Aquatic Weed Control: When Every Drop Counts

As water becomes more precious each year, the sports turf manager must consider surface water as more than "aquascapes," lagoons or recreational sites. Every drop must be protected from misuse or waste.

Droughts, as we have seen this summer, can strike anywhere at any time. The news media pays great attention to the impact of droughts on agriculture, but very little attention to their impact on the multi-billion dollar sports turf industry. Farmers can do little to counteract a drought. Sports turf managers, on the other hand, have a short-term solution in lakes and ponds if they plan ahead and keep surface water in condition for irrigation. That entails regular aquatic weed control and lake management.

While the original justification for building lakes and ponds is usually both aesthetic and functional, the combination of the two has never been stronger. Any body of water built for flood control, wildlife, swimming and appearance, must also be treated as a potential bank for water when drought or water restrictions occur.

Today, as in frontier days, water rights are something worth fighting for and protecting at all costs. Instead of rancher fighting against rancher for limited water, the battle today is between water agencies trying to meet the demand of residential and industrial growth . . . and golf courses, parks and other recreational facilities.

When the chips are down, the only water you can really count on is that water held in reserve on your property. Water flowing in rivers through your facility or pumped by wells from subsurface aquifers may not be at your disposal in times of shortage. Only you really appreciate the value of water to your sports turf. Leaving the decision of water availability during shortages up to a public agency places your facility at serious risk. You simply can't count on having water during droughts unless it is in reservoirs under your direct control.

Aquatic management should definitely be part of a water shortage plan. Facilities in drought-prone areas should invest no less in aquatic weed control and lake management than they do in efficient irrigation and pumping systems, drought-tolerant turfgrasses or water-conserving redesign. No

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Floating and emergent weeds clog golf course pond. Photo courtesy: Monsanto.

Same pond following treatment with glyphosate. Photo courtesy: Monsanto.

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amount of efficiency is important if your water source is inadequate.

To complicate matters further, liability associated with lake management is a deterrent rather than an endorsement of wise water storage. In many cases, proper aquatic weed management requires treatment with chemicals and lake aeration. Insurance companies are sensitive to the potential for contamination, electrocution, or drowning. They indirectly penalize those parks, golf courses or sports facilities with lakes by charging higher premiums. For this reason many facilities contract out water treatment to transfer part of their liability to the contractor.

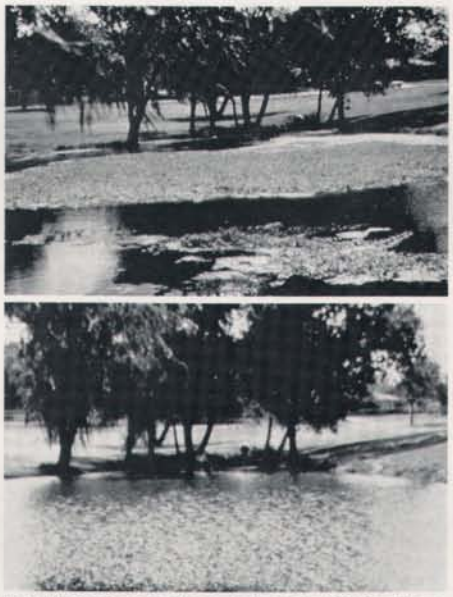
Realistically, it's doubtful if any facility can store enough water in surface reservoirs when an irrigation system requires millions of gallons per week. However, one acre-foot of water represents 325,829 gallons you might not have otherwise. That is enough to irrigate a regulation size football field for nearly six weeks (1½ inch per week) or 18 average size golf greens for three weeks (2 inches per week). But it pales in comparison to the two million plus gallons needed by 50 acres of fairways each week during the growing season. For total independence from outside water sources an 18-hole golf course would need seven acre feet of water per week, or the equivalent of a seven-foot-deep, one-acre lake each week. It makes you extremely grateful for rainfall even though it may cause a golf course to lose rounds or a game to be cancelled.

The value of surface water has never been greater than it is today. Allowing reservoirs to become choked with aquatic weeds or covered with algae blooms not only ruins their aesthetic value, it destroys their functional value as well. Algae can be transported from infested lakes through irrigation lines to turf. Parts of vascular aquatic weeds can enter intakes, go through pumps and end up anywhere irrigation water is distributed if the water is not filtered or screened. Like any weed, once it becomes established within the boundaries of a sports facility, it places "weed pressure" on the remainder of the facility.

A sports turf manager needs to understand that a lake or pond left unattended will go through a natural progression that fills it in over time. Water- and air-borne debris gradually reduces the depth of lakes and isolates them from one another. As lakes become shallower, bottom-rooted aquatic plants flourish by taking advantage of sunlight penetrating the top few feet of water. Waterfowl deposit seeds to establish shoreline vegetation which blocks air circulation at the surface and serves to hide insect larvae from fish and other natural predators.

As the lake becomes overloaded with vegetation, wind is unable to create waves or a current to circulate oxygen from the surface and cool water from the bottom. Without oxygen, plant material can't decompose properly and fish can't live. During anaerobic decomposition, microorganisms release foul-smelling odors. Finally, the cold water at the bottom becomes trapped and the temperature of the surface water rises. This phenomenon, called stratification, can trigger an algae bloom as surface water temperatures reach optimum levels for algal growth.

When a sports turf manager applies six or more pounds of nitrogen per 1,000 square feet per year and two inches of water per week to turf surrounding lakes, part of the nitrogen in the watershed can reach the lake enriching the production of aquatic vegetation. This speeds up natural progression and lake decline unless measures are taken to stop it.



Lake before and after treatment with fluridone. Photo courtesy: Elanco.

To really get control over aquatic plant management you have to start at the bottom. The more shallow area there is in a lake or pond, the more aquatic weed problems you'll have. Aquatic plants may be desirable in certain locations. These sites can be shallow. But the remainder of the lake should be eight or more feet deep to discourage the establishment of bottom-rooted weeds. Lakes with gradually sloping banks will have more weed problems than those with steeper banks. The shoreline should be stabilized with rock, gabion baskets, jute or geotextile to prevent erosion until vegetation is established. Trees or shrubs with extensive root systems should not be planted near the edge of reservoirs. Their roots may eventually break through the water barrier. If chemical control of the lake becomes necessary later, these roots may absorb some of the herbicide intended for the aquatic weeds.

Lake bottoms should be tightly sealed with impervious liners or packed bentonite clay. The clay swells when wet to form a water-tight barrier. Core tests are frequently advised to locate any layers of sand or rock in the area which could lead to rapid loss of water.

The ultimate lake has a drainage outlet and/or weir to control the water level. One method of aquatic weed control is to draw the lake level down to expose weeds to dessication or cold winter temperatures. If drawdown is a possibility, a deep pocket should be provided in the lake bottom as a temporary home for fish. An irrigation intake leading to a filter system should be installed in any sizeable pond or lake.

Today, many sports facilities with lakes are taking an extra step to improve oxygen levels and to prevent stratification. They are installing aerators which either pump water into the air where it can take on oxygen or inject air into the lake. The action of the aerators creates a flow that constantly mixes the water in the lake. By keeping surface water cooler and preventing the buildup of nutrient levels in lakes, aerators can prevent and in some cases correct algae blooms.

Water treatment plants have used aerators for decades to improve bacterial decomposition of organic materials in water. The oxygen added to the water favors aerobic decomposition over anaerobic (with its unpleasant odors) and speeds up processing.

Fountain aerators provide an aesthetic dimension to lake aeration by propelling water into the air in an attractive display. Lights can be added to fountain aerators to extend their appearance benefits into the night. Many aerators can be installed by the sports turf manager with the help of an electrician. Some lakes may require more than one aerator. Check with manufacturers for specifications on pumping capacity, energy consumption and the mixing depth of their various units.

The above measures play a major role in keeping lake water in suitable condition for irrigation. The key is knowing when desirable aquatic vegetation growth starts hurting the functional use of the lake or when undesirable weeds become established. No one wants a sterile, lifeless lake sitting in the middle of their landscape. However, ignoring lake vegetation for months can lead to trouble.

There are four basic types of aquatic weeds — algae, floating plants, submersed weeds and emergent weeds. Sports turf managers for the most part can handle control of algae and emergent weeds. Many choose to hire aquatic weed specialists for control of submersed or floating weeds.

Algae are very simple forms of plants. Serious outbreaks of algae can rob a lake of oxygen causing fishkills, give off a musky odor, plug up irrigation intakes and heads, and ruin the appearance of water features. Warm temperatures and water rich in nutrients can bring on a "bloom" in a matter of days.

Three types of algae are generally recognized. The first is called planktonic. These tiny microscopic plants can accumulate in the top three to four feet of water giving it a green, soupy appearance. Filamentous algae join together in mats, usually form-

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ing along the edge or banks of lakes. These mats grow in size and can rise to the surface in time. The third and most advanced type of algae is called attached-erect. They appear like plants growing from the lake bottom, but they are not rooted. Often they are called chara, nitella, muskgrass or stonewort instead of algae.

Fortunately, algae is very sensitive to copper in the water. Control efforts revolve mainly around keeping copper levels up as temperatures rise in the spring and summer. Early treatment utilized copper sulphate. Today, chelated forms of copper are available which release the metal slowly. Applications should be made periodically during the growing season to maintain copper at control levels in the top four feet of water.

Emergent weeds are found along the banks and shallow areas of lakes. They are rigid plants which support themselves out of water. Many are considered desirable and serve as habitat for fish, waterfowl and insects. Cattail, arrowhead, bullrush, water primrose and purple loosestrife are emergent aquatic weeds when they spread beyond control.

Since emergent plants are above water and near the shoreline, they can be controlled effectively with contact herbicides such as 2,4-D, Diquat, and glyphosate (Rodeo). A surfactant or sticker can be mixed with these products to improve contact and control. These chemicals will harm any plant they contact so pay close attention to drift. Glyphosate is deactivated rapidly upon contact with muddy water or soil therefore there is no time restriction on use of lake water following treatment. Diquat is deactivated within 14 days. The water use delay for 2,4-D varies according to the specific formulation used.

Gilbert advises that early treatment avoids a heavy "biomass" and protects some types of desirable plants.

Floating weeds have leaves that float on the surface. They may float freely on the surface or be rooted. Water lilies are floating plants that are sometimes planted in lakes for the appearance of their flowers and round leaves. Other floating weeds include water hyacinth, duckweed, water pennywort, common salvinia, watershield and water lettuce.

The fact that the leaves are on the surface provides a control advantage. Herbicides such as Diquat, glyphosate (Rodeo) and 2,4-D mixed with a surfactant can be applied to the leaves just as they would be for emergent weeds. Application is most effective on young or new foliage. Dichlobenil and a new herbicide fluridone (Sonar) are also effective on floating weeds. Dichobenil's label carries a 90-day restriction on eating fish from a treated lake. Elanco recommends that water treated with fluridone not be used for irrigation for 30 days.

Aquatic weed control becomes most difficult with submerged weeds. They include the notorious hydrilla, watermilfoil, naiad, pondweed and coontail. These plants cannot support their own weight and depend upon the water to hold them up. Small flowers, seedheads and fruit can extend above the water surface. Foliage is close enough to the surface for water fowl to feed on it. Stems, nutlets and seed can be carried by birds to other lakes to spread infestations.

Since the plants are below the surface herbicides must be mixed with lake water or applied as granules to be absorbed by foliage or roots in the soil. Calculations must be made to determine the proper rates for the volume of water in the lake, typically measured in acre feet. Applications must also be made carefully to distribute the herbicides equally throughout the treatment area. For these reasons, sports turf managers should consider hiring an aquatic weed specialist for submerged weed control.

In most areas, treatment of rivers and other flowing water is strictly the responsibility of a government agency. Managers of private recreational lakes without training or certification specifically in aquatic weed control should not attempt treatment.

Diquat, fluridone (Sonar), 2,4-D formulations (i.e. Weedtrine II), endothal (Aquathol, Hydrothal 191) are the primary herbicides used for submersed weeds. Irrigation restrictions range from 7 to 25 days for endothal. Timing of applications is important. Some selectivity may be possible through timing. This is a major marketing point for fluridone.

One concern over controlling dense infestations of aquatic weeds is the amount of dead and decaying material in the water and its drain on oxygen levels. Weeds can be removed mechanically with special harvesters if desired. The advantage to this method is the weeds are removed, but stems and rhizomes below the cutting height may regenerate into new plants. It is a compromise to chemical control or may be used in conjunction with follow-up herbicide treatment.

Grass carp are another option to chemical control. These sterile fish feed on submerged aquatic weeds. Ten to 20 carp can control these weeds in an acre of lake. They will feed on floating and some emergent weeds if there are not enough submersed weeds for them. For this reason, they should not be placed in lakes which contain desirable plants.

Lake dyes can be added to small lakes that are too shallow to prevent establishment of algae and weeds by robbing them of sunlight. These non-toxic colorants also carry no water use restrictions.

Charles Gilbert, president of Allied Biological, an aquatic weed control contractor in Gladstone, NJ, advises sports turf managers to treat weed problems early in the year, beginning in April in his state. This way the sports turf manager avoids a heavy "biomass" after control and has free use of the water for irrigation during the hottest times of the year. Early treatment can also protect some types of desirable plants.

Hydrilla has spread as far north as Delaware and Virginia, says Gilbert. Sports turf managers in those states and south should be on the alert for the fast-spreading weed and begin control measures without delay. Hydrilla pieces on boat props or trailers can become serious infestations in the next lake the boat is placed in.

"People are becoming more interested in selective control of aquatic plants."

He adds that aerators are helpful in algae control and decomposition of dead vascular weeds in the top few feet. Beneath that level, submersed aeration units can be used. Gilbert advises that chelated copper algaecides are more effective than copper sulfate in hard water with a high pH.

In the South, sports turf managers start treating lakes in January, reveals David Tarver, aquatic weed specialist for Elanco in Tallahassee, FL. One of the advantages of fluridone (Sonar), the new aquatic herbicide Tarver sells, is that it works over a 30 to 90 day period to help the lake manager avoid large amounts of dead vegetation in a lake at any one time. "People are also becoming more interested in selective control of aquatic plants," he adds.

The other new aquatic herbicide that is improving aquatic weed control is glyphosate (Rodeo). It provides control of emergent weeds and shoreline brush without any restrictions on water use.

Few sports turf managers in the South attempt major aquatic weed control anymore, says Tarver. "When lake water is used for irrigation the superintendent can't risk making a mistake. He has to control aquatic weeds, but he'd rather focus his efforts on what he knows best, turf, and let a specialist concentrate on aquatic weeds — as long as weed control doesn't get in the way of turf management."

Controlling aquatic weeds and protecting irrigation reservoirs will be more closely linked in the future. The turf must come first, but every gallon of water must be ready for irrigation when droughts strike. Lakes must be maintained in the event of such unpredictable shortages. Each acre foot of water in storage can provide weeks of green, playable turf when all other water sources are shut down. That's something worth serious consideration. □