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

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Water quality and quantity are important issues. The frequently asked questions (FAQs) in this publication, based on extensive UF/IFAS research, were created to help guide landscape and irrigation professionals, homeowners, Extension agents, scientists, and the general public. The questions address common concerns related to water, irrigation, fertilizers, best management practices (BMPs), landscapes, and landscape maintenance. This document also aims to help government officials in developing local regulations based on science.

1. Why are landscapes irrigated?

Irrigation provides the water requirement for plant growth and quality 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. Once established and 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 (most common soil in Florida), some grasses may need to be irrigated at least twice a week to ensure acceptable quality (Shedd et al. 2008).

2. What is the irrigation requirement for turfgrass and landscape plants?

Note: The term "irrigation requirement" is the amount of irrigation needed to supplement the effective rainfall, to achieve plant growth without any water stress. Effective rainfall is the amount of rainfall that remains in the plant

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root zone and is available for use and is calculated as the total rainfall minus losses to runoff and drainage below the root zone.

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. Trees require about three to four months per inch of caliper (trunk diameter measured 6 inches from the 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 the irrigation requirement 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 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 requirement for bahiagrass. On average, irrigation requirement for turfgrass is about 20–25 inches/yr in north Florida and 30–35 inches/yr in south Florida (Smajstrla 1990). These numbers correspond to the net irrigation requirement, which do not include the additional irrigation needed due to the inefficiency inherent in all irrigation systems. However, all reasonable measures should be made to reduce irrigation inefficiency. 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% higher water use rates than St. Augustinegrass when well-watered, but 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 native species 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. In addition, 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 research study, Florida native shrubs required the same irrigation as non-native shrubs (Scheiber et al. 2007). Fertilizer requirements have not been investigated.

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, which 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 the environment. 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 (up to the plant root zone depth) is filled and gravity drainage and runoff do not occur. This approach is detailed in 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 or local governments 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 UF/IFAS 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 decently 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 inch 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"(https://edis.ifas.ufl.edu/ae220). The recommendations in this publication have been further refined into user-friendly guidelines and posted as the FAWN Urban Irrigation Scheduler (https://fawn.ifas.ufl.edu/tools/urban_irrigation/).

Generally, these irrigation schedules developed for turfgrass will over-irrigate ornamental plantings. The most efficient way to irrigate trees and shrubs is through using microirrigation. Ongoing research projects using these schedules have shown that 60 percent replacement in "Operation of Residential Irrigation Controllers" (https://edis.ifas.ufl.edu/ae220) provides 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 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 efficiency mechanisms. Drought avoidance may be escape, such as through quick reproduction, or through conservation mechanisms such as stomatal closure, change in leaf canopy or orientation, or cuticular resistance. Plants may also avoid drought by developing an extensive root system.

Physiological adaptations may include osmotic adjustment, changes in cellular elasticity, and desiccation-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 unit 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 plant to grow without water stress. It is the difference between ET (evapotranspiration or plant water use) and effective 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.

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 for some of them to resume growth after conditions become favorable again.

8. Can reclaimed water be used for irrigation?

Yes, reclaimed water can be and is used for irrigation. In fact, Florida is the leader in the United States in the use of reclaimed water for irrigation. In 2021, reclaimed water was used to irrigate 533,286 residences, 512 golf courses, 1,160 parks, and 405 schools, with approximately 908 million gallons of reclaimed water being used each day (FDEP 2021).

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.

Additionally, reclaimed water may contain plant nutrients, which may need to be considered in any fertility program. This could be important for certain homes that tend to over-irrigate their lawns. Cardenas and Dukes (2016) reported that, on average, homes irrigating with reclaimed water in the locality of Palm Harbor applied 4.4 times the water needed by the plants.

It is not clear that all the nutrients in reclaimed water are available for plants. In addition, the content of nutrients in 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 https://floridadep.gov/water/industrial-wastewater.

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

Haley et al. (2007) showed that homeowners irrigating with potable water used significantly less water in the winter than other seasons. However, overall homeowners overwatered as much as 2–3 times the amount needed by the plants, based on estimates of environmental 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?

Results are mixed. Whitcomb (2006) evaluated eight utilities in the St. Johns River Water Management District in northeast Florida, where first restrictions limited irrigation to two days per week in 2001 through 2003, and only two utilities resulted in 12% to 19% reduction in monthly total (indoor and outdoor) water demand.

Some studies have studied the effect of switching from two days/week to one day/week. Within the Southwest Florida Water Management District during 1998–2003, total (indoor and outdoor combined) monthly volumetric reductions ranged from 9% to 20% (Whitcomb 2005). Other studies have not found statistical difference between the two days/week and one day/week restrictions (Ozan and Alsharif 2013; Tampa Bay Water 2017; Duke and Burgerhoff 2011). Finally, the effect of long-term water restrictions (1998 through 2010) that periodically reduced irrigation from two days/week to one day/week was studied by Boyer at al. (2018) in southwest Florida. The average annual irrigation demand decreased by 13% during the one day/week restriction.

Day-of-the-week restrictions limit flexibility for users who try to plan irrigation based on rainfall trends. In addition, they may encourage overwatering on the allowed day. Just because potable water demands decrease under restrictions, it does not mean that irrigation is being applied at the right time and in the right amount — in other words, it is 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 restrictions.

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 https://hort.ifas.ufl.edu/woody/. There is no documentation on 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. Furthermore, in many irrigation systems, turfgrass, ornamentals, and trees are not separated in terms of irrigation zones and thus receive the same amount of water according to the irrigation system programming.

Turf

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

Haley et al. (2007) showed that using the schedule recommended in "Operation of Residential Irrigation Controllers" (https://edis.ifas.ufl.edu/ae220) reduced watering by 30% over a 30-month study. Thus, if this recommendation were followed, substantial water savings would be possible for moderate to high irrigators. The FAWN Urban Irrigation Scheduler (https://fawn.ifas.ufl.edu/tools/urban_irrigation/) 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 overwatering right now on existing irrigation systems in landscapes? How effective are these mechanisms?

Current statutes mandate a device that prevents irrigation when soil moisture conditions are adequate. Rain sensors are one type of device and soil moisture sensors are another. Under research conditions, UF/IFAS research has shown that expanding disk rain sensors can be effective at conserving water. Potential savings of 17% to 34% were shown at ½-inch and ¼-inch thresholds on turfgrass plots under normal rainfall frequencies (Cardenas-Lailhacar and Dukes 2008; Cardenas-Lailhacar et al. 2008). However, in practice, rain sensors have not been found to be effective at reducing excess irrigation (Cardenas and Dukes 2016).

Ornamentals

In 22 years of UF/IFAS 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; however, there are issues with pests such as squirrels chewing through the lines and causing maintenance problems.

Turf

Cardenas-Lailhacar et al. (2008) showed that technology such as soil moisture irrigation controllers can reduce irrigation by 70%–90% 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 44%–50% irrigation savings without a negative impact on landscape quality (Haley et al. 2007; Cardenas and Dukes 2016). Savings over 30% are possible with other "smart irrigation" controllers such as ET controllers (Cardenas et al. 2021).

14. What is the Florida-Friendly Green Industries BMP educational program?

The Florida-Friendly Green Industries Best Management Practices (GIBMP) 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. BMPs use horticultural and environmental science-based information. UF/IFAS Extension offices and other venues statewide deliver the program via trainings to Green Industry workers. A written BMP manual in either English or Spanish is available free of charge by contacting the local county UF/IFAS Extension office. They can be viewed online or downloaded at https://ffl.ifas.ufl.edu/ffl-and-you/gi-bmp-program/gi-bmp-manual/.

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

Florida Statute 482.1562 states that all commercial fertilizer applicators must have a Limited Urban Commercial Fertilizer Applicator Certification from the Florida Department of Agriculture and Consumer Services (FDACS). To get this license, each Green Industry worker must be trained in the GIBMPs and receive a certificate of completion from UF/IFAS. Green Industry professionals holding the certification are not authorized to apply pesticides or operate a pest control business.

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

Yes, and the GIBMP training is a mandatory statewide training.

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

The GIBMP training certificate issued by UF/IFAS does not expire, but the Limited Urban Commercial Fertilizer Applicator Certification issued by FDACS expires 4 years after the date of issuance. The professional must complete 4 CEUs for renewal.

Questions should be directed to Michael D. Dukes (md-dukes@ufl.edu**), director, Center for Land Use Efficiency.**

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