Water Conservation Emerges as the Big Issue at National Turfgrass Research Conference.

By Dr. Doug Soldat, *Department of Soil Science, University of Wisconsin-Madison*

Every year, around the time when superintendents begin the ritual of blowing out the irrigation system, turfgrass researchers from all over the country gather to present the results of their most recent research. With over four hundred active members, this group is larger than you might expect. At the conference, the research presentations last only fifteen minutes but run back-to-back for four straight days. The topics are diverse and include breeding and genetics, general turf management, physiology, soils, pathology, weed management and more. Although there is no official theme year-to-year, it was clear to me this year that the number one issue was water conservation.

Water-related issues are no longer relegated to the arid west, a fact made clear by the media coverage of the Atlanta water crisis this fall. Although Atlanta receives over fifty inches of rainfall each year, the growing population in the metro area is using more water than is being replaced. Analogous situations exist in some of Wisconsin's population centers. In my opinion, the largest obstacle facing the green industry today is overcoming the negative public opinion on the impact of turfgrass areas on the environment. Negative perceptions lead to situations like the one in Atlanta where the green industry was the only industry regulated during the water shortage, despite it being nowhere near the number one user of water in the area. Coca-cola is the largest user of water in Atlanta, and they were not regulated. I think pursuing strategies to conserve water on golf courses can work to change public opinion when we communicate our efforts; and secondly, if and when water regulations appear, golf course superintendents will have the tools and know-how to deal with the regulations.

I thought I'd highlight some of the presentations at the confer-

ence related to water conservation that caught my eye. I've broken them down into three categories representing the major strategies for conserving water in turfgrass.

Development and Selection of Improved Species/Cultivars

There was plenty of research on the development of salt-tolerant cultivars, much more than can be adequately summarized here. However, one very interesting presentation made by Christian Baldwin of Clemson University documented the creation of an extremely drought-tolerant creeping bentgrass plant by transferring a gene from a different species into the bentgrass. Due to the concerns of the potential "invasiveness" of turfgrass, it is unlikely that this creeping bentgrass will ever be released — unfortunate due to the tremendous water savings that could result from its use. Dr. Stier's research on the invasive potential of turfgrasses will eventually provide comprehensive science-based information to the governmental agencies which make decisions on whether or not to allow the release of cultivars like the one from Clemson. Rest assured that researchers from across the U.S. are working very hard to improve the salt and drought tolerance of every major turfgrass species and exploring entirely new species as well.

You might be thinking that new cultivars are great, but my course is 80 years old with 80% annual bluegrass and I know my membership will never support a full renovation. Well there is good news for you too. Jing Dai of Penn State studied the salinity tolerance of annual bluegrass ecotypes and found the annual types to be very sensitive to salinity, while the greens-type annual bluegrass was much more tolerant of high salinity levels. She concluded that the salinity tolerance of greens type annual bluegrass was similar to creeping bentgrass, and could be used on golf courses with mild to moderate salinity issues.

Use of Alternative Water Sources

Aside from plant selection, use of alternative water sources is a major water conservation strategy. There is nothing new about using non-potable water for irrigation in the west, but what about in regions of high rainfall? Almost no research on using poor quality irrigation water exists for these areas. However, this is beginning to change. A presentation made by Mark Slavins of Cornell University focused on the use of high salinity irrigation water in the North East. Mark highlighted the fact that nat-

ural rainfall events dilute the salt concentration from the applied irrigation. When rainfall occurs periodically, high salinity water can probably be used for irrigation without making changes to irrigation management. However, irrigating with high salinity water during extended periods of drought (three to five months) will decrease turf quality unless excess irrigation water is applied to leach accumulated salts. Sandy soils were found to be more susceptible to salt accumulation than sandy loam and silt loam soils.

High salinity water, like wastewater, is not the only possible source of alternative irrigation water. In fact, harvested stormwater might become the most prevalent type of alternative water in humid regions of the US. Dr. Kevin Frank of Michigan State University discussed this technique. The concept is simple: capture the runoff from snowmelt and rainfall events that occur in urban areas and use that water for golf course irrigation. This strategy solves two problems at once. First, the nutrient-rich stormwater from the urban areas doesn't ever make it to the surface water bodies where it can cause pollution, and second, the amount of groundwater required for irrigation is drastically reduced. This is another example of how golf courses can potentially provide environmental services in urban areas.

Improved Irrigation Scheduling and Design

The third strategy for water conservation is to improve irrigation design and scheduling. In terms of irrigation design, there were several excellent presentations on sub-surface drip irrigation at the conference. Subsurface drip irrigation is a series of underground emitters which release water into the soil slowly and efficiently. The main drawback of this technology is the poor results found during turfgrass establishment; however, it has found a market in the golf industry for bunker faces and other difficult to irrigate areas. Subsurface drip irrigation is the most efficient water delivery system, and I expect that future research will continue to improve the utility of this technology.

One of my favorite presentations of the entire conference was made by Larry Stowel (co-author Wendy Gelernter) of the PACE institute. The title of the talk was "Virtual Irrigation Audits in Real-time." Larry noted that there are several ways to check the coverage

of an irrigation system. One way would be to put catch cans out on a putting green spaced on regular intervals. Turn on the irrigation system for a while and then check the amount of water the fell in each can. This is too labor intensive to be of practical value. What Larry and Wendy found was that one could use a GPS system to map the perimeter of the green and also map the locations of the irrigation heads. Then, using the theoretical throw of each head one could identify areas with different numbers of head throwing to it (Figure 1). They found that the higher the number, the greater the moisture content. This information is quick and easy to obtain, and the manager will have an instant idea of the distribution of soil moisture content following an irrigation event. The manager could use the maps to help employees find "hot spots" for handwatering, or make adjustments to heads in an attempt to improve coverage. Larry stressed that the theoretical maps should be confirmed by taking soil moisture measurements. He gave an example of when the soil moisture probe measurement did not match up with the map. Further investigation found that a surrounds head was hitting the green, making the soil much wetter than expected. The surrounds head was adjusted and irrigation efficiency was instantly improved. With out this type of audit, the problem would have gone undetected.

As you can see, water conservation is an exciting area of turfgrass research and it will become increasingly important to have science-based information when State water regulations become more commonplace. Currently, we are in the process of building a "rain-out" facility at the O.J. Noer Facility that will move out over the plots when rain is detected in order to simulate extended periods of drought so we can accurately conduct studies on water conservation strategies for Wisconsin without a storm coming through and confounding the work. I look forward to using the information we gather to help turfgrass managers improve water conservation.

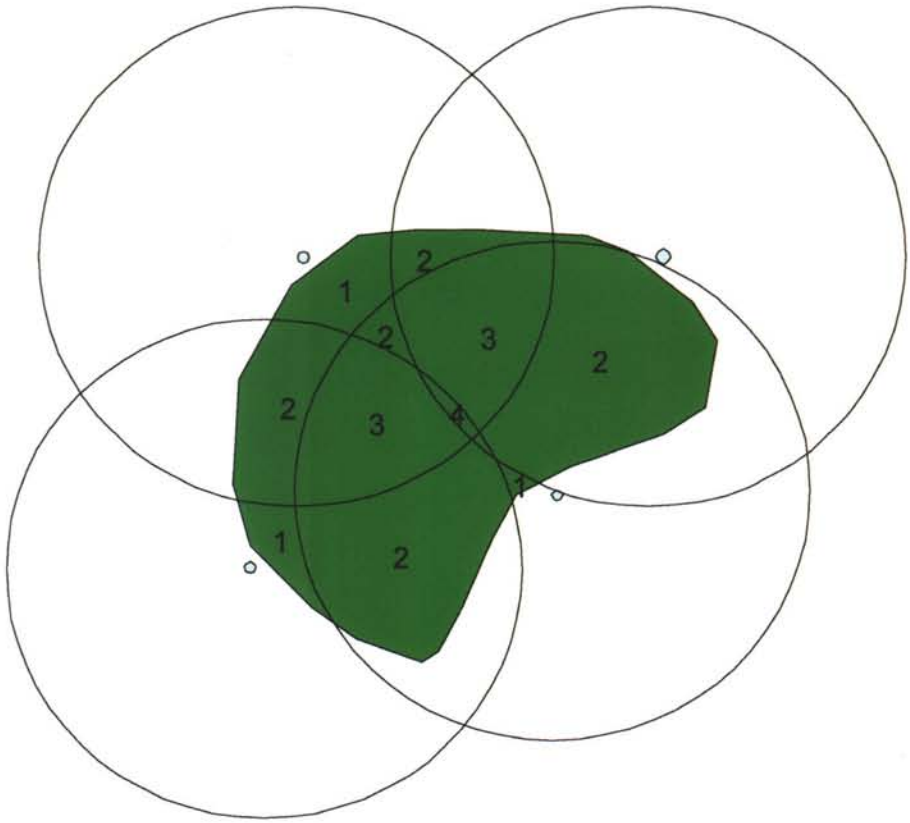

Figure 1. Example of a putting green with imperfect head spacing leading to theoretical differences in soil water content. Areas with one or two heads throwing to them will likely be drier than areas being hit by 3 or 4 heads. A soil moisture probe can be used to validate these predictions. Improved moisture management is possible with this type of information.

As a final note, you might be wondering how the work done at the University of Wisconsin was received at this national conference. Well, I am proud to say that Dr. Stier's graduate student Eric Koeritz took 2nd place in the graduate student competition for his presentation on "Seed Mixtures and Timing for Cool Season Sports Turf Establishment", and Jake Schneider (also with Dr. Stier) took 1st place for his presentation on "Rain Gardens and Urban Water Quality". They were competing against close to one hundred students from dozens of Universities. Congratulations to Eric and Jake and On Wisconsin!