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UF UNIVERSITY of FLORIDA
IFAS Extension

AE485

Interactive Urban Irrigation Tool for Florida[1]

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Introduction

A team from UF/IFAS has developed a new interactive irrigation tool for homeowners, irrigation professionals, and others for investigating different irrigation schemes using site-specific irrigation system specifications and real-time data from the Florida Automated Weather Network (FAWN) stations located around the state of Florida. This interactive tool as well as other FAWN data and tools is organized and available on the FAWN website (http://fawn.ifas.ufl.edu). The new tool is located under *Interactive Urban Irrigation Tool*, which is located in the FAWN Tools menu under the Irrigation option (http://fawn.ifas.ufl.edu/tools/interactive_irrigation_tool/).

Purpose of the Interactive Irrigation Tool

The purpose of this tool is to provide users with the ability to test different ways of scheduling irrigation for their lawn (or turf) without having to purchase different controllers and with the ability to simulate the use of lower water amounts without causing over- or under-irrigation to their turf. The tool allows the user to simulate the performance of new technologies such as smart irrigation soil moisture sensor controllers (SMS) or evapotranspiration (ET) controllers in a virtual environment. Using the tool, the user can determine which system would be best for their lawn as well as implement practices that could potentially result in water conservation, a healthier lawn, and lower water bills. The interactive irrigation tool is designed for turf and not for ornamental plants such as trees or shrubs. It has limitations because of the differences among site conditions, unaccounted for site characteristics, distances between weather stations and sites, and assumptions made by the model. The tool should only be used for comparative purposes and as a learning tool. UF/IFAS and the authors are not advocating a particular technology or providing any lawn quality guarantees associated with this tool.

Students can use this tool to learn how to correctly operate irrigation scheduling systems. Property owners can assess various ways to improve their irrigation efficiency by using less water and to reduce their water bills. Irrigation professionals can use the tool to assist their clients in determining how to best manage home and business irrigation.

How the Tool Works

The tool is based on a daily water balance method, which is reported to the user weekly and considers rainfall, infiltration, runoff, percolation, ET, irrigation, and soil water content. The tool combines user input, the simple water balance calculations, and real-time FAWN data to provide the information on either how much excess water the lawn received (as a combination of irrigation and rainfall) or how many days the lawn experienced water stress (i.e., too little water to support grass growth). The results of the tool are

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provided to the user via a weekly email (using Gmail), with results based on calculations from the previous week.

How to Get Started Using the Tool

The tool can be found at the FAWN website. Select the FAWN Tools menu, then select Irrigation, and you will find the Interactive Urban Irrigation Tool link (http://fawn.ifas.ufl.edu/tools/interactive_irrigation_tool/). This link will take you to the application. Once you sign in, you will be directed to the system input web page.

Following are the system inputs:

Units

In this section, you must select a unit system of either English or Metric (Figure 1). All subsequent values should be submitted using the unit system selected.

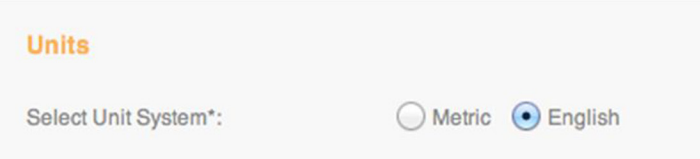

Figure 1. Screenshot of Units input section.

Soil Characteristics

In this section (Figure 2), you submit rooting depth, soil type, and irrigated area. Rooting depth refers to the depth of the roots of the lawn turf. The rooting depth can be estimated by digging small areas of turf and observing roots, or the default value can be used. For soil type, one of the following options must be selected from a dropdown menu: sand, sandy loam, loam, silty loam, clay loam, or clay. For soil texture information in your area, call your local Natural Resources Conservation Service (NRCS) office or visit the USDA soil survey website (http://websoilsurvey.nrcs.usda.gov). The default soil type is sand. Since all soil types may not fit into the categories provided, the soil type that is most similar in terms of water-holding ability should be selected. Also, you must input the irrigated area, which is the size of area receiving irrigation.

Figure 2. Screenshot of Soil Characteristics input section.

Irrigation Technology Used

Irrigation system information is submitted here (Figure 3). The choices are Time-Based Scheduler, Time-Based plus Rain Sensor, Time-Based plus Soil Moisture Sensor, or ET Controller.

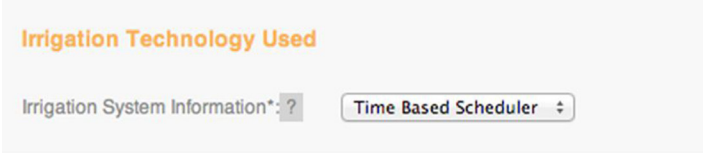

Figure 3. Screenshot of Irrigation Technology Used input section.

Time-Based Scheduler refers to a controller that is set to irrigate on certain days at certain times.

Time-Based plus Rain Sensor (Figure 4) refers to a Time-Based Scheduler with a rain sensor to bypass irrigation if the rain sensor signals that rain has occurred. If this option is selected, a rain sensor setting must be submitted in inches or the default value can be used. Figure 5 shows an example of a rain sensor.

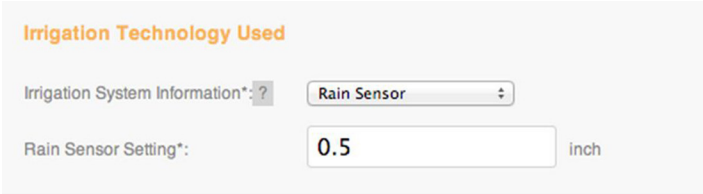

Figure 4. Screenshot of Irrigation Technology Used input section showing selection of Time-Based plus Rain Sensor option and default sensor setting.

Figure 5. Example of rain sensor.

Credits: Nicole A. Dobbs, UF/IFAS

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Time-Based plus Soil Moisture Sensor (SMS, Figure 6) indicates that a Time-Based Controller is being used with a SMS. The SMS acts as a switch and bypasses irrigation if the soil moisture is over a set threshold. The threshold is a percentage of the amount of water the soil can hold, and the default setting is 0.7 (which corresponds to soil that is at 70% of its water-holding capacity) but can be adjusted by the user. Figure 7 shows an example of this type of controller.

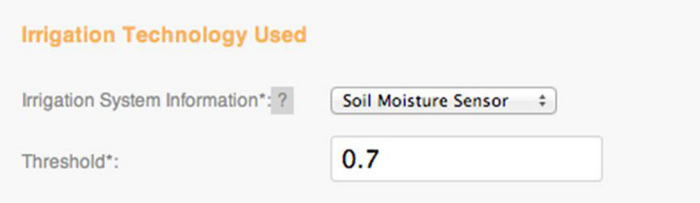

Figure 6. Screenshot of Irrigation Technology Used showing selection of Time-Based plus Soil Moisture Sensor and default soil moisture value.

Figure 7. Example of a time-based controller with a soil moisture sensor. Credits: S. Michael Gutiérrez, UF/IFAS

If ET Controller is selected (Figure 8), the irrigation will be determined based on ET estimated using FAWN data and crop coefficients for Florida. ET is an estimate of water use by plants and evaporation. Crop coefficients are values that adjust the ET calculated using weather information to estimate water use by grass. Figure 9 shows an example of an ET controller.

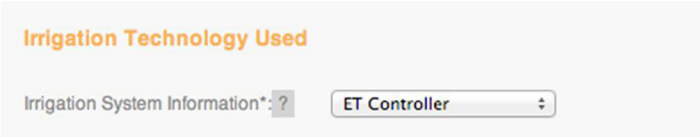

Figure 8. Screenshot of Irrigation Technology Used showing selection of ET Controller.

Figure 9. Example of an ET Controller. Credits: Nicole Dobbs, UF/IFAS

More information on these technologies is available in the following EDIS documents:

- *Residential Irrigation System Rainfall Shutoff Devices* (http://edis.ifas.ufl.edu/ae221)
- *How Do Soil Moisture Sensor (SMS) Irrigation Controllers Work?* (http://edis.ifas.ufl.edu/ae437)
- *Smart Irrigation Controllers: What Makes an Irrigation Controller Smart?* (http://edis.ifas.ufl.edu/ae442)
- *Smart Irrigation Controllers: Operation of Evapotranspiration-Based Controllers* (http://edis.ifas.ufl.edu/ae446)

Videos of these technologies are available on Dr. Michael Duke's website at http://abe.ufl.edu/mdukes/video-presentations.shtml.

Irrigation Schedule

The Irrigation Schedule section (Figure 10) begins with entering a ZIP code. This is used to determine which FAWN weather station will be used in the water balance calculations. Once you enter your ZIP code, you can specify irrigation days (i.e., Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, and Saturday) by checking the boxes. While the tool is for all of Florida, water-use restriction information has been integrated into the tool only for Miami-Dade County at this time. If a Miami-Dade County ZIP code is entered, then a house number (e.g., for the address 22001 West St., the house number would be 22001) must be submitted also because Miami-Dade County is restricted to watering two days per week depending on the house number. Even-numbered addresses irrigate on Sunday and Thursday, while odd-numbered addresses

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irrigate on Wednesday and Saturday. Other locations in Florida may have restrictions that should be considered when describing the irrigation schedule; however, they are not currently integrated into this tool.

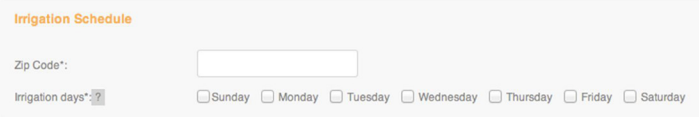

Figure 10. Screenshot of Irrigation Schedule showing ZIP code and Irrigation Days input.

Irrigation Amount Applied Per Event

If a technology other than the ET Controller is selected in the Irrigation Technology Used section, then an Irrigation Amount Applied Per Event must be submitted. This is accomplished in one of two ways. You can input an Irrigation Depth/Amount (Figure 11) or select an Irrigation System Type and input the length of time the system runs per irrigation event (Figure 12). The options for Irrigation System Type are Micro Irrigation Head (delivering 0.25 in/hr), Fixed Irrigation Head (delivering 1.5 in/hr), Gear Driven Irrigation Head (delivering 0.5 in/hr), and Impact Irrigation Head (delivering 0.5 in/hr).

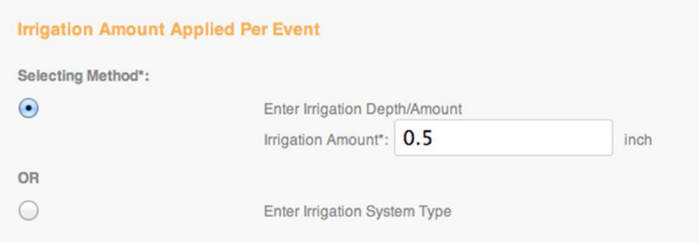

Figure 11. Screenshot of Irrigation Amount Applied Per Event input section showing the default Irrigation Amount.

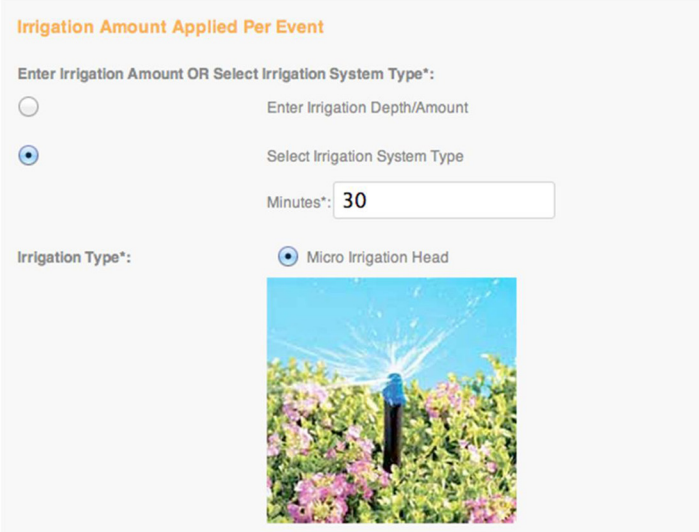

Figure 12. Partial screenshot of Irrigation Amount Applied Per Event input section showing selection of Micro Irrigation Head and the runtime of 30 Minutes.

Subscription

If you subscribe, you will receive the resulting irrigation schedules calculated by the tool in a weekly email. In this section, you will need to accept the subscription to receive the weekly email. Users can cancel delivery of the email at any time.

Weekly Reports

Each week, the tool evaluates water usage of the user's lawn based on the submitted information and FAWN data from the previous week, and sends the evaluation to the user via Gmail (Figure 13). If the lawn receives too much water, this is reported in terms of gallons of water and the percentage of overwatering that occurred. If too little water was received, then the number of days the lawn did not receive enough water is displayed. The email includes web links to relevant EDIS documents and UF/IFAS programs, and the user also receives a water efficiency score on a 1 to 5 scale, with 1 being excellent and 5 being poor.

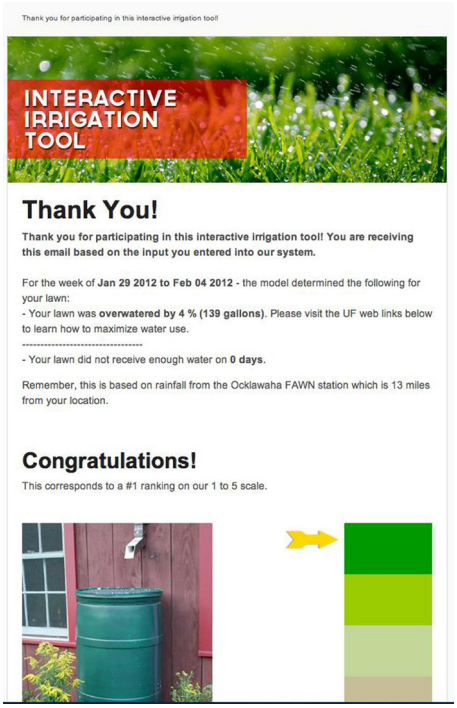

Figure 13. Screenshot of weekly email report.

Limitations

A major limitation of this tool is that rainfall can be highly variable in space and the FAWN stations can be located some distance from the user's location. With this in mind, the email displays the distance between the user's ZIP code and the FAWN station. There are plans to investigate

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alternate sources of rainfall data that could be integrated into the calculations. Another limitation is that the tool does not address trees, shrubs, annuals, or other ornamental plants.

Further Questions

This tool was developed through a collaborative effort between FAWN and UF/IFAS faculty. To help ensure questions are answered in a timely manner, please send questions or comments to Dr. Kati Migliaccio at klwhite@ufl.edu. You can also contact your county Extension service office for questions related to irrigation and plant health.

References

Dukes, M.D., M. Shedd, and B. Cardenas-Lailhacar. 2012 reviewed. *Smart Irrigation Controllers: How Do Soil Moisture Sensor (SMS) Irrigation Controllers Work?* AE437. Gainesville: University of Florida Institute of Food and Agricultural Sciences. http://edis.ifas.ufl.edu/ae437.

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