STUDENT MASTER

A Chilling Effect

Get ready to explore the world of data. Be a data detective and see what interesting facts you can find. But be careful. You'll be working with graphs that have two different sets of data shown on the same grid. The two graph lines share the same horizontal axis, which is time. But the vertical axis is different for the two different sets of data. Be sure you're looking at the correct axis for each set of data on your graph.

Water temperature versus latitude

1. Visit http://estuaries.noaa.gov/ScienceData/Graphing.aspx and click on the map where it says "Click here". This will open up the SWMP graphing tool.

2. The graphing tool application will open with a map of the United States. On the left hand side of the page will be Step 1 titled "Which Data". This section lists the various types of stations that gather data within Reserves around the United States. If you click on Meteorological Factors button, the icons on the map will change. These icons represent stations recording weather data.

3. Select the "Water Quality" button.

4. Specify a Date Range under Step 2. Enter a start date of "January 1, 2010" and an end date of "December 31, 2010."

5. Under Step 3 choose "AK >> Kachemak Bay >> Homer Dolphin Deep" from the pull-down list of recording stations. The map view will change to a close-up view of the Kachemak Bay, Alaska location.

6. Now you need to select a type of water data to graph. Click on the "Which Parameter" pull-down found under Step 4. Select "Water Temperature" from the list of water data gathered at this site.

7. Select an output format for the data you want graphed under Step 5. Click next to the "Graph" button.

8. Then at the bottom of the page click on the blue "Get Data" button to generate your graph of 2010 water temperature at the Homer Dolphin Deep, AK station.

9. Look at the graph. The dark grey horizontal line in the middle of the graph represents 0 degrees Celsius, the temperature at which water freezes. Between what two dates did water temperatures not fall below freezing during 2010 at the Homer, AK station?

10. Let's compare the water temperature at the Homer, AK station with a station to the south in California. You can add a second set of data to the same graph by selecting from the pull-downs found at the bottom of the graph.

11. Select "Water Quality" for the second data type. Change the station to "CA >> Elkhorn Slough >> South Marsh." Finally select "Water Temperature" as the second parameter.

12. Click the "Plot Graph" button and your results will appear on the graph in blue.

13. Look at the graph to answer the questions below. You may want to save the graph image to your local computer as a PDF or print the graph before moving on. (You can print a graph by clicking on the "Print Graph" button found in the bottom right hand corner of the graph.)

Questions

Q1. Between which two dates did water temperatures not fall below freezing during 2010 at the Homer Deep station in Kachemak Bay, Alaska?

Q2.   Were there more or fewer days with freezing water temperatures at the Elkhorn Slough, CA station than at the Homer Deep, AK station?

Q3.   Did it ever get below freezing at the Elkhorn Slough station in 2010?

Water temperature versus dissolved oxygen concentration

14. Click "Close" to start a new graph.

15. Select the "Water Quality" button under Step 1 "Which Data".

16. The date range should already be selected as the same range as your previous graph (January 1, 2010 to December 31, 2010).

17. Choose "AK>>Kachemak Bay>>Homer Dolphin Deep" from the pull-down list of recording stations.

18. Under Step 4: "Which Parameter", use the pull-down list to select "Water temperature" from the list of water data gathered at this station.

19. Select an output format for the data you want graphed. Click next to the "Graph" button. At the bottom of the page click on the blue "Get Data" button to generate your graph.

20. Now use the graphing tool to compare the water temperature at the Homer, AK station with the oxygen concentration in the water at the same station. You can add a second set of data to the same graph by selecting from the pull-downs found at the bottom of the graph.

21. Second Data Type will be "Water Quality". Choose "AK>>Kachemak Bay>>Homer Dolphin Deep" from the pull-down list under Second Station. Select "oxygen concentration" for the parameter. Click on the "Plot Graph" button to add the second set of data to your graph.

22. You may want to save the Kachemak Bay graph image to your local computer as a PDF or print the graph before moving on.

23. Click Reset to start a new graph. After you click on Reset, a pop-up saying "You have asked to Reset your graph….Would you like to continue?" appears. Click "Yes."

24. Now repeat Steps 2 through 8 to create a water temperature versus oxygen concentration graph for the "CA>>Elkhorn Slough>> South Marsh" NERR.

25. You may want to save the Elkhorn Slough graph image to your local computer as a PDF or print the graph before moving on.

26. Look at the two graphs to answer the questions below.

Questions

Q4.   Do you see a gap in the oxygen concentration data for Homer, AK? When does it occur? What might cause such a gap?

Q5.   What happens to oxygen concentration when water temperature goes up? What happens to oxygen concentration when water temperature goes down?

Q6. Can you find a place on the Homer, AK graph when oxygen concentration relates differently to water temperature? What might explain this?

Q7. Do water temperature and oxygen concentration have the same relationship at Elkhorn Slough as they do in Kachemak Bay?

Q8. How do you think differences in temperature and dissolved oxygen affect animals and plants that live in estuaries?

EXTENSION

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Extension: Salinity versus cumulative precipitation

1. Return to http://estuaries.noaa.gov/ScienceData/Graphing.aspx and click on the map where it says "Click here". This will reopen the SWMP graphing tool.

2. Create a graph showing cumulative precipitation for "CA>>Elkhorn Slough>> Caspian Weather Station" from January 1, 2010 to December 31, 2010.

3. Then add a second set of data to the same graph. Add salinity at "CA>>Elkhorn Slough>>South Marsh" for the same date range.

4. Look closely at the Elkhorn Slough graph. Notice when precipitation changes the most. What happens to water salinity during the time when precipitation changes the most? Why?

5. Now repeat the process for the Kachemak Bay NERR. Plot cumulative precipitation at "AK>>Kachemak Bay>>Homer" from January 1, 2010 to December 31, 2010.

6. Then add a second set of data to the same graph. Add salinity at "AK>>Kachemak Bay>>Homer Dolphin Deep" for the same date range.

7. Look closely at the Kachemak Bay graph. Notice when precipitation changes the most. What happens to salinity during that time?

8. Look at both graphs together. Are the trends in precipitation versus salinity the same for Kachemak Bay and Elkhorn Slough?

9. Now look at the graph of 2010 air temperature versus water temperature for Kachemak Bay from earlier in this exercise:

● Air Temperature @ AK >> Kachemak Bay >> Homer

● Water Temperature @ AK >> Kachemak Bay >> Homer Dolphin Deep
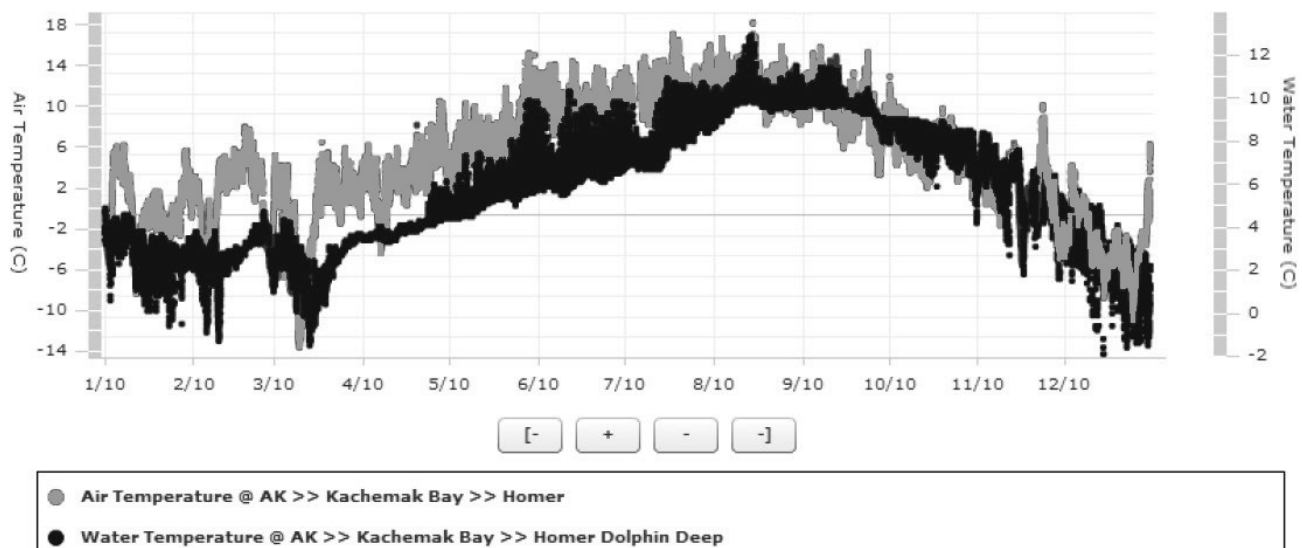
10. Compare data in this graph with the salinity versus cumulative precipitation graph for the same estuary. Precipitation from December through April does not seem to cause salinity to decrease in Kachemak Bay? Can you find a reason why this might be the case?