



LANDSCAPE IRRIGATION AND FLORIDA-FRIENDLY LANDSCAPING DESIGN STANDARDS

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Contributors:

Northwest Florida Water Management District

Southwest Florida Water Management District

St. Johns River Water Management District

South Florida Water Management District

Suwannee River Water Management District

Florida Department of Environmental Protection

Florida Department of Agriculture and Consumer Services

Florida Department of Transportation

Florida Association of Counties

Florida League of Cities

Institute of Food and Agricultural Sciences at the University of Florida

Florida Native Plant Society

Florida Nursery, Growers and Landscape Association

Florida Chapter of the American Society of Landscape Architects

Florida Irrigation Society

Association of Florida Community Developers

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Overview

Given Florida's limited water resources in combination with a rapidly growing population, wise irrigation practices play an essential role in ensuring a sustainable water future for our state. Properly designed and installed permanent landscape irrigation and Florida-Friendly Landscaping™¹ design and maintenance standards can help save significant amounts of water and money, achieve attractive landscapes and protect our natural resources.

This document is intended to be utilized by landscape designers, irrigation designers and irrigation system installers as a best management practice guide when including permanent in-ground irrigation systems.

The Florida-Friendly Landscaping™ Program is implemented through a partnership between the Florida Department of Environmental Protection (DEP) and the University of Florida's Institute of Food and Agricultural Sciences (UF/IFAS) pursuant to section 166.048, Florida Statutes (F.S.). The program contributes to the conservation, protection and restoration of water through the implementation of science-based landscaping guidance.

The contributors to this document recognize that technologies and best practices change over time. For that reason, this document is intended to be a living document, able to be updated and changed as necessary. The contributors recognize that the Florida Nursery, Growers and Landscape Association, through its regular meetings, facilitates a frequent and open dialogue on landscape irrigation practices in the industry and the contributors welcome regular communication on these practices. To facilitate amendments to this document, the contributors will strive to convene no less than every three years to review these best practices and make any necessary amendments. Persons who wish to submit revisions to the document may do so to the Florida Nursery, Growers and Landscape Association, the Florida-Friendly Landscaping™ Program at UF/IFAS, or DEP's Nonpoint Source Management Program.

The Committee on Landscape Irrigation and Florida-Friendly Design Standards was formed in 2006 to work together to develop landscape irrigation and Florida-Friendly Landscaping™ design standards for new construction which incorporate a landscape irrigation system and develop scientifically based model guidelines for urban, commercial and residential landscape irrigation. This statute additionally directs that:

- i. The Landscape Irrigation Design Standards are to be based on the Irrigation Code defined in the Florida Building Code presently found in Appendix F of the Plumbing Volume.²

¹ The Florida-Friendly Landscaping Program™ is recognized by sections 166.048 and 373.185, F.S. For more information visit FloridaFriendlyLandscaping.com.

² These standards utilize the definitions and requirements of Appendix F of the Florida Building Code. Landscape and irrigation professional should defer to Appendix F and always follow Florida building code

- ii. Local governments shall use the standards and guidelines when developing landscape irrigation and Florida-Friendly Landscaping™ ordinances.

These updated standards recognize and build on the many major efforts previously achieved to improve landscape irrigation design in Florida, including:

- [Florida-Friendly Landscaping™ publications:](#)
 - [Best Management Practices for the Protection of Water Resources by the Green Industries.](#)
 - [Florida-Friendly Landscaping™ Guide to Plant Selection & Landscape Design.](#)
 - [Florida-Friendly Landscaping™ Handbook for Home Landscapes.](#)
 - [Example Ordinance for Compost Amending Soil in Urban Landscaping.](#)
- Specification for Turf and Landscape Irrigation Systems referenced in [Appendix F of the Plumbing Volume of the Florida Building Code.](#)

These construction codes apply to all irrigation systems used on residential and commercial landscape areas. They address the design requirements, water quality, materials, installation, inspection and testing for such systems. These construction codes do not apply to irrigation systems for golf courses, nurseries, greenhouses or agricultural production systems.

- [Irrigation Association Landscape Best Management Practices.](#)
- The [Florida WaterStarSM](#) Certification Program.

Statutory Directives

section 373.228, F.S. (2023), Landscape Irrigation Design

- (1) The Legislature finds that multiple areas throughout the state have been identified by water management districts as water resource caution areas, which indicates that in the near future water demand in those areas will exceed the current available water supply and that conservation is one of the mechanisms by which future water demand will be met.
- (2) The Legislature finds that landscape irrigation comprises a significant portion of water use and that current typical landscape irrigation systems and Florida-friendly landscaping designs offer significant potential water conservation benefits.
- (3) It is the intent of the Legislature to improve landscape irrigation water use efficiency by ensuring that landscape irrigation systems meet or exceed minimum design criteria.
- (4) The water management districts shall work with the Florida Nursery, Growers and Landscape Association, the Florida Native Plant Society, the Florida Chapter of the American Society of Landscape Architects, the Florida Irrigation Society, the Department of Agriculture and Consumer Services, the Institute of Food and Agricultural Sciences, the Department of Environmental Protection, the Department

requirements. To learn more about Appendix F, visit <https://up.codes/viewer/florida/fl-plumbing-code-2017/chapter/F/proposed-construction-building-codes-for-turf-andlandscape-irrigation-systems>.

of Transportation, the Florida League of Cities, the Florida Association of Counties, and the Florida Association of Community Developers to develop landscape irrigation and Florida-friendly landscaping design standards for new construction which incorporate a landscape irrigation system and develop scientifically based model guidelines for urban, commercial, and residential landscape irrigation, including drip irrigation, for plants, trees, sod, and other landscaping. The standards shall be based on the irrigation code defined in the Florida Building Code, Plumbing Volume, Appendix F. Local governments shall use the standards and guidelines when developing landscape irrigation and Florida-friendly landscaping ordinances. By January 1, 2011, the agencies and entities specified in this subsection shall review the standards and guidelines to determine whether new research findings require a change or modification of the standards and guidelines.

(5) In evaluating water use applications from public water suppliers, water management districts shall consider whether the applicable local government has adopted ordinances for landscaping and irrigation systems consistent with the Florida-friendly landscaping provisions of s. 373.185.

History.—s. 6, ch. 2004-381; s. 13, ch. 2008-150; s. 19, ch. 2009-243.

Definitions

An asterisk (*) indicates the definition is from Appendix F of the Plumbing Volume of the Florida Building Code.

Automatic (Landscape Irrigation) System*

An irrigation system which operates following a preset program entered into an automatic controller.

Bubbler Irrigation*

The application of water to the soil surface or a container as a small stream or fountain. Bubbler emitter discharge rates are greater than the 0.5 to 2 Gallons Per Hour (GPH) characteristic of drip emitters, but generally less than 60 GPH.

Controller*

The timing mechanism and its mounting box. The controller signals the automatic valves to open or close according to a pre-set program or based on sensor readings.

Drip Irrigation*

The precise low-rate application of water to or beneath the soil surface near or directly into the plant root zone. Applications normally occur as small streams, discrete or continuous drops in the range of 0.5 to 2.0 GPH.

Drip Line Emitter (aka Line-Source Emitter or In-Line Emitter)

A tube which discharges water from integrated evenly spaced emitters, perforations or a porous wall.

Emission Device

An irrigation system component used to dispense irrigation water to the landscape at a specific rate.

Florida-Friendly Landscaping™

A statewide program implemented by UF/IFAS and DEP. Florida-Friendly describes quality landscapes that conserve water, protect the environment, are adaptable to local conditions and are drought tolerant. The principles of such landscaping include planting the right plant in the right place, efficient watering, appropriate fertilization, mulching, attraction of wildlife, responsible management of yard pests, recycling yard waste, reduction of stormwater runoff and waterfront protection. Additional components include practices such as landscape planning and design, soil analysis, the appropriate use of solid waste compost, minimizing the use of irrigation and proper maintenance.

Florida Water StarSM

A statewide voluntary certification program owned by the St. Johns River Water Management District that certifies new and existing homes and businesses for water efficiency indoors and out.

Flow Sensing Device

These devices detect when water is flowing and can transmit a signal to an indicating device. This can be used to detect unscheduled, low-flow or high-flow events. Also referred to as a “flow sensor.”

Functional Turf

Turfgrass that has been included in a landscape design to serve a specific function in the landscape. Examples may include recreational spaces, low traffic walkways, landscape continuity and areas prone to erosion.

Head (aka Sprinkler Head)

The exterior case or shell of a sprinkler incorporates a means of connecting to the piping system and is designed to provide above ground or overhead irrigation. Also known by industry terms such as rotor, spray head, mist head and impact sprinkler, when referring to the type of emission. May be used interchangeably with, and in conjunction with, “sprinkler.”

Head-to-Head Spacing

Spacing of sprinkler heads so the distance between sprinklers is equal to the sprinkler head rated throw radius (i.e., water from one sprinkler reaches the other sprinkler).

Hydrozone

A distinct grouping of plants with similar water and irrigation needs and climatic requirements which can be irrigated with a common zone.

Irrigation

The application of water by artificial means, that is, means other than natural precipitation.

Microirrigation*

The frequent application of small quantities of water directly on or below the soil surface, usually as discrete drops, tiny streams or miniature sprays through emitters

placed along the water delivery pipes (laterals). Microirrigation encompasses a number of methods or concepts, including drip, subsurface, bubbler and spray irrigation. Previously known as trickle irrigation.

Microirrigation Emission Device

An emission device intended to discharge water in the form of drops or continuous flow at rates less than 30 GPH or 113.5 Liters Per Hour (LPH) at the largest area of coverage available for the nozzle series when operated at 30 Pounds per Square Inch (PSI) (206.8 (kPa), except during flushing.

Microspray

A microirrigation emission device with one or more orifices to convert irrigation water pressure to water discharge with a flow rate not to exceed 30 GPH(113.5LPH) at the largest area of coverage available for the nozzle series when operated at 30 PSI (206.8 kPa). Microsprays include “microbubblers,” “microspinners” and “microspray jets.”

Multiple Outlet Emitter

A microirrigation emission device with more than one emission point from a centralized assembly.

Native Vegetation (Native Plants)

A plant species, subspecies or variety of species that is presumed to have been present in Florida before European contact. Rule 5B-40.003, Florida Administrative Code (F.A.C.) For reference, see [Native Plants: An Overview](#).

Noxious Weed

Any living stage, including, but not limited to, seeds and reproductive parts, of a parasitic or other plants of a kind, or subdivision of a kind, which may be a serious agricultural threat in Florida, or have a negative impact on the plant species protected under section 581.185, F.S. or if the plant is a naturalized plant that disrupts naturally occurring native plant communities. Rule 5B-57.001(p), F.A.C. Nursery sales of these weeds are prohibited, and their movement is regulated by the Florida Department of Agriculture (FDACS) and Consumer Services' Division of Plant Industry.

Point-Source Emitter

A microirrigation drip emitter which discharges water at a single emission point.

Reclaimed Water

Reclaimed water is water that has been treated in municipal wastewater facilities, has received at least secondary treatment and basic disinfection, and is safe to use for irrigation and other permitted purposes.

Rain Shut off Device*

A calibrated device that is designed to detect rainfall and override the irrigation cycle of the sprinkler system when a predetermined amount of rainfall has occurred.

Rotor Sprinkler

A sprinkler that applies water in a pattern by means of one or more rotating streams to a defined landscape area.

Soil Amendment

Materials added to soil to improve physical properties, such as water retention, permeability, water infiltration, drainage, aeration and structure.

Spray Sprinkler

A sprinkler that continuously applies water in a pattern to a defined landscape area.

Sprinkler

An emission device consisting of a sprinkler body with one or more orifices to convert irrigation water pressure to high velocity water discharge through the air, discharging a minimum of 0.5 Gallons Per Minute (GPM) (1.9 Liters Per Minute [LPM]) at the largest area of coverage available for the nozzle series when operated at 30 PSI (206.8 kPa) or more with a full-circle pattern.

Total Irrigable (Landscape) Area

Total site area less the residential building footprint, paved or impervious surfaces, waterbodies and stormwater control structures. Specifically, any permeable surface that is typically covered with turfgrass, landscape, gardens or mulch on a given lot or parcel.

I. General Florida-Friendly Design Standards

A Florida-Friendly Landscape™ begins with proper design. These guidelines should be followed for sustainable landscapes and, where irrigation systems are installed, to promote proper irrigation system design and minimize supplemental irrigation.

A. Preservation

To create a Florida-Friendly Landscape™, low-impact site design practices (such as the preservation of existing native trees, vegetation, and soil) shall be used to the maximum extent feasible, which should include, where possible, removal of invasive species.

A.1. Tree Shade

A Florida-Friendly Landscape™ shall protect existing tree canopy where possible. Tree canopies reduce stormwater runoff through the process of evapotranspiration from the surface of the canopy. The shade created by the canopies aid in moisture retention in a landscape, thus reducing or eliminating the need to provide supplemental irrigation.

In addition to the [Florida-Friendly Landscaping™ Plant Guide](#), landscape designers can use the [University of Florida Plant Information Databases](#), to assess the mature shade area of the trees.

A.2. Preservation of Preconstruction Vegetation

Preservation of preconstruction vegetation can reduce the irrigated area of a landscape, reduce the need for chemical applications, and increase plant and animal diversity. Preservation of existing on-site vegetation retains values such as wildlife habitat, soil integrity and shading, and create beautiful and welcoming natural spaces in the landscape. These areas reduce overall landscape irrigation demand and stormwater runoff. Vegetation that is preserved is already established and can survive without landscape irrigation.

B. Plant Selection

Designing a Florida-Friendly Landscape™ requires correct plant selection, known as [the “right plant, right place” principle](#). Landscape material selection should be matched with site conditions such as soil type, shade/sunlight level and [U.S. Department of Agriculture \(USDA\) Hardiness Zone](#). Additionally, the plant’s mature size, susceptibility to pests and water requirements should be evaluated before a landscape design is finalized.

The [Florida-Friendly Landscaping™ Plant Guide](#) can be used to identify “right plant, right place” site compatibility, water requirements (to aid in plant grouping) and other plant selection criteria.

B.1. Plant Site Compatibility

Plant material compatible with the site conditions should be utilized. “Right plant, right place” installation ensures sustainable landscapes can survive on minimal, if any, irrigation after establishment. Plants require more irrigation and maintenance when planted in unsuitable conditions. If established plants are sited appropriately, they can survive primarily on rainfall and with minimal or no supplemental irrigation during dry periods.

B.2. Plant Grouping for Irrigation Systems

If a permanent irrigation system is installed, plants shall be grouped together by landscape irrigation needs. Plants within the same irrigation zone, or hydrozone, should have similar moisture and maintenance needs. When plants with dissimilar needs are installed within the same hydrozone, overwatering and unsustainable maintenance practices can occur. This can lead to poor landscape health, disease, and plant death in addition to unnecessary water use.

The irrigation system should be divided into hydrozones based on the following considerations:

- Available flow rates.
- Use of the area.
- Type of vegetation irrigated (i.e., turf, shrubs, native plants, etc.).
- Type of sprinkler (i.e., sprinklers with matching precipitation rates).
- Soil characteristics and slope.
- Sun exposure.

B.3. Plant Spacing

Plant beds should be designed to provide a minimum of 60% plant coverage at plant maturity and plants should be spaced according to their mature sizes. When immature plants are densely spaced to provide a “fuller” appearance immediately upon installation, it leads to complications once the landscape matures. While an over-crowded design may provide some immediate satisfaction, as plants mature there is often insufficient space for them to establish and thrive. In turn, this can increase the need for irrigation, fertilization and pesticide applications due to stressed conditions.

B.4. Plant Proximity to Buildings

A plant’s mature size should be considered when plants are installed adjacent to structures. In most cases, plants with mature widths greater than 2.5 feet should not be installed immediately adjacent to structures. A buffer zone of 2.5 feet should be specified within a landscape design, meaning that the plants root ball and the main leader of a tree/shrub will remain 2.5 feet away from the structure at mature growth.

The spacing guidelines in B3 and B4 apply to conditioned/enclosed structures, but do not apply to porches, patios and similar structures.

B.5. Turfgrass and Landscape Bed Separation

Turfgrass and landscape beds do not have the same watering and maintenance requirements. When turfgrass and landscape beds are planted in the same irrigation zone or intermixed within a zone, it can be difficult to apply irrigation efficiently.

When designing a Florida-Friendly Landscape™ with in-ground irrigation systems, turfgrass and landscape bed areas shall be distinctly separate. To meet this requirement, separate zones must be used to irrigate turfgrass and landscape beds. The irrigation zones must clearly match landscape hydrozones within the irrigation design.

B.6. Turfgrass Best Management Practices

Builders and landscape professionals should contact their local UF/IFAS extension office to determine the best turf species for reduced irrigation and/or un-irrigated areas. If correctly selected, established and maintained, Florida-Friendly designs may incorporate turfgrass into landscapes in accordance with the Florida-Friendly Landscaping™ principle “[Right Plant, Right Place](#).” Some of the functional turf applications include recreational space, erosion control, low traffic parking and flood control.

Florida-Friendly designs will avoid designing turfgrass areas that will be difficult to manage and irrigate. This includes avoiding narrow strips of turf, sharp angles, and turf in less-than-ideal locations such as high-traffic walkways and under dense shade.

Resources for turfgrass best management practices:

- [Turfgrass Selection](#).
- [The Florida-Friendly Landscaping™ Guide to Plant Selection & Landscape Design](#).

Artificial turf should not be used in a Florida-Friendly Landscape™. Artificial turf does not provide ecological benefits, reduces soil health and may leach pollutants. To learn more, read [Synthetic Turfgrass and the Nine Principals of Florida-Friendly Landscaping™](#).

C. Invasives and Noxious Weeds

To protect natural ecosystems, a Florida-Friendly Landscape™ should be free of invasive plant species and noxious weeds. Native or otherwise recognized Florida-Friendly plants should be used.

Invasive plants are species capable of spreading into natural areas and outcompeting native vegetation. The spread of invasive species damages natural ecosystems and can be costly to control.

To identify whether a plant is native, non-native and/or invasive, use the [UF/IFAS Assessment of Non-Native Plants in Florida's Natural Areas](#).

It is unlawful to introduce, possess, move, or release any plant pest or noxious weed regulated by FDACS and the USDA except under permit issued by FDACS or the USDA. Therefore, plants found on the Florida and/or federal noxious weed lists shall not be used in a landscape design.

The following resources can be used to identify noxious weeds:

- [Florida Noxious Weed and Invasive Species List](#).
- [Florida Prohibited Aquatic Plant Species List](#).
- [Federal Noxious Weed List](#).
- [The UF/IFAS Assessment of Non-Native Plants in Florida's Natural Areas](#).

D. Organic Mulch

When correctly applied, mulch can provide several benefits to increase the overall sustainability of landscapes. Mulch reduces evaporative water loss from the soil, suppresses weed growth, moderates soil temperatures and adds nutrients to the soil.

A Florida-Friendly Landscape™ utilizes sustainable, organic mulch. By-product mulch, such as pine straw, or recycled mulches, such as utility mulch, should be used when available. Additionally, “self-mulching” areas can be designed where leaves can remain on the landscape where they fall. Leaves can also be used to mulch surrounding plant beds. Mulched beds should be maintained at a 2–3-inch depth, except for immediately surrounding a tree or shrub.

Ideally, mulch will be pulled back 12-18 inches from the base of trees and 1-2 inches away from shrubs and left bare. However, if mulch is desired throughout the bed for aesthetic reasons, it should be at a depth of no more than one inch over the root ball. This will help water reach the plant roots efficiently. Excessive mulch at the base of a plant, known as “volcano” mulching, should be avoided since this can damage plants.

Recommended Florida-Friendly Landscape™ mulch types include:

- Fallen leaves.
- Utility mulch, which comes from tree debris that utility companies have trimmed*.
- Commercial, bagged Melaleuca mulch.
- Pine bark.

- Pine straw.
- Commercial, bagged Eucalyptus mulch.
- Mixed hardwood mulch.

Florida-Friendly Landscape™ mulch types do not include:

- Cypress.
- Non-organic mulch (rocks, rubber, etc.).

*Note, utility mulches may contain noxious and invasive plant material (seeds, stems, etc.) and precautions may be needed when the mulch is added to landscapes and adjacent to natural areas.

E. Soil Amendments

A Florida-Friendly Landscape™ will preserve natural soil conditions wherever possible. Where needed, however, soil amendments may be made to improve soil's physical properties. A [soil test](#) should be used to identify the current conditions of the soil prior to making any amendments. Soil amendments should be added according to manufacturer-recommended rates.

Florida-Friendly organic amendments, such as organic compost, manure or even worm castings can be used. Such amendments may be beneficial where the soil needs increased nutrient content and help retaining soil moisture and stabilizing soil pH, such as in flower beds and vegetable gardens. Nonorganic types of amendments may be used when incorporated properly and in accordance with manufacturer-recommended rates. These may include wetting agents that improve penetration of water into soils, superabsorbent polymers that increase water holding capacity, and hygroscopic humectant products, which act as moisture magnets, attracting unused water molecules from air pockets within the soil.

For more information regarding the use of soil amendments, see the [Guidance for Amending Urban Soils with Organic Amendments](#).

F. Preventing Stormwater Runoff

Florida-Friendly Landscapes™ shall be designed to reduce stormwater runoff. Rain barrels and cisterns are examples of easy ways to collect rainwater for reuse in the landscape. The collected rainwater can be attached to irrigation systems or used for hand watering to decrease the need for traditional irrigation.

In addition to rain barrels and cisterns, water directed from a home's gutters and downspouts can provide additional supplemental water for landscapes in lieu of running off impervious surfaces such as driveways.

Where applicable, landscapes should be designed with [green stormwater infrastructure](#) to increase permeable surfaces and capture more water on site.

G. Protect the Waterfront

A Florida-Friendly Landscape™ design will include [Florida-Friendly Landscaping™ principle nine “protect the waterfront.”](#) This principle requires that designs include a minimum of a 10-foot “low-maintenance zone” around any water body where no, or minimal, maintenance activities will take place. This includes mowing, irrigation, and application of fertilizer or pesticides. Landscape and irrigation designers and maintenance contractors should be knowledgeable of state or local regulations that may have more stringent requirements for waterfront properties.

Landscapes adjacent to waterbodies can enhance the natural system by including littoral zones as part of the landscape. Florida-Friendly waterfronts should be free of invasive and noxious plants and planted with native or other Florida-Friendly shoreline plants. Landscape installers should follow all state and local regulations relating to plant removal and planting. Native plants on site should be preserved.

H. Plant Installation Best Practices

The quality of a plant’s installation can greatly affect its establishment and long-term health.

Before digging the hole, all soil from above the topmost root should be removed and the distance between the topmost root and the bottom of the root ball should be measured. The hole should be dug about 10% shallower than this depth and as wide as possible (at least one and a half times the width of the ball and even wider in compacted soils).

The root ball should be positioned in the hole sufficiently shallow so the finished grade of the backfill and landscape soil is lower than the top of the root ball. In other words, leave the upper portion of the sides of the root ball exposed to air. Then mulch consistent with section D., above.

After mulching, one should see the topmost root in the root ball originating from the base of the plant at the soil surface. In other words, the trunk flare (root flare) should be visible. Soil should be packed firmly between the root ball and existing soil to eliminate air pockets where roots can dry out. Air pockets can be removed when planting large specimens by inserting a running hose between the root ball-soil interface several times until all the soil settles around the root ball.

I. Plant Establishment Best Practices

During the establishment phase, plants may need supplemental irrigation to promote healthy growth. The length of the establishment period will vary between plant species

and the size of the plants installed. In landscapes where there will be no permanent in-ground irrigation system, temporary irrigation may be employed and installed to meet the needs of the designed landscape through establishment of the plant material.

Resources for plant needs and establishment periods include:

- [UF/IFAS County Extension Agents.](#)
- [Establishing Shrubs in Florida Landscapes.](#)
- [Planting and Establishing Trees.](#)
- [Turfgrass guidance.](#)

Florida-Friendly designs will include an establishment plan based on the plants' needs and in compliance with applicable water management district rules regarding establishment irrigation. The plan should indicate the time required for establishment and any recommended irrigation rates during and post establishment. This plan should be shared with and explained to the final operator of the irrigation system, such as the homeowner or business.

More information on the establishment and maintenance of landscapes can be found through [local UF/IFAS county extension offices.](#)

II. Irrigation System Design Standards

This section generally describes elements that are consistent with the Florida Building Code, Plumbing, Appendix F and are not intended to supplant the Code itself. If there is a conflict between this document and the latest version of the Florida Building Code, Plumbing, Appendix F, irrigation system installation shall follow all legal requirements.

An automatic in-ground irrigation system is not essential for a Florida-Friendly Landscape™, but can be used to provide supplemental irrigation, as needed. To ensure water conservation, the following needs to be considered:

- Efficient design (including a design drawing).
- Correct installation.
- Site-appropriate scheduling and run time consistent with water management district watering rules.
- Regular maintenance by qualified entities.
- For irrigation intended only for establishment, post-establishment scheduling and capping/removal, as appropriate.

Irrigation system plans and specifications should identify all design elements, materials and the installation methods to be used. In accordance with the Appendix F of the Plumbing Volume of the Florida Building Code, plans or drawings for landscape irrigation installation should be submitted, where required, prior to building construction. Design drawings shall be clearly readable, to reasonable scale, show the entire site to be irrigated and include all improvements.

Additionally, designs for commercial, industrial, municipal and multi-family buildings have additional requirements set forth in Appendix F.

J. General Design

J.1. Irrigation System Zones

The irrigation system should be divided into zones based on consideration of the following hydrozoning conditions, in accordance with Appendix F of the Plumbing Volume of the Florida Building Code, which identifies the following six factors:

- Available flow rate.
- Cultural use of the area.
- Type of vegetation irrigated (i.e., turf, shrub, native plants, etc.).
- Type of sprinkler (i.e., sprinklers with matching precipitation rates).
- Soil characteristics and slope.
- Sun exposure.

J.2. Reduced Sprinkler Areas

Both the Florida Building Code and the Florida-Friendly Landscaping™ Program share in the goal to have turf and landscape areas that promote the efficient use and protection of water and other natural resources.

One strategy to reduce water use is to design the landscape with smaller areas of sprinkler irrigation (i.e., irrigated turf areas and irrigated landscape bed areas). This approach may need to be modified where obstacles, such as swales and steep grading, make the use of certain irrigation approaches infeasible.

Landscape areas that are less than 4 feet wide are difficult to irrigate without creating overspray to adjacent areas. Designers should avoid the creation of narrow areas where possible and, additionally, should be aware of all state, district, and local laws, including those that may require turf strips in side yards or rights of way. This can also occur on a small lot that must have turf grass for stormwater conveyance.

For any unirrigated turf grass areas, builders and landscape professionals should contact their local UF/IFAS extension office to determine the best turf species to use.

J.3. Microirrigation Technology

Florida-Friendly irrigation designs will use microirrigation in landscape beds if supplemental irrigation is needed. Microirrigation is the application of small quantities of water directly on or below the soil surface or plant root zone, usually as discrete drops, tiny streams or miniature sprays through emitters placed along the water delivery pipes (laterals). Microirrigation encompasses a number of

methods or concepts, including drip, subsurface, microbubbler and micro-spray irrigation, previously known as trickle irrigation, low volume or low-flow irrigation.

Most types of microirrigation result in higher application efficiencies than sprinklers, if properly maintained. Higher application efficiencies allow for effective irrigation while using less water than sprinklers. Lower application rates allow more time for water to infiltrate the soil, thus reducing the likelihood of runoff.

J.4. Microirrigation Recommendations

Some general Florida-Friendly practices for installing microirrigation include:

- Limit ½-inch poly tubing to lengths less than 250 feet.
- Limit ¼-inch spaghetti tubing to lengths less than 5 feet.
- Use buried PVC pipes or poly tubing to deliver water closer to the irrigated area.
- Place emitters so they are evenly spaced around plants. For example, the emitter should be placed halfway between a tree's trunk and the canopy edge.
- Install micro-sprays to provide head-to-head coverage.
- For large trees, or container garden areas, additional rows and/or emitters may be necessary to meet the plants' water needs.
- Maintain plant health by moving emitters away from plants as they mature to encourage proper root development.

Due to smaller emitters, tubing and other components, microirrigation might require pressure regulation, filtration and flush valves to prevent clogging and damage from high water pressure. Alternately, low flow sprinkler heads spray less water, but operate for longer, so the water has a chance to properly absorb into the top of slopes or deep into garden soil.

Tampa Bay Water developed [A Guide to Micro-Irrigation for West-Central Florida Landscapes](#) that provides guidance on installation of microirrigation that can be valuable in all areas of the state.

J.5. Check Valves

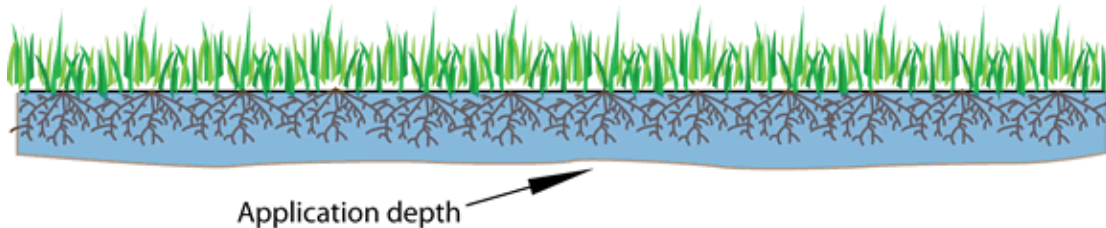
A check valve is a device that permits water to flow in one direction only and must be installed on any sprinkler where low point drainage occurs. Locations that typically require check valves are the site perimeters found at a low point in a slope away from the building. Florida-Friendly irrigation designs shall ensure that when the system is off, there is no drainage from any emission device. Heads requiring check valves must be clearly identified in the irrigation system design and must be field verified.

K. Distribution (Application) Uniformity (DU)

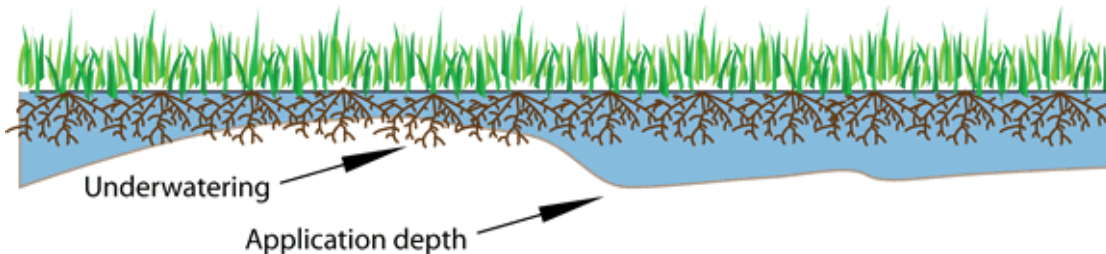
K.1. Distribution Uniformity

DU describes the evenness of an irrigation application across a landscaped area. Poor (low) DU in overhead irrigation is common, resulting in significantly reduced overall system efficiency and causing large quantities of wasted water. DU can be expressed as a percentage or decimal value. Refer to the [Florida Water Star Technical Manual irrigation system criteria guidance on distribution \(application\) uniformity](#) for more details. Installers shall strive to achieve evenness in their landscape irrigation.

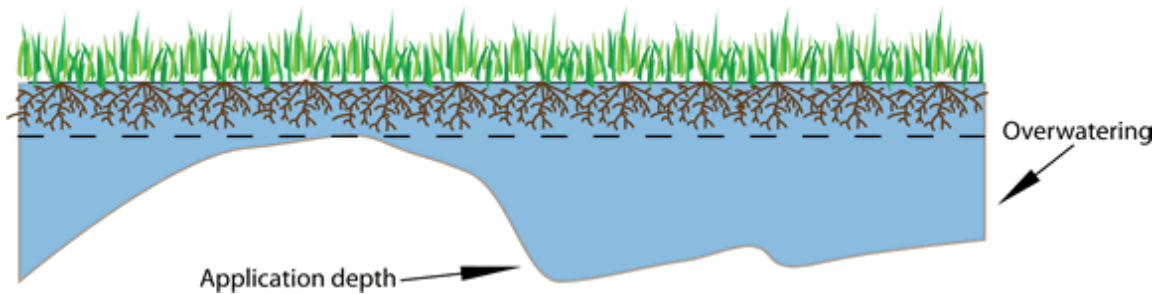
Good DU: The below figure shows an irrigated area containing turf grass with good DU. The depth of irrigation is relatively even, and no plant is receiving significantly more or less than another. There is always some variation in an irrigation zone, and therefore it is impossible to have perfect uniformity.



Poor DU: The below figure shows an irrigated area containing turf grass with poor DU. During the irrigation cycle, the area on the right receives sufficient amounts of water, while the area on the left does not.



Consequences of poor DU: The figure below showing poor DU depicts the increased potential for stress to the turf area on the left. When this results in apparent plant stress, irrigation system operators are likely to increase watering times, resulting in overwatering of the turf on the right. The overwatering figure depicts what occurs when system run times are increased to compensate for poor DU. In this example, nearly twice the irrigation is necessary to meet the plant's watering requirements. If these plants require $\frac{3}{4}$ inch of irrigation water, then approximately 1.5 inches would be required.



K.2 Matched Precipitation

The precipitation rate, also known as application rate, is the average rate (inches per hour) of rainfall or irrigation system water application. Precipitation rates are found in manufacturer recommendations and vary among emission devices and their ranges of throw.

The term “matched precipitation” means all the emission devices in a particular zone apply an equal distribution of water on a given area.

All spray and rotor nozzles within the same zone shall have matched precipitation rates, unless otherwise directed, in order to increase efficiency by adjusting the nozzle selection to match site conditions.

K.3. Sprinkler Spacing

In addition to the sprinkler installation requirements of Appendix F of the Plumbing Volume of the Florida Building Code, when designing an irrigation system for a Florida-Friendly Landscape™, sprinkler spacing shall be designed to maximize efficiency.

The design should include head-to-head spacing and consider soil, slope and other site characteristics to minimize water waste, such as: overspray, off-site runoff, the watering of impervious surfaces and other non-vegetated areas.

A Florida-Friendly Landscape™ design’s sprinkler heads must be spaced at 50% of the nozzle throw diameter from the adjacent head. In other words, a sprinkler head with a 10-foot throw should be spaced 10 feet from the adjacent head. This spacing must occur in all directions the nozzle is throwing. In narrow areas under 8 feet, head-to-head spacing may lead to soil oversaturation and other inefficiencies.



Area between heads is receiving the same amount of water.

In accordance with Appendix F of the Plumbing Volume of the Florida Building Code, sprinklers should be adjusted and spaced to avoid watering impervious surfaces such as sidewalks, buildings and roadways.

Irrigating impervious surfaces is not only a waste of water, but can help transport nutrients, such as leaf debris and fertilizer, to waterways.

Irrigation drawings should depict sprinkler spacing, and any notes associated with design drawings should confirm this requirement.

Refer to the [Florida Water Star Technical Manual irrigation system criteria guidance on distribution \(application\) uniformity sprinkler spacing](#) for more details.

K.4. Sprinkler Clearance

Sprinkler water application can be altered when sprinkler heads are unable to rise above the turfgrass. When application is obstructed, distribution of water is increased in areas adjacent to the sprinkler head and areas further away receive less water. Sprinklers that do not clear turfgrass are another cause of reduced distribution uniformity, which can significantly diminish plant vitality.

In accordance with Appendix F of the Plumbing Volume of the Florida Building Code, all sprinkler heads in turf areas shall be designed with:

- A minimum of 6-inch in height for St. Augustine, Zoysia and Bahia grasses.
- A minimum of 4-inch in height for Centipede, Bermuda and Seashore Paspalum grasses.

K.5. Pipe Sizing

Consistent with Appendix F of the Plumbing Volume of the Florida Building Code, a maximum 5 feet per second (ft/s) water flow velocity should be kept to maintain irrigation system integrity. Velocities above this rate can damage components essential to the irrigation system's operation.

To create a Florida-Friendly design, designers must size pipes according to a recognized pipe sizing/friction loss chart and clearly specify pipe sizes on the irrigation system design. Pipes must be sized to prevent velocities greater than 5ft/s.

Irrigation systems with main lines larger than 2 inches or designed to supply more than 70GPM , should incorporate a flow sensor to measure irrigation water use.

L. Pressure Regulation

Maximum efficiency is achieved when emission devices function within the manufacturers' recommended pressure ranges. A Florida-Friendly design must include suitable regulation of the pressure throughout the irrigation system utilizing such devices as pressure-regulating valves, heads and/or screens. Proper pressure at the device may be achieved by either of the following:

L.1. Pressure-Regulating Emission Devices (Zone Pressure-Regulation)

Pressure-regulating emission devices restrict water pressure to the range recommended by the manufacturer. Use of these devices increases application efficiency.

L.2. Pressure-Regulating Devices

Whether adjustable or fixed, pressure-regulating devices automatically provide a predetermined pressure immediately downstream.

M. Water Supply

A Florida-Friendly Landscape™ that has an in-ground automatic irrigation system will utilize the lowest quality water available for irrigation systems. This can vary by region and may include stormwater, reclaimed water and certain shallow water aquifers. Additional reclaimed water use considerations are provided below.

M.1. Reclaimed Water

“Water reuse” is the term used to describe the beneficial application of reclaimed water and is referred to as “effluent water” in Appendix F of the Plumbing Volume of the Florida Building Code. A Florida-Friendly irrigation system should be connected to reclaimed water when it is available at or adjacent to the property boundary. Contact the local wastewater utility serving that area to determine availability. If other non-potable source water is available, it should be evaluated for its suitability for use. The system should be designed to use the lowest quality of water feasible.

Using reclaimed water for landscape irrigation can significantly reduce the demand for high-quality, freshwater supplies and reduce costs related to the development of more costly alternative water sources. Water conservation elements outlined in this document should be applied to reclaimed water as they would to potable water. Reclaimed water is a valuable, but limited, source of water and therefore should be conserved. Additionally, overwatering with

reclaimed water can result in increased introduction of nutrients to Florida's waterways.

M.2. Reclaimed Water Labeling

Appendix F of the Plumbing Volume of the Florida Building Code requires that all pipes, valves, valve boxes, and sprinklers utilizing reclaimed water be designated for non-potable use by either label or by the industry standard color purple.

M.3. Nutrient Considerations

Depending on the level of treatment and design and management of the storage and delivery system, reclaimed water may contain higher amounts of nutrients than other sources. The amount of nutrients in reclaimed water varies between wastewater facilities. The local reclaimed water provider should be contacted regarding reclaimed water quality.

Plants in the landscape can use the nutrients present in reclaimed water, potentially reducing the need for applying fertilizer. Prior to fertilizer application, all nutrient inputs to the landscape should be accounted for, whether they are in the form of fertilizers, compost or are associated with reclaimed water.

Maintenance of a high level of distribution uniformity in reclaimed water-irrigated sites is critical to minimizing the leaching and runoff of these nutrients. With all water sources, a soil's field capacity should not be exceeded to minimize runoff and leaching and the application of irrigation water to impervious surfaces should be eliminated.

N. Operation and Scheduling

N.1. Automatic Landscape Irrigation Controller Systems

Since 1991, in accordance with section 373.62(1), F.S., "Any person who purchases and installs an automatic landscape irrigation system must properly install, maintain, and operate technology that inhibits or interrupts operation of the system during periods of sufficient moisture." Automatic irrigation systems are not required to be installed by local code and a carefully designed landscape and temporary irrigation is an option for any landscape.

There are smart irrigation devices that can help landscape designers ensure this statutory requirement is achieved. These devices can not only save water but can help save homeowners money.

N.2. Rainfall Shut-Off Device

A rainfall shut-off device is a calibrated device that is designed to detect rainfall and override the irrigation cycle of the sprinkler system when a predetermined amount of rainfall has occurred.

There are a variety of devices available to automatically bypass an irrigation cycle after a certain amount of rainfall.

N.3. Soil Moisture Sensor (SMS) Controllers

An SMS controller uses a moisture-detecting probe installed within the root zone in a landscape to determine if irrigation is required. An SMS is a device which interrupts programmed schedules when sufficient moisture is present in the root zone and applying supplemental irrigation is not necessary.

N.4. Weather-based Controllers (ET Controller)

A weather-based evapotranspiration (ET) controller uses climatic information to determine when the irrigation system should operate. ET controllers may achieve greater savings than a standard rain shut-off device by reducing or skipping irrigation in response to temperature and other climatic conditions, in addition to rainfall.

Refer to the [U.S. Environmental Protection Agency WaterSensesm Labeled Controllers](#) webpage for more information.

N.5. Flow-Sensing Devices

To minimize water waste due to leaks, breaks, etc., irrigation systems should incorporate a means to shut down when leaks are detected by flow-sensing devices. Irrigation systems should be installed with a “normally closed” master valve assembly and flow monitoring controller that will sense leaks and breaks and alert the operator.

N.6. Post Installation

The irrigation installation contractor should conduct final testing and adjustments to achieve design specifications prior to the system’s completion and acceptance by the owner or owner’s representative in compliance with code.

Initially, the landscape irrigation schedule may need to be more frequent to allow for plant establishment. The schedule should be adjusted after establishment to comply with water management district rules. The irrigation installer should provide instructions for when and how to make necessary adjustments and may want to reference how it can save the user on the costs of water and why it is so important.

The irrigation system should be set for watering in accordance with the installed landscape’s needs and in compliance with the irrigation rules adopted by the applicable water management district and ordinances adopted by the local government.

The irrigation installer should provide the property owners and users with post-construction and maintenance system information including:

- Design drawings as detailed in Appendix F of the Plumbing Volume of the Florida Building Code.
- Recommended maintenance activities and schedules.
- Operational schedule.
- Instructions on adjusting the system to irrigate in accordance with the rules of the applicable water management district after a landscape is established.
- Water shut-off method.
- A manufacturer's operational guide for the controller.

Upon establishment of the landscape, it is not essential to leave the automatic or smart controller turned on. If turned off, it can easily be turned on if the landscape is showing signs of stress. Supplemental irrigation water should only be used when needed. A Florida-Friendly Landscape™ helps to ensure a more resilient landscape that maximizes opportunities to protect Florida's natural water resources.

Conclusion

Florida residents can reduce the stress on the state's water supply by using water in the landscape responsibly. These standards were developed for landscape and irrigation design experts, for use in the design and installation of efficient irrigation systems. This document is not intended to be a comprehensive guide for the implementation of all Florida-Friendly Landscaping™ best practices.

These standards also provide a guide for local governments, municipalities, HOA's, and developers to implement effective outdoor water use reduction strategies and can be utilized when developing or revising local codes and ordinances.

There is ongoing research into landscape and irrigation best practices. These standards are intended to be a living document, updated as necessary to ensure that the most effective guidance available is being utilized.

Persons who wish to submit revisions to the document may do so to the Florida Nursery, Growers and Landscape Association, the UF/IFAS Florida-Friendly Landscaping™ program or DEP's Nonpoint Source Management Program.

Contacts

Northwest Florida Water Management District

81 Water Management Drive
Havana, FL 32333-4712
www.nfwwater.com

Southwest Florida Water Management District

2379 Broad Street
Brooksville, FL 34604-6899
www.swfwmd.state.fl.us

St. Johns River Water Management District

4049 Reid Street, P.O. Box 1429
Palatka, FL 32178-1429
www.sjrwmd.com

South Florida Water Management District

P.O. Box 24680
West Palm Beach, FL 33416-4680
www.sfwmd.gov

Suwannee River Water Management District

9225 County Road 49 Live Oak, FL 32060
www.srwmd.state.fl.us

Florida Department of Environmental Protection

3900 Commonwealth Blvd
Tallahassee, FL 32399
www.FloridaDEP.gov

Florida Department of Agriculture and Consumer Services

Office of Agricultural Water Policy
The Elliot Building, 401 S. Monroe
Tallahassee, FL 32399
<https://www.fdacs.gov/>

Florida Department of Transportation

Environmental Management Office
605 Suwannee Street, MS 37
Tallahassee, FL 32399-0450
www.dot.state.fl.us

Florida Association of Counties

P.O. Box 549
Tallahassee, FL 32302
www.fl-counties.com

Florida League of Cities

P.O. Box 1757
Tallahassee, FL 32302
www.flcities.com

University of Florida Institute of Food and Agricultural Sciences

University of Florida
P.O. Box 110180
Gainesville, FL 32611-0180
www.ifas.ufl.edu

Florida-Friendly Landscaping™ Program

2140 NE Waldo Road
Gainesville, FL 32609
<https://ffl.ifas.ufl.edu/> or
FloridaFriendlyLandscaping.com

Florida Nursery, Growers and Landscape Association

1533 Park Center Drive
Orlando, FL 32835-5705
www.fn gla.org

Florida Native Plant Society

Florida Chapter of the American Society of Landscape Architects

P.O. Box 841
Pensacola, FL 32591
info@aslaflorida.org
www.aslaflorida.org

Florida Irrigation Society

9340 56th Street N., Suite 105
Temple Terrace, FL 33617
www.fisstate.org

Association of Florida Community Developers

307 West Park Avenue, Suite 214
Tallahassee, FL 32301-1422
www.afcd.com