



FACILITATOR GUIDE

Paper Mountains

Learning objectives

- Earth is a constantly changing and dynamic system.
- The shape of the land and the pull of gravity both influence how water moves over Earth.
- NASA scientists use observations to make predictions about the future of our planet.

Materials

- Copy paper
- Washable markers
- Dropper bottles
- Microfiber towel
- Water
- Try this at home *Make a Rain Gauge* cards
- Activity and facilitator guides
- Information sheets
- *Tips for Leading Hands-on Activities*

The Explore Science toolkit comes complete with all necessary materials for this activity. Materials are also readily available to create or restock activity kits. Graphic files can be downloaded from www.nisenet.org.

Notes to the presenter

Coloring the mountain peaks can be a confusing step for some visitors. It helps to have the visitor trace a mountaintop with their fingertip, so that they get a physical sense of where the ink should go.

For visitors with low or no vision, this activity can be mostly tactile. You may choose to skip the coloring step. Instead, simply have the visitor feel the mountainous paper and identify peaks and valleys. Then, just as you would otherwise, invite them to choose a peak, make predictions, and make it rain on that peak. They can then feel the paper for wetness to learn how far the water traveled and in which directions.

This is an excellent activity for young children, who are drawn to the opportunity to color with markers and experiment with water. It is rich in science process skills such as making predictions, observing, and constructing explanations. Exercising these skills is already a valuable experience for young children, even if they don't go so far as making connections to dynamic Earth systems, watersheds, or

runoff. Meanwhile, for older children, you can add complexity and personal connections by providing local watershed maps for connecting to local topography and geography.

Conversational Prompts

Visitors may spend several minutes at this activity. While they color and test their mountains, try having some of these conversations:

- “Can you predict how the flow of water will change over the landforms? Can you define your watershed?”
- “What do you think the marker ink could represent? Can you think of anything that gets washed away in the rain? (e.g., sidewalk chalk, oil, seeds, trash) Where will that stuff end up?”
- “If you were going to live somewhere on your paper, where would you want to live? Why would you choose to live there? Where would you get your water? Would you have neighbors? What kinds of rules would you and your neighbors follow about water?”
- “What is the water like around your house/town/city? Do you get lots of rain? Or is the weather dry? Are there any lakes or streams around where you live? What have you noticed about them? Has your water/weather been in the news lately?”
- “How might your life be different if you knew exactly what the weather would be like tomorrow? Next week? Next year? Can you think of anyone for whom weather has an even bigger effect on their life than it does on yours?”

Optional Extensions

This activity includes an optional takeaway card with instructions on how to make a rain gauge at home and a link to NASA's GLOBE Observer citizen science project. The rain gauge described in the instructions won't work well in dry hot climates due to evaporation. Visit <https://observer.globe.gov> to learn more and join a global community contributing to NASA science. At that site you'll also find trainings, protocols, tutorials, and other resources to take measuring ground precipitation to the next level. And stay tuned for other GLOBE Observer citizen science campaigns coming soon.

You may also choose to add local watershed images or maps to the materials in this activity in order to help participants make a connection between what they're doing in the activity and familiar regional landmarks. The USGS website has downloadable printable resources you can use: https://water.usgs.gov/wsc/map_index.html

Difficult concepts

While this activity does not specifically address the causes of global climate change, you may find that you engage with some visitors on this important topic. Some participants might dispute climate change. You can respectfully respond, “Yes, not everyone is in complete agreement about climate change. The great majority of scientists agree it is occurring, and we have a lot of supporting evidence. We are presenting the scientific perspective on the importance of studying Earth from above in this activity.”

People may struggle to understand the full water cycle, especially young children who may experience evaporation as a magical process where water disappears and reappears in the form of rain. The water cycle includes ice and snow, and not all water runs off into the oceans—some of it stays present in the ground and plants and evaporates from there.

Given that NASA’s name includes the word “Space,” many people are surprised to learn that NASA also studies Earth from above. Satellites, other spacecraft launched into orbit around Earth, and aircraft like weather balloons and jet airplanes provide important observations about water, landmass, ice cover, the oceans, weather, climate and other Earth systems.

Staff training resources

Refer to the *Tips for Leading Hands-on Activities* sheet in your activity materials.

- An activity training video is available at vimeo.com/245834493
- A content training video is available at vimeo.com/245835046
- The NISE Network has a curated list of programs, media, and professional development resources in the NASA Wavelength Digital Library that directly relate to the toolkit. These resources can be viewed and downloaded from nasawavelength.org/users/nisenet.

Credits and rights

This activity was adapted from Crumpled Paper Watershed, developed by The Alice Ferguson Foundation. Retrieved from: http://fergusonfoundation.org/teacher_resources/crumpled_paper.pdf

Images of Global Precipitation Measurement mission; airplane shadow; and weather balloon courtesy NASA’s Goddard Space Flight Center.

Images of students measuring water and GLOBE app courtesy NASA/GLOBE Observer.

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