

## Dive deeper into water quality

ANALYSIS SHOULD TEST FOR ELEMENTS THAT IMPACT TURF HEALTH

by  
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Unfortunately, superintendents don't have a choice in the quality of water available for their courses. More and more, they're being forced to accept water that might not be fit for other domestic uses. Fact is, if soil is irrigated with certain water throughout an extended period, the soil will assume the characteristics of that irrigation source.

Most of the problems encountered with irrigation water are associated with the direct and indirect effects of excess total salts

(TDS), excesses of specific mineral ions (sodium, boron, chloride, etc.) and excesses of bicarbonate, which contribute to elevated (alkaline) pH.

As a result, it's imperative to know the condition of the soil and the mineral makeup of the irrigation source. The first step should be an irrigation suitability test. While there are more than 50 different types of water tests available from analytical labs, golf course superintendents should test for elements that affect or impact turf quality.

Steve Ninemire, president and chief agronomist for Prosper, Texas-based 9Mire Group, says the company's analysis addresses the properties that enhance or impede plant growth.

"It's important for superintendents to understand that there are a lot of water quality standards that don't apply to turfgrass, such as testing effluent at an industrial plant," he says. "Not all water is bad, and it's important that turfgrass managers understand the driving influences and delve deeper."

Old Memorial, an 18-hole private course in Tampa, Fla., uses 95 percent effluent water for irrigation.



## Take the test

A good irrigation suitability test should include the following minimum test standards: pH, conductivity, calcium, magnesium, potassium, sodium, iron, alkalinity, carbonate, bicarbonate, hydroxide, chloride, sulfur, boron and total salt concentration.

For effluent water nutrients, a test should analyze for: phosphorus (P), total Kjeldahl nitrogen (TKN), ammonia-nitrogen and nitrate-nitrogen.

Helpful formulas and ratios a lab should calculate include: sodium absorption ratio (SAR), pHc, adjusted SAR and total cations and anions.

And a good soil test is equally important, Ninemire says.

"It will help determine where the levels of critical elements are, and will give an indication of the quantity of any one type of irrigation water the soil will be able to filter before significant problems occur," he says. "It is extremely important that sodium be included in the test because some labs include this in their standard and some don't. Also, sample each area of your property. Typically, greens, tees and fairways might have different soil types and different concentrations of harmful elements."

## Multiple sources

It's not uncommon for golf courses to use several water sources – wells, city, surface drainage, river, effluent and potable. It's important to sample each source individually.

"There may be three or four wells, and over time, one or more has been drilled deeper," Ninemire says. "The solution to a water problem may be as simple as turning off one well. Also, take one composite sample directly from an irrigation head after it has run at least 10 minutes to flush all the stagnant water from the line."

It's also important to sample throughout the year to check for variations. Most waters change throughout the course of the year, and some will change significantly because of seasonal demands on the water table.

"For example, later in summer or in times of drought, the reserves in an aquifer are pulled on and the negative elements become concentrated," Ninemire says. "This changes the quality of the water. It's a movable target, so the superintendent has to document the season when the analysis was conducted."

"Again, in our irrigation suitability testing, we look for things that will impede plant growth," he adds. "The effluent op-

erator may look at the test results and say the water is fine because it's clear and free of bacteria, but there are different standards for turfgrass."

## An effluent source

In many areas of the country, groundwater usage is becoming more restricted. In the South and West, its availability is considered a rarity and has been replaced by effluent water. To make matters more difficult, some courses have to compete with residential subdivisions for the amount of effluent water they receive.

In Tampa, Fla., Old Memorial, an 18-hole private course, uses 95 percent effluent water for irrigation. Superintendent Trent Inman says records show the amount the course gets has steadily decreased throughout the past few years.

"When we opened in 1998, we were one of the first large businesses in the area using reclaimed water because no one else wanted it," he says. "However, as development in the area increased, all water sources became more and more in demand. The majority of subdivisions in our area are being built with effluent. The course has a well, but it's limited to emergency use.

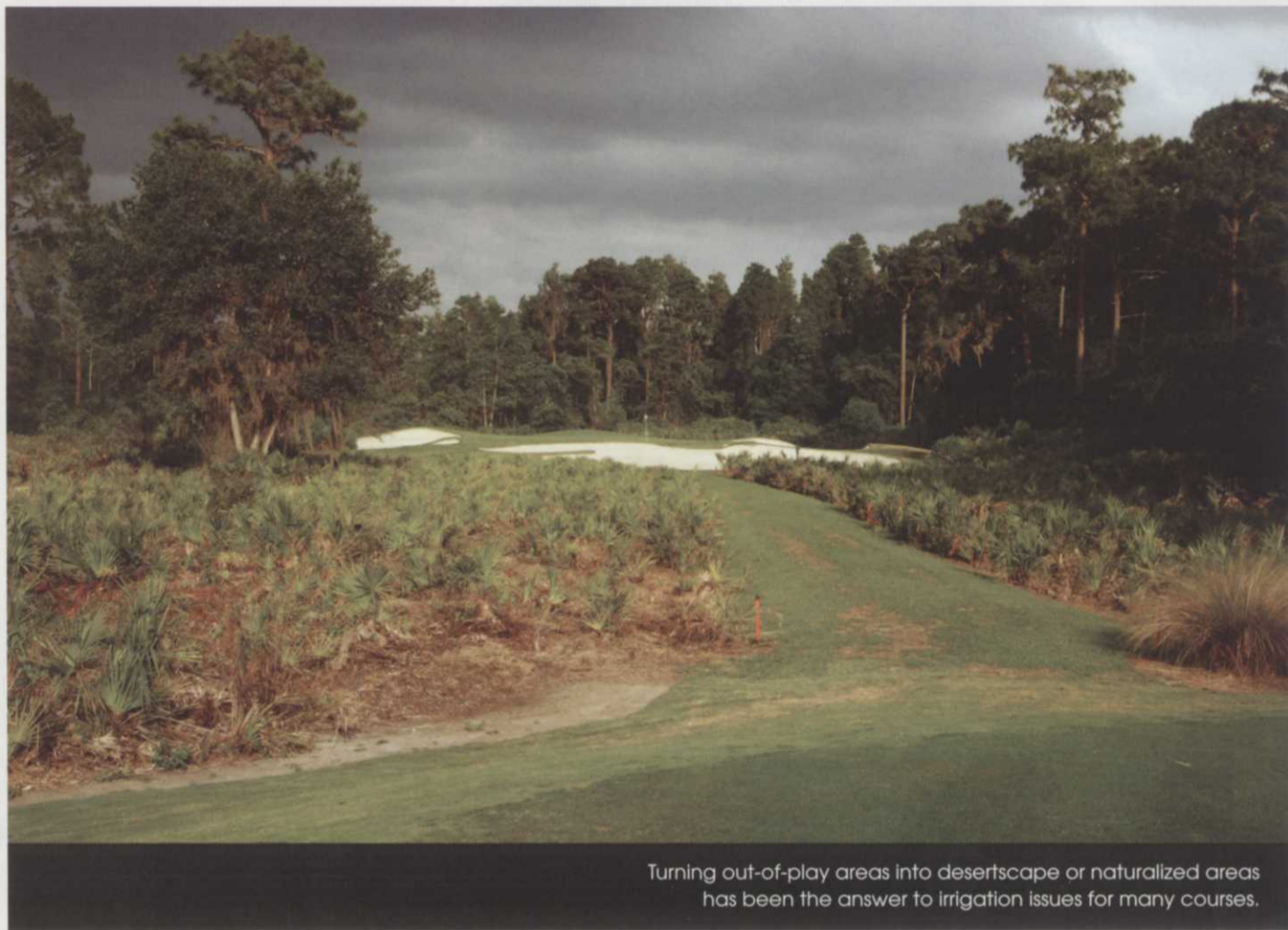
Groundwater is a luxury, and most of it is sold to surrounding counties."

Inman samples the effluent water in the course's holding pond three or four times a year.

"The samples we've analyzed haven't been great, but compared to other places I know, they're pretty good," he says. "We have an acid injection system to treat the water. We want to control sodium and bicarbonate levels, and the acid product lowers the pH to give us better water going out on the golf course."

Old Memorial's peak irrigation season is from October to May. During summer, the course could get rain every day. Inman quips that sometimes the staff can't get water off the course fast enough. He tests soil regularly, but because of the effluent, he samples water quality more often.

"The quality of groundwater, for the most part, is pretty consistent, but we don't really know with effluent," he says. "Effluent companies have standards they have to meet, but they're not as concerned with pH and other things that are important to us. They're looking at something totally different, and we work with a water source that can vary a lot. That's why we have to



Turning out-of-play areas into desertscape or naturalized areas has been the answer to irrigation issues for many courses.

Photo: Old Memorial



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stay on top of monitoring water quality.”

## Water treatment

Silver Lakes in Helendale, Calif., is a 27-hole golf course that's part of a large planned community. Most of the irrigation water comes from two large lakes and other bodies of water with a total surface area of 150 acres. The Silver Lakes Association is planning to add another nine holes and more homes, pushing the existing water supply to its limits.

“We've got enough water for the existing golf course, but we lose an unbelievable amount through evaporation – much more than we use,” says superintendent Darin Pakkala. “To accommodate another nine holes and the new development, we've got to find another source.”

San Bernardino County operates a sewage treatment plant but doesn't have enough capacity to service the entire Silver Lakes property. The association is working with the county to upgrade the plant so it can treat wastewater in a third stage of filtration called tertiary effluent.

“This is highly purified water and has no smell,” Pakkala says. “We believe the effluent plant will be able to produce more than 400 acre-feet per year, which will be used for the new nine holes. We also will be running a line that will tap into the original 27-hole irrigation system. By doing this, we also will cut back on our well-water use. The association is looking into turning out-of-play areas into desertscape, which will save more water.”

## Water usage

Inman says it's critical for superintendents

## Proactive environmental stewardship

Water use is an essential part of environmental stewardship in golf course management and will become an increasingly critical component politically, socially and economically. Many believe there's a need to be proactive in effective water management to ensure the survival of the golf course industry.

David Wienecke, a USGA Green Section agronomist, put together a list of best management practices to help ensure golf course irrigation can stand the test of public and agronomic scrutiny. The list is based on classes and documentation provided at the 2004 GCSAA Show in San Diego by Dr. Robert Carrow and Clint Waltz of the University of Georgia and Dr. Ron Duncan, an independent consultant based in Texas.

- Conduct an irrigation system audit. Distribution uniformity of at least 80 percent is needed to ensure precise water application for optimal water conservation and turf health;
- Make irrigation system design changes as needed to eliminate water going off target and excess water application;
- Keep accurate water-use records. This also enables factual fine-tuning of irrigation system operation needed for good stewardship of the water resource;
- Develop a water conservation management plan that specifies prioritized management zones (e.g. greens, tees, fairways, rough and landscape). An accurate size of each management zone provides factual data needed if there are water restrictions;
- All turf irrigation isn't created equal. Research identified the need for more water on the edge of a turf area to achieve equivalent turf quality compared with turf in the middle; and
- When determining water quality standards, the Environmental Protection Agency has ignored agronomic standards. Reclaimed or effluent irrigation water might meet or exceed federal and state clean water standards and not meet agronomic needs for turf irrigation.

to change the perception that golf courses are large water consumers. He uses a model developed by the University of Florida that considers total acres, irrigated acres and soil type to calculate how much water a course should be using.

“Of course, if someone were to look at the total output of our irrigation system, it might seem like we use a lot of water, but we rarely use that amount,” he says. “It's frustrating when I'm driving home in a rainstorm and see sprinklers running at house after house. We're one source that has the potential to use a large volume of water, but it's a small amount compared to the total from all the developments and residences in the area. That's an image we need to change.”

Additionally, Inman deals directly with the people making decisions about water usage.

“Our water contract expires in two years, and we'll definitely have availability challenges,” he says. “The key is communication, and we're trying to develop a good relationship with local county government

officials. We'd like to have guarantees on how much water we can use. I don't think people outside the golf industry understand what a big deal water is. We do weekly readings, and all water-use records have to be sent to the state monthly. I guarantee the public doesn't know this.”

In the meantime, Old Memorial is exploring ways to minimize its water use. Native areas outline the course, and Inman is looking to reduce the amount of water used by the irrigation system.

“We can possibly eliminate some sprinkler heads and change where the water is going in other places,” he says. “We've got about 100 heads around the perimeter of our turf and probably don't need to be using all of them. In other cases, maybe there's a head with a 360-degree pattern where 180 degrees would be sufficient in that area.” GCN

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