

Dirty Snow in Shishmaref Research Report  
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by

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Special thanks to *The Dirty Snow Science*: Christi Buffington, Dr. Carl Schmitt, Dr. Ulyana Horodyskyj, Dr. Olivia Lee, and Ken Stenek, Shishmaref Science Teacher

## Abstract

We did the project to see how dirty the snow is. Norman Stenek, Trevor Eningowuk, and Emma Olanna were all there. This took place in Shishmaref, Alaska. We did this project from February to March. We collected the snow and filtered it to see how dirty the snow is.

These questions are our research questions: How dirty is the snow? Which site is the dirtiest? We were taught how to do this project by Christi Buffington and Carl Schmitt. We did this project with materials from Christi and Carl. We also had Zoom classes with other scientists and citizen scientists, students like us.

We learned that the West Runway site was the dirtiest out of five sites. The snow is dirty, but which site is dirtiest? It's important to know because the snow becomes our drinking water here in Shishmaref. We also need clean snow for things to grow.

## Research Questions

How dirty is the snow? Which site is the dirtiest? Why is it dirty? Why did we do this project? Which site is the cleanest?



Water source

## Introduction

The snow provides us water for Shishmaref. It feeds the plants and berries for cooking. We use the water for surviving life. We need it for the plants. We have a water source because we don't have running water and fresh water sources like a lake or river.

The snow is dirty from the disturbance of people or animals. The dirtiest site might be where it is most disturbed. Snow tracks from animals lead hunters to that animal. We need the animal for food so we can live life. A snow path allows us to go from one place to another with a snow machine. It might also make the snow dirty.



Filtering and runway

## Research Methods

Climatic characteristics of Shishmaref are cold in winter, warm in summer, and our tiny island is eroding. In the summer, there is grass, crow berries, and sometimes blueberries. In the winter, there is just snow and plants in their winter stage.

We used the GLOBE Cloud Observer from NASA to tell what clouds we had while collecting the samples. We used white and grey tiles in the pictures to see what color the snow was.

To collect the snow samples, we used a ruler, meter stick, Ziploc bags, and a clipboard. We used the meter stick to measure the snow and clipboard to get the snow out, like a shovel. We used Ziploc bags to hold the snow. We melted the snow in bags of hot water. Then we took the pH of the snow three times to see the acidity of the samples. Next, we filtered the snow to see how dirty it was. We used a syringe to filter the snow. The filter was in a little filter holder.

Sometimes the dirtiness of the filters was gross and disgusting. The snow looked clean but when we filtered it as dirty a wild caribou skin.

Before we got samples we would agree to a time and day when we are all available to collect the snow samples. Like Friday we'll agree to go on Saturday the next week. We would do this every week for four weeks. We would do the sampling from 3:00 to around 4:30 when we knew a satellite was over us.

We would collect our samples with the materials sent from Christi Buffington and Carl Schmitt. They sent the tiles, syringes, filters and filter holders, pH strips, and data sheets. We collected data at east and west runway because planes landed over the snow. We also collected data from the water resource. We chose this place because this is where we get our water. When the snow melts the snow becomes part of our drinking water, we call it washeteria or quarter water.

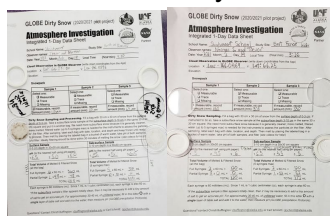
We used snow collection protocols given to us by Christi Buffington and Carl Schmitt. We measured snow depth three places at each site. For example, this is the measurement for East of the runway. Sample one is 50 mm deep, sample two is 60 mm deep, and sample three is 110 mm deep. We would collect 30 cm by 30 cm and 0-3 cm in depth for the surface sample. The subsurface was 3-10 cm in depth. We used a meter stick and a ruler to get the snow from the surface. We also used a clipboard to get the subsurface snow. We needed five full syringes

of snow for the subsurface. Each syringe should be 60 mL. We would do this at all five sites. The five sites are North, East and West of Runway, and East and West of our water source.



## Results

The west runway site was the dirtiest site. The water source was the cleanest site.



Example of data sheets and dirty filters

(ug/L: amount of chemicals per liter)

Table: The 2021 Shishmaref Snow Sample Results

Shishmaref East Runway Subsurface	Volume: 300 ml filtered ug/L on filter: 3.52 ug per liter: 11.7
Shishmaref East Runway Surface	Volume: 175 ml filtered ug/l on filter: 1.4 ug per liter: 8.01
Shishmaref West Runway Subsurface	Volume: 286 ml filtered ug/Lon filter: 32.6 ug per liter: 114
Shishmaref West Runway Surface	Volume: 476 ml filtered ug/L on filter: 25.1 ug per liter: 52.7
Shishmaref North Runway Subsurface	Volume: 300 ml filtered ug/L on filter: 2.25 ug per liter: 7.49
Shishmaref North Runway Surface	Volume: 408 ml filtered ug/L on filter: 5.64 ug per liter: 13.8
Shishmaref East Water Source Fence Subsurface	Volume: 172 ml filtered ug/L on filter: 1.22 ug per liter: 7.11
Shishmaref East Water Source Fence Surface	Volume: 120 ml filtered ug/L on filter: 0.959 ug per liter: 7.99
Shishmaref West Water Source Fence	Volume: 300 ml filtered ug/L on filter: 2.49

Subsurface	ug per liter: 8.29
Shishmaref West Water Source Fence Surface	Volume: 324 ml filtered ug/L on filter: 3.73 ug per liter: 11.5
<b>Dirtiest Location:</b>	<b>Shishmaref West Runway Subsurface</b>
<b>Cleanest Location:</b>	<b>Shishmaref East Water Source Fence Surface</b>

## Discussion

The results show that the west runway is the dirtiest, 32.6 ug/L on filter, while the water source is the cleanest, .0959 ug/L on filter. The results support our hypothesis that the most disturbed site was the Runway and the least disturbed was the Water Source. Our results came from scientifically collected samples. We couldn't step in the sample snow and we couldn't contaminate the snow. Our findings are good because our water needs to be clean.

## Conclusions

This study was important and it was fun collecting the samples. Our snow is dirty and it is important to keep on studying the snow to see if it'll get dirtier or cleaner. This research should continue and check if the snow depth regularly because the snow might blow away and take the dirtiness with it. Having a project mentor helped us a lot with our work and it felt great. In the future, we recommend a scooper tool to get the snow samples because the snow was sometimes difficult to get and put into the Ziploc bag.

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