**Tracking Climate Change-Lake Ice Cover**

**Student Handout**

Is our climate changing? You are in charge of finding the evidence. You will be riding along with the scientists at Hubbard Brook Experimental Forest in the White Mountains of New Hampshire to investigate. Where will you begin? *You may complete this exercise alone or in a group. You can use* <https://climate.gov/> *as a resource for the first three questions.*

1. First, what are we talking about? What is climate?

2. How is climate different from weather? Give an example.

3. Make a list of what might change about the climate and what measurements you would take to document any changes. List at least 5 physical characteristics that you could measure to understand and track climate change in the area where you live. (for ideas, scroll down to the *Climate Dashboard* at <https://climate.gov/>).

 a.

 b.

 c.

 d.

 e.

4. On your own, or with your partner, open up Mirror\_Lake\_Ice\_Data.xls. On the spreadsheet, you will find data gathered from Mirror Lake by researchers at the Hubbard Brook Experimental Forest. It is one of the most studied lakes in the world. The scientists documented the date of ice in and ice out each year and the data show the number of days that the lake was covered by ice for that “water year.” The date of ice in is recorded as the date when more than 50% of the lake surface is covered with ice and remains covered. Ice out is the reverse.

 a. What was the maximum number of days of ice cover and in what year was this?

 b. What was the minimum number of days of ice cover and in what year was this?

 c. Can you see any trends from looking at the data table? Explain.

5. Using Excel, plot this data as a scatter plot by highlighting the two columns of data. Then select the insert tab and select the “insert scatter” option under charts. Activate the graph, label the two axes and give your graph a title.

 a. What do you observe about the results? Can you see a trend that you did not see before?

 b. How variable is the data? Do you think these patterns are more than random chance? Why or why not?

6. Now place your cursor on one of the data points and right click on it. Select the option to add a trendline. To find out how well the line describes the data, you can ask the program to calculate and display the R2 value for the line. The highest an R2 value can be is 1; and the higher the R2 value, the closer the data points fall to the line. Submit your graph.

 a. What do you observe? How can you interpret the data better than you could before? What is your R2 value. Do you think these data show a trend or is this just random chance? Be prepared to discuss this with the class.

7. a. Make a list of factors that you think might influence the number of days of ice cover from year to year.

 b. Pick one of these factors and write a hypothesis that you could test. Give an example of data that you would collect and over what period of time.

8. a. Read the interview of Dr. Gene Likens who conducted the ice cover research at Mirror Lake. <https://www.caryinstitute.org/news-insights/feature/listening-science-conversation-gene-e-likens> (You do not need to read the last portion of the article about acid rain, although you can discover that Dr. Likens is also credited with discovering acid rain!) Given what he describes and what you have learned about lake ecology, how might the duration of ice cover affect the lake? Write a paragraph.

b. Can you think of any ways that changes in duration of ice cover could feed back and influence climate, especially if ice cover duration changes throughout the globe? Explain your thinking.