Mount St Helens National Volcanic Monument – Teacher's Corner 2016
Gifford Pinchot National Forest
USDA Forest Service

Hummock Habitats

Outdoor Activity

Teacher Information:

Time Requirement:	2 Hours to 2 ½ Hours
Trail Used:	Hummocks Trail
Location:	Hummocks Trailhead
Group Size:	Not Recommended for groups larger than 30

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

Materials Needed:

Pencil, clipboard or notebook to write on, download copies of the 'Hummock Habitats' worksheet for students and copies of 'Hummock Habitats *Answer Sheets'* for chaperones.

Materials Provided:

A storage box mounted behind the trailhead bulletin board contains basalt, andesite and dacite rock samples, and visual aids. Return these items to the storage box when you conclude the trailhead activities.

Student worksheet stop locations are marked with wooden posts with green circles along the trailside. Note: some of the wood posts have other colored shapes on them which designate stop locations for other educational activities.

Goal:

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

Objectives:

1) The student will use the scientific process 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.

Important vocabulary students should know before arriving:

1) **Abiotic Factors:** Environmental factors produced other than by living organisms; for example temperature, wind patterns, humidity, pH substrate rock type, and other physical and chemical factors.
2) **Biotic Factors:** Environmental influences produced by living organisms (competition between one organism and another, one organism feeding upon another, etc).
3) **Consumer:** Make up the heterotrophic element, which uses the food stored by the autotrophic elements, rearranges it, and finally decomposes the organic materials into simple compounds.
4) **Ecosystem:** An ecological community of plants, animals and organisms interacting with each other and with non-living resources in the environment.
5) **Food Chain:** A term describing the dependence of one organism on another for food, progressing in a series, beginning with primary producers and ending with carnivores.
6) **Habitat:** a place or type of place where an organism, population or community live.
7) **Hummock:** large mounds of intact chunks of Mount St. Helens deposited by the May 18, 1980 landslide.
8) **Landslide:** a rapid and unusually sudden sliding or flowage of unsorted masses of rock and other material falling under the force of gravity
9) **Carnivores:** Organisms that feed on herbivores are termed first level carnivores or first level consumers. Consumers that use both plant and animal matter are called omnivores.
10) **Producer:** Largely green plants make up the autotrophic element which fixes the energy of the sun and manufactures food from simple inorganic substances.
11) **Riparian:** living on or located on the bank of a natural, lake, pond, or watercourse.
12) **Wetland:** Lands where saturation with water is the dominant factor determining the nature of soil development and the types of plants and animals living in the soil and on its surface.
13) **Primary Succession:** Occurs in an environment in which new substrate devoid of vegetation formed as the result of a disturbance. Ecosystems develop gradually over a longer period.
14) **Secondary Succession:** The succession that occurs after a disturbance in which seeds, underground roots, plants and/or animals survive. It is usually faster than primary succession.

Hummock Habitats

Outdoor Activity

Your Mission: To examine the roles of landforms, water, plants, and animals in the evolution of habitats on the May 18, 1980 landslide.

Possible Explanations:

1) Landforms and water influence the shaping hummock habitats.
2) Plants and Animals influence the shaping hummock habitats.
3) Landforms, water, plants, and animals influence the shaping hummock habitats.

Case Facts:

1. Between March 20th and May of 1980 rising magma forced its way into the north side of Mount St. Helens, pushing solid rock and ice outward to the north 300 to 450 feet. This swollen area on the north side of the volcano was called the **bulge**.

2. The bulge collapsed on May 18, 1980 and generated a gigantic **landslide** that traveled 5 ½ miles north and 13 ½ miles west of the volcano. The depth of the landslide along the hummocks trail is 250 to 400 feet deep.

3. The landslide deposit is composed of huge intact pieces of the volcano called **hummocks.** The small hills or mounds visible on the valley floor are hummocks.

4. Prior to the 1980 eruption, 30 lakes and ponds existed within what is now the blast zone. **118 new lakes, ponds, and wetlands formed** among the hummocks and along the margins of the valley after the landslide filled this valley.

5. The hummocks area is the most biologically diverse landscape in the Monument. Up to 150 plant species have inhabited its **wetland**, **meadow** and **alder forest** habitats. The area also hosts some of the largest populations of amphibians and elk found in the Pacific Northwest.

Directions:

Begin at the trailhead by a bulletin board. Stop at the wood posts with the GREEN CIRCLES. At each stop read the facts listed below and observe landscape features to answer the questions.

Hummock Habitat Worksheet Name: _____

STOP 1:

1) The landslide began on the north side of the volcano, but traveled only 5½ miles *north*. However, the landslide traveled 13½ miles *westward*. Circle the answer that best explains why this happened.

   a. Johnston Ridge prevented most of the landslide from traveling further north.

   b. The landslide was deflected westward by Johnston Ridge.

   c. The Toutle River Valley funneled the landslide westward.

   d. All of the above.

2) The landslide traveled at speeds of up to 100 mph and filled the valley here with 250 to 400 feet of rock. Virtually no plants or animals survived in areas impacted by the landslide. Would the process of succession on majority of the landslide be considered primary or secondary? Circle your answer.

   Primary Succession Secondary Succession

4) Predators eat consumers, who in turn eat producers. Make a food chain for this meadow by placing the plants and animals listed below in the correct categories.

   Willow Trees, White Clover, Columbia Black-tailed Deer, Mountain Lion, Creeping Blackberry, Fireweed, Roosevelt Elk, Grass

Predator	Consumers	Producers
		_____
	_____	_____
_____		_____
	_____	_____
		_____

5) Which member of the food chain (predator, consumer, or producer) has the greatest influence in the ecosystem? Explain why?

STOP 2:

6) What is the large mound of the rock on the opposite side of the pond called? _____

7) Turn slowly a full revolution and observe the landscape as you turn. Circle the answer that best explains factors that influenced the development of this pond habitat?

a. Hummocks are often separated by dips and depressions. The force of gravity causes snowmelt and rainfall to flow into dips and depressions.

b. The landslide transported large blocks of glacial ice from glaciers on the north side of Mount St. Helens. Blocks of ice deposited on the surface of the landslide melted and formed ponds.

c. All of the Above.

8) The large broad-leafed trees here are Sitka and red alders. Observe the trees visible from this site then read the statements below. Circle "T" for true or "F" for false.

T or F The diameter of red alder trees decreases with distance from ponds, indicating that forests developed along the edges of ponds and spread outward.

T or F The development of ponds had little influence in the development of plant and animal communities on the hummocks.

T or F The dense alder forests that now cover much of the landslide deposit and along the margins of the valley are largely due to the 118 new lakes, ponds and wetlands that formed among the hummocks.

STOP 3:

9) Note the odd-shaped conifer trees. These conifers have been browsed by deer and elk. The trees response to browsing pressure is to produce more branches. Conifers are not preferred food sources due to their taste and poor nutritional value. Why do you think deer and elk are eating these foods? Circle answer.

a. There is not enough food available for large deer and elk populations.

b. Deer and Elk populations are too small.

c. The nutritional value of foods in the winter/spring is not high enough to support deer and elk populations causing them to eat the few available food sources.

d. Answers A and C.

e. None of the Above.

10) Seeds “hitchhike” here inside the intestinal tracks of elk, and are deposited in “nuggets” of fertilizer. At least 15 plants species growing in the Monument are known to have sprouted from elk poop. Circle the answer that reveals the power of poop!

a. Elk preferences in diet do not influence the composition of plant communities.

b. Elk preferences in diet can strongly influence the composition of plant communities

c. Elk can accelerate the pace of recovery by enriching ash and ‘planting’ plants.

d. Answers B and C.

STOP 4:

11) On May 18, 1980 the North Fork of the Toutle River was completely buried beneath the landslide. A new river re-formed after the eruption and carved most of this canyon. You passed ponds with lush plant growth along the trail. Circle the answer that best explains why there so little plant life on either side of the river?

a. There are few nutrients available for plants in the rock and ash along the river.

b. The river channel continuously shifts eroding ash, rock, and colonizing plants.

c. Sediment carried in the milky water prevents plants from establishing.

12) Seasonal weather changes affect the amount of water in the river and its ability to erode, transport and deposit the landslide deposit. Find the series of step-like flat areas along each side of the river. Circle “T” for true or “F” for false for the answer that best describes how the flat terraces formed and effect habitats.

T or F The flat terraces reveal different levels the North Fork of the Toutle River once flowed as it eroded this canyon.

T or F Sediment fills river channels, which increases flooding hazards and degrades downstream habitats for salmon, steelhead and other fish.

STOP 5:

13) How did the beaver's dam-building activities change the habitat here? Circle answer

a. It increased the amount of wetland habitat.

b. It decreased the amount of wetland habitat.

c. There was no significant change to the amount of wetland habitat.

14) How did the beaver's dam-building activities change habitat here? Circle "T" for true or "F" for false

T or F It drowned trees and plants unable to tolerate excessively wet conditions.

T or F It created new habitat for some amphibians, waterfowl, aquatic plants and plankton.

T or F It reduced the amount of breeding habitat for some species of amphibians and birds.

15) How will this habitat change if the beaver dam washes away and this becomes a creek again?

_____

_____

STOP 6:

16) The deciduous trees are Sitka and red alders. Alders grow rapidly due to their ability to produce their own nitrogen with the help of bacteria in their roots. Circle "T" for true or "F" for false

T or F Shade from alder forests adversely affects some plant species, and creates habitat for other plants species.

T or F Alder forests can alter temperatures, affect the availability of moisture, and increase nutrient levels by creating organic matter.

Conclusions:

Circle the best possible explanation or hypothesis (1, 2 or 3) that describes what is influencing habitats.

1) Landforms and water influence the shaping hummock habitats.
2) Plants and Animals influence the shaping hummock habitats.
3) Landforms, water, plants, and animals influence the shaping hummock habitats.

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

_____

_____

Answer Sheet Hummock Habitats

Your Mission: To examine the roles of landforms, water, plants, and animals in the evolution of habitats on the May 18, 1980 landslide.

Possible Explanations:

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2. The bulge collapsed on May 18, 1980 and generated a gigantic **landslide** that traveled 5 ½ miles north and 13 ½ miles west of the volcano. The depth of the landslide along the hummocks trail is 250 to 400 feet.
3. The landslide deposit is composed of huge intact pieces of the volcano called **hummocks.** The small hills or mounds visible on the valley floor are hummocks.
4. Prior to the 1980 eruption, 30 lakes and ponds existed within what is now the blast zone. **118 new lakes, ponds, and wetlands formed** among the hummocks and along the margins of the valley after the landslide filled this valley.
5. The hummocks area is the most biologically diverse landscape in the Monument. Up to 150 plant species have inhabited its **wetland**, **meadow** and **alder forest** habitats. The area also hosts some of the largest populations of amphibians and elk found in the Pacific Northwest.

Directions:

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Hummock Habitat Answer Sheet

STOP 1:

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a. Johnston Ridge prevented most of the landslide from traveling further north.

b. The landslide was deflected westward by Johnston Ridge.

c. The Toutle River Valley funneled the landslide westward.

(d.) All of the above.

2) The landslide traveled at speeds of up to 100 mph and filled the valley here with 250 to 400 feet of rock. Virtually no plants or animals survived in areas impacted by the landslide. Would the process of succession on majority of the landslide be considered primary or secondary? Circle your answer.

(Primary Succession) Secondary Succession

4) Predators eat consumers, who in turn eat producers. Make a food chain for this meadow by placing the plants and animals listed below in the correct categories.

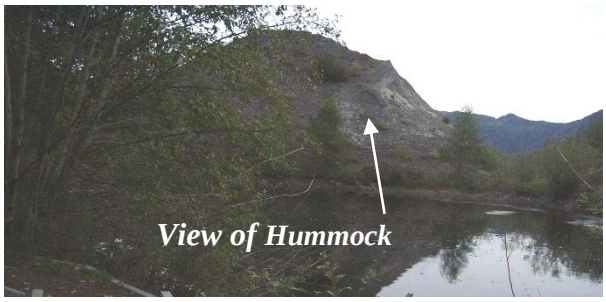
Willow Trees, White Clover, Columbia Black-tailed Deer, Mountain Lion, Creeping Blackberry, Fireweed, Roosevelt Elk, Grass

Predator - Omnivore	Consumers	Producers
		Willow Trees
	Roosevelt Elk	*White Clover*
Mountain Lion		*Creeping Blackberry*
	Columbia Black-tailed Deer	*Fireweed*
		Grass

5) Which member of the food chain (predator, consumer, or producer) has the greatest influence in the ecosystem? Explain why? *Producers are the primary source of food and energy that powers an ecosystem. Nutrients and energy are transferred up the food chain through the herbivores and omnivores (consumers) that eat the primary producers (plants) and predators.*

STOP 2:

6) What is the large mound of the rock on the opposite side of the pond called? __*It is a hummock*_____



7) Turn slowly a full revolution and observe the landscape as you turn. Circle the answer that best explains factors that influenced the development of this pond habitat?

a. Hummocks are often separated by dips and depressions. The force of gravity causes snowmelt and rainfall to flow into dips and depressions.

b. The landslide transported large blocks of glacial ice from glaciers on the north side of Mount St. Helens. Blocks of ice deposited on the surface of the landslide melted and formed ponds.

(c.) All of the Above.

8) The large broad-leafed trees here are Sitka and red alders. Observe the trees visible from this site then read the statements below. Circle "T" for true or "F" for false.

(T) or F The diameter of alder trees decreases with distance from ponds, indicating that forests developed along the edges of ponds and spread outward.

T or (F) The development of ponds had little influence in the development of plant and animal communities on the hummocks.

(T) or F The dense alder forests that now cover much of the landslide deposit and along the margins of the valley are largely due to the 118 new lakes, ponds and wetlands that formed among the hummocks.

STOP 3:

9) Note the odd-shaped conifer trees. These conifers have been browsed by deer and elk. The trees response to browsing pressure is to produce more branches. Conifers are not preferred food sources due to their taste and poor nutritional value. Why do you think deer and elk are eating these foods? Circle answer.

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STOP 4:

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(T) or F The flat terraces reveal different levels the North Fork of the Toutle River once flowed as it eroded this canyon.

(T) or F Sediment fills river channels, which increases flooding hazards and degrades downstream habitats for salmon, steelhead and other fish.

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(T) or F It drowned trees and plants unable to tolerate excessively wet conditions.

(T) or F It created new habitat for some amphibians, waterfowl, aquatic plants and plankton.

T or (F) It reduced the amount of breeding habitat for some species of amphibians and birds.

15) How will this habitat change if the beaver dam washes away and this becomes a creek again?

Beavers abandon dam and lodge sites if there are insufficient food sources to sustain them. When they leave, beaver dams deteriorate and eventually fail, which dramatically changes habitat conditions at the site. When water levels drop, water-loving plants are left high and dry which causes them to eventually die. These former wetland areas often become grassy meadows. Willow and alder tree populations will re-establish along the new streamside, but populations along the edges of the former pond may struggle to survive. Both the amount and type of habitat for waterfowl and amphibians is reduced significantly. Wildlife that favor stream habitats increase and the number of pond-dwelling species decrease.

STOP 6:

16) The deciduous trees are Sitka and red alders. Alders grow rapidly due to their ability to produce their own nitrogen with the help of bacteria in their roots. Circle "T" for true or "F" for false

(T) or F Shade from alder forests adversely affects some plant species, and creates habitat for other plants species.

(T) or F Alder forests can alter temperatures, affect the availability of moisture, and increase nutrient levels by creating organic matter.

Conclusions:

Circle the best possible explanation or hypothesis (1, 2 or 3) that describes what is influencing habitats.

1) Landforms and water influence the shaping hummock habitats.
2) Plants and Animals influence the shaping hummock habitats.
3) Landforms, water, plants, and animals influence the shaping hummock 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 118 ponds and wetlands. The landslide also acted as an earthen dam, which blocked Coldwater and Castle Creeks and enabled two massive lakes to form. In areas where water could not collect meadows formed. Some hummocks are so hard today that plants root systems are still unable to penetrate the hard rock.*__

Some ***Plant and Animal*** *species are having an enormous impact on hummock habitats. Deer and elk have dramatically changed the composition of plant communities through their browsing preferences. Beaver and their dam-building activities change pathways of succession with massive impacts to wetlands. Shade from alder forests is editing some sun-loving plant species from areas and creating new habitats for shade-tolerant species.*

Water *is powering the return of life on the hummocks! 118 new pond, wetlands, and lakes formed on the hummocks. This fivefold increase in aquatic habitat has fueled spectacular ecological communities. The hummocks are is the most biologically diverse landscape within the Monument. Vibrant wetlands host the 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 the re-establishment of the Toutle River chronically re-disturb other areas. In areas where water could not collect distinct meadow habitats formed.

Instructional Sequence for Hummock Habitats:

Before Hiking the Trail or Leaving the Parking Lot:

1) Make sure that students are dressed appropriately for the weather conditions that they have a pencil, a clipboard or notebook and a copy of the 'Hummock Habitats' worksheet. **Inform them that they will be hiking within a research area. 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, and disturbing research sites is strictly prohibited ($100 fine).**

2) There are two trailheads at the parking lot, depart from the trailhead with the bulletin board. Inform the students that you will lead the way because there are specific points along the trail where they will be stopping to observe geographic features and complete answers to questions on their worksheets.

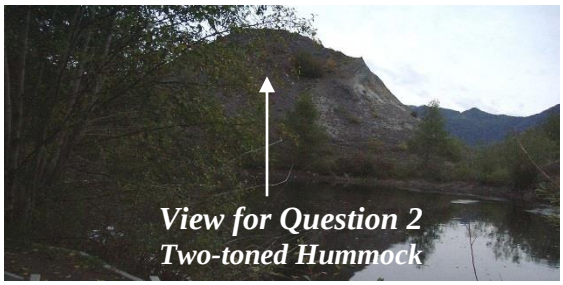
   If your group is larger than 30:
   Divide your groups in half. Have ½ the group start at the trailhead with the bulletin board, and the other half walk the trail in reverse (the trailhead is located 75 feet to the right of the main trailhead. This second group would need to answer the questions in reverse order or you could create your own version of the activity by cutting and pasting the stops in reverse order.

   Student worksheet stop locations are marked with wooden posts with GREEN CIRCLES along the trailside. Note: some of the wood posts have other colored shapes on them which designate stop locations for other educational activities.

On the Trail:

1) Remind students to use make observations and use the "case facts" provided to answer the questions.

2) The hummock to look for in stop two is located across the pond. During sometimes of the year vegetation can obscure views of the two-toned hummock.



3) The odd-shaped conifers in stop 3 look like the one in the picture.