Student Guide Activity 11 Harlem River – Student Monitoring and Data

A. Explore the Harlem River

The Harlem River separates Manhattan from the Bronx. It is not a true river since it has no source and does not always flow into another body of water. It really is a "strait" or passageway, about 8 miles long, between the Hudson River and the East River.

Open Google Earth and re-visit the Harlem River monitoring site you marked at the beginning of this study. Explore the River from the southern to the northern end. Then return to the monitoring site and zoom in fairly close.

B. The Frederick Douglass Academy (FDA) Student Monitoring Project

This monitoring site is run by high school students who attend the Frederick Douglass Academy nearby. The students have been monitoring DO, salinity and temperature since March 2009. Their equipment consists of several probes placed in a piece of PVC pipe suspended 20 feet below the surface. The probes record water quality data and wireless technology sends the data to a computer onshore.

Watch this 3- minute video to learn about the project. It shows the students going under the freeway to collect data from the sensor attached to a bridge piling.
http://www.ny1.com/content/special_reports/connect_a_million_minds/124107/students-use-harlem-river-as-source-of-scientific-exploration/

C. View Harlem River in Salinity Animation

Start by finding out how water moves through the Harlem River and where the water is coming from. To do this you'll use the salinity animation you used in Activity 8.

Open this site: http://hudson.dl.stevens-tech.edu/maritimeforecast/maincontrol.shtml

In the blue box on the right of the screen, enter the following:

Region: **NY/NJ Harbor Estuary**
Parameter: **Surface Salinity**
Time Series: **Ignore**
Units: **psu**
Date: **2009 June 18**
Time: **00:00**

Don't start the animation yet; take a few minutes to reorient yourself to the map and familiar landmarks and to locate the Harlem River.

1. Before you start the Animation compare the surface salinity of the Harlem River with surface salinity of the Hudson River, on the other side of Manhattan. What do you notice?

Now start the animation and watch for a while.

2. Which river seems to have a higher surface salinity – Harlem or Hudson?

3. Now switch the parameter to bottom salinity. Does this change your answer to the last question?

4. What's a possible explanation for the differences in salinity between the Harlem River and the Hudson River?

Now watch the movement of salt water as it moves back and forth in both the Hudson River and the Harlem River.

5. Does ocean water flow into the Harlem River and the Hudson River at the same time?

6. What do you think is happening to water in the Harlem River when salt water moves up into the Hudson River?

7. Do you think that water in the Harlem River always flows in the same direction? Explain your reasoning.

C. Do other parameters in the Harlem River change along with salinity?

We know that as the tides change, the Harlem River sometimes receives very salty water coming from the ocean and at other times, it gets water with far less salt from the Hudson River. Is the water from these two sources different in other ways? Making and comparing several Harlem River graphs will help answer this question.

Use the Graphing Tool to make a graph of Harlem River Salinity. Label your graph: **Harlem River Salinity**, choose **Harlem River Salinity** as the series and select **2009-06-18** and **2009-06-25** as start and end dates.

Copy and paste the Harlem River Salinity graph into your Journal. Then return to the Graphing Tool and make a graph of Harlem River Water Temperature, keeping the dates the same but changing the parameter from **Harlem River Salinity** to **Harlem River Temp**.

Go back to the Graphing Tool and use it to make one more graph for the same dates, this one of **Harlem River DO**. Copy and paste it just below the graphs of salinity and temperature, making sure it is lined up perfectly with the two above.

First look at the top graph, Harlem River Salinity, and notice the up and down pattern. The high points on the graph correspond to times in the animation when the River was full of high-salinity water from the ocean (shown in yellow or red in the animation) and the low points on the graph to times when the River was full of low-salinity water from the Hudson River (shown in purple).

Notice how the second graph (Harlem River Temperature) differs from the first graph. Then compare those to the third graph (Harlem River DO). Next you'll decide how the water temperature and DO are changing as salinity in the river goes up and down. It may help to use a straight edge to line up changes taking place at the same time of day, shown on the X-axis of all three graphs.

In your Journal you will find a chart to fill out, which will show how three water quality parameters change in the Harlem River during tidal cycles. First decide whether temperature and DO get higher or lower as salinity goes up and down. Then figure out the approximate range of the high values and low values for each of them. For example, if you look at just the high points on the salinity graph, they range between 17 and 19. (Use whole numbers for this.) What is the range of the low points? Then do the same for temperature and DO. Check carefully to make sure you are entering the information in the correct part of the chart.

When the Harlem River receives water from the ocean, its waters will have a			
higher	Salinity	Range (psu)	17-19
	Temperature	Range (°C)	
	DO	Range (mg/L)	

When the Harlem River receives water from the Hudson River, its waters will have a			
lower	Salinity	Range (psu)	
	Temperature	Range (°C)	
	DO	Range (mg/L)	

Look at these results, think about the questions below and then record your responses in your Journal:

8. Did these results surprise you? (Did you see anything that seems inconsistent with what you have seen in other sites?) If so, explain your thinking.

If these results didn't surprise you, why do they make sense to you? Explain why you think these results are reasonable to expect.

E. Hypoxia in the Harlem River?

Recall from Activity 10 that hypoxia conditions (extremely low DO) are most common in late summer. Find out whether DO in the Harlem River ever dropped into the hypoxia range, which is 1 to 3 mg/L. Use the Graphing Tool to examine Harlem River DO during the months of July and August.

If you find hypoxia, make a graph of the period in which it occurred, and copy it into your Journal. Then answer the questions below in your Journal.

9. On what dates—or range of dates—was water in the Harlem River hypoxic?

10. What's a likely reason the Harlem River has problems with low DO levels?