

Where Has All the Snow Gone?

#3879

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Abstract can be viewed online at
sefmd.org

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Division: Junior
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Project

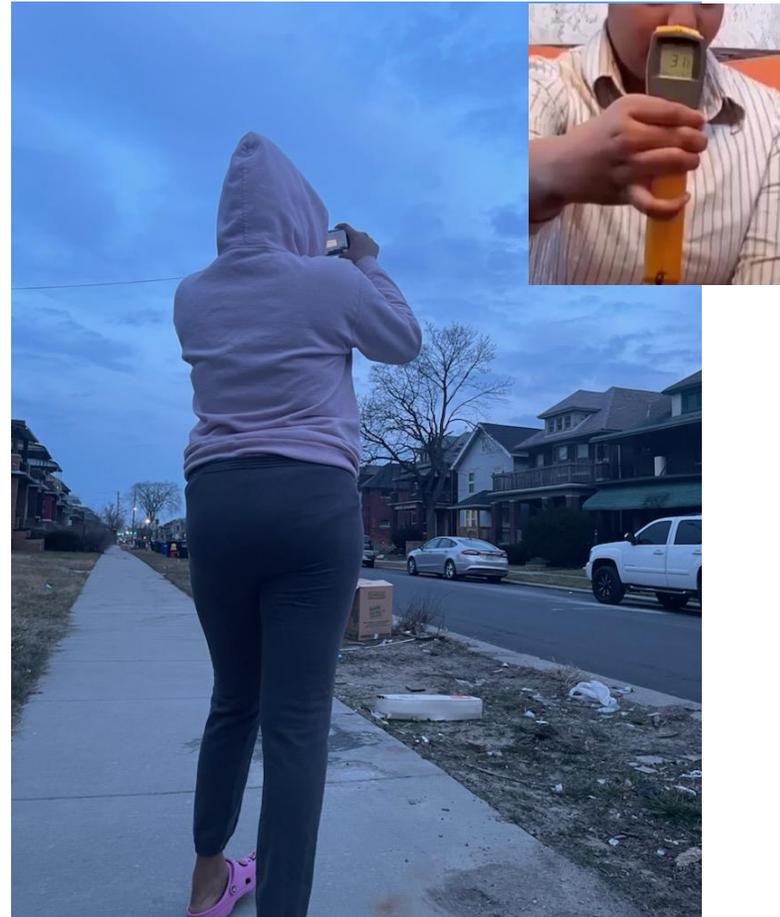
Introduction:

It seems like winter weather changes every year. We used to get a lot of snow and I can remember when I was younger, seeing enough snow that you could build a snowman, but you could also build a fort and climb inside and stack up snowballs for a fight.

- My parents talked about the snowfall they used to get and it seems they got much more than I have ever seen.
- So where has all the snow gone? Why has the weather changed so much in just a few years? We learned in school that weather and climate are the same, but different. Weather is what's happening now, but climate is weather over time- like 30 years. That's a lot of weather!
- Is this one those deals where parents and older generations always tell their kids it was worse when they were little or has there really been a change in the snowfall? If so, what has caused this weather phenomena?
- To find the answer to these questions, weather will be studied over the past 30 years to see if there has been a decrease over time or if other atmospheric conditions could cause these precipitation changes.

Methods: What is the Experimental Design?

- The purpose of this project is to research historical data for snowfall, air temperature, and cloud cover for the past thirty years in my urban area for the winter months: December through February.
- Current data will be collected using the NASA GLOBE Observer app and atmospheric protocols which are uploaded into the NASA database. Snowfall, air temperature will be collected daily using the app and an IRT (noncontact infrared thermometer) through February and recorded in the logbook to be analyzed later.



Using the IRT to obtain current air temperature

What you see when you use an IRT

Date	Air Temperature	Cloud Cover	Precipitation	Present	
	C°	% type	Snow	Rain	None sleet
Feb 1	11	0%	0		
2	11	0%	1.50		
3	8	0%	0		
4	4	0%	0		
5	2	5	0		
6	2	0	1.00		
7	11	0	0.51		
8	14	0	0.25		
9	5	0	0		
10	3	0	1.00		
11	6	0	0		
13	17	0	1.00		
14	3	0	0.25		
15	1	35	0		
16	4	0	0		
17	4	0	0		
18	8	0	0.25		
19	8	0	0		
20	10	0	0		
21	2	0	0		
22	2	0	0		
23	8	0	0		
24	6	0	0		
25	1	0	1.00		
26	1	0	1.50		
27	11	0	0		
28	9	0	0		
29	4	0	0		
30		0	0		
31					

Detroit, Michigan USA

Many pages such as this were used to record historical data found on web.

Methods: What is the Experimental Design?

- Historical data will be researched through a number of credible sites and added to the logbook for analysis. Both historical and current data will focus only on the calendar winter months. Some of those sites include: GLOBE.gov and www.weatherunderground.com which provide historical data to its members.
- The GLOBE Observer app is a NASA based, citizen science driven, weather app that uses real time data and compared it to satellite data for use with NASA work.



This data base stores real time data gathered by citizen scientists from all over the world, for use by students and scientists as needed, for research.

You can see it in use here. Your phone shows you directions as it takes pictures automatically in four cardinal directions plus up and down.



Methods: What is the Experimental Design?

- These protocols from the GLOBE Observer app help the receiver determine what the landcover is like where the observation is taken. It reports air temperatures, cloud cover, wind speed, and several other atmospheric conditions. During the solar eclipse, it will also cover atmospheric activities related to that.
- It is expected that the research will show that the hypothesis will be supported by the data. The historical data and the current data gathered will show a decrease over time, making it impossible to generate more snowfall.
- All data will need math computations to analyze and graph results to look for patterns and changes that might indicate answers to prove or disprove the hypothesis.

Results: What Did the Data Show?

- First, the amount of data that was gathered was overwhelming. There was no way the original amount of data could be gathered and sorted in the time provided so I was forced to select a much smaller sample in an attempt to prove or disprove my hypothesis.
- For this research project, only the data for the years 2020 through 2024 are utilized. To use all that was originally planned, it would take the rest of the school year to complete all the math equations! A sampling of the raw data will be visible in the log book section.

Date Feb 2023	Air Temperature Celsius	snow/amount in inches	Cloudy days 71.5% 28.5% clear Average snowfall 35.3"
1	11	0	
2	3	0	
3	2	0	
4	8	0	
5	2	0	
6	2	6.35	Y
7	2	10.37	Y
8	13	0	Y
9	8	0	Y
10	14	0	Y
11	5	0	Y
12	6	0	Y
13	6	0	Y
14	12	0	
15	12	0	
16	12	0	Y
17	16	1.32	Y
18	6	0	Y
19	0	0	Y
20	8	0	Y
21	13	0	Y
22	8	0	Y
23	6	16.26	
24	1	0	Y
25	6	0.25	Y
26	2	0	Y
27	3	0	Y
28	9	21.29	Y

8 sunny days

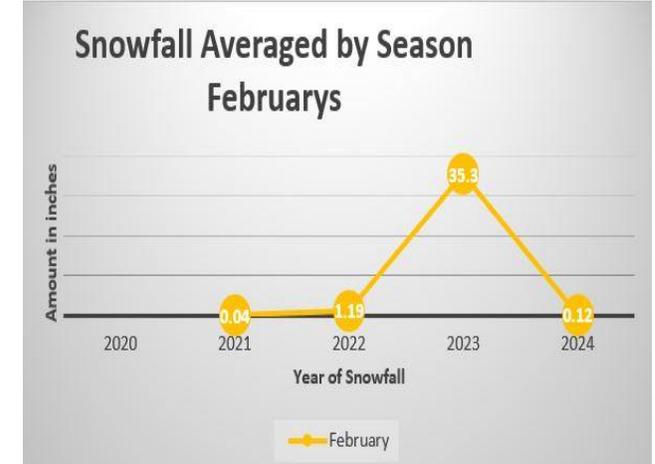
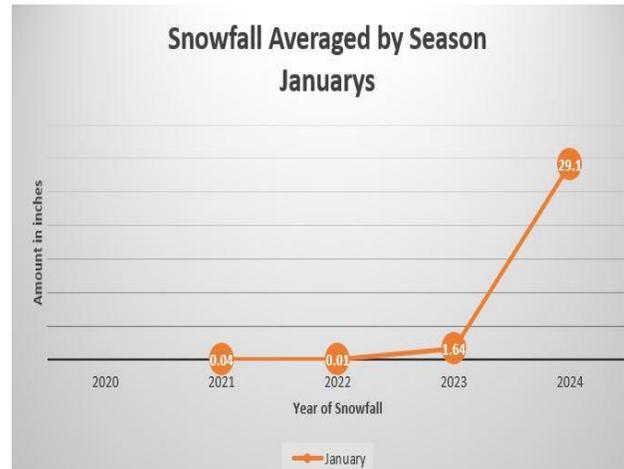
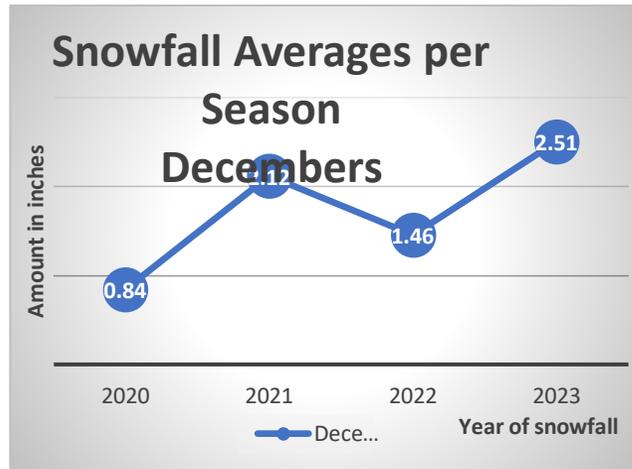
This chart is a random sample of how the data was graphed for analysis

Results: What Did the data show?

- From these graphs, I could analyze the temperatures and snowfall amounts for season and for specific months of the year. We also counted sunny days and cloudy days. There is a great deal of data here.
- Each month was completed in this manner. For most months, the temperatures stayed pretty consistent: going all over the place! I could determine the snowfall amount, the number of cloudy days and sunny ones, and what the percentage was. Using these graphs helped to see patterns in the snowfall, which is a form of precipitation. Just for the four seasons done for this research, it was a huge amount of data!
- The data showed something completely different from I expected. It showed patterns rather than higher or lower amounts of snowfall.

Discussion: What Does the Data Mean?

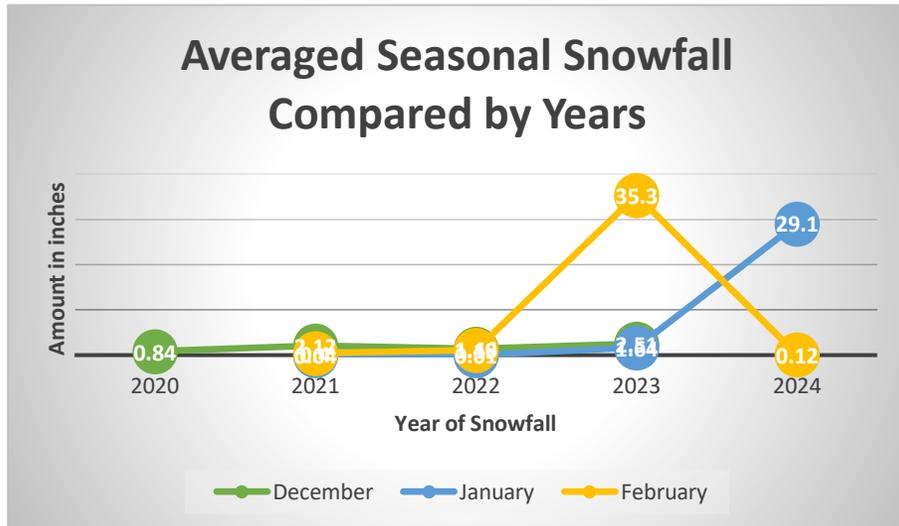
These next charts will show the comparison between the snowfall in each month during the season as they progressed. This was the most surprising to me. It was completely the opposite of what I expected to find. Analyzing the data in this manner was interesting but it did not provide me with anything that would assist me in answering the hypothesis question: where has all the snow gone?



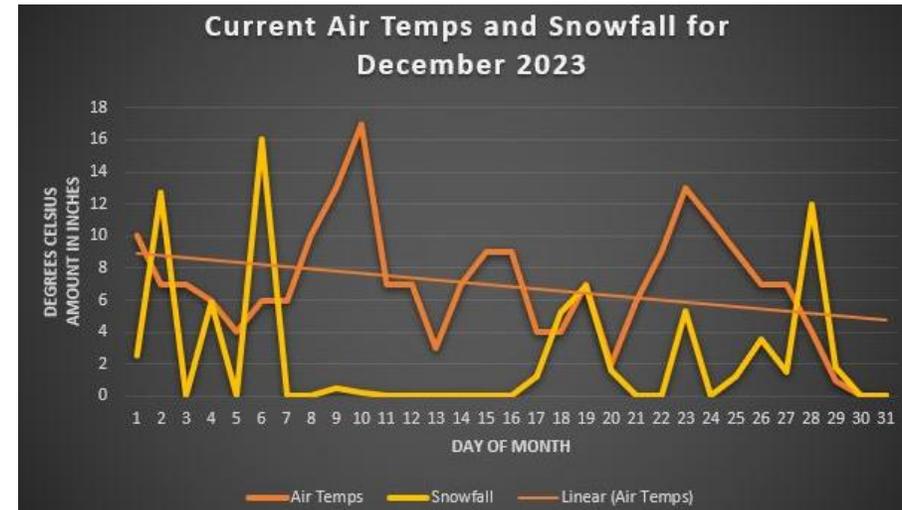
From the data on these graphs, it appears the snowfall is not decreasing, but increasing! Between the years 2022 and 2023, all three years show a dramatic increase in snowfall which is consistent through all the seasons analyzed. This also infers that snow fall might be cyclical, since snow is now increasing instead of decreasing. Definitely NOT the answer I was expecting!

Discussion: What Does the Data Mean?

- My first thought was perhaps we should not throw away our snowsuits and gloves just yet because the snow may be returning!



This graph shows the comparison of the seasons studied. The patterns can easily be seen.



I also compared air temperatures and snowfall and the pattern is almost the same. The data suggests there is a connection which is one reason I think the snowfall is cyclical. It cannot go up if it did not first go down.

Conclusion:

- The next steps would be to compile all the data for the 30-year time period that constitutes a regional climate for my area. Then to complete all the math computation require to organize the data into usable forms for this research. This might be best in a non-school period which allows time for this to be completed.
- Looking over this data where it can be visualized, would give the researcher the answers needed for the hypothesis.
- This is the biggest limitation for this research: the small sample size and the short time frame. Even with all this data, the samples are too small to fully answer this question for the entire planet. It does infer that this snowfall question might best be answered in a cyclical movement. There are times of higher snowfall and times of lower snowfall and it depends on weather patterns. Further research is necessary.
- This data is important to many careers and sets of people. Everyone from the local consumer, city planners, builders, infrastructures, water providers, would all be interested in this research. It would help in building structures that can withstand weather patterns, snowfalls or lack thereof, and water quality provision for communities who would need to know how weather affects the cycling of water through the local environment.

Conclusion:

In conclusion, the data offered another response to the question being researched. It did not prove or disprove my hypothesis.

The hypothesis was incomplete as the data showed an INCREASE in snowfall but the increase came from years back when there was much less snowfall within the same climate period.

It infers that there are times of high snowfall and low snowfall and that perhaps another source is responsible for the snowfall, possibly the temperatures and cloud cover and wind formation.

Further research should uncover this mystery.

References / Works Cited:

- www.globe.gov
- www.wunderground.com
- www.weather.gov
- www.timeanddate.com/weather/usa/detroit/historic