bingo

Directions: Write a geology term from the vocabulary list in each blank space. Cover the word when it is called (as you would in BINGO). You have won "ROCKS" if you cover the squares in the format pre-established by the teacher (line down, line across, diagonal, or "postage stamp" – all 4 squares covered in any corner, 4 corners, or full board).

Name_____

R	O	C	K	S
		FREE PEBBLE		

Shenandoah National Park Education Program

Geology Pre-Visit Activity
"ROCKS" Bingo - Teacher Page

Use this table as a master copy of vocabulary words to call. Mark off each word when it is used. Have students prove their winning format by calling their list back.
To create words for a "draw-from-bowl," color-code the backs of each column to differentiate various columns before cutting them out. i.e.: blue = R, red = O, etc.

R	O	C	K	S
basalt	basalt	basalt	basalt	basalt
compression	compression	compression	compression	compression
convergent boundary	convergent boundary	convergent boundary	convergent boundary	convergent boundary
crust	crust	crust	crust	crust
divergent boundary	divergent boundary	divergent boundary	divergent boundary	divergent boundary
erosion	erosion	erosion	erosion	erosion
earthquake	earthquake	earthquake	earthquake	earthquake
fault	fault	fault	fault	fault
fold mountains	fold mountains	fold mountains	fold mountains	fold mountains
geology	geology	geology	geology	geology
igneous rock	igneous rock	igneous rock	igneous rock	igneous rock
inner core	inner core	inner core	inner core	inner core
lava	lava	lava	lava	lava
magma	magma	magma	magma	magma
mantle	mantle	mantle	mantle	mantle
metamorphic rock	metamorphic rock	metamorphic rock	metamorphic rock	metamorphic rock
minerals	minerals	minerals	minerals	minerals
outer core	outer core	outer core	outer core	outer core
plate tectonics	plate tectonics	plate tectonics	plate tectonics	plate tectonics
rift	rift	rift	rift	rift
rock	rock	rock	rock	rock
rock cycle	rock cycle	rock cycle	rock cycle	rock cycle
sedimentary rock	sedimentary rock	sedimentary rock	sedimentary rock	sedimentary rock
shear	shear	shear	shear	shear
subduction	subduction	subduction	subduction	subduction
tension	tension	tension	tension	tension
transform boundary	transform boundary	transform boundary	transform boundary	transform boundary
uplift	uplift	uplift	uplift	uplift
volcano	volcano	volcano	volcano	volcano
weathering	weathering	weathering	weathering	weathering

Shenandoah National Park Education Program

Post-Visit Activity

Geology Portfolio Page

Name _____ **Date** _____

School _____ **Teacher** _____

#1 – 2 Facts And Knowledge:

Identify 2 new facts you learned in this unit of study and tell why you think each is important.

1)
2)

#3 – 4 Behaviors:

List 2 behaviors you learned in this unit that can help protect our national parks and/or preserve the natural resources of our world.

3)

4)

#5 <u>Environmental Writing:</u>
Write a paragraph, creative story, poem, essay, rap, song, etc. about these stewardship behaviors. You might tell how using them will change your life and your future world.
If you have time, create a picture to go along with your writing.

5)

Shenandoah National Park Education Program

Geology
Pre-Visit/Post-Visit Assessment

Name _____ **Date** _____

Instructions: Read each question carefully and choose the one best answer. Circle the letter of your choice.

1. Hot lava erupting from a volcano and then cooling is an example of _____ rock being formed.
   a. igneous
   b. metamorphic
   c. sedimentary
   d. shale

2. _____ occurs when rocks or soil are carried away from one place to another.
   a. intrusion
   b. weathering
   c. erosion
   d. hardening

3. *Metamorphic rock* is formed when sedimentary or igneous rock is put under tremendous _____.
   a. heat and pressure
   b. ozone and pollution
   c. chemicals and weathering
   d. erosion and drought

4. Rocks are important because they can be used for _____.
   a. tools
   b. building
   c. habitats
   d. all of the above

5. Which geologic feature was most likely formed by the movement of the Earth's crustal (tectonic) plates?
   a. The Appalachian Mountains
   b. The Shenandoah River
   c. Sand dunes
   d. All of the above

6. A shell fossil is most likely to be found in which rock type?
   a. Igneous
   b. Sedimentary
   c. Metamorphic
   d. All of the above

7. Water freezing in cracks and breaking rocks apart is an example of _____.
   a. erosion
   b. weathering
   c. organic waste
   d. plate tectonics

8. Geologist think that the Appalachian Mountains were once much taller than they are today. This decrease in size was caused mostly by _____.
   a. earthquakes
   b. volcanoes
   c. weathering and erosion
   d. tectonic plate movement

9. Which action can be used to protect soil and prevent erosion?
   a. Grazing cattle on a steep hillside.
   b. Planting trees and grass.
   c. Cutting forests.
   d. Trampling stream banks.

10. How does Shenandoah National Park protect geological resources?
    a. By teaching preservation and protection of natural resources
    b. By participating in and encouraging recycling programs
    c. By requiring people to leave fossils and artifacts where they are found
    d. All of the above

Shenandoah National Park Education Program

Geology
Pre-Visit/Post-Visit Assessment

Answer Key

1. Hot lava erupting from a volcano and then cooling is an example of _____ rock being formed.
   a. **igneous**

2. _____ occurs when rocks or soil are carried away from one place to another.
   c. **erosion**

3. *Metamorphic rock* is formed when sedimentary or igneous rock is put under tremendous _____.
   a. **heat and pressure**

4. Rocks are important because they can be used for _____.
   d. **all of the above**

5. Which geologic feature was most likely formed by the movement of the Earth's crustal (tectonic) plates?
   a. **The Appalachian Mountains**

6. A shell fossil is most likely to be found in which rock type?
   b. **Sedimentary**

7. Water freezing in cracks and breaking rocks apart is an example of _____.
   b. **weathering**

8. Geologist think that the Appalachian Mountains were once much taller than they are today. This decrease in size was caused mostly by _____.
   c. **weathering and erosion**

9. Which action can be used to protect soil and prevent erosion?
   b. **Planting trees and grass.**

10. How does Shenandoah National Park protect geological resources?
    d. **All of the above**