Student's Name _____ Date_____

A Surprising Day at the Beach

Introduction:

School has been back in session for a few weeks and the temperature is beginning to cool. At dinner one night, your parents surprise you with their plans for a trip to the beach for the weekend. Normally, if it were summer, this would be great news—hot sun and the refreshing ocean water! Unfortunately, the beach you'll be visiting is not located in one of those areas that stay warm year-round. So how much fun will this weekend be if you cannot swim in the ocean!?

The weekend finally arrives, and at last you're at the beach! As you stand in your bathing suit inches from the breaking waves, you start to wonder if swimming is a good idea after all. The air temperature is in the mid-70s and the water temperature is sure to be cold! Finally you build up the nerve, take a deep breath, grit your teeth and run full speed into the water. You're sure it's going to feel like the Arctic as soon as the water touches your skin.

Once submerged, you come up for air thinking you'll run out of the water quickly and wrap yourself in your beach towel to try to warm up again. But wait! Soon you realize that the water isn't cold at all. In fact, the water is warmer than the air around you. Looks like this IS going to be a fun day at the beach!

Later, on the way home, you start to wonder about what happened at the beach. How could the water be warmer than the air when for several days before your trip to the beach it had been so cool outside? What's going on here? You wonder if this phenomenon is unique to the beach you visited or if air temperature at this time of year is generally cooler than the water temperature. Time to plan an investigation!

Guiding Question: How do ocean water temperatures compare to air temperatures in the fall?

Background Information:

To investigate our guiding question without visiting air and water monitoring stations in person, we can use published data available on the Internet. The National Oceanic and Atmospheric Administration (NOAA) maintains two websites that provide air and ocean/bay water temperatures consistently throughout the year: the National Data Buoy Center and the Chesapeake Bay Interpretive Buoy System.

A buoy is a moored (fixed to the ocean floor) floating marker used to mark channels for navigation in coastal waters (see figure 1).

Figure 1

Source:
https://www.ndbc.noaa.gov/station_page.php?station=44

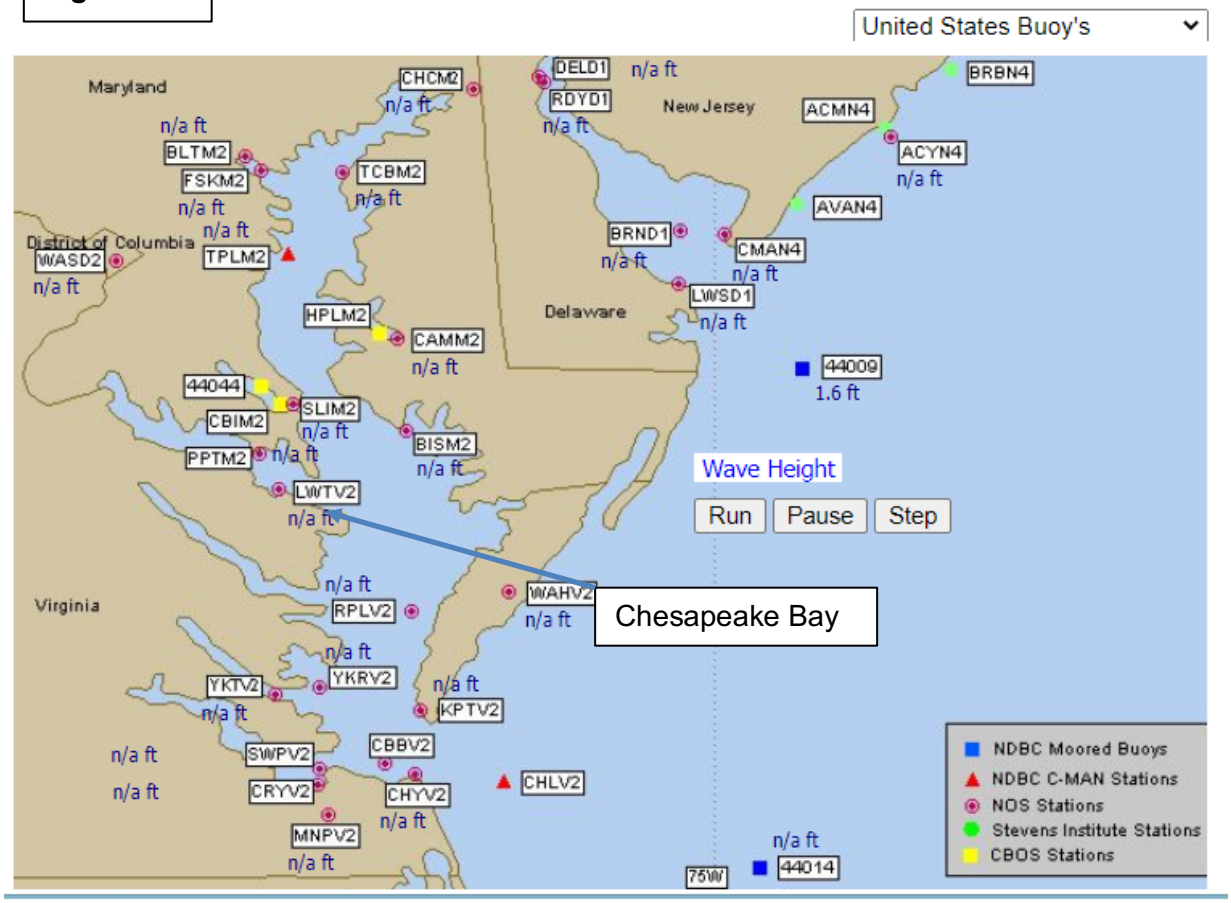
Some buoys carry air and water temperature sensors. These buoy sensors send information (data) via satellite to various agencies for their use. These agencies, such as NOAA, share the data with the public through websites like the National Buoy Data Center and the Chesapeake Bay Interpretive Buoy System.

In this investigation you will use buoy air and water temperature data to answer the question, "How do ocean water temperatures compare to air temperatures in the fall season?" You will design an investigation using data from the Chesapeake Bay Interpretive Buoy System website.

Chesapeake Bay is a large inlet off the Atlantic Ocean in the states of Maryland and Virginia. The map in Figure 2 shows the Chesapeake Bay estuary and the locations of many buoys that are actively collecting data. Use the key at the bottom right of the map to locate buoys on the map.

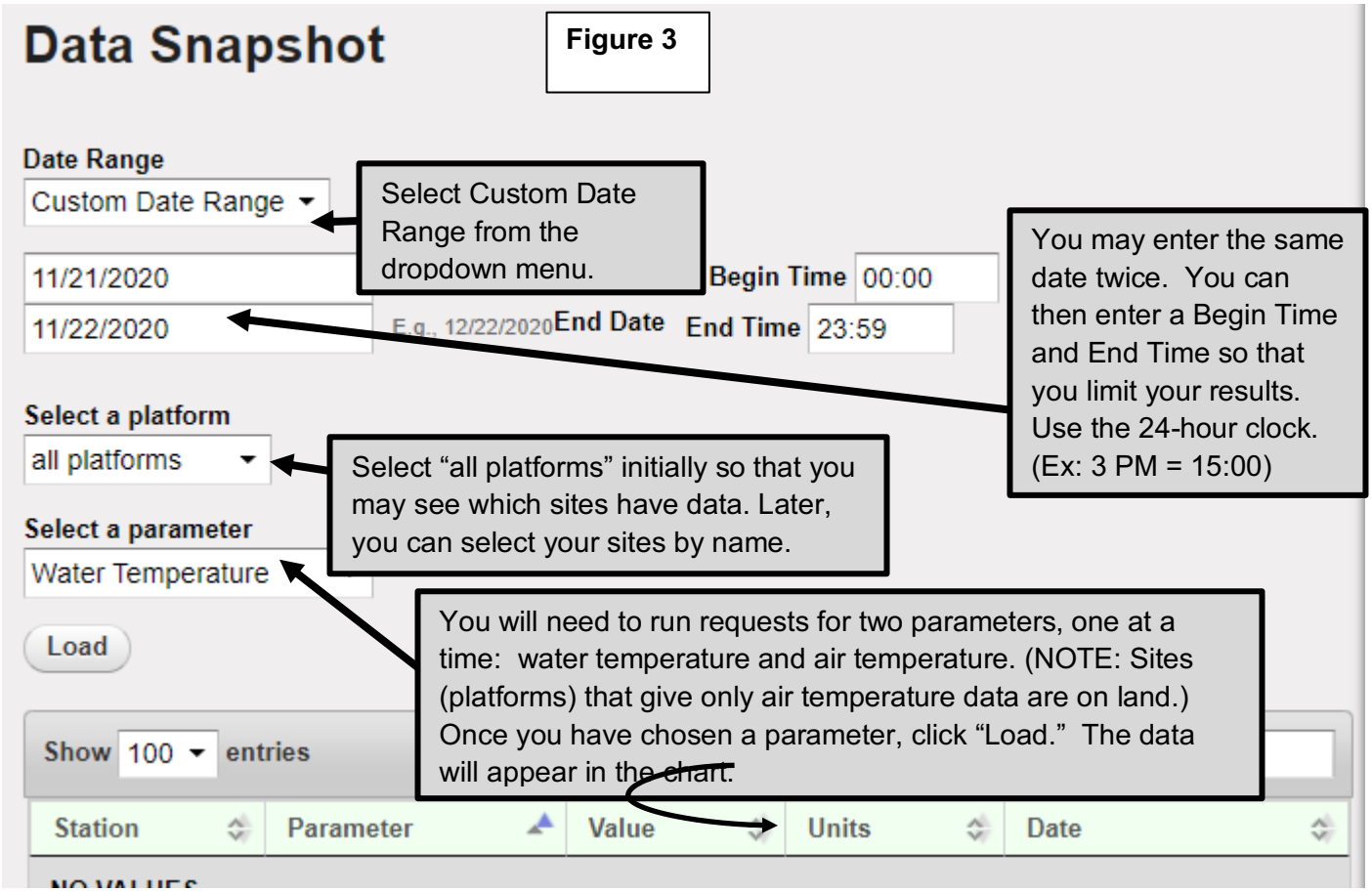
Figure 2

Chesapeake Bay Live Buoy Observations



Source: https://www.eldoradoweather.com/buoy/Chesapeake%20Bay/buoy-xhtml.php

Before you can plan your investigation you need to learn more about the Chesapeake Bay website and the data it provides. Click on the link here: Chesapeake Bay Interpretive Buoy System. Take a close look at the drop-down windows on the Data Snapshot. To become familiar with the available data, test various entries in the drop-down menus. Once you have an understanding of the website, use the guidelines shown in the shaded rectangles on Figure 3 to help you limit the data you will gather for your investigation.



Plan Your Investigation:

For your investigation, choose three buoys that you will use to gather data. Keep the guiding question in mind as you select your buoys and as you answer the following questions. You must be able to use your data as evidence to support your answer to the guiding question.

1. What two parameters must be available for each of the buoys you select?

2. Ho

3. w many days of data do you think you should use? Why do you think so?

4. Which buoys have you chosen?

5. What are the dates that you will use to gather your data? (Remember that we are interested in the early to mid-fall season, so your dates should be in the months of October and/or November.)

Once you have chosen the buoys you will use, how many days of data you will need, and the dates you will use, prepare a data table that you will use to organize and display your findings. Construct your table in the space below. Ask your teacher to review your plans and your data table before you begin your investigation.

Teacher signature _____

Do Your Investigation:

Once your teacher has approved, do your investigation using the Chesapeake Bay Interpretive Buoy System and record your data in your data table.

Analyze Your Results:

When you have gathered all the data, discuss with the members of your group how you could use graphs to display your data by making one graph for each of your group's buoys. What information should you put on the y-axis? What information should be on the x-axis? When you have agreed on how you will set up your graphs, have each person in your group prepare a graph for one of the buoys. Use the space provided to draw your graph. Be sure to label each axis clearly and write a title for the graph that includes the name of the buoy used.

Construct your graph here:

Answer the following questions as you analyze your results:

1. Do you see any pattern in the air and water temperature data you graphed? Describe any patterns you see.

2. Compare your graph with the graphs prepared by the other members of your group. Are there any similarities between the graphs of data from different buoys? Describe the similarities you observe. Are there any differences between the graphs of data from different buoys? Describe any differences you see.

3. If you observed differences in data patterns between buoys, what might explain those differences?

Draw conclusions:

1. With the members of your group, discuss how you can use your data to answer the guiding question, **"**How do ocean water temperatures compare to air temperatures in the fall?" Record your responses.

2. State specific evidence from your data that supports your answer to the guiding question. Be sure to describe how the data support your answer.

3. Now that you have done this investigation of air and water temperature data from Chesapeake Bay, what new questions come to mind? Write all the questions that your group has shared.

4. Select one of your questions and briefly describe how you could investigate that question.

Source: Christopher J. Petrone, Virginia Sea Grant, Virginia Institute of Marine Science. Retrieved from http://www2.vims.edu/bridge/DATA.cfm?Bridge_Location=archive0909.html