



Water Chemistry – What do all of those numbers mean?

➤ What does the UCBN monitor in this park?

The UCBN measures 5 water chemistry parameters every hour during a 6 month deployment June-November. These measurements are taken at each park every 3 years. The parameters we measure are: **dissolved oxygen, pH, specific conductance, temperature, and turbidity**. Non-routine measures include the assessment of *E. coli* bacteria.

➤ Why is each parameter important?

Dissolved Oxygen: Indicates the amount of oxygen available for fish and aquatic insects.

Fish generally need above 4 mg/L (milligrams per liter) to survive. They become stressed at 5-6 mg/L. The amount of dissolved oxygen decreases as temperature increases. This is one reason why trout and salmon do not do well in warm water. Dissolved oxygen is also influenced by the amount of vegetation/algae that grows and decays in the water. Specific types of pollution can also reduce dissolved oxygen.



pH: Indicates how acidic or basic water is. Pure water is neutral and has a pH of 7.0 units, as water becomes more acidic the pH decreases and as water becomes more basic the pH increases (the pH scale is from 0-14 pH units). This parameter can vary depending on levels of plant growth, excessive nutrients, and pollution. pH can affect the efficiency of fish and aquatic insect gills, and how they are affected by other pollutants. An acceptable pH is usually between 6.0 and 8.5 pH units.

Specific Conductance: Indicates how well water conducts electricity, which is a measure of the amount of dissolved solids in the water. One way to think of this parameter is how “salty” the water is. Not only is specific conductance influenced by salt like you put on your food, it is also influenced by a number of other dissolved substances in the water. This parameter is influenced by natural sources such as geology, stream flow, precipitation, and human induced sources such as salt water intrusion, and industrial pollution. Typical specific conductance in this area ranges from 150 to 300 $\mu\text{S}/\text{cm}$ (micro Siemens per centimeter). By comparison the specific conductance of sea water is near 55,000 $\mu\text{S}/\text{cm}$.

Temperature: Indicates how hot or cold the water is. Temperature impacts how much dissolved oxygen is in the water. Many animals have a range of thermal tolerance, for instance, the upper lethal for many trout is generally reported to be 77-78 °F (25-25.5 °C). Decreases in stream flow also contribute to increased temperatures. Stream side (riparian) vegetation helps reduce water temperature by providing shade to the stream.

Turbidity: Indicates how many suspended solids are in the water or how “muddy” the water appears. Turbidity is reported in Nephelometric Turbidity Units (NTUs). In simple terms, NTUs measure the amount of light scattered by particles (clay, silt, plankton, fine organic matter) suspended in the water. Pure water has a turbidity of zero and most “clear” streams in this area have turbidity less than 20 NTU. Turbidity often indicates how much sediment is in a river. Increased turbidity can be caused by natural or human induced stream bank or upland erosion. Sediment can cover the clean gravel necessary for fish to spawn, and reduce the habitat for aquatic insects.

***E. coli* Bacteria:** *E. coli* is an indicator organism used to measure fecal contamination in water samples. *E. coli* is a bacteria found in the lower intestine and waste of warm blooded animals like humans, dogs, livestock (cattle, sheep, hogs, etc.), deer, elk, bear, waterfowl, etc. While there are natural levels of *E. coli*, increased levels may pose a health risk to humans and/or indicate the presence of other harmful pathogens in the water. Un-natural sources of *E. coli* come from waste water facilities (releasing raw sewage), broken septic systems, concentrated animal feeding operations and pet waste (usually dogs). Less than 1 *E. coli* colony/100ml is permitted in drinking water and average levels below 100 colonies /100ml are suggested for contact recreation (swimming, etc.).





Water Chemistry – What do all of those numbers mean? (continued)

➤ Why does the UCBN monitor so many parameters?

The UCBN monitors five core water chemistry parameters that allow natural resource managers to determine the overall “health” or status of streams in each park. You might compare this to how a doctor measures your “vital signs” when you go for a checkup. If the doctor measured your body temperature and did not check your heart rate, blood pressure and rate of breathing, he/she could not understand your general overall health or physical condition.

➤ What can you do to protect water quality in this park?

- Stay on trails to reduce erosion and damage to vegetation

Why? When one person leaves a designated trail and stomps down vegetation, other people often follow the same path. Over time, the vegetation dies or loses its ability to hold the soil in place. As a result, soil and stream bank erosion contributes to increased stream turbidity.

- Pick up after your pet, even in the parking area

Why? Pet waste can contribute to increased *E coli* and fecal coliform in the stream. Pet waste can also harbor other pathogens such as *Cryptosporidium*, *Giardia lamblia*, and *Salmonella*. According to the EPA, “studies performed on watersheds in the Seattle, Washington, area found that nearly 20 percent of the bacteria found in water samples were matched with dogs as the host animals.”

- Dispose of your trash or recyclables in a designated receptacle or pack it out

Why? Much of the trash found along streams is recyclable (glass, plastic, paper, etc.). Most of these items will never decompose or exist for many years. Eventually, much of this trash is washed downstream towards coastal areas and into the ocean. Trash is often mistaken for food, and ingested by fish and birds.

- Reduce your water use while visiting the park and in your home

Why? Freshwater is a limited resource. Only 3% of the earth’s water is freshwater and only 1% is available for human use! The less water we use, the more water will be in streams and the water table for the benefit of wildlife and people. Most parks are equipped with low flow devices in faucets and toilets to reduce their impact on water resources. Even though you may live far away from a park, when you reduce water consumption you contribute to sustainable water use in the watershed.

- Follow park rules regarding hiking, fishing and water related activities

Why? Park rules are established for the protection of natural resources and visitors. Not following park rules and guidelines may reduce your ability to enjoy the park and ruin the experience of other visitors. Check with a park ranger to find out what activities are allowed.

➤ Additional Information

The most recent water chemistry data can be found in park specific resource briefs and in annual reports. Look for copies of these resource briefs in the visitor center. In addition, both the resource briefs and annual reports are available on the UCBN website (<http://science.nature.nps.gov/im/units/ucbn/>). Visit the USGS Water Science for Schools website for general information on water resources in the United States (<http://ga.water.usgs.gov/edu/index.html>)

