

Water Quality Parameters

Parameter	Streams	Explanation
Alkalinity	20 to 200 mg/L; PA standards require 20	Usually expressed in terms of calcium carbonate; carbonate compounds are found abundantly in nature & provide natural buffering; optimal is 100-200 ppm; low alkalinity cannot mediate low pH levels
Calcium	In limestone areas, typically 30-100mg/L	Leached from nearly all rocks but most prevalent in regions with limestone, dolomite & gypsum deposits; low Calcium in areas with granite or siliceous deposits; important for biological activity-plant cell walls, bony tissue & shells
Chlorine	Not to exceed 150 mg/L	Used for disinfection; does not occur naturally
Chlorophyll a	Recreation/aesthetics: <0.025mg/L	0-10 microg/L - no problems evident; 10-20 microg/L - algal scums evident, some discoloration; 20-30microg/L - nuisance conditions encountered; >30 microg/L - severe conditions encountered, very deep discoloration
Dissolved Oxygen	<3-4 mg/L is stressful to aquatic life; >6 mg/L is best for coldwater fishes	Oxygen levels controlled by photosynthetic & respiratory activity & diffusion; higher late in the day; lowest early AM
Fecal coliform bacteria		Not necessarily bad in itself, but may indicate presence of pathogens
Hardness	0-60 mg/L = soft; 61-120 = mod. hard; 121-180 = hard; >180 = very hard; 100-200 mg/L optimal	Due to dissolved salts of calcium, magnesium & sometimes aluminum, manganese and iron; Usually expressed in mg/l as CaCO ₃ ; >250 CaCO ₃ can precipitate out to stream bottom; May effect fish tolerance to toxic metals, toxicity of mercury, copper, lead, ammonia, phenols increases with lower alkalinity
Iron (Fe)	Not to exceed 1500 microg/L; Acceptable level: 0.3 mg/l	At pH > 3, iron precipitates out in water as ferric hydroxide (yellow boy); Can clog gills & smother habitats
Manganese (Mn)		Mostly a color problem
Magnesium (Mg)	In areas with source, 5-50 mg/L	Mainly from leaching of igneous & carbonate rocks; essential micronutrient in plants for chlorophyll production
Nitrogen (N)		Present in several forms - organic nitrogen, ammonia (the product of decomposition), nitrate and nitrite; occasionally it is the nutrient that limits algae growth
Ammonia nitrogen (NH₃-N)	Non polluted: <1 mg/L	EPA's recommended criteria is 0.02 mg/L for freshwater aquatic life with caution against using with temp. <5°C & pH>8.5 (Toxicity affected by temp. & pH); Acute lethal levels for fish ranges 0.2 to 2.0 mg/L; Sources - wastewater, agricultural runoff, decay of organisms
Nitrate nitrogen (NO₃-N)	Rarely exceeds 10 mg/L; Frequently <1 mg/L during high primary production	The most abundant inorganic form of nitrogen; drinking water standard is 10 mg/L; Algae can use nitrate as nitrogen source for growth
Nitrite N (NO₂-N)	Typically present in extremely low concentrations	Rarely present in unpolluted natural waters; generally <1 mg/L; High concentrations may be indicative of septic or sewage

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pH	6.5-8.2 optimal	7.0 is neutral; 8.5 and above may result from biological productivity (CO ₂); 5.5 and below is stressful to organisms, may indicate acid rain/acid mine drainage; low pH can release metals into the water
Phosphorus (P)	Non polluted waters - total phosphorus usually <0.1 mg/L	Present in several forms - organic bound, inorganic polyphosphates and inorganic orthophosphates; Very biologically active and cyclic; Sources - leaching from phosphate bearing rocks, fertilizers, sewage, detergents, septic tanks, soil erosion, agriculture, development; The element most likely to cause stimulation of plant production (Algae and aquatic plants use only the orthophosphate (PO ₄) form of phosphorus)
Ortho-phosphorus	Ortho-phosphorus <0.01 mg/L	Soluble Ortho-Phosphorus is the form most available to plants
Silica (Si)	Natural waters - 1 to 10 mg/L; rarely >60 mg/L	Common in nature from igneous rocks, quartz & sand; principle component of diatoms (silica-shelled algae); use by diatoms influences silica cycle
Sulfate (SO₄)	5-50 mg/L in natural waters; Not to exceed 250 mg/L	Usually second most common anion; from sedimentary rocks; in lakes is cyclic - organically reduced forms & free Sulfate is taken up by higher plants and algae
Specific conductance (conductivity)	Usually between 50-1500 micromhos	In natural waters, unit is micromho; affected by temperature; indicator of the amount of total dissolved solids
Temperature	Up to 66 F for coldwater fish; Up to 87 F for warm water fish	Maximum allowable temperature varies by season and water body
Total Dissolved Solids	Maximum = 1500 mg/L	The total amount of solids that are in solution in water; total dissolved solids consist of the anions and cations that are dissolved in water and include sodium, calcium, sulfates, orthophosphate, and other dissolved chemicals
Total Suspended Solids (TSS)	High level of protection = <25 mg/L; Moderate protect. = 80 mg/L; Low level protect. = 400 mg/L; Very Low level protect. = >400 mg/L; Harmful to fish eggs = 75-100 mg/L	Not all kinds of TSS are equally harmful; Walleye are sensitive to TSS with death rates at >200mg/L (reduced sight affects feeding ability); Good to moderate fisheries - 25 to 80 mg/L; 80 to 400 mg/L unlikely to support good fishery but could get by at lower end; AFS suggests limit of 100 mg/L to prevent aquatic life mortality, but concentrations can be greater without adverse effects
Turbidity	>100 NTU is excessive; 50 NTU is considered turbid	Turbidity is caused by the presence of suspended matter in water such as clays, mud, algae, silica and bacteria
Visibility - Secchi Disk		Usually used in lakes

mg/L = milligrams per liter, ppm = parts per million, ppb = parts per billion, microg/L = micrograms per liter
1 mg/L = 1 ppm = 1000 ppb
1 microg/L = 1 ppb = 0.001 mg/L

Parameters adapted from The Pennsylvania Lake Management Society (PALMS)

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