Student Guide Activity 10 DO: How Low Will it Go?

In previous activities you learned that DO is extremely important to aquatic life and that DO levels are very sensitive to other environmental conditions. One of these is **eutrophication**, a process whereby bodies of water receive an excess of nutrients, which causes excessive plant growth.

You'll use an interactive map to find out how places around the world and in the Hudson River Estuary are affected by eutrophication. Then you'll graph DO data from the Hudson River George Washington Bridge (GWBr) monitoring site to examine conditions there.

A. Interactive Map of Eutrophication

The on-line map you'll use shows locations around the world with low DO levels caused by eutrophication. Each place is marked on the map by a colored dot. The color of the dot indicates how each place has been classified.

- Yellow Dot = Eutrophic—places with high nutrient levels and abnormal algae growth. Still, DO levels there aren't low enough to label them "Hypoxic."
- Red Dot = Hypoxic—places with extremely low dissolved oxygen due to eutrophication.
- Blue Dot = Improved—places that were hypoxic at one time but are now improving, usually because of some environmental action.

The Interactive Map of Eutrophication has some of the same navigation tools you used in Google Earth. Here is the website: http://www.wri.org/project/eutrophication/map.

Move slowly around the world, noticing the parts of the world that seem to have the most colored dots. Click on one of the dots to open an information frame where you'll find a photo of the location and a summary of the problem there.

Find your way to the Hudson River. The alphabetical scroll bar on the right is an easy way to get there. Just scroll most of the way down until you get to US locations, then continue scrolling down by state until you reach US-New York-Hudson River. Click on that location. You'll zoom in and an information frame opens. You can close the information frame to see where the marker is located, and then click on the marker again to bring back the information frame. The Hudson River marker is high in the watershed, but the information given is for the entire Hudson River.

On this map you may disagree with where some of the some markers have been placed. This sometimes happens when people send GPS coordinates to the website that aren't exact.

In addition to the Hudson River marker, you will also visit the Narrows, Harlem River, and East River. Use the information at these locations to answer the following questions in your Journal:

Hudson River

1. The Hudson River has been labeled as improved on this map. What change led to an improvement in water quality in the Hudson River?

2. Does the Hudson River still have a problem with eutrophication? Explain.

The Narrows

3. Water moves back and forth through the Narrows, as you saw in the tidal Animation. In places like this, algae and plants often get washed away before they have time to cause problems. Yet water in the Narrows gets hypoxic every summer. What source of organic material is making this water hypoxic?

Harlem River

4. What two rivers does the Harlem River connect with?

5. What classification was the Harlem River given in the Interactive?

To answer the next question, close the information frame and move the map slightly so you can see the very large bay to the east, Long Island Sound. (On the map, it's to your right.) Long Island Sound is very often hypoxic and sometimes even anoxic (DO level of zero, or a level so low that no life form requiring oxygen can survive).

6. Do you think the Harlem River is ever affected by water conditions in Long Island Sound? Explain your reasoning.

East River

7. When did the East River first start having very low DO levels?

8. The East River was once very polluted. How is it classified now? How did this change occur?

B. Hudson River DO Graph

What will a graph of DO from the Hudson River (GWBr) monitoring site show? Find out by using the Graphing Tool to make a graph of DO in the Hudson River. Data from this monitoring site is only available from June through December, so select 2009-06-01 as the start date for your graph, select 2009-12-31 as the end date, and select Hudson River DO as your parameter.

You'll notice several places where the graph seems to drop to zero. Dissolved oxygen didn't really drop to zero at those times; these are actually data gaps, times that no measurement was taken. The recorder entered zero instead. Just ignore them.

Take a close look at the graph and answer questions 9 and 10 in your Journal.

9. Did DO at George Washington Bridge ever drop below 3 mg/L? (You'll probably need to run the cursor over the graph, looking at the numbers that appear in the small box above it). Did DO at this site ever drop below 4 mg/L?

10. What was the lowest DO level recorded at George Washington Bridge, and what date was it recorded on?

Now copy the graph of George Washington Bridge DO in the space below question 12 in your Journal.

Next, make a graph of Cascade Br DO using the same dates you used for GW Bridge DO. (Keep the same start and end dates but use Cascade Br DO as the series.) Then answer questions 11 and 12 in your Journal.

11. Did DO at Cascade Brook ever drop below 4 mg/L?

12. What was the lowest DO level recorded at Cascade Brook, and what date was it recorded on?

Copy the graph of Cascade Br DO into your Journal, directly below your graph of Hudson River and use the two graphs to answer these questions.

13. Look at the overall patterns you see on the DO graphs of Hudson River and Cascade Brook. What similarities and what differences do you notice between them?

14. Based on those observations, what are some factors (besides eutrophication in the Hudson River) that you think might also be influencing DO at that site?