A Few Things to Know About...

WATER CHEMISTRY

DISSOLVED OXYGEN/TEMPERATURE

Dissolved oxygen (DO) is the most critical indicator of a lake's health and water quality. DO levels in natural waters are dependent on the physical, chemical and biochemical activities prevailing in the water body. Oxygen is added to aquatic ecosystems by aquatic plants and algae through the process of photosynthesis; and by diffusion at the water's surface and atmosphere interface. Animal and plant respiration and decomposition are major causes of oxygen depletion. Oxygen is required for fast oxidation of organic wastes including bottom muck. When the oxygen is used up in the bottom of the lake, anaerobic bacteria continue to breakdown organic materials, creating toxic hydrogen sulfide gas in the process. For a healthy game-fish population, oxygen levels in the 6-10 mg/L range are necessary. Respiration stress in most fish occurs when oxygen levels are reduced to 3-4 mg/L.

Temperature must also be considered when looking at oxygen levels in lakes since warmer water cannot hold as much oxygen as cooler water. A difference of 1°C (33.8° F) or more between surface temperature and temperature at depth indicates that the lake is stratified, and is therefore in danger of having low oxygen levels below the surface.

pH

The pH value of a body of water expresses its tendency to donate or accept hydrogen ions on a scale of 0 (very acidic) to 14 (very basic). Natural waters generally range from pH 6.5 to pH 8.5 and are often slightly basic, especially in Florida retention ponds. Any major pH deviations over time for a given water body could indicate the onset of intrusion of strongly acidic or alkaline wastes.

When pH is higher we might suspect some marine influence and when pH is lower we become concerned that the water may not have enough buffering capacity to handle some types of pesticides. In itself, a pH outside of the desirable range is not necessarily a concern unless the other parameters in the lake suggest problems.

CONDUCTIVITY/TOTAL DISSOLVED SOLIDS (TDS)

These measurements of freshwater salinity estimate the total concentration of the ionized substances dissolved in the water. The concentration of these dissolved substances is measured by the water sample's ability to carry an electrical current. Conductivity measures salinity with a current while TDS estimates the concentration of salts in water based on that current. A significant increase in conductivity may indicate a recent increase in domestic or industrial pollution. High dissolved solids may cause irrigation water to stain vehicles and other surfaces in the general vicinity.

While the state standard for conductivity is 1275 µmhos/cm, we chose to lower our desirable threshold to 1000 µmhos/cm. Water with conductivity greater than 1000 µmhos/cm generally experiences some marine influence and should be treated with that in mind.

COLOR

Color in water is a result of natural iron and manganese ions, decomposing organic plant material, tannins, plankton algae, and industrial and domestic pollution. Changes in color may reflect increases in dissolved nutrient levels. Colored lakes can withstand higher nutrient levels without experiencing algae blooms due to the reduced penetration of light. However, colored lakes generally have higher nutrients to begin with since the source of the color is likely a nutrient source as well. There are no known aquatic health issues associated with high color. However, we measure apparent color (unfiltered water), and values greater than 200 may indicate high turbidity, which can adversely affect wildlife.

PHOSPHATE

Biologically available phosphorus is found in lakes, waterways and wastewater in the form of phosphates. Phosphate increase is the most common cause of undesirable growth of aquatic weeds and algae. The discharge of reclaimed wastewater and watershed drainage will increase a lake's phosphate level. Lawn and landscape fertilizer runoff are another major source of phosphate in lakes and their use should be avoided near the water.

TOTAL PHOSPHORUS

Total phosphorus measures all the forms of phosphorus, both dissolved and particulate. Ponds and lakes are categorized by their total phosphorus level and high phosphorus waters are considered polluted or "eutrophic". Control of undesirable blue green algae can often be obtained at phosphorus levels below 0.02 mg/L.

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AMMONIA

Nitrogen is a product of the natural metabolism of plant and animal matter, and fertilizer runoff. Organic nitrogen can take many forms in water, including nitrate, nitrite, and ammonia. If ammonia is present in significant quantities, it can indicate that the water column does not have sufficient oxygen to oxidize ammonia to nitrite and nitrate. When available, all three of these nutrients can promote plant and algae growth when phosphate levels are sufficient. Ammonia concentrations below 0.3 mg/L significantly limit plant and algae populations in low phosphate lakes, although phosphate is generally the limiting nutrient in Florida lakes. Reduced fertilizer applications near shorelines can sometimes help prevent increases in these and other nutrient levels, but much of the ammonia and phosphate present in older lakes (5+ years) is recycled from the sediment. Both aeration and dredging can reduce this internal loading.

Ammonia can be toxic to fish and other animals, and the toxicity is based on the total ammonia concentration, pH, and temperature. We chose our acceptable ammonia levels based on where we might expect to start seeing toxicity under some pH and temperature conditions. When we see levels higher than 1 mg/L, we suspect unusual discharges (such as treated wastewater) to that pond and do not expect to control algae or plants very well in the pond without higher than normal levels of aeration.

TURBIDITY

Lack of clarity, known as turbidity, in natural waters is caused by the presence of suspended solids such as silt, clay, fine organic and inorganic matter, plankton and other microscopic organisms. The turbidity test measures an optical property of the water sample and is used as an index of water clarity. Turbidity values of 10 N.T.U.'s (Nephelometric Turbidity Units) or more indicate high sediment concentrations, often due to increased runoff, higher flow, or construction activity in the drainage basin.

SECCHI

Secchi depth is a mechanical test to judge the depth of clarity of a body of water. This is accomplished by lowering a black and white disk into the water and recording the point at which it disappears. Generally, nutrient rich lakes tend to have Secchi depths less than 8 feet and highly enriched sites less than 3 feet. However, many lakes are exceptions to this rule based on other parameters, and Secchi in isolation cannot always diagnose a lake's overall health.

CHLORIDE

One of the major inorganic anions in water, chloride levels in coastal communities may be high due to saltwater intrusion, and levels over 250 mg/L chloride will have a detectable salty taste. Florida turf grasses have varying tolerances for chloride and levels exceeding 600 mg/L are not suitable for irrigation. Levels higher than 600 mg/L can also harm aquatic life.

HARDNESS/ALKALINITY

Alkalinity indicates the water's buffering capacity. Good buffering capacity can limit dangerous pH swings caused by the introduction of highly acidic or basic substances, the effects of which can be compounded by the consequent loss of aquatic life. Total hardness is defined as the concentration of calcium and magnesium in the water. Calcium is necessary for proper fish egg and fry development. Closely related to alkalinity and pH, sufficient hardness levels can help decrease ammonia and pH toxicity.

IRON

When concentrations exceed 0.1 mg/L, iron precipitates on exposure to air, decreasing pond clarity, potentially clogging irrigation pipes, and encouraging iron bacteria, which affects the flavor of both fish and water. Levels greater than 0.3 mg/L can cause staining on buildings and sidewalks when the water is used for irrigation.

TOTAL ORGANIC CARBON (TOC)

TOC is a non-specific estimate of 'cleanliness' of water that is often used in the wastewater industry. Natural sources of TOC include decaying plants and other organic materials. These carbon wastes feed bacteria and contribute to oxygen demand that strips the water column of dissolved oxygen.

ALKALINITY

The result of this test indicates the water's buffering capacity. Water with adequate buffering capacity can limit dangerous pH swings caused by the introduction of highly acidic substances, such as acid rain and pollution, the affects of which can be compounded by the subsequent loss of plant, algal, and other aquatic life.

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