



Estuary Data Mystery

Title: What happens after a massive chemical spill in Mississippi?

Reserve, State: Grand Bay Research Reserve, Mississippi

SWMP Station: Water Quality (WQ) Bangs Lake

Parameters: pH, turbidity, dissolved oxygen, salinity, and nutrients

Start and End Dates: April 10 to 18, 2005

Data: Available and easy to graph at nerrsdata.org

Investigate This: On April 14, 2005, a catastrophic pollution event occurred at Bangs Lake along the western border of Grand Bay in Mississippi. The spill occurred when the walls of retaining ponds filled with wastewater collapsed at a nearby fertilizer manufacturing company. The retaining walls were made of stacks of gypsum, a byproduct of the creation of fertilizer. Approximately 17.5 million gallons of polluted water were released from the ponds and flowed into the nearby Grand Bay estuary. The released wastewater had a pH of 2.2 to 2.4 and contained high levels of phosphates (4,000-5,000 parts per million). The wastewater may have also contained ammonia, fluoride, selenium, chromium, copper, cadmium, nickel, aluminum, and even uranium.

The National Estuarine Research Reserve maintains a water quality monitoring station in Bangs Lake that collects [pH](#), [turbidity](#), [dissolved oxygen](#), and [salinity](#) data every 30 minutes. Review **figure 1** (pH), **figure 2** (turbidity), **figure 3** (dissolved oxygen), and **figure 4** (salinity); which of the water quality parameters do you think would be affected by the spill? After developing and explaining your predictions, go to nerrsdata.org to create and study graphs of water quality data from the week surrounding the spill. Were your predictions correct?

Figure 1: pH from April 10-18, 2005 at Bangs Lake water quality station in Grand Bay

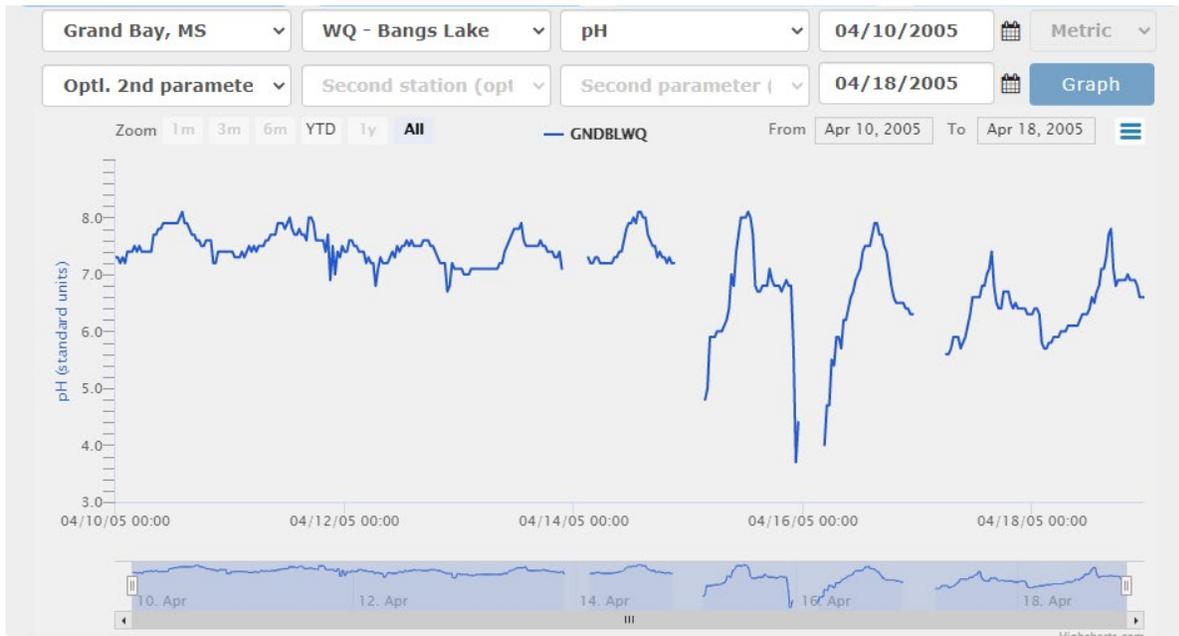


Figure 2: Turbidity from April 10-18th 2005 at Bangs Lake water quality station in Grand Bay

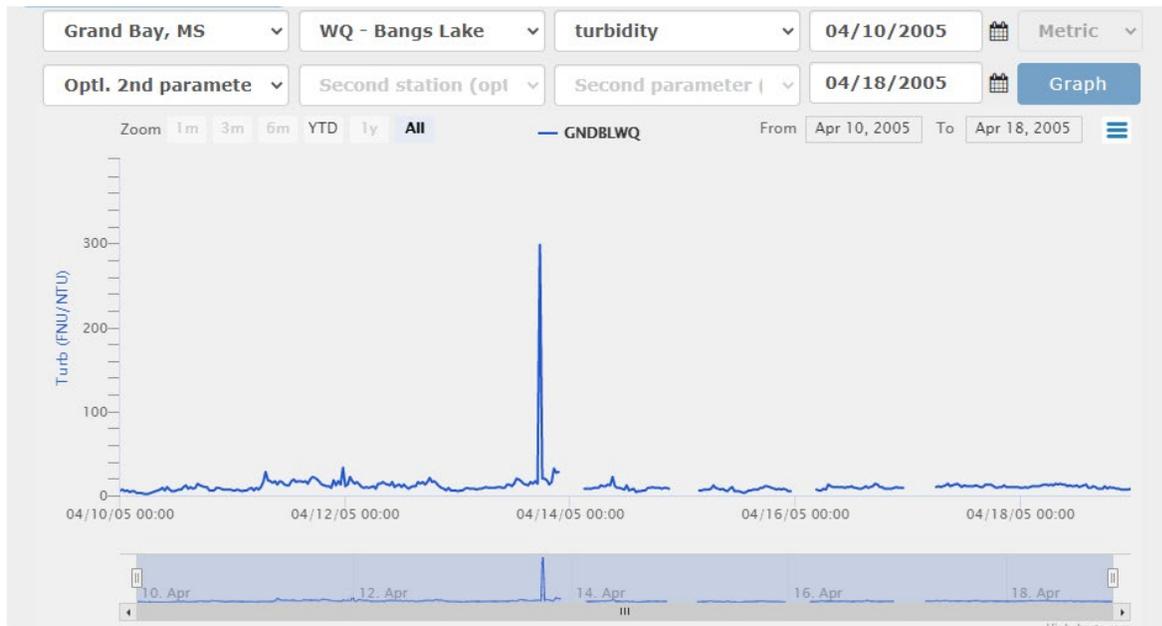


Figure 3: Dissolved oxygen from April 10-18, 2005 at Bangs Lake water quality station in Grand Bay

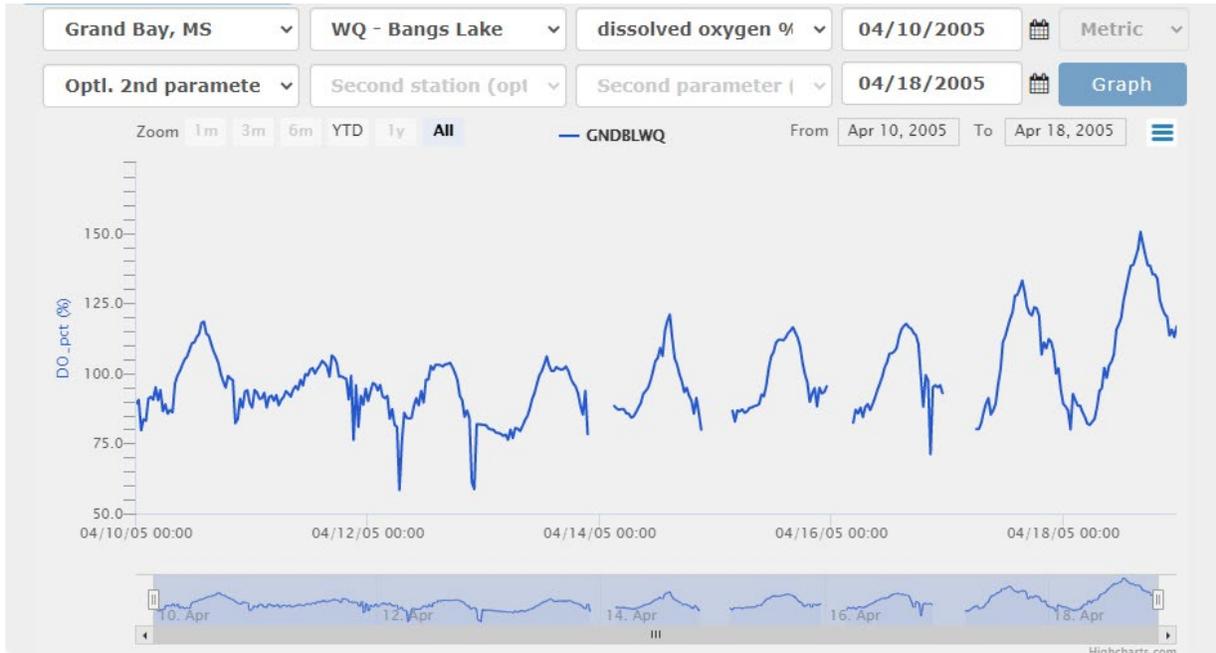
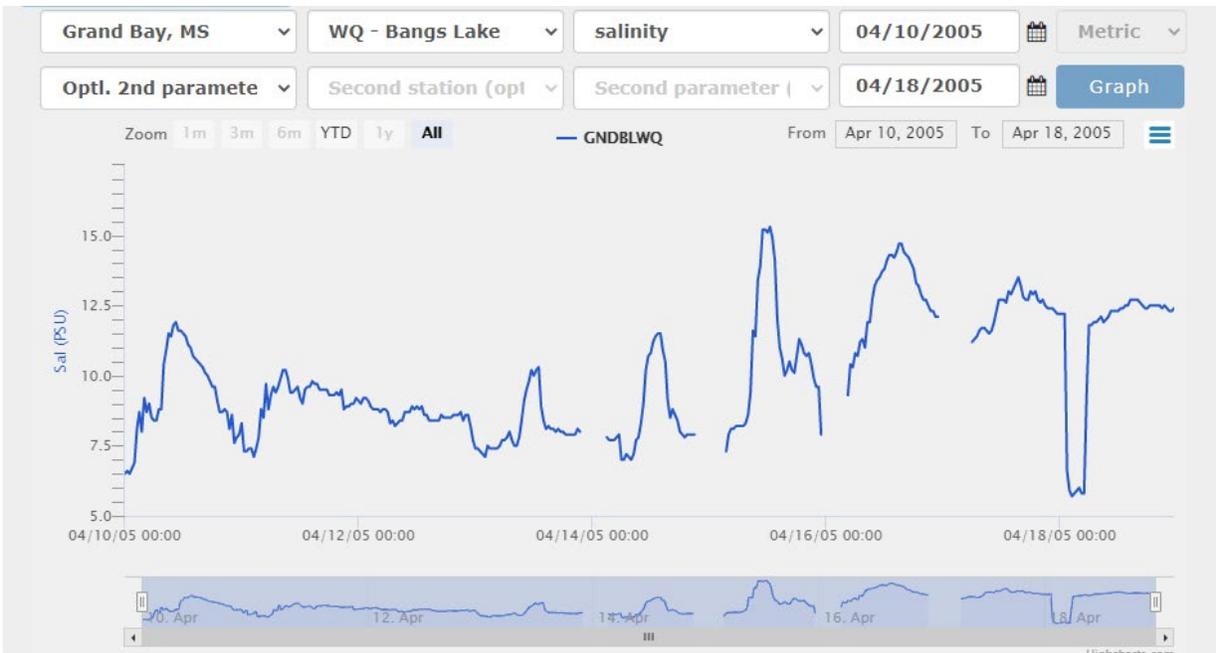


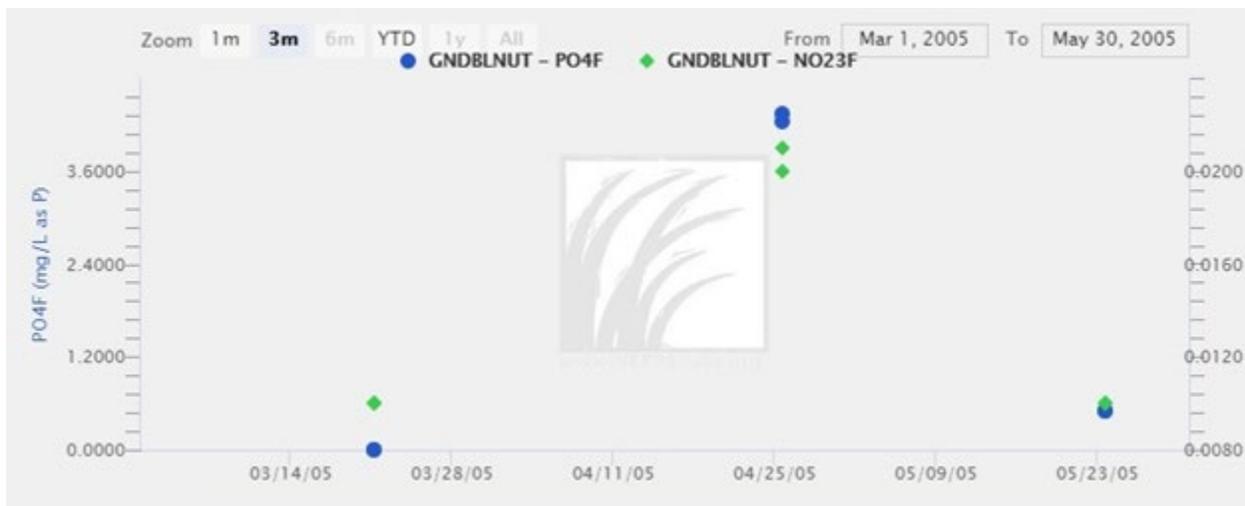
Figure 4: Salinity from April 10-18, 2005 at Bangs Lake water quality station in Grand Bay



Explanation and Further Investigation: The fertilizer company, claimed that the stacks of gypsum holding the wastewater failed because of heavy rainfall. The company's permits from the Mississippi Department of Environmental Quality specified that the waste ponds must be designed to withstand a storm producing about 11 inches of rain in a 24-hour period. Is there evidence in **figures 1-4** that support or discredit the company's assertion that there was an unusually large rainfall event before the spill? What additional data would you need to determine whether the fertilizer company should be held responsible for the failure of the gypsum stack and the subsequent spill?

Extension: Scientists reported seeing large algal mats in the shallow water areas of the lake two to three weeks after the spill. Grand Bay National Estuarine Research Reserve also collects nutrient data from Bangs Lake once per month. Using this data, can you develop an explanation for why algae mats grew in the estuary?

Figure 5: Phosphates (blue dot) and nitrate and nitrites (green diamond) from March 1, 2005 to May 30, 2005 at Bangs Lake water quality station in Grand Bay.



**This SWMP Story can be used to teach Next Generation Science Standards Science and Engineering Practices of analyzing and interpreting data and engaging in arguments from evidence.*

It can also be used to support the following Performance Expectation: MS-LS2-4. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.