

Introduction

The hydroprobe at Lehigh University is designed to measure pH, Total Dissolved Solids, Dissolved Oxygen, and temperature. With the data collected the hydroprobe has begun to make a historic record of the river's attributes. The increased amount of human activity has a profound affect on the surrounding environment. This could be valuable data in many research projects such as the affects of global warming, or pollution. This past year a bridge was built as an extension of a major highway. This introduces a spectrum of changes that could have positive or devastating affect on the aquatic community.

Our measurements began 10/5/00 and ran through 12/6/00. There were certain times where no data was collected due to battery failure.

These are: 10/22/00-10/26/00
 11/1/00- 11/10/00

Procedures: For well-documented procedures on use and care of the hydroprobe see website www.leo.lehigh.edu/LEO_procedures/hydroporbe_main.html

Results/Discussion

See Attached Graphs

Temperature: Is a measurement of the heat intensity per volume of water. Water temperature is one of the most important standards and is essential to the measurement of dissolved oxygen, conductivity (salinity), pH, and almost every other water quality measurement.

Our Observation: In the time period measurements were collected there was a downward trend in temperature. The months incorporated in our data include October, November and December, with the coming of the winter season, there is less sunshine and colder weather. The high during this period was 16.64 °C on 11/5/00 at 4:00PM.

The low of 2.02 °C on 12/7/00 5:00 PM. The average daily highs were found morning to mid-afternoon and the average daily lows from mid-afternoon through the evening.

pH: This is the measurement of the hydrogen-ion concentration in the water. A pH below 7 is acidic (the lower the number the more acidic), pH is neutral and pH above 7 (to a maximum of 14) is basic (the higher the pH the more basic). pH is a major factor affecting the availability of nutrients to plants and animals. A pH range of 6.0 to 9.0 has been discovered to provide protection for the life of freshwater fish and bottom dwelling invertebrate.

The most significant environmental impact of the levels of pH involves the combination of two or more substances, which produce effects greater than their sum. This process is known as synergy and is important in surface waters. Runoff from agriculture, domestic, and industrial areas may contain iron, aluminum, mercury or other elements. The pH of the water will determine the toxic effects of these substances.

Our Observations: The measurement of pH stayed between the range of 6.5 and 8.5. The highest pH reading 8.22, was recorded on 10/16/00 5:00 AM. The lowest reading was 6.72 recorded on 11/11/00 at 7:00 AM. It tends to rise during the day and fall by nighttime. Any deviations observed could be due either to precipitation events or unusually warm weather. The general trend detected was when the temperature increased the pH began to fall. This seems likely to occur, because pH is dependent on temperature.

Specific Conductivity: This refers to the relative ion content of the water solution. This shows how well the solution can pass electric current, which increases with the amount of dissolved ionic substances, thus another method to determine the level of dissolved solids. Specific Conductivity of water has been shown to increase dramatically with an increase in temperature, but no optimal range has been determined, however the natural waters fall between 50 $\mu\text{S}/\text{cm}$ to 1500 $\mu\text{S}/\text{cm}$.

Our Observation: The daily fluctuations of Specific Conductivity show highs around midnight and lows during the day. Other than this, there were no other apparent trends in the past three months. The high during this period reached 460 $\mu\text{S}/\text{cm}$ with lows dropping to 250 $\mu\text{S}/\text{cm}$.

Total Dissolved Solids: Is the amount of materials that are either dissolved, or too small to be filtered in a large body of water. Dissolved salts such as sodium, chloride, magnesium and sulphate contribute to elevated filterable residue values, values in fresh water ranging from 0-1000 mg/L. These solids include ions, which are important to the internal balance in aquatic organisms. High levels of total dissolved solids also limit the suitability of water as a drinking source and irrigation supply.

Our Observations: Like Specific Conductivity Total Dissolved Solids have no apparent trend during the time period observed. In fact Total Dissolved Solids followed the same daily activity as Specific Conductivity with highs at midnight and lows throughout the day. The highest reading observed was 0.296 Kmg/l on 11/01/00, 1:00 PM of and the low was 0.162 Kmg/l, 11/30/00, 11:00 PM.

Dissolved Oxygen: Refers to the amount of oxygen that is contained in an aqueous solution. Oxygen enters the water through several different methods, which include diffusion from the surrounding air, by rapid movement or aeration and as a waste product of photosynthesis. There are four factors, which determine the amount of oxygen that can be held in a water solution, water temperature, salinity, and pressure. Gas solubility increases with temperature because colder water is able to hold more oxygen. Gas solubility increases with decreasing salinity because fresh water holds more oxygen than salt water. Finally gas solubility decreases as pressure decreases.

Total dissolved oxygen concentrations in the water should not exceed 110 percent. Concentrations above 110 percent could be harmful to the survival of biota resulting in “gas bubble disease” from excessive dissolved oxygen in the water.

Our Observations: Dissolved oxygen content constantly remained between 106 percent and 70 percent saturation. The highest reading recorded was 10/22/00, 12:00 AM at 106.3%. The lowest reading recorded was 10/17/00, 12:00 PM at 72.7%. Saturation readings were high during the evening and low during the day. Plants respire during the night and release oxygen as a part of photosynthesis, this is a plausible reason for the increase of

Works Cited

1. http://www.four.gov.bc.ca/ric/pubs/aquatic/interp/Interp_01.html
2. <http://www.state.ky.us/nrepc/water/wcpdo.html>
3. <http://h2osparc.wq.ncsu.edu/info/do.html>
4. <http://www.hydrolab.com>