

A grayscale mosaic of Mars showing various craters and geological features. The image is composed of several overlapping rectangular panels, each showing a different region of the planet's surface. The terrain is heavily cratered, with craters of various sizes and shapes. Some craters have distinct rims and shadows, while others are more subtle. The overall appearance is that of a rugged, ancient landscape. In the center of the image, there is a white rectangular box containing the title and subtitle for the activity.

ACTIVITY 5
Creating a Large-Scaled Model
of Catastrophic Flooding



Overview

Students model catastrophic flooding. Working at a larger scale than is possible in a stream table – either at a beach or on a sand-covered driveway – students create a sudden outflow of water and observe the shapes created by the flooding. Students observe separating and rejoining channels, streamlined shapes, ripples and poorly-sorted sediments.

Content Goals

- In order to form, Scabland features required high flow rates and immense quantities of water.
- Features created in the model illustrate features associated with the Scabland flood.
- Larger-scaled models enable one to study the more subtle aspects of a process.

Skill Goals

- *Creating* large-scale models to study the effects of catastrophic flooding.
- *Extrapolating* the size of actual structures represented in the model.

Possible Misconceptions

This activity provides an opportunity to solidify understandings and note some surprising effects of scaling up a model. Nonetheless, students may be surprised:

- by how many containers of water are needed to fill their large excavations;
- by how quickly water soaks into the soil behind their dams;
- by how little water it takes to affect a thin coating of sand on a driveway and to create features associated with cataclysmic flooding.

Materials

An expanse of sand (e.g. a beach, a slightly-sloped side lot, or a slightly-sloped driveway covered with a thin layer of sand), buckets, water jugs, shovels, devices for shaping banks and outcrops, meter sticks or tape measure, camera.

Preparation

Before going outside, discuss the academic focus of the planned activity.

Time

Half a day (beach) or one to two periods (driveway).



Both for reasons of scale and convenience, modeling catastrophic flooding in the classroom is difficult. In this activity students create a large-scale model of catastrophic flooding at a beach or on a driveway. This model also helps students to synthesize what they have learned in activities earlier in the module by enabling them to see the features associated with flowing water at a larger scale.



PROCEDURE



Students modeling catastrophic flooding on a beach.

1. Arrange students in teams of 3 to 10. Have them create their own versions of the Martian channels and impound water behind dams so they can create sudden releases.
2. Have students fill the impounded basins with water. These basins represent chaotic terrain.
3. Take photos to motivate careful construction.
4. Announce each demolition so students can watch and analyze the effects of each flood.
5. Identify the features created in the sand by the water.
Students should observe anastomosing channels, streamlined shapes, ripple marks, alluvial fans, and deltas.
6. Analyze the way the sediments were sorted.
Students should see the grading (and possible layering) of outwash particles. In areas of gentle flow, the sorting should be by size and density. In areas of catastrophic flow, the sediments should be unsorted.



Activity 5 can be done right after Activity 4 or as a culminating activity such as a beach day at the end of the school year. You might include this activity as one of several options for a year-end celebration day. Even if the module work was completed much earlier during the school year, students can still enjoy and learn from the activity if it is done late in the year. You can get a self-selected group of motivated students by letting students choose between a morning session of either sand castle building, making sand sculptures or dam building.

If your class cannot get to a beach, a driveway can provide the large-scale model experiences associated with the great floods. On a driveway, spread a thin layer of sand over wide area. To create the water flow, use a garden hose, pour water from buckets, or build dam structures that impound water. Keep in mind that this sand layer is thin and can be easily removed by too much water. Have students think about scale and what would be too much water, even for a catastrophic flood. On both a beach or driveway, decide on ways to clean up the sand after you are finished. Try to avoid sites that will need extensive restoration or cleaning up. A site near a river or beach restores itself naturally.