What Our Volunteers Measure

Alkalinity

Alkalinity measures the acid neutralizing, or buffering, capacity of a solution. Most natural waters contain certain ions that can neutralize acidic ions. These neutralizing ions are dissolved in the water and come from the soil and bedrock in the watershed. The presence of these ions in the water gives it the ability to withstand some acidic input. How strong this ability is depends on how high the alkalinity is. Streams that flow through limestone deposits have the highest alkalinity values and therefore the highest buffering capacity. The alkalinity of streams can vary tremendously due to the amount of rainfall, the season, as well as the geology of the watershed. This is why it is important to measure the alkalinity of a stream on a regular basis. Alkalinity is measured in parts per million or milligrams per liter of water.

Conductivity

Conductivity is an indicator of the amount of inorganic dissolved solids in a liquid. Conductivity values are generally consistent for a particular stream, reflecting the geographic characteristics of the watershed. Gross increases in conductivity may indicate additional inputs into the stream system. Our conductivity meters measure in microSeamans (µS) which is a measurement of resistance and can be converted to Total Dissolved Solids. Road salt applications during winter months can result in high readings.

Dissolved Oxygen

Dissolved oxygen (D.O.) is one of the most important indicators of the quality of water for aquatic life. Dissolved oxygen levels below 3-5mg/L can harm or kill fish and other aquatic organisms. Temperature influences D.O. levels - the warmer the water is, the less dissolved oxygen it can hold. Cold water can hold more dissolved oxygen. Streams gain oxygen from the atmosphere through wind or wave action and by churning over rocks. Aquatic plants both add (photosynthesis) and consume (respiration) oxygen. DO levels can vary by time of day and by time of year.

Oxygen levels may be reduced by elevated water temperatures (e.g. removal of trees that shade the water or by industrial/municipal discharges) or by the excessive growth and subsequent oxygen-depleting decomposition of algae. Dissolved Oxygen is measured in parts per million or milligrams per liter of water.

% Saturation: The amount of DO in the water compared to the maximum amount that could be present at the same temperature. Warmer water holds less oxygen than cold water. % saturation levels between 80 – 120% are ideal.

Habitat
The presence of an altered or degraded habitat is a major stressor of aquatic systems. Habitat assessments provide a general description of the site and a visual assessment of in-stream and stream side habitat quality. Combined with chemical and biological data, these visual surveys provide an integrated picture of the different factors influencing the biological condition of a stream system. These assessments are not as comprehensive as needed to adequately identify all causes of impact. However they offer a quick screening to prioritize areas for more detailed analysis.

Macroinvertebrates
Macroinvertebrates are animals that lack a backbone but are typically visible to the unaided eye. These are primarily aquatic insects, but also include worms, mussels, snails, and crayfish. Certain macroinvertebrates are sensitive to pollution while others are more tolerant of pollution. The diversity of macroinvertebrates, especially the number and diversity of pollution sensitive animals, can be used to monitor the water quality of streams and rivers.

Nitrate Nitrogen
Nitrogen makes up about 80% of the air we breathe. It is an essential component of proteins and is found in the cells of all living things. Inorganic nitrogen may exist as a gas, or as nitrites, nitrates, or ammonia; organic nitrogen is found in proteins and other compounds. Nitrates represent the most completely oxidized states of nitrogen commonly found in water. Nitrates in water come from soil, fertilizer runoff, malfunctioning septic systems, sewage treatment plants, manure from livestock animal wastes and from car exhausts. In abundance, these nitrates become detrimental to aquatic systems through a process called eutrophication. Eutrophication refers to the natural aging process of a water body that may be greatly accelerated by human activities, causing algal blooms and a corresponding decrease in dissolved oxygen. Nitrate is measured in parts per million or milligrams per liter of water.

pH
pH is widely monitored because it is a simple process and an important indicator of water quality. On a scale from 0 to 14, it measures the hydrogen ion (H+) concentration of a solution. It is used to give a quick indication of how acid or alkaline a substance is. Water that has a pH less than 7 is acidic, while water pH greater than 7 is alkaline. Water of pH of 7 is neutral – neither acidic or alkaline.

The pH of non-polluted rainfall is acidic with values ranging from 5.0 to 5.6. As part of the general northeast region of the United States, Delaware's rainfall is further acidified by the release of sulfur dioxide and nitric oxide from the burning of fossil fuels, with power plants and automobiles being the most significant sources. The average pH of rainfall monitored at Cape Henlopen by the University of Delaware for recent years is 4.3 with occasional summer values in the low 3 range. Yet, acidification of Delaware streams, ponds, and lakes is not a problem at present. Most coastal plain streams have pH values of 6.5-7.0 while piedmont streams tend to have values of 6.5-8.5. Notable exceptions are streams in the southern part of the state draining from swamps and bogs. In those, the natural tannic acids from decaying vegetation may cause the pH to drop to the 3.5-5.0 range. Ponds and lakes with high algal content and excessive plant growth have more alkaline values, pH 9.0-10.0. pH is recorded as standard units.

Phosphate

Phosphorus is an essential nutrient. In nature, phosphorus is usually found as phosphate (PO4-3) molecules. The term orthophosphate is used to describe the dissolved and suspended phosphate that is available to aquatic plants. Phosphates in water come from a variety of sources including soil, fertilizer runoff, malfunctioning septic systems, sewage treatment plants, and manure from livestock animals. Since this nutrient is usually found in small amounts, even small increases can have dramatic effects on aquatic systems. In abundance, phosphates can cause extensive algal blooms and a corresponding decrease in dissolved oxygen. To compare your results to state regulations, divide the amount of orthophosphate by 3 to convert to mg/L phosphorus.

Temperature

Although temperature may be one of the easiest measurements to perform, it is also one of the most important parameters to be considered. It dramatically affects the rates of chemical and biochemical reaction within the water. Temperature determines how much oxygen the water can hold (the higher the temperature the less oxygen the water can hold), the distribution and abundance of organisms, and rates of chemical reactions. Temperature is reported in degrees Celsius (Centigrade).

Turbidity

Turbidity is the measurement of the relative clarity of water. Turbidity increases as suspended solids (sediment, algae, sewage) in the water reduce the transmission of light. Sources of turbidity include sediment from runoff, stormwater, waste discharge, algal growth, and stirring of bottom sediment from storm events. The higher the turbidity level the lower the water quality for aquatic life. Water with high turbidity holds more heat and therefore less oxygen. Photosynthesis also decreases as light cannot filter as far down the water column. Turbidity is a measurement of suspended solids and this can affect aquatic life in adverse ways, including clogging gills, smothering bottom dwellers, and filling in habitat for aquatic organisms.