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SELF SUFFICIENCY

Why your course should go from its water source to one less expensive.

When you research the type of water supplies being used for golf course irrigation, there are many different sources of water being used. These include potable water, treated wastewater, groundwater, pond or lake water, stream, creek or river water, canals and desalted water. The GCSAA's Golf Course Environmental Profile Series, Volume II: Water Use and Conservation Practices on U.S. Golf Courses, published in 2009 outlines the percentages of golf courses that use each different source of irrigation water. The GCSAA data shows the following:

potable water	14%
treated wastewater	12%
lakes or ponds	52%
ground water wells	46%
rivers, creeks and streams	17%
canals	4%
desaltation plants	<1%
other	3%

Many of the golf courses surveyed used a combination of sources such as pond-fed system backed up by a well or potable water, which is fairly typical for golf course irrigation. The type use also varied significantly by region and that data is also available in the report. If you want more information, the entire report is downloadable, free of charge from the GCSAA website.

As shown above, 14 percent of U.S. golf courses use potable (municipal) water to irrigate. As potable water prices continue to increase – as much as 300 percent over the last 10 years in some major U.S. cities – golf courses are under pressure to look at less expensive sources of water to save money and to be more sustainable. Additionally, the large use of water by golf courses is very visible and in times of drought under scrutiny by both the general public and regulating authorities.

How can you wean your golf course from a primary or back up potable water source and be self-sufficient? Groundwater wells are certainly an option, but at most golf courses wells have already been explored and if there is groundwater available they are already using it, unless they do not have the water right or permit to do so. When there are not any options and your Owner, Board or Commission is tired of paying more and more for water potable, then it's time to look at increasing storage as a solution.

Increasing storage is usually accomplished by adding additional ponds on the golf course.

There are two ways to do this, a pond that is out of play and preferably out of view that you can pump lots of water out of and you don't care about what it looks like or a pond that is in play or visible that you can only take so much water out of to maintain an acceptable appearance.

In play storage will require golf course architect input as it may affect play. If you are trying to catch storm water then you would prefer a pond that is out of play, keeping the water

level low so you can take advantage of significant rain events. If you have wells that you want to take advantage of by pumping either all day long or at the beginning of the year when the wells are performing at full capacity. You really don't want to fill a pond with potable water unless it's absolutely necessary. It's inefficient and a percentage of this water will evaporate. It's also more expensive than using the potable water directly into your irrigation system, cross-connections aside.

The size and depth of the pond will dictate how much water you can store. You need to figure out how much water you need in a year. You can do this hopefully by looking at old use records.

Remember if you do not measure your use you cannot manage it. Calculate your available storage and take into account any make up water sources.

A couple of things to keep in mind: a pond should be a minimum of five feet deep so the pond turns over. If it turns over it will be easier to manage with less algae, etc. At five feet the sunlight will not penetrate all the way down to the bottom. You also cannot get all the water out of the pond which will require it to be even larger. Depending on the type of pump intake or pond overflow system you're using, only 60-70 percent of the stored water will be retrievable. Additionally, there will be evaporative losses from the pond surface that need to be taken into effect.

To calculate the pond storage the conversions to keep in mind are that there are 27,154 gallons per acre inch and 325, 848 gallons per acre-foot. For example, a 1.5 acre pond that has an average eight foot depth would store approximately 3.9 million gallons. To have an eight foot average depth, the pond would be closer to 12 feet deep as it is not a box and the configuration of the side slopes needs to be considered. Of the 3.9 million gallons, if you could get 70 percent of that out, then the useable storage would be just over 2.7 million gallons. Another way to look at it would be to determine how much additional storage you would need to get you through the year, say 4.5 million gallons. If 65 percent was available you would need a total of 6.92 million gallons, 21.24 acre-feet (254.8 acre-inches) of storage total.

The table below shows various storage amounts per acre based on an eight-foot depth, the usable storage and what the drawdown would be on a 350,000 gallon (12.89 acre-inches) irrigation cycle and no make-up water.

Surface Area (acres)	Available Storage Capacity (gallons)	Useable Storage Capacity (gallons)	Drawdown No make-up (0 gpm)
1.5	3,910,176	2,541,614	8.6 inches
2.0	5,213,568	3,388,819	6.44 inches
2.5	6,516,960	4,236,024	5.16 inches
3.0	7,820,352	5,083,329	4.30 inches
3.5	9,123,744	5,930,434	3.68 inches
4.0	10,427,136	6,777,638	3.22 inches
4.5	11,730,528	7,624,843	2.86 inches

As you can see, the larger the pond surface area the less drawdown, so if the pond is in play and you are worried about aesthetics a larger surface area is needed.

> "As potable water prices continue to increase – as much as 300 percent over the last 10 years in some major U.S. cities – golf courses are under pressure to look at less expensive sources of water to save money and to be more sustainable."

A pond out of play can be smaller and deeper since you don't care what it looks like. The table shows total acreage. You do not need to accomplish the total storage with one pond and could do it with several ponds if need be as long as you come up with the total acreage/storage needed. However, there will be some inefficiency in a number of smaller ponds and of course the costs will be higher to construct.

The goals and benefits in increasing storage are multiple; to make you less dependent on make-up water sources, to put you in control of your water supply, to save money long term and to make your irrigation system water supply self-sufficient. The days of using potable water for irrigation are limited and you need to be thinking long term. Adding storage is one solution. **GCI**