

Rock and Roll



Rock and Roll

Curricular Connection



2.0 Earth/Space Science – Students will use scientific skills and processes to explain the chemical and physical interactions (i.e., natural forces and cycles, transfer of energy) of the environment, Earth, and the universe that occur over time.

A. Materials and Processes That Shape A Planet

2. Cite and describe the processes that cause rapid or slow changes in Earth's surface.

- a. Identify and describe events such as tornadoes, hurricanes, volcanic eruptions, earthquakes, and flooding which change surface features rapidly.
- b. Recognize that the natural force of gravity causes changes in Earth's surface features as it pulls things toward Earth, as in mud and rock slides, avalanches, etc.
- c. Cite examples that demonstrate how the natural agents of wind, water, and ice produce slow changes on the Earth's surface such as carving out deep canyons and building up sand dunes.

3. Explain how rock is formed from combinations of different minerals and that smaller rocks come from the breakage and weathering of bedrock (solid rock underlying soil components) and larger rocks; soil is made partly from weathered rock, partly from plant remains-and also contains many living organisms.

c. Describe ways that the following processes contribute to changes always occurring to the Earth's surface.

- Weathering
- Erosion
- Deposition

6.0 Environmental Science: Students will use scientific skills and processes to explain the interactions of environmental factors (living and non-living) and analyze their impact from a local to a global perspective.

B. Environmental Issues

2. Recognize and describe that consequences may occur when Earth's natural resources are used.

a. Explain how human activities may have positive consequences on the natural environment.

- Recycling centers
- Native plantings
- Good farming practice

Background



Earth's surface features can change rapidly during brief violent events such as earthquakes, tornadoes, hurricanes, floods, and volcanic eruptions. These natural processes can reshape the Earth's surface in a matter of minutes, hours, or days.

Weathering and erosion by wind, water and ice are very slow processes which reshape the Earth's surface over millions of years. The Grand Canyon in the Southwest United States was carved by the action of moving water in the Colorado River. The Great Sand Dunes in Colorado were formed by the action of winds blowing sand from dry lake beds. The sand from these beds was originally part of the surrounding mountains that was eroded and deposited as sediment during flooding. Wind erosion and sand deposition interact continuously to change the size of the dunes. The slow movement of glaciers over thousands of years produced the mountains and deep valleys in Yosemite Park, California. The steep sides and rounded bottoms of the fjords along the coast of Norway were also carved out by the action of glaciers.

Weathering is the process of breaking down rocks into smaller particles near the surface of the Earth by the effects of water, ice and wind. Weathering is part of the rock cycle. Soil and sediment consist of weathered rock and decomposed organic materials from dead animals and plants.

Water can expand and contract with wetting and drying. Air in water that is drawn into cracks in rocks and soil can exert pressure when the water moves to a different place. Water may enter a crack in a rock, freeze and push the rock apart. This process is most common in mountainous regions with cold temperatures and plentiful precipitation. It may take many cycles of freezing and thawing to complete the fracture of the rock.

Weathering by wind occurs when rocks are exposed to wind-driven particles. The surface of the rock is gradually worn down by the abrasive force of the particles.




Erosion is the carrying away of weathered rocks by water, wind, ice or gravity. Erosion loosens and carries away rock debris formed by weathering. Rain, wind, moving water, cold and hot temperatures, and ice cause the crust to break up into smaller pieces and be deposited in other areas.

Water is the strongest agent of erosion. Erosion from water can occur when the amount of precipitation is greater than the ability of the soil to retain water. Erosion by water can also occur in coastal areas through the action of waves against the shore. Erosion transports particles to a new location.

Erosion by ice occurs when glaciers move due to gravity or by melting. As glaciers move they can move rock fragments or erode entire mountain sides or carve valleys.

Weathered particles from mountains are deposited by wind erosion in other areas to form sand dunes.

Resource: mdk12.org

<p>Materials/ Resources</p> 	<p>Teacher Materials</p> <ul style="list-style-type: none"> • crackers for demo • stream table • Rock-n-Roll PowerPoint • sample rocks • I-pod touch or digital camera • rock hike map 	<p>Student Materials (1 of each item per group)</p> <ul style="list-style-type: none"> • Fairview geology hike map • Fairview Weathering and Erosion Guide (Laminated with pictures/tasks at 9 sites) • I-pod touch or digital camera
<p>Safety</p> 	<ul style="list-style-type: none"> • At the stream table, the teacher should oversee the experimental design and control the pump at all times to avoid injury to the students or damage to equipment. • The students should not throw rocks and materials. • The students should not run during activities. 	
<p>Enduring Questions and Focus Questions</p> 	<p>Enduring Questions</p> <ul style="list-style-type: none"> • What are the nonliving (abiotic) and living (biotic) characteristics of an ecosystem? • How does energy flow through an ecosystem? <p>Focus Questions</p> <ul style="list-style-type: none"> • How do the processes of weathering and erosion contribute to the rapid and slow changes on the surface of the earth? • How can human activities at Fairview have a positive or negative effect on erosion and the environment? 	

Vocabulary



biological weathering – Weathering caused by plants and animals. Plants and animals release acid forming chemicals that cause chemical weathering and also contribute to the breaking down of rocks and landforms.

chemical weathering – Weathering caused by breaking down of rocks and landforms. The most common agent of chemical weathering is rainwater. Chemical weathering, such as acid rain, eats away at certain types of rocks such as limestone, creating cracks and holes.

deposition – The Process by which sediments are deposited in a new location

erosion – The carrying away of weathered soil, rock, and other materials on the Earth's surface by gravity, water, ice, and wind.

deposition – The Process by which sediments are deposited in a new location.

igneous rock - Rock formed through the process of magma or lava cooling and hardening.

limestone - Sedimentary rock made mostly of the mineral calcite (calcium carbonate). Limestone is usually formed from shells of once-living organisms.

metamorphic rock – Rock formed when igneous or sedimentary rock is changed by pressure, heat, or chemical reactions.

mechanical weathering – Weathering caused by the breaking down of rocks by physical force without any change in the chemical nature of the rocks. Mechanical weathering is usually caused by extreme hot and cold temperatures. Water seeps into cracks in rocks, freezes, and expands, causing further breakdown of rocks. Wind is another example of mechanical weathering. Wind can move sand from one place to another or blow it against hard surfaces rubbing away at them like sandpaper.


natural agents – water, wind, and ice

sandstone- Sedimentary rock is made mostly of sand-sized grains.

sediment - Small pieces of rock, shell, and plant and animal matter that is moved and deposited by water, wind, or ice.

sedimentary rock - Rock formed from sediment that have been pressed and cemented into a rock.

weathering – A chemical or physical process in which rocks exposed to the weather are worn down by water, wind, or ice.

5 E Model	Time Frame	Activity
<p data-bbox="185 260 358 306">Engage</p> 	<p data-bbox="500 222 618 247">30 minutes</p>	<p data-bbox="667 222 1084 247">BEFORE ENTERING ROUNDHOUSE:</p> <p data-bbox="667 289 1528 470">Take the students on a walk around the outside the roundhouse to make observations of the rain barrels, rain pond, and rain garden. Have students look for evidence of erosion around the roundhouse. Discuss how the rain barrels, pond, and garden help to control erosion. Ask the students to suggest ways to improve erosion control around the roundhouse.</p> <p data-bbox="667 506 911 531">Slide 1: TITLE SLIDE</p> <p data-bbox="667 569 959 594">Slide 2: Focus Questions</p> <p data-bbox="667 636 984 661">Introduce the focus questions</p> <ul data-bbox="716 678 1523 804" style="list-style-type: none"> • How do the processes of weathering and erosion contribute to the rapid and slow changes on the surface of the earth? • How can human activities at have a positive or negative effect on erosion and the environment? <p data-bbox="667 846 894 871">Slide 3: Vocabulary</p> <p data-bbox="667 909 1211 934">Review these two words on the Vocabulary Poster:</p> <ul data-bbox="716 976 1490 1186" style="list-style-type: none"> • Erosion –all the processes that cause rock to be carried away by water, wind or ice • Weathering –the processes that break rock into small particles resulting in the formation of soil • Deposition -the process by which sediments are deposited in a new location <p data-bbox="667 1228 1325 1253">Click on YouTube link to show 58 second clip on erosion.</p> <p data-bbox="667 1291 1252 1316">Slide 4: Cracker and Stream Table Demonstrations</p> <p data-bbox="667 1358 1487 1425">Use a saltine cracker to demonstrate the processes between mechanical and chemical weathering.</p> <p data-bbox="667 1463 1520 1799">Mechanical Weathering: Break the cracker in half. Rub the cracked edges of the crackers against each other. Ask the students what they see happening. The students should be able to see smaller pieces of cracker falling from the larger pieces rubbing together. Ask: Is it still a cracker? If you had a lot of time and a magnifying glass could you put it back together? This is an example of mechanical weathering. The rocks rubbing or hitting against one another cause smaller pieces of rock to come off of the rock. The pieces of cracker can be blown away to show wind erosion and where the pieces land in a new location is called deposition.</p> <p data-bbox="667 1900 1528 1967">Chemical Weathering: Ask students to predict what will happen when you chew the cracker? Put a fresh cracker in your mouth. Chew it for a few moments</p>

Engage (continued)



until it becomes soft and mushy in your mouth. Open your mouth and stick out your tongue.

Ask: Can you rebuild the cracker now? Is it still a cracker or is it now cracker mush? Chemicals in your saliva (spit) change the nature of the cracker so that it is no longer a cracker. You couldn't put it back together if you tried. This is an example of Chemical Weathering.

Use the stream table to demonstrate erosion.

Step 1: Be sure fine sand is evenly and smoothly distributed throughout the top portion of the stream table. Run the stream table pump on a setting of 30 seconds.

- Have the students make observations about the movement of the sand. Ask the students to predict what will happen if the speed of the water is increased.

Step 2: Run the water in the stream table for another 30 seconds on a setting of 60.

- Have the students make observations about the movement of sand after this second trial
- Have the students predict what will happen if larger pebbles and rocks are added to the sand in the stream table.

Step 3: Smooth out the sand and have students place larger pebbles and rocks in the sand. Run the water in the stream table for 30 seconds on a setting of 60.

- Have the students make observations about the movement of the sand and gravel.

Step 4: Raise the level of the stream table by inserting the 4x4 beam under the upper end of the stream table. Ask the students to predict how this will affect the rate of erosion. Run the pump again for 30 seconds on a setting of 60.

- Have the students make observations about how the higher elevation affected the rate of erosion.

In an orderly fashion, allow the students to experiment with different arrangements of sand, gravel, flow rate, and elevation in the stream table. **The teacher should oversee the experimental design and control the pump at all times to avoid injury to the students or damage to equipment.** Allow approximately five minutes for experimentation.

Slide 5: Appalachian Mountain Wannabes

Ask: Where are the tallest mountains in the world?

Click #1

Answer: The Himalayan mountains are the tallest, with Mt. Everest being the tallest mountain in the world at 29,041 feet. The Himalayan Mountains are

Engage (continued)



growing at a rate of approximately 2.4 inches per year.

Ask: Did you know the Appalachian Mountains used to be taller than the Himalayan Mountains? 320 million years ago the highest peak of the Appalachian Mountains was over 36,000 feet.

Click # 2 to show the difference between the Himalayan Mountains and the Appalachian Mountains.

Discuss the role of erosion and weathering in the breakdown of mountains.

Slide #6 Chesapeake Bay

Click #1 – Say: Look at this image of the Chesapeake Bay. What do you notice about the color of the water? What are some actions that humans take that might increase the rate of erosion?

Answer: Deforestation, farming, parking lots, roads and housing developments.

Ask: What do you think happens to the water in the rivers when there are severe storms? What color does it turn? Why?

Answer: There is an increase in the amount of erosion due to greater amounts of water running across surfaces at higher speeds.

Click #2: Chesapeake Bay with erosion picture.

Explain that this image was taken after severe storms dumped large amounts of rain on the area, which resulted in greater amounts of runoff and erosion.

Ask: What impacts do you think this has on aquatic ecosystems such as the Chesapeake Bay?

Answer: Cloudy water leads to less sunlight for submerged vegetation, clogged fish gills, sediment build up and loss of habitat on the bottom of the bay.

Explore



60 minutes

Slide 7: Rock and Roll Hike

On the rock and roll hike the groups will visit nine sites to discuss evidence of weathering and erosion. The staff at Fairview needs one more site. Your job as a student is to find and photograph at least one other site that shows evidence of weathering and erosion as a proposed tenth site for the rock and roll hike. Be prepared to present you proposed site to the rest of the group at the end of the hike back at the roundhouse.

The teachers and chaperones will be provided a question guide to use for leading discussion with the students at each of the 9 sites.

Slide 8: Tools for Rock and Roll

Be sure to have the Fairview Materials for Rock Hike.

(1 per team, four teams of supplies available)

- Fairview Geology Hike Map
- Fairview Weathering and Erosion Guide (Laminated with pictures/tasks at 9 sites)
- I-pod touch or digital camera





Place the students in their subgroups.

● **Map Person:** Have one student come and pick up the map. Review the course they will travel using the map. Tell the students that they will be going in different directions. There are 5 stops up the mountain and the rest (#6-9 stops) are down the mountain.

● **Photographer:** Have another student pick up the I-pod touch or digital camera. The I-pod touch or digital camera will be used to take pictures at each site along the hike.

The following things should happen during exploration time:

- **The students should collaborate about their observations at each site with the teacher using the question guide to help facilitate conversation.**
- **The students should be using this time to rehearse what they will share about their photographs using an appropriate explanation for evidence of weathering and erosion, natural agents, and erosion control.**
- **Rotate the person with I-pod/ digital camera and map at each station. Each person should have at least two opportunities to use each piece of equipment.**
- **The students should be looking for evidence of weathering and erosion for their recommendation of the tenth site for the rock and roll hike.**

<p style="text-align: center;">Extend</p>  <p style="text-align: center;">Evaluate</p> 	<p>30 minutes</p>	<p>Slide 9: Rock and Roll Showcase</p> <p>The students will showcase their photographs from their hike. The teacher will need to take the IPOD and download the pictures to the computer. During the showcase the students will describe evidence of weathering and erosion, natural agents, and erosion control. If your group has returned early you may have time to view all the photographs and allow for more time for the students to share their explanations for evidence of weathering and erosion. If your group has returned just on time the students should share their recommendation for the tenth site and then if more time is available, they can view and discuss the other pictures. If your group is running behind the students should view and discuss photographs that have already been downloaded from previous groups. Reassure that students that their photographs will be provided for them to view at a later time.</p> <p>Slide 10: Focus Questions</p> <p>Revisit the enduring and focus questions.</p> <p>Enduring Questions</p> <ul style="list-style-type: none"> • What are the nonliving (abiotic) and living (biotic) characteristics of an ecosystem? • How does energy flow through an ecosystem? <p>Focus Questions</p> <ul style="list-style-type: none"> • How do the processes of weathering and erosion contribute to the rapid and slow changes on the surface of the earth? • How can human activities at Fairview have a positive or negative effect on erosion and the environment?
<p style="text-align: center;">Career Links</p> 	<ul style="list-style-type: none"> • Geologist • forest ranger • soil scientist 	
<p style="text-align: center;">Considerations for Larger Groups</p> 	<ul style="list-style-type: none"> • The classroom teacher will have more students in their group during the hike. Remind the students that cooperation and collaboration will be especially essential since they are working in a larger group. 	

Inclement Weather Back-Up Plan



Consider the following:

- Use the photographs from other groups to have the students to discuss the evidence of weathering and erosion.
- Stream table create a structure that will control weathering and erosion.

Cleaning Up and Setting Up for the Next Teacher



- ✓ Replace the clipboards with the hike information.
- ✓ Be sure the stream table and implements are in a safe place.
- ✓ Turn off the projector.

Slide 1



ROCK AND ROLL

Slide 2

Focus Questions

- How do the processes of weathering and erosion contribute to the rapid and slow changes on the surface of the earth?
- How can human activities at have a positive or negative effect on erosion and the environment?



Slide 3

Vocabulary



- **Erosion** –all the processes that cause rock to be carried away by water, wind or ice
- **Weathering** –the processes that break rock into small particles resulting in the formation of soil
- **Deposition** -the process by which sediments are deposited in a new location

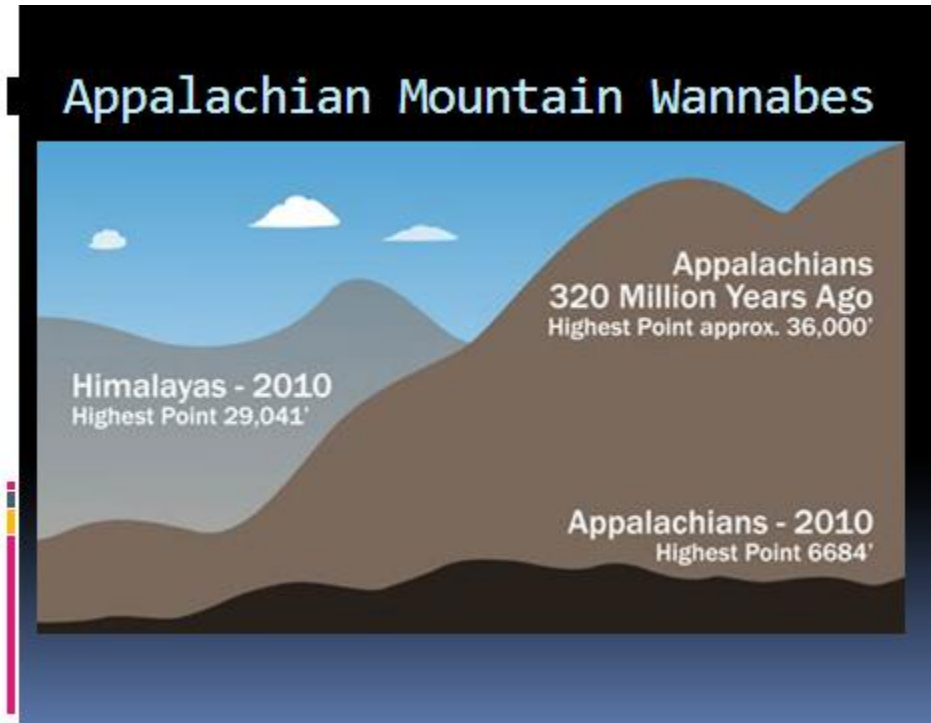
<http://www.youtube.com/watch?v=y3ZndIBSoHo>

Slide 4

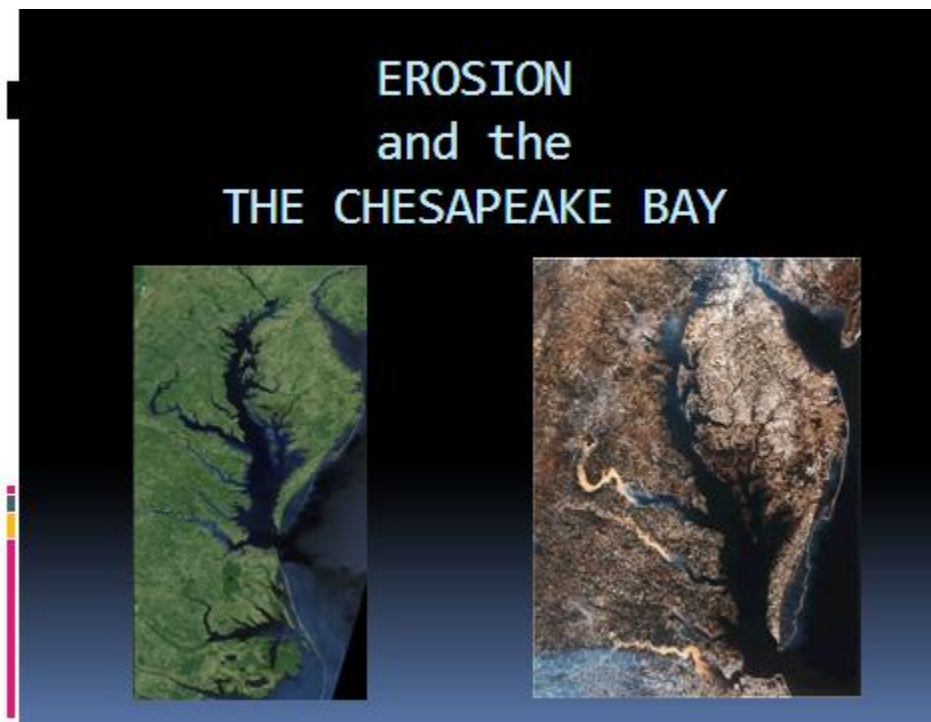
Cracker And Stream Table Demonstrations



Slide 5



Slide 6



Slide 7

Rock and Roll Hike



Slide 8

Tools for Rock and Roll



Slide 9

Rock and Roll Showcase



Slide 10

Focus Questions

- How do the processes of weathering and erosion contribute to the rapid and slow changes on the surface of the earth?
- How can human activities at have a positive or negative effect on erosion and the environment?

U ROCK!

Quick View for Rock and Roll

Materials/ Resources	Teacher Materials	Student Materials (1of each item per group)
	<ul style="list-style-type: none"> • cracker for demonstration • stream table • Rock-n-Roll PowerPoint • sample rocks • I-pod touch or digital camera • rock hike map 	<ul style="list-style-type: none"> • Fairview geology hike map • Fairview Weathering and Erosion Guide (Laminated with pictures/tasks at 10 sites) • I-pod touch or digital camera
Safety	<ul style="list-style-type: none"> • At the stream table, the teacher should oversee the experimental design and control the pump at all times to avoid injury to the students or damage to equipment. • The students should not throw rocks and materials. • The students should not run during activities. 	
Engage	Use slides 1-5 from the PowerPoint. Before entering the Roundhouse the students look for evidence of erosion around the roundhouse. Introduce focus questions, review vocabulary, and do demonstration with cracker and stream table. Also provide background information on Appalachian Mountains and Chesapeake Bay.	
Explore	Use slides 7 and 8 in the PowerPoint to prepare the students for the rock and roll hike. Allow 60 minutes for the students to do the rock and roll hike.	
Extend/ Evaluate	Use slide 9 in the PowerPoint to introduce the rock and roll showcase. The students showcase their photographs and explain evidence of weathering and erosion, natural agents, and erosion control. Use slide 10 in the PowerPoint to revisit the enduring and focus questions.	
Cleaning Up for the Next Teacher	<ul style="list-style-type: none"> ✓ Replace the clipboards with the hike information. ✓ Be sure the stream table and implements are in a safe place. ✓ Turn off the projector. 	

Rock and Roll Hike

1. The Great Appalachian Valley and South Mountain
(Middle of trail from round house to shed)
Lat: N 39.66432° Long: W 77.94227°

You are standing on a 400 million year old **sandstone** mountain (sandstone weathers slowly), looking across the Cumberland Valley which is part of the larger Great Appalachian Valley. The mountain in the distance is South Mountain. You cross South Mountain on your way to Frederick. The valley is made of limestone and shale rocks (limestone and shale weather quickly).

What evidence can you cite from this location to show that limestone weathers quickly and sandstone weathers slowly?

Take a picture of the church steeple in the valley.



2. Rock Garden
(Behind the storage buildings in front of the black pearl)
Lat: N 39.66489° Long: W 77.94102°

Study the rocks all over the ground here. What kind of rocks are they? Where did they come from? Why are there so many rocks here? Did people do this or is it natural?

What was the role of weathering, and gravity in building this pile of rocks?



3. Grandfather Rock Can you see my mouth and beard?
(By trail going uphill to fire tower.)
Lat: N 39.66474° Long: W 77.94267°

Like all of the rocks on the Mountain at Fairview, Grandfather Rock is sandstone. 400 million years ago these mountains were as big as the Himalayas (The world's highest mountains).

Why are our mountains so small today?

Take one picture that shows weathering in grandfather rock. Take a second picture that shows erosion around the area.



4. Snake Head Rock

(On trail junction on left at top of hill)

Lat: N 39.66453° Long: W 77.94361°

Lichens (ly-kens) give this rock its green to gray colors. Lichens are made of an algae and a fungus that live together. The algae makes food for the fungus, and the fungus makes a moist habitat for the algae. This is a type of symbiosis called mutualism. Both the algae and the fungus benefit from the relationship. Lichens are among the first organisms to grow on bare rocks. Lichens produce weak acids as they grow.

What effect do lichens have on rocks ?

Take a picture of another type of organism (other than lichens) growing on or out of a rock.



5. Turtle Trail

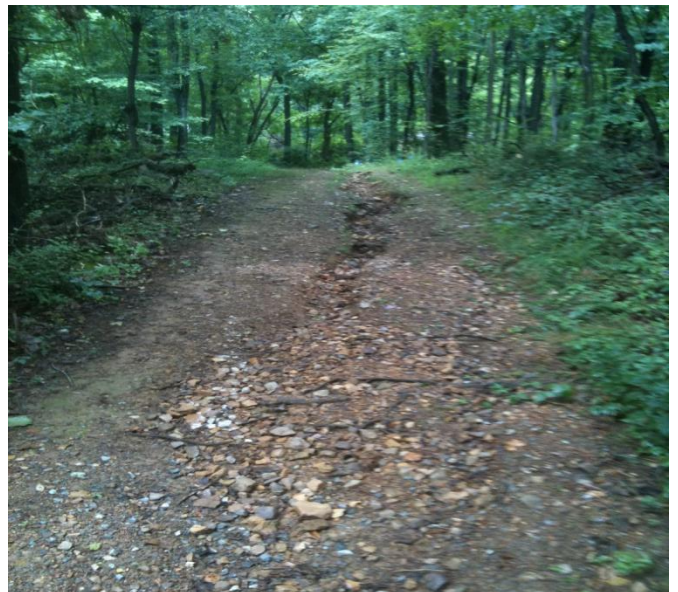
(Behind dining hall leading to pond)

Lat: N 39.66317° Long: W 77.94292°

The base of this trail is showing great amounts of erosion. Search for human behaviors and natural features that have contributed to this erosion. Compare the amount of erosion in the wooded areas, and grass covered trails to the erosion on the base of turtle trail.

What impact do plants have on rates of erosion?

Take a picture of the gully erosion occurring along the turtle trail.



6. Geology Wall

(Near Astronomy Station at bottom of hill)

Lat: N 39.66319° Long W 77.94141°:

This wall contains a rock from every rock type in Washington County MD. Notice the cracks in the wall. What processes would cause these cracks?

How might weathering and erosion affect other human built structures like roads and buildings?

Find where rock weathered away from the wall and the wall was repaired. Take a picture of it.



7. Sink Hole

(On Road to Cedar Lodge)

Lat: N 39.66358°

Long: W77.93909°

Rainwater is slightly acidic under normal conditions because it mixes with carbon dioxide in the air. Air pollution causes rain to become even more acidic. Limestone rocks break down easily by chemical weathering. Caves form as the limestone rocks under the soil dissolve. Soil from the surface is carried into these caves causing **sink holes** like the one you see in our field.

How would you expect this sink hole to change in 10, 100, and

Take a picture of your team standing in the sink hole.



8. Trail Erosion

(At beginning of Nature trail to archeology)

Lat: N 39.66264°

Long: W 77.93871°

There are many factors that affect the rate of erosion by water: size of the particles, volume of water, and gravity are three. Notice how water has washed different sized particles in this area.

What factors determine how far particles are carried by erosion?

Take two pictures showing the deposition of different size particles in different areas.



9. Dinosaur Valley

(On Nature trail, go past Archeology and look behind a metal post at trail junction by the dry pond.)

Lat: N 39.66053°

Long: W 77.94180°

600 million years ago this land was a shallow sea. Tiny sea creatures produced the **calcium** that was cemented together to form limestone rocks. The rock that is weathered like a dinosaur head is one of these rocks. Find the #10 at this site and notice the rock fragments on the rocks under the #10. **Please do not disturb the rock fragments.** These are shale rocks and weather more quickly by mechanical weathering than chemical weathering.

Why do you think you are able to see fragments like these on these shale rocks in the valley but not on most other rocks at Fairview?



ROCK AND ROLL HIKE

Teacher/Parent Facilitator Support Pages



Parents and Teachers:

Remember that your role in this hike is to facilitate and help guide students to the answers. This information is provided to help you as you guide students. Do not simply read this information to students or tell them the answers. Help them and guide them as they **struggle** to interpret the evidence at each site.

Site 1 – Great Appalachian Valley and South Mountain

What evidence can you cite from this location to show that limestone weathers quickly and sandstone weathers slowly?

When the mountains here formed, the entire area was raised up much higher than it is today. The limestone and shale rocks weathered more quickly than the sandstone rocks. Over millions of years this resulted in the formation of valleys where there were limestone and shale, and mountains where there were more resistant rocks like sandstone. The limestone and shale rocks break down and are carried away by erosion leading to the formation of the valley. Sandstone rocks do weather but at a much slower rate than limestone and shale.

- Help the students arrive at the answer by emphasizing the different rates of weathering and erosion among different rocks resulting in our mountain and valley terrain.

Site 2 – Rock Garden

What was the role of weathering, and gravity in building this pile of rocks?

Processes of physical weathering caused larger rocks to break into smaller pieces. The smaller pieces of broken rock were carried downhill by gravity. Gravity plays an important part in erosion. Higher elevations have greater rates of erosion due to the force of gravity.

- Ask the students what they know about gravity. Have them apply their knowledge of gravity to the movement of these rocks down the mountain.

Site 3 – Grandfather Rock

Why are our mountains so small today?

Millions of years of weathering and erosion have resulted in the down grading of the Appalachian Mountains. As the rocks weather and are eroded away the mountains gradually become smaller. This is why our old mountains are much smaller than they once were.

- This is a summary of information from previous sites. Remind the students of what they have seen and discussed at the two previous sites.

Site 4 – Snakehead Rock

What effect do lichens have on rocks?

Lichens increase the rate of chemical weathering of rocks. They breakdown rocks and help to create soil that other plants such as mosses and eventually grasses can survive in.

- Emphasize the acids produced by lichens to lead students to identify them as a type of chemical weathering

Site 5 – Turtle Trail

What impact do plants have on rates of erosion?

The roots of plants hold the soil and help to slow erosion. This should be obvious to students as they look around and see that there is little evidence of erosion in areas covered with plants.

Site 6 – Geology Wall

How might weathering and erosion affect other human built structures like roads and buildings?

Human made structures are susceptible to weathering and erosion just like naturally occurring rocks. If we do not maintain and repair our buildings and roads they will break down and be eroded away just like the rocks.

Site 7 – Sink Hole

How would you expect this sink hole to change in 10, 100, and 1000 years?

Changes due to chemical weathering are slow in human terms. The erosion of soil into underground caverns generally happens over hundreds of years. Occasionally a sink hole will open in one rapid event and may engulf surface objects that once seemed stable above the unseen cavern. Over 10 years there would be little noticeable change in the sink hole. The sink hole would grow gradually and may show noticeable change in 100 years. In 1000 years the sink hole should be noticeably wider and deeper and may be the entrance to a cave.

- Remind the students that these changes are slow and constant

Site 8 – Trail Erosion

What factors determine how far particles are carried by erosion?

The smallest particles are most easily moved by wind and water causing erosion. Clay particles are the smallest then silt, sand, and gravel. At this site you will notice large gravel closest to the trail. The size of the gravel will gradually decrease away from the trail. Eventually particle size will decrease from gravel to sand, silt and finally clay sized particles. The greater the rate of flow of water, the larger particles it can carry. As the water flow slows down the larger particles fall out as deposition. Sand, silt, and clay particles are deposited as the water slows down and loses most of its energy.

- Have the students point out the change in particle sizes in the area of deposition beside the trail. Lead them to explain what causes this change in particle size.

Site 9 – Dinosaur Valley

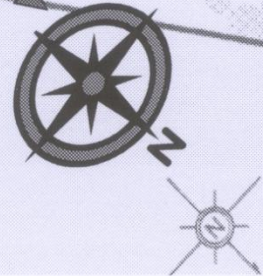
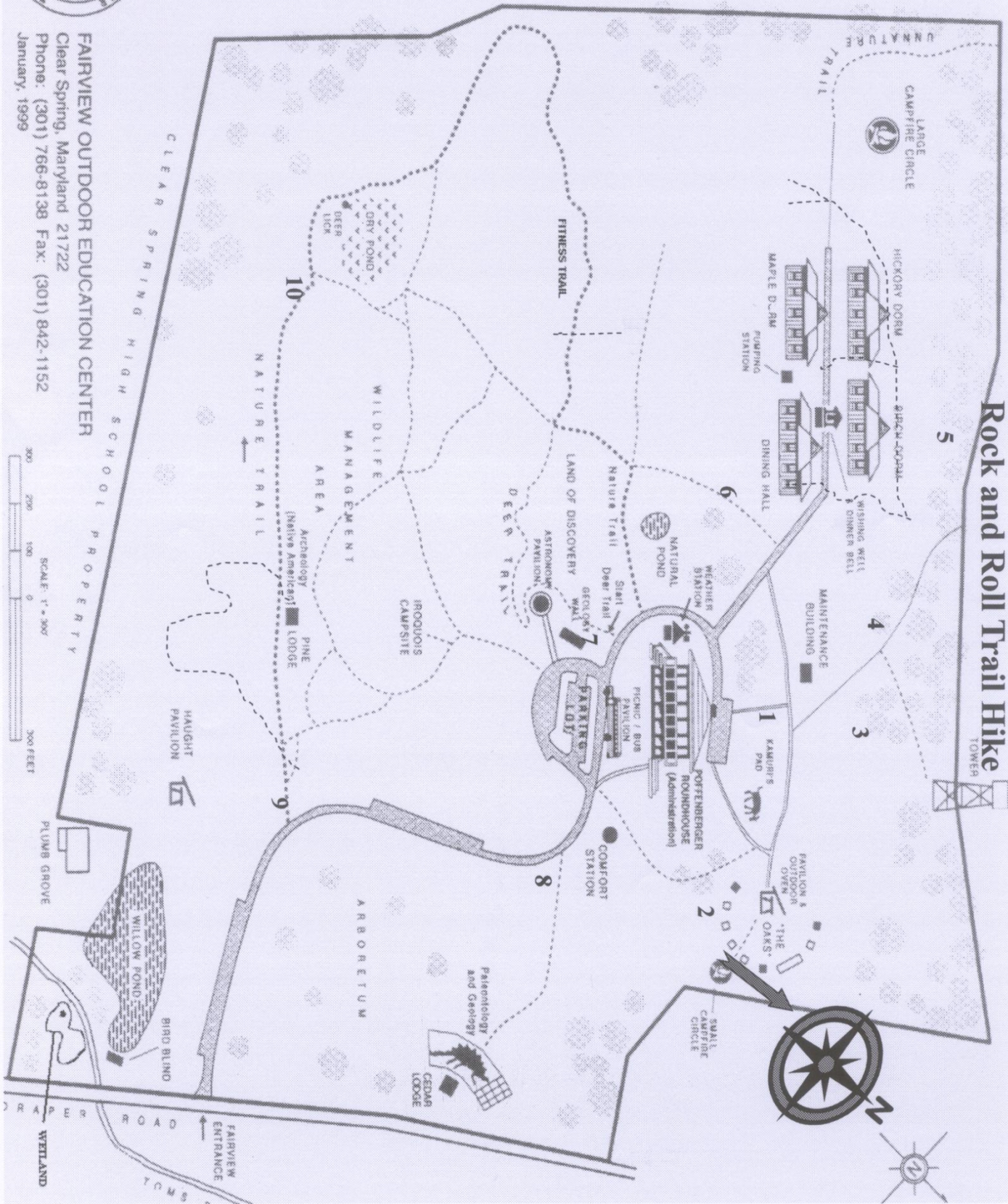
Why do you think you are able to see fragments like these on these shale rocks in the valley but not on most other rocks at Fairview?

Limestone rocks weather mostly by chemical weathering. In chemical weathering the rocks dissolve rather than breaking into smaller fragments. Sandstone rocks weather mechanically and produce fragments. These fragments are usually not seen on the sandstone rocks because they are higher up on the mountain. As fragments form on the sandstone rocks they are quickly eroded downhill. The shale rocks in the valley break into fragments that are not carried away as quickly because they are at a lower elevation. Gravity has less impact on erosion in the valley than it does on the mountain.

- Remind the students that they are in a valley where erosion rates are going to slow down because gravity has less affect than it has on the mountain.

Rock and Roll Trail Hike

TOWER



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 January, 1999



