

## Landforms and Geomorphology

### **Background**

**Geomorphology** is the science of landforms: the shape, origin, evolution and distribution of formations on the earth's surface. The Shaping Watersheds sandbox can be used to model the varied landforms found on the planet, explore the processes that create them and think about how the shape of the earth's surface affects humans and ecosystems.

Geomorphic processes are generally considered to be either **erosional or depositional**. An erosional process is one in which the earth's surface is worn down by wind, water, and/or ice. A depositional process involves the laying down of material (soil, rock, or organic matter) on the surface of the earth.

Scientists who study geomorphology generally focus on analyzing one or a combination of the main geomorphologic processes: fluvial (rivers and streams), aeolian (wind), hillslope (gravity), glacial, tectonic, and biologic (e.g., burrowing). To study landform history and predict future earth surface changes, researchers use tools such as geochronology (dating rocks, fossils and sediments), GPS (global positioning systems), remote sensing, and computer modeling.



*Visitors at UC Davis' KeckCAVES building different landform types, such as islands and ridges. (Photo Credit: Burak Yikilmaz)*

## Primary Activities

- **Model a variety of landforms.** Visitors often name and/or create a variety of landforms without prompting. You may also want to suggest landforms to make: mountains, volcanoes, islands, archipelagos, ridges, hills, straits, cliffs, mesas, dunes, buttes, peninsulas, isthmuses, alluvial fans, valleys, deltas, canyons, craters, basins, flood plains, deserts, lakes, rivers, drainage patterns (e.g., dendritic), meanders, creeks, dams. See Wikipedia's [list of landforms](#) for a detailed list and descriptions of landforms. You may want to assemble a collection of photographs and/or topographic maps of these landforms.

Many visitors are also interested in modeling specific geographic features. Some landforms visitors could build include: mountains such as the Sierra Nevada mountain range if you're on the west coast or the Green Mountains or Adirondacks if you're on the east coast; local lakes like Lake Tahoe, Lake Champlain, Lake Superior; volcanoes such as Mt. St. Helens, Kilauea, Mt. Fuji, or Mt. Kilimanjaro; other landforms of interest such as Grand Canyon, Mt. Everest, San Francisco Bay watershed, Mariana Trench, Badlands, Mima mounds, Nile River, Tibetan Plateau, Great Rift Valley, Uluru (Ayers Rock), etc.



*A young visitor at the Tahoe Environmental Research Center creates rain over a mountain built by another visitor. (Photo Credit: Jim Markle)*

## Extension Activities

- **Introduce erosion and make connections between erosional processes and landform shape.** “When water flows downhill, does anything else flow with it? Water flowing through a watershed often carries eroded sediment. How does erosion relate to the landforms we have explored?” Ask visitors to make or observe a sandbox landform with steep slopes, along with a landform with gentler slopes. Ask them to predict on which landform erosion would be the strongest and help them discuss their logic. Steeper slopes result in faster flowing water which has more energy and can carry larger loads of material increasing the amount of erosion and deposition. Relate the concept of erosion back to the landforms you created, e.g., ask visitors why the Grand Canyon is so deep.
- **Explore depositional processes.** “What happens to the sediment carried by the river when it reaches the bottom of the hill?” Deposition happens when the energy needed for sediment transport is too little - when it is no longer sufficient to overcome the . Then the soil or sediment is left on the earth’s surface, often while the river or transporting force moves elsewhere. Relate the concept of deposition back to the landforms the visitors created. For example, ask visitors how deposition may lead to the creation of dunes.
- Ask visitors to think about how **human activities** affect erosion and deposition. Construction, road building, and other activities can increase the amount of erosion flowing through the watershed by exposing sediment that was protected under the soil surface. This increased erosion can negatively impact the health of lakes and streams. Climate change is expected to reduce the snowpack in many mountain regions. This would decrease the flow rate of rivers, which would reduce erosion rates and the timing of deposition.

## Additional Resources for Landforms Lessons

- Wikipedia’s list of landforms  
[http://en.wikipedia.org/wiki/List\\_of\\_landforms](http://en.wikipedia.org/wiki/List_of_landforms)
- An introduction to stream geomorphology  
<http://glaquarium.org/wp-content/uploads/2012/11/A-Meandering-Story.pdf>

## Hydrology

### Background

Hydrology is the study of how water on earth moves and is distributed in the atmosphere and on and under the earth’s surface. Water is one of earth’s most limited resources -- the overall amount of water on the planet is constant. The planet’s water is involved in a continuous process of movement and transformation -- called the **water cycle** -- between phases (liquid, gas and solid) and between locations (oceans, bodies of water, atmosphere, and land).