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## PLANT HEALTH



On-site testing of new fertilizers on a golf course.

University. “One has to be, obviously what your entire program is. How you set things up throughout the spring, summer and fall. You can always talk about cost, and that is a factor that certainly weighs in the industry today. Another thing you have to consider at some point is how many times you have to apply.”

How many times you apply depends on what type of fertilizer you’re looking for.

kind of like a control release. You have some chemical mechanism. In essence it’s kind of a controlled release situation.”

“There are soluble products, and those are going to impart an immediate release to the crop,” says Elizabeth Guertal, alumni professor at Auburn University. “They’re going to go into a solution rapidly, and the nitrogen and ammonia that the turf needs is going

“There are certainly a number of factors. One has to be, obviously what your entire program is. How you set things up throughout the spring, summer and fall. You can always talk about cost, and that is a factor that certainly weighs in the industry today. Another thing you have to consider at some point is how many times you have to apply.”

– Kevin Frank, Michigan State University

“Control released products are often soluble products that, because of some membrane or protectant, release that product over time,” says Miller. “Slow release is often more of a homogeneous product. It kind of wears it away or microbial activity breaking it down. Stabilized is typically in some respect

to be there. Soluble materials can either be sprayed as foliar, as liquids or as granular. Then you have slow released materials, and typically they’re slow released by one of two ways. They’re either slow release because there’s been a physical coating placed around a soluble material, like sulfur coat uria, or





resin coat or polymer coat urias. Those are very big in the turfs marketplace. Or they're slow release because of a chemical reaction, and those are the uria formaldehyde, methalene urias... those are also very popular and widely used in the turf marketplace. [T]hen you've got, kind of what I call naturally slow release, which are the true organics, which also have to be broken down by microbial activity, and those would be things from sewage sludges or bio solids, or manures; all kinds of different materials like that. Then kind of the other grouping is the stabilized nitrogens, and that's sort of a trademark name, but they're not really sold as, nor can they be labeled as, slow release, but they have something in them to extend the longevity of a nitrogen response in the crop; so those are materials with either a nitrification inhibitor or an ammonia volatilization inhibitor, or they have both."

Despite all of this, most people agree that the right fertilizer for your course really depends more on the superintendent's personal preference.

"I personally think you can use all of them," says Frank, "it just depends on how you build your program. If you're going into looking at what should I do in the fall, a lot of that obvi-

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ously depends on what you've done to this point as you get into September or October. What did you do in the summer?"

It also comes down to what you want to get out of your fertilizer, says Guertal.

"The first thing is to look at what time of year it is," she says. "What do you want that fertilizer to do? Do you want it to create growth? Or are you looking for maintenance of the turf area?"

Budget is a very important factor to consider, as well, she says.

"Soluble nitrogen sources per pound of nitrogen are often cheaper, but you have to consider that they may be too large," she says. "They may not be what you want to create a long term greening response."

"You can always talk about cost, and that is a factor that certainly weighs in, in the industry today," says Frank. "Another thing you have to consider at some point is how many times you have to apply. The slow and controlled folks will say if you apply one time you save labor, fuel costs of driving around, etcetera. That's something superintendents should consider. Do you want to frequently apply with a lower cost product or pay a little more and not apply as often?"

"The hardest [thing] is when you budget for a soluble program and the nitrogen doesn't last as long as you thought it would," Guertal adds, "and then you have to reapply."

On the topic of budget, it's important to develop your fertilizing program the same way you develop your course's budget: with room for adjustments, Miller says.

"Truth be known, developing a fertilizer program is a lot like developing a budget," he says. "You can make good plans but you'll probably have to adjust it along the way. Fertilizer programs are a lot like that. You can put down on paper when you think you would fertilize and the amounts and products based on soil tests and your experience, but almost guaranteed along the way you're going to have to make adjustments. [For example] the east coast this year has gotten so much rainfall; lots of adjustments. Things happen along the way so you can put down a plan, and I suggest everyone do plan their fertility program, but you're going to be constantly tweaking them."

And speaking of tweaking, what happens if you chose a fertilizer option, put it down on



Fall Fertilization aft Black Mesa Golf Club - [youtu.be/odKamBd8RLQ](http://youtu.be/odKamBd8RLQ)

## Watch it

Black Mesa Golf Club superintendent Pat Brockwell shares their fall fertilization strategy and why it plays an important role in the spring green-up. Enter the following url into your browser to watch it now.

your turf, and then realize you made a mistake?

"You have the ability to make changes as it wears off," says Miller. "You can make subtle changes. Once you put the fertilizer out, there's not really a way to take it back up. If you put down too little you can add some. It's just a matter of monitoring your plan."

Something that plays a big role in learning to know how to fertilize your turf over time is location. Although the general consensus is that all fertilizer types can be used anywhere, it is important to take into consideration what kind of affect your layout and climate can have on the product.

"[A]s you move into different climates, some of the slow release products break down quicker, so you use them differently," says Miller. "If you move further north you may not fertil-

ize as late in the year."

"We put [a controlled release product] out on a slope and we got some heavy rainfall and it actually moved the product down the slope and accumulated in an area," says Miller, explaining why your course layout should also play a role in your fertilizer choice. "When you move them off site and they accumulate you have problems. Placement issues can come into play."

Your location can also play another role; one you may not have given much thought to. Before you run to your distributor and pick out a type of fertilizer, it might be smart of you to check state legislation.

"There are 11 states that have some type of phosphorous rule," says Guertal, "so now superintendents are having to make decisions with somebody else making some decisions already."

The 11 states Guertal mentions are Illinois, Maine, Maryland, Michigan, Minnesota, New Jersey, New York, Vermont, Virginia, Washington, and Wisconsin. Make sure to check the legislation however, because some of the states, such as Illinois, have exemptions for golf courses.

At the end of the day, it is always important to remind yourself that fertilizing your turf is a learned skill that takes time.

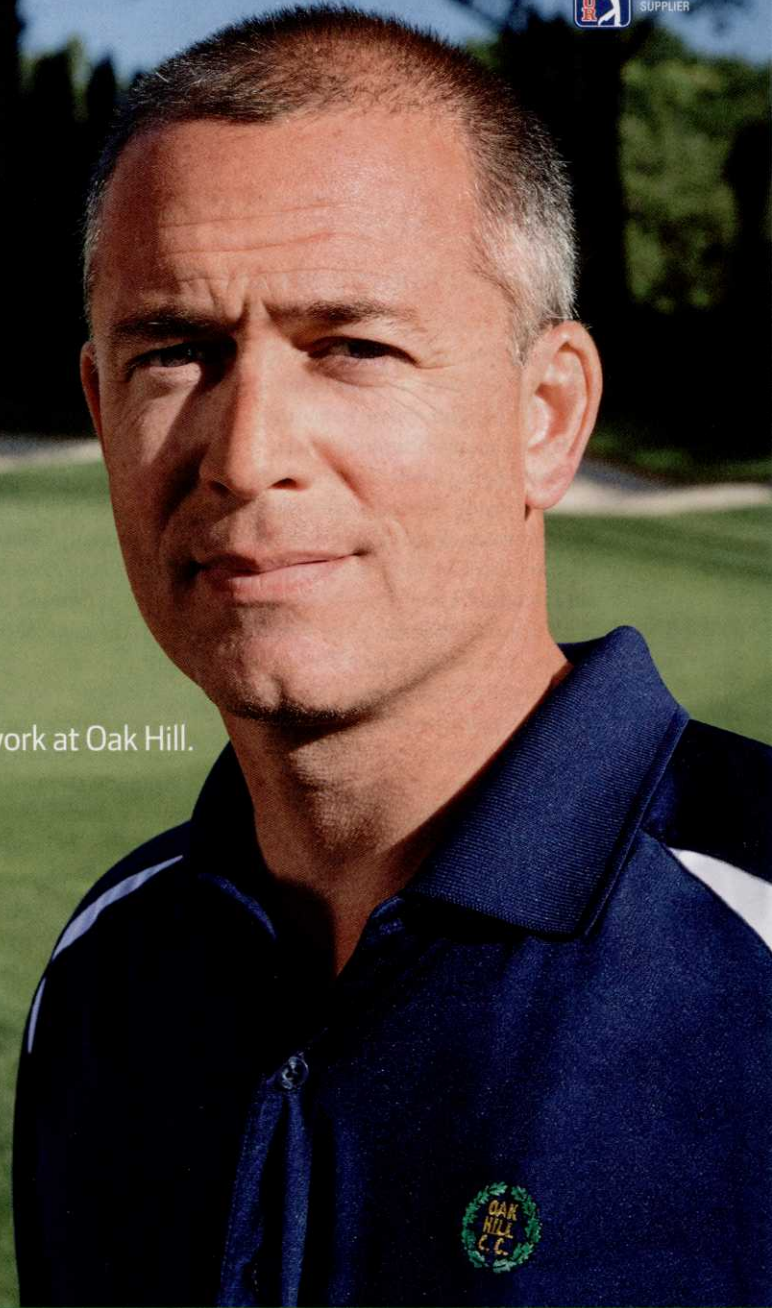
"Most supers get a feel within a couple years of how their greens respond to fertilizers," says Miller. **GCI**

Katie Tuttle is GCI's assistant editor.



"Truth be known, developing a fertilizer program is a lot like developing a budget," – Dr. Grady Miller.





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**Brian Vinchesi**, the 2009 EPA WaterSense Irrigation Partner of the Year, is president of Irrigation Consulting Inc., a golf course irrigation design and consulting firm headquartered in Pepperell, Mass., that designs irrigation systems throughout the world. He can be reached at [bvinchesi@irrigationconsulting.com](mailto:bvinchesi@irrigationconsulting.com) or 978/433-8972.

## 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%
desalination 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.

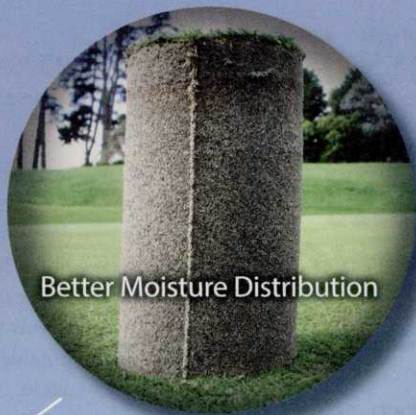
There are two ways to do this, a pond that is out of play and preferably out of view that you can pump lots of water out of and you don't care about what it looks like or a pond that is in play or visible that you can only take so much water out of to maintain an acceptable appearance.

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

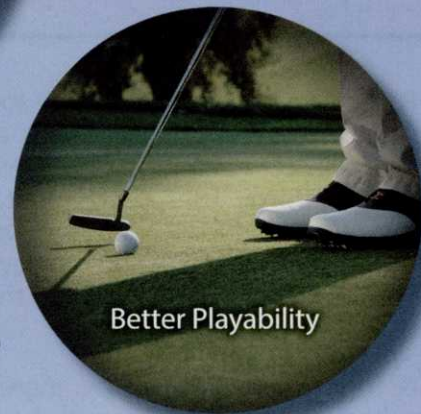


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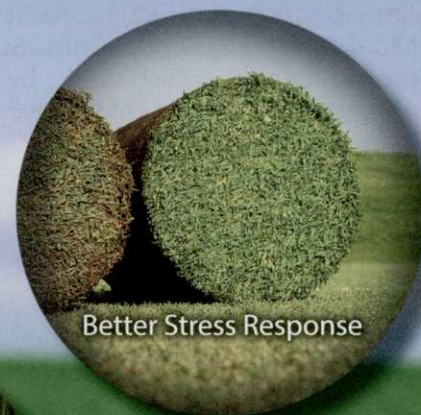


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# CONTROLLING THE TOUGHEST WEEDS REQUIRES A POWERFUL PUNCH!

Particularly stubborn weeds – such as wild violet, ground ivy, black medic, clover and other species found in cool-season turfgrasses – call for tough weed control. That is the constant challenge of herbicide producers, who are leveraging the latest field research and chemistry to develop formulations that pack a punch against these particularly hard-to-control weeds.

A formulation with active ingredients including sulfentrazone, a phenoxy and triclopyr creates a potent, fast-acting solution for tough weeds, says Jim Goodrich, product specialist for Kansas City, Mo.-based PBI-Gordon Corp. Sulfentrazone is a protox inhibitor, which works by preventing a key enzyme required for chlorophyll production, and it provides enhanced speed as well as yellow nutsedge suppression. Triclopyr provides an extra kick for controlling problem weeds such as wild violets.

One product that includes this formulation and provides a precision performance tool for turf managers is T-Zone™ Broadleaf Herbicide for Tough Weeds. Even hard-to-control weeds show visible injury within a few hours, and weed death can occur within 10-14 days.



As shown in this before and after treatment photo, wild violet was eliminated from the treated area after 14 days.

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## IRRIGATION ISSUES

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



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# Take COVER!

Dodge the bullet of unpredictable and inclement winter weather by covering your greens.

by John Torsiello

**I**n northern climate zones of the United States covers for greens and other winter weather-vulnerable areas of a golf course can be important tools with which a superintendent can protect his layout from the vagaries of the cold months of the year.

There are “numerous” benefits to using covers on turf during the winter months, says Dr. Paul Koch, associate researcher of Turfgrass Pathology at the University of Wisconsin-Madison. He cites protection from winter desiccation and early spring green-up as probably the most significant benefits. There may also be some protection from crown hydration when using an impermeable cover like a GreenJacket, although he says data is a little more mixed on that subject.

Robert Wolverton, greens superintendent at Edgewood Country Club in River Vale, N.J., has employed green covers with considerable success.

“I have used them in areas that were renovated or newly established. The turf in these areas might not be ready for winter and need a few more weeks of growth. Likewise, the covers will give them a jump start in the spring.” He says the decision when and when not to cover greens and other areas is dependent on the environmental conditions surrounding the greens. “If there are shade issues where ice can build up, then a cover might be warranted or in an area of tremendous exposure in order to limit desiccation.”

Ken Smith has seen just about every winter weather condition during his 26 years as course superintendent at Eagle River Golf Course in Eagle River, Wis. For many years it appeared as though Mother Nature was treating his course kindly. Then conditions began to change.

“We always had very good snow cover but from 2005 thru 2007 I started seeing some ice damage on greens facing north,” Smith says. “It was minor, but I had never seen ice damage here before. Then in 2008 we had at least three inches of ice everywhere, on the greens, tees and fairways. But we had an early spring, which saved us from losing turf.” Okay, bullet dodged. But just to be safe, Smith used six Green Jackets in the winter of 2011-12 to prevent putting surfaces from potential ice damage. “In the spring, the greens covered with the Green Jackets

