



Changing Habitats

Outdoor Activity

Teacher Information:

Time Requirement:	45 minutes to 1 Hour
Trail Used:	Discovery Area and Birth of a Lake Trail
Location:	Coldwater Lake Recreation Area
Group Size:	Not recommended for groups larger than 40

This activity is organized to be sequential by step. This is a challenging activity that will test your students’ observational skills and deductive capabilities.

Goal:

- 1) The student will understand the factors that led to the development of specific habitats in areas affected by the May 18, 1980 landslide.

Objectives:

- 1) The student will use the scientific method to deduce a reasonable explanation.
- 2) The student will apply knowledge acquired during the activity.
- 3) The student will compare, contrast and sort observations.
- 4) The student will reach a conclusion and be able to support it with evidence in writing.

Washington Essential Academic Learning Requirements

1.2.1 Structure of Physical Earth/Space and Living Systems

Analyze how the parts of a system go together and how these parts depend on each other.

- Describe the effect on a system when an input in the system is changed.

1.2.4 Components and Patterns of Earth Systems

Understand the Earth’s systems include a mostly solid interior, landforms, bodies of water, and an atmosphere.

- Identify and describe various landmasses, bodies of water, and landforms.

1.3.4 Processes and Interactions in the Earth’s system

Know processes that change the surface of the Earth.

- Describe how earthquakes, landslides, and volcanic eruptions change the surface of the Earth.

1.3.8 Life Processes and the Flow of Matter and Energy.

Understand that living things need constant energy and matter.

- Identify sources of energy and matter used by plants to grow and sustain life.

1.3.9 Biologic Evolution

Understand that plant and animal species change over time.

- Recognize and tell how some kinds of plants and animals survive well, some survive less well, and some cannot survive at all in particular environments, and provide examples.
- Recognize and describe how individual plant and animals of the same kind differ in characteristics and sometimes the differences give individuals an advantage in surviving and reproducing.

1.3.10 Interdependence of Life

Understand that an organism's ability to survive is influenced by the organism's behavior and the ecosystem in which it lives.

- Describe the role of an organism in a food chain or ecosystem.
- Describe how an organism's ability to survive is affected by change in an ecosystem.
- Describe the path of substances through a food chain.

2.1.3 Limitations of Science and Technology

Understand how to construct a reasonable explanation using evidence.

- Generate a scientific conclusion including supporting data from an investigation.
- Describe a reason for a given conclusion using evidence from an investigation. Generate a scientific explanation of observed phenomena using given data.

2.2.5 Evolution of Scientific Ideas

Understand that scientific comprehension of systems increases through inquiry.

- Describe how scientific inquiry results in facts, unexpected findings, ideas, evidence, and explanations.

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Mission:

Use the 'case facts' and evidence along the trail to answer the questions. Use your answers to determine which explanation is best.

Possible Explanations:

- 1) Landforms and water change habitats.
- 2) Plants and Animals change habitats.
- 3) Landforms, water, plants, and animals change habitats.

Case Facts:

1. In the spring of 1980 magma rose into Mount St. Helens and caused the north side of the volcano to swell out sideways. The hole in the side of volcano reveals the area that swelled out sideways.
2. On May 18, 1980 a landslide fell from the swollen side of Mount St. Helens. The landslide flowed 13 ½ miles down the Toutle River Valley, and 2 ½ miles up the Coldwater Creek valley.
3. The landslide deposit is 150 to 250 feet deep. The landslide is composed of big chunks of the volcano called hummocks. The mounds at this site and rising out of Coldwater Lake are hummocks.
4. Before the May 18, 1980 eruption, 30 lakes and ponds existed in what is now the blast zone. The landslide caused 150 new lakes and ponds to form.

Directions:

Begin this activity at the "Birth of a Lake" Trailhead. Walk to the third boardwalk platform on the right side of the trail.

1) How do you think the landslide changed the shape of Mount St. Helens?

a) The hole in the side of the volcano shows where the landslide started. What caused the landslide to flow down the Toutle River Valley?

b) Face the trail leading to this viewpoint. What are the large mounds?

c) Face the lake and find the island. What is the island? _____

d) How far do you think the landslide traveled up this valley?

e) Before the May 18, 1980 eruption Coldwater Creek flowed down the center of this valley. Why do you think there is a lake here now?

Stop 2: Turn right as you leave the platform. Turn right when you reach the boardwalk and walk to the end of the boardwalk.

2) Did the formation of Coldwater Lake help or hurt the following animals? Circle help or hurt and explain why.

Help or Hurt Stream-dwelling Salamanders

Help or Hurt River Otters

Help or Hurt Pocket Gophers

Help or Hurt Mallard Ducks

a) A lake ecosystem without fish developed naturally after the eruption. Rainbow trout were stocked in the lake in 1989. How would these predators change the ecosystem?

b) What types of plants are growing on the hillsides near Coldwater Lake?

c) What types of plants are on top of the hillsides above Coldwater Lake?

d) Unscramble the letters and make a word that explains the main reason why plant communities differ on the top and bottom of the hillsides.

 / R E W T A
____ _ E ____ _

Stop 3: Walk back to the main trail and turn right. Your teacher will direct you where to stop.

3) Deer and elk usually don't eat conifer trees. They taste bad and lack nutrients. This odd-shaped conifer tree has been eaten by deer and elk. Circle the answer that explains why deer and elk are eating these foods.

- a. There is not enough food available for deer and elk.
- b. Deer and Elk populations are too large.
- c. Both a. and b.

a) Some seeds "hitchhike" inside the stomachs of elk. When elk poop they can "plant" seeds. Fifteen plant species growing in the Monument sprouted from elk poop. Circle the answer that reveals the power of poop!

- a. Elk diets can change the plant communities.
- b. Elk fertilize hummocks.
- c. Both a. and b.

b) Many different kinds of plants grew here before the broad-leaved Sitka and red alder trees established. How many plant species do you see growing under the alder forest? Circle the correct answer:

Few OR Many

c) Unscramble the letters and make a word to discover how _____ from the alder forest has reduced the number of species growing here.

/ E D H A S
_____ E

Conclusions:

Circle the best explanation (1, 2 or 3) for what is changing habitats here.

- 1) Landforms and water change habitats.
- 2) Plants and Animals change habitats.
- 3) Landforms, water, plants, and animals change habitats.

In complete sentences, explain the evidence you used to reach your conclusion.

Answer Sheet to 'Changing Habitats'

Outdoor Activity

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Use the 'case facts' and evidence along the trail to answer the questions. Use your answers to determine which explanation is best.

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4. Before the May 18, 1980 eruption, 30 lakes and ponds existed in what is now the blast zone. The landslide caused 150 new lakes and ponds to form.

Directions:

Begin this activity at the "Birth of a Lake" Trailhead. Walk to the third boardwalk platform on the right side of the trail.

1) How do you think the landslide changed the shape of Mount St. Helens?

The landslide removed the top of the mountain and the north side of the volcano. 1300 feet was removed from the summit and the large hole in the side of the volcano shows where the north side of the volcano was.

a) The hole in the side of the volcano shows where the landslide started. What caused the landslide to flow down the Toutle River Valley?

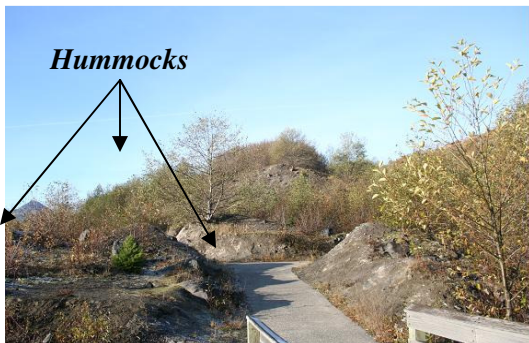
The landslide fell from the north side of Mount St. Helens and slid into Johnston Ridge. The landslide bounced off of Johnston ridge and was deflected westward into the North Fork of the Toutle River valley.



b) Face the trail leading to this viewpoint. What are the large mounds?

The mounds are hummocks—big intact chunks of Mount St. Helens that rode along on the top of the landslide.

c) Face the lake and find the island. What is the island? *It is the top of a submerged hummock*



d) How far do you think the landslide traveled up this valley?

The landslide traveled at least as far as the hummock. The case facts state that the landslide flowed 2 ½ miles up the Coldwater drainage.

e) Before the May 18, 1980 eruption Coldwater Creek flowed down the center of this valley.

Why do you think there is a lake here now?

The landslide dammed the creek. This caused water to pool behind the 150 to 250 foot deep landslide deposit, and this new lake formed. The lake is 4 ½ miles long, ½ mile wide and is up to 205 feet deep.

2) Did the formation of Coldwater Lake help or hurt the following animals? Circle help or hurt and explain why.

Help or Hurt Stream-dwelling Salamanders

Stream dwelling species lost habitat in this drainage. The formation of the lake had a negative impact on the stream dwellers that lived in the creek that existed in this valley before the eruption.

Help or Hurt River Otters

River Otter may have occupied the Coldwater Creek prior to the eruption due the presence of fish. The lake habitat is far larger than the pre-eruption stream, so it beneficial.

Help or Hurt Pond-dwelling Frogs

Frogs, toads, salamanders, and newts survived the eruption in large numbers. Pond-dwelling frogs were able to reach many of the 150 new lakes, ponds and wetlands. The monument hosts one of the largest populations of amphibians in the Pacific Northwest due in part to abundant new habitats.

Help or Hurt Mallard Ducks

The formation of the lake and new ponds and wetlands greatly benefited waterfowl by creating new habitat for them.

- a) A lake ecosystem without fish developed naturally after the eruption. Rainbow trout were stocked in the lake in 1989. How would these predators change the ecosystem?

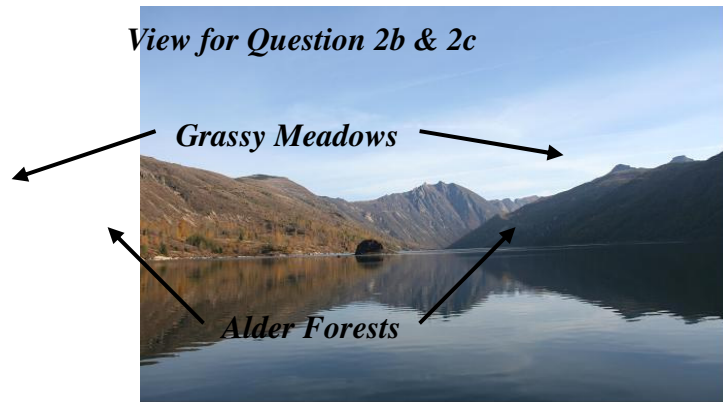
The introduction of a top predator dramatically changes any ecosystem. Rainbow trout feed on microscopic plants called zooplankton, insects, snails, worms, and amphibians. Reductions in populations directly effect other plants and animals in food chains and food webs.

- b) What types of plants are growing on the hillsides near Coldwater Lake?

Many alder trees grow on the lower portion of the hillsides. The trees are largest near the lake shore tend to be smaller further up the hillside. This indicates that the trees established along the lakeshore first and then spread up the hillsides.

- c) What types of plants are on top of the hillsides above Coldwater Lake?

Grassy meadow-like habitats dominate the upper portions of the hillsides, where there is less water available for plants.



- d) Unscramble the letters and make a word that explains the main reason why plant communities differ on the top and bottom of the hillsides.

R E W T A

W A T E R

Water accounts for the differences and amounts of vegetation growing on the hillsides. Grassy-meadows dominate the top of the hillsides due to the absence of water. The alder forests spreading up the hillsides started along the shoreline and spread outward from this moist epicenter. As alder forests spread they greatly accelerate the pace of recovery in areas impacted by the lateral blast. Today over 20% of the landslide is covered with alder forests, largely due to the creation of 150 new aquatic epicenters that are fueling spectacular change.

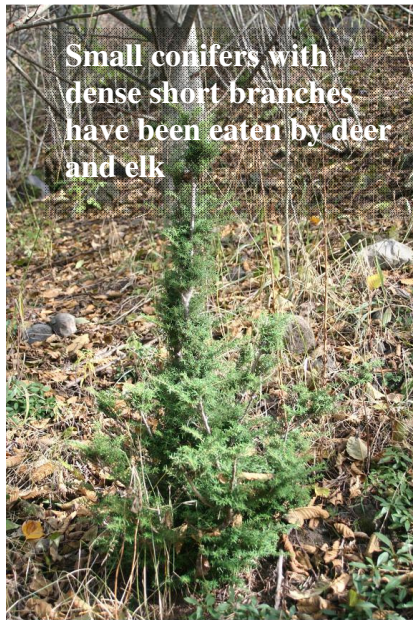
Stop 3: Walk back to the main trail and turn right. Your teacher will direct you where to stop.

- 3) Deer and elk usually don't eat conifer trees. They taste bad and lack nutrients. This odd-shaped conifer tree has been eaten by deer and elk. Circle the answer that explains why deer and elk are eating these foods.

- a. There is not enough food available for deer and elk.
- b. Deer and Elk populations are too large.

c Both a. and b.

If deer and elk are feeding so heavily on food sources with poor nutritional value, it indicates that during critical stress periods such as late winter or early spring that there is not enough food available. This also indicates that the deer and elk populations are too large, especially during the winter/spring when animals are competing for foods with low nutritional values.



a) Some seeds “hitchhike” inside the stomachs of elk. When elk poop they can “plant” seeds. Fifteen plant species growing in the Monument sprouted from elk poop. Circle the answer that reveals the power of poop!

- a. Elk diets can change the plant communities.
- b. Elk fertilize hummocks.
- c. Both a. and b.

Elk preferences in diet have changed the composition of plant communities. i.e. Alder leaves are difficult to digest and are rarely eaten, while willow and cottonwood trees are preferred food sources. All three tree species should be abundant at Mount St. Helens, but alder dominate in part because they taste bad. Despite popular belief, volcanic ash is not nutrient-rich (it becomes a rich soil when organic matter is added) and many of the hummocks are made of nutrient-poor rocks. Elk accelerate the pace of recovery by enriching ash.

b) Many different kinds of plants grew here before the broad-leaved Sitka and red alder trees established. How many plant species do you see growing under the alder forest? Circle Few OR Many

c) Unscramble the letters and make a word to discover how _____ from the alder forest has reduced the number of species growing here.

E D H A S
S H A D E

The availability of moisture, amount of sunlight, and presence of organic matter directly affect the amounts and types of plants growing in the understory of alder forests. Dense concentrations of hardy weeds and grasses grow in open, warmer, and drier sites. As alder trees established and grew taller, forests soon out-competed and shaded out the surrounding sun-loving weeds. Shade from the developing alder forest reduced the amount of evaporation and temperatures. A moist layer of nutrient rich organic matter developed as leaves, twigs, and catkins from the alder's accumulated.



Sun-loving plants

Fewer plants and different species in shady areas

Conclusions:

Circle the best explanation (1, 2 or 3) for what is changing habitats here.

- 1) Landforms and water change habitats.
- 2) Plants and animals change habitats.
- 3) Landforms, water, plants, and animals change habitats.

In complete sentences, explain the evidence you used to reach your conclusion.

Landforms created by the 1980 landslide set the stage for distinct habitats to form. The uneven topography—high hummocks and depressions beside them led to the creation of one hundred fifty new ponds and wetlands. The landslide also acted as an earthen dam, which blocked

Coldwater and Castle Creeks and enabled two massive lakes to form. Meadows formed in areas where water could not collect. In other areas, hummocks are still barren because the rock is so hard plant roots are unable to penetrate it.

Some **plants and animals** species are having an enormous impact on hummock habitats. Deer and elk have dramatically changed the composition of plant communities through their browsing preferences. The introduction of fish changed the composition of amphibian, insect and zooplankton populations. Alder trees improve growing conditions by adding nutrients and organic matter to the sandy rocky ground, and create new habitats for shade-loving plants, but also edit sun-loving plants from the understory.

Water is powering the return of life on the hummocks! 150 new pond, wetlands, and lakes formed on the hummocks. This increase in aquatic habitat has fueled spectacular ecological communities. The hummocks are the most biologically diverse landscape within the Monument. Vibrant wetlands host one of the largest populations of amphibians in the Pacific Northwest, as well as diverse populations of waterfowl and migratory birds. As plants established along the moist shoreline in the 1980's, vegetation spread outward. The alder forest growing here started beside the wet shoreline and spread outward from these moist epicenters. As alder forests spread outward from one pond, they soon began to merge with alder stands growing away from adjacent wetlands, creating dense alder forests. Today over 20% of the landslide is covered with alder forests, largely due to the creation of these new aquatic habitats, and these forests are now spreading up the valley walls—greatly accelerating the pace at which life returns in the surrounding blown down forest. Stable water sources like ponds flourish, but some areas with moving water—like the Toutle River chronically disturb the landscape.

Instructional Sequence for “Changing Habitats”:

Before Hiking the Trail or Leaving the Parking Lot:

- 1) Students ability to successfully complete this activity will be greatly enhanced if they have obtained a basic understanding of the May 18, 1980 eruptive events prior to conducting this activity. Teachers are encouraged to drive to the Johnston Ridge Observatory to explore the visitor center before conducting this activity.
- 2) Make sure that students are dressed appropriately for the weather conditions before they exit the bus, and explain that each student will need a pencil, a clipboard or notebook to write on, and a copy of the ‘Changing Habitats’ worksheet. **Hiking in this area is a privilege and that student behavior will determine if future groups will be able to use this site. Off trail travel, the collection of rocks, plants, and wood is strictly prohibited (\$100 fine).**
- 3) Make sure all chaperones and teachers have a copy of the answer sheet. Chaperones will play a critical role in aiding students to successfully complete this activity. The answer sheet has pictures of landscape features that students will be looking for along the trail.
- 4) Inform the students that you will lead the way because there are specific points along the trail where they will be stopping to observe features and use the ‘case facts’ to answer questions on their worksheets.

On the Trail:

- 1) Start at the Birth of the Lake Trailhead and walk to the third boardwalk platform on the right side of the trail. There are two interpretive signs at the platform which provides a view straight down the length of Coldwater Lake. Explain that the students are to make observations and use the “case facts” provided to answer the questions. Allow 5 to 10-minutes for students to answer the questions. Use your answer sheet to orient students to features designated in the questions if weather conditions limit visibility.



- 2) Turn right when you return to the main trail. Turn right again when you reach the boardwalk section passing over the lakes surface and proceed to the end of the boardwalk. Allow 5 to 10-minutes for students to complete the questions.
- 3) Return to the paved trail, turn right and walk up the small hill. Walk until you find an example of an odd-shaped conifer tree (see examples on answer sheet) in the understory of an alder forest. Identify the odd-shaped conifer tree. Identify the alder trees surrounding the site (single tree trunks are red alder. Multiple branching trunks at the base of the tree are Sitka alders). Point out the plant growth along the edges of the paved trail and have the students compare the type and amount growing there to the plant communities within the understory of the alder forest. Answer questions 3a-b.
- 4) Veer left as you return to the bus (a trail veering to the right leads to a parking lot and boat launching area). Use great caution once you reach the parking lot—students may try to dash to the bus without looking out for on-coming traffic. Consider stationing several adults in key locations to ensure student safety. Review the answers in route back school.