Frequently Asked Questions about Landscape Irrigation for Florida-Friendly Landscaping Ordinances[1]

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These days, water quality and quantity are important issues that are on everyone's mind. These Frequently Asked Questions address common concerns related to water, irrigation, fertilizers, best management practices (BMPs), and landscapes and their maintenance. These FAQs draw on extensive UF/IFAS research, and were created to help guide government officials in developing local regulations based on science.

1. Why are landscapes irrigated?

Simply stated, irrigation provides the water requirements for sustainability of plants when rainfall is not sufficient.

Ornamentals

Trees and shrubs are irrigated frequently when grown in the nursery and when first planted so that their roots quickly grow out from the root ball and into the soil in the landscape. It is crucial that roots grow as quickly as possible so irrigation can cease. The best way to encourage rapid root growth is frequent light irrigation applied to the root ball after planting. Under ideal conditions (e.g., in non-compacted soils, surrounded by extensive irrigated areas), many Florida-Friendly plants do not require further irrigation except in prolonged drought.

Turf

Although Florida receives substantial rainfall, dry periods are common in the late spring and fall. The dry period in the spring coincides with peak plant water needs due to increasing temperatures, solar radiation, and day length. Due to relatively shallow roots, turfgrasses typically require irrigation at least once a week to maintain quality. On sandy soils, some grasses may need to be irrigated at least two days a week to ensure acceptable quality (Shedd et al. 2008).

2. What are the irrigation requirements for turfgrass and landscape plants?

Note: The term "irrigation requirements" implies well-watered conditions, which means that this is the amount of irrigation water in addition to effective rainfall (that which is stored in the plant root zone and available for use) needed for plant growth and without any water stress.

Ornamentals

All landscape shrubs and trees grown in a nursery and planted in a landscape require water to become established. Under most circumstances, rainfall occurs irregularly, so irrigation is required, at least until plants are established.

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Trees require about three to four months per inch of caliper (trunk diameter measured 6" from ground) to become established. Shrubs require about 20 to 28 weeks to become established. Irrigation events should be 2 to 3 gallons of water per inch trunk diameter. For example, a 2-inch tree should be watered 4 to 6 gallons at each irrigation event. Water every other day until plants are established.

In addition to initial watering for establishment, irrigation in the year following establishment may be needed to maintain good quality in dry weather. We have little data on irrigation requirements for plants once established, due to the many factors that influence this. These factors include slope, aspect, soil compaction, soil depth, soil volume, width of soil space, depth to water table, wind, season, size of plant at planting, nursery production method, length of time in the container, and root pruning strategies at planting. This research simply has not been done.

Turf

Under well-watered conditions, Stewart and Mills (1967) reported that annual water consumption in South Florida for St. Augustinegrass and bermudagrass averaged 43 inches/yr over five years. For North Florida, Jia et al. (2007) reported 33 inches of total water requirements for bahiagrass. Irrigation requirements for turfgrass in North Florida are on the order of 20–25 inches/yr and 30–35 inches/yr in South Florida, on average (Smajstrla, 1990). These numbers are net irrigation requirements and do not include added irrigation due to the inefficiency inherent in all irrigation systems. See *Efficiencies of Florida Agricultural Irrigation Systems*, for more information on irrigation efficiency (Smajstrla et al. 1991). In most years, rainfall will contribute substantially to meeting the total water demand of turfgrasses.

3. Do different varieties of turfgrasses use different amounts of water?

Many studies have been conducted on water use of turfgrasses. Most of these studies are conducted under "well-watered" conditions (i.e., no stress due to lack of water) and should not be confused with drought studies where water is withheld and physiological responses of grasses are studied.

All turfgrasses need water to sustain good quality (dense, uniform, green), whether it comes from rainfall or supplemental irrigation. Drought-tolerant grasses will go into dormancy during dry periods, growing more slowly or turning brown until conditions are favorable for growth. When enough soil moisture returns, these grasses can usually recover from drought-induced dormancy rather than dying. For example, bahiagrass is drought-tolerant, but if it is not supplied with adequate water, the drought response of this grass will result in dormancy and a "dead" appearance.

Much of the literature seems to indicate that there may be differences in water use between different warm-season grasses. These disparities likely stem from natural differences in mowing heights (e.g., St. Augustinegrass lawns versus bermudagrass golf turf), fertility, leaf architecture, etc. However, these differences have not been clearly documented in Florida work.

In one study, Zazueta et al. (1999) found that when maintained under UF/IFAS recommendations, bahiagrass had 11 percent higher water use rates than St. Augustinegrass when well-watered, but that the two grasses had similar transpiration rates when under continual stress. A current UF/IFAS study is exploring the water use rates, under well-watered conditions, of several grasses including St. Augustinegrass and bahiagrass.

4. Do natives require less water? If so, when?

A plant's indigenous status does not affect its fertilizer or irrigation requirements. There is no scientific evidence that native plants require less fertilizer and water than plants not native to Florida. To put it another way, residential and commercial landscapes are often very different from the native conditions where a plant originated, even if they are found in the same state. Additionally, a plant that was previously indigenous to a site may not be adapted to the location any longer, depending on the way the site has been altered. In a recent research study, Florida native shrubs required the same irrigation as non-natives (Scheiber et al. 2007). Fertilizer requirements have not been tested.

5. Will planting another type of turfgrass automatically result in water savings?

The scientific evidence seems to point to human behavior with regard to over-irrigation—not particular plants in the landscape—as the reason for much wasted irrigation water. In addition, there is some evidence that in well-watered (i.e., sustained good quality) conditions, bahiagrass uses slightly more water than St. Augustinegrass. Thus, replacing St. Augustinegrass with bahiagrass will not likely reduce water needs for well-watered conditions. In addition to water, there are many other factors, such as maintenance level, diseases, and pests, that need to be considered related to a turfgrass change.

6. What is the proper way to irrigate?

Scientifically, irrigation should occur based on plant response to environmental demand. Thus, irrigation frequency and amount will be defined by the environmental demand (i.e., evapotranspiration, ET), soil water-holding capacity and plant root zone depth. Irrigation should be applied such that the soil water reservoir is filled and gravity drainage and runoff do not occur. This approach is detailed in an EDIS publication entitled, *Basic Irrigation Scheduling in Florida*, (Smajstrla et al. 2006), which provides summary information from internationally recognized publications such as *Crop Evapotranspiration: Guidelines for Computing Crop Water Requirements* (Allen et al. 1998). This scientifically accepted approach aims to result in "well-watered" conditions where no stress is allowed. In addition, an irrigation system must be well-designed and in good repair to apply irrigation efficiently to plants (i.e., without losses due to runoff and deep percolation).

In practice, irrigation is often limited to specific days of the week by water management districts through most of Florida. Thus, landscape plants may undergo varying levels of stress depending on specific site conditions and plant type.

Ornamentals

In the case of newly planted trees and shrubs, water should be applied to the root ball and perhaps the soil just beyond the root ball. In all of the studies over the past twenty-two years on trees in Florida, the area beyond the root ball has not been irrigated. Trees and shrubs establish just fine without broad, landscape-wide (i.e. sprinkler) irrigation. For example, live oak and southern magnolia tree root systems extend to about 14–20 feet in diameter one year after planting in a non-compacted soil without interference from curbs, sidewalks and other soil obstructions.

Turf

Guidelines for turf irrigation include an irrigation system that is well designed and in good repair. Generally, UF/IFAS irrigation guidelines recommend irrigation of ½–¾ inches when 30–50 percent of turfgrass shows signs of wilt during the day. However, if an automatic irrigation system is used under day-of-the-week water restrictions, program run time recommendations are given in *Operation of Residential Irrigation Controllers*. The recommendations in this publication have been further refined into user-friendly guidelines and posted as the FAWN urban irrigation scheduler.

Generally, these irrigation schedules developed for turfgrass will over-irrigate ornamental plantings. As indicated in this section, the most efficient way to irrigate trees and shrubs is using microirrigation. Ongoing research projects using these schedules have shown that 60 percent replacement in *Operation of Residential Irrigation Controllers* http://edis.ifas.ufl.edu/ae220, and "maximum conservation" in the FAWN urban irrigation scheduler, http://fawn.ifas.ufl.edu/tools/urban_irrigation/, provide adequate water for St. Augustinegrass during drought with well-designed irrigation systems in good repair. Technologies such as soil moisture sensor irrigation controllers have been shown to reduce irrigation 70–90 percent over a range of irrigation schedules and controller brands (Cardenas-Lailhacar et al. 2008).

7. Are the terms "drought-tolerant" and "irrigation requirement" related?

Physiologically, tolerance means that the organism tolerates the stress without suffering major damage or is able to continue to function in a stress-induced state. Plants may do this through drought avoidance, physiological adaptations that afford tolerance, or through efficiency mechanisms. Drought avoidance may be escape, such as a plant that reproduces quickly, thereby avoiding drought, or through conservation mechanisms such as stomatal closure, change in leaf canopy or orientation, or cuticular resistance. They may also avoid drought by developing an extensive root system.

Physiological adaptations may include osmotic adjustment, changes in cellular elasticity, and dessication tolerant enzymes, all of which help the plant maintain turgor. Efficiency mechanisms include high water use efficiency (WUE). WUE is often defined as growth per units water provided, photosynthesis per units water, etc. Mechanisms that enhance drought tolerance reduce WUE because growth and carbon assimilation are reduced by leaf firing, rolling, etc.

It is important to note that any plant will require frequent irrigation after planting to ensure survival and establishment. For established plants, the irrigation requirement is defined as the water needed, exclusive of rainfall, for a crop to grow without water stress. It is the difference between ET (evapotranspiration or plant water use) and rainfall. ET may be calculated using one of a number of models, all of which have inherent uncertainty. Using climatological data, one can estimate ET and thus calculate the irrigation requirement on a monthly or annual basis as the difference between ET and effective rainfall. Effective rainfall is rainfall that is estimated to remain in the root zone of the plant. Effective rainfall is the result of total rainfall minus losses to drainage and percolation below the root zone.

Ornamentals

Once drought-tolerant plants, like live oak and burford holly, are established, they can withstand extended dry periods with little or no irrigation.

Turf

All of our grasses in Florida use different mechanisms to go into dormancy during drought stress (leaf firing, rolling, etc.). This metabolic resting state allows them to survive the stress and some of them to resume growth after conditions again become favorable.

8. Can reclaimed water be used for irrigation?

Yes, reclaimed water can be and is used for irrigation. In fact, Florida is a leader in the US in the use of reclaimed water for irrigation, with approximately 660 million gallons of reclaimed water being used each day, according to the Florida Department of Environmental Protection 2006 Reuse Inventory http://www.dep.state.fl.us/water/reuse/inventory.htm.

Reclaimed water does typically contain elevated levels of salts relative to Florida surface and groundwater, except where saltwater intrusion is problematic in coastal areas. The elevated levels of salts in reclaimed water may impact different plant species in varying ways due to differences in salt tolerance. Periodic testing of reclaimed water used in irrigation is recommended.

Also, reclaimed water may contain plant nutrients, which may need to be considered in any fertility program. It is not clear that all the nutrients in reclaimed water are available for plants. Finally, the content of reclaimed irrigation water can vary between different municipalities due to permitting differences and specific differences between wastewater treatment plants. For more information on the reuse of reclaimed wastewater see the Florida Department of Environmental Protection at http://www.dep.state.fl.us/water/wastewater/.

9. Is there a correlation between plant water need and homeowner water use?

Haley et al. (2007) showed that homeowners did use significantly less water in the winter than other seasons. However, overall homeowners over-watered as much as 2–3 times the amount needed by the plants, based on estimates of climate demand. Thus, there is some indication that homeowners reduce irrigation during periods when less is needed; however, it appears that over-irrigation may still occur.

10. Are day-of-the-week restrictions effective at reducing water use?

In a word, yes, but only if they are enforced. Over time, their effectiveness can become reduced. Olmsted (2008) reviewed the literature to determine the effectiveness of day-of-the-week watering restrictions specific to Florida. In Hillsborough and Orange Counties, water use reductions (by utilities) were reported as 17–18 percent; however, no reductions were seen in Seminole County. In South Florida, day-of-the-week restrictions reduced water use up to 21.5 percent during one day/week watering restrictions.

Day-of-the-week restrictions limit flexibility for users who try to plan irrigation based on rainfall trends. In addition, they may encourage over-watering on the allowed day. Just because potable water demands decrease under restrictions, it doesn't mean that irrigation is being applied at the right time and in the right amount—in other words, it's possible that water is still being wasted, even though it may be a smaller amount. However, to a large extent, many landscape plants can survive during most periods of water restriction.

11. Are there UF/IFAS recommendations for irrigation, and, if followed, do they provide water conservation benefits?

Ornamentals

Irrigation recommendations for trees can be found at http://hort.ufl.edu/woody/. There is no documentation of how many people follow them. It would be difficult to document the effect of specific practices on ornamental plant material, since these materials only make up part of the planted landscape in most cases. Further, in many irrigation systems, turfgrass and ornamentals and trees are not separated in terms of irrigation zones and thus receive the same amount of irrigation relative to the system programming.

Turf

UF/IFAS recommends watering when 30–50 percent of turfgrass wilts. This should provide water conservation benefits relative to "set it and forget it" time clock programming; however, this has not been documented.

Haley et al. (2007) showed that using the schedule recommended in *Operation of Residential Irrigation Controllers* reduced watering by 30 percent over a thirty-month study. Thus, if this recommendation were followed, substantial water savings are possible for moderate to high irrigators. The FAWN urban irrigation scheduler uses these recommendations in a user-friendly fashion to encourage users to adjust irrigation time clocks to better adjust for climatic demand throughout the year.

12. Which turfgrasses and landscape plants can be grown without supplemental irrigation or fertilization?

Some turf species may not need water to survive, but all need water to stay green. Drought tolerance implies that the grasses will "fire" (turn brown) and reduce leaf area to conserve water. Some, such as bahiagrass or centipedegrass, will exhibit better recovery from drought stress. St. Augustinegrass and most of the zoysiagrass varieties will not generally persist well without supplemental irrigation during times of limited rainfall. Fertilization follows a similar trend—bahiagrass and centipedegrass have low fertilization requirements and can persist with relatively low levels of nutrients.

13. What are the mechanisms available to reduce over-watering right now on existing irrigation systems in landscapes? How effective are these mechanisms?

Florida statute 373.62 mandates the installation of a working rain sensor device or switch on all automatic irrigation systems installed since 1991. UF/IFAS research has shown that expanding disk rain sensors can be effective at conserving water. Potential savings of 17 to 34 percent were shown at ½-inch and ¼-inch thresholds under normal rainfall frequencies (Cardenas-Lailhacar & Dukes 2008; Cardenas-Lailhacar et al. 2008).

Ornamentals

In 22 years of irrigation research on trees and shrubs, only drip irrigation and other low-volume irrigation devices have been used. These devices have allowed very little water application while maintaining plant quality, though there are issues with pests such as squirrels chewing through the lines, causing maintenance problems.

Turf

Cardenas-Lailhacar et al. (2008) showed that technology such as soil moisture irrigation controllers can reduce irrigation by 70–90 percent for a range of products and irrigation watering days without negatively impacting turf quality during normal rainfall conditions. Further work with properly installed soil moisture sensor irrigation controllers on homes in Florida shows the potential for 50 percent irrigation savings without a negative impact on landscape quality (Haley & Dukes 2007). Similar savings appear possible with other "smart irrigation" controllers such as ET controllers.

14. What is the Florida-Friendly Green Industries BMP Educational Program?

The Florida-Friendly Green Industries Best Management Practices (BMP) educational program was developed by the Florida Department of Environmental Protection (FDEP), UF/IFAS industry representatives, and others to guide commercial lawn-care and landscape industry professionals in the use of sound horticultural practices. The goal of implementing the BMPs is to reduce potential environmental impact resulting from landscape maintenance. BMP practices use horticultural and environmental science-based information. UF/IFAS Extension offices and other venues statewide deliver the program via trainings to Green Industry workers. Many cities and counties have enacted local fertilizer ordinances which require lawn-care professionals to become certified in the BMPs. A written BMP Manual is available at the trainings or by contacting your county Extension office.

15. Who should become BMP-certified—every worker, or just supervisors and foremen?

BMP training is recommended for all Florida landscape industry workers, including installers, designers, mowers and pruners, fertilizer and pesticide operators, managers, and sales representatives. Individuals who successfully finish the training will receive a Certificate of Completion.

Those who are unable to pass the written test due to literacy issues should still attend a training to improve their of knowledge about environmental protection. The course and the written test are compliant with the Americans with Disabilities Act and are offered in both English and Spanish.

16. Is a BMP training from one county good in another county?

The BMP training program is a state educational program. There are strong incentives, both regulatory and financial, for local governments to accept the state program if they require training, but under their constitutional rights of Home Rule, it is not required.

17. Is a BMP Certificate of Completion good forever or are updates required? If updates are required, how often?

Training updates will be provided on a regular basis. At this time, individuals should plan to obtain additional training every one to three years if training is mandatory in their area, depending on their local ordinances. Instructors are required to be up-to-date at all times and are required to attend refresher courses every two years.

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