Life Returns to the Mountain

Activity based on
Gopher to the Rescue! A Volcano Recovery Story

I. Introduction:

Using *Gopher to the Rescue! A Volcano Recovery Story* by Terry Catasús Jennings as a launching point for the discussion, this activity will guide students in discovering what is required for an ecosystem to recover after a natural disaster. This book was based on the eruption of Mount St. Helens in May, 1980, however it may serve to discuss the recovery after other natural disasters. Through the activity and discussions students will discover simple rules for what plants and animals need to survive. As a result of this activity, students will have graphic evidence of the recovery which may be compiled into a booklet. Grades K-5

It is important to note that this activity gives a broad sequence of how the recovery took place. What has to take place before something else happens. It is not representative of any one place or time on the mountain. It is an exploration of how life returns to a damaged area.

II. **Materials and Handouts**:

A. Plant Master
B. Animal Masters and Answers
C. Plants' and Animals' Return to the Mountain PPT
D. *Gopher to the Rescue! A Volcano Recovery Story*
E. Life Returns to the Mountain Power Point Presentation
http://www.terrycjennings.com/Teacher-Guides-and-Activities.html

III. Concepts:

A. After a volcanic eruption, the affected area is devastated.
B. There are various ways in which a volcano erupts.
    1. Each volcano erupts uniquely.
    2. Mount St. Helens had several areas of damage.
        a. Blast zone where the trees were burned and leveled
        b. Avalanche where the side of the mountain slid down to the valley in a rock fall

c. Mudflows or lahars where the glacier melted, mixed with soil and flowed down the mountain
d. Pyroclastic flow where the ash covered the landscape
e. This activity is about the area damaged by ash flow.

C. Water is affected by an eruption, but there was always water on the mountain, before and after the eruption. Streams and rivers changed course. A river became dammed and created Coldwater Lake. On the other hand, Spirit Lake was filled with logs and its depth decreased dramatically. Because ash fell over a wide area, some water was not fit to drink until the ash settled out, but there was still rain. Since most animals did not return to the mountain right away, by the time the return began, water was not an issue.

D. Plants need soft, fertile soil to be able to sprout.

E. In this book, and at Mount St. Helens (MSH), gophers were agents that cracked the crusty surface of erupted ash and brought up nutritious bacteria from below.

F. Seeds need the right conditions to sprout.
1. Conifer seeds need shade to sprout.
2. Deciduous seeds need sun to sprout and live.

G. Animals will return to the mountain when there is an abundance of new food, shelter, and places to nest. Each animal has a particular set of food, shelter and place to nest it requires to return to the mountain.
1. For this exercise, shelter provides an animal with a place to rest, hide from the sun and hide from predators. Nesting place may be in a totally different sort of place than where an animal may seek shelter.
a. Consider tree nesting birds. They can seek shelter under low growing bushes, or rock ledges. They need tall trees to nest. They would not be able to return to the mountain until tall trees are available.

H. Predators will follow their prey.
1. Food Chain

I. Recovery is not predictable. Each area on the mountain was affected differently and the recovery in each area varied. Rates of recovery will not be the same under different situations.

J. Recovery takes decades and still continues today.

K. Recovery may be stopped or set back by another eruption.

IV. Skills:

A. Comparing the survival needs of different plants and animals

B. Understanding that plants and animals have essential needs for surviving

C. Understanding the food chain

D. Categorizing animals by whether they can stay at the volcano to live at a specific time in the recovery.

E. Recognizing that if humans impact an environment we may be affecting a plant's or animal's ability to survive

F. Recognizing that recovery after a natural disaster takes a very long time.

V. Attitudes:

A. Increasing awareness of the devastation wrought by a natural disaster
B. Appreciating effects of a natural disaster
C. Appreciating effects of man-made disasters
D. Appreciating effects of individual's actions on an ecosystem.

VI. Science Vocabulary:

- ash/tephra
- colonization
- conifer
- deciduous
- ecosystem
- eruption
- lahar
- predator
- prey
- shelter
- succession
- survival
- volcano

VII. Additional Vocabulary

- fertilizer
- moisture
- nutritious

VIII. Pre-Reading Discussion:

A. Ask students to share what they know about volcanic eruptions and how they think the mountain will change—what will happen to ponds and streams on the mountain, what will happen to the soil, how will plants and animals be affected?
B. Discuss what kinds of plants and animals might survive and what plants and animals will need to to live on the mountain after the eruption.

IX. Post-Reading Discussion:

A. Share with students what the habitat was like before the eruption.
    1. The mountain was covered with conifers (hemlocks, firs, trees that look like Christmas trees) (First three spreads in the book).
B. Share with students that the mountain became covered in hard crusty ash.
    1. Slide 2 provided on the PPT or spreads 5-6 in the book.
    2. Discuss what could live in that sort of environment.
C. Discuss with the students how plants might come back to the mountain.
    1. Seeds that blow in the wind (Slide 5)
    2. What about seeds that don't blow in the wind? (slide 6)

a. conifer seeds (encased in pine cones) fall to the ground close to the tree. They depend on animals to distribute to far locations in their gut or on their coats.

3. It will take a lot longer for conifers to return to the mountain.
4. What do plants need to sprout?
    a. Place to send down their roots
    b. Nutrition
    c. Moisture

D. Explore with the students which animals survived the eruption. (Spreads 6-8)
1. Consider why they survived.
    a. They were sheltered from the force of the eruption in their tunnels or rotting trees or in lakes or ponds under the ice.
2. Consider the food these animals had that would let them continue to live after the eruption.
    a. Gophers eat roots and bulbs that were not damaged. This food remained undamaged inside the earth and accessible from their tunnels.
    b. Animals in the rotten log use these rotten log for food as well as shelter.
    c. Toads and salamanders had bugs to eat not long after the eruption.
3. Consider the shelters these animals had that would let them continue to live after the eruption.
    a. Gophers had tunnels.
    b. Mice and beetle, etc. had the rotten logs.
    c. Gave them a place to rest, sleep, keep out of the sun, hide from predators and nest.
    d. Discuss toads and salamanders.
        (1). They need shade. Depended on the shade of the forest before the eruption.
        (2). Without a forest, they used gopher tunnels to find shade.
        (3). They could burrow in the mud.
4. Consider the food chain with the students to determine the sequence of return to the mountain.
    a. Carnivores (predators) need smaller animals.
        (1). Smaller carnivores
        (2). Smaller herbivores
    b. Herbivores need plants.
    c. Plants need nutritious soil where they can spread their roots.
        (1). Some plants need sun to sprout.
        (2). Some plants need shade to sprout.

X. Activity 1: Plants Return to the Mountain

This activity will demonstrate through drawing how plants will return to and grow in an environment damaged by a volcano. **Actions taken by students are listed in bold lettering.**

Using Plant Master 1:

A. Right away
   1. Explain to students that gray rectangles represent gopher tunnels.
      a. Spread 9 in Gopher book, Slide 3 in PPT
      b. Gophers broke up the ash.
      c. Gophers brought up bacteria which normally lives beneath the ground up to the surface. Made the soil over gopher's tunnels nutritious.
      d. What will happen to seeds that fall on hard crusty ash?
         (1) Are unable to sprout.
      e. What will happen to seeds that fall on gophers' tunnels?
         (1) Are able to send down roots and sprout. Have nutrition.
   2. Explain to students that small circles represent elk's hoof prints.
      a. Elk hoof prints break up ash.
      b. Will seeds that fall on elk hoof prints sprout?
         (1) They may sprout
      c. Will they grow as well as seeds which fall on gopher's tunnels?
         (1) No. They will not have nutrition unless fertilizer falls in the hoof print.
         (2) Discuss where the fertilizer might come from.
         (3) Not always lucky that fertilizer falls in the hoof prints.
   3. **Ask students to fill in a couple of elk hoof prints with fertilizers. (slide 8)**
   4. Discuss how seeds come to the mountain in the wind.
      a. Spread 9 in Gopher book. Slide 5 in PPT
      b. Some seeds are very light and are carried by the wind.
         (1) Black cottonwood, red alder, shrubs
         (2) They sprout in the sunny mountain in just a few weeks.
         (3) Not too many, though. Conditions have to be just right.
      c. **Ask students to fill in some small plants in places where seeds might have landed. (Slide 9)**

B. By the end of the first summer (slide 10)
   1. Discuss with students what might have happened by summers' end.
      a. More gopher tunnels

b. More elk prints

2. **Ask students to fill in more gopher tunnels, more elk prints. (Slide 11)**
3. Discuss with students what else might have happened.
   a. More plants
   b. Plants grew.
   c. Even a couple of tree seedlings
4. **Ask students to fill in more plants, maybe even a tree seedling, more elk prints, more gopher tunnels. (Slide 11)**
   a. Not many plants. It happened very slowly.
5. Remind students that some seeds (conifer seeds) are heavier and they fall at the feet of the trees.
   a. Firs, hemlocks, trees that look like Christmas trees. (Most of the trees in MSH prior to the eruption were conifers).
   b. Discuss how the trees were carried to the mountain.
6. **Ask Students to fill in a hoof print with a conifer seed.(slide 11)**
   a. Consider whether this seed will be able to sprout.
   b. Conifers need shade to sprout.

C. Second Summer (slide 12)
1. One year later
2. Discuss what might have happened.
   a. The ash has been softened by rain, so seeds might sprout in places where there are no gopher tunnels or elk foot print.
3. **Suggest that students grow their trees and bushes. Add a few more deciduous trees. Add a few more plants even in places where there are no gopher tunnels or hoof prints. (Slide 12)**
4. Discuss what may have happened to the conifer seed?
   a. Does it have shade now?
   b. Ask students to draw in tiny conifer seedling (slide 12).

D. Years later (slide 13)
1. Discuss with students how all plants are growing, more plants have come to the mountain.
2. **Ask students draw everything bigger, more deciduous trees, more coniferous trees (Slide 13).**

E. Ten years later
1. Discuss with students that plants are all growing and even more plants have come to the mountain.
2. **Ask students draw everything bigger, more deciduous trees, more coniferous trees (Slide 14).**

F. In the Future, a long, long time later
1. Explain to students that deciduous trees stop growing after a certain amount of time, like humans..
2. Explain that coniferous trees grow much taller than deciduous trees.
   a. Coniferous trees shade deciduous trees.

3. **Ask students to draw in the coniferous trees, make them bigger. Make more. Make a forest (Slide 15).**
4. Consider with students what happens when coniferous trees take the sun away from the deciduous trees?
    a. Deciduous trees can't live in the shade.
    b. They will die
    c. Only coniferous trees will remain on the mountain
    d. This is what lived in Mount St. Helens before the eruption.
    e. Explain to students that this succession
    f. Consider with students what would have happened if red alders and cottonwoods had not come first?
        (1) Coniferous trees need deciduous trees to colonize the forest before they can reclaim it.

XI. Activity 2: Animals Return to the Mountain

This activity will demonstrate how animals will return to an environment damaged by a volcano. **Actions taken by students are listed in bold lettering.**
Provide students with Animal Masters. Answers are provided for your use.

A. Explore with students which animals are able to visit the damaged area.
    1. Animals with long legs like Elk can visit the mountain.
        a. Elk were seen on the mountain on the second day.
    2. Animals that fly, like birds and bugs, can visit the mountain.
    3. Smaller animals like squirrels and rabbits may get too tired of walking in a place without food?
        a. Too small to visit the area hurt by the eruption.
        b. Can't get very far on their short legs.
        c Continue to live below, in the undamaged areas (slide 18).

B. Remind students of the discussion about what animals need to return to live on the damaged area.
    1. Water
        a. The eruption filled in and changed course of some rivers and streams, but created others. Filled in some ponds and lakes but created others. Once ash settled, water was not a problem for animals.
        b. There was always rain.
    2. Shelter
        a. From the sun, to hide from predators, to sleep
    3. Places to nest
        a. Not the same as shelter
        b. Some birds can hide from predators in the brush, but need to nest on a sturdy tree

C. Food
    1. Some animals have preferences like humans have preferences
        a. Elk prefer conifer needles.

b. Consider whether the elk would try to live in a place without enough conifer needles or stay in the areas where conifers were not damaged?

2. Predators will follow their prey stay.
   a. Predators will not live on the devastated mountain until their prey live there.

D. After the eruption
1. Consider with your students why gopher was able to live and stay in the damaged area.
   a. Had food, shelter and a place to nest.
2. Consider the other animals on the Master. Could any return to the damaged area?
   a. Point out and explain (if needed) the words “visit” and “live.”
3. **Ask students to draw a line from each animal to whether it can visit or live on the mountain. (slides 19-20)**

E. Weeks after the eruption
1. Consider with your students whether anything has really changed?
2. Could insects return to those few plants?
3. **Ask students to draw a line from each animal to whether it can visit or live on the mountain. (slides 21-22)**

F. End of Summer
1. Consider with your students what has changed at the end of summer
2. Refer to Plants Return Activity
   a. There are more plants where some bugs can land and live.
   b. The bugs that can stay to live on the mountain are those that have enough shade from the sun, can eat the plants on the mountain now
3. **Ask Students to draw a line from the animal to whether they can visit or live on the mountain. (slide 23-24)**

F. Second Summer - One Year Later
1. Consider with your students what has changed by the second summer.
2. Refer to Plants Return Activity
   a. There are more shrubs and some small trees.
   b. Discuss if there are any more animals that have food, shelter and places to nest in the damaged area.
      (1) Is there enough cover for ground nesting birds to feel safe enough to return? Can they hide their nests in the small bushes?
      (2) Some ground nesting birds may have come to the mountain.
   3. **Ask students to draw a line from the animal to whether it can visit or live on the mountain. (Slide 25-26)**

G. Years Later

1. Recovery was spotty and jumbled. In some areas, trees and shrubbery grew more than others.
2. Explore which animals will have food and shelter and places to nest in the damaged area five years later
    a. Is there enough cover for a ground nesting bird to feel safe from predators to nest in the damaged area?
    b. Are the trees strong enough to hold a nest for a tree-nesting bird?
    c. Discuss the eagle, predator of the birds. Will it live in the area now?
    d. Discuss the bobcat, predator of squirrels and rabbits. Will it return to live on the mountain now?
    d. Consider the difference between a scant meal in the damaged area and an all-you-can-eat buffet in the area that wasn't damaged.
    e. Discuss whether Elk can return.
        (1) Is there enough coniferous food for Elk to eat?
3. **Ask students to draw a line from the animal to whether they can visit or stay on the mountain. (Slide 27-28)**

F. Ten Years Later

1. Explore which animals have food and shelter and places to nest?
2. Even the small mammals have come back.
3. Is there enough food for predators to come back?
4. **Ask students to draw a line from the animal to whether they can visit or stay on the mountain. (Slide 29-30)**

XII. Wrap Up

Explain that the recovery was a jumble. This activity gives a broad sequence of how the recovery took place. What has to take place before something else can happen. It is not representative of any one place or time on the mountain. It is an exploration of how life returns to a damaged area. It returns at different rates in different areas depending on the type and extent of damage. The mountains still not back to what it was before the eruption. Recovery is still going on and the mountain will continue to change and heal. Or perhaps another eruption will set it back. Only time will tell.

A. Review what plants needed to return to the mountain

B. Review what animals need to return to the mountain

C. Write a five paragraph essay/story with your students about the recovery as they have just studied it.

or

Ask students to write a five paragraph essay/story about the recovery.