



Where did all this snow come from?

Introduction:

If you live around the Great Lakes, you are familiar with snow... Lots and lots of snow. The Greats lake region often has more snow than other areas throughout the country because we have something called “lake effect snow.” So, how does all this extra snow effect our lives in the Great Lakes region? Well, we have lots of special activities that we get to do like skiing, snowboarding, snow shoeing and sledding! Although there are a lot of fun things that go along with this snow, there are also some responsibilities that come with it.

To live in this region, you must be a safe driver! Driving in the snow can be dangerous and it takes a certain amount of skill to drive safely on those snowy days. We also must have special kinds of clothing to stay warm throughout the winter. We can't forget about our snowshoes, snow pants, a warm winter coat and our hats and mittens! With all the fun that comes with the snow it also comes with some hard work. We must shovel to keep our sidewalks clean; we also must have special equipment to help keep our roads and functional and safe, like snow blowers and snow plows.

Although other places in the country and in the world have lots of snow, they aren't as special as ours. Our Great Lakes give us extra lake effect snow! So, the next time you are around the Great Lakes and it's snowing, try to remember how special our area really is!

Subject Areas: Science

Grade Levels: 4th and 5th Grade

Topics: Earth Science, Weather

Great Lakes Literacy Principles:

3. The Great Lakes influence local and regional weather and climate.
6. The Great Lakes and humans in their watersheds are inextricably interconnected.
8. The Great Lakes are socially, economically, and environmentally significant to the region, the nation and the planet.

I. Materials Needed/Prep

- One cup for each student
- Snow
- Very warm water
- Colored pencils

II. **Objective:** The objective is for students to understand how the lake effect causes heavy snow in the areas around the Great Lakes.

III. **Important Vocabulary/ Background Information**

Many factors play into how snow accumulates in a region. The Great Lakes region often has more snow than surrounding areas that are further from the lakes. This is due to the lake effect. The lake temperatures rise throughout the year, as winter moves in the air temperature drops faster than the water temperature. When cold air moves over the lake, the temperature differences cause water to evaporate. As the water evaporates and the air temperature above the lake starts to warm, the air rises, taking the moisture with it.

As the water collects, we start to receive heavy snow falls around the lake. Mid November to Mid-January is often the time with the largest temperature difference. The temperature difference between the water and air can be as large as 50°F. Air pressure also plays a big role in creating the lake effect. A low-pressure cell followed by a high-pressure cell provides favorable conditions for lifting the warm, moisture filled air. As the moisture rich air rises and cools, snow crystal form.

- a. **Fetch-** Fetch is a measurement of distance that indicates how far wind has traveled over open water. <https://www.thoughtco.com/what-is-wind-fetch-2292990>
- b. **Lake Effect Snow-** Lake Effect snow occurs when cold air, often originating from Canada, moves across the open waters of the Great Lakes. As the cold air passes over the unfrozen and relatively warm waters of the Great Lakes, warmth and moisture are transferred into the lowest portion of the atmosphere. <https://www.weather.gov/safety/winter-lake-effect-snow>

IV. **Procedure Part One**

- a. **Collecting Snow Outside (30 Minutes)**
 - i. Give the students a cup and have them collect a small amount of snow. Bring them back into the classroom and allow the snow to melt.
 - ii. Prompt questions:
 1. What is going to happen to the snow in the cup? (Its melting)
 - iii. This will help the students to make then connection that snow is water and so it must come from some water source.
- b. **Coloring snowfall map (160 inches to 100 inches of snow) (15 minutes)**
 - i. Have the students first color in the Great Lakes with a color of their choice.
 - ii. After they have colored in the lakes, have them color in the isolines in colors ascending form lightest to darkest in correlation with the shallowest snow to the deepest snow.
 - iii. Questions to ask about the map
 - 1) Why do you think the snow accumulation is deeper near the lake?
 - 2) How could the lake be affecting the snow accumulation within the area?

V. **Procedure Part Two**

- a. **Create some steam! (30 minutes)**

- i. Take your VERY WARM water and fill the cups about half way, have the students go out into the cold and observe what is happening to the water.
 - ii. Prompt questions:
 1. What is the water doing? (Creating steam or evaporating)
- b. Snow from space!
- i. Have the students review the lake effect diagram that shows how water that evaporates from the lake turns into snow
 1. How does the water in this cup relate to Lake Superior when a cold front move in?
 2. What happens once the steam reaches the sky?
 - ii. Have the students look at the satellite image and try to make the connection of what is happening in the image compared to the diagram.
 - iii. Then have them make a guess about the possibility of lake effect snow based on the conditions outside on the day you do the lesson. There is a table of questions to guide them in their guess.

Resources:

Satellite Image: <https://www.weather.gov/safety/winter-lake-effect-snow>

Lake effect snow diagram: <https://scijinks.gov/review/lake-snow/lake-effect-diagram.png>

Isoline Map:

https://www.michiganseagrant.org/lessons/wpcontent/uploads/sites/3/2019/04/ClimateWeath_L3_SnowfallMap.pdf

Fill-in chart: <http://www.theweatherprediction.com/winterwx/lesnow/tree/>