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Here's Johnny!

Sure, *The Shining* was terrifying. But algae strikes fear into our hearts, too.

Last spring's rains caused many different feelings, from concern over prolonged lush growth of grass into the heat of summer to possible flooding to confusion about what was happening to the bodies of water we had to contend with on a daily basis. Those of us charged with maintaining "water quality" in the lakes and ponds probably felt like Jack Nicholson's character in The Shining *was reincarnated as an algae bloom on a weekly basis. The frequent rains regularly loaded nutrients into the water and fed our unsightly friend a steady diet. This was more of a problem for some than for others.*

The most frequent cause of problems in a pond, lake, water hazard, etc., is the design and construction of the body of water itself, which sometimes doesn't provide for the natural cycles of the seasons and their effects on the ecology of the aquatic environment.

Various options are available to deal with the conditions we experienced, including chemical treatments and aeration. I don't intend to go into either of those directly here. My intention is rather to share some observations and help achieve a better understanding of what happens to cause the problems.

The most frequent cause of problems in a pond, lake, water hazard, etc., is the design and construction of the body of water itself, which sometimes doesn't provide for the natural cycles of the seasons and their effects on the ecology of the aquatic environment. For example, a pond (a small lake with a depth of 7-8 feet or less) doesn't go through the normal temperature cycles that occur in all deeper bodies of water in temperate climates. There is no temperature layering, but rather a gradient of temperatures from top to bottom. There is no formation of a thermocline, dividing the lake into upper and lower levels. As a result, the warm upper layer extends all the way to the bottom, allowing the algae to develop throughout the profile.

Fish and other aquatic animal life require oxygen in varying amounts. Most fish require 4.0 milligrams per liter for survival, and more than that for adequate growth and activity. The factors of temperature, pH, concentrations of carbon dioxide and oxygen and the decomposition of organic matter work against one another. The cycle of the photosynthesis process, wherein plants take in carbon dioxide and give off oxygen in the presence of sunlight, is also an important issue.

During the warmer summer days, the water at the surface increases in temperature, expands slightly and becomes less dense. Because of its exposure to sunlight and the surface-available oxygen and carbon dioxide, this "lighter" water will support the greatest level of photosynthesis and growth of microscopic plants—namely algae. These organisms have short life spans, so many generations of them end up on the bottom of the pond by season's end. In the shallower ponds, the resulting decomposition of organic matter increases the carbon dioxide and reduces the pH, creating an environment in which fish cannot take up oxygen as rapidly. There is less oxygen because the warm water doesn't dissolve as much as colder water and because the aerobic bacteria use it much more rapidly to decompose the organic matter.

In deeper, colder water, however, bacteria consume oxygen less rapidly. Even though oxygen is more soluble in colder water, and colder water has a greater capacity to hold oxygen, there is less oxygen in the lower level of the lake because it doesn't pass through the thermocline from the upper layer. This causes the fish to stay in the upper layer of the profile. The oxygen supply in this layer can be quickly depleted. The dead organisms that fall to the bottom from the upper level increase the demand for oxygen and increase the production of carbon dioxide. In addition, when the photosynthesis process of the various aquatic plants stops each evening, carbon dioxide uptake and oxygen production stop. Oxygen uptake and carbon dioxide production continue slowly until morning, sometimes reaching disastrously low levels of oxygen for fish by the time there is sufficient sunshine to reverse the process.

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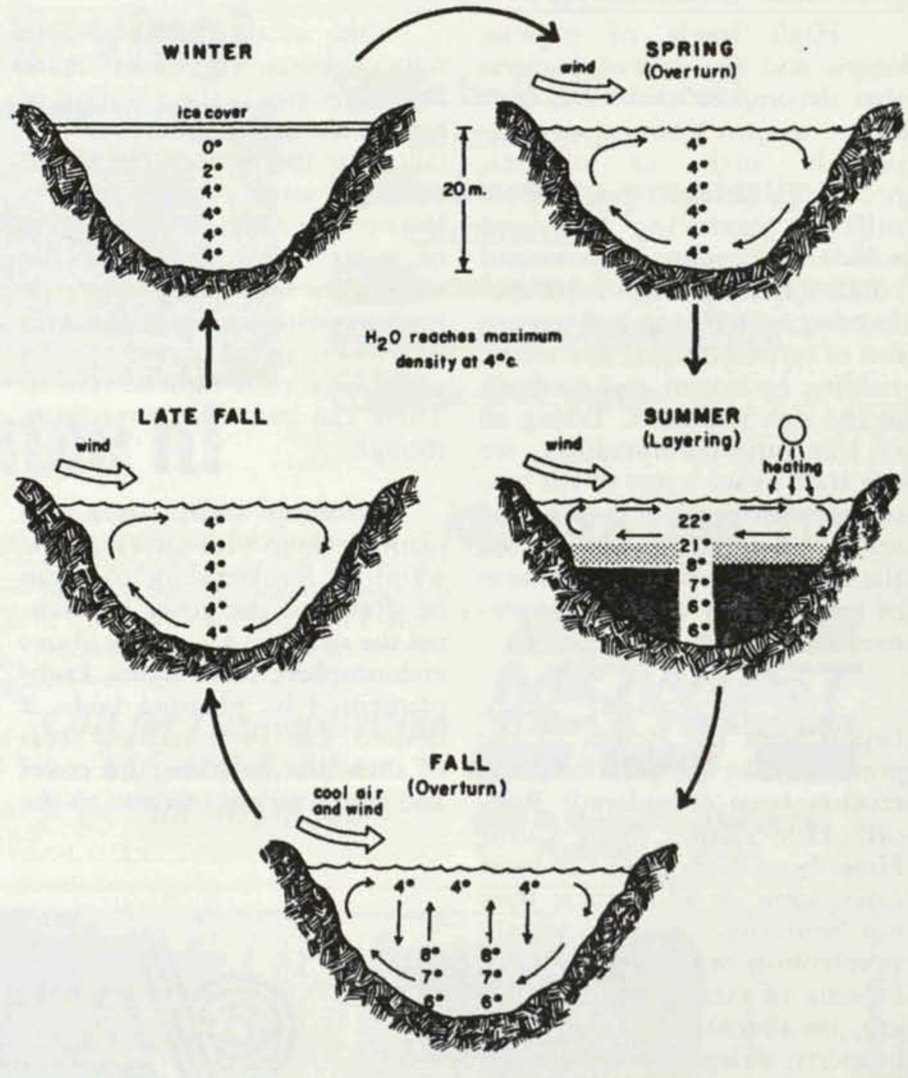

TEMPERATURE CYCLES IN A LAKE

Typical events of warming, cooling and stratification in a temperate lake.

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High levels of organic debris and the related bacteria that decompose them can start to use oxygen from other compounds such as nitrates, producing nitrogen gas, or from sulfates, producing hydrogen sulfide. In extreme or prolonged conditions, special methane-forming bacteria can pull oxygen out of carbon dioxide and water, yielding hydrogen and methane in the rich sediment. Taking all of this into consideration, we can start to see some of the reasons for mixing and cooling the water. In addition, we can see the relative need for prevention of pollution by a variety of elements.

This prevention, again, begins with the design of the pond or lake in question. Has erosion been considered? Run-off? How 'bout them Cubs? How 'bout them geese? In most cases, some or all of these have not been given as much priority as retention or holding capacity, expense of excavation and hauling, or alternative uses for the property, all legitimate concerns. However, considering a little remodeling or rework can have some long- and short-term benefits.

Shoreline erosion prevention can be addressed in many different ways with as many different costs. Formal and informal settings have different requirements. Important to remember, though, is that the shoreline treatment does not have to be continuous and uniform. Stone or block walls are ideal in areas of high water movement. Segments of seawall can be used as well. A less expensive alternative is rip-rap. None of these are effective deterrents to run-off, however.

One of the most efficient ways of preventing run-off into a body of water is the planting of cattails along the shoreline. Cattails slow the flow of solids and consume some of the nutrients before they reach the main body of water. They also block the view of the water, in many cases, to the consternation of the residents who, in many cases, paid a premium for the right to view it. There can be a happy medium, though.

Forming small coves and planting them with cattails is one solution. Surrounding turf can be sloped to the coves to channel the run-off. Any of the above erosion-prevention styles, complemented by planting beds, if desired, can then address areas of shoreline between the coves and give a variety of views to the water. In addition, any of the plantings that could theoretically harbor predators can be a passive deterrent to our beloved geese. Anything of this nature is a bonus. Periodic cleaning of the coves can prevent a majority of the unwanted pollutants from reaching the main body of water.

Any effort to minimize man's effect on the life span of a body of water should be considered. That life span, from lake to pond to swamp to bog, etc., gets shorter everyday. Despite the title of this column, there are no experts, just a lot of people who keep trying.