GLOBE ABSTRACT

Elevation Station
(A study conducted to measure the effect on weather from different heights of elevation)
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How much does elevation affect air temperature, soil temperature, and precipitation? It was predicted that the higher elevation location for the Compton GLOBE weather station would have a colder air temperature, and soil temperature with more precipitation than the GLOBE weather station set up at a lower elevation in Alpena, AR.

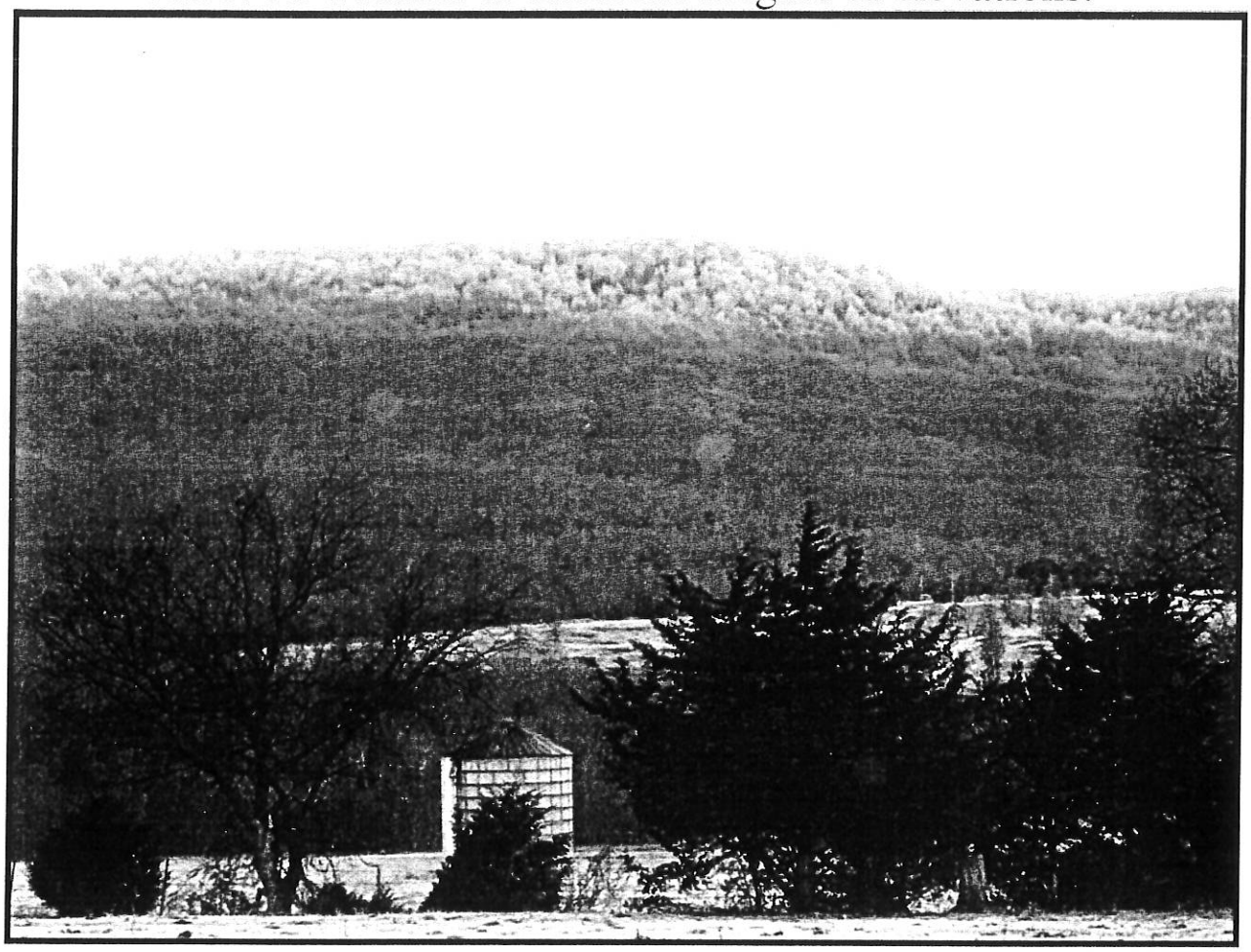
Following GLOBE protocols, GLOBE weather stations were set up at Compton, AR elevation 2,172ft, and on the Alpena School campus, elevation 1,220ft. Each afternoon, the researcher collected the maximum and minimum air and soil temperatures and precipitation levels at both locations for 37 consecutive days.

The average maximum air temperature for Compton was 9.22°C. The average minimum air temperature for Compton was 1.02°C. The average maximum air temperature for Alpena 9.74°C. The average minimum air temperature for Alpena 4.39°C. The average maximum soil temperature for Compton 6.41°C. The average minimum soil temperature for Compton 5.32°C. The average maximum soil temperature for Alpena 11.19°C. The average minimum soil temperature for Alpena 2.52°C. The total rainfall for Compton was 26mm. The total snowfall for Compton 54.6mm. The total rainfall for Alpena 20mm. The total snowfall for Alpena 53.8mm.

The GLOBE weather station at Compton averaged -0.52˚C for maximum air temperature and -3.37˚C for minimum air temperature along with +6mm in rainfall and +1.6mm snowfall. The Compton GLOBE weather station averaged -4.78˚C for maximum soil temperature and +2.8˚C for minimum soil temperature compared to the Alpena weather station. The hypothesis supported the data in all aspects except for minimum soil temperature.

Elevation Station

A study conducted using GLOBE protocols to measure the effect on weather at different heights of elevations.



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Research Question and Hypothesis

INTRODUCTION

I have lived on the mountain for 12 years. It is a whole different world up there. In the winter, you can almost see a line where the snow stops and it is warmer. There is ice cycles on the bluffs and it is about 10 degrees colder on the mountain than in the valley. It gets so icy, that snow plows don't come all the way to my house. They never salt the roads up at my house. It can also be kind of dangerous. People spin out and land in the ditch. If people are driving too fast on the curves, it can be very dangerous. There is a lot of curves up there. I get car sick all the time when going down or up the mountain. It is really fun though, because there is a lot of hills that you can sled down. Many times if feels warmer when I get to school and starts cooling down when I go back home. People refer to the area as "The Mountain" but it is not actually a mountain. However, it is a lot higher up than in Alpena where I go to school. This project is the result of an experiment conducted to analyze the effect on weather at different elevation heights and the minimum and maximum temperature, rainfall, and soil temperature differences.

QUESTION

The research question being addressed in this project is: "How much does elevation affect the weather, specifically air temperature, soil temperature, and precipitation, at different heights? The engineering goal in this project is to establish which elevation location has colder air temperature, soil temperature, and rainfall amounts.

HYPOTHESIS

It was predicted that the higher elevation location for the Compton GLOBE weather station would have a colder air temperature, and soil temperature. It was also predicted that there would be more precipitation in both rain and snow than at the Alpena GLOGE weather station.

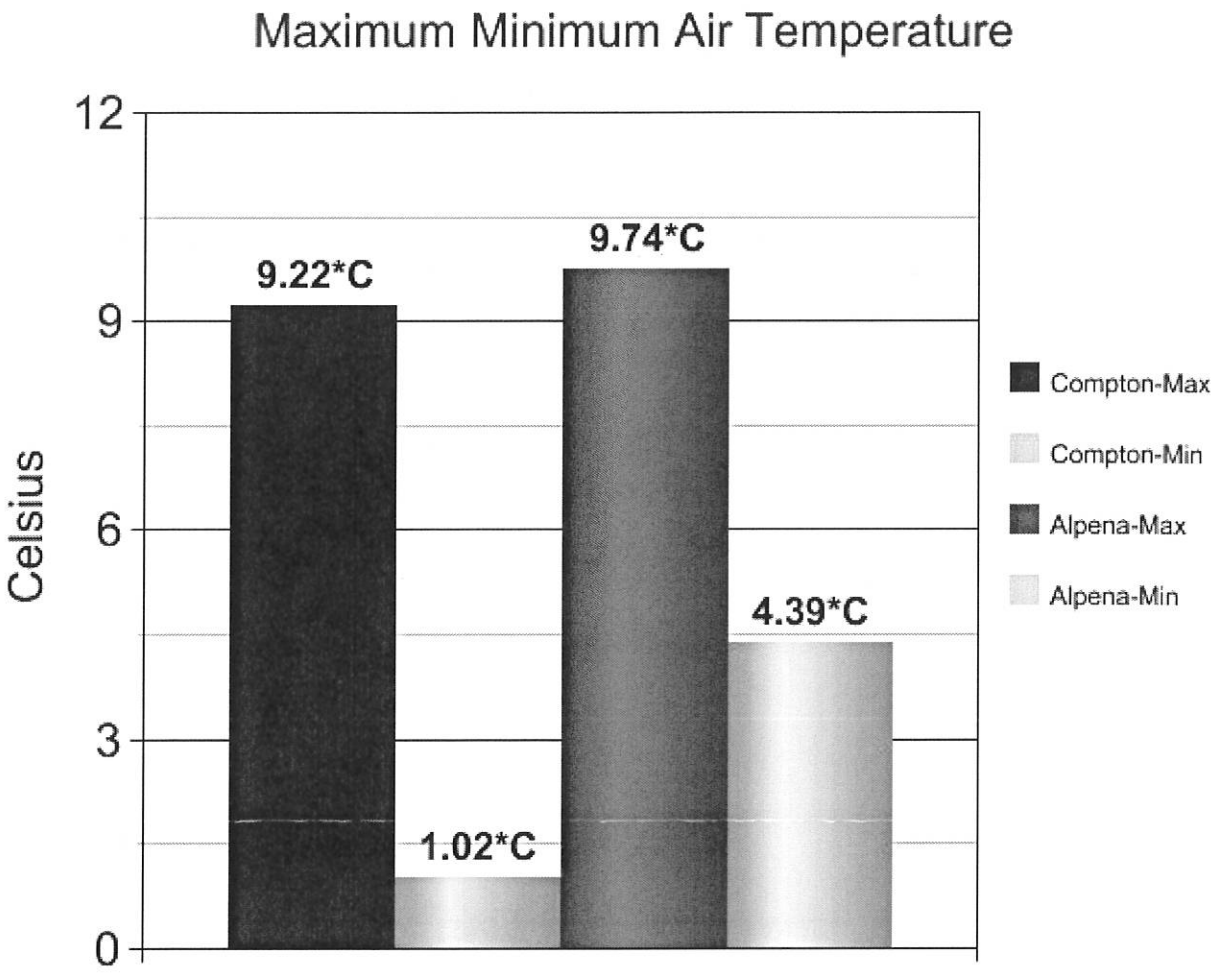
Materials and Method

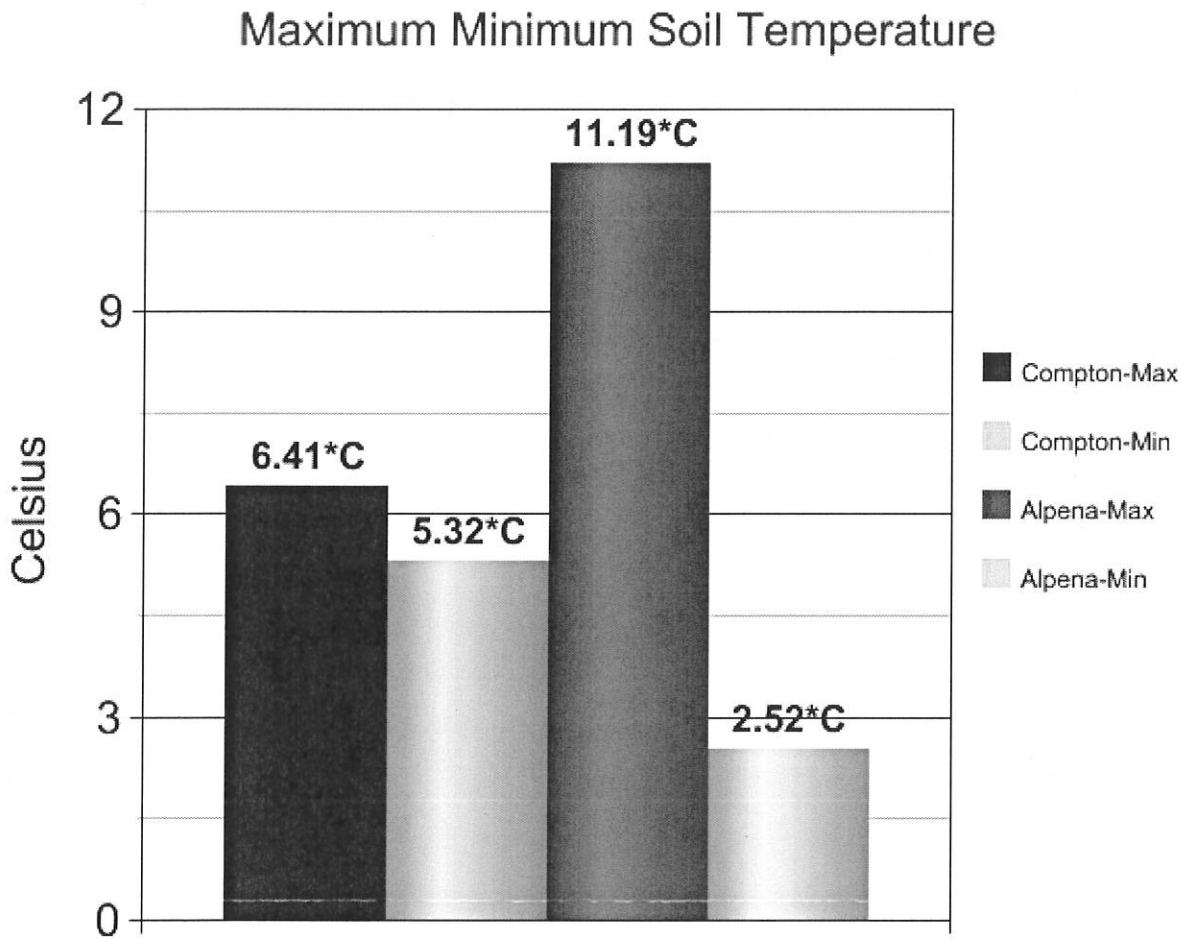
PROCEDURE

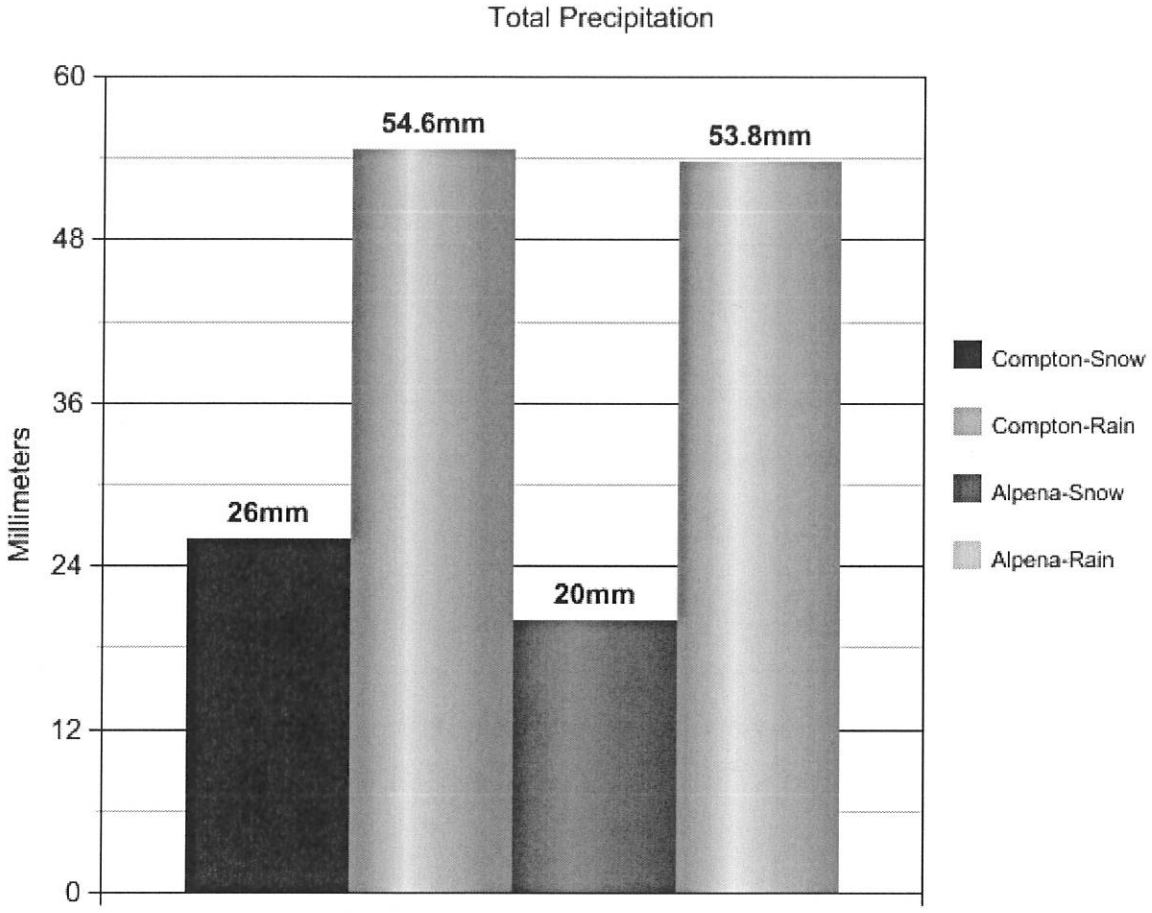
To prepare for this project, the researcher talked with the science teacher about the GLOBE program and collecting weather data. Then, the researcher, with the help of her father, set up a GLOBE weather station at her house in Compton, AR. The GLOBE protocols for setting up the weather station were followed. The latitude longitude and elevation for each location was recorded.

The **MATERIALS** in this project were two GLOBE Weather Stations. Inside each weather station there was a digital thermometer which recorded the maximum and minimum temperatures for air and soil. The meter had a memory which could store data for up to 6 days. Each afternoon, the researcher collected the maximum and minimum air and soil temperatures at school in Alpena and at her home in Compton. GLOBE rain gauges were also set up at the weather station to collect rainwater. A snow board was set on the ground close to the weather station in order to collect and measure snow which fell. The amount and type of precipitation was also collected and recorded. Weather data was collected for 37 consecutive days, then totals and averages were calculated.

Data Summary




Maximum Minimum Soil Temperature
12
9
6
3
0
Celsius
6.41*C
5.32*C
11.19*C
2.52*C
Compton-Max
Compton-Min
Alpena-Max
Alpena-Min


Total Precipitation
60
48
36
24
12
0
Millimeters
54.6mm
53.8mm
26mm
20mm
Compton-Snow
Compton-Rain
Alpena-Snow
Alpena-Rain

Temperature Record for Air & Soil

(Temperature recorded as °Celsius)

Location →	Compton Weather Station (elevation 2,172ft) 36°05'33.09"N 93°18'19.50"W				Alpena Weather Station (elevation 1,220ft) 36°17'26.29"N 93°17'46.47"W			
Date	Air		Soil		Air		Soil	
	Max	Min	Max	Min	Max	Min	Max	Min
1 11-28-17	21.2	8.7	10.8	9.7	23°C	13.4°C	19.9°C	10.1
2 11-29-17	15.2	14.9	10.8	10.8	16	12	13.9	11.4
3 11-30-17	12.3	12.0	11.1	10.3	17.4	10.8	13.7	12.5
4 12-1-17	13.1	0.4	11.2	8.7	13.6	9.7	15.9	-1.5
5 12-2-17	19.4	7.3	9.8	9.3	14.1	11.3	23.2	7.8
6 12-3-17	20.2	8.2	11.4	9.9	15.0	11.4	24.7	6.2
7 12-4-17	16.5	16.0	11.9	11.8	15.0	13.2	21.6	14.5
8 12-5-17	16.9	1.4	12.3	9.3	15.4	10.7	20.6	2.1
9 12-6-17	1.3	-2.8	9.4	7.2	10.9	7.7	12.1	-0.3
10 12-7-17	3.7	-3.8	5.8	5.8	10.6	6.7	8.9	-4.5
11 12-8-17	4.2	-11.6	5.9	4.2	8.0	4.4	6.3	-11.9
12 12-9-17	5.1	4.5	4.4	3.8	8.1	5.3	8.9	-4.3
13 12-10-17	14.9	4.5	4.8	3.8	9.5	5.1	17.3	-4.7
14 12-11-17	20.1	4.3	6.3	4.8	10.1	6.8	21.8	2.8
15 12-12-17	1.9	1.4	5.4	5.3	10.8	7.1	15.6	-1.3
16 12-13-17	10.3	9.6	5.9	5.7	9.4	6.4	17.7	-2.9
17 12-14-17	10.3	0.2	6.0	4.8	10.1	7.6	12.3	3.1
18 12-15-17	7.7	4.2	5.6	4.4	9.4	6.6	10.8	-1.3
19 12-16-17	13.4	3.6	5.7	4.3	10.0	6.3	16.8	0.5
20 12-17-17	9.3	3.6	5.9	5.2	10.2	8.6	11.5	6.5
Total	237	86.6	160.4	139.1	246.6	171.1	308.5	46.3
Mean	11.85	4.33	8.02	6.96	12.33	8.56	15.43	23.2

Precip: 7.8mm (1 11-28-17); 10.6mm (20 12-17-17)

Precip: 5.0mm (2 11-29-17); 9.6mm (20 12-17-17)

Temperature Record for Air & Soil

(Temperature recorded as °Celsius)

Location →	Compton Weather Station (elevation 2,172ft) 36°05'33.09"N 93°18'19.50"W				Alpena Weather Station (elevation 1,220ft) 36°17'26.29"N 93°17'46.47"W				Precip
Date	Air		Soil		Air		Soil		
	Max	Min	Max	Min	Max	Min	Max	Min	
1 12-18-17	11.4	10.4	7.8	7.6	10.2	9.4	15.3	8.4	
2 12-19-17	13.6	8.6	8.9	7.3	16.4	7.5	12.4	9.9	
3 12-20-17	12.6	8.1	9.6	8.8	13.8	11.1	12.8	11.6	10.2mm
4 12-21-17	16.0	8.3	10.1	9.2	22.7	8.8	13.3	10.7	
5 12-22-17	13.6	3.1	10.3	8.9	17.4	5.3	13.2	10.5	27mm
6 12-23-17	3.1	-3.2	8.9	3.9	5.4	0.6	10.6	6.8	1cm Snow
7 12-24-17	0.7	-4.1	4.4	3.9	1.9	-2.2	7.5	6.0	2mm
8 12-25-17	1.6	-8.7	3.9	2.9	2.7	-5.1	6.0	4.0	
9 12-26-17	0.8	-10.0	2.9	2.2	5.2	-7.0	5.8	3.8	
10 12-27-17	1.3	-13.4	2.7	1.5	2.5	-8.9	5.6	3.2	
11 12-28-17	-3.7	-14.1	1.9	0.9	-0.7	-8.8	3.8	2.7	
12 12-29-17	3.3	-9.2	1.6	0.8	8.3	-9.3	3.6	2.6	
13 12-30-17	1.6	-8.2	1.5	0.8	5.5	-3.7	4.5	3.6	
14 12-31-17	8.0	-14.3	1.0	0.3	-3.6	-9.9	3.9	2.7	1cm Snow
15 1-1-18	10.1	-21.3	0.6	-0.7	2.8	1.6	-6.4	-16.0	
16 1-2-18	8.7	-18.7	0.1	-1.1	1.8	1.1	-4.1	-14.6	
17 1-3-18	4.3	-4.6	0.4	0.4	1.5	1.0	0.4	-9.1	
Total ②	107.0	-48.7	76.6	57.6	113.8	-8.5	105.7	46.8	
Total ①	237.0	86.6	160.4	139.1	246.6	171.1	308.5	46.3	
Overall Total	341.0	37.9	237.0	196.7	360.4	162.6	414.2	93.1	
Overall Mean	9.22	1.02	6.41	5.32	9.74	4.39	11.19	2.52	

Precip: 10.8mm; 4.0mm; 21.4mm; Snow 1.3cm; Snow 1.3cm

Analysis and Results

RESULTS

The elevation for the Compton GLOBE weather station was 2,172ft above sea level. The elevation for the Alpena GLOBE weather station was 1,220ft above sea level. The average maximum air temperature for Compton was 9.22 °C. The average minimum air temperature for Compton was 1.02 °C. The average maximum air temperature for Alpena was 9.74 °C. The average minimum air temperature for Alpena was 4.39 °C. The average maximum soil temperature for Compton was 6.41 °C. The average minimum soil temperature for Compton was 5.32 °C. The average maximum soil temperature for Alpena was 11.19 °C. The average minimum soil temperature for Alpena was 2.52 °C. The total rainfall for Compton was 26 mm. The total snowfall for Compton was 54.6 mm. The total rainfall for Alpena was 20 mm. The total snowfall for Alpena was 53.8 mm.

Conclusions

CONCLUSION

It does appear to be cooler up on the mountain. The mountain got more snow and more rainfall. If you like cold weather, then you should live on the mountain. The GLOBE weather station at Compton averaged -0.52˚C for maximum air temperature and -3.37˚C for minimum air temperature along with +6mm in rainfall and +1.6mm snowfall. The GLOBE weather station at Compton averaged -4.78˚C for maximum soil temperature and +2.8˚C for minimum soil temperature compared to the Alpena weather station. The hypothesis supported the data in all aspects except for minimum soil temperature. Sometimes they don't run the bus routes on the mountain because of ice and snow. One time, I had no power for 2 weeks. It is definitely colder on the mountain.

Acknowledgements

My dad, Gregg Lowry, helped set up the weather station at Compton. My science teacher, Mr. Rose, helped set up the weather station at Alpena. Mr. Rose also helped me set up my graphs, board, and data board. My friend, Ava, would go outside and help me collect my data.

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