

## Water Erosion Exploration

**Overview:** In this lesson students will understand the natural process of water erosion on a landscape region in the Pacific Northwest, and will understand the impacts that human interaction with the natural environment may have on this natural processes.

### **National Geography Standards:**

Geography Standard 7: The physical processes that shape the patterns of Earth's surface.

Geography Standard 14: How human actions modify the physical environment.

**Oregon Geography Content Standards:** 6.14. Identify physical features of the Western Hemisphere and explain their effects on people and events.

**New Generation Science Standard:** MS-ESS2-2 Earth's Systems: Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.

### **Objectives:**

In completing this activity, students should be able to:

- Understand** how a landscape's physical features impact the effects of water erosion.
- Understand** the how human actions influence the impact of water erosion on the natural environment.
- Identify** areas in the natural environment that have been impacted by water erosion, and/or human intervention.

**Grade Levels:** 6th Grade    **Time:** 1 week at outdoor school  
4 - 60 minute exploration exercises.

### **Materials:**

Before planning this activity be sure to verify with outdoor school site that you and your students will be able to gather natural elements at the site.

Each exploration group will need:

- Cardboard/plywood that will act as *erosion board* approximately 24in x 40in (does not need to be exact).
- 50 gallon heavy duty garbage liners - to cover the erosion board.
- Soil - Approximately 4ft<sup>3</sup> - this should be enough to cover the surface with a minimum of 6 inches (the landscape height can be adjusted as desired by students).
- Natural elements gathered at the outdoor school site (suggested that students are responsible for gathering all elements except for the soil - under the guidelines of the outdoor school site.
  - Sticks, twigs, grass, moss, rocks, etc.
- Something to angle the erosion board - (suggested ideas, rocks, logs, and or campfire wood that can be used after the week).
- Water Erosion Simulation Graphic Organizer (Attached as resource 1)
- Water Erosion Observation and Proposal Graphic Organizer (Attached as resource 2)
- Writing utensils to record their observations.
- Clipboard/Writing Surface for students

**Background:** Prior to Outdoor School, students will have studied water erosion as a physical process impacting the earth's surface. Students should be familiar with causes of water erosion, as well as what the effects of water erosion look like.

Students should also know examples of how both natural events and human intervention may change a region.

Students will also have studied/have prior experience with the geographic features of landscapes similar to that found in ecoregions similar to that of the Outdoor School site.

### **Procedures:**

Group sizes may be created as desired; however, it is suggested that students are partnered in groups of two. Small groups provide each person in the pair ample opportunity to participate in the creation of their water erosion board and allows the opportunity for keen observation and accurate recording of data.

### **Day 1**

In pairs, students will design their erosion board with physical features similar to those found in the ecoregion of their outdoor school site.

Erosion Board Design - Depending on time during outdoor school, students should have between 40 minutes and an hour to design their erosion boards.

- Angle erosion board (suggested use a downed log, firewood, or rocks).
- To waterproof the erosion board, cover with large garbage bag.
  - Depending on the size of the erosion board, the bag can be cut and draped over, or slid over. There should be no need to affix, as the weight of the soil will hold in place.
- Have students begin designing their erosion boards by placing soil first.
  - Encourage students to be creative with their design. Build peaks, valleys, plateaus, use more tightly packed and loosely packed soil, etc.
- Have students utilize natural elements that they have gathered to design their erosion board. These elements should help simulate the natural environment. Encourage students to

be creative and detailed with the design of their erosion boards, and to try to incorporate different features that they may have seen, or that they know exist in this region (forest, grassland, river valley, etc.)

- Ideas for how to simulate these regions: students may use moss to represent dense vegetation, or rocks to simulate mountains, cliffs, hillsides, etc.

### Primary Erosion Simulation:

As groups finish the design of their erosion boards, assist students in introducing water to their erosion boards. This can be done by using a hose, watering can, or a bucket of water.

- Depending on the goals of your simulations, you may want to choose a controlled way to introduce water to all groups, or you may want groups to experience variability in the way that water is dispersed onto their erosion boards (discussed as an extension activity).

### Recording Observations

As water is introduced to erosion boards have students observe and record the impact that the water had on the various features of their erosion board on their Water Erosion Simulation Graphic Organizer.

- You may want students to observe each other's erosion simulations - or have them all do this step independently.

**Days 2-4 (repeat this process each day)**

### Modification of Erosion Boards

Have students use between 30 and 40 minutes to make modifications to their erosion boards. This time includes the time for students to gather materials that they may need.

- You may want students to modify their designs based upon their previous observations, or students may be given specific modifications (discussed as an extension activity).

Be sure that throughout the week students' modifications include at least one natural change to the ecosystem (forest fire) and at least one human intervention to the ecosystem (river dam).

### Hypothesis of Impacts of the Modifications

Have students record the modifications made to their erosion boards on their Water Erosion Simulation Graphic Organizer.

Students should hypothesize as to the impact of the changes that have been made. These hypotheses should be recorded on their Water Erosion Simulation Graphic Organizer.

### Erosion Simulation After Modifications

Introduce water to students erosion boards.

- You may choose to introduce the same amount of water at a similar rate each day, or vary the amount and/or rate that water is introduced. (discussed as an extension activity)

### Recording Observations

As water is introduced to erosion boards have students observe and record the impact that the water has on the environments on their Water Erosion Simulation Graphic Organizer.

- Have students make specific note of how things may have changed as a result of the changes to the natural environment that have been introduced.

**Assessment:** Use the attached Water Erosion Observation and Proposal Activity and Scoring Guide

Students will learn how to observe a large natural environment and identify evidence of water erosion within this environment using natural indicators as evidence of water erosion.

### **Procedures:**

Find a place where students have a larger landscape view of the region.

Give students a writing utensil, clipboard, and Water Erosion Observation and Proposal Graphic Organizer (resource 2). Have students sketch the greater landscape of the outdoor school site and surrounding areas in the provided space of the graphic organizer.

When sketches are completed have students identify locations where evidence of water erosion is present. Students should be able to **indicate** the evidence of the erosion.

Have students propose at least one human intervention that could help positively impact at least one of the areas that has been impacted by water erosion, OR describe why human intervention should not occur in this location despite the impacts of water erosion.

As a class, discuss students sketches with a specific emphasis on:

- where there is evidence of water erosion
- similarities/differences and disagreements that groups may have with each other in regards to where water erosion has occurred.
- students' proposal for human interventions or lack thereof.

### **Extensions and/or Adaptations:**

This activity can be extended in several different ways:

You may choose to have various methods (rate and amounts) of having water introduced to students erosions boards each day. These various methods may help indicate different type of precipitation events (rain, drought, flooding, etc.). Students may be able to hypothesize how these different events may impact water erosion in different ways.

You many choose to intentionally set up students' erosion boards at different angles to simulate differences in the change of

elevation that occurs in nature. Students can hypothesize as to how the differences in angle (gradual vs. immediate changes in elevation) will impact water erosion differently.

Instead of having students make modifications to their erosion boards by their own choice. You may choose to introduce changes to students' erosion boards by giving (randomly or intentionally) students various scenarios that determine the modifications that will occur. Examples of these modifications may include:

- Forest Fire removes 80% of a forests trees
- Clear Cutting
- Damming a river or lake to provide flood control downstream.
- Development of housing/commercial buildings
- Laws/Policies introduced limiting logging, or restricting locations of roads, housing, etc.

## Erosion Simulation Observation

Name: \_\_\_\_\_

	Changes Made to Erosion Board	Hypothesis: Impact of the Changes Made  Where will water flow? What changes will it make to the landscape?	Observation of Water Erosion
<b>Day 1</b>	Initial design:		
<b>Day 2</b>			

Day 3			
Day 4			

**Based upon your observations, what things - natural or human interventions, have the largest impact on whether or not water erosion will occur in a given region?**

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## Observation Exercise: Water Erosion Observation

### **Objective:**

Students will learn how to observe a large natural environment and identify evidence of water erosion within this environment using natural indicators as evidence of water erosion.

### **Procedures:**

Find a place where students have a larger landscape view of the region.

Give students a writing utensil, clipboard, and Water Erosion Observation and Proposal Graphic Organizer (resource 2). Have students sketch the greater landscape of the outdoor school site and surrounding areas in the provided space of the graphic organizer.

When sketches are completed have students identify locations where evidence of water erosion is present. Students should be able to **indicate** the evidence of the erosion.

Have students propose at least one human intervention that could help positively impact at least one of the areas that has been impacted by water erosion, OR describe why human intervention should not occur in this location despite the impacts of water erosion.

As a class, discuss students' sketches with a specific emphasis on:

- where there is evidence of water erosion
- similarities/differences and disagreements that groups may have with each other in regards to where water erosion has occurred.
- students' proposal for human interventions or lack thereof.

## Water Erosion Observation and Proposal

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<sup>2</sup> Resource 2

Shaphan Thomas

Sketch the landscape area that you can view, be sure to include prominent geographic and/or man made features



Indicate on your sketch, areas of the landscape that have been impacted by water erosion.

Based upon your observations and knowledge of water erosion, propose at least one intervention that could be beneficial to this region OR propose why human intervention should not occur in this region.

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## Water Erosion Observation and Proposal (Scoring Guide)

	4 Highly Proficient	3 Proficient	2 Close to Proficient	1 Developing Proficiency
Observation Sketch	Student's sketch is <b>complete</b> , and includes <b>all</b> prominent geographic features. Students sketch contains detail of less prominent geographic features.	Student's sketch is <b>complete</b> , and includes <b>all</b> prominent geographic features. Students sketch contains <b>some</b> detail of less prominent geographic features.	Student's sketch has <b>most</b> prominent geographic features, but may be <b>missing one or more</b> prominent features. Sketch contains <b>little to no detail</b> for less prominent features.	Student's sketch is <b>not complete</b> . Sketch is <b>missing both</b> prominent and less prominent geographic features.
Water Erosion Identification	Student's sketch has identified <b>all possible locations</b> where water erosion has occurred, and has <b>included proper evidence</b> of the erosion.  Student's sketch highlights details of other types of natural modifications to the land forms.	Student's sketch has identified <b>possible locations</b> where water erosion has occurred, and has <b>included proper evidence</b> of the erosion.	Student's sketch has identified <b>possible locations</b> where water erosion has occurred, and has <b>included evidence</b> of the erosion, however the evidence may not be consistent with water erosion or the landscape.	Student's sketch has <b>not identified possible locations</b> where water erosion has occurred.
Proposal	Student's written proposal discusses <b>details</b> and <b>evidence</b> of the water erosion in this specific site. Proposal to intervene or refrain from intervention is <b>well thought out AND</b> considers the <b>potential specific and realistic</b> consequences of <b>both</b> sides of the argument in its proposal.	Student's written proposal discusses <b>details</b> and <b>evidence</b> of the water erosion in this specific site. Proposal to intervene or refrain from intervention <b>provides potential specific and realistic</b> consequences of the proposed actions.	Student's written proposal discusses <b>details</b> and <b>evidence</b> of the water erosion in this specific site. Proposal to intervene or refrain from intervention <b>provides some</b> consequences of the proposed actions however these consequences may not be <b>specific or realistic</b>	Student's written proposal indicates intervention, or lack of intervention, however does not discuss the details and evidence of the water erosion in this specific site.