agement philosophy dictates they don't want to promote *Poa annua* as their major species, then how can *Poa's* strengths be used to keep it at bay? Most superintendents, and those in the academia world, agree that *Poa's* amazing ability to produce seed – even at extremely low heights of cut – is what makes this plant what it is.

Imitating strengths

Bentgrass doesn't possess the ability to produce seed at the desired heights of cut used in golf course management. But what if bentgrass had the ability to seed? Would this ability make it more competitive against *Poa annua*? It seems logical. Then again, the seedhead formation of *Poa* also is a considerable drawback when it comes to consistent, uniform-quality putting surfaces. It makes sense then, not to breed bentgrass to have the ability to seed at low heights of cut.

So, what if golf course managers physically imitated *Poa annua's* strengths by seeding greens with bentgrass more often? Let's face it, the majority of golf course management programs seed only when aerification or some other cultural practice takes place. In some areas of the country, *Poa annua* seems to seed continually throughout the entire growing season.

So, as a management practice, why don't superintendents imitate *Poa annua* and seed bentgrass more consistently throughout the season? There are some who argue it would be a waste of time and money. The primary argument is that a seedbed needs to be created for good germination to occur. There's certainly some credence to this, but *Poa annua* has been doing fine for some 100 plus years on golf courses with no creation of any special seedbed. Others would argue that the seed wouldn't remain viable in the soil very long.

On the contrary, according to Joseph Duich, a retired turfgrass professor from Penn State University, bentgrass easily can remain viable in the soil for as long as 10 to 15 years.

Turfgrass managers also can imitate the ability of *Poa annua* to build a natural seedbank in the soil throughout time by creating a seedbank for bentgrass. Without question, the ability to seed and create its own seedbank is the biggest strength *Poa annua* has. By imitating this strength, bentgrass can be seeded more frequently, and a seedbank can be built.

This also can be considered a more proactive approach in turfgrass management practices. If you analyze the normal thought process of seeding greens – excluding aerification and cultural practices – it's always a situation in which there's some weakened turf because of a problem. This could be caused by disease, traffic, weather, etc. When there's a void created in the turfgrass canopy by such problems, or a ballmark for example, *Poa annua* always has the upper hand because of its existing seedbank. So if superintendents also developed a bentgrass seedbank that would compete against *Poa annua's*, then maybe the invasion would be reduced.

Photo: Kevin Ross

Drop seeding consistently throughout the summer can help build a bentgrass seedbank.

Implementing seeding

How can this program be initiated? First and foremost, a club's budget must be considered. Seeding more often equates directly to more money spent. Most courses that fight the *Poa annua* battle would certainly pay, within reason, for whatever helps. Some extra seed might be a wise investment. Then a couple questions need to be asked. How many times a year should a club seed? What should the seeding rate be?

These questions have no definitive answers, but there are some thoughts. Let's take topdressing for example. Many clubs are on a once-every-two-to-three-weeks program. This could be the perfect time to incorporate a seeding program. Just incorporating a seeding operation with each topdressing would be a great option. Whether it's once or twice a month, it's a great way to start incorporating this program into the management scheme.

One item of caution should be noted. Seed tracking from golfer and mechanical traffic can be an issue. Taking extra precautions during the topdressing operation can minimize this issue. Many superintendents are reporting that when the surface is dry, tracking isn't

Turfgrass managers also can imitate the ability of *Poa annua* to build a natural seedbank in the soil throughout time by creating a seedbank for bentgrass.

Photo: Kevin Ross

Summer seeding should be performed after mowing and before topdressing.

a problem. A drench-type irrigation in the evening also would help drive the seed deep into the canopy and seed tracking shouldn't be an issue after the first day.

The next things to consider – how much to seed and can too much be seeded? A seeding rate of as low as 0.25#/M will equate to 14 seeds per square inch based on an 8 million seed count per pound. Using a 100,000-square-foot green-surface average for an 18-hole golf course, 25 pounds is used per seeding. Depending on the cultivar, this equates to about $125 to $225 per seeding. A bi-weekly program for a six-month season would cost $1,500 to $2,700 per year, again depending upon the cultivar used.

Photo: Kevin Ross

Poa annua has the ability to produce seed even at extremely low heights of cut.

Is there a possibility of seeding too much? No, according to the little research available. Turfgrass species seem to have an equilibrium for mature, stable shoot density. Basically, it becomes survival of the fittest.

One of the more critical times for seeding might be during late fall, as part of a dormant seeding program for winter preparation. It has been proven that late fall-seeded areas are ready to germinate in the spring, about four to six weeks ahead of any spring-seeded area. This happens primarily by the seed going through a priming process during this period. Then, before actual germination takes place, it goes into a frozen state throughout the winter. This is a tool to give bentgrass the jump over slower *Poa annua* in the spring and also a preventative measure for any winter damage that has occurred.

No interseeding

Imitating *Poa annua* shouldn't be considered an interseeding-type method. As shown recently by Karl Danneberger of The Ohio State University, the best way to get germination from an interseeding is with the creation of some sort of void with spiking, aerification, etc.

This said, it makes sense that if the seed is already present and a void occurs, successful bentgrass germination from this type of seeding program certainly can occur. It would be difficult to quantify how much seed is germinating without solid research. However, superintendents using the program with relatively new greens are reporting it might be helping with *Poa annua* invasion, and certainly with ballmark damage.

Will imitating the strength of our toughest foe be the trick needed to insure pure bentgrass green surfaces? Probably not, but it's another tool in the arsenal for the battle against *Poa annua*. GCN

Kevin J. Ross, CGCS, is director of golf course management at Country Club of the Rockies, Vail, Colo. He can be reached at kjross@vail.net.

Millennium ULTRA²™

Zero Weeds ... Zero Complaints! Millennium Ultra²

Golfers want one thing, a tee-time on a beautiful day on a beautiful course.

We can't help with the weather, but we can help keep your course weed-free and looking great with the next generation of superior weed control – Millennium Ultra².

Specially formulated for golf courses, parks and playing fields, Millennium Ultra² is the premier herbicide for sports and recreation use. Millennium Ultra² is a premium blend of Clopyralid, Dicamba and 2,4-D that offers rapid response, awesome weed-killing power and incomparable clover control – often with just one application!

Zero weeds ... happy golfers – by any measure, Millennium Ultra² excels.

Millennium Ultra² is a registered trademark of Nufarm Americas Inc.

Nufarm
Turf & Specialty

Home of Riverdale Brands
Phone: 800.345.3330
www.turf.us.nufarm.com

USE READER SERVICE #17

Dive deeper into water quality

ANALYSIS SHOULD TEST FOR ELEMENTS THAT IMPACT TURF HEALTH

by DAVID WOLFF

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.

Photo: Old Memorial

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."

Photo: Old Memorial

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

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 operator 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

Photo: Old Memorial

It's not uncommon for golf courses to use several water sources for irrigation, and it's important to sample each source.

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 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

David Wolff is a freelance writer based in Watertown, Wis. He can be reached at dwolff@charter.net.

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.

In the wake of the staggering tragedy
caused by the Asian earthquake and tsunami,
the Salvation Army World Service Office
is providing help to people
rebuilding their lives and livelihoods.

Your financial contribution can make a difference
in the lives of people in desperate need
by supporting our efforts to provide long term
restoration to this hurting part of the world.

SAWSO

The Salvation Army
World Service Office

**Please mail your donation to SAWSO c/o South Asia Relief Fund,
P.O. Box 269, 615 Slaters Lane, Alexandria, VA 22313**

SAWSO@usn.salvationarmy.org • www.SAWSO.org • 703-684-5528

Irrigation improvements

COST, MORE WATER-DISTRIBUTION CONTROL AND BETTER WATER CONSERVATION ARE AT THE ROOT OF IRRIGATION SYSTEM UPGRADES

by DOUG SAUNDERS

The need for golf course superintendents to provide the best possible playing conditions for golfers drives them to look at all aspects of turf management. The enhanced conditions of newer courses have put pressure on older courses to improve their product to stay competitive, and many times, an irrigation system is part of that improvement.

An irrigation system can be the most expensive investment on a course, but it also can have the greatest longevity, lasting an average of 15 to 20 years. The complete replacement of an irrigation system for a championship course can run from $1 million to $1.5 million. Even a partial upgrade can cost between $250,000 and $400,000, so the decision to upgrade and how to implement a design change need to be considered carefully.

"Many systems that were installed 20 years ago were done in an era where cost restraints led to the installation of inadequate systems for today's demands," says Larry Rodgers of Larry Rodgers Design in Lakewood, Colo. "In some instances, the pipes may not be large enough to carry enough water to be truly efficient. The spacing between sprinkler heads may be too great, which adds to the time needed to apply enough water. Also, the increase in play at a course can put other demands on the superintendent. As you look to the prospect of upgrading the system, all of these factors need to be taken into consideration."

Self-analysis

The first step when upgrading an irrigation system should be to analyze the existing system honestly and look at the costs, including

An irrigation system can be the most expensive investment on a course, but it also can have the greatest longevity.

Photo: Willow Point Golf Club

the labor and materials necessary to maintain the current system. By learning the true operation cost for an existing system, it will be easier to determine if a new system is necessary or if a partial upgrade of the infrastructure could be implemented. It's also advisable for a superintendent to document everything about the existing system so the features he likes can be saved or replicated in the new system. This self-analysis will be helpful when presenting the need for upgrading to a membership or management group.

"One of the most overlooked aspects to consider in this assessment phase is for all the decision-making entities, including the general manager, greens committee and superintendent, to identify what the expectations are for this new maintenance tool," Rodgers says. "The superintendent might be looking for more flexibility in the system, the manager might be looking for cost savings, and players want to see the course conditions be as good as the new course down the block. While all of these goals can be obtained, defining the common goals can make it easier to plan what type of upgrade will fit your particular situation."

It's also important to secure the services of an irrigation consultant who knows the golf course's needs and can help develop a plan to retrofit the course.

Each course will present its own unique circumstances that will determine how extensive an upgrade can be achieved. But whether it's a partial renovation that includes adding more heads to specific areas or changing the wiring patterns, or a complete replacement of an old system, the goal for most superintendents is to develop more control and flexibility of their water management program.

More control

The Willow Point Golf Club in Alexander City, Ala., a private golf club with 800 members, underwent a complete renovation, including the irrigation system, in 2002.

"Our old system was a 19-year-old, double-row system where each controller operated three or four heads in unison," says superintendent Cole McInnis. "Over the years, I had numerous problems with it because the hydraulics weren't sufficient and the wiring sequence of the heads wasn't efficient. Ten years ago, we added a dedicated computer to the system, but a lightning strike had seriously damaged it. When we planned the course renovation, we decided to replace the system completely."

The club added new pumps and larger pipes to deliver a more adequate flow rate to the course. The new system also provided more heads to the course with tighter spacing so each head serviced a smaller area. The advantage of more heads in closer proximity is to help reduce the time it takes to deliver an adequate amount of water, as well as reduce power and the amount of water.

Photo: Willow Point Golf Club

Golfers' expectations, system flexibility and cost need to be considered when looking into an irrigation system.

The placement of the new sprinkler heads was determined by topography, aerial photos and mapping of the course, which gives an accurate blueprint for the placement of irrigation lines and heads. Another improvement is the addition of multiple heads around the greens, which allows for varying water rates for greens and surrounds. The new sprinkler heads are then pinpointed through GPS mapping to develop a final record of the placement of all pipes and lines for future reference.

"The extra heads around the greens are helpful because the green has a sandy, porous subsurface compared with the hard, red subsoils around the greens," McInnis says. "Each area is its own microsystem and has completely different watering needs. I now have much better control of how much water I need to keep my greens and surrounds healthy and in good condition."

The control of the new system also gives McInnis other advantages. The central computer, which comes from the irrigation manufacturer, has the entire operating software factory loaded. The industry-standard feature has eliminated some of the early computer glitches in which course owners, trying to save money, would provide the computer and then load software on their own.

"I also have complete radio control of each head while I'm out on the course, and with the handheld PDA, I can make program changes in the field that can be downloaded into the control computer back at the maintenance building," McInnis says. "These new tools have been relatively easy to learn about and use and have made controlling the system easy. We have seen a 40-percent reduction of our water use, and it has been a godsend to not have to work constantly on irrigation problems."

More capabilities

Having better control of a system and all of the components can make a big difference for any superintendent. El Dorado Country Club in Indian Wells, Calif., is located in the desert region, and during the summer, the course sometimes uses one million gallons of water daily, so the ability to manage water efficiently is critical.

In 2002, the course was remodeled and more heads were added to the irrigation system.

"To give me more ability to expand my capabilities, I requested that quick couplers be installed on every other head so I can include hand-watering as an option for any place on the course," says superintendent Craig Ellis. "This just gives me another tool to use."

While upgrading to a new system is what any superintendent would like to do, the economic reality of $1-million expenditure might dictate another approach. In looking at a partial upgrade, the self-analysis should determine what could be accomplished through the project.

Photo: Toro

With an irrigation system upgrade, some superintendents have the capability to make program changes in the field.

One phase at a time

Butte Creek Country Club in Chico, Calif., is a private club with an aging irrigation system. Superintendent Tim McCoy came to the club last fall after the membership researched the irrigation system considerably. McCoy's recent experience growing in new courses was helpful as the club planned how to address the upgrade issue.

"The existing system is in total disarray," he says. "The heads are spaced far apart, averaging 80 to 85 feet apart, and three to five heads are tied together. While I would like to replace everything, the club decided to break down the upgrade into several phases. The first phase will focus on getting more heads around the green complexes and tees and adding computerized control, which this club has never had. This will lead to eventually replacing pumps, pipes, and more heads to get single head control of the rest of the course."

For McCoy, the key has been the development of a strong team that included consultant Russ Mitchell of Foremost Construction and the continuing input of the membership.

"It's important for everyone involved to understand all aspects of the plan, and so far, that has been the case here," McCoy says.

McCoy plans to keep the course open during the upgrade. In doing so, the construction crew needs to be flexible with their schedules because they have to deal with the impacts of weather and the course needs to be available for weekend events.

The plan is to bring a new service line into the green complexes and add a series of new heads from 100 to 150 feet in front of the green. This will require adding a lot of pipe. The course has Bermudagrass fairways and bentgrass/*poa annua*-mixed greens, so water management is different for each grass type. The inadequate system led to a noticeable loss of turf in the fairways and uneven conditions around the greens.

"Adding more heads to the greens areas will allow me to develop more consistent conditions in these areas," McCoy says. "The success of this project won't be seen by the membership until late next summer, but the improvement will meet their desires. The improvements will also encourage upgrades of other portions of the system."

Conserving water

But even more important than the ability to improve course conditions is the ability to use and conserve water in a more efficient manner. Water usage has become a hot-button topic recently, and it's expected to remain one.

"One of the big changes in irrigation has been the ability to close the watering-window time down considerably through larger main lines, sprinkler heads spaced closer together, and the ability to truly control where the water is going," says Bob Bryant of Bryant, Taylor, Gordon Golf, an irrigation consulting company. "Many upgrade projects might begin as partial upgrades because club members or g.m.s might balk at a new system and think it's just a lot of bells and whistles. But it's important to factor in how a good irrigation system that's properly planned and runs efficiently can also be an important conservation tool for this precious resource." GCN

Doug Saunders is a freelance writer based in Truckee, Calif. He can be reached at dougs@sierra.net.