

# Understanding Your Pond and Lake Conditions

Golf Course Superintendents are faced with a unique challenge by managing their aquatic resources. You are expected to maintain lush green turfgrasses and crystal clear lakes, ponds and streams. As research has shown, irrigated and fertilized landscapes may leach minute amounts of nutrients into water resources. Higher nutrient levels eutrophy (or age) lakes at an accelerated rate. Lake bed aeration is one of the most fundamental steps towards achieving balance in your aquatic resources.

## Pond & Lake Environmental Conditions

During the summer months, ponds have a tendency to develop algal blooms, depending on the amount of nutrients that flow into the pond. These blooms (unicellular) can be beneficial in the sense that they shade out the sunlight and to a degree stop the development of undesirable plant growth.

These blooms are alike to terrestrial plants in that they produce oxygen during the daytime and are oxygen consumers at night. The algal blooms seldom exceed a depth of much greater than three feet; however, they prevent the penetration of sunlight to greater depths. As a result, the upper surface of the pond is supersaturated with oxygen and the bottom is frequently devoid of oxygen.

The pond or lake is divided into three regions in accordance with temperature and depth.

The upper region is called the epilimnion and under normal conditions contains suitable amounts of oxygen and is the site of algae growth. The next is the thermocline which is the point where light penetration is minimal or nonexistent. A severe oxygen and temperature gradient exists between these two layers. The next region is called the hypolimnion. This is the bottom layer of the pond or lake. Because of these conditions, fish are restricted to the upper regions in order to obtain sufficient oxygen to survive. Lake trout and deep water fish are killed off by the low levels of oxygen.

They are unable to feed on the bottom which, if oxygenated, would provide benthic organisms. That in turn would provide additional nutrition resulting in better growth and survival. During the latter part of the fall, the water in the epilimnion becomes colder. The resulting increase in density causes it to sink to the bottom, bringing oxygen to the hypolimnion. However, if oxygen levels in the epilimnion have been low all summer, then all three regions may contain very low levels of oxygen.

During the winter when the pond ices over, the same effect occurs. The ice prevents the penetration of the life-supporting sunlight. It effectively seals the surface of the pond or lake and does not permit gas exchange with the

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## Pond and Lake Conditions —

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atmosphere. This eliminates the supply of oxygen to the living organisms in the pond they suffocate.

### Lake Bed Aeration

Aeration means adding air to the water. Because air contains 22% oxygen, aeration adds oxygen to the water. "To restore a lake to health, it is essential to get oxygen down to the lake bottom. Lake bed aeration not only adds oxygen to the surface water but to the water at the bottom of the lake as well. Once the lake is full of oxygen near the bottom, new insect larvae, snails and other fish food can begin to live on the bottom.

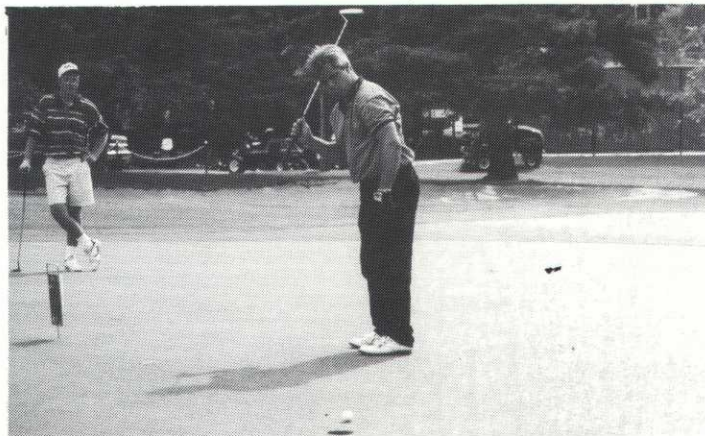
Lake eutrophication begins when the BOD (Biological Oxygen Demand) of a lake cannot be met. When too much pollution enters the lake, plant and algae growth dies and sinks to the bottom and an overload of organic buildup occurs. The lower forms of life on the lake bed die and this debris rots. Anaerobic bacteria, which need no oxygen, give off deadly poisonous gases, such as hydrogen sulfide, ammonia and methane. These gases, as they arise through the water, unite with and bind up any dissolved oxygen remaining in the water. There being no oxygen left, the fish die.

By pumping compressed air out of the lake bed aerator, the rising air bubbles bring the bottom water to the surface. Large volumes of water lose bad gases to the air and

pick up more oxygen while on the surface. If oxygen is present at the lake bed, dead organisms won't accumulate. What there is will quickly be eaten by aerobic bacteria, thus providing for a healthy lake environment.

Aeration systems also reverse lake aging and degradation; clean up lake water and improve water clarity; oxidize phosphate, ammonia and nitrate to reduce their level; stop buildup of organic and inorganic pollutants that are "killing" your lake; increase fish growth, fish production and carrying capacity of your lake; reduce aquatic vascular plant growth; prevent summer and winter kill of fish; keep water open year around to water livestock and help reduce unsightly green algae and planktonic algae blooms.

—Keeton Fisheries Consultants, Inc. in *The Perfect Life*



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