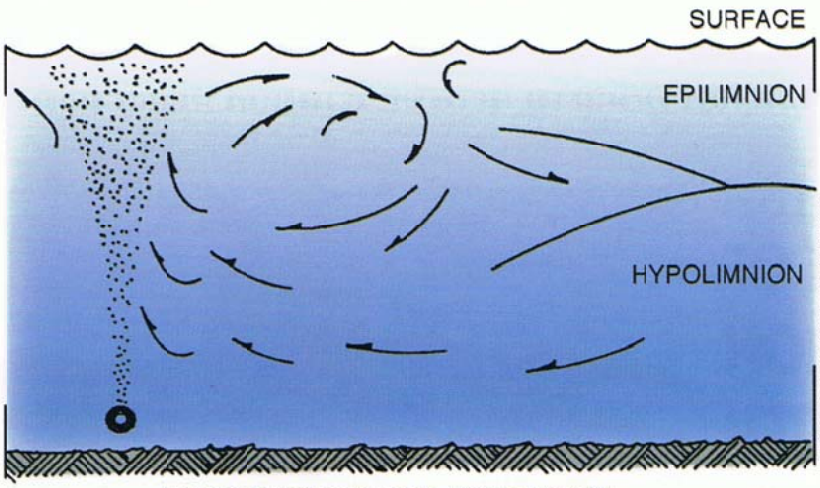
Lake Aeration con't

bacteria, crayfish, and other beneficial organisms die, providing additional nutrients, and an anoxic release from the sludge is likely to be precipitated in.

Thermal stratification is common in lakes and ponds, even large reservoirs. Many professionals are familiar with the problem of "turnover" in a lake, where large amounts of material from the sludge layer rise to the surface, usually in the fall. At the least, massive algae blooms are a common result of thermal stratification.

Chemicals, like copper sulfate, are often effective in killing the algae. Unfortunately, the causes of the algae bloom are not addressed, and, as has been pointed out, the dead organisms provide fuel for a future fire. In addition, beneficial life forms may be affected by the chemicals and a hazardous waste situation may result if the water feature in question has to be dredged or enlarged.



PHOTOS COURTESY OF E.P. AERATION

CIRCULATION INDUCED BY AERATION

Aeration encourages the beneficial, or desirable, life forms in a water feature to compete effectively for available nutrients with the algae. The role of an aeration system is to bring into balance the dissolved oxygen levels and temperature throughout the water column.

Principles of Aeration

Aeration, on the other hand, can effectively treat the causes, the disease itself. In order to do this, an aeration system must be capable of moving the lower layers of water to the surface, where they can be oxygenated most efficiently. Ideally, in water features of 2 or 3 million gallons or less, the entire body of water should be "turned" about eight times per day.

What actually takes place in effective aeration is the encouragement of the beneficial, or desirable, life forms in a water feature to compete effectively for available nutrients with the algae. Aeration systems, even those using ozone, are not designed to "kill" the algae, but to create an ecological balance which discourages the conditions in which algae blooms occur. Furthermore, higher bottom oxygen levels will benefit any bioremediation programs in use.

Moving the water from the lower levels to the surface must not create turbulence at the sludge layer. If the sludge is disturbed through relatively violent action, nutrients are released into the water column.

This brings us to the nature of the delivery system. In addition to low turbulence, the question of whether the system can directly address the problem of thermal stratification is of extreme importance.

Another important consideration in choosing an aeration system, in addition to the efficiency of the system in turning the millions of gallons of water in a typical water feature, is the operating cost. A system using high horsepower to move relatively small amounts of water will obviously cost much more in the long run than a system using low horsepower to move larger amounts of water, despite any disparity in purchase price.

However, no aeration system can truly be effective in very shallow (less than 4 feet of depth) water features. This is because sunlight can generally penetrate right to the bottom, and the ability of a system to set up any kind of movement between the bottom and surface layers is severely hampered.

This brings us to some notes on design and construction of water features. Depth and bottom contours should be consistent, with a depth of 6 to 25 feet, a general rule of thumb, in order to maximize the efficiency of an aeration system. Shelves around the edges, often designed for safety considerations, will act in the same way as very shallow overall depths – like petrie dishes, an algae paradise.

Inlets and outlets should ideally be placed as much at opposite ends of the water feature as possible. This is particularly the case with lakes or ponds used for irrigation. Otherwise, the water which flows in quickly flows out, leaving it untreated by aeration.

These are just highlights gained from years of study and experience. To sum it all up, efficient aeration can address the causes of algae blooms, as well as metals, chlorohydrocarbons, phosphates, and other chemical contaminants. Such a practice makes for better neighbors and fewer regulatory concerns, as well as more pleasing aesthetics in your water features. lasn

Michael McGee is president and general manager of E. P. Aeration. Frank Gardner is a freelance writer and marketing consultant based in Arroyo Grande, Calif. For further information, contact Mike McGee at E. P. Aeration, 2615 Meadow St., San Luis Obispo, CA 93401. Phone 1-800-556-9251, FAX 805-541-6149. www.epaeration.com

Reprinted with the permision of Landscape Communications, Inc. from the August 1999 issue of *Landscape Architect and Specifier News.*

www.landscapeonline.com

LANDSCAPE ARCHITECT

AND SPECIFIER NEWS

THE INDUSTRY TRADE MAGAZINE FOR THE COMMERCIAL LANDSCAPE SPECIFIER NATIONWIDE!

Lake Aeration

THE ROLE OF AERATION IN WATER FEATURES

by Michael McGee & Frank Gardner

PHOTOS COURTESY OF E.P. AERATION

Through effective lake aeration, the unattractive slimy green surface was transformed into a healthy lake environment. The role of an aeration system is to bring into balance the dissolved oxygen levels and temperatures throughout the water column.

In warm weather, the surface of your lovely water feature suddenly develops a green, slimy mass which looks as if it may begin to pulsate, leave the water, and threaten the surrounding countryside, like the monstrous entity in some early Steve McQueen B movie. Your instinct may be to use extreme measures – the chemical equivalent of calling in the National Guard for a tactical nuclear strike.

Instead, what's really needed is something more environmentally friendly and less radical – air. To be more precise, oxygen, delivered through an effective aeration system, is the weapon of choice. Like the defeat of the Martians by the common cold in War of the Worlds, it is usually the simplest solution which works best.

Algae are ever-present in natural water features. The organism can survive frozen in Arctic wastes, and thrives in the hottest climates. Killing the existing algae bloom is a short-term measure, and actually contributes to future blooms by depositing nutrients (organic matter) in the sludge layer.

It is necessary to understand and treat the causes of massive algae blooms – the disease itself – rather than treating the symptoms. These causes are imbalances in both dissolved oxygen levels and temperature between the surface layer and the bottom layer of a water feature, and thermal stratification.

Therefore, the role of an aeration system is to bring into balance the dissolved oxygen (DO) levels and temperatures, throughout the water column. An effective aeration system must move water from the bottom layers to the surface. Although a certain amount of oxygen transfer can take place through the injection of air into the water column, the greatest amount of oxygenation takes place at the surface, through wind and wave action.

Defining the Problem

Let's examine how the factors introduced above affect algae blooms. First, dissolved oxygen levels naturally fluctuate throughout the day. If the DO levels at the bottom, or sludge, layer drop below 2 parts per million, nutrients sequestered in the sludge are released into the water column. This process is called an anoxic release of nutrients.

These sludge-layer nutrients can range from decaying organic matter to chemicals such as phosphates, chlorohydrocarbons, and metals (particularly iron and manganese). The introduction of additional nutrients, plus sunlight, plus the constant presence of algae equal the probability of a massive algae bloom.

Temperature differences of as little as three degrees Centigrade between the surface layer and the bottom can produce thermal stratification. Below the warm surface layer, a cold layer, or thermocline, forms. This condition inhibits the natural movement of surface water to the bottom, and vice versa, through convection.

The result is rapid depletion of oxygen by the existing organisms in the layers below the thermocline. When the oxygen is depleted, the