



Mount St Helens National Volcanic Monument – Teacher’s Corner 2011
Gifford Pinchot National Forest
USDA Forest Service

Patterns of Recovery

Outdoor Activity

Time Commitment: 45 minutes to 1 hour.
Site: Johnston Ridge Observatory
Location: The Eruption Trail

Because students identify and observe landscape-level features, this activity should be conducted on days with good visibility. The purpose of this activity is to familiarize students with the characteristics of three of the May 18, 1980 eruptive events, and to explore how these events set unique pathways of biologic succession. Through small group exploration, students will observe, and identify landscape features to determine possible explanations for what is driving the biologic recovery of the areas affected by each eruptive event. Students will be better served if they watch the movie and review the exhibits in the Johnston Ridge Observatory before conducting this activity.

Goal: The student will understand the factors influencing the biologic recovery on areas impacted by the May 18, 1980 landslide, lateral blast, and pyroclastic flows.

Objectives:

- 1) The student will use the scientific process to deduce a reasonable explanation.
- 2) The student will compare, contrast and sort observations.
- 3) The student will reach a conclusion and be able to support it with evidence in writing.
- 4) Students will abide by all monument regulations while on the trail.

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.

- Identify parts of a system and how the parts go together.
- 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.

1.3.1 Nature of Force

Understand forces in terms of strength and direction.

- Compare the strength of one force to the strength of another force.

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.

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 how an organism's ability to survive is affected by change in an ecosystem.

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.

Patterns of Recovery

Outdoor Activity

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) Each stage of the eruption changed the landscape in similar ways, so the biologic recovery in each area is similar.
- 2) Each stage of the eruption changed the landscape in different ways thus the biologic recovery is different in each area.

Case Facts:

- 1) Areas affected by the lateral blast have stumps with shredded tops, blown down logs with root systems, and pieces of wood.
- 2) Areas affected by the landslide have large mounds of rock called hummocks, no logs due to burial, and areas with barren rock due to scouring.
- 3) Areas affected by pyroclastic flows are in valley bottoms and have gentle sloping plains of ash and light-weight pumice rocks.

Evaluate the Evidence:

Walk to a point where you can see Mount St. Helens and the parking lot and answer the questions.

- 1) Find a stump or log. Describe what's missing from the tree and where you think it went?

- 2) Mount St. Helens is due south. What direction are you facing? _____
What direction does this side of Johnston Ridge face? _____
Face Mount St. Helens, if a lateral blast burst out of the volcano what side of your body would be hurt the most, your front or back? _____
- a) If a plant or animal could survive the eruption, which side of Johnston Ridge would it be more likely to survive on, the side facing the volcano or the opposite side? _____
- b) Walk on the trail to a place where you can see the opposite side of Johnston Ridge. Compared to the south side of the ridge is there more or less plant life growing on the opposite side? _____
- c) How could a plant or animal have survived the eruption on the opposite side of the Johnston Ridge? _____

Stop at the circular plaza on the left side of the trail. Use the sundial-like locator map to help you answer the questions.

- 3) Use the locator map and look east down Johnston Ridge. What are the mounds on top of Johnston Ridge? _____
- a) How did the mounds get there? _____

- b) Look east. Why is there barren rock on the side of the Johnston Ridge facing the volcano? _____

c) This eruptive event scoured and buried the ridge. Could plants or animals have survived there? _____

4) Use the locator map and look west. Find the Toutle River Valley. 150 new lakes and ponds formed in this valley due to this eruptive event. How has the presence of water in the valley affected the return of life?

a) Is the pace of recovery in the Toutle River Valley and on the mounds on the east side of Johnston Ridge the same or different? _____

b) Explain why you think the pace of recovery is the same or different.

Turn left as you leave the circular plaza, and continue on the trail. Stop at the stone memorial to people who died during the eruption.

5) The eruption began with a landslide that filled the valley with hummocks. Why are so few hummocks visible in the valley?

a) An eruptive event in the valley was 1,350 degrees Fahrenheit. Invent a plant or animal that could have survived this heat. Name your invention and describe things about it that would have helped it survive.

6) Water erosion carved the large canyons on the valley floor after the eruption. How would erosion affect the return of plant and animal life?

a) Based on the amount of plant growth in the valley would you agree or disagree that conditions for plants in the valley include: few nutrients, little water and hot summer temperatures. Circle: Agree or Disagree

Conclusion:

Circle the best explanation.

- 1) Each stage of the eruption changed the landscape in similar ways, so the biologic recovery in each area is similar.
- 2) Each stage of the eruption changed the landscape in different ways thus the biologic recovery is different in each area.

In complete sentences explain the evidence you used to support your conclusion or reach a different conclusion.

Answer Sheet for Patterns of Recovery

Outdoor Activity

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) Each stage of the eruption changed the landscape in similar ways, so the biologic recovery in each area is similar.
- 2) Each stage of the eruption changed the landscape in different ways thus the biologic recovery is different in each area.

Case Facts:

- 1) Areas affected by the lateral blast have stumps with shredded tops, blown down logs with root systems, and pieces of wood.
- 2) Areas affected by the landslide have large mounds of rock called hummocks, no logs due to burial, and areas with barren rock due to scouring.
- 3) Areas affected by pyroclastic flows are in valley bottoms and have gentle sloping plains of ash and light-weight pumice rocks.

Evaluate the Evidence:

Walk to a point where you can see Mount St. Helens and the parking lot and answer the questions.

- 1) Find a stump or log. Describe what's missing from the tree and where you think it went?

When gas bubbles in dacite magma expand rapidly molten rock is broken apart into large and tiny pieces, and the volcano to explode violently. New and old rocks burst out of the side of Mount St. Helens at speeds of 300 mph to 500 mph. Commercial jetliners fly at speeds of 500 mph hour. The lateral

blast stripped needles, branches and bark from the trees, and shattered the trunks into tiny pieces. Needles, branches, bark, and pieces of wood from the tree trunks are not visible here so they must have been carried away by the blast.

2) Mount St. Helens is due south. What direction are you facing? South

What direction does this side of Johnston Ridge face? South

Face Mount St. Helens, if a lateral blast burst out of the volcano what side of your body would be hurt the most, your front or back? Front

a) If a plant or animal could survive the eruption, which side of Johnston Ridge would it be more likely to survive on, the side facing the volcano or the opposite side? The opposite side of the ridge.

b) Walk on the trail to a place where you can see the opposite side of Johnston Ridge. Compared to the south side of the ridge is there more or less plant life growing on the opposite side? More

c) How could a plant or animal have survived the eruption on the opposite side of the ridge?

Protective aspects are key to this answer. Deep snow packs that had accumulated on the north-facing slopes protected some small plants and animals from the scouring and intense heat of the blast. Stumps and rocks may have also offered some protection. The root systems of some plant species survived and were able to re-sprout, and animals that live underground were able to survive.

Stop at the circular plaza on the left side of the trail. Use the sundial-like locator map to help you answer the questions.

3) Use the locator map and look east down Johnston Ridge. What are the mounds on top of Johnston Ridge? The “case facts” indicate that the mounds are hummocks.

a) How did the mounds get there? Hummocks were deposited there when the landslide tumbled over Johnston Ridge. The narrow patch of blown down trees in foreground of the mounds reveal that the landslide spilled over Johnston Ridge in two locations.

b) Look east. Why is there barren rock on the side of the Johnston Ridge facing the volcano? When the landslide hit Johnston Ridge, it scraped away the soil and exposed bedrock on the right side of the ridge facing the volcano. Johnston Ridge deflected the landslide westward into the Toutle River Valley.

c) This eruptive event scoured and buried the ridge. Could plants or animals have survived there? No

4) Use the locator map and look west. Find the Toutle River Valley. 150 new lakes and ponds formed in this valley due to this eruptive event. How has the presence of water in the valley affected the return of life?

The valley west of Johnston Ridge has dense stands of alder trees. Sitka and red alder trees were able to colonize the creeks moist shorelines. These clearly visible alder forests are slowly spreading up the hillsides, accelerating the pace of recovery in the landslide-scoured areas and adjacent blown down forests.

a) Is the pace of recovery in the Toutle River Valley and on the mounds on the east side of Johnston Ridge the same or different? Different

b) Explain why you think the pace of recovery is the same or different.

There is far more plant growth in the Toutle River Valley because of the ponds that formed. Less water is available for plants and animals on the east side of Johnston Ridge. This has slowed the pace of recovery.

Turn left as you leave the circular plaza, and continue on the trail. Stop at the stone memorial to people who died during the eruption.

5) The eruption began with a landslide that filled the valley with hummocks.

Why are so few hummocks visible in the valley?

There are few hummocks between Johnston Ridge and the volcano, because they were covered by pyroclastic flows. These super-heated rock avalanches spilled out of the crater and covered most of the landslide deposit within five miles of the volcano with 130 feet of ash and pumice.

a) An eruptive event in the valley was 1,350 degrees Fahrenheit. Invent a plant or animal that could have survived this heat. Name your invention and describe things about it that would have helped it survive.

The ability to withstand tremendous heat and ability to breath in the heat is key to survival. The plant or animal would also require protective capabilities to withstand burial and brute force.

6) Water erosion carved the large canyons on the valley floor after the eruption. How would erosion affect the return of plant and animal life?

Plant seeds do not have time to take root before they are washed away when water levels are high. The absence of root systems allows sediment to continue to be washed away.

a) Based on the amount of plant growth in the valley would you agree or disagree that conditions for plants in the valley include: few nutrients, little water and hot summer temperatures. Circle: Agree or Disagree

Conclusion: (Circle the best explanation.)

1) Each stage of the eruption changed the landscape in similar ways, so the biologic recovery in each area is similar.

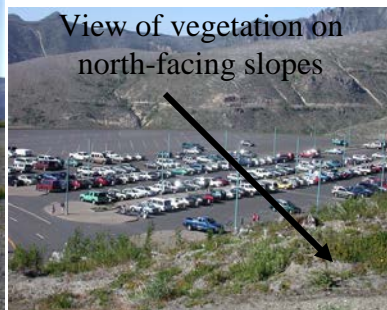
2) Each stage of the eruption changed the landscape in different ways thus the biologic recovery is different in each area.

In complete sentences explain the evidence you used to support your conclusion or reach a different conclusion.

There is evidence that each stage of the eruption changed the landscape in different ways and the biologic recovery is different in each area. Plants and animals survived the eruption on north facing slopes within areas impacted by the lateral blast. The legacy of these survivors is clearly visible on the north side of Johnston Ridge. Dense alder forests covered much of the areas impacted by the landslide. The creation of new ponds and wetlands in the Toutle River Valley is fueling the development of forests. The intensity of the disturbance caused by the pyroclastic flows, lack of survivors, and harsh environment created slowed the pace of recovery.

Instructional Sequence for “Patterns of Recovery”

1. Send a chaperone up the eruption trail ahead of the group and have the adult stop at the first interpretive sign on the right side of the trail. Make sure the adult is clearly visible to the students at the trailhead. The adult’s role will be to orient students to a maximum distance to travel before stopping.
2. Gather students at the trailhead, located on the outdoor viewing plaza at the Johnston Ridge Observatory. Divide students into groups of five and assign one chaperone to assist each student group. Students will need a pencil, “*Patterns of Recovery*” worksheet and clipboard or notebook to write on.
 - a) Explain that this area was forested before the May 18, 1980 eruption.
 - b) Explain the importance of staying on trail at all times. It has taken over 28 years for plant life to get a foothold on this ridge. **Hiking in this area is a privilege and that student behavior will determine if future groups will be able to use this site.** Students will be examining rocks and shattered tree stumps, but they are **not to get off the paved trail or collect, ash, rocks, wood or plants.**
2. Point to the chaperone standing at the interpretive sign (see picture below). Explain that students are not to proceed beyond that point, and that they will need to spread out along the trail, stop near a stump or log, and stop where they can see the opposite side of the ridge. The ‘case facts’ will be critical to answering these questions.



- a) While the students are answering these questions send another adult to the top of the hill and have them stop at the intersection to the viewing plaza with sundial-like map locator.
 - b) Move between groups, and assist where needed. Inform the students to stop at the circular viewing plaza where the adult will be waiting.
3. Allow the students 15 to 20-minutes to make observations and use the locator map in the circular plaza to answer the questions. East-west orientation is critical to this stop and to the biological stories on this ridge.
- a) While the students are answering these questions send another adult to the memorial to the people who died during the May 18, 1980 eruption.
4. Turn left as they leave the plaza and stop at the memorial to those who died during the eruption. The 'case facts' will be critical to answering the questions.



- a) Allow the students 15 to 20-minutes to make observations, answer the questions, and to answer the concluding question. Move between groups and assist where needed.
- b) Gather students by the memorial and review answers to the concluding question
- c) Continue on the eruption trail to the parking lot. Use your chaperones to safely direct students across the parking lot to the busses.