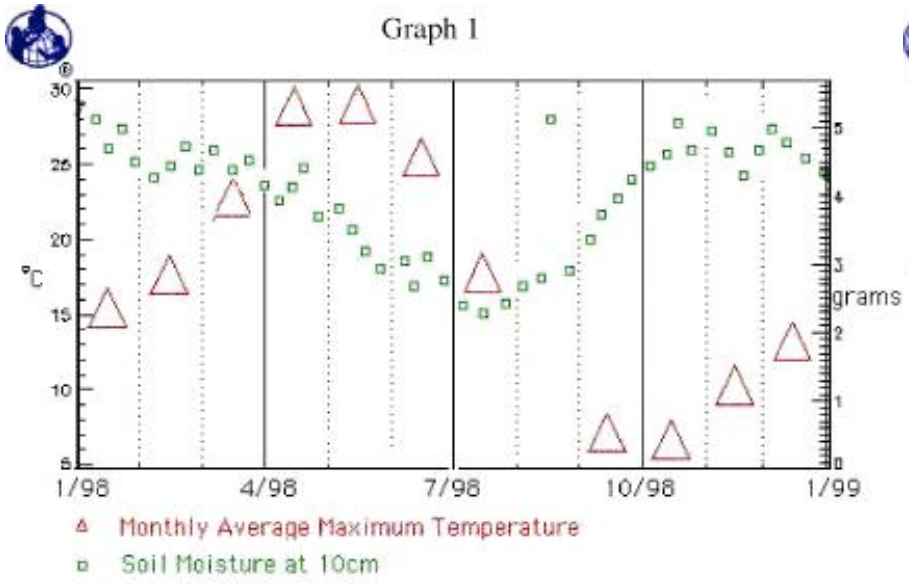
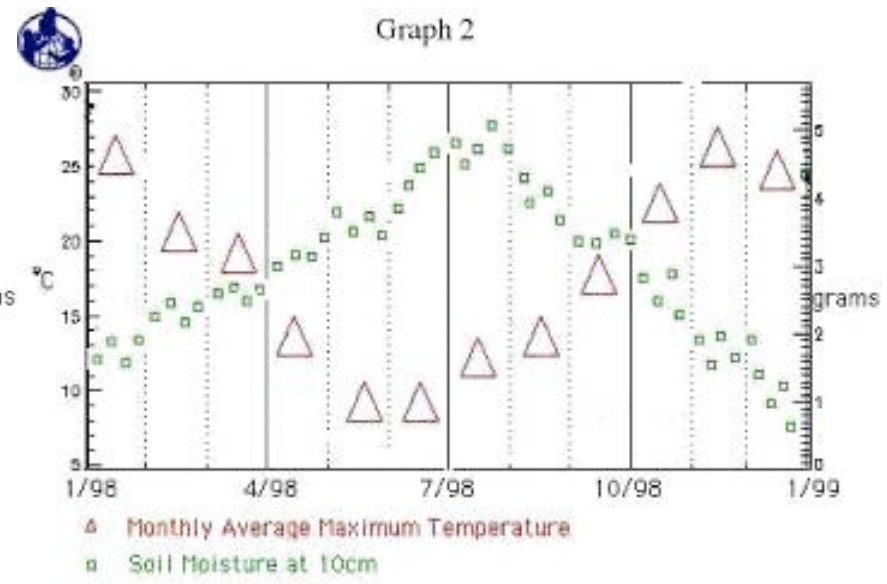
SOILS INVESTIGATION AREA
GLOBE SAMPLE STUDENT ASSESSMENT TOOL – HIGH SCHOOL





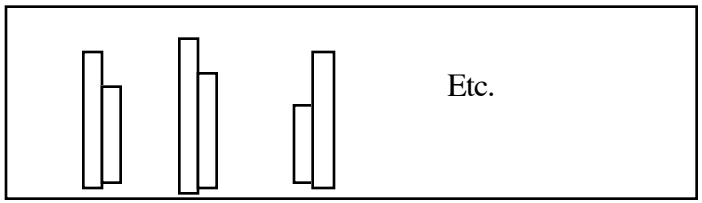
(Present problem requiring use of GLOBE data archives)
The Standard Weather Service for North America recently collected the data in the graphs shown above. The data shows temperature and soil moisture information for the year 1998. However, due to a mislabeling of files from an outside agency, the two graphs are for a single site in North America – clearly a mistake. Since a single site cannot have completely different readings for the same time period, the correct data set must be determined. The Standard Weather Service is in the process of preparing their annual weather report for all the major cities in Canada, Mexico, and the United States. You have been hired as a consultant to a) determine which set of data is the correct set for the site in North America and b) to help with the analysis of the data.

1) **(Interpret GLOBE Data: Create multiple formats for representing data)** After collecting data, scientists often have to determine the best way to view it – should they look at it in a data table, in a line graph, or perhaps as a bar graph? Often, they represent or show the data in a variety of formats. What is one reason why you think scientists might want to have several representations to look at? In this investigation the data was presented in a line graph form. Using both graphs 1 and 2, ma a table that shows the average maximum temperature each mon for the two sites. You should use the middle of the triangles or the graph to determine temperature.

It seems to me that sometimes it is easier to see a trend in one type of representation than in another. In our science class w have seen that many times you want to make a graph out of yo data because you can easily see when certain variables go up and down over time. We have also used bar graphs, pie graphs, and even the data table itself to help analyze data. It really depends on what you want to find out.

Date	Graph 1 temp (C)	Graph 2 temp (C)
Jan 98	15	26
Feb	18	21
Etc.		

2. **(Interpret GLOBE Data: Create multiple formats for representing data)** To give yourself another way to view the given data, convert the data table you made in question 1 into a bar graph. For each month show one bar for graph 1 and another bar for graph



3) **(Interpret GLOBE Data: Create multiple formats for representing data)** Scientists sometimes find it helpful to use the average of a group of measurements instead of tryin to analyze every data point. This is sometimes called "cleanin the data." What would be one reason that you can think of wh a scientist might want to do this? To try this out for yourself, make a data table that shows the average soil moisture per month for each graph.

One reason that we have discussed in class is that it makes the data look smoother. By this I mean that you can get a clearer picture of when a measurement is going up or going down and how it relates to another measurement. It basically makes the picture a little clearer but keeps most of the information.

Date	Graph 1 moisture (g)	Graph 2 moisture (g)
Jan 98	4.7	1.9
Feb	4.5	2.3
Etc.		

4) **(Interpret GLOBE Data: Infer patterns, trends)** Scientists use their different representations of their data to help them uncover "trends" or patterns in the data. These trends often show a relationship between several variables.

For example, a scientist might want to know if there is a relationship between temperature and amount of rainfall in a certain region to help her understand the plant growth in the area. What is a possible trend or pattern that you see between the maximum temperature and soil moisture when looking at the site 1 line graph? How about for the site 2 line graph?

In Graph 1 it appears that there is a relationship between the maximum temperature and the soil moisture. It looks like they are opposite of each other. In other words, when the temperature goes down, the soil moisture goes up. This is the same trend that I see in graph 2, although in graph 2 the temperature and soil moisture start at different places than in graph 1.

5) **(Interpret GLOBE Data: Infer patterns, trends)** Repeat what you did in question 4 but instead use the representations you created in questions 1, 2, and 3 above. What trend or trends do you see? Are they the same trends that you saw in question 4? Which type of representation (line graph, data table, or bar graph) was the most helpful in trying to see trends in this data? Why?

Using the bar graph, I can see a similar trend to that in the line graphs. However, it is easier to compare the data from the two graphs using the bar graph because the information for each is right next to each other. I had a hard time seeing the trends using the data tables – it was possible, but it took much more time than trying to use the line or bar graphs.

I saw the same trends in each representation. I expected this because it is really the same data in each representation – it just looks different.

For this investigation I would have to go with using the line graph because it seems to give the clearest picture of what the trends are. However, if I was interested in say comparing two different sites, the bar graph might be more helpful. If I was interested in reporting exact values and not really interested in trends, I would probably choose the data table.

6) **(Plan Investigations: Set up new problem)** While analyzing data, scientists often come up with reasons why they think there are certain relationships between variables. Given the relationship you suggested in the question above, what hypothesis might you make as to why this is? How would you test your hypothesis? What additional data from the GLOBE database would you need to help determine if your hypothesis was correct?

I was thinking about this as I was doing the investigation. My guess or hypothesis is that warmer air can hold more moisture and therefore it doesn't need to rain as often when the temperature is higher. When it gets colder, it is more likely to rain. Since the soil moisture reading is pretty close to the surface of the land, it seems that soil moisture is directly related to how much it rains.
To help confirm or disconfirm my hypothesis I would have to have additional information on the site, such as if it is on the coast or is in a region with lots of vegitation or if it is a very dry area. Also, it would be helpful to have rainfall data and humidity data for this site over the same time period to see if there is a relationship between these variables and the temperature and soil moisture data.

7) **(Taking GLOBE Measurements: Errors are detected; use quality assurance)** Having collected data for the GLOBE database before, you know that you have to be very careful and accurate when collecting data. Look at the Site 1 graph. Are there any data that you suspect might be due to a measurement error? How can you tell? What would you tell someone who is collecting data to ensure that this doesn't happen again?

It looks like there is a soil moisture data point in August that is awfully high. I would guess that this was some sort of error because it seems highly unlikely that the soil moisture would shoot up that high one week and then drop back down

so quickly the next. Also, I noticed there was a temperature reading missing in August as well. This probably isn't a measurement error but it does make it a little harder to determine the exact temperature for August (it is probably somewhere between the temperatures for July and September.)

I would tell someone who is taking measurements to be very careful when collecting and reading the information. I would say that they should also double check their readings and have a second person check their work. Sometimes the error is just in inputting the information into the computer or when writing it down. Here again it would be helpful to have a double check on the work.

8) **(Interpret GLOBE Data: Explain data & relationships)** Looking any of the data representations you have, which site seems like it would be in North America? Why do you think so? What additional data from the globe database might be useful to help you confirm or disconfirm your hypothesis?

I'm guessing that the correct graph for North American is graph 1. Just looking at the temperature this graph shows it being cold in the September through February period, which is a closer match to the temperature in an area in the Northern hemisphere rather than the Southern. My guess is that the region described by graph 1 has mild summer and winter temperatures – there is not a huge difference between the highest and lowest temperatures compared to an area that has hot summers and very cold winters.

I think it would be helpful to create some similar graphs from the GLOBE database but for several Northern hemisphere and Southern hemisphere regions so I could compare them to graphs 1 and 2.

9) **(Communicate: Compose reports to explain or persuade)** Using the data analysis you have done, write a short report (1-2 pages) that summarizes your findings and explains which data set fits a site located in North America. Be sure to support your conclusions with data you have analyzed.