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Fertilization and Irrigation Needs for Florida Lawns and Landscapes [1]

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A healthy lawn and landscape increase the value of properties and provides many ecosystem benefits. However, urban landscapes are often mismanaged due to the lack of awareness or knowledge of proper management. Thus, following proper maintenance practices is critical for the benefit of the lawns and landscapes and also for the viability of Florida's water resources.

Florida has abundant surface-water resources—rivers, streams, springs, lakes, and oceanfronts. In addition, the below-ground aquifer in many parts of the state is close to the soil surface. These factors all contribute to the potential for nonpoint-source pollution, which can occur when fertilizers and chemicals are moved by rain or irrigation into water resources.

Given the predicted impacts of climate change which include more extreme temperatures (i.e., higher highs and lower lows) and an increased frequency and intensity of natural disaster (i.e., hurricanes, wildfires, pest outbreaks, etc.), it's more important than ever that we work with our natural systems rather than against them (IPCC 2021). Furthermore, Florida is predicted to nearly double in population by 2070 (1000 Friends of Florida 2017). This increased demand on natural resources will further exacerbate our native ecosystems and potentially render many unforeseen landscape challenges.

How lawns and landscapes are fertilized and irrigated can have a direct impact on the natural environment, so it is imperative that both landscape maintenance professionals and homeowners adopt the environmentally friendly approaches that are outlined in this publication.

Florida Friendly Landscaping™ Best Management Practices (BMPs) for management of commercial and residential lawns and landscapes were developed by scientists with the University of Florida's Institute of Food and Agricultural Sciences (UF/IFAS). These BMPs assist homeowners and professionals in making management choices that will help sustain lawns and landscapes in Florida without impairing Florida's water resources.

Establishment of Lawns and Landscapes

Fertility and irrigation needs of lawns and landscapes differ during their establishment phase from the needs of mature plants. During establishment, plants are less able to support themselves and generally require more water to become self-sufficient. The water and fertilizer needed during establishment also vary due to season of the year and location, but some general guidelines are as follows.

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Lawns

Irrigation

Florida lawns are most commonly established by sodding. In this method, the entire lawn area is covered with a thin layer of above-ground turfgrass leaves and stems and a short below-ground root system. Because sod lacks a developed root system, sodded lawns need frequent, short waterings to help them survive and become established following planting.

The objective in watering during establishment is to keep the turfgrass alive until it starts to root down and then to encourage the roots to grower deeper into the soil. To ensure that roots in sod do not die from lack of water following planting, irrigate two to three times daily for brief periods (about 5 to 10 minutes for spray heads and 15 to 20 minutes for rotary sprinklers each time). During this establishment phase, only irrigate the sod enough to wet the top few inches of soil. It will generally take about 7 to 10 days for the roots to "peg" down so that they are firm in the soil, depending on season of the year, temperature, soil type, and other factors.

Once roots are pegged down approximately ½ inch to 1 inch into the soil, reduce irrigation to once a day to supply approximately ¼ inch of water daily. After seven to 10 days on this regime, reduce irrigation frequency to every other day to apply approximately ½ inch in each irrigation event. Irrigate every other day for about 7 to 10 days, by which time roots should be growing down through the soil, and the sod should not pull up if tugged on.

By this time, three to four weeks after sodding, the grass should be able to thrive on an irrigation schedule for an established lawn. However, in the summer months, under drought conditions, an extended period of more frequent watering may be required to ensure that the lawn establishes, particularly if watering restrictions limit irrigation of established lawns to once a week. Current day of the week watering restrictions vary 30-60 d depending on location in the state. Check with your local utility or water management district (https://floridadep.gov/water-policy/water-policy/content/water-management-districts) for restrictions in your area.

Fertility

Do not fertilize a newly planted lawn until 30-60 days after sodding. The short root system of the grass during this period of establishment means the grass has little ability to absorb nutrients. As a result, fertilizing during this period, coupled with the increased irrigation frequency during sod establishment, may lead to increased nutrient leaching past the roots through the soil. Additionally, because sod is generally fertilized prior to harvest at the sod farm, the sod will not typically require additional fertilizer during the establishment period. If the sod appears to lack sufficient nutrients (yellow coloration and spindly growth), apply fertilizer no sooner than 30 days after sodding. If possible, ask the sod grower or installer when the sod was last fertilized.

Before it is time to fertilize the newly established lawn, conduct a soil test available from www.soilkit.com/florida to determine what nutrients are readily available in the soil for plant uptake. In most areas of Florida, with the exception of the Panhandle, phosphorus is available in the soil in quantities that are sufficient for lawn grasses, so applications of phosphorus may not be needed in many lawns in Florida or may be needed only in small quantities.

Look for a fertilizer with at least some of the first number (which represents the nitrogen content of the fertilizer) in a slow-release form. Slow-release is usually denoted as "controlled release," "coated," "insoluble," "polymer coated," or "sulfur coated." Slow-release fertilizer allows the nitrogen to be available to the turfgrass for uptake over a longer period of time.

Apply the fertilizer at a rate of no more than 1 pound of nitrogen per 1,000 square feet of lawn. For more information on application rates for turfgrass fertilizers, refer to EDIS Publication ENH 979, Homeowner Best Management Practices for the Home Lawn, https://edis.ifas.ufl.edu/publication/EP236. After the first fertilization, follow the UF/IFAS guidelines for annual lawn fertilization for your grass species and your location. These rates can also be found in the above publication. There is often a tendency to over fertilize lawns, but for both the health of the grass and the health of Florida's water environment, it is important that these guidelines be followed.

Landscape

Irrigation

Several months are required for a containerized tree or shrub to adjust to its new landscape surroundings. Specifically, roots must grow from the artificial confines of the container into the surrounding landscape soil. Roots grow in response to the soil conditions at the site and will spread out and sometimes down into a more natural position. This root growth and redistribution takes about 6-12 months in most parts of Florida. For trees and shrubs to remain

reasonably healthy during this establishment period, irrigation is required. Cutting this period short could result in stressed plants and plant death unless regular rainfall occurs. Once established, they should survive on rainfall alone except during times of extended drought or if planted in situations which might cause them to dry out, such as full sun, deep sand soil, etc.

Ideally, the irrigation system is hydrozoned such that tree and shrub planting areas can be irrigated separately from turfgrass. When irrigated with a turfgrass zone, they are commonly over-irrigated. This has the potential to adversely affect plant health by causing anerobic (oxygen deprived) conditions. When these conditions persist for a prolonged period of time, this can result in root dieback and decay as well as inhibit the plant's ability to uptake nutrients and water. This can stress the plant, stunt growth, and increase its susceptibility to secondary pest and disease issues. Waterlogging due to over-irrigation is typically only an issue in poorly drained soils and less problematic in sandy soils common to many parts of Florida.

Irrigation recommendations that promote tree health and establishment following planting are dependent on several variables. For example, smaller trees, <2" caliper can survive and establish in the landscape with as little as 4-6 gallons of water when applied to the root ball 2-3 times a week. When watering for vigor, the frequency of irrigation needs to be increased. As a result, trees watered for vigor will take less time to establish. As the caliper of the plant material increases, the time needed for establishment after planting increases (Table 1). Depending on the location of the planting, trees in North Florida take slightly longer to establish than trees in the southern part of the state.

Whereas shrubs planted from 3-gallon containers can establish in landscape with as little as one gallon of water applied every eight days in north Florida and every four days in south Florida (Table 2).

More frequent irrigation (e.g., every four days in north Florida and every two days in south Florida) has been shown to result in more vigorous plant growth. However, applying a volume of water greater than one gallon per irrigation event does not increase survival or growth. Light, frequent applications are much more efficient and effective than applying large volumes less frequently. Applications of large volumes of water will not compensate for infrequent irrigation.

For additional information on irrigating and establishing newly planted trees and shrubs, refer to the Florida Grades and Standards for Nursery Plants (Anonymous, 2022) and EDIS Publications ENH1061 - Planting and Establishing Trees (2017) and ENH1130 - Establishing Shrubs in Florida Landscapes (2021).

Fertility

Slow-release (or controlled-release) fertilizer can be applied on top of the root ball and backfill soil or on top of the mulch at planting. There is no need to mix it with the backfill soil or place it at the bottom of the planting hole. Under most circumstances, mulch will not prevent fertilizer from reaching the tree or shrub roots. Adding slow-release fertilizer at planting has not been associated with improved survival but can increase growth rate in some situations. Adding soluble fertilizer to a newly installed plant could burn roots if too much is applied. This root condition will injure the plant and could kill it. For additional information pertaining to fertilizer applications for newly planted trees and shrubs (i.e., rate, timing, method, and location), refer to the ANSI (2018) A300 (Part 2) Soil Management standard and the ISA Best Management Practices for Tree Planting (Watson, 2014).

Bedding plants should be fertilized prior to planting or at the time of planting. Incorporate 12-4-12 or a similar analysis fertilizer uniformly throughout the soil at the rate of 1 pound per 100 square feet of bed area. Slow-release fertilizers are ideal for establishing bedding plants.

Established Lawns and Landscapes

Lawns

IRRIGATION

If irrigating by hand or manually operating an irrigation system, lawns should be irrigated when a substantial portion of the lawn shows signs of wilt (Figures 1 and 2). These signs include the following:

- Leaf blades are folded in half lengthwise in an attempt to conserve water.
- The grass takes on a blue-gray tint.
- Footprints or tire tracks remain visible on the grass long after being made.

The length of time needed between irrigations will vary, depending upon grass species, soil characteristics, location, time of year, temperatures, and any particular micro-environmental effects, such as shade. If rain is forecast within the next 24 hours, delay irrigation. In most areas

of the state, irrigation with potable water is limited to 2 d/wk in the warm months and 1 d/wk in the cooler months. Check with your local utility or water management district (https://floridadep.gov/water-policy/water-policy/content/water-management-districts) for the current day of the week water restrictions.

Figure 1. Unirrigated bahiagrass wilting in foreground and irrigated bahiagrass in the background.
Credits: Michael Dukes

Figure 2. Wilting Floratam St. Augustinegrass in the background contrasted with well irrigated turfgrass in the foreground.
Credits: Michael Dukes, UF/IFAS

Different types of soils will require different watering frequencies. Many Florida soils are sandy and hold 1 inch of water in the top 12 inches of soil. Since most roots are in the top 4-6 inches of soil, ½–¾ inch of water will wet that area and below to encourage deeper rooting. Some lawns may be growing on compacted or fill soil, which may require more frequent watering with smaller amounts each time to reduce runoff. Soils with greater amounts of organic matter or clay may require less frequent watering. Regardless of soil type, however, light, frequent watering of mature turfgrass is inefficient and encourages shallow root systems. Conversely, excessive irrigation, which keeps the root system saturated with water, is also harmful to the lawn.

When manually irrigating, a simple watering schedule would apply ½ to ¾ inch of water when turfgrass shows symptoms of water deficit as discussed earlier. Once this amount of water has been applied, do not apply any more until drought symptoms are again noticeable. If rainfall occurs, irrigation should be suspended until visible drought symptoms appear. If using an automated timer, guidelines for irrigation runtimes can be found in EDIS publication AE220, Operation of Residential Irrigation Timers, https://edis.ifas.ufl.edu/publication/AE220.

The best time for lawn irrigation is in the early morning hours prior to sunrise. Watering during the day wastes water due to excessive evaporation. Watering in late afternoon or late morning may be detrimental if it extends the time the lawn is naturally wet from dew. This extended wet period can accelerate disease occurrence.

Fertility

Fertility needs for lawn grasses vary due to homeowner preference, grass species, and location. The following table (Table 3) based on EDIS publication ENH1089 Urban Turf Fertilizer Rule for Home Lawn Fertilization (https://edis.ifas.ufl.edu/publication/EP353) and is a guide for fertilization needs based on species and location. The application rates are based on pounds of nitrogen per 1,000 square feet of lawn. For more information on how to apply this amount properly, refer to EDIS Publication ENH 979, Homeowner Best Management Practices for the Home Lawn, https://edis.ifas.ufl.edu/publication/EP236. Choice of a fertilizer should be based on results of a soil test to determine whether the soil needs phosphorus (P).

Landscape

Irrigation

Many established, drought-tolerant landscape trees and shrubs require little or no irrigation, provided roots are not obstructed by compacted soil, foundations, or other obstacles in the soil. Trees and shrubs often require supplemental irrigation to remain healthy in landscapes where roots are confined to a small area or have suffered considerable damage due to construction (e.g., replacement of sidewalks or curbing). In general, mature trees and shrubs may require periodic irrigation during extended periods of droughts to remain healthy. For example, plants such as azaleas and other shallow-rooted shrubs that lack

drought tolerance may require irrigation during such time to look their best.

After establishment, bedding plants should be watered on an "as-needed" basis. If these beds have a dedicated irrigation zone that zone should be operated manually. Frequency of irrigation will depend on soil type, exposure to sunlight, kind of bedding plant, and season of the year. Most commonly used ornamental plants do not require regular irrigation once established according to EDIS publication ENH1130, Establishing Shrubs in Florida Landscapes, https://edis.ifas.ufl.edu/publication/EP391.

Fertility

Fertilization may be justified when faster growth is desired or when plants exhibit nutrient deficiencies. Bedding plants receiving water-soluble fertilizers may need monthly fertilizations to remain in continuous bloom. When it has been determined that fertilization is necessary, most established landscape plants should be fertilized at rates within the ranges listed in Table 4. The number of pounds per year of various N-containing fertilizers to apply per 1,000 square feet of bed area is presented in Table 4. To prevent increased fertilizer costs and unintended loss of nutrients from landscapes, fertilizer should only be applied to targeted areas.

Although fertilizer (mainly nitrogen) will sometimes increase growth and enhance the appearance of young and medium aged trees, there is little evidence suggesting that it increases growth of mature trees. In most cases, applying fertilizer is unnecessary, especially when the surrounding turfgrass is being fertilized. When fertilizing trees and shrubs that are established in the landscape, be sure to follow the recommendations outlined in the ANSI (2018) A300 standard and ISA Best Management Practices (Smiley et al., 2022). Fertilization recommendations can vary depending on species, age, and health of the plant as well as differ across sites, methods, fertilizer type, and the desired outcome of the application.

When applying fertilizer, be cautious of environmental contamination (i.e., nutrient runoff and leaching). Apply the minimum amount necessary to treat the problem as improper applications can potentially have adverse effects on plant health (e.g., fertilizer burn). Likewise, avoid fertilizing when plants are stressed. It's unnecessary and has the potential to cause more harm than good. When fertilizing trees and shrubs, it has been recommended to use a slow-release fertilizer (ENH858 - Fertilizer Recommendations for Landscape Plants; Smiley et al. 2020; Lilly et al. 2022). Before applying any fertilizer, read and follow the product labels as well as adhere to the recommended safety precautions. If fertilization is deemed necessary, it's best to do so during periods of active root growth (i.e., summer) as more of the nutrients will be taken up by the plant. Fertilizer should be applied within the root zone of the plant and can be achieved by using broadcast applications or soil injections.

Phosphorus content of the fertilizer should be 0 - 2% P_2O_5. Historically, the ratio of nitrogen (N) to potassium (K_2O) for landscape plants has been in the range of 1:1 - 2:1. However, due to the prevalence of magnesium (Mg) deficiency on certain landscape plants in many parts of the state, up to 2.5 pounds Mg/1000 ft /year may be applied to address this problem. Micronutrients can be applied at specified rates and timing to achieve fertilization objectives.

Water-soluble (quick-release) fertilizers should be applied at no more than ½ pound N/1000 ft per application. Application rates of slow-release fertilizers depend on release rates of the product.

Palms have different nutritional requirements than other landscape plants and turfgrass. When palms are an important feature of the landscape, they should be fertilized with a 4-1-6-2 (N-P2O5-K2O-Mg) ratio fertilizer. An 8-2-12+4 is an example of a fertilizer using this ratio and may be referred to as "Palm Special". A blend of 8-0-12+4 Mg is also an acceptable formulation for palms. Palm fertilizer should have N, K, Mg and B in controlled release form and Mn, Cu and Zn in sulfate forms. Fe should be in a chelate form. Using a fertilizer with a ratio other than that specified may induce or accentuate nutrient deficiencies in palms. Fertilizer should be applied under the canopy of the palm at a rate of 1.5 lbs/100 sq ft. Palms located within 10-14 ft of a waterway should not be fertilized with soil directed fertilizers. If potassium and/or magnesium nutritional deficiencies are severe, palms may be treated with 0N-0P2O5-16K20+6Mg during fertilizer blackout periods to maintain palm health. Unlike landscape plants and turfgrass, palm fertilization is targeted at emerging leaves and developing leaves in the bud and will not correct the leaf symptoms (yellow-orange or necrotic leaves) already present. Depending on the severity of the deficiency, a nutrient deficient free crown may take as long as two or more years to produce. Applications of fertilizers 3 - 4 times a year are recommended to maintain palm health. For more information on palm fertilization, refer to EDIS publication ENH 1009 Fertilization of Field-Grown and Landscape Palms in Florida, https://edis.ifas.ufl.edu/publication/EP261.

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Table 1. Irrigation scheduling for recently planted trees.

Size of Nursery Stock	Irrigation Schedule for Vigor [1,3]	Irrigation Schedule for Survival[2,3,4]
< 2 inch caliper	Daily for 2 weeks; every other day for 2 months; weekly until established.	2-3 times weekly for 2-3 months
2-4 inch caliper	Daily for 1 month; every other day for 3 months; weekly until established.	2-3 times weekly for 3-4 months
> 4 inch caliper	Daily for 6 weeks; every other day for 5 months; weekly until established.	Twice weekly for 4-5 months

Notes on Irrigation:
[1] Delete daily irrigation when planting in winter. Irrigation frequency can be reduced slightly (e.g. 2-3 times each week instead of every other day) when planting hardened-off, field-grown trees that were root-pruned during production. Establishment takes 3 (hardiness zones 10-11) to 4 (hardiness zones 8-9) months per inch trunk caliper.
[2] At each irrigation, apply 2-3 gallons per inch trunk caliper to the root ball. Apply the water in a manner so all water soaks into the root ball. Do not irrigate if root ball is already wet/saturated on the scheduled irrigation day.
[3] Trees take much longer to establish when irrigating for survival rather than vigor. As a result, it may be necessary to continue irrigating a newly planted or young tree during the hot and dry season of the subsequent year.

Table 2. Irrigation schedule for establishing shrubs in well drained soil (irrigation schedule is based on shrubs planted from 3-gallon, smooth-side plastic containers).

Location	Irrigation Schedule for Vigor	Irrigation schedule for Survival
North Florida	Every 2-4 days	Every 8 days
Central Florida	Every 2-4 days	Every 8 days
South Florida	Every 2 days	Every 4 days

Table 3. Fertilization guidelines for established turfgrass lawns.

Species/Location[1]	Nitrogen Recommendations (lbs 1000 ft^{-2} yr^{-1})[2, 3]
Bahiagrass- North	1-2
Bahiagrass- Central	1-2
Bahiagrass- South	1-2
Bermudagrass- North	3-5
Bermudagrass- Central	4-6
Bermudagrass- South	5-7
Centipedegrass- North	0.4-2
Centipedegrass- Central	0.4-3
Centipedegrass- South	0.4-3
St. Augustinegrass- North	2-4
St. Augustinegrass- Central	2-5
St. Augustinegrass- South	4-6
Zoysiagrass- North	2-3
Zoysiagrass- Central	2-4
Zoysiagrass- South	2.5-4.5

[1] North Florida in this example is considered to be anything north of Ocala. Central Florida is defined as anything south of Ocala to a line extending from Vero Beach to Tampa. South Florida includes the remaining southern portion of the state.
[2] Preferences for lawn quality and maintenance level vary; therefore, a range of fertility rates is recommended. Additionally, effects within a localized region (i.e., microenvironmental influences such as shade, drought, soil conditions, and irrigation) necessitate a range of fertility rates.
[3] These recommendations assume that grass clippings are left on the lawn.

Table 4. Fertilization Rates for Established Landscape Plants.

Level of Maintenance	Amount of Nitrogen Fertilizer
Basic	0 - 2 pounds N/1000 ft^2/year
Moderate	2 - 4 pounds N/1000 ft^2/year
High	4 - 6 pounds N/1000 ft^2/year