How does Lake Erie ice cover affect our snowfall in the winter?

Main Street Intermediate School
Norwalk, Ohio USA
N41.24 latitude
W-082.61 longitude

April 2013

Contents

Abstract

Snowy winters mean more snow days for fifth graders at Main Street School. For the second year in a row, we have had very little snowfall to measure when doing our GLOBE protocols. We wanted to know how ice cover on Lake Erie affects our winter snowfall. We hypothesized that less ice on Lake Erie would cause more evaporation and more snowfall. We looked carefully at climate data for the winter months during 1972-2013 and Lake Erie ice cover data. We concluded that our temperatures stay colder throughout the winter and we get more snow when there is more ice on the lake. Lake Erie does not affect how much snow we get in our town. The moisture must come from somewhere else.

This research project was completed by fifth grade students at Main Street Intermediate School in Norwalk, Ohio, USA.

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Lake Erie February 6, 2013 Source: NOAA MODIS image

Purpose

In 2012, the GLOBE students at our school found out that the average annual precipitation for our town has increased over the past fifty years. Temperatures have not changed very much. This year our class has learned about the climate in our region and the climate in different places in North America. We have observed clouds, air temperature, surface temperature, and snow cover in our schoolyard using GLOBE protocols. We did not have very much snowfall to measure on our playground for the second year in a row. We would like to know if the amount of ice cover on Lake Erie affects how much snowfall we get in the winter.

Hypothesis

We think that when Lake Erie is covered with ice the air temperatures in our town are lower. When there is more ice there is less evaporation, so we think that there will be less clouds and less snowfall. During the winter of 2011 we had to make up school days because we had so many snow days.

Materials and Procedures

- The first thing we did was to learn that the climate in our region is Continental with cold, snowy winters and hot, humid summers. Lake Erie keeps our region warm longer in the autumn.

- We learned how to do GLOBE protocols for clouds, GPS, surface temperature, and measuring snowfall. Data was collected regularly and entered into www.globe.gov.

- The wastewater treatment plant in our city is a reporting station for the National Weather Service (Norwalk WWTP OH 336118). We found monthly mean air temperature, snowfall, and liquid precipitation for 40 years (1972-2013) for the months of December through April.

- The monthly mean temperatures and precipitation were put on line graphs so that we could look for patterns in the data using Microsoft Office 10 Excel.

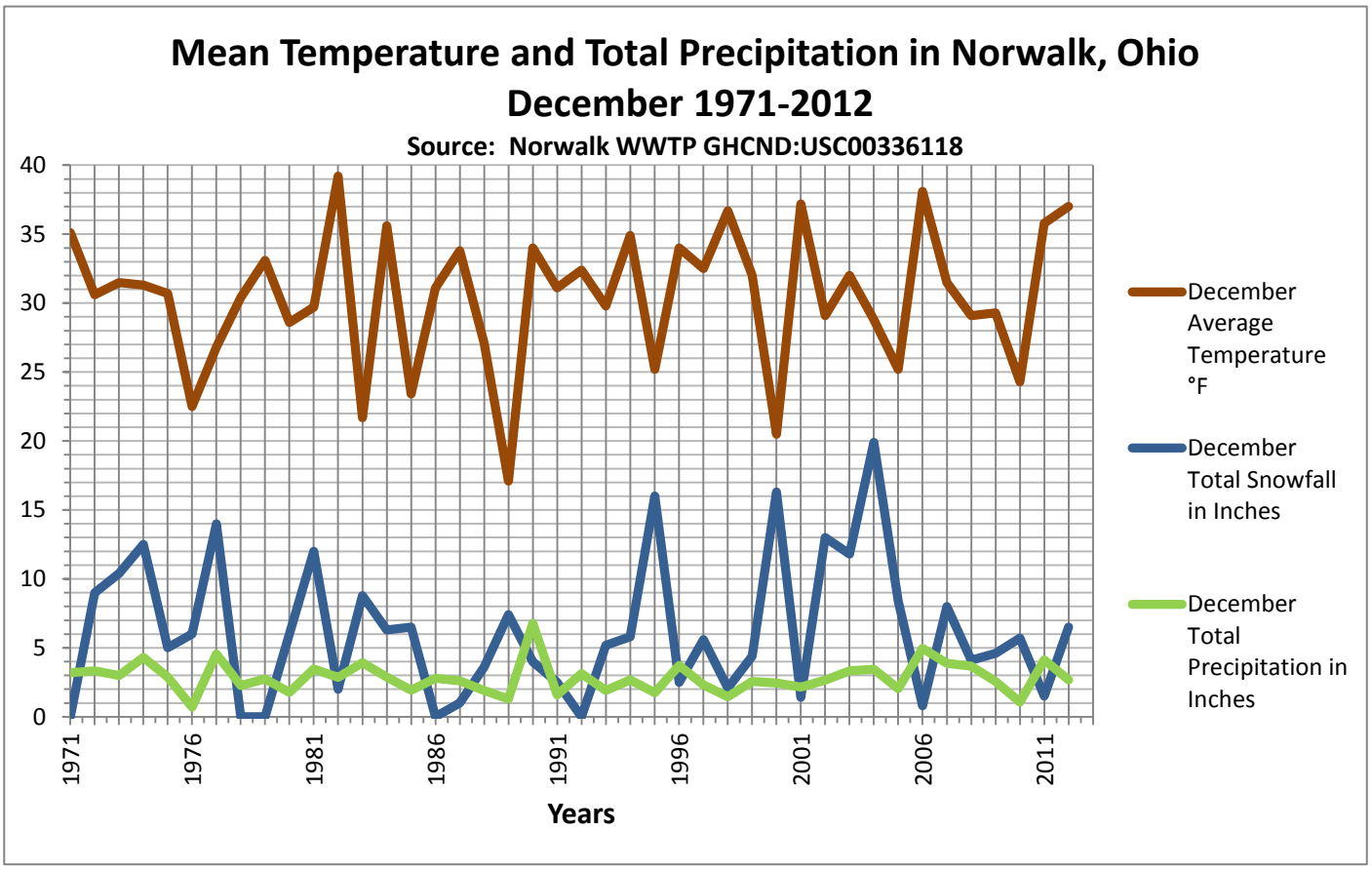
- We were given some help from Dr. Rosanne Fortner, Professor Emerita, Ohio State University in finding Lake Erie ice cover data.

- Our GLOBE cloud data was also compared with the climate data and ice cover.

- We found the five years with the greatest ice cover and the five years with the smallest amount of ice cover and compared it with the snowfall and precipitation for those years to see if Lake Erie ice cover affects our winter snowfall.

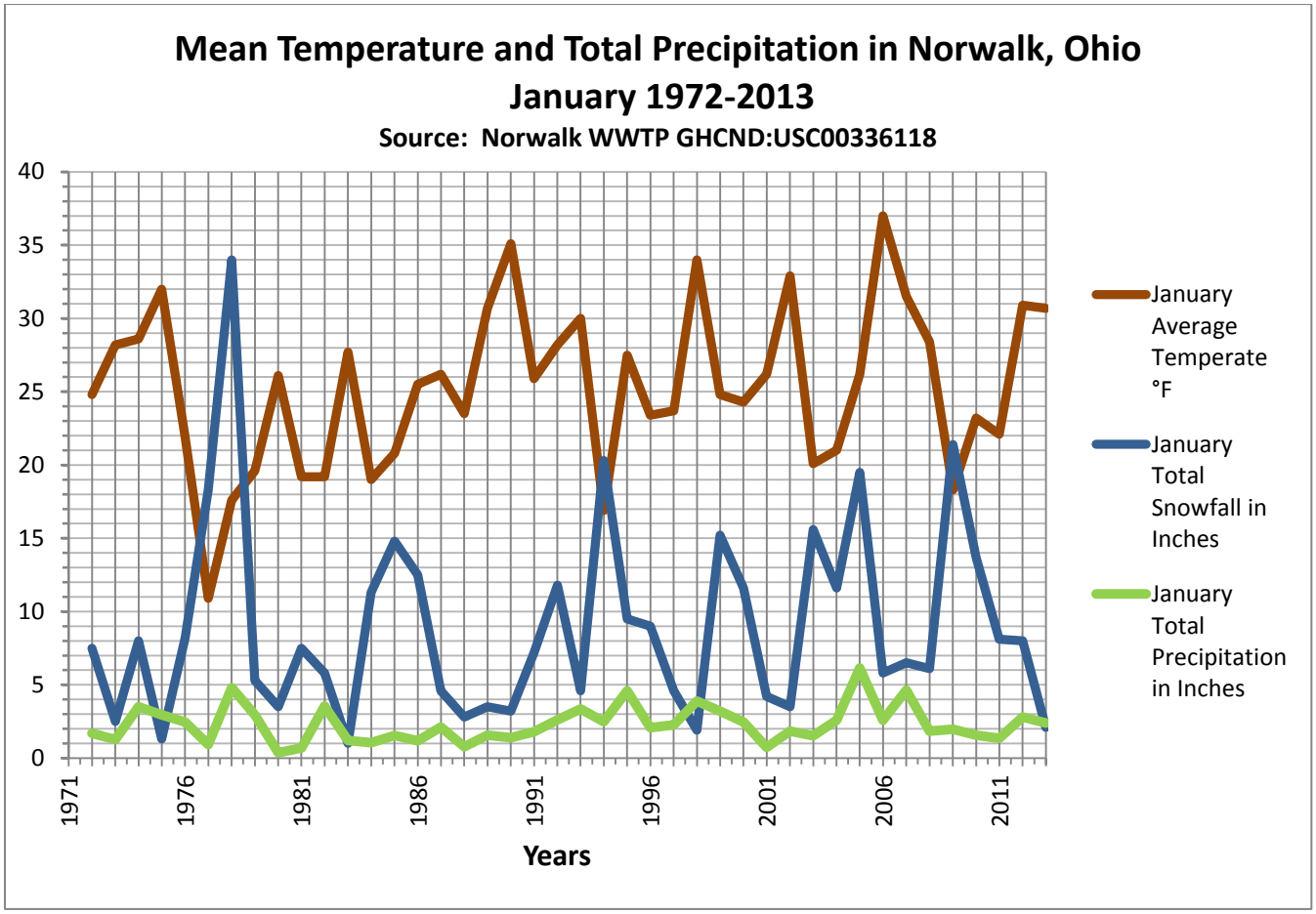
- Photographs were taken with a Sony Bloggie camera.

Climate Data—Norwalk, Ohio
December 1972-2012

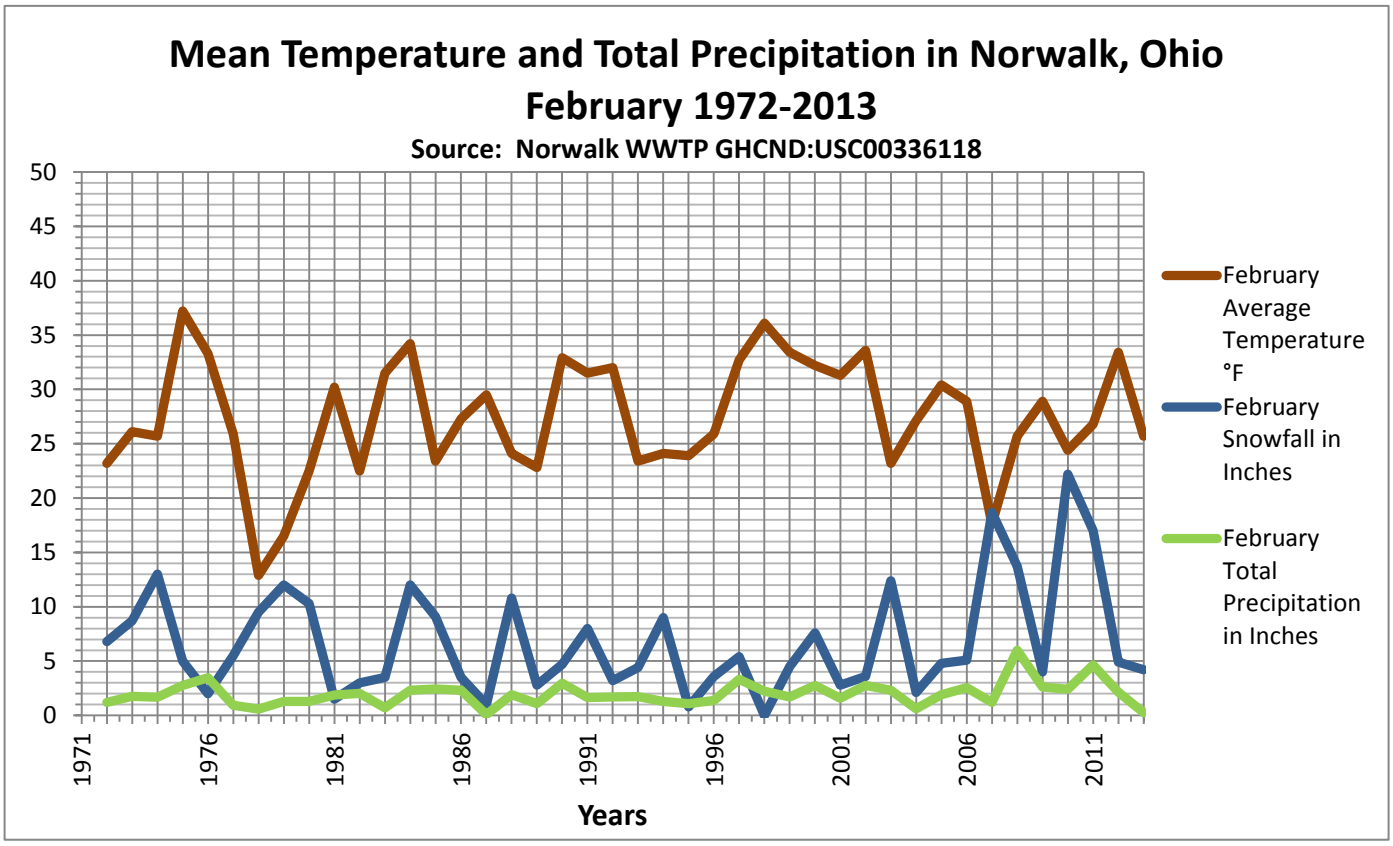


Climate Data—Norwalk, Ohio

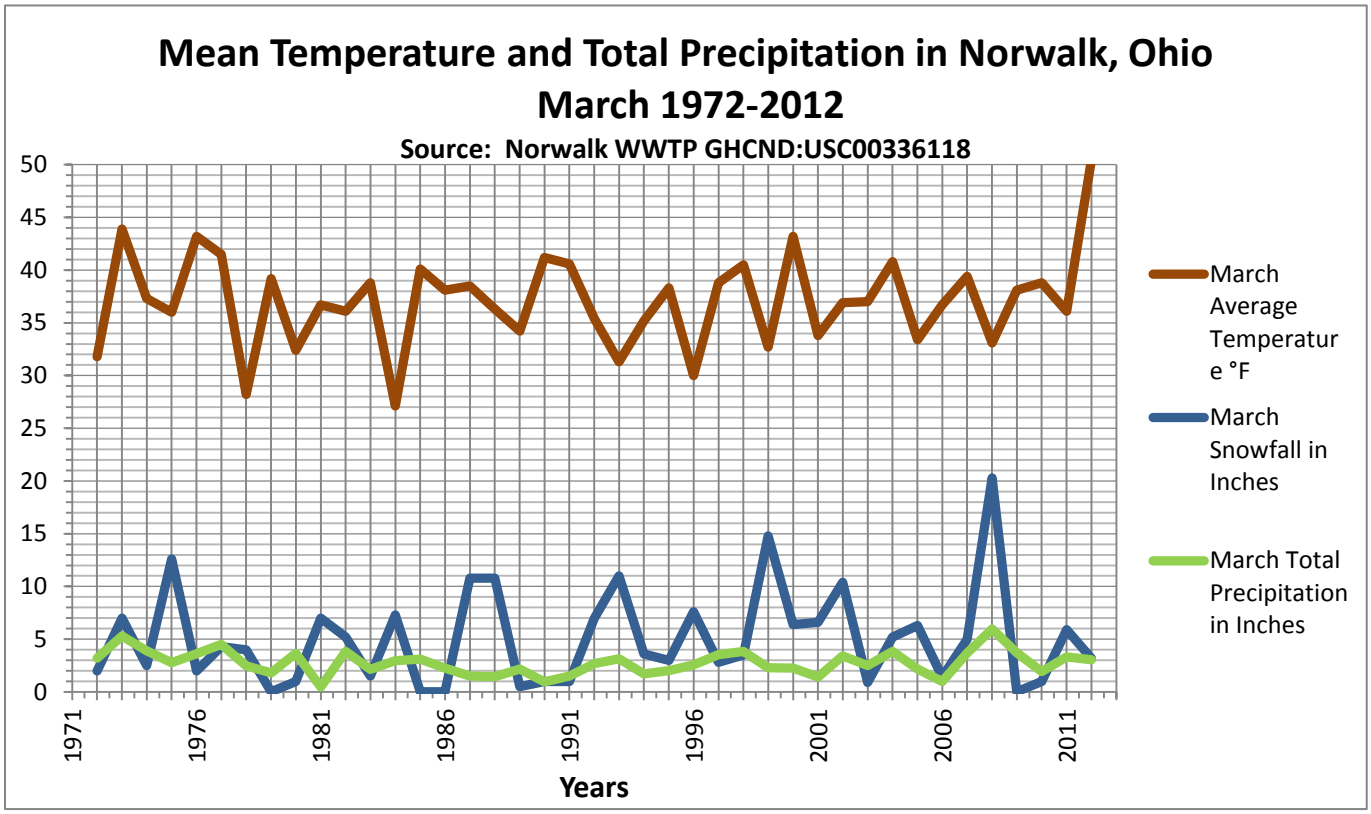
January 1973-2013



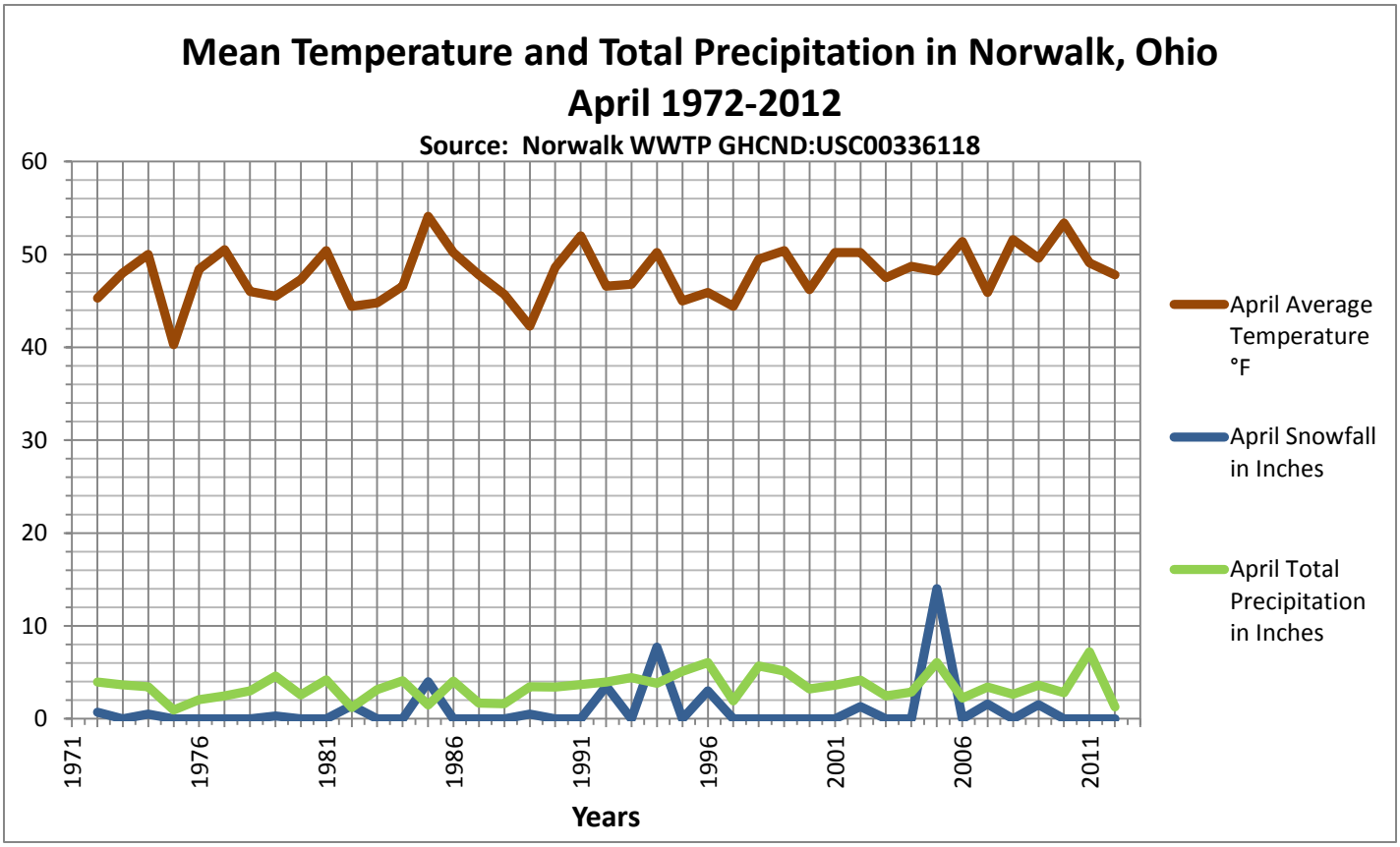
Climate Data—Norwalk, Ohio
February 1973-2013



Climate Data—Norwalk, Ohio
March 1973-2012



Climate Data—Norwalk, Ohio
April 1973-2012

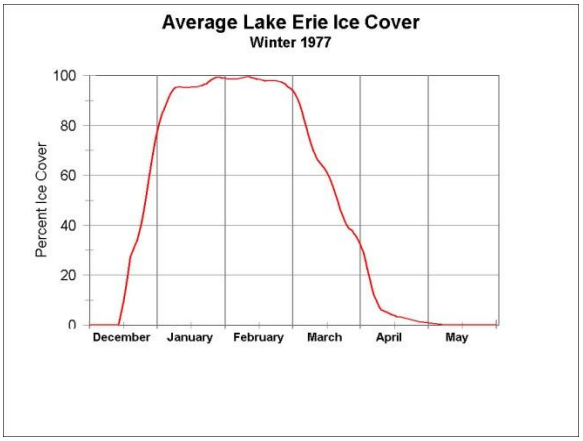


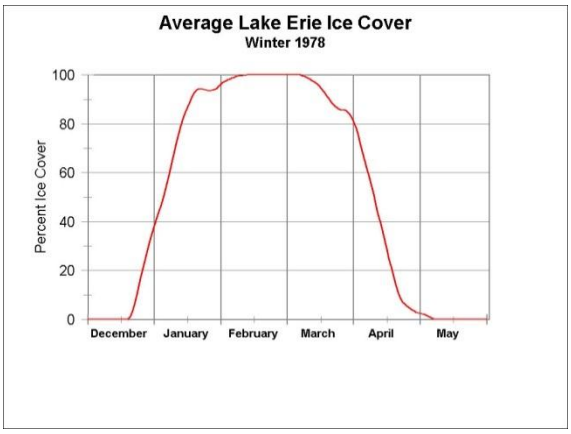
Our GLOBE Cloud Data

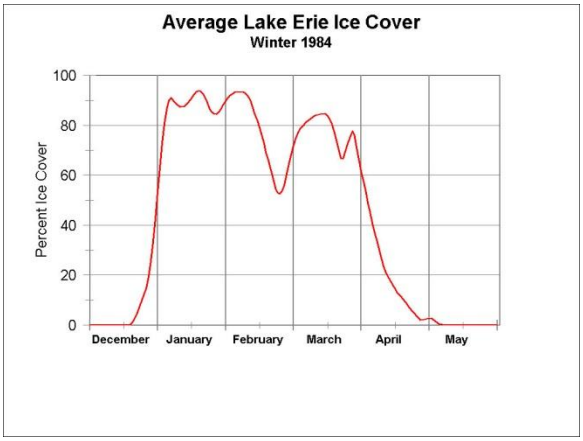
The GLOBE cloud cover data that we have collected at our school since 2006 shows that the majority of days during the winter have cloud cover that is broken or overcast.

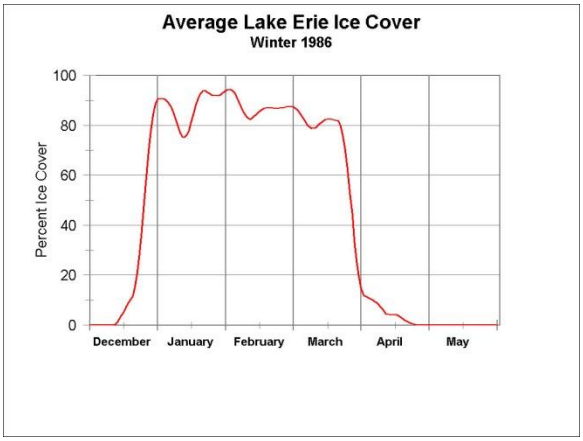
Five Years with Greatest Ice Cover 1972-2013

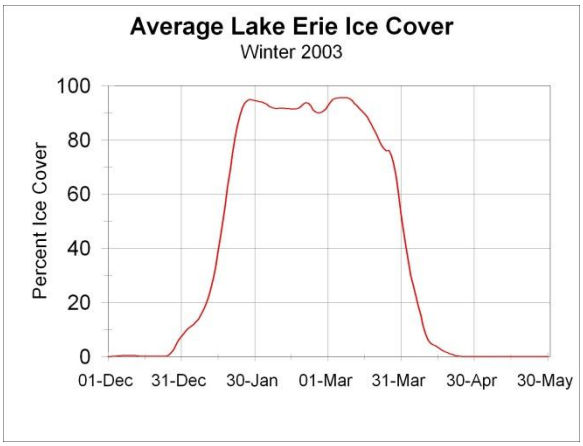
Source: NOAA Great Lakes Ice Atlas





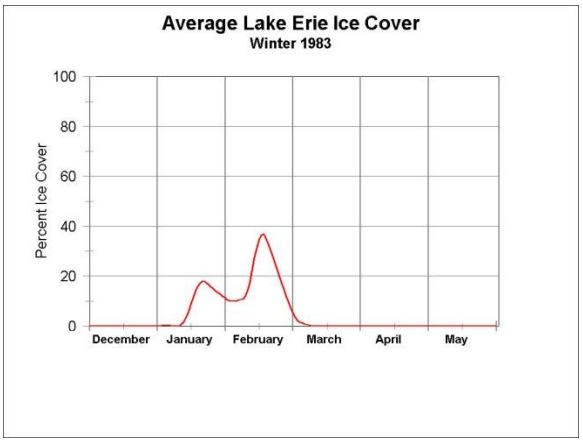


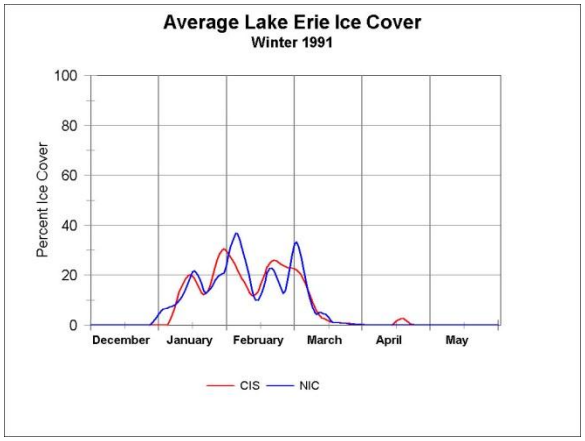


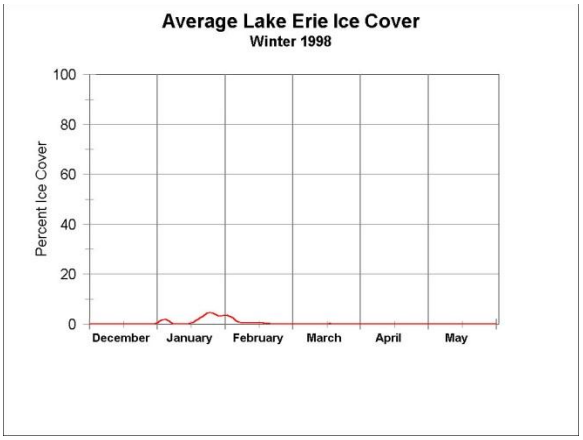


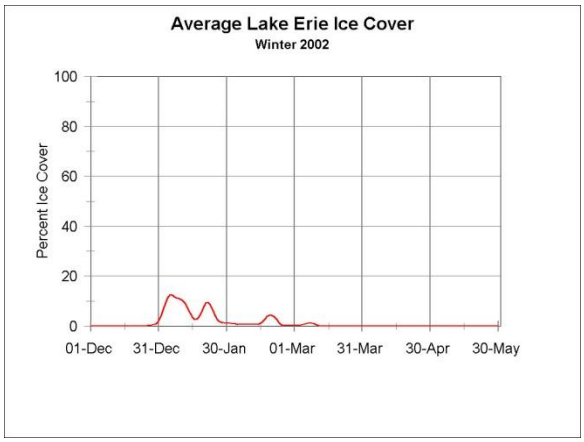
Five Years with Lowest Ice Cover 1972-2013

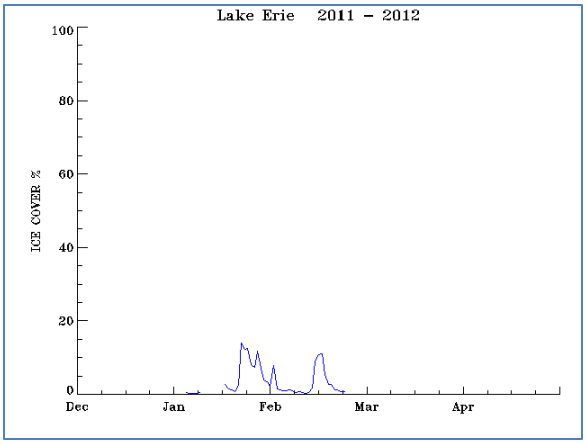
Source: NOAA Great Lakes Ice Atlas











Conclusion

The purpose of our project was to find out if the ice cover on Lake Erie has an effect on how much snow we get in the winter. Snowy winters mean more snow days for fifth graders. We thought that if there is low ice cover during the winter then more evaporation from the lake would cause more clouds to form. With more clouds there usually is more precipitation. We also thought that more ice cover would mean less evaporation, less cloud cover, colder temperatures and less snow. Our hypothesis was not totally correct.

During our research we found Lake Erie annual ice cover data for the years 1972-2013. We used the five years with the greatest amount of ice cover and the five years with the least amount of ice cover. We compared the ice cover with the snowfall amounts for the winter months of each year. Our data shows that when there was more ice cover on Lake Erie there was more snowfall that year in our town. When there was less ice cover there was less snowfall. Lake Erie does not affect the amount of snowfall that we get in the winter. When the lake is covered with ice our temperatures are colder. Our moisture must come from somewhere else to meet the cold temperatures that give us snowfall.

The GLOBE cloud cover data that we have collected at our school since 2006 showed us that during the winter the majority of days have cloud cover that is broken or overcast. It does not matter what the ice cover is on Lake Erie. The evaporation from the lake without ice must go to the east. Northeast Ohio gets a lot of lake effect snow each winter.

We will need to continue our quest for finding out what affects our winter climate and snowfall in Norwalk, Ohio.

Questions for further study

- Where does the moisture come from that causes an increase in precipitation in our region?
- How do the western Great Lakes affect our climate?
- Does Lake Erie ice cover affect the growing season of apples, peaches and grapes in our region?
- Is ice cover on Lake Erie a good indicator of whether or not the groundhog in Pennsylvania will see his shadow?

Resources

- www.globe.gov
- Norwalk WWTP, weather reporting station 336118
- The Globe Program, "What is your climate classification?"
- www.ncdc.noaa.gov/cdo-web/datasets/GHCNDMS/stations
- www.glerl.noaa.gov/data/ice/atlas/daily_ice_cover/daily_averages/dailyave.html
- Dr. Rosanne Fortner, Professor Emerita, Ohio State University
- "Is climate change the reason that we did not have any school snow days this year?", 2012 GLOBE inquiry project by 5th grade students at Main Street Intermediate School, Norwalk, Ohio, USA