

# WaterSense at Work

## Outdoor Water Use 5.2 Irrigation



Best Management Practices for  
Commercial and Institutional Facilities



November 2023

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WaterSense® is a voluntary partnership program sponsored by the U.S. Environmental Protection Agency (EPA) that seeks to protect the nation’s water supply by transforming the market for water-efficient products, services, and practices.

*WaterSense at Work* is a compilation of water efficiency best management practices intended to help commercial and institutional facility owners and managers from multiple sectors understand and better manage their water use. It provides guidance to help establish an effective facility water management program and identify projects and practices that can reduce facility water use.

An overview of the sections in *WaterSense at Work* is below. This document, covering water efficiency for irrigation systems and equipment, is part of **Section 5: Outdoor Water Use**. The complete list of best management practices is available at [www.epa.gov/watersense/best-management-practices](http://www.epa.gov/watersense/best-management-practices). WaterSense has also developed worksheets to assist with water management planning and case studies that highlight successful water efficiency efforts of building owners and facility managers throughout the country, available at [www.epa.gov/watersense/commercial-buildings](http://www.epa.gov/watersense/commercial-buildings).

- **Section 1. Getting Started With Water Management**
- **Section 2. Water Use Monitoring**
- **Section 3. Sanitary Fixtures and Equipment**
- **Section 4. Commercial Kitchen Equipment**
- **Section 5. Outdoor Water Use**
- **Section 6. Mechanical Systems**
- **Section 7. Laboratory and Medical Equipment**
- **Section 8. Onsite Alternative Water Sources**

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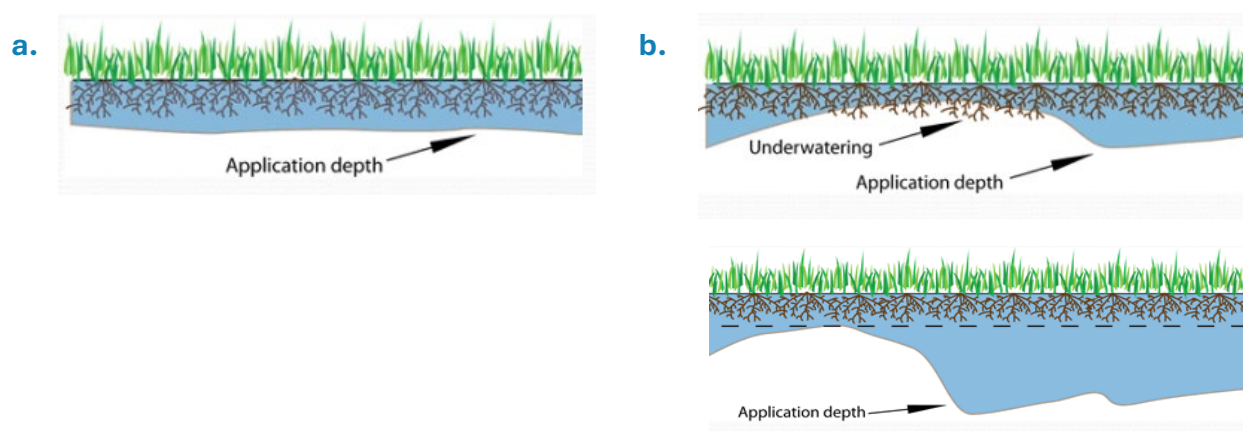
This document is one section from *WaterSense at Work: Best Management Practices for Commercial and Institutional Facilities* (EPA-832-F-23-003). Other sections can be downloaded from [www.epa.gov/watersense/best-management-practices](http://www.epa.gov/watersense/best-management-practices). Sections will be reviewed and periodically updated to reflect new information. The work was supported under contract 68HERC20D0026 with Eastern Research Group, Inc. (ERG).

## Overview

The efficiency of a landscape irrigation system is determined by many factors, including human, mechanical, and environmental components. Implementing mechanisms and practices that increase an irrigation system's efficiency could reduce a property's outdoor water use by more than 50 percent. In landscapes around the country, a significant amount of water is lost from evaporation, wind, or runoff due to improper irrigation system design, installation, or operation and maintenance. Eliminating this waste involves trained professionals, appropriate irrigation schedules, and efficient technologies. Additionally, the landscape itself (e.g., plant palette, soil type, etc.) plays a role in irrigation water use and provides the potential for additional water savings. See *WaterSense at Work Section 5.1: Landscaping* at [www.epa.gov/watersense/best-management-practices](http://www.epa.gov/watersense/best-management-practices) for more details.

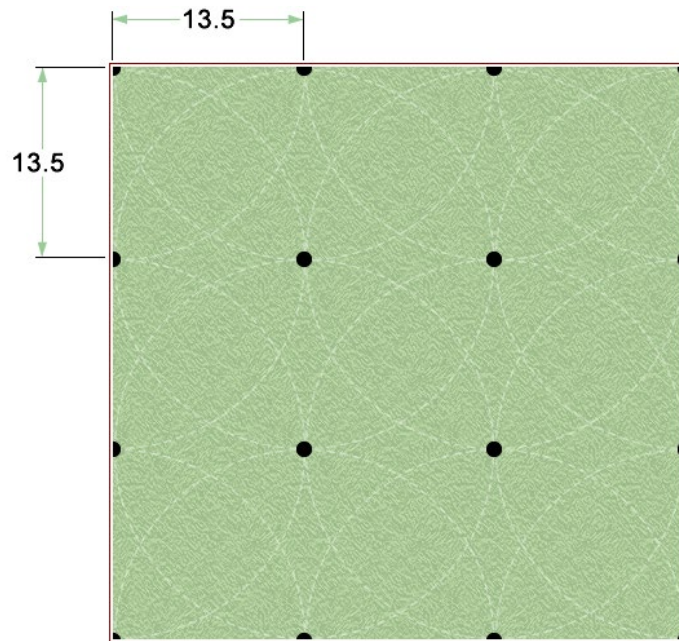
One of the most important concepts affecting irrigation system efficiency is how evenly water is applied to the landscape. Figure 1a below illustrates uniform application. Figure 1b below shows uneven application, where some parts of the root zone may be underwatered or overwatered. Without uniform application, the landscape is often watered to keep the driest spot green, resulting in overwatering of other areas. Head-to-head coverage, illustrated in Figure 2 on the next page, is intended to apply water as uniformly as possible. For maximum efficiency, sprinklers should be located so that water distributed from one sprinkler reaches adjacent sprinklers.

**Figure 1. Examples of Good (a) and Poor (b) Uniformity<sup>1</sup>**



<sup>1</sup> Florida Water Star. Distribution (application) uniformity. <https://floridawaterstar.com/technical-manual/irrigation-criteria/distribution/>.

**Figure 2. Example of Head-to-Head Coverage Spray Pattern<sup>2</sup>**



In addition to considering how evenly water is applied, it is equally important to consider the irrigation schedule, which dictates the amount and timing of the water applied. Landscape water needs change with the seasons, and so should the irrigation schedule. Many landscapes are irrigated at the same rate all year, which can lead to unnecessary water use. Overwatering can damage plants more than underwatering; it can also lead to runoff that can pollute waterways as it runs over streets, curbs, other pavement, and damage building foundations.

The right components and proper design, installation, operation, and maintenance of an irrigation system play a significant role in landscape water efficiency. To capitalize on the water savings potential from more water-efficient irrigation technologies, the EPA has published specifications for three irrigation products to earn the WaterSense label:

- *WaterSense Specification for Spray Sprinkler Bodies<sup>3</sup>*
- *WaterSense Specification for Weather-Based Irrigation Controllers<sup>4</sup>*
- *WaterSense Specification for Soil Moisture-Based Irrigation Controllers<sup>5</sup>*

<sup>2</sup> Florida Water Star. Sprinkler spacing. <https://floridawaterstar.com/technical-manual/irrigation-criteria/distribution/sprinkler-spacing/>.

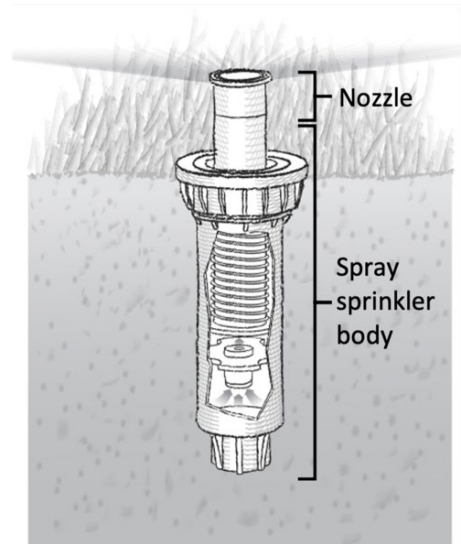
<sup>3</sup> U.S. Environmental Protection Agency's (EPA's) WaterSense program. Spray Sprinkler Bodies. [www.epa.gov/watersense/spray-sprinkler-bodies](http://www.epa.gov/watersense/spray-sprinkler-bodies).

<sup>4</sup> EPA's WaterSense program. Weather-Based Irrigation Controllers. [www.epa.gov/watersense/weather-based-irrigation-controllers](http://www.epa.gov/watersense/weather-based-irrigation-controllers).

<sup>5</sup> EPA's WaterSense program. Soil Moisture-Based Irrigation Controllers. [www.epa.gov/watersense/soil-moisture-based-irrigation-controllers](http://www.epa.gov/watersense/soil-moisture-based-irrigation-controllers).

The list below provides more information on irrigation technologies and how WaterSense labeled irrigation products can help reduce water use.

- WaterSense labeled spray sprinkler bodies** adjust the incoming water pressure to match the optimal pressure of the sprinkler nozzles (e.g., 30 pounds per square inch [psi] [207 kilopascals or kPa]). The spray sprinkler body is the exterior shell that connects the irrigation system piping and the spray nozzle that applies water on the landscape. In some cases, the irrigation system pressure is higher than recommended for the sprinkler nozzle, resulting in excessive flow rates, misting, fogging, and uneven coverage. WaterSense labeled spray sprinkler bodies regulate water pressure and reduce water waste by providing a constant flow at the sprinkler nozzle. They also generate the appropriate amount of water spray and coverage for more uniform distribution of water across the landscape. For incoming water pressure above 60 psi (414 kPa), pressure-regulating spray sprinkler bodies can reduce water use from spray sprinklers by more than 20 percent.<sup>6</sup>



*Cross-section of spray sprinkler body and nozzle*

*Image courtesy of Irrigation Association Smart Water Application Technologies*

- High-efficiency sprinkler nozzles** distribute water in multiple streams and trajectories, resulting in larger droplets that are less likely to be affected by wind. These features can increase the efficiency of the sprinkler distribution. Existing spray sprinklers can be retrofitted with high-efficiency nozzles, which can be screwed into the sprinkler body. Sprinkler nozzles should also have a matched precipitation rate, meaning that all nozzles in a particular zone apply the same amount of water across a given area per hour.<sup>7</sup> WaterSense is considering labeling high-efficiency sprinkler nozzles. For more information on the specification development process, refer to [www.epa.gov/watersense/spray-sprinkler-nozzles](http://www.epa.gov/watersense/spray-sprinkler-nozzles).
- WaterSense labeled irrigation controllers**<sup>8</sup> apply water only when needed based on weather data, soil moisture, or other onsite conditions. These controllers can be stand-alone controllers or add-on or plug-in devices that can be used in conjunction with an existing clock-based controller (i.e., an irrigation timer) to help

<sup>6</sup> EPA's WaterSense program. September 21, 2017. *WaterSense Specification for Spray Sprinkler Bodies Supporting Statement*. [www.epa.gov/sites/default/files/2017-09/documents/ws-products-support-statement-ssb.pdf](http://www.epa.gov/sites/default/files/2017-09/documents/ws-products-support-statement-ssb.pdf).

<sup>7</sup> Florida Water Star. Matched precipitation. <https://floridawaterstar.com/technical-manual/irrigation-criteria/distribution/matched-precipitation/>.

<sup>8</sup> EPA's WaterSense program. WaterSense Labeled Controllers. [www.epa.gov/watersense/watersense-labeled-controllers](http://www.epa.gov/watersense/watersense-labeled-controllers).

it water more efficiently. Some models are app-based, providing the added convenience of monitoring and controlling water use from mobile devices, whether onsite or from afar. Properly installed WaterSense labeled irrigation controllers can reduce irrigation water use by 15 to 30 percent. WaterSense currently has specifications for two types of irrigation controllers to earn the label:

- o **Weather-based irrigation controllers** can make irrigation schedule adjustments more convenient and water-efficient by using local weather data and landscape conditions to tailor the amount, frequency, and timing of landscape watering. To work effectively, these controllers must be installed and programmed properly, accounting for facility-specific landscape conditions and the irrigation system installed.<sup>9</sup>
- o **Soil moisture-based irrigation controllers** (commonly known as soil moisture sensors, or SMSs) effectively tailor irrigation schedules to meet landscape water needs based on direct measurements of moisture in the soil, which helps reduce water waste and promote plant health.<sup>10</sup> SMSs include a sensor mechanism that is inserted into the soil and an interface device that enables or disables an irrigation event at preset or selected soil water values.
- **Microirrigation** is a highly efficient method of application because it directs water to plant roots at a low flow rate, avoiding water lost to wind or



*Weather-based irrigation controller  
Photo courtesy of Rachio*



*Soil moisture sensor (inset: sensor in ground)  
Photos courtesy of Hunter Industries*



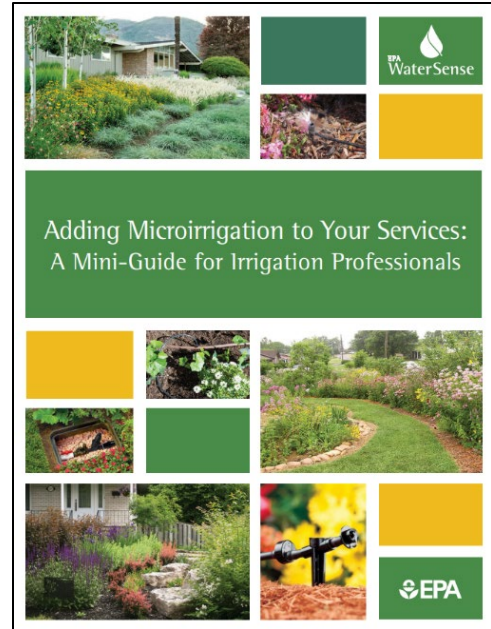
*Example of microirrigation: drip emitter  
Photo courtesy of Rain Bird Corporation*

<sup>9</sup> EPA's WaterSense program. May 2020. *Smart Watering With Weather-Based Irrigation Controllers*. [www.epa.gov/sites/default/files/2020-05/documents/ws-products-irrigation-outdoor-wbic-mini-report.pdf](http://www.epa.gov/sites/default/files/2020-05/documents/ws-products-irrigation-outdoor-wbic-mini-report.pdf).

<sup>10</sup> EPA's WaterSense program. March 2021. *Smart Watering With Soil Moisture-Based Irrigation Controllers*. [www.epa.gov/sites/default/files/2021-04/documents/ws-outdoor-products-sms\\_mini-report.pdf](http://www.epa.gov/sites/default/files/2021-04/documents/ws-outdoor-products-sms_mini-report.pdf).

runoff. Microirrigation delivers water directly to the root zone of the plant, where it is needed most. It disperses water slowly and over a longer period of time so the water infiltrates the soil, preventing runoff and reducing evaporation. Microirrigation is recommended for non-turf landscape areas (e.g., plant beds, trees). This technology uses between 20 to 50 percent less water than conventional spray sprinkler systems.<sup>11</sup>

WaterSense also labels programs that assess and certify irrigation professionals' competency in irrigation system design, installation and maintenance, and auditing;<sup>12</sup> and publishes guides focused on educating residents or property managers about specific aspects of outdoor water use, such as microirrigation.<sup>13</sup> The suite of product specifications, labeled professional certification programs, and technical guides is intended to address water use in irrigation systems as a whole.



To date, there are no federal standards for water efficiency in irrigation products. However, several states require that certain irrigation products meet WaterSense's criteria.<sup>14</sup> In addition, many water utilities offer rebates for WaterSense labeled or other efficient irrigation products to encourage customers to install them where appropriate. Use the WaterSense Rebate Finder at [www.epa.gov/watersense/rebate-finder](http://www.epa.gov/watersense/rebate-finder) to find current rebates for a particular location.

The key to saving irrigation water is to combine water-smart landscaping and efficient irrigation practices with efficient technologies. Below are some tips for improving irrigation system efficiency, including operation and maintenance, replacement, and retrofit options. Additional details on many of these principles, practices, and technologies can be found in the Irrigation Association's (IA's) guidance, *Landscape Irrigation: Best Management Practices*.<sup>15</sup>

<sup>11</sup> EPA's WaterSense program. May 2018. *Adding Microirrigation to Your Services: A Mini-Guide for Irrigation Professionals*. [www.epa.gov/watersense/microirrigation](http://www.epa.gov/watersense/microirrigation).

<sup>12</sup> EPA's WaterSense program. Irrigation with a Pro. [www.epa.gov/watersense/irrigation-pro](http://www.epa.gov/watersense/irrigation-pro).

<sup>13</sup> EPA's WaterSense Program. Additional Outdoor Resources. [www.epa.gov/watersense/additional-outdoor-resources](http://www.epa.gov/watersense/additional-outdoor-resources).

<sup>14</sup> Appliance Standards Awareness Project. State Standards. <https://appliance-standards.org/states>.

<sup>15</sup> Irrigation Association (IA). May 2014. *Landscape Irrigation: Best Management Practices*. [www.irrigation.org/IA/Advocacy/Standards-Best-Practices/Landscape-Irrigation-BMPs/IA/Advocacy/Landscape-Irrigation-BMPs.aspx](http://www.irrigation.org/IA/Advocacy/Standards-Best-Practices/Landscape-Irrigation-BMPs/IA/Advocacy/Landscape-Irrigation-BMPs.aspx).

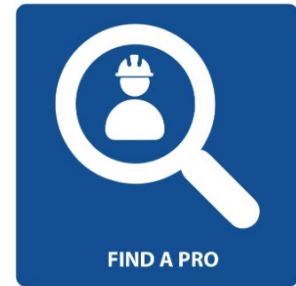
## Operation, Maintenance, and User Education

A facility can consider several best management practices to optimize an irrigation system's efficiency. These can include ensuring that irrigation professionals are properly educated on water-efficient practices and technologies and that existing irrigation systems are properly operated and maintained.

### Irrigation Professional Education

Consider the following to ensure that irrigation professionals have a strong understanding of the principles of water-efficient irrigation:

- Ensure that existing professionals or staff managing the irrigation system become familiar with water-efficient irrigation practices through partnerships, classes, seminars, and/or published guidance documents. Encourage professionals or staff managing the system to:
  - Become certified through a WaterSense labeled irrigation professional certification program with an emphasis on water efficiency.<sup>16</sup>
  - Consult the local water utility, community colleges, or agricultural services for courses or seminars on water-efficient irrigation practices.
  - Review technical guidance documents provided by local cooperative extension services and irrigation trade associations.
- When hiring new irrigation professionals to work with the system, inquire whether they have water efficiency certifications or specific training focused on efficient irrigation, and look for irrigation professionals certified by WaterSense labeled programs. Visit the WaterSense Find a Pro tool at [www.epa.gov/watersense/find-pro](http://www.epa.gov/watersense/find-pro) to find certified professionals in your area.



### Irrigation System Operation

In addition to periodically reviewing all irrigation service agreements to emphasize the operation of a water-efficient system, verify that the irrigation schedule is appropriate for climate, soil conditions, plant materials, grading, and the season as described below:

- Irrigation schedules should be updated based on changing weather conditions and as part of regular maintenance. Require the irrigation professional and/or auditor to deliver options for automating schedule changes based on changing weather

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<sup>16</sup> EPA's WaterSense program. Professional Certification. [www.epa.gov/watersense/professional-certification-0](http://www.epa.gov/watersense/professional-certification-0).



conditions. Installing and properly programming a WaterSense labeled controller can provide this capability.

- Certain soil types or steep slopes could increase the chance of surface runoff. Irrigation events may need to be separated into multiple applications depending on landscape conditions. This is commonly known as cycle and soak methodology. If existing irrigation controller(s) are not capable of such programming, consider installing more current technology.
- It is generally better to apply water in larger volumes less frequently. This deep watering approach encourages the growth of deep roots, resulting in healthy plants. Note that soil type plays a role in creating this type of schedule and should be taken into consideration.
- Incorporate a water budget, which can be used as a performance standard for water use. A budget provides a specified amount of water that should not be exceeded when watering the landscape and can be compared to the property's actual water use.

### Irrigation System Maintenance

Irrigation systems require regular maintenance to ensure optimum performance. Consider the following system maintenance tips:

- Install a dedicated water meter for the irrigation system to measure the amount of water applied to the landscape. Some water utilities offer an interruptible rate for the service or will not apply sewer charges to water used for irrigation. Have the irrigation professional or staff managing the system keep a record of trends in irrigation water use as part of the maintenance program.
- Train facility staff and landscape contractors to perform frequent site walks of the irrigation system. Staff should look for unexpected wet spots on sidewalks, in parking lots, and in landscaped areas and report instances to building management. These wet spots could be a sign of an underground irrigation line leak or improperly positioned or broken sprinkler heads. For more detailed guidance on finding leaks, refer to the *WaterSense Find It*,

#### The Importance of Metering

Since outdoor water use can make up a significant portion of a facility's total water use, it is important to install a dedicated water meter to measure irrigation water use. Reading the meter regularly can help facilities fully understand their outdoor water use trends, see the results of water efficiency efforts, and quickly identify leaks. For more information about using water meters to manage facility water use, refer to *WaterSense at Work Section 2.1: Metering and Submetering* at [www.epa.gov/watersense/best-management-practices](http://www.epa.gov/watersense/best-management-practices).

*Flag It, Fix It Checklist*<sup>17</sup> or *WaterSense at Work Section 2.2: Leak Detection and Repair* at [www.epa.gov/watersense/best-management-practices](http://www.epa.gov/watersense/best-management-practices).

- Require a full audit of the irrigation system every three years by a qualified irrigation auditor certified by a WaterSense labeled program if possible. The American National Standards Institute (ANSI)/American Society of Agricultural and Biological Engineers (ASABE) *Standard S626: Landscape Irrigation System Uniformity and Application Rate Testing* provides guidelines for conducting an irrigation audit.<sup>18</sup> A full audit should include an in-depth assessment of the irrigation system, its performance, and schedule. In addition, the audit should expose deficiencies that have occurred from either system and/or landscape changes. The audit is an opportunity to identify appropriate new technologies as well. Audits should evaluate the uniformity of water applied across the landscape. To help ensure uniformity, replacement equipment should be compatible with existing equipment and manufacturer.



*Improperly positioned irrigation sprinklers spraying onto pavement*



*Leaking irrigation valve*

- Verify that irrigation system pressure is within manufacturer specifications. Sprinkler nozzles typically operate optimally at a water pressure between 30 or 45 psi (207 or 310 kPa). Installing WaterSense labeled pressure-regulated spray sprinkler bodies or a pressure-regulating valve on the whole system can help sprinklers function more efficiently under high incoming pressures, which can commonly exceed 60 psi (414 kPa).
- Request that irrigation professionals or staff managing the system include immediate reporting and repair of problems in maintenance programs, and require regular maintenance routines as part of the overall irrigation maintenance program.

<sup>17</sup> EPA's WaterSense program. April 2020. *Find It, Flag It, Fix It: A Checklist for Your Landscape*. [www.epa.gov/sites/default/files/2020-04/documents/ws-outdoor-landscaping-find-it-flag-it-audit-checklist.pdf](http://www.epa.gov/sites/default/files/2020-04/documents/ws-outdoor-landscaping-find-it-flag-it-audit-checklist.pdf).

<sup>18</sup> American National Standards Institute (ANSI)/ American Society of Agricultural and Biological Engineers (ASABE). *ANSI/ASABE S626 Landscape Irrigation System Uniformity and Application Rate Testing*. <https://elibrary.asabe.org/abstract.asp?aid=47429>.

## Retrofit Options

If retrofitting an irrigation system, consider the following options to decrease landscape water use.

### Irrigation System Controllers and Sensors

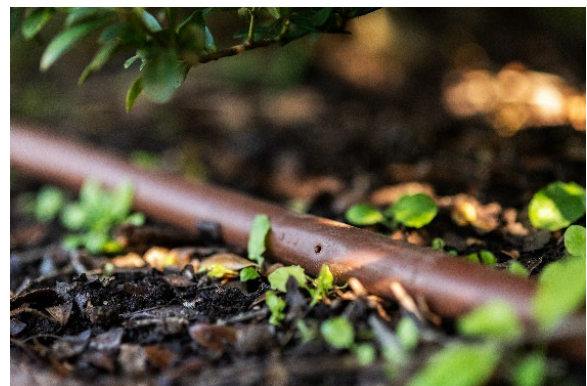
An existing irrigation system can be optimized with the following retrofits to the controls or components:

- Replace existing irrigation system controllers with WaterSense labeled irrigation controllers that water plants only when needed. There are many available models using weather or soil moisture information to schedule irrigation according to plant needs. WaterSense labeled weather-based and soil moisture-based irrigation controllers can be purchased as standalone controllers, or they can upgrade an existing clock-based controller as an add-on or plug-in device.
- If not installing soil moisture-based irrigation controllers, consider installing rain-sensing technology to prevent irrigation from taking place during periods of sufficient rainfall. Note that many cities and some states require rain-sensing technology by law. Check with the state or city on relevant mandates.
- Consider installing other sensors to cut down on wasted water. For example, wind-sensing technology interrupts irrigation cycles in the presence of significant wind. Freeze-sensing technology prevents irrigation during freeze conditions. Flow rate monitoring equipment can interrupt irrigation if excess flow is detected (e.g., caused by broken pipes, fittings, emitters, or sprinklers).
- If managing a large property, consider installing central control systems that use demand-based controls to enable a water manager to centrally operate and manage multiple irrigation systems at multiple locations with various means of communication.

### Irrigation System Hardware

In addition to retrofitting the control system to decrease water use, a facility can consider retrofitting irrigation system hardware as follows:

- Consider retrofitting a portion of the sprinklers that water trees, shrubs, or plant beds with microirrigation. Microirrigation is more appropriate than traditional spray sprinklers for many plant beds.



*Microirrigation in shrub beds*

- Consider exchanging existing sprinkler bodies with WaterSense labeled pressure-regulated spray sprinkler bodies.
- If sprinkler spacing will be changed, arrange sprinklers to provide head-to-head coverage.
- Replace traditional spray sprinkler nozzles with high-efficiency nozzles that have matched precipitation rates, meaning that all nozzles in a particular zone apply the same amount of water across a given area per hour.
- Retrofit other water-using devices on the property to use water more efficiently. For example, attach shut-off nozzles to handheld hoses to make sure water is going directly to the plants rather than dripping on the ground.

## Replacement Options

If replacing an irrigation system, there are as many opportunities to increase its efficiency during the phases of system design and installation as there are during system operation and maintenance. Hiring qualified irrigation professionals and ensuring a well-designed system are key to achieving water savings from an irrigation system replacement.

### Qualified Irrigation Professionals

Select an irrigation installation and maintenance professional who has been certified by a WaterSense labeled program or otherwise has experience in water efficiency. Use WaterSense's Find a Pro web page at [www.epa.gov/watersense/find-pro](http://www.epa.gov/watersense/find-pro) to find a qualified local irrigation professional. In addition, consider the following:

- Ensure onsite staff are trained in the maintenance and use of the new system.
- When a new irrigation system is installed, use a qualified irrigation auditor certified by a WaterSense labeled program<sup>19</sup> to ensure that the installed system's

#### Look for Irrigation Professionals Certified Through a WaterSense Labeled Program

When a facility chooses to hire irrigation professionals certified through a WaterSense labeled program, it ensures the irrigation professional is familiar with water-efficient irrigation practices, which can help reduce water use, save money, and maintain healthy landscapes by maximizing the efficiency of the irrigation system. A facility can find certified irrigation professionals to design, install, maintain, repair, and/or audit irrigation systems using WaterSense's Find a Pro tool at [www.epa.gov/watersense/find-pro](http://www.epa.gov/watersense/find-pro). A facility can encourage their existing irrigation professional to get certified through a WaterSense labeled program to improve their aptitude in water-efficient irrigation best practices by directing them to WaterSense's website at [www.epa.gov/watersense/professional-certification-0](http://www.epa.gov/watersense/professional-certification-0).



<sup>19</sup> EPA's WaterSense program. Find a Pro. [www.epa.gov/watersense/find-pro](http://www.epa.gov/watersense/find-pro).

performance meets the design intent. The auditor can make minor adjustment recommendations as needed.

### System Design Considerations

When replacing an irrigation system, recommend that the system be designed, installed, and maintained according to technical guidance published by local cooperative extensions or IA. Visit IA's website at [www.irrigation.org/IA/Resources/IA/Resources/Resources.aspx](http://www.irrigation.org/IA/Resources/IA/Resources/Resources.aspx) for further technical guidance and information related to the most widely known irrigation best practices. In addition, consider the following:

- Design the system for maximum water application uniformity. Request that the designer:
  - Ensure that water is not distributed to impermeable surfaces or non-target areas.
  - Maximize irrigation uniformity by following manufacturer recommendations for sprinkler spacing and design the system with head-to-head coverage.
- Create irrigation hydrozones by placing plants with similar water needs together. Also consider varying soil conditions, sun/shade/wind exposure, slope, and other site specifics that could impact watering needs.
- Consider installing the following components for optimal water efficiency:
  - Microirrigation for all areas suitable for such technology.
  - High-efficiency sprinkler nozzles and WaterSense labeled spray sprinkler bodies for turf and other areas that require spray irrigation.
  - Check valves in all sprinklers to retain water in lateral pipes between cycles.
  - WaterSense labeled irrigation controllers.
  - Rain, freeze, and wind sensors to interrupt irrigation during unfavorable weather conditions.
  - Flow rate monitoring equipment that can interrupt irrigation if excess flow is detected.
- Arrange for an irrigation system audit by a professional certified by a WaterSense labeled program after installation to ensure the design intent was met and any problems are repaired before the system goes into operation.



*Rain sensor*

*Photo courtesy of Hunter Industries*

- Use alternative sources of water (see *WaterSense at Work Section 8: Onsite Alternative Water Sources* at [www.epa.gov/watersense/best-management-practices](http://www.epa.gov/watersense/best-management-practices)) where environmentally appropriate and local regulations allow. Keep in mind that while alternative sources are an additional way to save water in a landscape, improving efficiency should be the first step in a water conservation project. Apply all relevant principles above to build the most efficient system possible, and then consider using alternative sources.

## Savings Potential

To evaluate both water and cost savings associated with irrigation system improvements, it is important to first understand how much water is applied to the landscape. Dedicated irrigation meters track irrigation water use and allow facilities to document actual savings. Use these meters to measure water usage before and after irrigation upgrades. See *WaterSense at Work Section 2.1: Metering and Submetering* at [www.epa.gov/watersense/best-management-practices](http://www.epa.gov/watersense/best-management-practices) for more information.

Savings from implementing any water-efficient technology depend on the operation of the system as a whole, including the landscape and climate. As a result, actual water savings are landscape-specific. Following are a few examples of anticipated savings, as well as some examples of projects that realized savings from implementing water-efficient technologies in the landscape. To view details of these projects and additional case studies on water-efficient irrigation in a commercial setting, visit the WaterSense Case Studies web page at [www.epa.gov/watersense/case-studies](http://www.epa.gov/watersense/case-studies).

- The Oklahoma City Utilities Department retrofitted the irrigation system for turfgrass in three roadway medians to include pressure-regulating spray sprinkler bodies that met WaterSense criteria and high-efficiency nozzles. The project also switched to using WaterSense labeled weather-based irrigation controllers. The project reduced water use in the medians by 67 percent.<sup>20</sup>
- The Resort at Pelican Hill in Newport Beach, California, installed WaterSense labeled weather-based irrigation controllers on its property as part of a suite of measures to increase water efficiency. The controllers accounted for most of the 18 percent water savings realized during the first year of the project.<sup>21</sup>

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<sup>20</sup> EPA's WaterSense program. "Oklahoma Makes Median Irrigation OK." [www.epa.gov/sites/default/files/2020-03/documents/ws-commercial-casestudy-oklahomacity-medians.pdf](http://www.epa.gov/sites/default/files/2020-03/documents/ws-commercial-casestudy-oklahomacity-medians.pdf).

<sup>21</sup> EPA's WaterSense program. "California Golf Resort Hits Hole in One With Outdoor Water Efficiency Efforts." [www.epa.gov/sites/default/files/2017-01/documents/ws-commercial-casestudy-pelican-hill.pdf](http://www.epa.gov/sites/default/files/2017-01/documents/ws-commercial-casestudy-pelican-hill.pdf).

- A field study of residential properties in Orange County, Florida, found that residents with a soil moisture-based irrigation controller used 30 percent less water for irrigation compared to residents with a regular clock-timed controller.<sup>22</sup>
- A field study of single-family homes in Palm Harbor, Florida, found that homes with a rain sensor used 14 percent less water than residences with a regular clock-timed controller.<sup>23</sup>

Finally, because behavior can also play a role in outdoor water use, it is important to make sure that staff who are responsible for landscaped areas understand the importance of ensuring that irrigation equipment is working properly. If irrigation controllers are not properly set or controls are overridden, the investments made to improve water efficiency may not result in water savings.

### Cost Savings

Multiple factors may influence cost savings associated with irrigation system improvements. Many of these factors depend on the billing policies of the local water utility.

Commercial buildings may be more likely to have utility-supplied water meters dedicated for irrigation. If so, the water utility may not issue sewer bills for water used for irrigation. The water rate (cost/unit of water) may also be different from the rate of the main potable water meters serving the facility. Similarly, if utility-supplied reclaimed water is used for irrigation, it may have a different rate than potable water. It is helpful to understand the water rate for irrigation water, as this may influence whether a project is cost-effective.

Rebates and other incentives can also impact the net cost savings of a water efficiency improvement project. Local water utilities may offer rebates to offset the cost of a particular irrigation technology or portions of the entire project.<sup>24</sup> “Pay for performance” rebates may also be available, in which rebate value is determined by the volume of water saved. These may be relevant for a larger project that addresses landscape transformation and multiple components of the irrigation system.

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<sup>22</sup> Water Research Foundation. *Smart Irrigation Controller Demonstration and Evaluation in Orange County, Florida*. [www.waterrf.org/research/projects/smart-irrigation-controller-demonstration-and-evaluation-orange-county-florida](http://www.waterrf.org/research/projects/smart-irrigation-controller-demonstration-and-evaluation-orange-county-florida).

<sup>23</sup> Haley, Melissa B., and Dukes, Michael D. December 2009. *Evaluation of Sensor Based Residential Irrigation Water Application on Homes in Florida*. Paper presented at International Irrigation Show in San Antonio, TX, December 2-4, 2009. [www.irrigation.org/IA/FileUploads/IA/Resources/TechnicalPapers/2009/EvaluationOfSensorBasedResidentialIrrigationWaterApplicationOnHomesInFlorida.pdf](http://www.irrigation.org/IA/FileUploads/IA/Resources/TechnicalPapers/2009/EvaluationOfSensorBasedResidentialIrrigationWaterApplicationOnHomesInFlorida.pdf).

<sup>24</sup> EPA’s WaterSense program. Rebate Finder. [www.epa.gov/watersense/rebate-finder](http://www.epa.gov/watersense/rebate-finder).

## Additional Resources

Alliance for Water Efficiency (AWE). Landscape, Irrigation, and Outdoor Water Use. [www.allianceforwaterefficiency.org/resources/outdoor](http://www.allianceforwaterefficiency.org/resources/outdoor).

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Austin Water, City of Austin Watershed Protection, Texas A&M Agrilife Extension. *Earth-Wise Guide to Irrigation*. [www.austintexas.gov/sites/default/files/files/Watershed/growgreen/factsheets/irrigation.pdf](http://www.austintexas.gov/sites/default/files/files/Watershed/growgreen/factsheets/irrigation.pdf).

City of Bend. *WaterWiseTips.org Irrigation Guide*. [www.bendoregon.gov/home/showpublisheddocument/32238/636596544544830000](http://www.bendoregon.gov/home/showpublisheddocument/32238/636596544544830000).

EPA's WaterSense program. Irrigation with a Pro. [www.epa.gov/watersense/irrigation-pro](http://www.epa.gov/watersense/irrigation-pro).

EPA's WaterSense program. Microirrigation. [www.epa.gov/watersense/microirrigation](http://www.epa.gov/watersense/microirrigation).

EPA's WaterSense program. Product Search. [www.epa.gov/watersense/product-search](http://www.epa.gov/watersense/product-search).

EPA's WaterSense program. Spray Sprinkler Bodies. [www.epa.gov/watersense/spray-sprinkler-bodies](http://www.epa.gov/watersense/spray-sprinkler-bodies).

EPA's WaterSense program. Spray Sprinkler Nozzles. [www.epa.gov/watersense/spray-sprinkler-nozzles](http://www.epa.gov/watersense/spray-sprinkler-nozzles).

EPA's WaterSense program. Watering Tips. [www.epa.gov/watersense/watering-tips](http://www.epa.gov/watersense/watering-tips).

EPA's WaterSense program. WaterSense Labeled Controllers. [www.epa.gov/watersense/watersense-labeled-controllers](http://www.epa.gov/watersense/watersense-labeled-controllers).

Florida Water Star. Irrigation system criteria. <https://floridawaterstar.com/technical-manual/irrigation-criteria/>.

Irrigation Association. May 2014. *Landscape Irrigation: Best Management Practices*. [www.irrigation.org/IA/Advocacy/Standards-Best-Practices/Landscape-Irrigation-BMPs/IA/Advocacy/Landscape-Irrigation-BMPs.aspx](http://www.irrigation.org/IA/Advocacy/Standards-Best-Practices/Landscape-Irrigation-BMPs/IA/Advocacy/Landscape-Irrigation-BMPs.aspx).



Irrigation Association. Resources.

[www.irrigation.org/IA/Resources/IA/Resources/Resources.aspx](http://www.irrigation.org/IA/Resources/IA/Resources/Resources.aspx).

Water Use It Wisely. Saving Water Outdoors. <https://wateruseitwisely.com/saving-water-outdoors/lawn-watering-guide/>.

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