

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

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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,

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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.

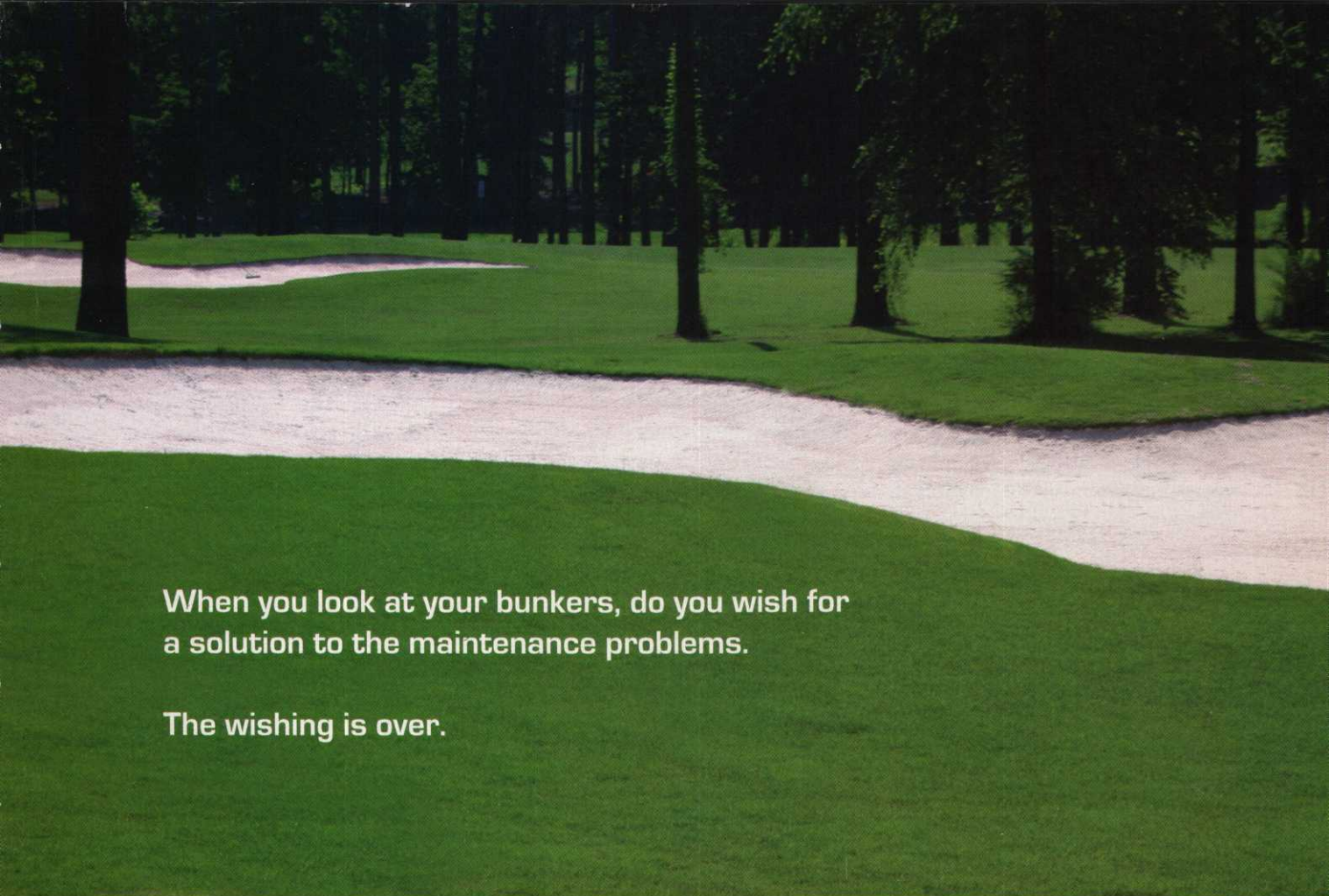
TDS levels above 770 parts per million (ppm) become increasingly difficult to manage because of potential for accumulation of salts in the soil.

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.



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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-

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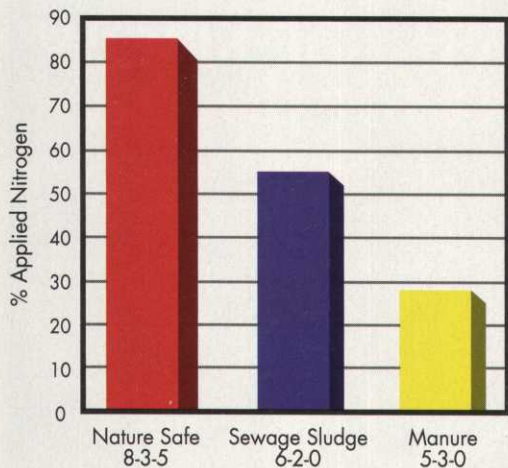
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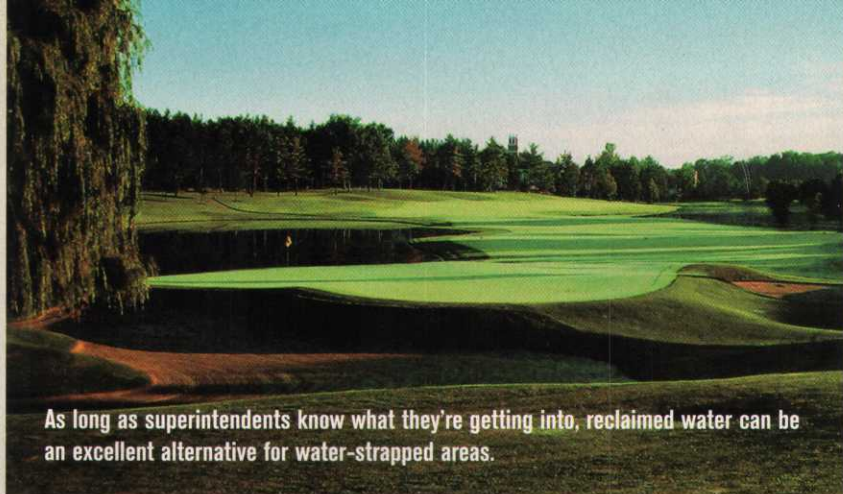
Real-Life Solutions: Effluent

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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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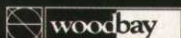
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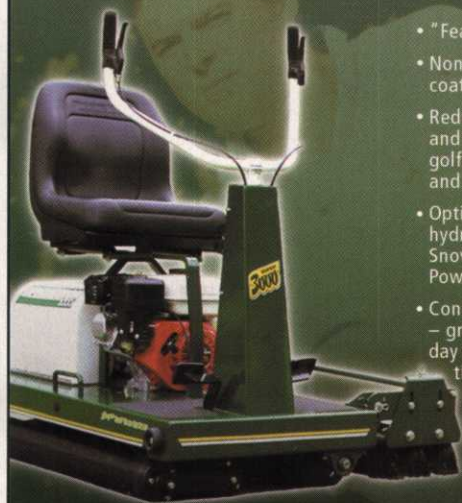


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Kevin Downing

**Certified Superintendent,
Willoughby Golf Club, Stuart, Fla.
Long-time USGA Green Section
Research Committee**

When 19-year-old intern Kevin Downing attended his first golf course superintendents association chapter meeting in 1974, he received a foretaste of the profession he would be joining.

On the two-hour drive to the meeting, he listened to two superintendents in the car exchange ideas. "I thought, 'What a wonderful profession that everyone helps out each other,'" Downing says.

Taking his elder colleagues' lead, Kevin has been heavily involved in volunteer work ever since. In the late 1970s, he worked his way through the chairs of the Palm Beach GCSA, culminating in its presidency. Then he served on the board of the Florida GCSA, serving as president in 1982. He has served on the USGA Green Section Research Committee for more than 15 years; been chairman of the Florida GCSA (FGCSA) Research Committee for more than a dozen years; was the FGCSA's delegate or alternate to the national Golf Course Superintendents Association of America (GCSAA) for a number of years; has served on various Florida Turfgrass Association committees over the years; and is a board member of the Treasure Coast GCSA, whose Education Committee he chairs.



Thomas Werner

**Certified Superintendent,
Ridgewood Country Club, Waco, Texas
Past president of Lone Star GCSA,
North Texas GCSA and Texas
Turfgrass Association**

Riding on inspiration from his first golf course boss, Tom Werner has planted a large volunteer footprint for anyone who wants to follow.

"I saw this guy [Gary Luscombe, at the former El Dorado Golf Club in Houston] totally immersed in the field and doing a lot with almost no money. That inspired me," Werner says.

Werner has worked on the boards of directors and served in all the offices of the Lone Star GCSA, North Texas GCSA and Texas Turfgrass Association (TTA). He was president of the Lone Star in 1991, North Texas in 1993 and TTA in 1999. At one point, he was on the boards of all three organizations. He also served on the board of the South Texas GCSA in 1986, when he worked at Tour 18 in Flower Mound.

"Giving back is a thankless job, but you take the attitude that you're making a difference," says the 1980 Texas A&M graduate. "It's a close-knit organization, and a lot of guys can't afford to go to the national conference. Whatever information you can share with them helps."



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Slowly But Surely

The change toward more eco-friendly oils is coming – and mower companies are preparing for it

BY FRANK H. ANDORKA JR., MANAGING EDITOR



It's not exactly a revolution. It's more like a building movement that may eventually engulf the industry. Eventually, eco-friendly oils will be standard on most mowing equipment, experts say.

Joe Wilson, senior engineer for John Deere, says he wouldn't describe the movement as robust, but he does believe it exists.

"The decision to produce these products has been spurred in part by municipal legislation and competition for contract bids where such oils are required," Wilson says. "There's clearly a movement in that direction."

"It's common sense," says Shawn Daly, product manager for Jacobsen. "Biodegradable oils cause less damage on the greens if they leak, and they're easier to clean up. Superintendents understand the advantages they offer."

Still, experts say there hasn't been a significant increase in requests for the oils despite

their advantages. Biodegradable oils often cost more for end-users. In addition, not all equipment is designed to handle the oils.

In the end, the decision about whether to switch to biofriendly oils will depend on how important it is to superintendents to have these eco-friendly allies in their arsenals.

Why make the change

The first and foremost reason to make the change is that bio oils do less damage than traditional petroleum-based products after a leak. The issue is particularly important for greens, Daly says.

"Greens are the most important asset a golf course has," Daly says. "Mineral-based hydraulic fluid leaks on greens can be devastating. They leave scars that can last for months."

Jody Hinkle, marketing communications manager for The Toro Co.'s golf and grounds division, says the inquiries her company receives about using bio oils usually center on the fairways because superintendents have the option of walk-mowing greens, which eliminates the risk of having pressurized oils in the equipment at all.

"The concern about larger burns and the destruction of grass is one reason courses consider moving to biodegradable oils," Hinkle says. "Local regulations governing contamination of soil and ground water that can result from oil leaks are another."

Daly says the ease of cleanup is the most compelling reason to make the change over to biodegradable oils.

"In certain areas of the country, petroleum-based products are considered toxic waste," Daly says. "That can make the cleanup expensive, and the damage to the grass can be enormous. Biodegradable oils don't pose those challenges."

"Ask any local oil-change center about the hoops they have to jump through to dispose of the oil," Daly adds. "Superintendents don't want to have to deal with that kind of hassle."

Hinkle says the disposal costs for both are similar. "Frequently, the bio oils are mixed with standard oils for disposal, so there's no savings."

Daly says the latest information he's seen places the costs of recycling biodegradable oils at between 10 cents and 30 cents per gallon, and motor oil costs 50 cents to \$1 per gallon to dispose. He adds that prices vary throughout the United States by market.

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Eco-friendly Oils

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The case against change

Hinkle says the two barriers to bio oils' success are price and accelerated deterioration of it.

"Bio oils have to be changed much more frequently than standard oils," Hinkle says. "The cost to use a bio oils is roughly three to five times more expensive than standard oils."

Hinkle says most Toro equipment can be converted to handle biodegradable oils, but the company hasn't seen a sharp rise in interest for this type of equipment.

"We're shipping a couple dozen pieces of equipment or less from the factory with these oils to meet customer requests," Hinkle says. "There are some

field conversions as well, but they're not in any great volume."

Daly admits that bio oils are slightly more expensive, but that superintendents are getting more interested in them. "There's a safety issue there for superintendents, and they're becoming more comfortable with the biodegradable products every day."

Jacobsen's mindset is that biodegradable oils will be their preferred oil in the future, Daly says.

Wilson says if superintendents want to change the type of oils they are using in Deere machines, they should flush the machines completely. Then the machines should be drained, refilled with bio oil and run until reaching normal operating temperatures. Then the oil

can be drained and replaced with fresh bio oil.

Some machines do not drain completely. If flushing is not done, some mixing of the mineral oil and bio oil will occur. The resulting mixture will be less biodegradable than the unmixed fluid.

Wilson says that care should be exercised when selecting a bio oil as brands are not created equal.

The challenges superintendents face with using eco-friendly oils will eventually be overcome, and the movement will continue to swell, Jacobsen's Daly predicts.

"It's an overall mindset — a strong commitment to the environment — that will eventually make this a permanent fixture in our industry," Daly says. "And that day may be coming soon." ■

Bio-products

Check out these organic and biological products for turf management:

New turf protectors

Becker Underwood's BioGain and Canteen work in tandem to treat newly seeded or established turf, according to the company. BioGain is designed for use in spray application programs to reduce stress and stimulate root growth through enhanced water and nutrient uptake and to correct iron deficiencies in turf. Canteen, a performance-enhanced spreader and soil penetrant, delivers pesticides and fertilizers to the root zone. For more information, contact 800-232-5907 or www.beckerunderwood.com.

Foliar nutrition program

Milliken Turf Products says its Emerald Isle CPR-True Foliar Nutrition Program is successful in defending against basal rot anthracnose. The CPR-True Foliar Nutrition Program provides small, efficient amounts of foliar-absorbed nutrition along with a generous amount of high-quality seaplant extract. For more information, contact 800-845-8502 or www.milliken.com.

Organic fertilizer

Earthworks offers Replenish 5-4-5 Natural Organic Fertilizer, a "formulated" granular organic. The Replenish line also includes an ammonium sulfate-based organic, 10-2-5; a potas-

sium sulfate product, 5-1-10; and a straight and inexpensive compost topdressing, 3-4-3. These are formulated natural organics, incorporating rich egg-layer compost, sugars, rock minerals and humic acids to allow for better microbial stimulation and soil conditioning. For more information, contact 800-732-8873 or www.soilfirst.com.

Organic fertilizer

Milorganite's organic fertilizer is versatile and can be used anywhere a superintendent or groundskeeper deems necessary. Milorganite is ideal for a variety of applications: greens; fairways and roughs; tee boxes; trees; planting beds; and flowering shrubs. For more information, contact 414-221-6810 or www.milorganite.com.

Nutrients

Floratine offers a variety of foliar auxiliary nutrients designed to address the photosynthetic & chlorophyll requirements of turfgrasses. The products include Astron, Per "4" Max, ProteSyn, Knife - Fortified iron supplement, Renaissance and others. For more information, contact 901-853-2898 or www.floratine.com.

Bio-fertilizer

Nutramax offers MACRO-SORB foliar, a biofertilizer based on amino acids. It allows for greater absorption and transport of nutrients through the leaves into the plant. The action of L- amino acids and substances with phyto-

hormonal effect in MACRO-SORB foliar helps to regulate the opening of the stomata, increase water potential and other factors. For more information, contact 800-925-5187 or www.nutramaxlabs.com.

Organic fertilizer

Nature Safe Natural and Organic Fertilizers are formulated by **Griffin Industries**, a producer of animal proteins for the feed industry. The organic feed compounds needed by animals are also required by plants for their growth, protection, reproduction and survival. Nature Safe has taken the same approach used to maximize animal nutrition to create products that emphasize soil and plant health. For more information, contact www.naturesafe.com.

Microbial-based products

Novozymes Biologicals offers microbial-based products, including EcoGuard biofungicide, which provides natural, effective dollar spot control. EcoGuard combines a patented microorganism and other natural ingredients for robust control of dollar spot, faster recovery from turf disease and protection from future infestations. It helps superintendents reduce the cumulative chemical exposure on their courses and meet integrated pest management (IPM) objectives when used in a recommended rotation program with standard chemical fungicides. For more information, contact 800-788-9886 or www.novozymes.com.