

Shrinking Glaciers: Why We're Losing Ice and Why It Matters

Learning Goals

- Glaciers across the world are shrinking.
- We know this because we can see the changes visually, and because glaciologists have methods they can use to measure glaciers.
- Glaciers act as a major fresh water storage system for the earth, and therefore losing them affects water supplies for humans, plants, and wildlife.

Drop-in Activities

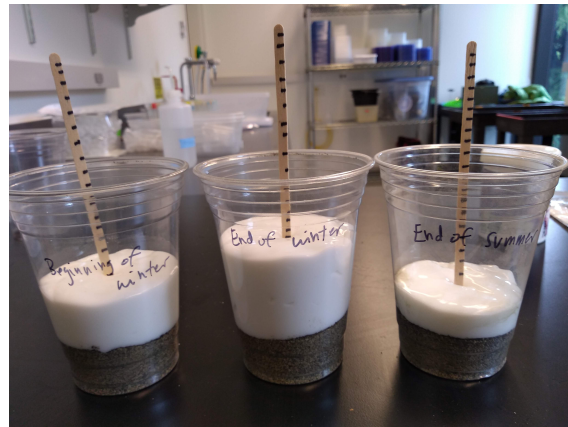
There are three different drop-in activities, best done one at a time. Guessing how much fresh water is held in glaciers and measuring glacier mass balance changes are both good options for all ages. The matching game with historic vs. contemporary photos works best with adults or kids older than 10 who are likely to recognize iconic peaks in their region.

Directions

- 1) **(Requires a bit of research and prep time):** Make the matching game
 - a) Search for paired historic and contemporary photographs (taken from approximately the same place, with several decades in between) of glaciers in your region showing the extent to which they have retreat. In my case, I was looking for photos of glaciers in the North Cascades and Olympics mountain ranges in Washington state. Often these can be found on National Park Service (NPS) or U.S. Forest Service (USFS) websites or from other federal or state land management agencies that care for the lands where these mountains are found. You may also be able to find articles in the scientific or popular press that discuss glacial retreat and include paired photos; some of mine came from a professional photographer who had done a project about the topic and from a local mountaineer who keeps a website about deglaciation.
 - b) Print copies of each pair of photos, resizing and/or cropping them as necessary to get them all approximately the same size (in my case, one photo fit on half an 8 x 11 sheet. This is a good size for people to see detail, but takes up a lot of space on the table so you may want to go smaller). I used a color printer, even though the historic pictures were in black and white; they still turned out more rich looking.
 - c) Label the back of each photo with the year it was taken, the name of the mountain, and the glacier name if known.

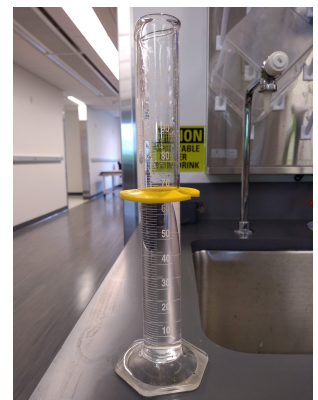


- d) Laminate the photos.
 - e) Shuffle the photos and have visitors try to match them; usually prompts lots of good conversation about how dramatic the changes have been and people’s personal experiences with the mountains. Especially appealing for teens and adults.
- 2) **(Requires a bit of time)**: Make sets of beginning-winter, end-winter, end-summer “glaciers”
- a) Make the “glacier goo” using this recipe (you will need Borax, Elmer’s glue, and water): [https://crisis.ku.edu/sites/default/files/Education/K-12/CRISIS%20Pieces/CPIL-10 GlacierGooRecipe sm 4up.pdf](https://crisis.ku.edu/sites/default/files/Education/K-12/CRISIS%20Pieces/CPIL-10%20GlacierGooRecipe_sm_4up.pdf)
 - b) To set up a single “year” of glacier measurements, you will need some glacier goo, 3 plastic deli cups, 3 long wooden sticks, a sharpie, and some sand.
 - c) Draw straight, evenly spaced marks down the length of each ice cream stick with the sharpie—about a cm apart or less is good. These are going to be your ablation stakes (see



here: http://www.antarcticglaciers.org/glacier-processes/introduction-glacier-mass-balance/#SECTION_2

- d) Label the three cups “Beginning of winter”, “End of Winter,” and “End of Summer”. Fill each a quarter to a third with sand, and then add the amount of glacier goo of your choice. Finally, poke an ablation stick into the cup until it reaches the bottom. Depending on the amount of goo you add, you can simulate gain or loss of glacier mass. The photo above illustrates a situation where the glacier has retreated because of summer melt (it gained mass from new snowfall during the winter, but lost more than that during the summer).
 - e) Have visitors count the visible markings on each cup in the trio and decide if the glacier has gained or lost mass, as well as figure out why.
- 3) **(Can be done immediately before tabling)**: How much fresh water do glaciers hold?
- a) Prepare a jug of water and a 100 mL graduated cylinder, flask, or any other container that has markings on it at least every 5 or 10 mL.



- b) Tell visitors to imagine all the fresh water on earth fills this flask. Explain that Fresh water is found in a) lakes, ponds, and rivers, b) in groundwater, and c) in glaciers and ice caps. Have them pour in as much water as they think is stored in glaciers and ice caps, and then adjust the amount until it's correct (it's about 69-70%).