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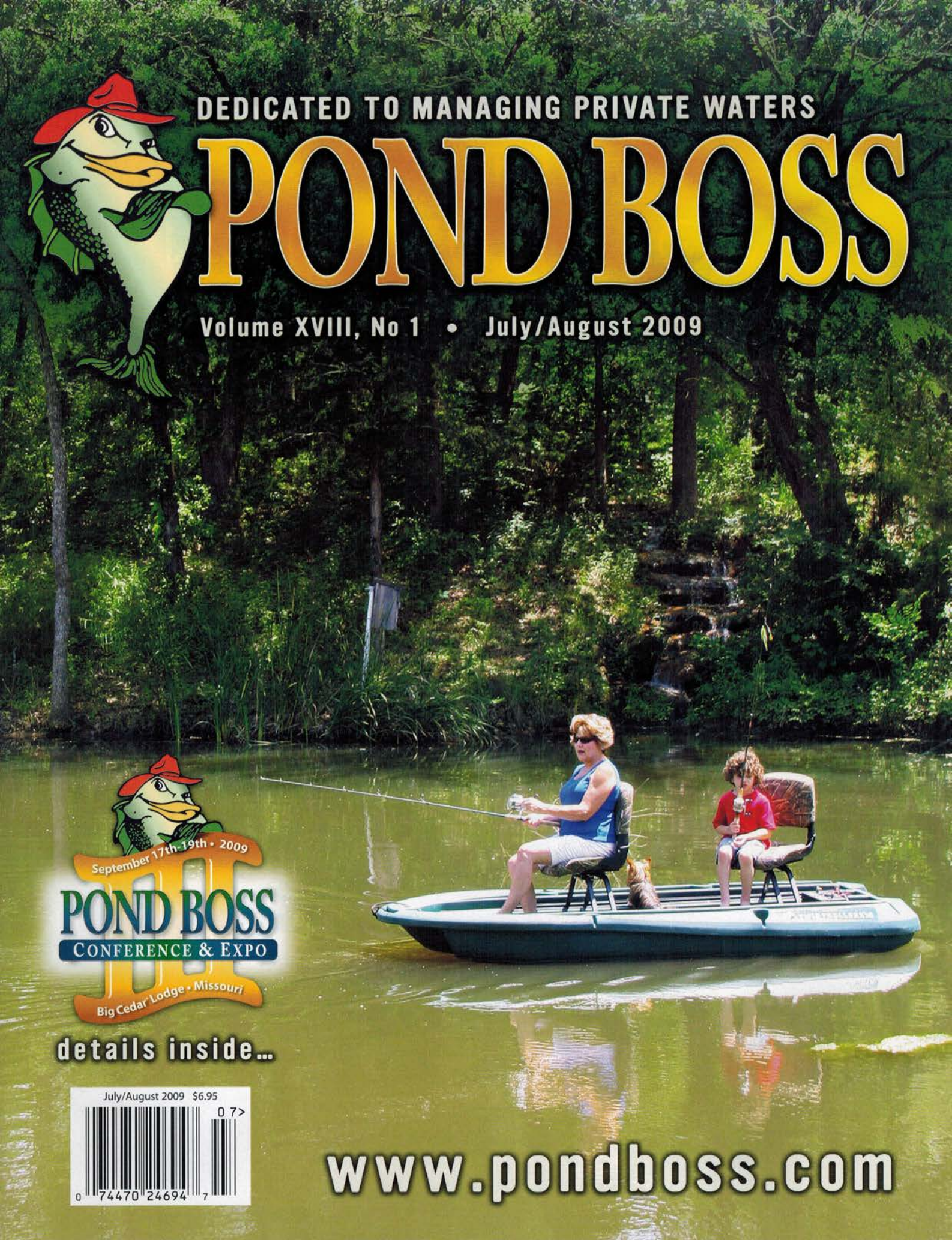

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Mixed Use Ponds- Water Stewardship

by Rich Dennis

"Whiskey is for drinking; water is for fighting over." Nowhere in our great nation is this Mark Twain quote truer than the arid West where there is simply not enough water to support the population. Water is a precious, reusable commodity rather than a simple resource.

On that part of the planet, landowners receive the most value by building what's generally termed a "mixed-use" pond. In fact, in order to obtain a permit to build a reservoir, the owner must show several beneficial uses for the water. These uses include recreation, fish habitat, irrigation, aquaculture, frost protection, and fire protection…to name a few.

Generally speaking, in the West, most mixed-use ponds reside on golf courses and farms. Different farms raise different commodities which require water storage for irrigation to get them through dry summer months. Water usage can be driven by crop demand, but more recently a trend toward regulatory restrictions on amounts and time of withdrawal of ground water has forced land managers to store water in ponds. Golf courses often receive water from treatment plants, store it and then use it to water greens and fairways.

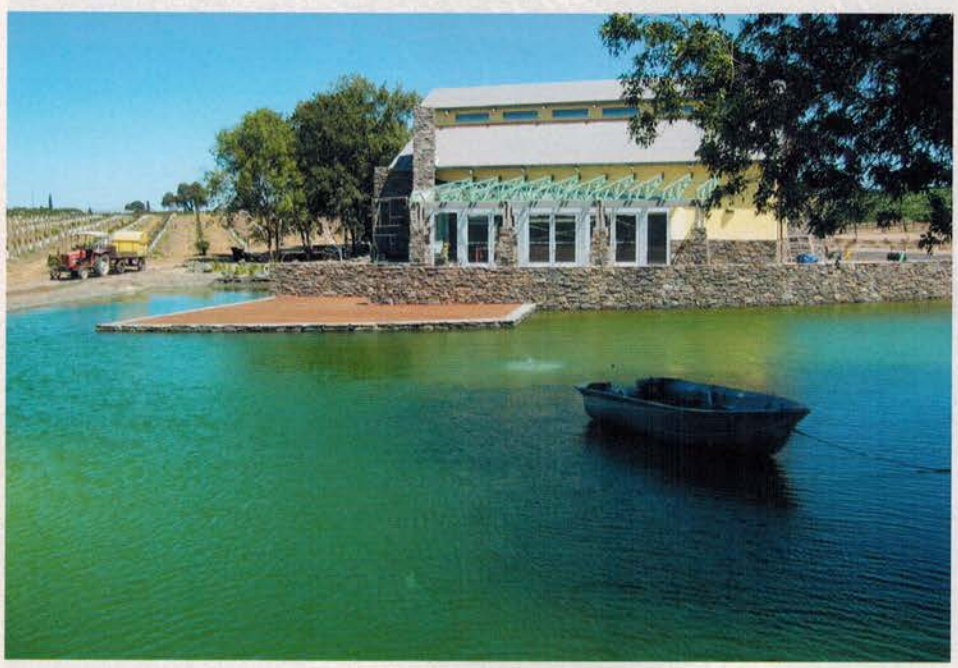
Now, I'm aware we have a biased audience here, but…what pondmeister in their right mind wouldn't want a nice fishery to go along with an irrigation reservoir… or, how about a private beach to lounge on in those warm summer months…or a water feature at corporate headquarters…or all of the above? Indeed, the necessity of stored water can create a great opportunity to enjoy water on several levels.

America has a growing affection for its water.

Mixed-use ponds are not immune to the same problems which plague the average pondmeister. In a mixed-use pond, water quality concerns may be different and affect the owner in different ways than someone who counts on water as a commodity. Whereas a more "casual" pond owner might be concerned about algae for aesthetic purposes, a farm operator might be more concerned about algae clogging pump filters and emitters. Luckily, whether your pond represents leisure or livelihood, the first step towards consistently addressing most water quality problems is the same…sub-surface aeration.

By now, most of us know aeration can reduce algae and odors, eliminate or manage thermal stratification, increase dissolved oxygen, and of course, improve fish habitat. And these are important things for people managing a recreational pond because we all want to keep the pond "healthy". But what does this mean in agronomic terms? That is, a land manager does not care about dissolved oxygen in itself; he cares about how an increase or decrease in dissolved oxygen is going to affect the efficiency of his operation and ultimately the bottom line. So how do the affects of aeration benefit both recreation and the business of agronomy?

Many pondmeisters approach aeration companies for the purpose of reducing algae for aesthetic purposes. However, the owner of the mixed use pond is also, if not more so, concerned about how the algae in his source water will affect irrigation pump efficiency. On farms in the west, reservoirs are used for irrigation as well as fire suppression and frost protection. Excessive algae can quickly clog filters requiring frequent and energy intensive back flushing. Organic material can also clog



Bianchi Winery in Paso Robles, California uses sub-surface aeration to maintain good water quality in the water feature outside its tasting room. This pond is also used as a water source for several acres of vineyards.

emitters on low flow irrigation products such as drip tubing. These problems are not only bad for pump efficiency and water distribution, but could potentially cause the loss of a crop to frost or fire.

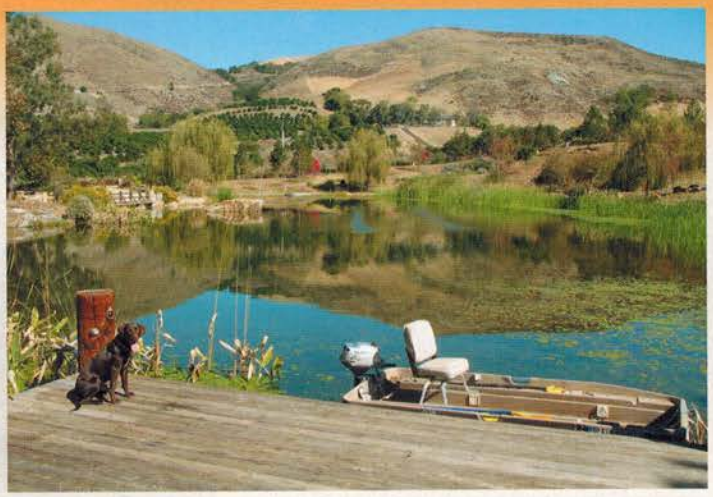
Historically, managers have treated algae with copper based algaecides which is not only expensive but horribly intrusive to the aquatic ecosystem. With the recent popularity of sustainable agricultural practices and "green" marketing, food producers can see a healthy return on investment by reducing or eliminating such chemicals and up-selling their organic or sustainable wares. Not to mention that the energy costs associated with an aeration system can be lower than the material cost of applying algaecides.

By bringing cooler bottom water to the surface of the pond, a subsurface aeration system will typically reduce evaporation by 10-30% in the summer months when you need it most.

Aeration is not just for algae control! One of the most overlooked benefits of aeration is one that should be as important as water quality… water quantity. By bringing cooler bottom water to the surface of the pond, a subsurface aeration system will typically reduce evaporation by 10-30% in the summer months when you need it most. In a 1968 study titled "Artificial Destratification of El Capitan Reservoir by Aeration" published by Scripps Institution of Oceanography, the author suggests that "Lake aeration is economically feasible. Evaporation and chemical treatment savings alone may more than pay for the aeration system."

Currently, environmental watch groups in the west are encouraging land managers with riparian water rights to draw and store water during high flow events in order to protect anadramous fish habitat in the summer months and protect groundwater supplies. With the drastic decline of the salmon run in California last year, coupled with drought and population increase, Federal and State regulatory agencies are considering implementing similar restrictions. This means that farmers in the west will no longer be able to supplement their water supplies in the summer. What they capture in the winter is what they get for the summer. As regulatory agencies tighten their restrictions on when and how much water we can draw from our "waters of the state" or aquifers, reduced evaporation will become a major value added for aeration systems.

Along the same lines of water quantity, eutrophication, the aging process of a pond, can cause loss of water storage volume. As ponds age, they fill with both organic and inorganic material essentially decreasing the depth of the water. Sub-surface aeration systems can halt this process by oxidizing organic material from the bottom of the pond and providing oxygen to the nutrient consuming, beneficial microorganisms that live in the sludge. Eutrophication can actually be reversed with aeration combined with the application of bacterial products specifically designed for the purpose of digesting organic sludge. In this



Top, left *- A private estate pond in San Luis Obispo, California is used for fishing, swimming, irrigation and to improve wildlife habitat.* ***Top, right*** *- This private estate pond is not only an environmental and recreational amenity, but is used as a reservoir to irrigate more than 20 acres of landscaping. (Notice this particular system is "Lab-tested").* ***Bottom, left*** *- A classic example of a mixed-use pond, Spanish Bay golf course in Pebble Beach, California utilizes aeration for wetland rehabilitation, irrigation water quality and to keep this water feature looking healthy.* ***Bottom, right*** *- Another example of a mixed-use pond, this golf course in Palm Desert, California uses aeration to keep this water hazard free of algae while improving water quality for irrigation purposes.*

way, aeration can ensure managers are able to hold as much water as possible. This is also an excellent alternative to dredging.

Aeration can also effectively manage dissolved metals such as iron and manganese in your source water. While dissolved metals are generally not a problem for fish, they can cause problems for plant physiology and can clog irrigation emitters with precipitated metals. By maintaining high dissolved oxygen levels throughout the water column, aeration can help keep metals sequestered in the sludge layer therefore making them unavailable to be picked up by irrigation pumps. This affect can be enhanced with the application of ozone in an aeration system.

Ozone (O3) is an unstable form of oxygen that has many benefits in water treatment. Due to the unstable nature of the ozone molecule, the additional oxygen readily "wants" to oxidize organic material, sulfur and any metal that can accept the oxygen. In fact, ozone is one of the strongest oxidants known to man and is commonly used in surface water treatment plants. In addition to the strong oxidizing affects of ozone, it also dissolves into water 11 times faster than air and reduces the surface tension of the water molecule making it easier for suspended solids to settle out. There are no harmful byproducts of ozone oxidation and it is completely harmless to fish and other wildlife when used in the proper quantities. When odors, metals, or mandated use of effluent water is a problem, ozone is a viable adjunct to a traditional aeration system…but I digress.

Problems with water availability and quality are not going away. In fact, the more we deal with availability though conservation efforts, the more we will degrade the quality by way of concentrating pollution. Sub-surface aeration is an efficient and effective way to deal with water quality problems on both a recreational and agricultural front.

Citations

1. Arlo W. Fast, "Fish Bulletin 141. Artificial Destratification of El Capitan Reservoir By Aeration. Part 1: Effects on Chemical and Physical Parameters" (April 1, 1968). Scripps Institution of Oceanography Library. Fish Bulletin: 141. http://repositories.cdlib.org/sio/lib/fb/141

Editor's note: Rich Dennis is Sales Manager for E.P. Aeration based in San Luis Obispo, California and works with pond clients in the arid West. Reach him through their website www.epaeration.com.