

How Effluent Is Changing the Industry

From maintenance practices to getting guarantees from local governments, the increased use of reclaimed water for irrigation is altering the way *you* do business

BY FRANK H. ANDORKA JR., MANAGING EDITOR



Alan Bakos, certified superintendent at The Moorings Country Club in Naples, Fla., says he can tell when his turf is taking a hit from the reclaimed water the water management district requires him to use. It usually starts in areas where there is short-rooted turf — often the result of nematode damage — and slowly spreads throughout the course. After a few short weeks, the course can look like it's been hit by a drought even though the irrigation system has been

working overtime. The actual culprit is the high salt content of his irrigation water.

“If we go two or three weeks without rain to push those salts through the soil profile, you can tell,” Bakos says. “Using reclaimed water is OK, but there are some costs involved, particularly on high-quality turf.”

That's the refrain heard around the country as potable water becomes increasingly scarce, even in areas of the country where water problems wouldn't be expected. More and more communities are turning to reclaimed water as a potential source for golf course irrigation.

For the city or county, selling effluent water to golf courses serves a dual purpose: It allows a city to get rid of water from its water treatment plants that would have to be disposed of anyway — and it can charge the end-users for the privilege, meaning extra revenue for the city's coffers.

Problem

Effluent water can add additional salts, heavy metals and other contaminants to the soil, making it difficult to produce high-quality turfgrass.

Solution

Monitor levels of minerals in the soil profile, fertilize with materials that counteract effluent's harmful effects and lock the provider into a contract that limits levels of harmful minerals allowed in the irrigation water.



Superintendents should be prepared to aerate more often to promote good drainage with effluent water.

PHOTOS COURTESY OF WYNSTONE GOLF CLUB

For superintendents, the situation is more complicated. In most instances, effluent water is cheaper than potable water and comes with fewer restrictions on its use. But for that savings, superintendents must plan for more maintenance (aerification and nutrient treatments) and expect a build-up of salts and other minerals in the soil that make it harder to grow high-quality turf. It's a trade-off, but many superintendents in water-restricted areas are often having less input into whether they use it or not. So if you're considering using (or are being forced to use) effluent water, experienced superintendents say it's best to plan ahead.

Unless superintendents understand that effluent water brings challenges of its own that they will have to combat, those considering making the switch could be in for rude surprises.

Growing trend

Larry Stowell, founder of PACE Consulting, a turfgrass consulting firm, says he first encountered effluent water in 1992. He worked with a course that asked him to monitor a stream where runoff flowed to see how effluent affected it. Stowell says he found no problems with the runoff into the stream. But that's not to say that effluent water doesn't present superintendents with problems they wouldn't see with traditional water.

"It's hard to make broad statements about effluent because it really depends on individual situations," Stowell says. "The quality of the water coming from treatment plants varies greatly. If your source is providing you with low-quality water, it can cause problems.

"It can be a tough call," he adds. "In some municipalities, particularly in the West, it's a choice between effluent water or no water."

Ted Fist, superintendent of Wynstone Golf Club, was one of those superintendents who didn't have a choice of what type of water to use. Wynstone is a gated community nearly 40 miles northwest of Chicago and three miles away from Lake Zurich, Ill., — too far away for either city's water and sewer lines to reach it, Fist says. So he needed to use the water provided from the community's water treatment plant.

"We have a contract that obligates us to use the water from the community," Fist says. "When I was an assistant here for three years, I saw it was problematic because the cool-season grasses we grow don't like excessive salts. But



Numbers Don't Lie

Since Ted Fist, superintendent of Wynstone Golf Club, convinced homeowners at his club to switch from sodium chloride to potassium chloride in their water softeners, the resulting changes to the chemical composition of his soil are startling. Consider:

- The overall levels of the damaging sodium ions dropped from 300 parts per million (ppm) to 106 ppm this year.
- The overall levels of beneficial

potassium rose from 14 ppm to 238 ppm.

- In 1998, the saturated soil extracts contained 3.2 percent potassium and 49 percent sodium. This year, those numbers were 36 percent potassium and 24 percent sodium.

"There's no doubt in my mind that we've improved the overall soil structure," Fist says. "The turf doesn't wilt as fast and the plugs we pull are darker and break apart more easily. It's starting to be good soil again!"

— F.H.A. Jr.

we were locked in by contract, so we had to make it work."

Tim Daniel, superintendent of Crown Colony Golf & Country Club in Fort Myers, Fla., says he takes what the county gives him because he has no choice. Located across the street from an inlet of the Gulf of Mexico, his other water sources are limited.

"We're pretty much at their mercy," Daniel says. "We have well water backup, but they've limited our take from the wells to 20 million gallons annually. That output wouldn't last long in this climate. Our lakes aren't much better than

Continued on page 72

Continued from page 71

the water they give us, so we make due — but it isn't always easy.”

Get an iron-clad contract

Planning on the front-end can help alleviate the feeling of helplessness when dealing with a municipality, says Jeff Beardsley, superintendent at Big Canyon Country Club in Newport Beach, Calif. Before he accepted a contract from the city to accept reclaimed water in 1996, he negotiated a few points with city officials. Beardsley currently uses 60 percent reclaimed water and 40 percent potable water on his 120-acre course.

“We wanted to make sure the water the city sent us wouldn't damage our golf course,” Beardsley says. “We asked the city to guarantee that the water wouldn't exceed certain levels of minerals like salts. Then the levels were written in black and white, along with the recourse we had should those limits be exceeded.”

Beardsley also negotiated a study paid for by the club, city and county of his fairways to see what the soil structure was in 1996. The

object was to develop baselines so progress — or problems — could be measured accurately. The contract also stipulated that the city pick up the tab for some of the infrastructure improvements that had to be made to use reclaimed water. No detail is too small to be included, Beardsley says.

But the situation isn't perfect, and the golf course recently reopened negotiations in the hopes of bringing the city's water back into line with the contract requirements. In September, the salt ratio was too high and damaged the grass severely during the summer, angering members and making Beardsley uneasy. The salts aren't as much of a problem during the winter, when the area gets enough rain to push the salt through the soil profile, so Beardsley says he's considering switching back to 100 percent potable water during summers and reclaimed water in the winter.

“That's not set in stone,” Beardsley says. “We're sitting down with the city right now to see if we can resolve some of these issues before it gets to that point. [City officials] have been receptive to hearing us out.”

One possible solution is the process of blending, which some wastewater treatment plants offer. It's the process of mixing the treated water with potable water to bring down some of the problem mineral levels, Stowell says.

“Originally, the treatment plant told us it couldn't blend — then we went out to visit and discovered they could,” Beardsley says. “It's one of the solutions we're exploring with them.”

Sodium solutions

Universally, superintendents who use effluent water complain about the sodium levels in it. In Wynstone, the naturally occurring problem of effluent was aggravated by the sodium chloride water softeners the residents used. Salts alter the soil's structure in a way that reduces water penetration to turf roots because sodium replaces calcium in the soil profile.

“When you have too many salts in the soil, fairways start to dry out quickly and trees defoliate at temperatures where that shouldn't happen,” Fist says. “We struggled to keep everything together until we could figure out a solution. It creates more work because you must stay on top of your soil profile to keep it balanced.”

During the first year as head superintendent,

Continued on page 74

Terms You Need To Know

Larry Stowell, founder of PACE Consulting, a turfgrass consulting firm, says superintendents need to know the following terms if they're planning on using effluent water:

Distribution Uniformity (DU) — A measurement of the uniformity of irrigation water application. This value should be near or exceed 80 percent, but many systems are well below the 80 percent value, leading to wet and dry areas that are difficult to manage.

Saturated hydraulic conductivity (Ksat) — A measurement of how fast water moves through the soil. The Ksat should exceed or match the irrigation precipitation rate or problems with wet spots will occur. Generally speaking, Ksats above .6 inches per hour are manageable.

Total dissolved salts (TDS) — A measure of salt content of the water.

TDS levels above 770 parts per million (ppm) become increasingly difficult to manage because of potential for accumulation of salts in the soil.

Sodium absorption ratio (SAR)

— A measure of the sodium hazard that can result in loss of soil structure. Water levels that have a SAR of 3 are characteristic of good quality irrigation waters.

Bicarbonate (HCO₃) — A water component that can also result in loss of soil structure and plugging of the soil surface. Bicarbonate levels below 90 ppm are characteristic of a good quality irrigation water.

Nitrate (NO₃) — A component of recycled water that can be beneficial at low levels, but can cause overfertilization and nitrogen toxicity problems if the levels are too high. Nitrate levels below 6 ppm are a characteristic of good quality irrigation water.

Continued from page 72

Fist aerified and limed the fairways more often and increased his usage of potassium sulfate to help get the soil in balance. In the spring of 1999, however, Fist tried a new approach. He worked with the Wynstone Property Owner's Association to wean homeowners off the sodium chloride they were using in their water softeners. Together, they began providing potassium chloride pellets to the homeowners to use in their water softeners. This alleviated some of the salt going into the water before treatment and reduced the overall sodium levels afterward.

By the fall of 1999, the amount of sodium in the irrigation water had dropped from 300 parts per million to 150 parts per million. The transition created a little more work for Fist and his crew because they had to deliver six bags of potassium chloride water softeners to each house three times a year. But three years later, they've streamlined the system so it's become a call-

on-demand system, where homeowners are responsible to call the maintenance facility on an as-needed basis. The results of the program are visible, Fist says.

"It's far more manageable than it was before," Fist says. "It's still not perfect, but the difference is visible."

Maintenance matters

Joe Traficano, senior agronomist for Desert Mountain Golf Club, says the labor costs of maintaining turfgrass with effluent water can reach hundreds of thousands of dollars, particularly in Scottsdale, Ariz. Like Beardsley in California, the rain of Arizona's winters keeps the salts and other damaging minerals from staying in the soil. But come summer, the salts can sit in the soil profile and destroy the turf.

That's one reason why the course spent \$1 million recently on one of the six courses Traficano oversees to renovate the fairways to add 4 inches of sand to the 30 acres of fairways to provide better drainage.

"It's a Band-aid that we'll probably try with our other courses and certainly will require with other new courses we build," Traficano says.

All the superintendents who use effluent water say adequate drainage is paramount to success. To aid in drainage, superintendents must aerify more often.

"You must open up pore spaces more often," Traficano says. "Otherwise, the salt buildup will be intolerable."

Superintendents should also monitor their micronutrient levels and be prepared to add whatever nutrients the effluent water takes out. Gypsum is a common addition to nutrient rotations on courses that use effluent water because it returns calcium to the soil that has been replaced by the sodium in the water, Fist says. He adds that superintendents should also be prepared to use more potassium-based fertilizers.

"I look at the turfgrass plant as a neg-

Continued on page 76

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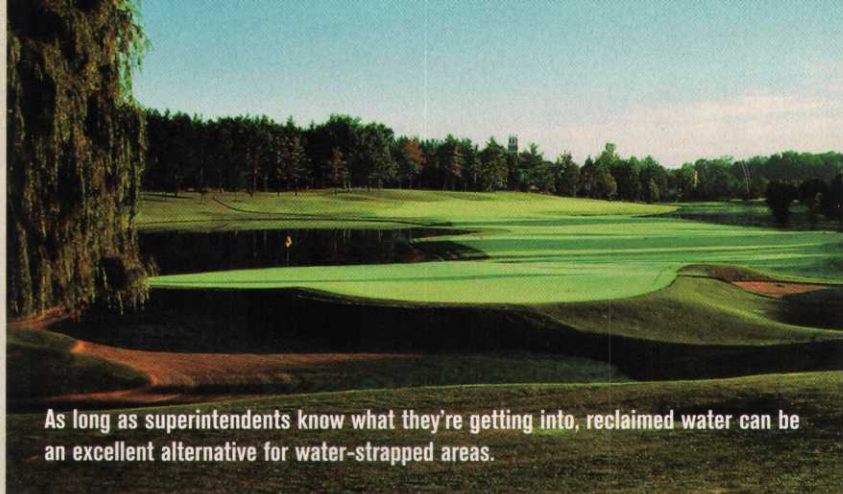
Real-Life Solutions: Effluent

Continued from page 74

actively charged magnet," Fist says. "Calcium, magnesium, potassium and sodium are all elements that are attracted to the plant, and they compete with each other. If there are more sodium ions in the soil than the others, they're the ones that will take the place of the other more beneficial nutrients. That's why you have to pay attention and adjust your fertilization schedules accordingly."

Beardsley says superintendents should visit potential water providers and educate them about what they do and why they need water to remain at specific quality levels. Don't be afraid to ask to take a sample of their water home, he adds.

"Get a sample of the water they'll be sending you ahead of time and send it off to your own lab," he says. "Set up protocols to test the water on your end. You can't be too careful. After all, it's *your* job that could be on the line if the turf dies — not the people at your local water authority."



As long as superintendents know what they're getting into, reclaimed water can be an excellent alternative for water-strapped areas.

There's another factor superintendents need to plan for — the fact that they may need to water about 15 percent more than they otherwise would to push the salts through the soil. The practice is called the leaching fraction, and Beardsley says it's vital to keeping the salts from remaining on the surface if the course doesn't receive enough rainfall to do the job naturally.

PACE Consulting's Stowell says an unexpected consequence with some effluent programs is an unwanted influx of nitrogen, which causes excessive turf

growth. "Researchers haven't figured out how to handle that yet," he adds.

Even with its problems, however, the trend toward using more effluent water is a good thing for the industry as long as superintendents prepare for what they're getting into, Mooring's Bakos says.

"It's a good way to protect a disappearing natural resource like water, but there are some challenges associated with it. If you're prepared and if you educate your members, however, it is a workable alternative." ■

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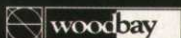
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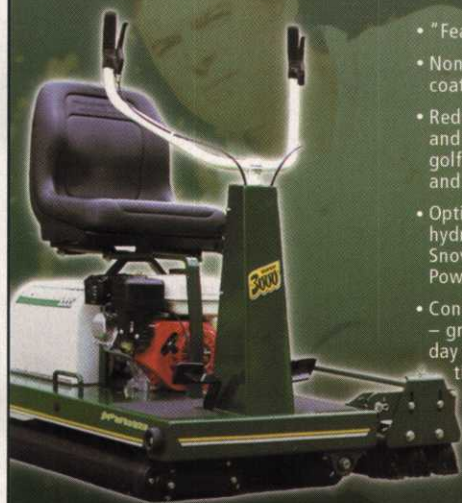


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