

Environmental CDE--Water Analysis

Measurable Parameters	Normal Ranges/Recommendations for Improvements
pH	Every one-unit in pH represents a tenfold change in acidity; Normal/acceptable ranges for fish production are 6.5 to 8.5; Acidic levels below 4.0 and alkaline levels above 11.0 are critical death points for fish; CORRECTIVE MEASURES (CM): pH can only be adjusted chemically—pH is raised by adding carbonates or bicarbonates; while pH is lowered by acids (acid-generating salts are used)
Nitrites	Comes from organic matter decomposition (sewage, fertilizers) and occurs in soils, mud and water; measurements more than 1mg/l (1 ppm) could cause fish death; especially a problem in ponds during spring and fall or when algae blooms suddenly die; ponds rich in nutrients can reach toxic levels quickly; causes “brown blood disease” (methemoglobinemia) in fish; most warmwater fish can tolerate ranges below 0.4mg/l if oxygen levels are high; CM: add 20mg/l for each 1mg/l of nitrite
Dissolved Oxygen (DO)	Desirable range is 5 ppm or above to avoid stress and death of aquatic animals; concentrations typical for surface water are influenced by temperature, but usually exceed 7-8mg/l (7-8 ppm); PONDS—DO fluctuates greatly due to photosynthetic oxygen production by algae during the day and continuous consumption of oxygen due to respiration; DO reaches maximum levels during late afternoon and minimum levels around sunrise; cloudy weather, rain, plankton die-offs, and heavy stocking and feeding rates result in low levels of DO, which can stress or kill fish; CM: avoid overfeeding; keep stocking rates at appropriate levels; avoid overfertilization; control plant growth; use aeration; circulate water (a stream will have higher levels of DO than a pond or still body of water)
Nitrates (NO ₃ -)	Produced by decaying organic matter, sewage, fertilizers and nitrates in the soil; generally nontoxic to fishes and can expect to occur at less than 2mg/l in natural surface water; fishes can tolerate several hundred mg/l; high concentrations may suggest pollution; high levels encourage growth of algae and other organisms which may produce undesirable taste and odor of water; CM:
Phosphates	Usually present in slight amounts (less than 01 mg/l) in natural surface and well water; aside from promoting unwanted algae growth in ponds, it is considered harmless; CM:
Water Hardness	Measured as ppm of CaCO ₂ (calcium carbonate); hard water consumes soap before a lather will form and creates scales in boilers, water heaters and pipes; fish do best when water is between 20 and 300 mg/l (ranges of soft, moderate, hard and very hard); levels below 20 mg/l results in poor fish production; CM: water softener

Chlorine

Usually present in levels of 1mg/l in municipal water because of chlorination; toxic to fish at concentrations less than 0.05 mg/l; water for fish culture should contain zero residual chlorine; CM: can be removed by extended aeration or by adding sodium thiosulfate

Ammonia

Is a product of fish waste; occurs in some well and pond waters; as fish populations increase, ammonia levels can reach harmful levels; any amount is considered undesirable, but stress and some death occurs at 2mg/l (2 ppm); at more than 7 ppm, fish loss increases significantly; occurs as either ionized ammonia (NH_4) or un-ionized (NH) ammonia \rightleftharpoons un-ionized is more toxic and occurs in greater proportions at high pH and warmer temperatures; un-ionized concentrations greater than 0.1 mg/l is stressful and concentrations approaching 0.5 mg/l become lethal; pH above 8 and ammonia levels higher than 0.5 mg/l is cause for serious concern; ammonia levels are usually low with phytoplankton blooms and is highest after plankton die-off; CM: avoid overcrowding; avoid overfeeding; add freshwater; control plant growth; monitor pH; remove fecal matter (backwash systems)

Current Temperature

Varies based on type of animals in water; cold water fish thrive in temperatures between 50°F and 65°F; warm water fish thrive in temperatures exceeding 70°F; changes in temperature of 2°F-3°F within a 24 hour period can cause thermal shock to fish; temperature influences solubility and percent of un-ionized ammonia in water; CM: