From Rocks to Soil

Grade Level: 4 - 12
Essential Skills: 1, 4, 5, 9

NGSS: 4-ESS2-1, 5-ESS2-1, MS-ESS3-3, HS-ESS2-1, MS-ESS 2-1

CCSS: RI4.7, RI.5.7, W.4.7, W.5.8
Historical Thinking 4.6

Time: 1-2 class periods

Materials:
Weatherization worksheet; other materials listed with each activity.

More AITC resources online:
Instructional Units: *Cycling Back to Nature - Soils Alive!*

Weathering: the process of the breaking down rocks into soil. There are two different types of weathering - *physical* and *chemical weathering*.

Physical weathering is the disintegration of rocks and minerals by a physical or mechanical process.

Chemical weathering is the chemical alteration or decomposition of rocks and minerals.

08/19

Description:

In this lesson students explore *weatherization* (physical and chemical) by doing a series of short experiments that demonstrate how rocks and minerals are broken down into soil. Expand this lesson further by taking students on a field trip to look for rocks breaking down into soil.

Directions:

Here are two ways to approach the five short demonstrations of how rocks become soil.

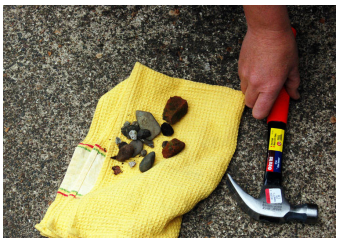
Option 1: Set up five experiment stations based on the activities below. Cut apart each station directions and set with corresponding station materials. Have students work in small groups, record their findings at each station, then complete the *Weatherization* worksheet. Plan for about 10 minutes per station. When everyone has done all the experiments, assign each group one of the activities to present and explain to the class.

Option 2: Break students into groups. Assign each group one of the activities below. After completing the experiment once on their own, each group will then demonstrate their activity for the class and explain what is happening and how it relates to soil formation.

For teachers, the directions include explanations of what is being seen and where in Oregon you can find this type of *weatherization*. You may wish to remove this information from the directions you give students to follow.

Beginning Activity: Forces of Nature

(Instructor demonstrate to class)
Materials – Several small rocks, cloth, hammer, safety glasses



Directions: Show students the rocks. Then wrap the rocks in a sturdy piece of cloth. Wearing safety glasses, hit the rocks with a hammer. Ask the students what they think they will see when the rocks are unwrapped. Unwrap the cloth and show the students how the rocks look.

Have students guess what forces in nature, if any, could cause this much change in a short time.

Answer: Earthquakes, severe freezing, hurricanes, or other violent forces can break up rocks.

Where can we find examples of this in Oregon?

Activity I: Roots, Heaving & Uplifting

Materials – Large balloon, small stack of lightweight books

1) Place a large flattened balloon between two light weight books.

2) Blow the balloon up while it is between the books. See image.

3) As you inflate the balloon, observe what happens to the books.

What is happening: The expanding balloon shifts and lifts the books. In this experiment the balloon represents both the roots of plants that, over time, can split rocks. The expanding balloon can also be used to represent water that freezes in the cracks in rocks, expands, and breaks rocks when it turns into ice. Finally, the balloon example can also represent the uplift of mountains.

Oregon example: In high mountainous places with freezing and thawing temperatures roads shift and buckle, and rocks on cliffs "pop" off on to roadways. You may have seen road signs that say, "Watch for falling rock," and "Frost Heaves." These are warnings to motorist about road hazards created by this type of weathering.

This exercise also demonstrates *uplift*. The Steen Mountains in NE Oregon are one of the largest single fault uplifts in North America and an excellent example of uplift.

A tree takes hold in a bolder and its roots split the rock.

Steen Mountains in NE Oregon are one of the largest single fault uplifts in North America.

Activity II: Wind Erosion

Materials – Soft rock, medium grade sandpaper, white sheet of paper

1) Over a white sheet of paper, briskly rub the surface of a soft rock with a piece of medium grade sandpaper.

2) Observe how much of the rock rubs off onto the paper.

What is happening: This experiment illustrates the influence of sandy winds on rock. It is one way rocks can be eroded. Wind erosion is also a problem in farmland. The greatest historical example is the Dust Bowl of the 1930s that literally blew away the soil of Midwestern farms.

Oregon example: On the Oregon coast sandy winds erode and reshape the coastline sandstone cliffs.

Floras Lake Beach, Langlois, OR

Activity III: Glaciation

Materials – Two sedimentary rocks, white sheet of paper.

1) Grind two sedimentary rocks together over a piece of white paper.

2) Observe how much of either rock falls onto the paper.

What is happening: This experiment illustrates the abrasive force of glaciers. Glaciers not only transport material as they move, but they also cut and carve the land beneath them. A glacier's weight, combined with its gradual movement, can drastically reshape the landscape, shearing away mountainsides and creating deep valleys with vertical walls. Much of the Midwest's rich, flat farmland was formed by glacial activity.

Oregon example: During the Pleistocene era (2.5 million - 12,000 years ago) scientists believe the entire Oregon Cascade Range may have been covered by glaciers, forming an ice cap over the region. Today, there is much less glacial activity. Glaciers can still be found on the ***stratovolcanoes*** of Oregon's Cascade Range and in the Wallowa Mountains of northeastern Oregon. These glaciers are important shapers of the landscape, as well as important sources of water to downstream ecosystems, farms and human infrastructure.

(above) Striations (linear marks) left by a glacier. The striations show the direction of movement of the ice.

(left) The Collier Glacier in the Oregon Cascade Range at an elevation 7,000+ feet is one of the largest glaciers in Oregon.

Activity IV: *Speleogenesis*

Materials – white vinegar, eyedropper, Tums or some other type of calcium carbonate tablet.

1) Place a few drops of vinegar on a piece of calcium carbonate tablet.

2) Observe.

What is happening: This experiment demonstrates ***Speleogenesis***. That's the scientific term for the (natural) chemical break down of rocks to form caves. Rainwater seeping into soil turns into a natural acid, carbonic acid, that dissolves away at rock underground to create caves. In this experiment the vinegar represents carbonic acid and the TUMS represents limestone. Note how the tablet quickly dissolves and even bubbles.

Oregon example: The Oregon Caves National Monument near Cave Junction is an excellent example of rock being carved away over millions of years. Deep inside the Siskiyou Mountains the caves formed when acidic rainwater dissolved the surrounding marble, creating one of the few marble caves in the world. Most caves are limestone.

The Oregon Caves

Activity V: Water Erosion

Materials – pan or paper plate, sand, 1/4 cup of water

1) Cover the bottom of a pan or paper plate with sand.

2) From about 2-4 feet above the pan, slowly drop the water onto the surface of the sand and observe what happens to the sand.

What is happening: This experiment shows how water erodes soil and rock.

Oregon examples: Oregon's landscape is full of examples of water erosion large and small. Examples can be found at river banks, farm fields, backyards, plus memorable features like the monoliths at Cannon Beach, waterfalls and deep canyons.

Hay Stack Rock at Cannon Beach, is the third largest monolith in the world.

The Snake River Canyon was carved away over millions of years.

Oregon's Multnomah Falls are the tallest year-round waterfalls in the United States.

Página de actividades

Ficha de climatización

Nombre del estudiante: _____

Los suelos se crean cuando las rocas se descomponen en pequeñas partículas. Este proceso se llama meteorización y puede ocurrir de muchas maneras diferentes. La meteorización física es el proceso que separa las rocas sin cambiar su composición química. Las imágenes en esta hoja, la mayoría de Oregón, son ejemplos de meteorización física.

Con su grupo, rotará por cada estación, leerá las instrucciones, completará la actividad y tomará notas en la sección correspondiente de esta página.

Activity I: Roots, Heaving & Uplifting (Raíces, levantamiento y elevación)
Describa lo que sucede en esta actividad y cómo se relaciona con las rocas.

Explique en detalle y ejemplo de esto teniendo lugar en Oregon.

Activity II: Wind Erosion (La erosión del viento)
Describa lo que sucede en esta actividad y cómo se relaciona con las rocas.

Explique en detalle y ejemplo de esto teniendo lugar en Oregon.

Activity III: Glaciation (Glaciación)
Describa lo que sucede en esta actividad y cómo se relaciona con las rocas.

Explique en detalle y ejemplo de esto teniendo lugar en Oregon.

Activity IV: Speleogenesis (Espeleogénesis)
Describa lo que sucede en esta actividad y cómo se relaciona con las rocas.

Explique en detalle y ejemplo de esto teniendo lugar en Oregon.

Activity V: Water Erosion (Erosión del agua)
Describa lo que sucede en esta actividad y cómo se relaciona con las rocas.

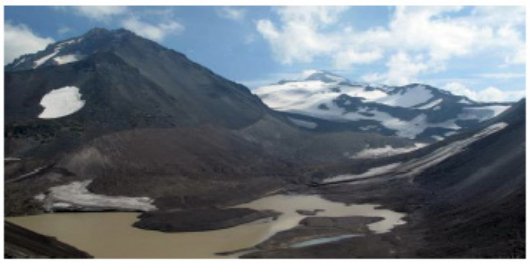
Explique en detalle y ejemplo de esto teniendo lugar en Oregon.

Revisar los tipos de erosión
Instrucciones: Etiquete cada imagen con el tipo de meteorización que se muestra. Puede haber más de una respuesta.

Erosión del viento: El viento sopla la arena contra la roca y la desgasta.
Expansión y contracción: Las rocas se dividen y se astilla por temperaturas de congelación o calentamiento.
Erosión del agua: El agua desgasta las rocas, a menudo con la ayuda de arena y grava.
Glaciares: El inmenso peso y la presión de estas masas de hielo muelen y rompen las rocas.
Raíces: Las raíces de las plantas abren grietas en las rocas.

Cañón de Hell

Caídas de Multnomah



Collier Glaciar

Haystack Monolito

Floras acantilados de playa

Primo: Sombrero de roca cerca de Hermiston es una columna de basalto enorme. Lewis and Clark lo nombré viajando por el río Columbia.