Quantifying Florida-Friendly Landscaping irrigation use in southwest Florida

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Abstract. *The objective of this study was to determine if Florida Friendly Landscaping (FFL), whose actual irrigation use has not been documented relative to typical landscapes, results in reduced irrigation application. Florida Friendly-recognized homes from Hillsborough, Pasco, and Pinellas counties in Florida were compared to representative neighbors with acceptable turf quality selected for each FFL home. A subset of FFL homes that were visibly following FFL principles while maintaining an aesthetically pleasing landscape were then compared to their neighbors. Estimated monthly irrigation use was determined from monthly total water use (potable billing data), an estimate of indoor water use, and an estimate of irrigated area. For both FFLs and comparisons, the means exceeded the medians in all months and a large portion of both groups did not irrigate at all. Florida Friendly Landscaped homes tended to irrigate less than their traditionally-landscaped neighbors, although there was high variability. The water savings of all recognized FFL homes was approximately 35% as compared to their minimally-acceptable turfgrass neighbors. Because of the high variability of the data, however, further analysis is needed to determine the effectiveness of FFL as a water conservation measure.*

Keywords. Irrigation, Turfgrass, Water Conservation, Florida

Introduction

Irrigation is often used to maintain high-quality residential landscapes in Florida and can be a substantial component of a home's total potable water use. Irrigation can account for 59% of total residential potable water use in the United States (Mayer et al. 1999). A study in central Florida found that an annual average of 64% of total potable water use (peaking to 88% in the summer months) was used for irrigation (Haley et al. 2007).

The term xeriscaping, from the Greek word "xeros", meaning dry or arid, was developed by Denver Water in 1981 and has gained popularity in the arid southwest. Several studies have documented the irrigation usage of single-family residential homes that use xeriscaping

(Medina and Lee 2006, Sovocool and Morgan 2005, Medina and Gumper 2004). Most studies documented water savings for all study groups with xeriscape, with Sovocool and Morgan reporting a reduction in total household water demand of 30% in southern Nevada.

While xeriscaping focuses primarily on water conservation, the Florida Friendly Landscaping (FFL) program has a broader environmental scope. The FFL program promotes attractive landscapes and environmentally sustainable practices through nine principles: 1.) right plant, right place, 2.) water efficiently, 3.) fertilize, 4.) mulch, 5.) attract wildlife, 6.) manage yard pests responsibly, 7.) recycle, 8.) reduce storm water runoff, and 9.) protect the waterfront (UF/IFAS 2009a). In the category of water efficiently, the FFL program recommends several water conservation measures such as: grouping plants with similar water needs, reducing irrigation in the summer and winter, and maintaining an automatic rain shutoff device for a sprinkler system (UF/IFAS 2009b). The residential component of FFL is Florida Yards and Neighborhoods (FYN). Homes are recognized as FFL (or FYN) by passing a landscape evaluation.

Unlike xeriscaping in the west, the actual irrigation usage of FFL has not been documented and therefore is not a proven conservation method. The objective of this study was to determine if FFL can be promoted as a water conservation measure based on quantifiable irrigation reduction relative to traditionally-landscaped homes. All FFL-recognized homes that were identified in water billing data from Hillsborough, Pasco, and Pinellas counties in Florida were compared to representative neighbors with acceptable turf quality selected for each FFL home. A subset of FFL homes that were visibly following FFL principles while maintaining an aesthetically pleasing landscape were then compared to their neighbors.

Materials and Methods

Data collection

Tampa Bay Water (TBW), a regional water supply authority, provided monthly billing records for seven member-government service areas: Pasco County, New Port Richey, Pinellas County, St. Petersburg, Northwest Hillsborough County, City of Tampa, and South Central Hillsborough County. Monthly water billing data for over one million customers was provided for the approximate time period of 1998-2010. Water billing data contained total water use (indoor and outdoor combined) for single-family residential properties. Customers did not have separate irrigation meters or have access to reclaimed water. In addition, TBW provided parcel data that included parcel identification numbers and estimates of the green space area. Lists of FFL-recognized homes were provided by Pasco, Pinellas, and Hillsborough counties and generally included at least the address and recognition date.

Identifying FFL homes in billing data

The parcel identification numbers (PIDs) for the 397 FFL homes in Pasco, Pinellas, and Hillsborough counties were obtained from the county property appraiser websites. Of these, 160 were identified in the TBW water billing and parcel data. A home may not have been found in the TBW data if the home is located in a municipality that purchases bulk water from TBW (and thus TBW only has aggregate water consumption for that municipality), the home is a townhome or other non-single-family residential, the home has a private potable well or reuse water, or if there was an error in the address provided.

Site visits of all identified FFL homes were conducted to evaluate the condition of the FFL yard and to identify up to ten nearby homes with acceptable turf quality. Turfgrass quality evaluations were made using the National Turfgrass Evaluation Program (NTEP) procedures (Shearman and Morris, 1998). Ratings of turfgrass quality were based on density, color, and presence of weeds and were on a 1 (dead) to 9 (perfect) scale. The minimum acceptable turf quality for this analysis was 6.

These nearby homes (comparisons) were chosen to be representative of the landscape characteristics of each neighborhood. Approximately 20 of the FFL homes were geographically clustered near at least one other FFL and therefore used the same comparison homes. Using the addresses of the neighbors, PIDs were once again obtained from county property appraiser websites. These PIDs were then used to identify the neighbors in the TBW data.

Data Analysis

All data analysis was performed in SAS. Two excel files were imported into SAS: the list of all FFL homes with recognition dates and the list of PIDs for the FFL homes and neighbors. The TBW water billing and parcel data for each service area were also imported and merged, which yielded over 44 million monthly customer records.

To calculate estimated monthly irrigation use, estimated indoor water use was first calculated using the total water use, estimated average per capita indoor use of 70 gallons/capita/day (based on the Mayer et al. 1999 estimate of 69.3 gpcd), the average household size for member government service areas (ranging from 2.12 to 2.38 people per household), and the irrigated area. The irrigated area used was estimated green space area provided in the parcel datasets and is defined as the lot area minus the sum of the building area and any taxable extra features such as patios. If a monthly billing record for an FFL home was missing, no comparison homes were included for that month. The maximum monthly irrigation depth was set as 15 inches because depths higher than this were deemed excessive for the types of landscapes evaluated for this analysis. Less than 0.6% of irrigation depths were greater than 15 inches.

The FFL and TBW data were merged and 86,511 records were isolated. Because the recognition dates varied from 1995 to 2010, the number of records after recognition for each FFL home and its comparison neighbors varied. A total of 42,621 records after FFL recognition were included in this analysis.

Results and Discussion

The histograms shown below indicate that the majority of customers (FFL and comparison) do not irrigate. Fifty-four percent and 47% of the monthly calculated irrigation depths for FFL and comparison homes, respectively, were 0. The exponential shape of the histograms is consistent with the distribution of all residential irrigators in Hillsborough County, FL observed by Romero and Dukes (2010), and is also consistent with the monthly mean and median calculated irrigation depths. For both FFLs and comparisons, the means exceeded the medians in all months. The median FFL irrigation depth was 0 for nine months out of the year, whereas the median comparison irrigation depth was 0 for two months out of the year.

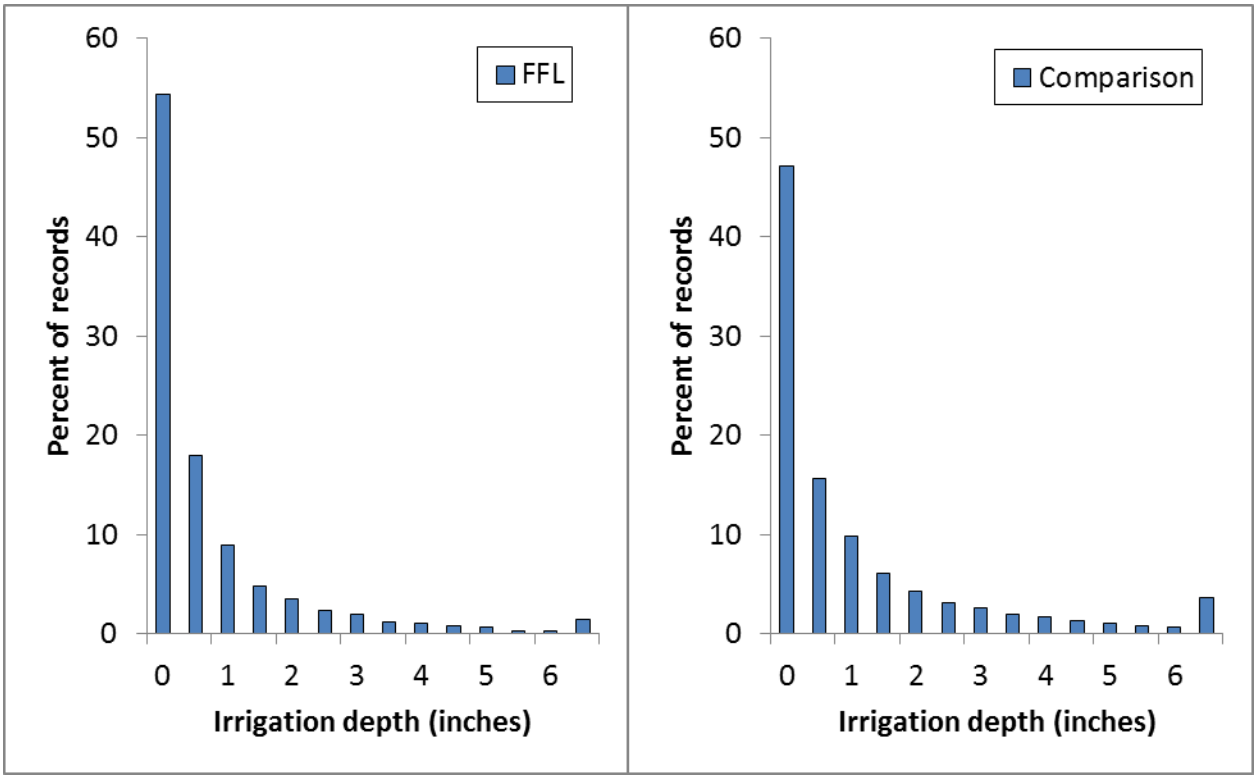

Figure 1. Histograms of calculated monthly irrigation depths over all months of recordfor FFL and comparison homes.

Calculated mean irrigation depths for FFL and comparison homes are shown in Figure 2. The error bars represent standard error. There is a clear trend that FFL uses less irrigation that

comparison homes. When modeling the irrigation depth in SAS and controlling for multiple observations for each home and the neighborhood in which homes were located, the mean monthly irrigation was 0.63 inches for FFL and 0.97 inches for comparisons, resulting in a significant ($p<0.0028$) annual water savings of 4.14 inches (35%) for FFL homes.

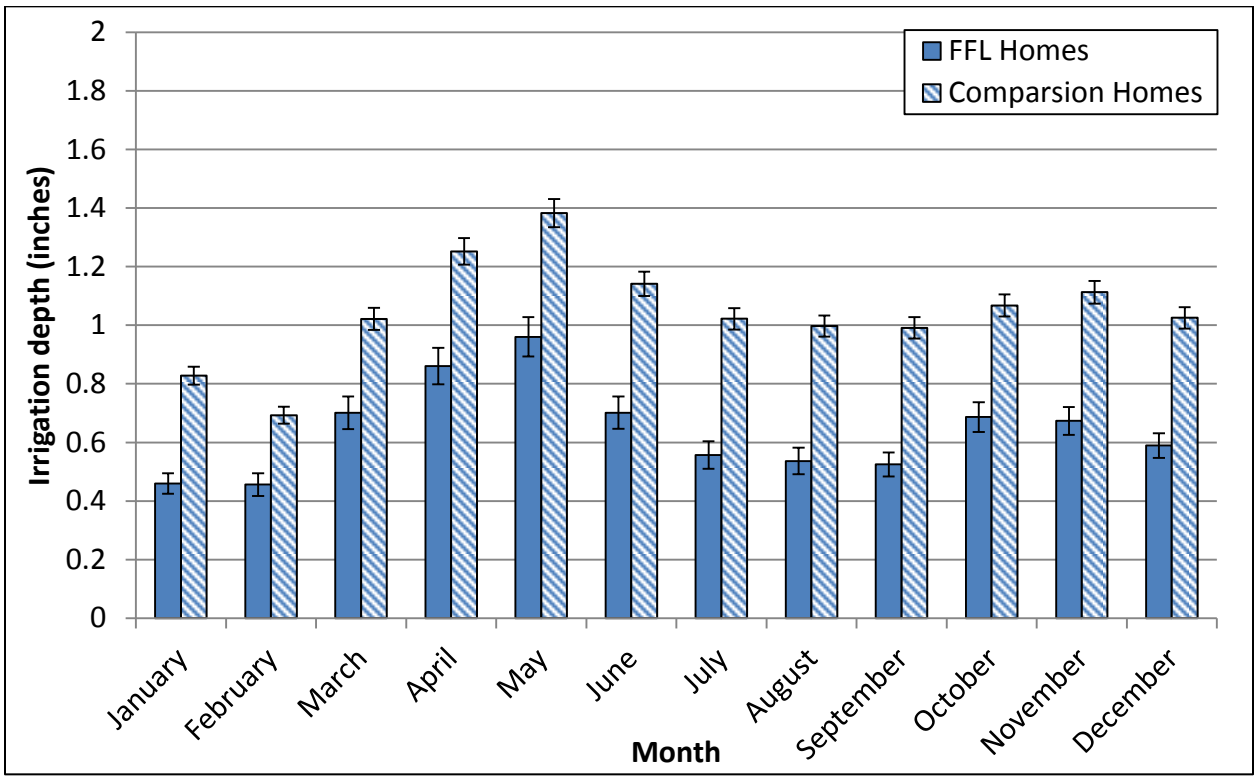

Figure 2. Mean irrigation depths with standard error of all identified FFL homes and their comparisons.

Next, the water savings of good examples of FFL homes were compared to high-quality turf landscapes. Based on the site visits of all FFL homes, it was apparent that there were FFL-recognized homes that were not meeting the intent of the FFL program. These homes may have had landscapes that were not aesthetically pleasing, had poor turf quality, had large gravel landscaped areas, or had very few ornamental areas or plant varieties. Sixty-seven FFL homes were classified as "good examples". Also based on the site visits, it was observed that turf quality tended to vary between neighborhoods and that those homes with high-quality turf (turf quality of 7 or greater) appeared to irrigate more and be better maintained than the minimally acceptable turf landscapes. These higher-quality comparisons would be likely targets for water conservations measures and conversion to FFL.

Results of the good FFL examples and high-quality comparisons are shown in Figure 3 and are similar those shown in Figure 2. There is a clear trend that FFL uses less irrigation that comparison homes. Both the good FFL examples and high-quality comparisons tended to

irrigate slightly more. When modeling the irrigation depth in SAS and controlling for multiple observations for each home and the neighborhood in which homes were located, the mean monthly irrigation was 0.63 inches for FFL and 1.13 inches for comparisons, resulting in a significant ($p<0.006$) annual water savings of 5.95 inches (44%) for FFL homes.

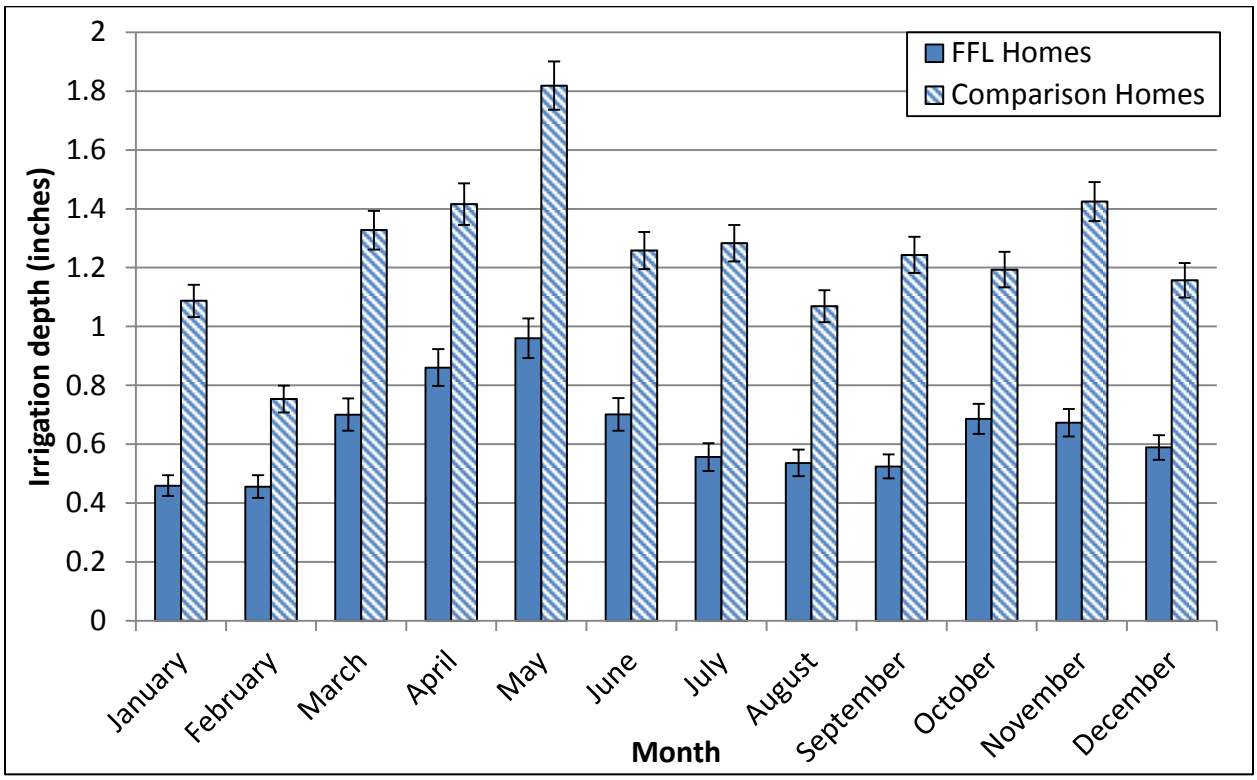

Figure 3. Mean irrigation depths with standard error of all identified FFL homes and their comparisons.

Conclusions

Florida Friendly Landscaped homes tended to irrigate less than their traditionally-landscaped neighbors, although there was high variability. The water savings of all recognized FFL homes was approximately 35% as compared to their minimally-acceptable turfgrass neighbors, and the water savings increased to 44% for good examples of FFL compared to high-quality turfgrass neighbors. Because of the high variability of the data, however, further analysis is needed to determine the effectiveness of FFL as a water conservation measure.

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