Home Irrigation and Landscape Combinations for Water Conservation in Florida[1]

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Introduction

Irrigation has become commonplace for residential homeowners desiring high-quality landscapes in Florida. Turfgrass is a key landscape component and normally the most commonly used single type of plant in the residential landscape. Although Florida has a humid climate where the precipitation rate, on average, is greater than the evapotranspiration (ET) rate, the winter and spring are normally dry. The dry winter/spring weather and sporadic large rain events in the summer, coupled with low water holding capacity of the soil, make irrigation necessary for the high-quality landscapes desired by homeowners.

Residential water use comprises 61% of the public supply category. This public supply category is responsible for the largest single portion (43%) of water withdrawal in Florida. Between 1990 and 2010, there was an 18% increase in total water withdrawals for public supply (which include freshwater and saline water), while the population increased by 45% over this period, indicating that water is being used more efficiently (Borisova and Rogers 2014). However, an average residential irrigation cycle consumes several thousand gallons of water, and the average homeowner typically runs two cycles per week during hot weather. Studies have shown that this water is often wasted through overirrigation. Thus, water conservation has become a major concern for Florida.

It is possible to decrease the amount of water consumed by a residential irrigation system without causing stress or reduced quality to the turfgrass and landscape. This Ask IFAS publication is intended for landscapers, irrigation professionals, homeowners, Extension agents, and the general public. This document summarizes a study whose objectives were to determine the amount of residential irrigation water use in central Florida, and to evaluate if combinations of irrigation scheduling and landscape/irrigation design could reduce irrigation water application.

Landscape Type and Irrigation Schedule Interaction

In a study where 27 homes were monitored in central Florida, residential lawns were categorized into one of three treatments based on lawn type and irrigation scheduling (Haley et al. 2007). Treatment one (T1) consisted of existing irrigation systems and typical landscape plantings (Figure 1), where the homeowner controlled the irrigation scheduling. Treatment two (T2) homes also consisted of existing irrigation systems and typical landscape plantings (Figure 1), but the irrigation scheduling was based on 60% replacement of historical ET. Treatment three (T3) consisted of an irrigation system designed according to specifications for optimal efficiency, including a landscape design that minimized turfgrass and maximized the use of native drought-tolerant plants (Figure 2). On average, T3 homes

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consisted of 65% landscape bedding that was irrigated with microirrigation. For T1 and T2 homes, typically less than 25% of the irrigated area was landscape bedding irrigated with sprinkler irrigation.

Figure 1. Examples of typical home landscapes, T1 and T2, where the turfgrass area is greater than the bedded area.
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Figure 2. Examples of T3 landscapes, where the turfgrass area was minimized and the bedded area was irrigated by microirrigation.
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Treatment 1

Treatment one homes consisted of sprinkler irrigation systems and typical landscaping (Figure 1) where the homeowner controlled the irrigation scheduling. Typical landscaping implies a greater percent of turfgrass than bedding area. The homeowner interaction involved in treatment one homes could be considered as "set it and forget it," with minimal alteration of the irrigation schedule based on seasonal changes. The homes in T1 consumed the most water for irrigation purposes.

Treatment 2

Treatment two homes also maintained the existing irrigation systems and had landscapes which were mostly turfgrass, similar to T1 (Figure 1). The irrigation scheduling for T2 systems was updated monthly based on historical ET. Ask IFAS publication CIR1421, "Operation of Residential Irrigation Timers" (https://edis.ifas.ufl.edu/AE220), explains how to determine zone run times based on the irrigation application rate. The document goes into detail on the suggested monthly zone run times based on historical ET. However, it is most important to adjust the irrigation run times based on seasonal weather changes. For the Central Florida Ridge area, depending on system performance and uniformity, the T2 run times were set according to Table 1.

The homes in T2 consumed 16% less irrigation water than T1 based on monthly water use data over a 29-month period. Therefore, adjusting the controller setting seasonally can lead to savings of 640 to 800 gallons per week based on typical system usage.

Treatment 3

Treatment three homes had their irrigation systems designed according to specifications for optimal efficiency (Irrigation Association 2003; Florida Irrigation Society 1989) and included a landscape design that had minimal turfgrass and an increased use of native drought-tolerant plants (Figure 2). To further achieve water savings in T3, most landscape plants were irrigated by microirrigation as opposed to standard spray and rotor heads. The average percentage of the irrigated area covered by turfgrass in T1 and T2 yards was 75%, with the landscaped bedding accounting for the other 25% of the irrigated area. T3 yards had an average irrigated area of 35% turfgrass and 65% landscaped bedding. Some of the T3 yards had as little as 5%–15% turfgrass.

Run time settings for T3 were the same as T2 for the spray and rotor zones (Table 1). The run time settings for the T3 microirrigation zones typically followed the rotor zone settings. Once the ornamental plants are established, the microirrigation zone run times can often be decreased. In the winter months, all microirrigation zones were greatly decreased or turned completely off.

The homes in T3 consumed 39% less irrigation water than T1 (based on monthly water use data over a 29-month period), which led to water savings of 1440–1800 gallons per week, based on irrigating twice weekly.

Seasonal Water Use

Based on irrigation water consumption data collected over a 29-month period, the following seasonal water use averages were determined.

Regardless of season, T1 systems used the most water for irrigation purposes (Table 2), whereas the T3 systems used the least water for irrigation purposes. Irrigation water consumption was lowest in the winter months (December through February), as would be expected due to reduced plant needs.

Turfgrass quality ratings were based on the rating method of the National Turfgrass Evaluation Procedures (NTEP) (Shearman and Morris 1998). This evaluation is based on visual estimates such as color, stand density, leaf texture, uniformity, disease, pests, weeds, thatch accumulation, drought stress, traffic, and quality. Turfgrass quality is a measure of aesthetics (i.e., density, uniformity, texture, smoothness, growth habit, and color) and functional use. The minimum rating while still maintaining acceptable quality is 6; however, lower ratings do not necessarily imply drought stress.

Treatments 1 and 2 maintained minimum or above average turfgrass quality during the entire data collection period of the project. The T2 turfgrass had no significant differences in quality from T1 turfgrass under decreased irrigation schedules.

The T3 lawns did have lower quality ratings compared to T1 and T2 for winter, summer, and fall. During these seasons, the T3 ratings were just below 6, the NTEP acceptable rating. The lower ratings for the T3 turf during the fall and winter months were because the turfgrass was permitted to go into partial dormancy. During dormancy, which is the normal state of turfgrass in the winter months, irrigation run times can be decreased because plants have decreased water needs. When the turfgrass goes into dormancy, the turfgrass color changes to brown-tan rather than green. The decreased turf quality was due to color change and not to drought stress or winter injury. In the spring months, after green-up (i.e., when the grass came out of dormancy), the T3 turf quality was better than T1.

Microirrigation in Landscape Bedding

The T3 irrigation designs included microirrigation in the bedded areas. Microirrigation components used included microspray heads (Figure 3) and drip tubing (Figure 4). The benefit of microirrigation is the low-volume water output, which allows for the irrigated area to be concentrated around the plant. Thus, much of the bedded area did not receive irrigation water since it was the area in between plants. This reduced the effective irrigated area and saved irrigation water compared to sprinkler irrigation.

Figure 3. Microspray or microjets in a plant bed.
Credits: Michael Dukes, UF/IFAS

Figure 4. Sample of drip tubing.
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Table 1. Seasonal irrigation run times for spray and rotor zones.

Head Type	Setting	Season			
		Summer	Fall	Winter	Spring
Spray	Ideal	25 min	15 min	0 min	20 min
	Range	20–30 min	10–20 min	0–10 min	15–20 min
Rotor	Ideal	45 min	30 min	<10 min	40 min
	Range	40–60 min	20–40 min	0–20 min	35–55 min

Table 2. Seasonal water use and turf quality across treatments.

	Winter			Spring			Summer			Fall			Average		
	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3
Water use (gal/ft^2)	2.53	1.91	1.35	4.32	3.31	2.33	3.29	2.70	2.35	3.80	3.63	2.50	3.48	2.91	2.13
Fraction of total water use (%)	75	63	37	77	74	42	82	66	63	62	61	55	75	66	46
Turf quality rating	5.7	6.4	5.4	5.9	6.6	6.4	5.8	5.6	5.1	6.6	6.9	5.8	6.0	6.3	5.7