Our Great Lake

Lesson Outline

Evanston Ecology Center

Opening discussion prompt

The Great Lakes hold about 21% of the world's surface fresh water — enough to cover the entire continental United States in about 9.5 feet of water.

Activity: Water percent bucket demonstration

- Explain the 5-gallon bucket = all Earth's water. Have students name water types (rivers, lakes, oceans, clouds/vapor, ice caps, groundwater, soil water, water in plants/animals) — prompt as needed.
- Two student volunteers help:
    - Student 1 removes 2 cups of water from the bucket, holds it up.
    - Cups = freshwater. Bucket = saltwater (undrinkable, makes us sick).
- Set the bucket aside. Student 1 pours 1/2 cup into Student 2's 1-cup measurer.
    - Remaining 1.5 cups = polar ice caps (frozen, unavailable).
- Set that aside; Student 1 sits down.
- Ask the class what the 1/2 cup represents: groundwater, surface water (lakes, rivers, wetlands), atmospheric water vapor.
- Ask the class to guess how much of that represents surface water alone. After guesses, use an eyedropper to place one drop in a few students' hands — that drop = all water available for human/animal drinking.
    - Note: the Great Lakes hold 20% of that available drinking water. (source)
- Close with discussion: why protecting the Great Lakes matters, and how human activity impacts this resource.

Activity: Arm-span geologic time scale demonstration

- Have the students spread out with their arms outstretched. Explain to the student that their wingspan is going to represent the timeline of the history of the Earth. Then, explain each of the following major events to the students and where they fall on their wingspan timeline.
    - **Earth's Formation (Left Fingertip):** Zero point on your left hand where the planet begins - 4.5 billion years ago.
    - **First Life (Left Wrist):** Single-celled organisms appear - roughly 3.8 billion years ago.
    - **Complex Animals & Dinosaurs (Center/Chest):** Multicellular life and the rise and fall of dinosaurs occupy the entire span across your torso.
    - **Ice Age & Great Lakes Formed (Right Palm):** Glaciers retreat to carve the Great Lakes just millimeters from your right hand - 14,000 years ago.
    - **All of Human History (Right Fingernail):** Recorded human civilization, agriculture, and modern history take up less space than the tip of your right thumbnail.

Before beginning, have students think, pair, and share:

"How do you think a lake as big as Lake Michigan could have formed?"

What are glaciers?

A glacier is a massive, slow-moving body of ice formed from compacted, accumulated snow over hundreds or thousands of years.

- Glaciers form when more snow falls each winter than melts each summer, so layers build up and compress into dense ice.

- They are so heavy and thick — sometimes over a mile deep — that they slowly flow like a very slow river, driven by gravity and their own weight.
- As glaciers move, they scrape, gouge, and grind the land beneath them, picking up rock and soil (like giant sheets of sandpaper).

How glaciers formed the Great Lakes

Before the modern Great Lakes formed, the region was an ancient low-lying basin shaped by river valleys. This landscape proved to be ideal for the formation of the largest freshwater lake system in the world. Over several million years, continental ice sheets advanced and retreated across the region as the climate cycled between warm and cold periods.

- Each time a glacier advanced, it gouged deeper into the existing river valleys and lowlands, widening and deepening them into basins.
- As the climate warmed and glaciers retreated large areas of the ice melted back, leaving enormous volumes of freshwater to fill the now widened and deepened basins.

Moraines (older kids only)

As a glacier moves, it bulldozes rock, gravel, and soil (called till) along its front edge and sides, like a plow pushing snow. This leads to the creation of moraines, essentially a ridge of till created by a moving glacier. Different types of moraines may form depending on where till gathers in relation to the glacier.

- **Terminal moraine**: Forms at the farthest point a glacier reaches. Think of the material at the front of a bulldozer
- **Recessional moraine**: Forms during a glacial retreat when till is left behind from a temporary pause in glacial retreat.
- **Lateral moraine**: Sharp ridges of rock and till that form along the side of a glacier as it moves through a landscape
- **Ground moraine**: A ground moraine is an irregular blanket of unsorted rock debris or till deposited beneath a melting glacier, typically forming gently rolling plains or low-relief landscapes
- **Medial moraine**: A long, dark line of rock debris that runs down the middle of a glacier. It forms when two smaller glaciers meet, and the rocky edges of their lateral moraines join together in the center of the new, larger ice stream.

Now that we've learned all about glaciers, let's go experiment with them!