



Water Quality Parameters Explained

Parameter	What is it?	General Ranges
pH	A measure of water acidity. Specifically, pH is a measure of the concentration of H ⁺ ions in the water. (-log[H ⁺]). pH is measured on a scale of 0-14.	6.5-8.5 (Higher salinity water is associated with higher pH, seawater is usually 8-8.5). pH can vary throughout the day and with rainfall, tidal changes, and bio-load.
Alkalinity	A measure of the buffering capacity of the water. Measured as the concentration of carbonate ions in the water (mg/L). Carbonate ions (with bicarbonate and a small mixture of other ions) react with H ⁺ ions, removing the free H ⁺ from the water - the higher the alkalinity, the more the water is able to absorb excess H ⁺ (acidity) without a visible pH change.	Approximately 30mg/L (fresh water) to 200+ mg/L (seawater). Dependent on many environmental factors.
Salinity	Concentration of dissolved salts in the water. Measured in ppt NaCl (concentration of sodium chloride).	0 (fresh water) - 35 (full seawater)
Ammonia-N	Measure of the Nitrogen present as Ammonia (NH ₃ -N) and Ammonium (NH ₄ ⁺ -N). Ammonia can be added to the water via animal waste and decaying organic matter. Low levels in soil are normal, and it is a necessary nutrient source, but high ammonia in water can be toxic to fish and other aquatic organisms. Ammonia is naturally removed by bacteria that convert it to Nitrite as part of the nitrogen cycle.	Dependent on pH, watershed type, and other factors; EPA and many biologists recommend a chronic level below 2.0 mg/L.
Nitrite-N	Measure of the Nitrogen present as Nitrite (NO ₂ ⁻ N). As part of the nitrogen cycle, bacteria first convert Ammonia to Nitrite before other bacteria convert Nitrite to Nitrate. Nitrite in high levels is toxic to aquatic organisms and usually indicate contamination from fertilizer run-off.	Maximum level for drinking water is set by the EPA at 1.0 mg/L. Nitrites can be extremely toxic to fish and other aquatic organisms.

Parameter	What is it?	General Ranges
Nitrate-N	Measure of the Nitrogen present as Nitrate (NO_3^- N). Bacteria convert Ammonia to Nitrite and Nitrite to Nitrate as part of the nitrogen cycle. Nitrate is not generally immediately toxic to most aquatic organisms except at extremely high levels, and it is a necessary nutrient for plants and algae. High nitrate levels in water are usually an indicator of contamination from fertilizer run-off or waste water and can be associated with algal blooms, excessive plant growth, and oxygen dead zones.	Maximum level for drinking water set by the EPA is 10 mg/L. Levels vary in natural water systems, and Nitrate is usually taken up quickly by algae and aquatic plants. Spikes in Nitrate levels can indicate contamination from run-off and can cause algal blooms and alter other water chemistry.
Ortho-phosphate	Measure of the orthophosphate form of phosphorous (mg/L PO_4^{3-}). Orthophosphate is a necessary nutrient for plant and animal life, but increased levels can result in algal blooms and oxygen dead zones. Fertilizer run-off, wastewater, soil, and manure can all contribute to increased phosphates in water.	Depends on the water parameters, sediment load, and location. Spikes can indicate contamination from run-off and can lead to algal blooms and other biological issues.
Free Copper	Measure of free copper ions in the water (mg/L Cu^{2+}). Copper is a necessary nutrient in small quantities. High levels can be toxic to aquatic organisms and are usually a result of contamination from industrial operations or corrosion of copper pipes.	EPA level for copper in drinking water is set at 1.3 mg/L. Toxicity in the environment depends on the organisms present, the water parameters (such as pH and alkalinity), and the form of the copper.
<i>Enterococcus</i>	<i>Enterococcus</i> is a genus of bacteria whose members are found naturally in human and animal digestive tracts. Presence in water often indicates fecal contamination, usually from human or animal waste entering the water directly or via run-off, and can be an indicator of the presence of other potentially harmful organism in the waters. Enterococci measurement is the US federal standard for bacterial water quality assessments at saltwater beaches.	Bacteria levels can change quickly and drastically in any location based on a number of factors, including tides, rainfall, water temperature, and human/animal activity. In Virginia, swimming advisories are issued when levels exceed 104cfu / 100mL.