

# Irrigation Research Solutions for Your Life



## THE IRRIGATOR NEWSLETTER



Feature story: EPA...

### EPA WaterSense Draft Specification

In January 2011, the EPA released a revised Weather-based Irrigation Controller Specification as a part of the WaterSense labeling program. This specification incorporates the Irrigation Association's Smart Water Application Technologies (SWAT) testing protocol as the basis of the test with some additional requirements above and beyond the current testing standards.

Prior to releasing the first draft specification, the EPA asked the University of Florida to research the SWAT testing protocol of weather-based controllers to independently answer some of the questions raised by the industry regarding the testing methodology. The University of Florida installed three brands of controllers previously tested with published results by the Irrigation Association. Duplicate controllers of two brands were installed and differed only in that one controller had an additional rain sensor. Therefore, the effect of using a rain sensor could be evaluated. The goal of the research was to determine if the SWAT testing results were transferrable to any location in the country and if the SWAT testing procedures were reproducible by independent testing labs in the current form.

The SWAT testing procedures were reproduced with help from the current testing lab. To make it easier for future testing labs to run the test, a spreadsheet was created by the University of Florida to calculate the scores of irrigation adequacy and scheduling efficiency used as a benchmark of performance. This research occurred over mostly a winter period with low ET<sub>o</sub> and little rainfall thus making the results generally inconclusive in the other areas. The final report is titled Examination of SWAT Protocol Utilizing a Performance Analysis of Weather-based Irrigation **Continued on page 3**

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*Did you know... You can find the irrigation application rate of a single zone by measuring the water caught in tuna cans placed across your yard.*

### A note from Dr. Michael Dukes...



Welcome to the spring 2011 issue of the IrriGATOR newsletter. In this issue, we highlight a variety of new information such as our role in the recently released EPA WaterSense weather-based controller draft specification, some new publications, and the website addition about turfgrasses in Florida. As we engage in various landscape and agricultural activities during this spring season, don't forget to look to our research results for guidance and inspiration in optimizing your irrigation strategies.

Happy reading,



Michael D. Dukes

## Publications: Hot Off the Press

### *A New Landscape Water Use Publication*

Are landscapes over-irrigated in Southwest Florida? A spatial-temporal analysis of observed data

By C.C. Romero and M.D. Dukes  
Irrigation Science 2011

Irrigation was estimated from monthly billing records for eleven cities to determine if there was significant over-irrigation in Hillsborough County, FL from 2001 to 2007. Irrigation was compared to a calculated irrigation requirement using a monthly soil water balance. Actual irrigation was estimated from total household water use by two different methods for determining indoor water use known as the per capita method and the minimum month method. Average estimated irrigation, ranging from 264 to 684 mm/yr, was generally less than the calculated irrigation requirement, ranging from 612 to 744 mm/yr. Estimated irrigation increased temporarily in areas under urban development, which was evidenced by built landscape expansion.

Additionally, good correlation was found between the annual estimated irrigation and the annual calculated irrigation requirements when the per capita method was used, but not between annual estimated irrigation and the annual rainfall. This method can be



utilitized in future conservation efforts to identify users that will benefit from outdoor water saving opportunities. [1]

We would like to thank the following agencies for funding this research:

- [1] Tampa Bay Water
- [2] Florida Turfgrass Association
- [3] Golf Course Superintendents Association of America
- [4] Environmental Protection Agency

### *A New Controller Publication*

Landscape irrigation scheduling efficiency and adequacy by various control technologies

By M.S. McCready and M.D. Dukes  
Agricultural Water Management 2010

The capability of evapotranspiration (ET) based controllers, soil moisture sensor controllers, and rain sensors to schedule irrigation was evaluated to determine their potential to conserve water



resources while maintaining good landscape quality. Irrigation adequacy, a measure of under-irrigation, and scheduling efficiency, a measure of over-irrigation, were calculated in 30-day running totals based on the Irrigation Association (IA) Smart Water Application

Technologies (SWAT) testing protocol. A time-based treatment irrigating on 2 days/week without a rain sensor was established as a comparison. Results showed that irrigation adequacy varied during the testing periods by 22 to 100 percent with higher values in the fall months due to lower ET, while scheduling efficiency, which ranged from 0 to 100 percent, decreased for all treatments when rainfall increased. Looking at only one 30-day testing period, as is done in the IA



SWAT testing protocol, will not fully capture the performance of an irrigation controller as exhibited in the fluctuation of results. The important factors to receiving good irrigation



adequacy and scheduling efficiency scores while maintaining acceptable turfgrass quality was a combination of the amount of water applied and the timing of application. [2,3]

*A complete collection of the UF-IFAS ABE Irrigation Research publications is on our website!*

**EPA, cont. from page 1**

Controllers and is available at [http://www.epa.gov/watersense/docs/university\\_of\\_florida\\_report.pdf](http://www.epa.gov/watersense/docs/university_of_florida_report.pdf).

Based on a combination of comments provided by the industry on the first draft of the WaterSense specification and the availability of more data due to continued monitoring by the University of Florida after the submission of the final report, the EPA turned to the University of Florida again to re-evaluate the previously unanswered questions as well as evaluate some newly proposed requirements during periods of variable weather conditions such as frequent/infrequent rainfall and high/low  $ET_0$  occurring since the end of the original analysis.

Below is a summary of key findings from this work:

- The impact of a rain sensor on scheduling efficiency scores varied throughout all of the periods but generally increased during frequent rainfall while resulting in less irrigation.
- Using average scores resulted in increased passing rates compared to using the minimum score across all zones.
- The combination of using average scores and changing the order of calculations to the order of  $ET_C$ , irrigation, and rainfall ensured the highest rate of passing.
- Using minimum scores instead of average and changing the order of calculations increased the passing rate to a lesser extent while encouraging appropriate scheduling techniques for all landscapes.
- Two consecutive days or three total days of missing weather data by the controller or from the weather station during a single 30-day test period should not significantly impact final results.

The following are recommendations for EPA WaterSense based on this research:

- Use one irrigation event for every zone. The only exception occurs when each zone without irrigation has zero deficit.
- Set minimum runtime of 3 min. Irrigation events totaling 3 min or less are removed from the test as if those events were never applied.
- Change order of operations to  $ET_C$ , irrigation, and rainfall. The specified order of calculations will eliminate the penalty for irrigation occurring prior to rainfall on the same day.
- Set a minimum number of rain events. The actual number should be based on regional climate norms.

Some of the proposed changes were incorporated into the revised specification released by the EPA in January. A detailed explanation of these findings and recommendations can be found in the second report titled Examination of SWAT Protocol Utilizing a Performance Analysis of Weather-based Irrigation Controllers: Update with Extended Data [http://www.epa.gov/watersense/docs/controller\\_2010-epa-report.pdf](http://www.epa.gov/watersense/docs/controller_2010-epa-report.pdf). Additionally, the revised specification can be found at <http://epa.gov/watersense/partners/controltech.html>. The specification closed for comment on March 23, 2011 and it is anticipated that the final specification will be released in the fall. [3]

## UPCOMING EVENTS

Project team members will be presenting their research projects at upcoming conferences.



Environmental and Water  
Resources Congress  
May 22-26, 2011  
Palm Springs, California



Annual International  
Meeting  
August 7-10, 2011  
Louisville, Kentucky



Water Smart Innovations  
October 6-8, 2010  
Las Vegas, Nevada

## What's up with the Research Team



### Meet Maria!

We would like to welcome the newest addition to the IrriGATOR research team, María Isabel Zamora Re from Heredia, Costa Rica. While obtaining her Bachelor of Science degree in Agricultural Engineering from EARTH University in Costa Rica, María participated in a student exchange program where she shadowed a graduate student in our research group for 4 months in 2007. During that time, she worked with irrigation control using soil moisture sensors in turfgrass. Since graduation in Fall 2008, María has gained experience by filling multiple positions at various golf courses throughout Costa Rica. Despite her success in the golf course industry, María had such a great experience at UF that she decided come back as a graduate student in 2010! Currently, she is working on multiple projects including distribution uniformity and frost protection of strawberries and the University of Florida SWAT testing of rain sensors for the Irrigation Association.

If you would like to contact Maria, or anyone else on the IrriGATOR research team, please see the contact details on our website <http://abe.ufl.edu/mdukes>

### Where are they now...

**Daniel Rutland** graduated with his Bachelor of Science in 2007 and with his Master of Engineering in 2009, both from the University of Florida Agricultural and Biological Engineering department. While working on his Masters degree, Dan focused on continuing on-going research using ET controllers for residential landscapes in southwest Florida. After graduation in 2009, Dan continued working with the research group to manage some budding projects, but ultimately decided to join the world of consulting in January 2011. Dan is currently employed by Royal Consulting Services, Inc. in Longwood, FL and now works on a wide variety of projects throughout the state that are related to water resources and agriculture. Some examples of his responsibilities include storm water modeling, environmental resources permitting, water use permitting, and comprehensive nutrient management planning. Dan can be reached at [dcrutland@gmail.com](mailto:dcrutland@gmail.com).

Thank you for all of your hard work and being an integral part of the IrriGATOR research team! We wish you the best of luck in your future endeavors!



If you are interested in receiving this newsletter, please email [irrigation@ifas.ufl.edu](mailto:irrigation@ifas.ufl.edu)

Further information can be found on our website <http://abe.ufl.edu/mdukes>

