MOUNT ST. HELENS FOREST LEARNING CENTER

**Grade Level:** 6-12
**Duration:** Preparation–1 hour; Activity–1 hour, plus weekly monitoring and final wrap-up
**Subject Areas:** Biology, Resource Management
**Skills:** Observing, measuring, analyzing, presenting results

# Reforesting the Blast Zone

***Face the challenge of replanting a forest in a new, harsh, ash-covered landscape.***


## Summary

Students recreate an experiment that was critical to the successful replanting of some of the forests around Mount St. Helens after the 1980 eruption. Students will explore the relationship between environmental conditions and plant growth. They will also better understand the challenges land managers faced as they attempted a large reforestation project.


## Objectives

In this activity, students will:

1. Design an experiment to test the effectiveness of ash as a plant growing medium.
2. Collect data over time.
3. Organize and analyze data.
4. Present results to classmates in a logical manner.

## Materials

For the whole class, you will need:

- scissors or utility knife
- permanent marker
- 5-gallon bucket of dry topsoil
- 5-gallon bucket of dry volcanic ash (sand works too)
- trowel or soil scoop
- large bowl or bucket
- triple beam balance/scale
- liquid measuring cup
- water

For each student team you will need:

- clear plastic 2-liter drink jug
- metric ruler
- marigold starts of equal size and vigor
- 1 copy of *Planting Instructions* sheet
- plastic plate to catch drainage water

## Preparation

Review the activity.
Make copies and gather materials.
Cut the tops off drink jugs, and poke a few drainage holes in the bottom of each jug.

## Background Information

The eruption of Mount St. Helens flattened the forest in the surrounding area and covered the land with as much as three feet of ash. After the disaster, Congress preserved some of the blast zone as the Mount St. Helens National Volcanic Monument.

Other land in the blast zone, like private timberland, was salvaged and plans were made to reforest the area. Since nobody had ever planted trees in an ash-covered landscape, foresters and scientists experimented with tree seedling survival in ash. These experiments initiated a reforestation project outside the Monument that culminated with the planting of millions of trees.

Volcanic ash produced in different eruptions varies greatly in nutrient content. The ash from Mount St. Helens' 1980 eruption was almost pure silica and therefore very nutrient poor.

## Key Words

**blast zone**–the area around Mount St. Helens where trees were killed by the volcanic blast

**control–**the standard of comparison for other experimental groups

**limiting factor**–a quality, condition or characteristic that reduces the ability of the test subject to thrive

**volcanic ash–**fine particles of fragmented volcanic rock and minerals

## Introductory Questions

- Could you really live on just bread and water? What basic elements are absolutely essential for human beings to survive? For plants to survive?
- How is surviving different from thriving? What makes the difference?

## Procedure

1. Brainstorm with your students about ways to test how well tree seedlings grow in ash compared with soil or soil covered by ash. Record their ideas. Later, you can discuss the differences and similarities between the students' ideas for an experiment and the actual procedure explained here.

2. Gather the students outside or in an area covered with newspaper. Divide them into small teams of two or three and assign one procedure to each team (see A-E, below). Each procedure should be done at least twice. (Teams can test more than one procedure if necessary.) Distribute a pre-cut plastic jug to each team and ask students to label the jug with their name, date and letter of their procedure.

3. Instruct teams to fill their jugs to within 2 centimeters (.75 inch) of the top with the appropriate planting mixture, according to their procedure:
   Procedures A and B—Fill jugs 3/4 full with soil, then add a 7.5 cm (3 in.) layer of ash
   Procedure C—Fill jug with ash only
   Procedure D—Mix equal amounts of soil and ash in a separate container; then fill jug with the mixture
   Procedure E—Fill jug with soil only

4. Distribute one marigold start and a copy of the *Planting Instructions* sheet to each team. Have students rinse off excess soil from their plant's roots and shake to dry. Next, pinch off all flowers and flower buds. Vegetative buds should not be removed.

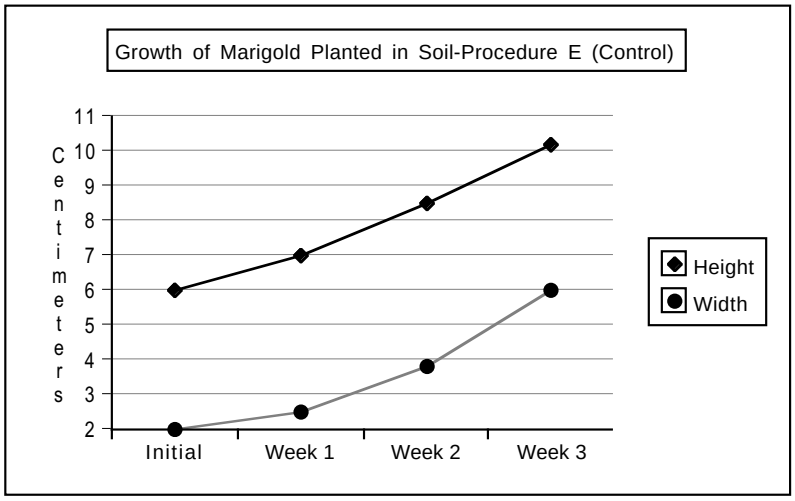
5. Have students weigh their plant to the nearest gram and record the weight on the "Growth Measurement Data Chart." Each team should then gently plant their marigold per the *Planting Instructions*. The roots should be pointing straight down, not bent or folded. The area where roots and stem meet should be 1 centimeter (approximately .5 inch) under the surface of the soil or ash.

6. After the planting is done, have teams predict how well their marigolds will grow over the next few weeks. Record their predictions. Discuss the following questions as a group:
   - What factors might affect the plants' growth?
   - Discuss the term "limiting factor." What do they think might be the limiting factor restraining plant growth?

7. Follow the "Continued Care" guide on the *Planting Instructions*. Teams should record weekly changes in their plant's growth on their *Data Chart*. Allow the plants to grow for at least 3 weeks.

8. At the end of the experiment, have each team carefully remove their plant from the jug, leaving the roots intact. Instruct them to gently wash the soil from the roots and shake the plant dry. Then weigh the plant and calculate the weight change.

9. Teams that used similar planting procedures should combine their data to find averages for their experiment, and then graph the results. For example, all teams who planted marigolds in pure topsoil (Procedure E) should make a graph showing the average growth of their plants on the y-axis, and the time frame on the x-axis. Growth may be combined into one factor, such as height + width, or height and width can be shown separately. Changes in weight and number of flowers and flower buds could graphed separately. (See example below.)




10. Have each group present their results to the class. Presentations should include a visual aid (graph), a synopsis of results, how the results compared to their predictions, and ideas about why they obtained these results.

## Assessment

Discuss the results together as a class.

- Which plants seemed healthiest? How can you tell? (Compare final results with the class's earlier predictions about plant growth.)
- Based on your findings, what procedure would your class recommend for planting trees in the blast zone? (Trees were planted in soil beneath the ash. Planting was delayed in areas of deeper ash to allow erosion to expose soil.)
- What other factors, besides soil type, might affect the growth of the plants? (Available water and sunlight, predation by animals or disease, care provided by people.)
- How might nutrient availability play a role?
- How does this experiment differ from actually testing tree seedling survival and growth in the blast zone?

## Extensions

- Repeat the experiment but eliminate a student-identified limiting factor. For instance, if the students identified lack of nutrients as a limiting factor, introduce fertilizer into the procedure. Does it make a difference?

- Visit a tree farm or plant nursery to learn more about how trees and plants are grown for commercial and residential purposes.

## Audio/Visual Resources

Unless otherwise noted, the following resources can be purchased through the Northwest Interpretive Association. Call (360) 274-2124 for a NWIA catalog.

*The Fire Below Us.* Earth Images. (Video)

*Fire Mountain: The Rebirth of a Volcano* (Video)

*Message from the Mountain* (Johnston Ridge video presentation)

"Mount St. Helens: A Changing Landscape."
(80 slides featuring the ecological recovery near Mount St. Helens)

"Weyerhaeuser at Mount St. Helens: The Days After."
(Educators pack of 20 or 60 slides available from the Forest Learning Center)

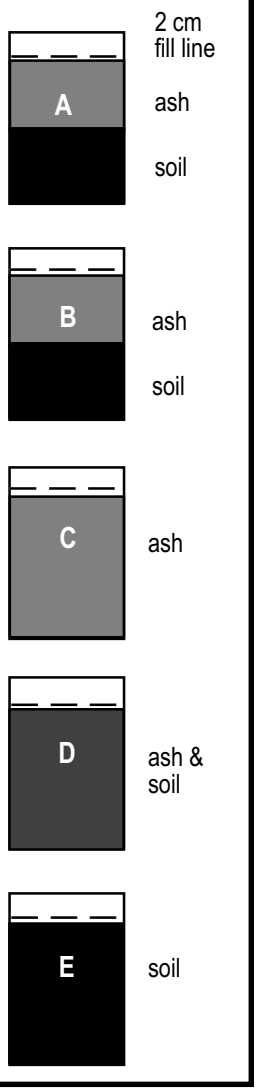
## Print Resources

Lauber, P. *Volcano: The Eruption and Healing of Mount St. Helens*. 1986.

Quiring, J. *Mount St. Helens: The Continuing Story*. 1991.

Rochelle, J. A. "Natural Resource Recovery Following the 1980 Mount St. Helens Eruption: Lessons in Ecological Resilience." Tacoma, WA: Weyerhaeuser Company, 1990. (Scientific paper available from the Forest Learning Center.)

**Jug Set-Up**




# Planting Instructions

## Procedure A

This experiment represents an area where trees were planted directly into volcanic ash. Plant the marigold in the ash on top of the soil. Do not dig down into the soil.

## Procedure B

This experiment represents an area where tree planters dug through the ash to reach soil before planting the trees. Dig a hole through the ash and plant the marigold in the soil below the ash. Maintain the hole throughout the experiment to ensure the marigold does not get covered with ash.

## Procedure C

This experiment represents an area with very deep ash. The roots of the seedling could not reach the soil below. Plant the marigold in the ash.

## Procedure D

This experiment represents an area where the tree planters mixed the ash with soil before planting the tree. Plant the marigold in the soil/ash mixture.

## Procedure E

This experiment represents the control group of trees planted outside the blast zone where there is no ash. Plant the marigold in the soil.

### Continued Care

After planting, water the control plant (Procedure E) with a measured amount until soil is damp. Add the same amount of water to all other seedlings. Place the containers in a sunny location on top of a plastic plate to catch water drainage. Water all jugs when the soil for the control plant (E) is nearly dry. Measure and record the amount of water used at each watering. Some plants may appear to need more water, but **water them all equally**. Do not fertilize plants. Record weekly changes on the Growth Measurement Data Chart.

## Growth Measurement Data Chart

*Each week measure and chart the growth of your team's plant. Measure the height from the soil level to highest point of the plant, and measure width at the widest horizontal point. Record the color of the vegetation and the number of flowers and buds. At the end of 3 weeks (or longer), remove the plants from their containers and wash the soil from the roots. Re-weigh the plants.*

| | Week Planted | Week 1 | Week 2 | Week 3 |
|---|---|---|---|---|
| Date | | | | |
| Color | | | | |
| Height | | | | |
| Change in Height | | | | |
| Stem Diameter (measured 1 cm above ground level) | | | | |
| Change in Diameter | | | | |
| Number of Flowers or Buds | 0 | | | |
| Weight | | | | |

*Calculate the weight gained or lost by your plant over the 3 weeks. What was the percentage weight change?*