WEATHERING AND EROSION

GRADE LEVEL: 4 -6

TIME REQUIRED: One class period

SETTING: Classroom, science lab, or outdoors

GOAL: To create a landform by using weathering and erosion processes

OUTCOMES: At the end of this lesson the student will be able to:
- define and give an example of mechanical weathering,
- define and give an example of chemical weathering,
- define the process of erosion,
- and list at least two types of sedimentary rocks.

KERA GOALS: Meets KERA goals 1.3, 1.4, 2.1, 2.2, 2.4, 5.1,.5.3, 5.4, 6.2

BACKGROUND INFORMATION
The earth is a dynamic body. Earth movements cause elevation of the surface while opposing processes wear it down. The wearing down processes include weathering and erosion.

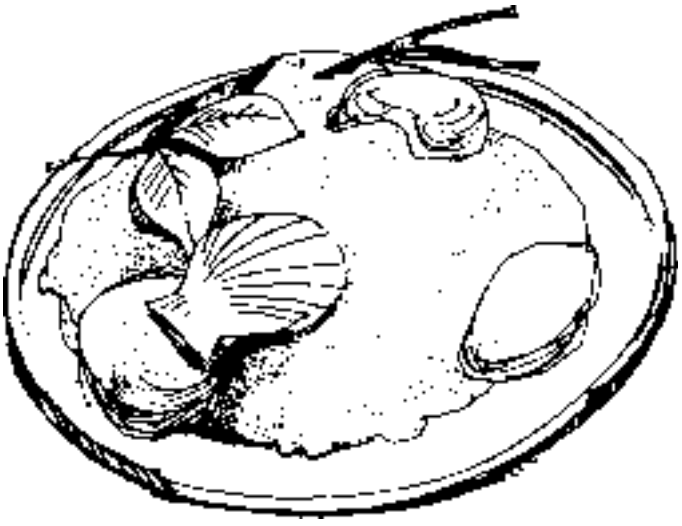
Weathering - is the disintegration and breakdown of rock near the earth's surface.
Mechanical weathering occurs when rocks are broken into smaller and smaller pieces. This process can occur when plant roots break rocks apart, or when freezing and thawing produce wedges in rocks.
Chemical weathering occurs as water combines with other elements to alter rocks. An example is carbonic acid. Water combines with carbon dioxide to produce a weak acid called carbonic acid. The carbonic acid then dissolves rock by chemical weathering.
Erosion - is the transportation of this material, usually by water, wind, or ice.

The products of mechanical and chemical weathering constitute the raw material for sedimentary rocks. Weathered debris is eventually deposited in lakes, river valleys, seas, and oceans. Over long periods of time these sediments are cemented together to form solid rock.

Since sediments accumulate at the earth's surface they contain indications of past environments. Layering is the most characteristic feature of sedimentary rock. As each layer accumulates it records the nature of the environment at the time. The layers are called strata and are separated by bedding planes. Generally, each bedding plane marks the end of one deposit period and the beginning of another.

Sandstone is the name given to rocks when sand grains predominate. Limestone is the result of cemented shells and bone fragments. Shale consists of silt and mud.

MATERIALS NEEDED
- One frisbee for each group
- Two pieces of sandstone and two pieces of limestone for each group
- Small bottle of vinegar with dropper for each group
- Dirt and small rocks
- An assortment of leaves, rocks, shells, twigs
- Small plastic containers with holes punched in the bottom (to form a "rain cloud"). NOTE: Containers from frozen lunches make excellent clouds
- Water
- Paper and pencil
- "Weathering and Erosion Worksheet"



WEATHERING AND EROSION

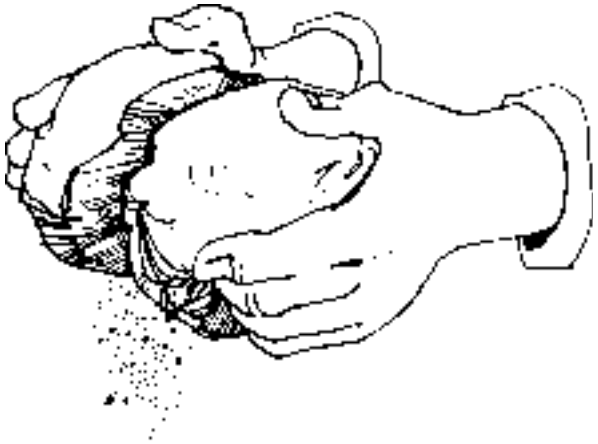
PROCEDURE

1. Divide students into small groups of 2-4 students each.
2. Give each group two sandstone rocks, two limestone rocks, a bottle of vinegar with a dropper, and one copy of the "Weathering and Erosion Worksheet."
3. *As a demonstration of chemical weathering:*

- Place several drops of vinegar on the sandstone and observe the action of acid on the rock. Record your observations.
- Place several drops of vinegar on the limestone and observe the action of acid on the rock.

4. *As a demonstration of mechanical weathering:*

- Give each group a frisbee in which to collect any rock particles or rock dust produced.
- Instruct students to take turns rubbing the limestone rocks together. Record your observations.
- Instruct students to take turns rubbing the sandstone rocks together. Record your observations.
- Discuss how long it took to produce the resulting particles. Which rock produced the most new soil?
- Estimate the total amount of soil produced by mechanical weathering.



5. Place a cup of dirt in the center of each frisbee. This represents the amount of soil necessary to grow a plant. Have students theorize the length of time it would take nature to produce sufficient soil to grow crops or support a forest.
6. Have students stabilize their landforms (soil mound) with rocks, leaves, and/or twigs.
7. Look at the effects of weathering. Pour water into each "rain cloud". Have students pass their rain cloud over their soil mound, allowing rain to fall onto their landform. Record the effects of erosion on the soil mound.
8. Compare the results of water on the various soil mounds. Did any withstand the erosional effects of water? Why were some more effective than others. Was there a correlation between the amount of "rainfall" and the amount of erosion? Was there a correlation between the type of ground cover and the amount of erosion?

EXTENSION

- Bury bits of shells or other fossil materials in the landform and discuss the process of extrusion.

WEATHERING AND EROSION WORKSHEET

Chemical Weathering

1. In the space below record the action of acid (vinegar) on sandstone rock.

2. In the space below record the action of acid (vinegar) on limestone rock.

Mechanical Weathering

1. In the space below record your observations after rubbing two pieces of limestone rock together. The frisbee will be used to collect rubbings.

2. The amount of "soil" produced by mechanical weathering of limestone rock was _____.

3. In the space below record your observation after rubbing two pieces of sandstone rock together.

4. The amount of "soil" produced by mechanical weathering of sandstone rock was _____.

5. Amount of "soil" produced by mechanical weathering of both limestone and sandstone rocks was _____.

6. After placing a cup of dirt in the Frisbee (enough to grow a small plant) record below your theory of the length of time it would take natural processes to produce sufficient soil to grow crops or support a forest.

WEATHERING AND EROSION WORKSHEET

Effects of Weathering

1. Stabilize your “landform” (cup of soil in Frisbee) with rocks, leaves and/or twigs.
2. Pour water into your “rain cloud” (small plastic container with holes punched in the bottom).
3. Pass your “rain cloud” over your “landform”.
4. In the space below record the effects of erosion on your landform.

5. Compare the results of “rainfall” on the landforms of the other groups in your class by answering the following questions.

- Did any withstand the erosional effects of water? Which ones?

- Why were some more effective than others?

- Was there a correlation between the amount of “rainfall” and the amount of erosion?

- Was there a correlation between the type of ground cover and the amount of erosion?