Water Efficiency Management Guide for Landscaping and Irrigation

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EPA WaterSense

Water Efficiency Management Guide

Landscaping and Irrigation

EPA

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The U.S. Environmental Protection Agency (EPA) WaterSense® program encourages property managers and owners to regularly input their buildings' water use data in ENERGY STAR® Portfolio Manager®, an online tool for tracking energy and water consumption. Tracking water use is an important first step in managing and reducing property water use.

WaterSense has worked with ENERGY STAR to develop the EPA Water Score for multifamily housing. This 0-100 score, based on an entire property's water use relative to the average national water use of similar properties, will allow owners and managers to assess their properties' water performance and complements the ENERGY STAR score for multifamily housing energy use.

This series of Water Efficiency Management Guides was developed to help multifamily housing property owners and managers improve their water management, reduce property water use, and subsequently improve their EPA Water Score. However, many of the best practices in this guide can be used by facility managers for non-residential properties.

More information about the Water Score and additional Water Efficiency Management Guides are available at www.epa.gov/watersense/commercial-buildings.

Landscaping and Irrigation Table of Contents

Background

Residential outdoor water use in the United States accounts for more than 9 billion gallons of water used each day, mainly for landscape irrigation. It is estimated that as much as 50 percent of the residential outdoor water we use is wasted through evaporation, wind, or runoff, due in part to improper irrigation system design, installation, and maintenance. Irrigation systems can water too much or too often, and equipment can wear over time. Improved landscaping, sound maintenance practices, and efficient irrigation equipment can significantly reduce water use and costs from property landscapes.

Typically, landscape watering is meant to supplement natural precipitation based on the plants' water needs. In some areas of the country, such as the arid Southwest, this gap in water needs and precipitation can be significant during certain times of the year. Not surprisingly, in larger properties with larger areas of maintained and irrigated landscape, as much as 30 percent of the water bill goes to maintain the landscape. In many instances, outdoor water use can be controlled and minimized with proper landscape design. Regionally appropriate plant choices, healthy soils with appropriate grading, use of mulches, and limiting the use of high water-using plants can significantly reduce the need for supplemental irrigation. In addition, proper design, installation, and maintenance of the irrigation system can reduce outdoor water use.

A variety of irrigation technologies can help reduce water use, from drip irrigation to WaterSense labeled controllers or components. This guide covers how to better assess and improve water used for irrigating landscapes and reduce operating costs, all while enhancing plant health and curb appeal.

Understanding Outdoor Water Use

In order to optimize water savings on multifamily properties, it is important to first understand how much water is being applied to the landscape. Outdoor water use is determined by: landscape size; plant palette; local climate; irrigation efficiency (a result of system design, equipment, and installation); and human behavior (e.g., desire for aesthetics, irrigation scheduling, system maintenance).

Dedicated irrigation meters can track irrigation water use and allow property managers to document actual savings. WaterSense strongly recommends installing and monitoring a dedicated meter or submeter for your irrigation system, as this is by far the most effective way of determining outdoor water use.

Several other (but less accurate) methods can be used to estimate irrigation water use if a submeter is not an option for your property. However, it is important to remember that these calculation methodologies only provide estimates of irrigation water use and can vary greatly from the amount of water your property actually uses. These estimates should only be used to examine possible savings of recommended practices or products. An irrigation system is just that—a system where all of the components must be optimized in tandem in order to realize maximum water savings.

Seasonal Comparison

By comparing the amount of water used during actual irrigation seasons to other times of the year, you can determine the amount of water used for irrigation throughout the year. For example, if irrigation only occurs from April through September, monthly water use is likely to be both higher and more variable in those months and lower/more constant from October through March. The difference between those two periods should be approximately equal to your property's total annual irrigation water use.

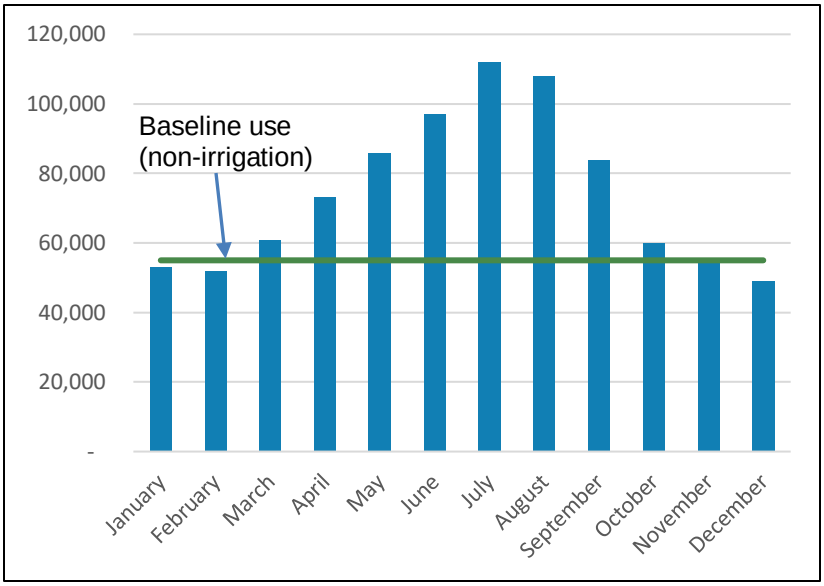
Note, however, that if other sources use water seasonally (e.g., cooling tower make-up water in the summer), this method may be less effective, as distinguishing between seasonal uses is impossible using billed water use information alone.

Example:

Table 1 represents water usage data for a multifamily property, pulled from monthly water utility bills. This information is illustrated in Figure 1 to the right of Table 1.

Table 1 and Figure 1. Example Monthly Property Water Use

Month	Water Use (gallons)
January	53,000
February	52,000
March	61,000
April	73,000
May	86,000
June	97,000
July	112,000
August	108,000
September	75,000
October	60,000
November	55,000
December	49,000
Total	890,000



In this example, a property's landscape is irrigated April through September. To determine the landscape's baseline (non-seasonal) water use, average the monthly water use from the non-irrigation months (October through March), which results in an estimated monthly baseline water use rate of 55,000 gallons per month. Therefore, estimated annual water use without irrigation is equal to:

55,000 gallons per month x 12 months = 660,000 gallons per year

To estimate irrigation water use, subtract this estimated annual baseline water use from the metered total presented in Table 1.

890,000 gallons/year – 660,000 gallons/year = 230,000 gallons used for irrigation per year

If other seasonal water uses (e.g., cooling tower make-up) are separately submetered, you can subtract the submetered water use from the total seasonal water use estimated using

this method. In this example, if the cooling tower operates during a similar season (April through September) and the make-up line submeter indicates 150,000 gallons used for the year, subtract that amount from the 230,000 gallons of seasonal water use.

230,000 gallons – 150,000 gallons = 80,000 gallons use for irrigation per year

This same methodology can be used regardless of your irrigation season. Simply average the monthly water use across the number of months that you know your property is not irrigating, then follow the same steps to estimate your seasonal water usage.

WaterSense Water Budget Tool

The WaterSense Water Budget Tool, available both online and as a Microsoft Excel spreadsheet on the WaterSense website,[1] guides a property manager, landscape professional, or irrigation professional through the needed calculations to establish a landscape water budget. This water budget approach not only serves as a design tool, allowing the user to design a sustainable landscape based on a regionally appropriate amount of water, but also to alter the irrigation type in a virtual setting and analyze the relative water savings associated with each design change. While the tool is effective at indicating the relative efficiency of one set of choices over another, it is not intended to estimate actual savings. The budget accounts for plant type, plant water needs, irrigation system design, and applied water that the landscape receives either by irrigation or by precipitation.

The WaterSense Water Budget Tool guides the user through the water budget calculation in three parts. First, the tool calculates a baseline amount of water for a landscape and subsequently an amount of water the designed landscape is allotted in order to be considered water-efficient. Next, the tool calculates how much water the designed landscape requires based on climate, plant type, and irrigation system design. Lastly, it compares the landscape water requirements to the budgeted amount of water to provide the user with information on the degree of efficiency of the landscape and irrigation design.

It is important to remember that water budgets must be associated with a specified amount of time, such as a week, month, or year. The WaterSense Water Budget Tool provides the user with peak month usage (the one month each year when the landscape needs more supplemental water than any other based on historic data), so scaling up to annual use should be considered when calculating annual savings.

System Input Methodology

If you do not have a dedicated irrigation meter or submeter, or the seasonal comparison method or WaterSense Water Budget Tool is not a viable option for estimating your irrigation water use, it is possible to estimate water use based on the number and type of emission devices (e.g., sprinklers or drip emitters), their associated characteristics (e.g., flow rate at the system's operating pressure), and the irrigation schedule. However, due to the complexity of these calculations, it is recommended that you work with a certified irrigation professional to collect this information and establish a water use estimate. This exercise can also be part of an irrigation audit.

[1] www.epa.gov/watersense/water-budget-tool

Landscaping

Outdoor water efficiency starts with the landscape itself. The soil, slopes, plantings, and placement of foliage can make the difference between a water-smart landscape and irrigation inefficiency. This section includes tips on how to design and maintain your landscaping to use less water.

Site Preparation

How the site is prepared has a significant impact on the ability of the landscape to retain moisture and limit the need for supplemental irrigation. Whether designing a new landscape or replacing an existing one, following are some ways to prepare the site for water efficiency:

- Limit the removal of native vegetation and soils, because once established, they will require little water beyond normal rainfall.
- Minimize soil compaction in the construction phase by limiting areas where heavy equipment is used.
- Install temporary protective fencing around trees to protect their root zones.
- Reduce the potential for runoff from steep slopes in the landscape by either grading appropriately or terracing. If slopes cannot be avoided in landscape design, install plants with deeper root zones to provide stabilization and prevent erosion.
- Before the landscape is installed, ensure that the soil is properly amended, tilled, and contoured to hold water. Where turfgrass is used, the area should include at least six inches of well-amended soil capable of easily absorbing and holding water in the root zone.

Plant Selection

Plant selection can make all the difference in a water-efficient landscape. Converting to a water-smart landscape through careful plant selection and design can reduce outdoor water use by 20 to 50 percent. When redesigning a landscape:

- Evaluate site conditions and plant species that work best in a particular space. Areas of the same site may vary significantly in soil type or exposure to sun and wind, as well as evaporation rates and moisture levels.
- Be mindful of a site's exposure to the elements and choose plants that will thrive in local climate conditions. Select drought-tolerant or climate-appropriate turfgrass, trees, shrubs, and ground cover when replanting landscaped areas.
- Incorporate shade trees into your landscape or plant near large shade trees. Shaded areas typically require less supplemental water than areas exposed to direct sun. Additionally, trees and other vegetation placed strategically to shade the south-facing wall of a building can eventually help to reduce energy costs.
- Practice hydrozoning, or grouping plants with similar irrigation needs together. Consider how the interplay between the types of plants and irrigation components can affect the

volume of water needed to sustain the landscape. For example, turf areas and shrub areas should always be separated into different irrigation zones to accommodate their differing water needs.

- Consider reducing the area covered by turfgrass in the landscape, as most turf generally requires more water than planted beds, especially if the plants are climate-appropriate and their surrounding soil is covered with mulch. Use turfgrass where it serves a practical purpose (e.g., play space for children and pets) and consider other plantings for areas that receive little to no foot traffic or use.
- Avoid installing "strip grass" (e.g., small strips of grass between the sidewalk and street), because these areas are hard to maintain and difficult to water efficiently.

Avoided strip grass.

- When designing or revamping a property's landscape, consider installing rain gardens, bioretention areas, bioswales, or other green infrastructure throughout the landscape. These features should include locally adapted or appropriate plantings designed to capture rainwater runoff from roofs, driveways, and sidewalks. These features can keep water on the property and absorb up to 40 percent more runoff than typical lawns. Rain barrels and cisterns that capture rainwater can also serve as a supplemental irrigation water source. Furthermore, green infrastructure can help your property comply with local regulations and offset stormwater treatment costs.[2]

Other Landscape Features

While water features are common in many landscapes, consider the annual water use of the specific feature before installing one. Ideally, these features should provide a beneficial use, such as a wildlife habitat, stormwater management, and/or noise reduction. Because some water from these features is lost to evaporation, use alternative water sources or look for a feature that recirculates water in order to reduce the amount of potable water used. Smaller pumps, lower pumping rates, and/or pressure-reducing valves can help reduce water flow. Install and maintain a water recirculation system to minimize the water used by water features, and set the recirculation system on a timer to turn off at night.

[2] EPA. Green Infrastructure. www.epa.gov/green-infrastructure

Landscaping Maintenance Best Management Practices

Maintaining the landscape appropriately is just as important as good design when it comes to water efficiency. Table 2 outlines best management practices that can guide a property manager in water-efficient landscaping maintenance.

Table 2. Landscape Maintenance Tips for Water-Efficient Landscaping

Item	Tip	Why
Soil	Cover bare soil in plant beds with mulch, and re-mulch areas annually.	Mulch helps soil retain its nutrients and traps in moisture while supporting plant growth and preventing erosion.
Soil	Maintain plenty of good topsoil (about 4 to 6 inches) in landscaped areas.	Topsoil helps capture precipitation as it falls and releases water back to plants over time, reducing water needs.
Soil	Incorporate soil amendments, such as lime, compost, and shredded bark, into water-logged or fast-draining soils. Landscapes with clay soils or sandy soils should incorporate topsoil or compost.	Proper soil water holding capacity prevents soil from draining too quickly. Adding compost or similar soil amendments can reduce irrigation water use by 20 percent annually.
Soil	Aerate areas with heavy foot traffic or where landscaping equipment is used regularly.	Aeration alleviates compaction and improves water infiltration rates. It can also improve soil's ability to hold water.
Plants	Keep the irrigated landscape free of weeds, and consider pulling manually instead of using herbicides.	Weeds consume water that could be used by your plants. Using herbicide to kill weeds can contaminate local water sources.
Plants	Raise the blade on mowers to allow grass to grow longer. Mow only when it reaches two to three inches in height, and remove just one inch.	Longer turfgrass promotes deeper root growth and more drought-resistant turf.
Plants	Know your plants' water needs and avoid watering during the heat of the day.	Watering during cooler times of the day, such as early morning or evening, prevents water loss from evaporation and protects plants from excessive heat.
Water features	Check water feature recirculation systems annually for leaks and other damage, and repair immediately.	Just like with other water-using equipment, water features that leak can waste significant amounts of water.
Green infrastructure	Clean and maintain green infrastructure features (e.g., rain gardens, bioretention area, permeable pavers) as recommended by the designer or state and local regulations. If at any point you see standing water in a green infrastructure feature, contact the design professional or your maintenance provider to determine how to regain its functionality.	Sediment can build up in bioretention areas, in permeable pavers, or at curb cuts, preventing water from flowing as intended and filtering into the soil. Good maintenance can prevent erosion and ensure vegetation continues to thrive and soil retains filtration characteristics.
Landscape Professionals	Use landscape professionals trained and certified in water-efficient or climate-appropriate landscaping. Existing staff who tend landscapes can attend courses or seminars to learn water-efficient techniques. Periodically review all landscape service and maintenance agreements to incorporate water, chemical, and energy efficiency requirements or performance standards.	Hiring qualified landscape professionals who specify plants that are low maintenance and do not require supplementation irrigation will cut down on costs in the long run. Many landscape professionals not only install and maintain plants in your landscape, but also install and maintain the irrigation system.

Irrigation

Although it is possible in many parts of the country to design a landscape that can live on rainfall alone, some irrigation may be needed to ensure landscape health and maintain an aesthetic property. The key to reducing irrigation water use is to combine efficient irrigation practices with efficient technologies.

If installing a new or replacing an existing irrigation system, there are many opportunities to increase its efficiency. Consider installing a separate meter to measure the volume of water applied to the landscape, which can reduce wastewater costs in some jurisdictions and help to identify leaks more quickly. Alternative water sources, such as collected rainwater, condensate from air conditioners, or boiler blowdown, can be used as a substitute for potable water sources for irrigation.

When installing irrigation equipment, whether new or for replacement, consider installing WaterSense labeled products, such as irrigation controllers and spray sprinkler bodies, which are independently certified to meet EPA's efficiency and performance criteria. These products can increase water efficiency, provide water cost savings, improve tenant satisfaction, and help reduce maintenance costs.

You can identify WaterSense labeled irrigation products by using the WaterSense Product Search Tool and by looking for the WaterSense label on product packaging or websites. Be sure to check with your local water utility or use the WaterSense Rebate Finder to see if there are any rebates available in your area.

Irrigation System Controllers and Sensors

An existing irrigation system can be optimized through retrofits to the control mechanism or other components. Consider replacing existing clock-timer controllers with more advanced control systems that water plants only when needed.

- WaterSense labeled irrigation controllers use local weather and landscape conditions to determine when and how much to water. In order to work effectively, these irrigation controllers must be installed and programmed properly, so consider having your controller installed by an irrigation professional who has been certified through a WaterSense labeled program (see box on page 8).

WaterSense labeled irrigation controller

- Soil moisture-based control technologies can be inserted into the soil to measure moisture, regulating irrigation so that it only occurs when soil moisture falls below a set threshold. These sensors can be connected to an existing controller or be installed in a new system to enable irrigation as needed by plants. Studies suggest that soil moisture-based control technologies can result in water savings of at least 20 percent.[3]

[3] EPA's WaterSense program. Soil Moisture-Based Control Technologies. www.epa.gov/watersense/soil-moisture-based-control-technologies

- Alternatively, consider installing rain-sensing technology to prevent irrigation from taking place during periods of sufficient rainfall. If a system irrigates a half an acre of landscape at ½ inch of water per cycle, a single instance of a rain sensor preventing an irrigation event can save nearly 6,800 gallons.
- If managing a large property, consider installing complete 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.

Work With a Certified Irrigation Pro

Whether designing a new irrigation system, installing retrofits, or contracting for a system audit to look for water-saving improvements, look for an irrigation professional who has been certified by a program that has earned the WaterSense label. These professionals have demonstrated their knowledge of water-efficient techniques and technologies in irrigation system design, auditing, or installation and maintenance. Visit www.epa.gov/watersense/find-pro to find a certified professional near you.
Photo credit: Brightview

Irrigation System Components

Individual irrigation system components also offer water savings opportunities:

- Consider retrofitting a portion of the spray bodies that water trees, shrubs, or plant beds with micro-irrigation or drip irrigation. Many plant beds do not require the spray heads traditionally used to water turf areas, and drip irrigation directs water to plant roots at a low flow rate, avoiding water lost to wind or runoff. This technology uses 20 to 50 percent less water than conventional in-ground or pop-up sprinkler systems.
- Landscape irrigation sprinklers are often installed at sites where the system pressure is higher than what is recommended for the sprinkler nozzle, thus resulting in system inefficiencies, including excessive flow rates, misting, fogging, and uneven coverage. In fact, approximately 63 percent of irrigation systems operate at pressures higher than the recommended operating pressure of sprinkler nozzles, which is around 30 pounds per square inch (psi) for most products. However, sprinkler bodies with integral pressure regulation can provide a constant flow at the sprinkler nozzle to help reduce water waste and provide more uniform distribution of water across the landscape. WaterSense labeled spray sprinkler bodies can reduce irrigation water use by 20 percent or more when irrigation system pressure exceeds 60 psi.[4]

The image at left shows a spray sprinkler with a body that is non-pressure-compensating, resulting in water wasted from misting and overwatering. The image at right shows a pressure-regulating spray sprinkler body that regulates the water pressure to the sprinkler nozzle's optimal pressure.

[4] EPA's WaterSense program. *WaterSense Specification for Spray Sprinkler Bodies Supporting Statement.* September 21. 2017.

- Pay attention to spacing between sprinklers during replacement to ensure the sprinklers have a matched precipitation rate, have matched trajectories, and offer head-to-head coverage.
- Consider installing sprinkler bodies with check valves, as this mechanism allows sprinklers to retain water in lateral pipes between cycles (rather than draining the water after the irrigation event), reducing the amount of water needed in the next irrigation cycle.
- 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.

Irrigation Maintenance Best Management Practices

Performing periodic inspections of your irrigation system will help keep equipment working and catch water waste before it impacts your water bill. Aim to conduct inspections at least annually, especially at the start of the irrigation season. In addition, consider having an irrigation professional certified by a WaterSense labeled program conduct an irrigation system audit at least every three years to make sure your system continues to operate efficiently.

Table 3 outlines best management practices that can guide a property manager in making more water-efficient landscaping choices.

Table 3. Irrigation Maintenance Tips for Water-Efficient Landscaping

Item	Tip	Why
Irrigation System Operation	Have a certified irrigation professional such as an auditor provide options for automating schedule changes based on changing weather conditions. Verify that the irrigation schedule is appropriate for climate, soil conditions, plant materials, grading, weather, and season. Update schedules based on changing weather and as part of regular maintenance. Installing and properly programming a WaterSense labeled irrigation controller or a soil moisture-based control technology can also provide this benefit.	Many landscapes are watered at the same level all year, but landscape water needs change with the seasons, and so should the irrigation schedule. Overwatering can damage plants more than underwatering and can also damage building foundations. A weather- or soil moisture-based controller waters plants only when and how much they need it.
Irrigation System Operation	Irrigation may need to be separated into multiple applications depending on landscape conditions, also known as a “cycle and soak” methodology. If your current irrigation controller(s) are not capable of “cycle and soak methodology,” consider upgrading to more current technology.	Certain soil types or steep slopes increase the chance of surface runoff.
Irrigation System Operation	Incorporate an outdoor water budget using the WaterSense Water Budget Tool to a new or existing landscape.	By identifying an allowable amount of water to be applied, a water budget can reduce water use on your landscape.
Maintain the Irrigation System	Verify that irrigation system pressure is within manufacturer specifications for sprinkler nozzles and adjust accordingly.	Sprinklers that operate at their optimal pressure reduce misting, fogging, and uneven coverage.

Table 3. Irrigation Maintenance Tips for Water-Efficient Landscaping

Item	Tip	Why
Maintain the Irrigation System	Ask the irrigation professional or staff managing the system to ensure sprinkler heads are placed and adjusted to water the lawn or garden only—not the street or sidewalk.	Periodically monitoring irrigation system for effectiveness throughout the year reduces water waste and runoff.
Maintain the Irrigation System	To help ensure consistent uniformity, require replacement equipment (e.g., sprinkler nozzles) be compatible with existing equipment and made by the same manufacturer.	Ensuring consistency across equipment results in a more efficient system.
Maintain the Irrigation System	Require a full audit of the irrigation system every three years by a qualified irrigation auditor, such as a professional certified by a WaterSense labeled program.	An in-depth assessment of the irrigation system, its performance, and schedule will expose deficiencies that can occur from either system and/or landscape changes and identify more efficient technologies.
Maintain the Irrigation System	Request that staff managing the system immediately report and repair leaks and other problems in the system.	A leak about as small as the tip of a ballpoint pen (or 1/32nd of an inch) can waste about 6,300 gallons of water per month. A drip irrigation system either with a programming malfunction or leaking at 1.0 gallons per minute can lose up to 43,200 gallons per month.
Maintain the Irrigation System	Install a dedicated meter for the irrigation system to measure the amount of water applied to your landscape. Require regular maintenance and request that staff managing the system record trends in irrigation water use as part of the maintenance program.	Obtaining records of outdoor water use trends can help identify opportunities for additional water and cost savings or common places or activities that contribute to water waste. Some water utilities offer an interruptible rate for the service or will not apply sewer charges to water used for irrigation.

Water Savings

How much water your property can save outdoors depends on where you are, what you plant, and how well your irrigation system is designed and maintained. But various studies have reported savings ranging from 18 to 50 percent from converting landscape plants with high water requirements to those with lower water requirements. A more water-efficient landscape can also provide ancillary benefits and cost savings by reducing the need for maintenance, fertilizer application, and fuel use.

An irrigation system's water use is the primary input to determine your landscape's potential water savings. As discussed previously in the Understanding Outdoor Water Use section, there are several approaches to estimate your landscape's annual irrigation water use. To estimate water savings resulting from replacing or retrofitting irrigation systems with more water-efficient components, insert your property's estimated annual irrigation water use into the equations presented on page 11.

Irrigation Controllers

EPA estimates that replacing a standard clock timer with a WaterSense labeled controller can reduce irrigation water use by 15 percent.[5] To estimate water savings from installing a WaterSense labeled controller in your system, use Equation 1.

Equation 1. Water Savings From Irrigation Controller Replacement (gallons per year)

☐	X	15%	=	☐
Annual Irrigation Water Use in Gallons		Percent Savings		Gallons Saved per Year

Spray Sprinkler Bodies

Replacing sprinkler bodies in an irrigation system operating at or above 60 psi with WaterSense labeled spray sprinkler bodies can save a property more than 20 percent of irrigation water use. Even irrigation systems operating at lower pressures can achieve some water savings by replacing existing spray sprinkler bodies without pressure regulation with WaterSense labeled models.

To estimate water savings from replacing spray sprinkler bodies, use Equation 2.

Equation 2. Water Savings From Spray Sprinkler Body Replacement (gallons per year)

☐	X	☐	=	☐
Annual Irrigation Water Use in Gallons		Percent Savings by System Pressure		Gallons Saved per Year

Based on your irrigation system's operating pressure, use Table 4 on page 12 to determine the percent savings associated with replacing existing spray sprinklers with or installing new WaterSense labeled spray sprinkler bodies.[6] If you do not know your system pressure, work with your irrigation professional to take this measurement at the sprinkler heads closest to and furthest away from the irrigation valve.

[5] EPA's WaterSense program. *WaterSense Specification for Weather-Based Irrigation Controllers Supporting Statement.* Version 1.0. November 3, 2011.
[6] EPA's WaterSense program. *WaterSense Specification for Spray Sprinkler Bodies Supporting Statement.* Version 1.0. September 21, 2017.

Table 4. System Pressure and Expected Associated Water Savings

System Pressure (Psi)	Percent Expected Water Savings
≤30	0
31 to 39	5
40 to 59	16
60 to 69	23
≥70	24

Additional Resources

Alliance for Water Efficiency. Resource Library. Landscape, Irrigation, and Outdoor Water Use.
www.allianceforwaterefficiency.org/Landscape_and_Irrigation_Library_Content_Listing.aspx

Department of Energy (DOE) Office of Energy Efficiency and Renewable Energy (EERE) Federal Energy Management Program (FEMP). Best Management Practice #4: Water-Efficient Landscaping.
https://energy.gov/eere/femp/best-management-practice-4-water-efficient-landscaping

DOE EERE FEMP. Best Management Practice #5: Water-Efficient Irrigation.
https://energy.gov/eere/femp/best-management-practice-5-water-efficient-irrigation

EPA. Green Infrastructure Web Page.
www.epa.gov/green-infrastructure

EPA's WaterSense Program Resources:

Irrigation Controllers
www.epa.gov/watersense/irrigation-controllers

Irrigation With a Pro
www.epa.gov/watersense/irrigation-pro

Outdoors
www.epa.gov/watersense/outdoors

Soil Moisture-Based Control Technologies
www.epa.gov/watersense/soil-moisture-based-control-technologies

Spray Sprinkler Bodies
www.epa.gov/watersense/spray-sprinkler-bodies

The WaterSense Water Budget Tool
www.epa.gov/watersense/water-budget-tool

WaterSense at Work. Best Management Practices for Commercial and Institutional Facilities. October 2012.
www.epa.gov/watersense/best-management-practices

Irrigation Association (IA). *Landscape Irrigation Best Management Practices*. May 2014.
www.irrigation.org/IA/Advocacy/Standards-Best-Practices/Landscape-Irrigation-BMPs/IA/Advocacy/Landscape-Irrigation-BMPs.aspx?hkey=93b546ad-c87a-41b8-bf70-8c4fd2cff931

The Sustainable Sites Initiative (SITES®).
www.sustainablesites.org/

Appendix A:Summary of Water Efficiency Measures and Savings

This appendix can be used to summarize water efficiency measures, upgrades, and projects that are identified at your property, based on a water assessment and/or review of this Water Efficiency Management Guide.

Summary of Water Efficiency Measures and Savings

Item Number	Location	Measure or Project Name and Description	Projected Annual Water Savings (gallons)	Projected Annual Water, Wastewater, and Energy Cost Savings ($)	Total Measure or Project Cost ($)	Simple Project Payback (years)
Example	*Landscape irrigation system for all zones*	*Replace existing clock timer irrigation controller with a WaterSense labeled irrigation controller. New controller costs $200 and a certified irrigation professional will install and program it for $400.*	*210,000 gallons*	*Water Cost Savings: $1,020*	*$600 (purchase and installation)*	*0.6 years*
1						
2						
3						
4						
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11						
12						