

# Lehigh River Water Quality Project

## 378 Bridge Sampling Report

Fall 2003

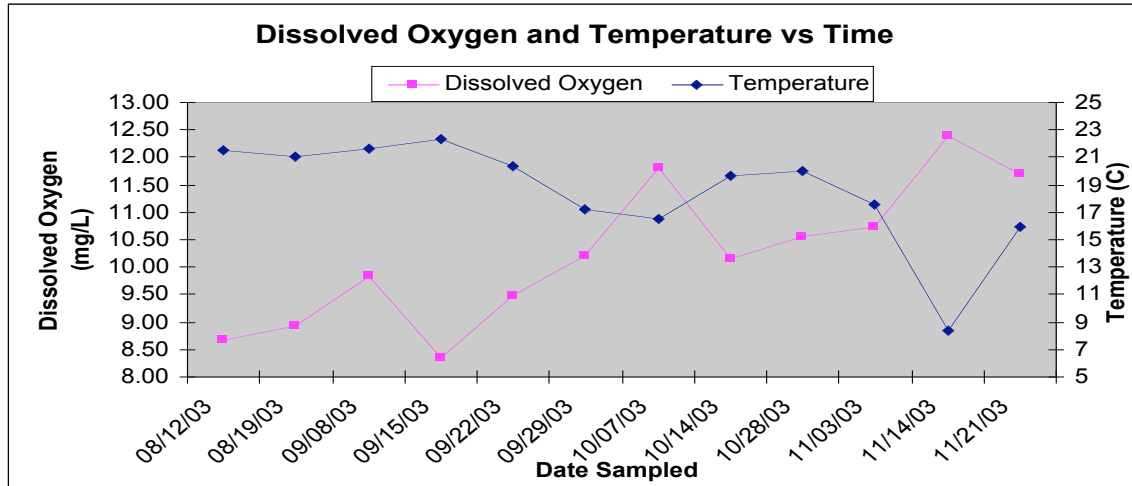
David Franklin  
LEO intern

Sampling Conducted 9/8/03 through 11/21/03

The Lehigh River is an important river ecologically, as well as economically and socially. Its 103 mile length drains an area of more than 1,300 square miles. It is home to numerous animal, plant, and microbe populations. Privately owned at one point in its history, it now reflects a river on its way back from pollution and disturbance. Therefore, much can be learned but tracking specific parameters of the river over time.

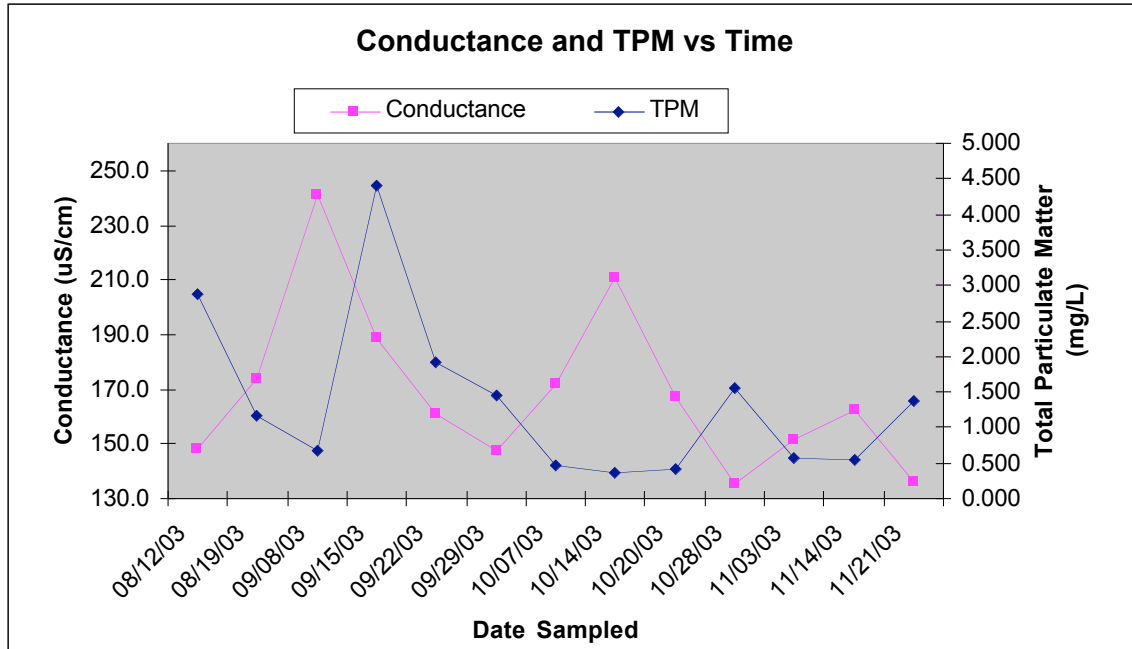
Weekly, collections were done from the 378 bridge in Bethlehem, PA. Upon collection, air temperature and water temperature were recorded, as well as a very general qualitative analysis of the river. In the lab, the water was analyzed for conductivity, dissolved oxygen, pH, alkalinity, and total particulate matter. Additionally, a pair of spectrographic scans were carried out, one for dissolved matter, and one for particulate matter. The first step in particulate phosphorus analysis was done. Finally, water was filtered for archiving.

Dissolved oxygen is very tightly correlated to temperature, as colder water can hold more oxygen than warm water. It is also related to aquatic life, amount of incoming solar radiation, and mixing. As the sampling period was from the fall through the winter, one would expect the dissolved oxygen to increase as the temperature decreases.



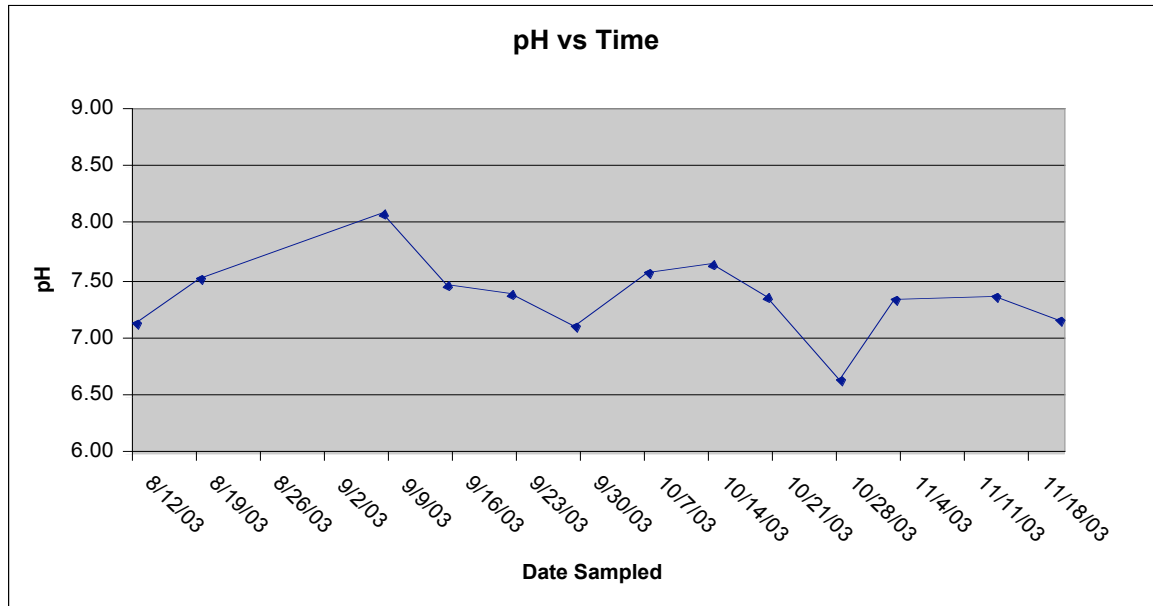
However, as the graph above shows, this clearly was not the case. There are a few possible sources of error. Pollutants may influence dissolved oxygen, and the Lehigh River is influenced by Abandoned Mine Drainage (AMD). AMD is responsible for increased levels of metals, as well as nutrients, both of which could cause incorrect readings. Another possible source of error would be the mixing and warming that the samples underwent in transportation from the sample location to the lab. Additionally, throughout the semester, there were problems with the membrane on the dissolved oxygen probe. This could cause the fluctuations in the readings that were seen, as it would not be reading the correct value. If these values are correct, it does signify that the water is fairly healthy. Trout require at least 7 mg/L and the Lehigh River exceeds that for all dates measured.

Conductivity is a measure of how well the water conducts electricity, a property derived from the ions suspended in it. It is generally directly linked to the amount of total dissolved solids.



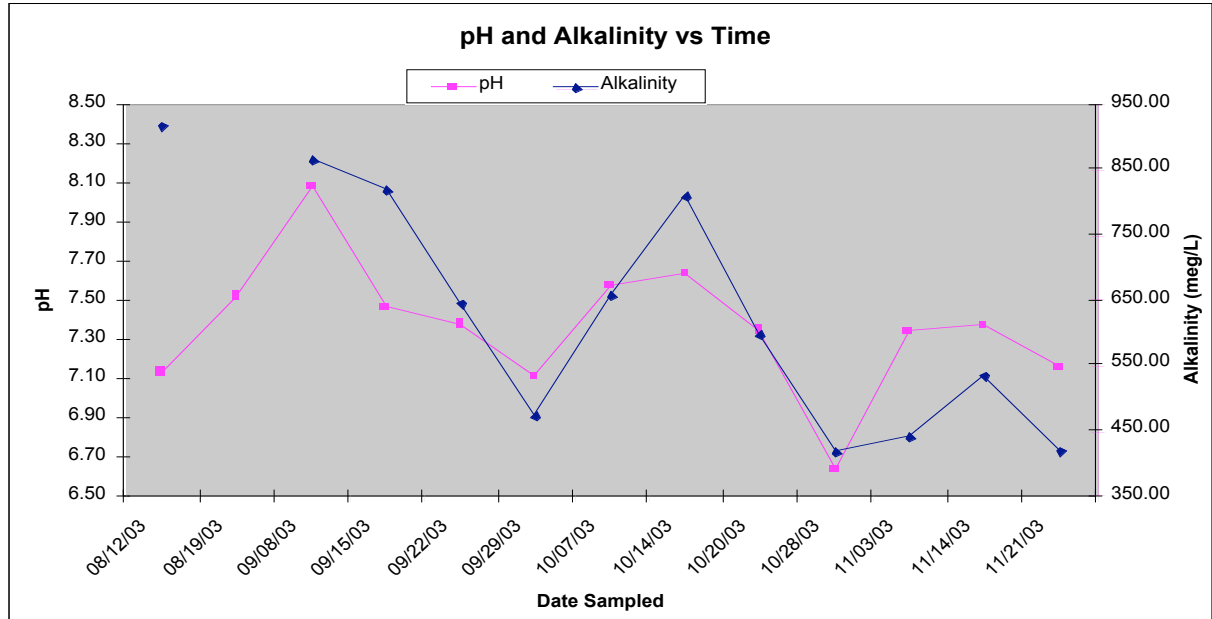
While both graphs show peaks, they show them at different times. This is not a peak in conductance leading to a peak in TPM, as it may seem at first glance. It is, however, a peak in total particulate matter, which is generally caused by a rain event, which causes a delayed peak to be seen in the conductance values.

The pH value is a measure of how acidic or basic water is. In the Lehigh River, the values were generally around neutral (seven) or slightly basic (above seven). There was one week where the pH was acidic (below seven).



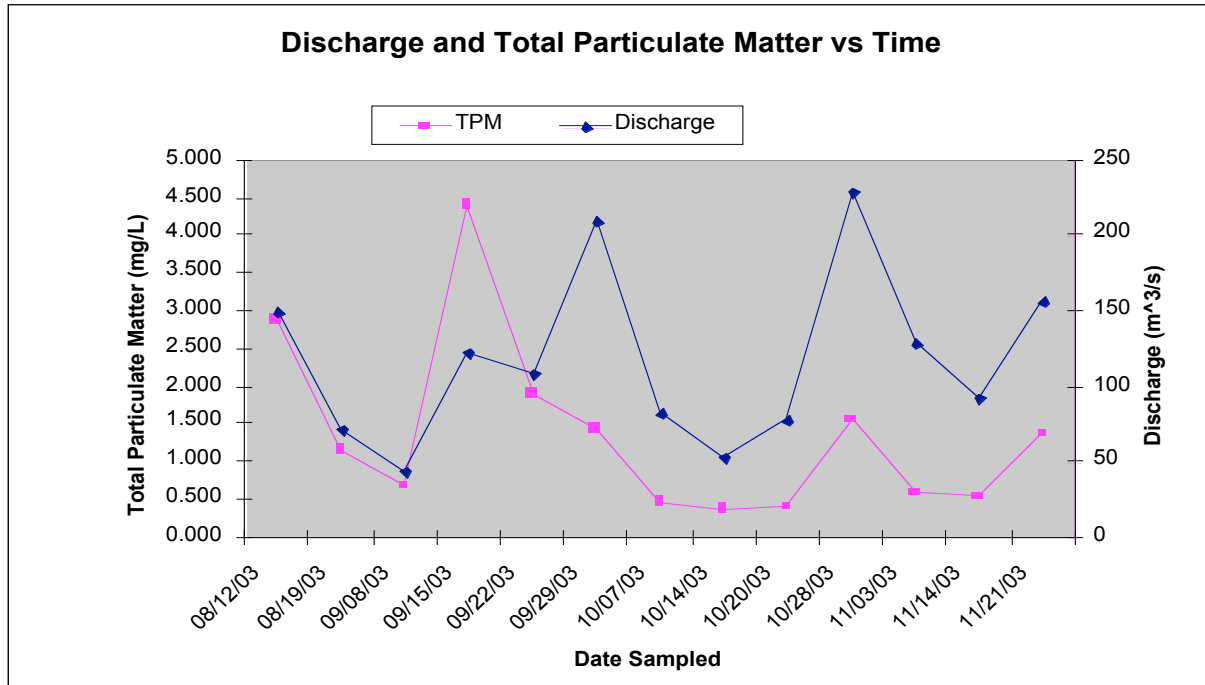
The water quality standard for surface waters is between a pH of six and nine. In this case, the Lehigh River clearly falls within these parameters. While pH alone may not say much as to the overall health of the Lehigh River, a subsequent measurement of pH, called alkalinity is very important.

Alkalinity is a measurement of how resistant water is to change in pH. This affects many other characteristics of the water, especially biological factors. If the pH fluctuates wildly when rain events occur, then an inhospitable environment for organisms is formed. Alkalinity is very closely related to pH, as seen below.



For most points, the pH doesn't go as far to the extreme as the alkalinity values go. This is because alkalinity is a buffer for pH. Errors in pH or alkalinity could have come from a couple sources. In the river, pollution or rain events could trigger changes in either parameter. Additional error could come in the lab, where calibration of the instrument was difficult at times. Alkalinity between 100 and 200 mg/L is ideal; this was most certainly not present in any of the dates sampled.

Total particulate matter (TPM) reflects how many particles are present that are larger than .45 microns in diameter. This directly affects how much light gets through the water, and directly or indirectly affects almost every other parameter measured. TPM is also very tightly correlated to rain events and thus discharge.



When it rains, the runoff picks up soils, leaves, and other sediments on its way to the river. When the water finally makes it to base level, all the solids are with it and go directly into the river to be eventually transported to the ocean, if they aren't deposited along the way. This measurement really does not have much error to it. The only real source of error is if any part of the filter is ripped off during removal from the filter apparatus the mass measurement would be thrown off, however this was controlled for as much as possible. The values that are recommended for particulate matter in streams are 25 mg/L, and below 10 mg/L are seen as very good levels. The values for the Lehigh River do not exceed 5 mg/L during the sampling period, which is a very good indicator of the health of the river.