Controlling nuisance aquatic growths in golf course ponds

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Introduction

Water and little boys have one thing in common — it's very hard to make them sit still and do nothing. When water is detained in a pond, the wise course superintendent prepares for trouble. It matters not whether your pond is essentially a large wading pool or a small lake, no size of pond is exempt from nuisance aquatic growths.

Certainly some ponds are more prone to problems than others. The ideal pond is spring-fed, cold and deep with steep shorelines and a short detention time. If your pond is a shallow, flooded swamp which is essentially stagnant, the author sincerely hopes that you enjoy a challenge.

Algae is the most common nuisance aquatic growth, with rooted aquatic weeds running a close second. Algae range from slimy or hairy growths or submerged substrates (epiphyton) to minute, suspended forms (plankton) which are distributed from the surface to the depth where light penetrates. An abundance of plankton is termed an algae "bloom" in which the algae form a scum and/or color the water brown or green, depending on the species involved.

Aquatic weeds can be found from the shoreline down to 5 metres, but the preferred depth is 1 to 3 metres. These plants have vascular supporting tissue, true leaves and they are rooted. Aquatic weeds range from short carpets of grass-like plants to objectionable, dense beds of surfacing pondweeds. And you thought that all your weed problems were in your turf ...

There are two avenues for attacking nuisance aquatic growths: chemical control, and modification of the pond environment. This article should help the ground superintendent develop a pond maintenance program and plan modifications to the pond itself if necessary.

Controlling algae and reducing nutrients

Like all plants, algae require a variety of minerals for optimum growth. By far the most common limiting nutrient is phosphorus, while nitrogen, silica and carbon are considered to be important macro-nutrients. A reduction in the available nutrients, particularly phosphorus, will result in a matching decline in a algae productivity.

An obvious source of nutrients to a golf course pond is the fertilization of the surrounding turf. Every effort should be made to ensure that no fertilizer falls directly on the pond during its application. Similarly, grass clippings, leaves, etc., represent a nutrient contribution and should be disposed of elsewhere. Sloughing banks also donate nutrients to the pond and they should be stabilized with a bulkhead or rip-rap.

In addition to the external sources of nutrients, ponds regenerate nutrients internally. The most significant source of internal loading are the sediments when anaerobic conditions prevail in the overlying water. Ponds that are 3 or more metres deep are prone to this problem. The mechanism is as follows: The sun warms surface water faster than bottom water, resulting in layers of water with different temperatures and hence unequal densities. The warm, upper epilimnion does not mix with the colder, hypolimnion until the return of cool weather, or a severe wind storm which has the required energy to mix the entire water column in what is called "turnover". During the

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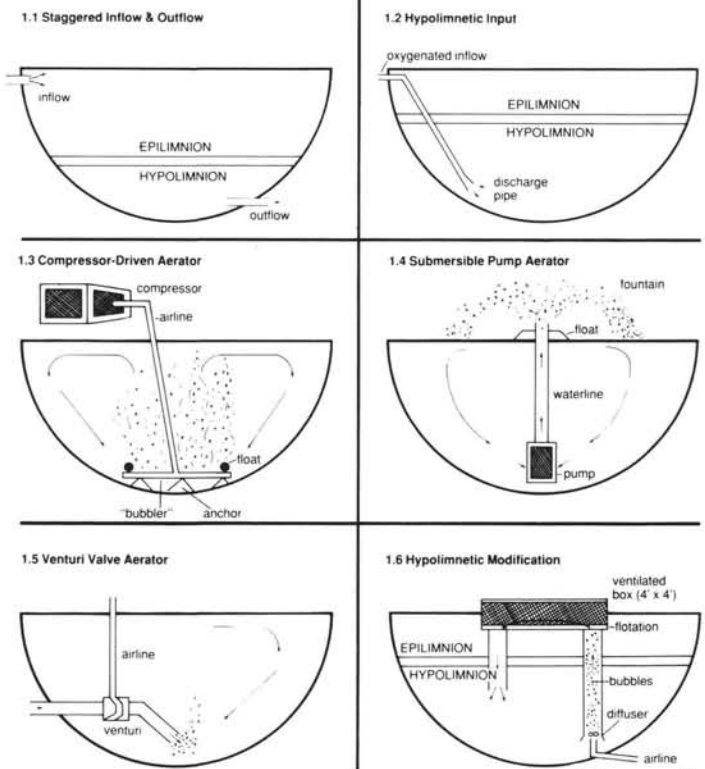
period of stratification, the water chemistry in the water layers becomes progressively different. The upper layer has more algae and an abundance of dissolved oxygen. The lower layer has more decomposers which consume oxygen, plus it is isolated from atmospheric oxygen. Bottom oxygen levels decline — often to the point that an anaerobic zone forms immediately above the sediments which are devoid of oxygen. Organisms which require oxygen are replaced by those that don't. These include the notorious bacteria groups that produce hydrogen sulphide (smells like rotten eggs) and methane (swamp gas). A sniff of the bottom water will tell you if your pond has an anaerobic zone.

The removal of oxygen from the sediment/water interface is somewhat like removing a lid; nutrients are liberated from the sediments, particularly phosphorus. When the pond experiences turnover, these nutrients are mixed into the water column where they can enhance algae growth. In summary, anaerobic zones are bad news.

What is needed is an input of oxygen to the bottom water. This can be accomplished in a number of ways. If water is normally added and withdrawn from the surface, it is sometimes possible to take water from the bottom instead (See Fg. 1.1). This has the effect of drawing surface water down into the bottom area with its fresh supply of oxygen. Alternately, if the inflowing water is well-oxygenated, it can be piped directly to the hypolimnion to supply the needed oxygen (See Fig. 1.2).

The cheapest aerators are the destratification type which break down the stratification (layering) in the pond. A homemade system can be constructed of a one horsepower compressor or blower connected to a 1'' pvc grid fitted with .03'' microjets or simply 1'' plastic tubing with holes smaller than 1/8 inch. The ''bubbler'' section is anchored about 0.5 metres from the bottom (See Fig. 1.3). The rising bubbles lift bottom water to the surface where it is oxygenated before dropping back to the hypolimnion.

Figure 1: Illustration of Pond Aeration Techniques



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