

## Editors Note

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# The Art & Science of Irrigation

A good portion of the eastern seaboard has endured severe water use restrictions. Florida has been in various stages of water restrictions for the last few years and the USDA Drought Monitor (<http://drought.unl.edu/dm/monitor.html>) indicates more than half of the United States is experiencing some form of drought.

Turf managers have learned the importance of being involved in regulatory discussions, few are more critical than water advisory boards that set watering restrictions. Advisory boards meet to clarify exact water needs and how golf courses are irrigated.

Professors Bob Carrow and Ronny Duncan at the University have outlined five steps for water conservation in turfgrass management. The strategies are species and cultivar selection, use of non-potable water, irrigation system design, irrigation scheduling and golf course design.

Turfgrass research has focused on biological implications of species and cultivar selection and non-potable water, with less on scheduling and virtually none on system and golf course design. Yet from a manager's perspective the design and more importantly the flexibility of an irrigation system is where the “rubber hits the road” when it comes to water management.

## Water Use

Mike Brownell is a Water Resource Scientist with the Susquehanna River Basin Commission (SRBC). The SRBC is a regulatory body responsible for managing the water resources in a 27,000 square mile watershed through three states. Mike is responsible for permitting new projects in the basin and monitoring consumptive use by golf courses.

“When we put flow meters on the intake pipe on golf courses,” Mike informs, “it is clear golf course superintendents are using much more water than they think,

or maybe even need.” Mike found that during the irrigation season the 30-day average use is 142,000 gallons per day (GPD) and peak use is 275,000 GPD. To put this in perspective, to water 2.5 acres of bentgrass greens daily for 7 days to supply 1.6”, it will take approximately 15,500 GPD.

The SRBC reports that high use for 30 day period was between 736,000 to 828,000 GPD watering the whole course to a low of 89,000 GPD watering greens and tees only. It is important to consider the potential influence on environmental quality when consuming large volumes of water. This would be consistent with a deep and infrequent watering approach.

If golf courses water deeply and infrequently there can be 475,000 gallons removed at once that will have a greater impact than if the golf course irrigated at 100,000 GPD. On-site storage is an option for mitigating large removals from a source. If, for example, a golf course has 13,000,000 gallons of water in storage they can pump at a low rate from the stream or well. Maintaining storage on site for peak needs will cause less of an impact on the environment.

In an effort to more thoroughly understand how superintendents make irrigation decisions, the SRBC surveyed golf courses in the basin. Superintendents were asked the amount and frequency of irrigation. There were no relationships among courses of similar grass and soil types nor topography and expected quality. The only consistent result was that irrigation amounts appeared to be related to superintendent.



*Troubleshooting irrigation systems is critical to water conservation and maximizing turf performance.*

One could be surprised by the personal nature of irrigation that gives the appearance of imprecision. Yet on the other hand, with the variety of microenvironments that exist on a golf course it could be due to site-specific irrigation. Of course when considering the amount of water being consumed in a region that will receive about 30 inches of precipitation during the growing season leaves one wondering about irrigation practices.

Is the industry doing all it can to use the minimum amount of water or are we simply making global adjusts on the irrigation software? Are we activating four heads in a zone when we only need one head or instead of dragging a hose?

### Site-Specific Irrigation

Carrow and Duncan discuss the importance of efficient irrigation design for water conservation. The efficiency is derived from limiting water loss from leaching or runoff, irrigating within evening time constraints, salt-leaching or water-control authorities and finally by making precise site-specific irrigation.

Top of the line irrigation systems with all the “bells and whistles” may cost more to begin with but are likely to save money and water in the long term. This assumes that when new systems are purchased, designed and implemented, the superintendent embraces the technology, finding ways to utilize sophisticated controls integrated with weather stations and even soil moisture sensors. Essentially an extensive approach like this is striving to add precision and remove any ambiguity associated with the “art or feel” of irrigation.

In the mid-1990's Apple Computer conducted a survey of various age groups regarding their perception and use of computer technology. There was an important finding relative to the irrigation technology discussion. Most people new to computer technology use less than 10% of the computing power available to them in a personal computer. In fact, the study concluded that persons over the age of 50 used a computer basically as a typewriter.

On the other end of the spectrum are the people who embrace new technology and see the benefits. Erick Holm, CGCS the former Superintendent of the Onondaga Golf and Country Club in Fayetteville, NY has been able to integrate the latest technology (science) with his feel (art) for golf turf irrigation.

Erick went from limited flexibility with ir-

rigation zones and heavy reliance on hand watering to maximum flexibility with less need for hand watering. The old irrigation system had six heads per zone while the new system provided individual head control. In two summers with similar weather conditions and different irrigation systems Onondaga reduced the amount of total man hours for hand watering from 290 to 85.

Erick was able to utilize important computer software to predict water loss measured as evapotranspiration (ET). Once a baseline water need was established, Erick adjusted greens different than fairways to a certain percentage of ET. Another adjustment was programmed to compensate for any microenvironmental factors and a final adjustment for a specific head that might be related to turf or soil conditions. This is the true meaning of site-specific irrigation and is the antithesis of the global adjustments made without regard for site conditions.

### What's Next?

“Soil monitoring is the final frontier in golf turf irrigation” proclaims Paul Roche, the Irrigation Manager for the S.V. Moffett Company in Rochester, NY. On the other hand Paul agrees that many superintendents are not using irrigation systems to their full potential.

Paul is an active user of a personal digital assistant (PDA) and has been demonstrating the benefit of PDA's when integrated with GPS/GIS. “We just finished creating over 15 layers of information for the Oak Hill CC as part of the new irrigation system and in preparation for the 2003 PGA Championship.” The superintendent will have access to cables, drainage and irrigation system information at his fingertips.

Whether or not all this technology will eliminate the “art” associated with golf turf irrigation is doubtful. However, there remains a huge gap between the amount of technology available and using the technology to its full potential. When technology use results in significant reductions in water use, there should be no obstacles to full implementation.

Frank S. Rossi



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