MARYLAND COOPERATIVE EXTENSION
UNIVERSITY OF MARYLAND
COLLEGE PARK-EASTERN SHORE

WATER QUALITY

Temperature -- High temperature can be detrimental to fish production. Not only is there a maximum temperature at which fish can live, but solubility of oxygen in water, along with its availability to the fish, diminishes at high temperatures. Oxygen demand of fish and other aquatic life usually increases as temperature rises. Sudden temperature changes, either up or down, are likely to be harmful.

Coldwater species (trout) require 52-68° F

Cool water species (walleye, muskie, etc.) require 68-Tr f

Warm water species (Bass) mid 70's-low 80's (catfish stop feeding about 60° F while Striped Bass and their Hybrids will go lower - while their feeding drops off rapidly at around 50° F, they may lightly feed in temperatures as low as the upper 30's to low 40's F)

This is easy and inexpensive to measure with thermometers.

Dissolved Oxygen -- This is one of the most critical parameters for a healthy fish environment and should be measured frequently in production systems. 0_2 requirements of the fish vary with the species and age of the fish, prior acclimitization, temperature and the concentrations of other substances in the water. Supersaturation of oxygen can also be detrimental to fish production. To show the comparison with surface dwelling animals, air has 200,000 ppm 0_2 but water may only have 10 or less. Dissolved oxygen is dependent upon the temperature of the water for its saturation point.

Coldwater species require more-keep above 6 ppm

Coolwater species keep above 5 ppm

Warmwater species keep above 5 ppm

pH -- Is the measure of the acid/base relationship of the water and controls the degree of dissociation of many substances. The optimum range depen□s upon temperature, dissolved oxygen, prior acclimitization and the content of various anions and cation. In most cases, a pH range of 6.5 - 8.2 is quite suitable for healthy fish production. It should be in the 6.5 - 9.0 range and is best in the area of 7.0 - 8.0 but can go as high as 10.0 or below 6.5 for short periods, pH fluctuates daily with increases occuring in the afternoon and decreases through early morning hours.

Alkalinity -- Buffers the water and prevents sudden shifts in pH. Alkalinity levels of 100 to 120 mg/L with pH values between 7.0 - 8.0 are generally recognized as best for support of diversified aquatic life.

30 - 50 mg/I preferred

≥40 mg/I - considered “hard”

<20 can cause fish mortality problems with copper sulfate applications

Hardness -- The measure of calcium and magnesium in water. Soft water increases sensitivity of fish to toxic metals. Some hardness is considered beneficial. Excess hardness in aquaria can limit fish growth.

20 - 300 mg/I is generally desirable

Ammonia -- Can be toxic to fish, especially at a high pH with low dissolved oxygen levels. It decreases ability of fish to take oxygen into their blood and can cause suffocation. Ammonia levels as low as 0.06 mg/L can damage fish gills, reduce feeding, and impair natural functions.

Nitrite -- Toxic to fish and should be monitored closely, especially when high production is the management objective. The •brown blood disease• problem in catfish farming is caused by toxic levels of nitrites which can occur when chloride and oxygen levels are too low. High nitrite levels are also detrimental to oxygen supply because plankton growth is stimulated.

Acidity -- Usually caused by the presence of mineral acids, salts of strong acids or free carbon dioxide. Although organic acids of natural origin are usually not a problem, mineral acid pollution is detrimental to fish.

Carbon Dioxide -- The toxicity level varies by fish type, water temperature and dissolved oxygen content. In some cases, CO_2 can have beneficial effects by lowering the pH and reducing ammonia toxicity. It is stressful to fish, hinders oxygen uptake, and has a marked effect on fish behavior.

Chloride -- The effects are closely related to total salinity and the ability of fish to take up oxygen. Freshwater fish cannot tolerate sharp changes in salinity. for some fish, 400 mg/L can be harmful. It can also be beneficial where nitrite levels tend to be high. Chloride is often added to catfish ponds to control the uptake of nitrite by the fish.

Copper -- May exist in natural waters as a soluble salt or a suspended solid. A small amount is essential for plants and animals and concentrations exceeding 0.1 mg/L are useful for controlling algae and plankton growth. In saltwater aquaria, copper (in the form of copper sulfate) is often used as a treatment for parasite-infested fish. Though saltwater fish are tolerant to high levels of copper, the dosage should not exceed 0.25 mg/L.

Phosphorus -- Enters water supplies from soil run-off. industrial operations, and sewage. While necessary for biological growth, too much can cause excessive growth of algae, and may lead to eutrophication.

Tannin/Lignin -- Lignin is a plant constituent often discharged during paper pulp manufacture. Tannin may enter the water through vegetable matter degradation or tanning industry waste. Tannin is also applied in internal treatment of boilers, reducing scale formation. Both contain aromatic hydroxyl groups that react with certain acids in test kits to form a blue color although the reaction is not specific for lignin or tannin. Unless either substance is definitely known to be present, results of test are usually reported as "tannin-like", “lignin-like", or simply as “hydroxylated aromatic" compounds.