WATERWISETIPS.org
IRRIGATION GUIDE

CITY OF BEND

Your Guide to Efficient Landscape Irrigation in Bend

IRRIGATION

INTRODUCTION

Bend is a beautiful High Desert community lucky to have access to some of the cleanest, best tasting water in the world. Perhaps this is one of the many reasons behind Bend's incredible growth in recent decades. Regardless of the reason, management of our water resources now and into the future will be key to our community's continued prosperity.

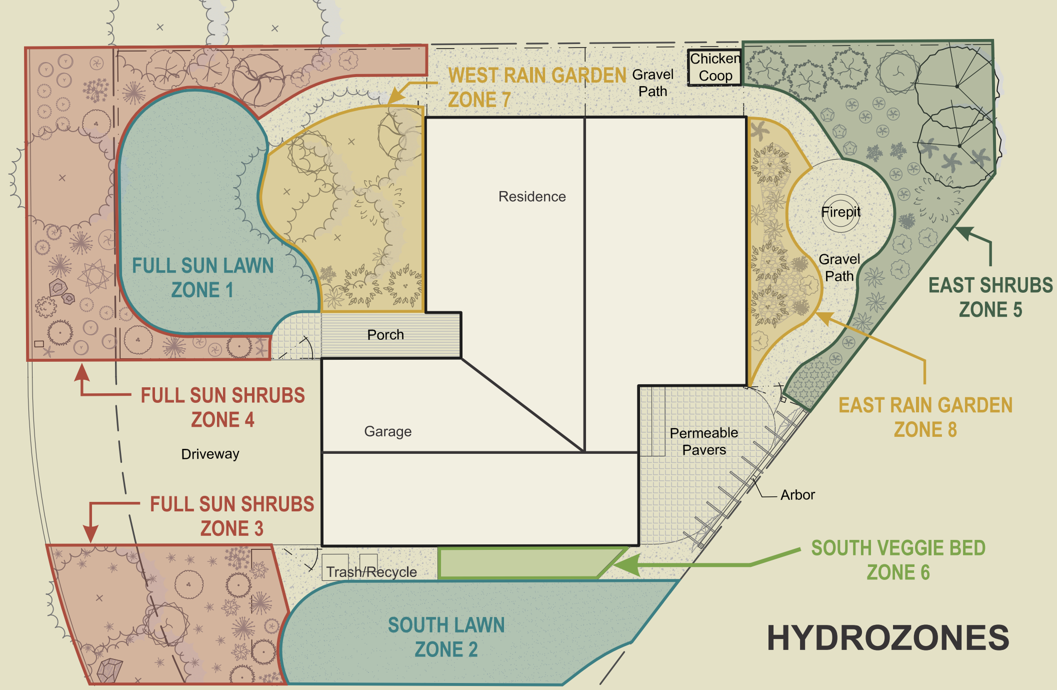
A large portion of our water is used to irrigate our urban landscapes. In fact, as much as 60 percent of a single family home's annual water use is for purposes of irrigation. Multiply that by the number of current residents now and into the future and it is easy to see why managing our irrigation water use is so important.

This WaterWise Irrigation Guide was created to help Bend utility customers and contractors better understand and operate their irrigation systems for maximum efficiency. There is a lot to know: basic system design, the difference between sprinkler types, how to program an irrigation controller, and how plant choice figures in only scratch the surface. However, taking a few moments to read through the following sections will give you a general understanding of what is buried below the ground and what you can do to save water and help us stretch supplies further into the future.

Table of Contents

SYSTEM DESIGN

Backflow Prevention Device



HYDROZONES

A well planned and thoughtful irrigation design is the foundation of an efficient landscape irrigation system. Whether it is a professional irrigation design or something slightly less detailed, efficient irrigation systems always start with a plan. Unfortunately, many irrigation systems (and the issues with them) get passed from homeowner to homeowner and rarely come with an actual plan. In these cases it is helpful to sketch up an as-built "plan" noting the location of key items such as the water meter, backflow prevention assembly, irrigation valves, and sprinklers.

For City of Bend water customers, the water meter is the point of connection to the city's potable water distribution system. This water meter is generally ¾" in pipe size and can safely deliver a **flow rate** of 20 to 30 gallons per minute (GPM) of flow to the average residence. The service **pressure** at the meter can range from 20 to 80 pounds per square inch (PSI). Irrigation systems are generally connected to the customer's water service line running between the water meter and where the line enters the residence.

A **double check backflow** prevention assembly generally marks the beginning of the irrigation system. It is required to be tested for operation annually and designed to prevent herbicides, fertilizers and other contaminants from entering the indoor plumbing. Backflow prevention assemblies are generally made of brass and located inside an underground box in between the meter and first set of irrigation valves. It is a good idea to know where it is located in case the irrigation system needs to be shut down for a repair or winterized.

Just down from the double check backflow prevention assembly are the irrigation control valves. These valves control the flow of water to sprinklers in different areas called **hydrozones**. Hydrozones are groups of plants with similar water requirements. For example, lawns and desert adapted shrub beds have differing water requirements and should be considered different hydrozones. They should be irrigated on separate irrigation zones.

Hydrozones – Groups of plants with similar water requirements planted together to allow them to be watered on the same schedule. This allows the correct amount of water to be applied to individual plants, leading to healthier plants and less water waste.

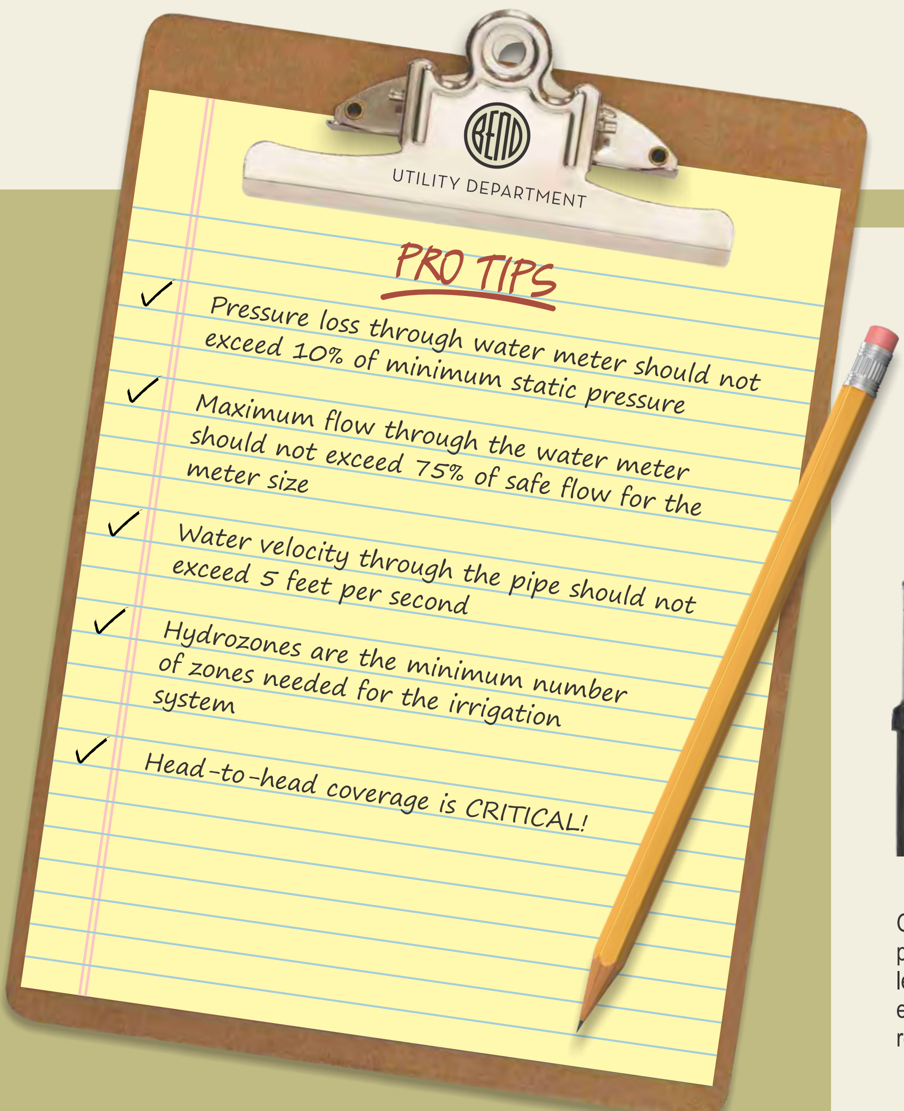
Flow Rate – The amount of water available through a pipe measured in gallons per minute (GPM). Sprinklers use different amounts of water at different pressures, flow determines how many sprinklers can fit on a single zone. It cannot exceed the maximum 20-30 GPM available at the water meter.

Pressure – The strength of water flow measured in pounds per square inch (PSI). Different sprinkler nozzles and emitters operate differently at different pressures. Too much pressure can lead to misting. Too little pressure can lead to poor coverage.

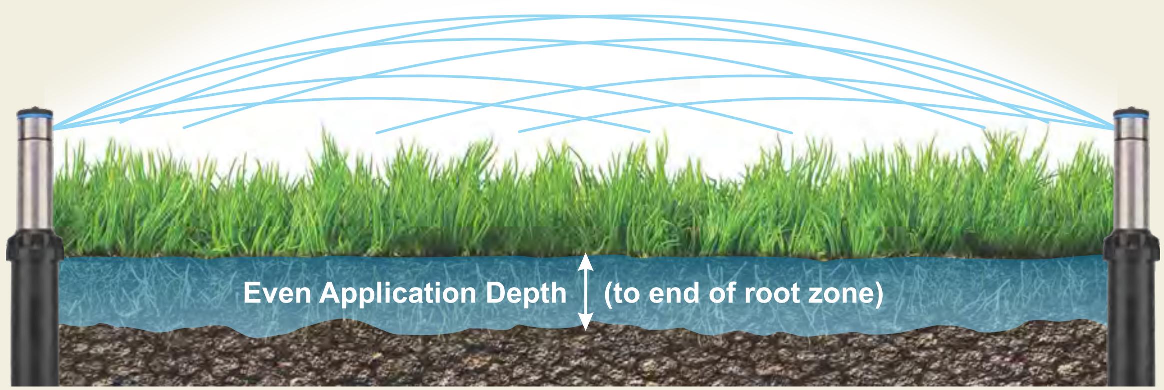
A good irrigation design will ensure **head-to-head coverage** throughout the system. Sprinkler head to sprinkler head coverage means that each sprinkler radius reaches the next, most adjacent sprinkler. This is critical in order to achieve good distribution uniformity when irrigating from above with conventional sprinklers. Good distribution uniformity, like a good rain, means water is applied evenly to the landscape without any dry or wet spots. The more uniform the application of water, the less time the irrigation system needs to run to cover those drier areas.

DESIGN TAKE-AWAY TIPS

1. Create a plan for your landscape, have dimensions and plant types identified
2. Separate landscape into hydrozones – areas within your yard that have different water needs
3. Layout location of sprinklers for each hydrozone, choose a sprinkler that has the proper radius and spray pattern for the area
4. Make sure spacing of sprinklers provides head-to-head coverage
5. Do not mix sprinkler types on a single zone



Head-to-Head Coverage and Sprinkler Efficiency



Good distribution uniformity is achieved when sprinklers are spaced with head-to-head coverage and nozzles have matched precipitation rates. Head-to-head coverage is accomplished when sprinkler heads are spaced so that the radius from one sprinkler reaches the sprinkler adjacent to it. Matched precipitation rates ensure the volume of water coming from all the sprinklers is even across the entire area. When these two conditions are met an equal amount of water reaches an equal depth of the plant roots. Ultimately, good distribution uniformity prevents dry or overly wet spots and improves the health of the landscape.

SPRINKLER TYPES

There are many types of sprinklers to choose from. Taking the time to choose the right sprinkler for the right place in the landscape will help keep irrigation on the landscape and prevent costly irrigation overspray and runoff onto neighboring street and sidewalks. In fact, much of the water Bendites see on the street is due to irrigation systems that simply didn't select the correct sprinkler type. Ensure the sprinklers that provide water to your landscape don't result in overspray or runoff.

Many sprinklers are pressure regulating and account for the high water pressure some homes experience. Some sprinkler bodies are pressure regulating and have built-in pressure reducing features that drop any inlet pressure down to the manufacturer's optimal operating range, usually 35 to 45 pounds per square inch (PSI) for typical pop-up type sprinklers. High pressure systems that don't include pressure regulation can lose up to 20 percent of their water due to misting and evaporation.

Some sprinklers are equipped with check valves at the base. Check valves prevent water from flowing in a particular direction. In this particular case, a sprinkler with a check valve will prevent water from leaking out of the lowest point in the irrigation system at the end of each irrigation cycle. This is often the case with irrigation systems that serve properties with varying elevations.

The dimensions and shape of an area determine what sprinkler type and size is most appropriate. Lawn areas require overhead irrigation which usually provided through pop-up type sprinklers that deliver **spray** patterns of 15' or less. Larger lawn areas may utilize **rotor** type sprinkler to cover larger areas of 10' or more. **High efficiency** sprinklers generally cover the same area as typical spray patterns, but deliver water at a much slower rate and larger water droplet due to their unique sprinkler nozzles. The slower precipitation rate means sprinklers run longer, but deliver less water allowing for better soil absorption. The larger water droplet is less susceptible to wind drift and more likely to penetrate through blades of grass and thatch to get to the soil. Ultimately, pressure regulated sprinklers with check valves and high efficiency nozzles are generally considered to be the most efficient overhead sprinkler option available today. Mixing of different sprinkler types on a single zone is not recommended.

Plant spacing will often determine if overhead irrigation is necessary or if **drip irrigation** would be more appropriate. Densely planted areas with mass plantings of perennials, grasses, and small shrubs can be irrigated overhead just as a lawn. It is important to ensure that all water stays on the landscape and doesn't overspray onto unintended areas.

SPRINKLER TAKE-AWAY TIPS

1. Use sprinklers with the proper radius for the planter area
2. Never mix sprinkler types on the same zone
3. Install nozzles for matched precipitation rate on rotor sprinklers
4. Using high efficiency nozzles can save water with every irrigation

MATCHING PRECIPITATION RATES WITH ROTOR NOZZLES

The identifying number on the sprinkler nozzle corresponds to a flow GPM and a radius of throw. To match precipitation rates you must match a flow in GPM with the arc that the sprinkler will cover. For example, if a #1 nozzle (applies 1GPM) is used on the sprinklers with 90 degree spray patterns then a #2 nozzle (applies 2 GPM) must be used on the sprinklers covering 180 degrees because it needs to apply twice the amount of area in the same runtime. One thing to consider is making sure that the total flow of the nozzles chosen can be supported by the water supply on that zone.

Dry Spots: Result of Uneven Coverage

Less densely planted areas may be able to utilize drip irrigation instead of irrigation from overhead. Drip irrigation systems are covered in more detail in the next chapter.

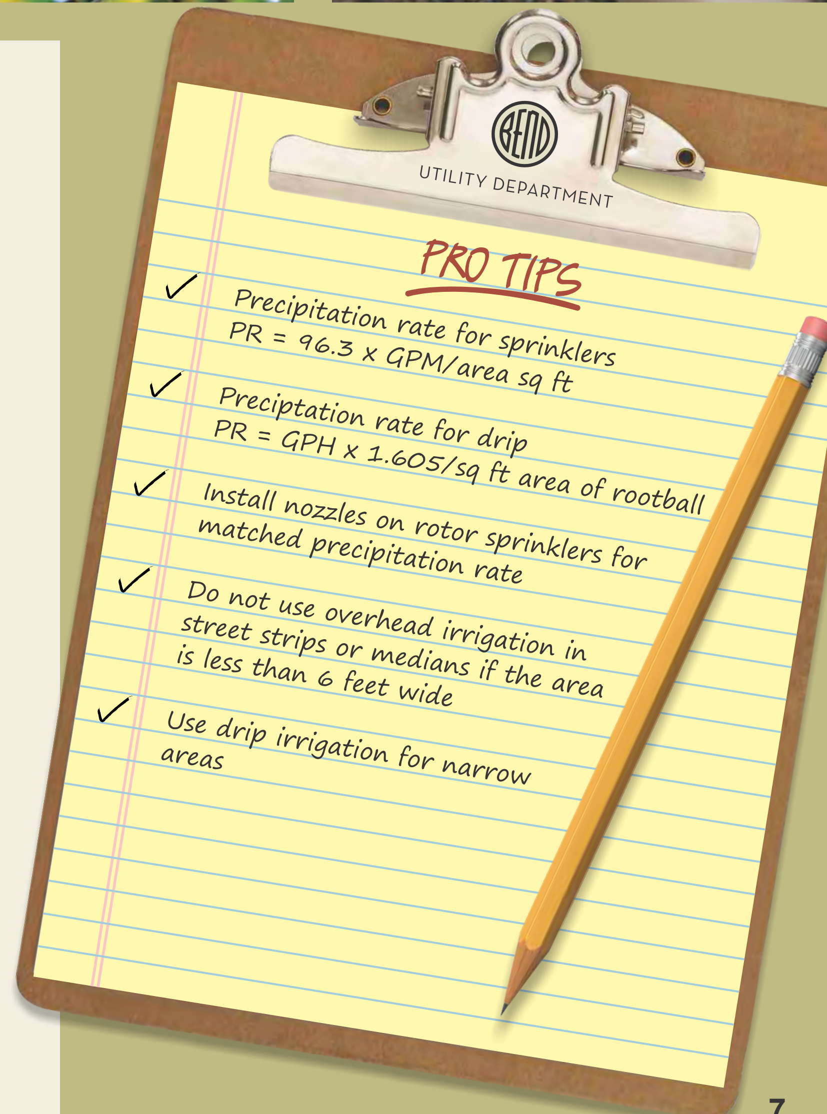
The **precipitation rate** of a sprinkler is the rate at which it applies water, usually designated in inches per hour (in / hr). The precipitation rate of a sprinkler is a factor used to calculate the length of a runtime necessary to get water to plant roots. You can calculate a sprinklers precipitation rate using the formula (PR = GPM x 96.3 / area of wetted area) or the rain gauge method on page 16.

Spray – Traditional spray heads are a broadcast, high precipitation rate (> 1 in / hr) sprinkler best used for lawns and groundcover in areas between 8 and 15 feet. Spray heads are usually a fixed type of delivery with a very high flow rate. Keep make / model of sprinkler type consistent for matched precipitation rates within a zone. The spray pattern is greatly influenced by wind as well as supply pressure.

Rotor – Usually a single stream, low precipitation rate (< 1 in / hr) long range nozzle used for lawn or planters in areas between 20 and 60 feet which require broadcast irrigation. Rotors generally have a low precipitation rate applying the water slowly. Rotors have interchangeable nozzles that need to be installed for matched precipitation.

High Efficiency – A (< 1 in / hr) sprinkler considered to be high efficiency has an improved distribution pattern and lower flow rate, depending on the make they can be used in areas 5 to 30 feet. Different makes include a multi stream rotor type and a high frequency oscillating stream. Both provide an improved delivery pattern and produce larger water droplets which are less effected by wind and a slower application that reduces runoff.

Drip Irrigation – A versatile type of irrigation can be used as point source (at the plant) or in-line (grid pattern laid out throughout the planter area). Drip irrigation delivers water at or close to the root ball of the plant and its delivery is not affected by windy conditions. It can require more maintenance than a spray station, however this can be minimized with proper installation.



DRIP IRRIGATION

In-line Drip

Point Source Drip

In-line drip is used when planting is dense and a wetted pattern similar to overhead irrigation is needed. The spacing and flow rate used is usually determined by soil type, for Central Oregon a common option is 12” spacing with 0.9 gph emitters. The in-line drip is installed in a grid pattern throughout the planter, the spacing of the dripline is based on the spacing of the emitters in the line (e.g. 12”).

Point source drip is used for more sparse plantings where water is needed on individual or clustered groups of plants. The individual emitters range in flow rate from 0.50 gph -24 gph and are placed to distribute water around the root ball of individual plants.

Drip is the most efficient form of irrigation. It applies the water slowly, at the root zone, and is generally unaffected by wind. When installed correctly, maintenance of drip irrigation systems require about the same amount of time when compared to their overhead counterparts. However, the water savings that comes with drip irrigation can be substantial. Perhaps the best part about drip irrigation is it gets water right where it is needed and rarely oversprays or runs off onto adjacent streets, sidewalks and driveways.

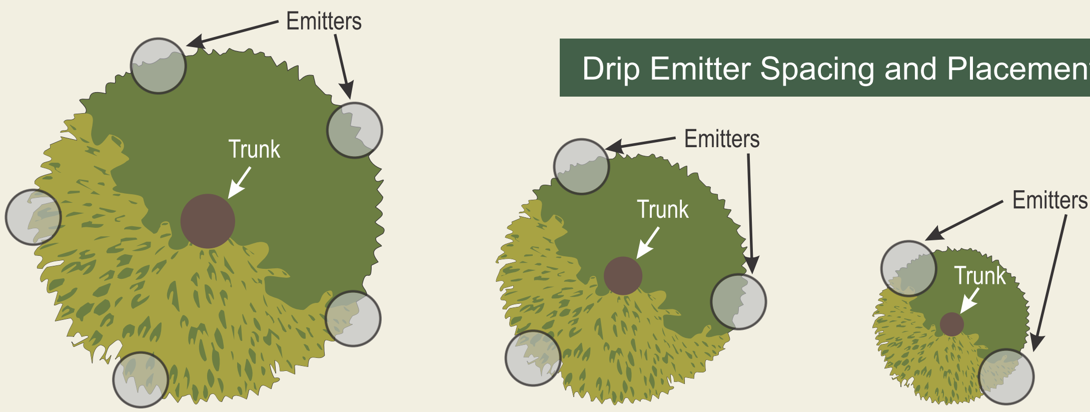
Drip irrigation zones operate as low volume, low pressure zones. For these reasons, drip irrigation zones include a pressure regulator shortly after the irrigation control valve. **Pressure regulators** generally reduce pressure to between 20 and 30 PSI to ensure that the downstream components stay intact and deliver equal amounts of water, slowly. Drip irrigation **filters** are often bundled with the pressure regulator and sold as a single assembly. Together they ensure that all water entering the drip zone is clean and free of debris that may clog drip emitters. Filters are extremely important for those landscapes that utilize untreated or unfiltered water from canals or ponds.

While drip irrigation is a very efficient and adaptable way to irrigate the landscape, it takes a little more know how to properly design and install. There are more components involved that may be new to many landscape owners and contractors. There are also multiple ways to design a drip irrigation zone that will vary depending on the landscape planting.

Dense plantings often utilize **in-line drip irrigation** that involves running parallel runs of ½” tubing with inline emitters spaced every 12” to 24”. These emitters are inside the tubing and cannot be accessed or adjusted. An in-line drip irrigation zone such as this will evenly distribute wherever the tubing is installed and is ideal for densely planted areas. However, this would be a fairly inefficient way to irrigate less dense plantings since no irrigation is needed in the bare areas between the individual landscape plants.

Less densely planted areas utilize **point-source drip irrigation**. Point-source drip irrigation also involves the use of ½" tubing, but no in-line emitters are included. Instead, the ½" black poly piping is buried 3" below grade and runs through the landscape so that it is approximately 2' to 4' feet from each landscape planting requiring irrigation. A button style drip emitter can be installed on the ½" black poly tubing with a **punch tool**. From there, ¼" diameter micro-tubing delivers water to the plant. Button style drip emitters are available with differing flow rates ranging from 0.5 gallons per hour to 24 gallons per hour. Adjustable emitters and micro-sprays are available, but only recommended if the flow rate can be verified. The use of more rigid PVC is often used in lieu of the ½" black poly pipe in some point-source drip irrigation designs. These drip systems are generally more durable.

Drip Emitter Spacing and Placement



Large Shrubs & Trees — Multiple Emitters Around Entire Dripline

Medium Shrubs — Multiple Emitters

Small Shrubs — Two Emitters

UTILITY DEPARTMENT

PRO TIPS

- ✓ Regulate pressure to 20-30 psi drip zones.
- ✓ Use pre-filtration if well or ditch water is being used
- ✓ Water trees on separate zones from the rest of the plant material
- ✓ Use pressure compensating (PC) emitters if bug or button type emitters are used for sparse plantings
- ✓ Calculating your drip precipitation rate:

Inline – 231.1 x (emitter flow rate)/(emitter spacing inches) x (row spacing inches)

Point Source – 1.605 x GPH/sq ft wetted rootball

DRIP TAKE-AWAY TIPS

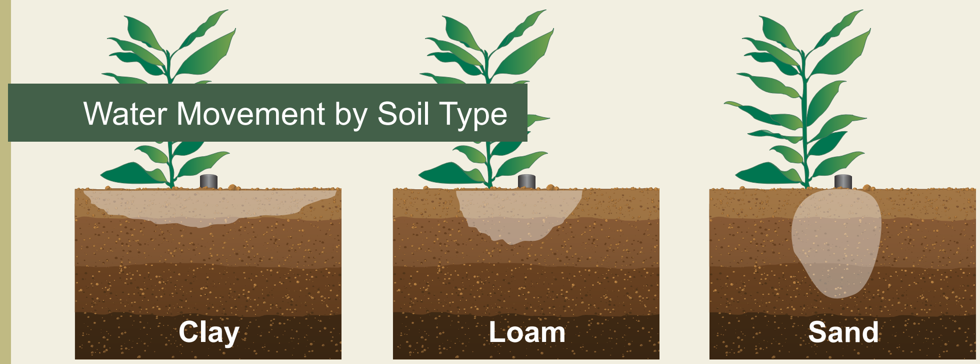
1. Use a pressure regulator and filter for each drip zone
2. In-line drip design for dense plantings (2' spacing or less)
3. Point-source drip design for more sparse plantings (4' spacing or more)
4. Avoid mixing microsprays and drip emitters on the same zone
5. Space emitters to reach plant's dripline

Drip Retro Kit

Converting areas from overhead irrigation to drip is easier than ever thanks to a variety of off the shelf drip conversion kits. Drip conversions generally occur where overhead irrigation is no longer desired. A typical example might include converting a lawn street strip to a low water alternative that won't irrigate the adjacent street and sidewalk. In this example, each pop-up style sprinkler is dug out and exposed. One sprinkler is replaced with a sprinkler body that isn't actually a sprinkler. Instead, it is a pressure regulator / filter assembly with fittings to connect to ½" drip tubing. From there, the ½" drip tubing can be run throughout the planting area using either in-line or point-source components. The other sprinklers are plugged or capped and no longer function.

- Replaces existing sprinkler body
- Internal filter and pressure regulator
- Connects to ½" drip tubing

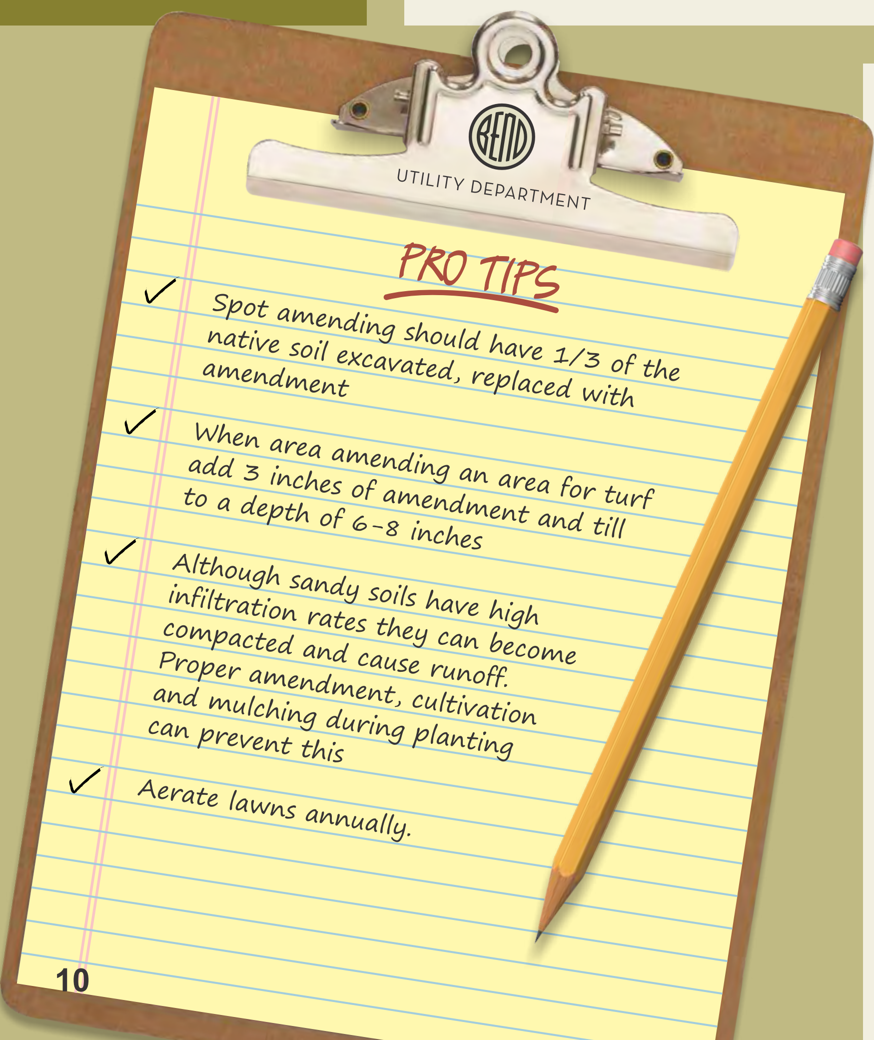
SOILS



Water movement through soil is an important factor in scheduling irrigation runtimes, without creating runoff. The infiltration of water into the soil is affected by soil type as is the horizontal movement as seen in the photo above. The width of the wetted pattern will affect how far drip emitters need to be spaced around plants to wet the root ball adequately.

SOILS TAKE-AWAY TIPS

1. Amend the soil!
2. Spot amend trees and shrubs
3. Spread and till for lawn areas
4. Top-dress existing lawns
5. Add mulch to retain moisture
6. Aerate lawns annually



Soils play a very important role in the health and longevity of our landscapes, but are often overlooked. They shouldn't be! The soil in our landscape is a living organism that stores water and provides a source of food for landscape plantings. While native soils generally lack significant organic matter, they can be amended with additions of compost or other soil amendments when necessary. But things like over tilling and heavy traffic can create compacted soils that have little air space, life or any of the benefits of an undisturbed native soil (for natives) or properly amended soil fit for a new landscape (for non-natives). There's a lot to think about.

In Bend, our native soil type is classified as sandy / sandy loam. It is very coarse with a high infiltration rate and very little water or nutrient holding capacity. This water movement has a direct impact on the duration of an irrigation cycle. For example, consider a typical lawn on top of a native soil in Bend with no soil amendments incorporated prior to installation. It might take an irrigation system as little as five minutes before irrigation infiltrates the soil to a depth beyond the lawn root zone. This is wasted water since it isn't held in the soil long enough to be absorbed by the lawn's roots. In other words, this soil has a high infiltration rate. Unfortunately, the answer to this for many is to irrigate more often which results in substantially higher water use than necessary. Lawns, when grown in Bend, require soil amendments to help retain more water in the root zone. If the soil in this example was amended prior to sodding, its water holding capacity would be significantly greater. Instead of the irrigation simply passing through the root zone, water is now held in the root zone and available to lawn roots for a longer period of time. The result is a healthier, more water efficient lawn.

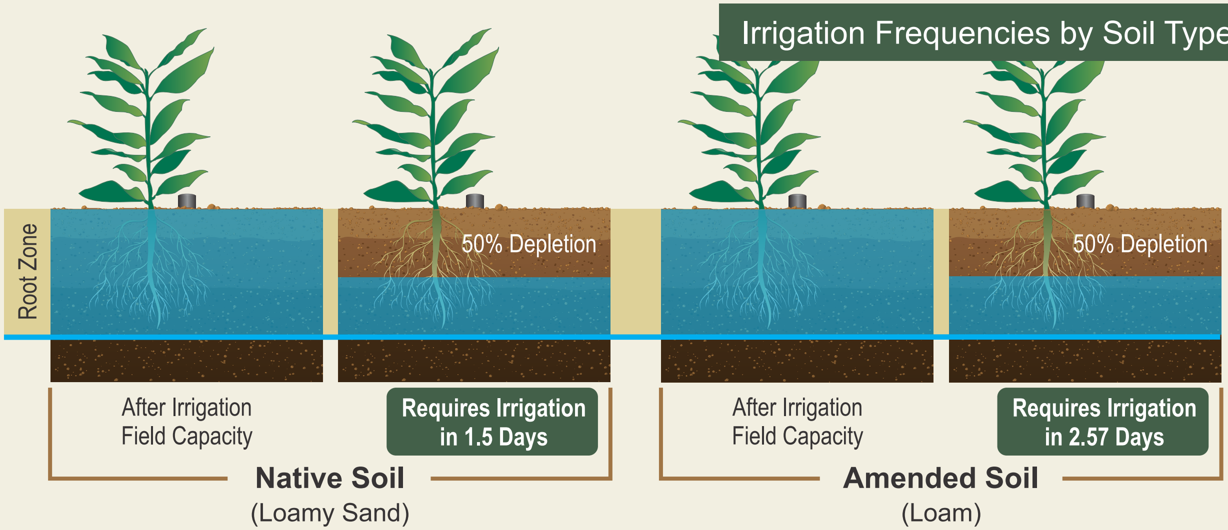
Existing lawns can be top-dressed annually with ¼” to ½” soil amendment to increase the water holding capacity and nutrient level of their soils. This is usually done after a core aeration and later in the growing season. This helps incorporate organic material above and below ground while increasing the available oxygen in the soil.

Amending the soil for individual plantings follows the same logic of slowing water down so that it can be absorbed by landscape plant roots. In general, individual plantings should be amended with an amount of soil amendment equivalent to 1/3 the size of the planting hole. More dense plantings can be amended together as a large planting bed.

Soil amendments should include organic matter such as compost, peat moss and manure. Most landscape material suppliers and compost facilities in the area offer a unique blend of these and refer to them as soil amendments.

Mulch is added as a top dressing to the soil to help reduce evaporation and to insulate the plant roots in hot and cold weather. Mulch can come in many different forms such as organic material (shredded wood trimmings, leaf litter, and grass clippings) or **decorative rock** and decomposed granite. The latter two are primarily used for aesthetics and don’t contribute to the improvement of the soil as well as organic mulch material does.

Irrigation Frequencies by Soil Type

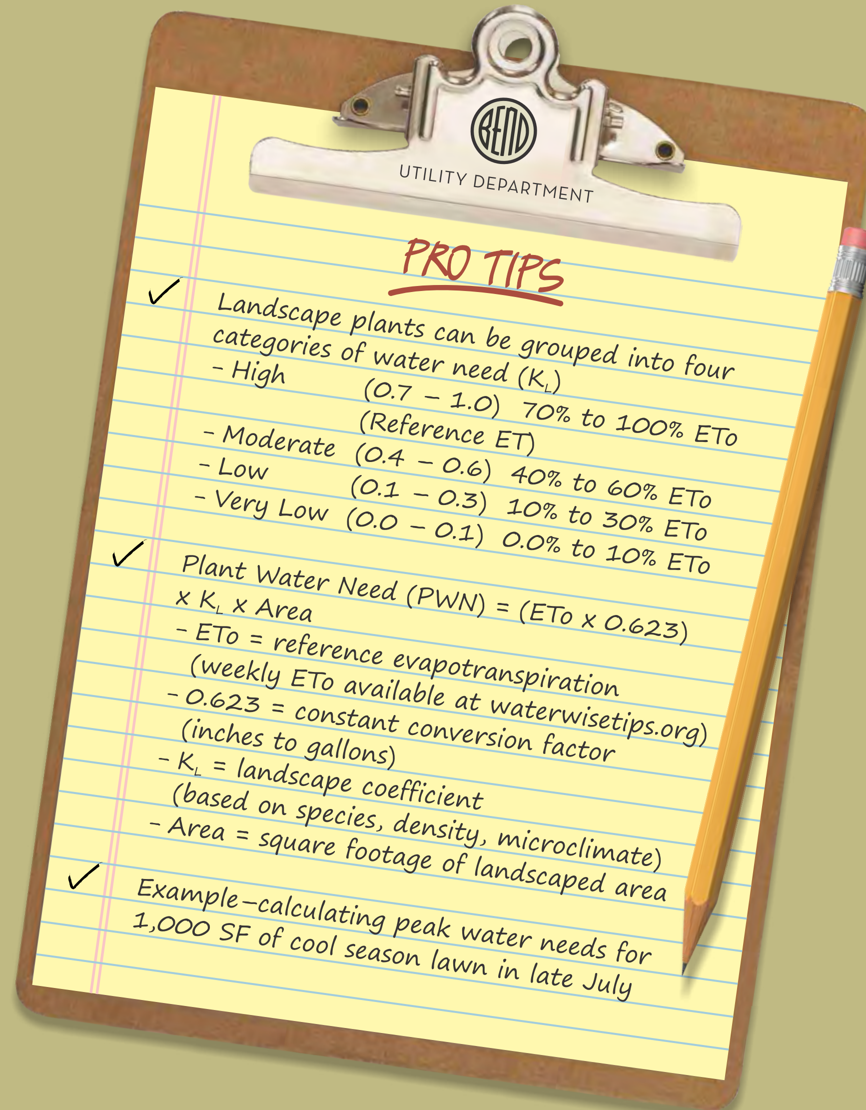


The frequency of irrigations also depends on the soil type. Coarse native soils are porous and allow water to move through the soil profile quickly; consequently these soils do not hold water for use by plants and require more frequent irrigation. Through the practice of amending we can change the water holding capacity of the soil and allow for more time in between waterings.

PLANT WATER NEED

The landscape plants chosen for a particular landscape have a direct impact on the amount of water it requires to stay healthy. For example, a native landscape of fescue grasses, sagebrush and juniper are able to sustain themselves on the 5” of natural precipitation Bend receives each growing season. This landscape requires zero supplemental irrigation beyond an initial establishment period of one to three years. Conversely, a cool season lawn of non-native Kentucky bluegrass requires about 30” of precipitation during the average growing season. The water requirements for these two landscapes couldn’t be more different.

The water requirements for most landscapes in Bend are somewhere in between the two described here. We refer to this range of water required for a healthy landscape as the **WaterWise Landscape Balance**. While there are many different factors that play into where a landscape may fall on this balance, none plays a greater role than plant choice. Choosing native or desert landscape plants with low water requirements dramatically reduces the overall water needs of the landscape. The good news is that there are hundreds of beautiful, hearty, water conscious landscape plants to choose from. Visit waterwisetips.org for more detailed information and photos of these plants in local Bend landscapes. Also be sure to check out Water-wise Gardening in Central Oregon published by Oregon State University Extension Service.



PLANT WATER NEED TAKE-AWAY TIPS

1. Plant choice is directly related to landscape water use
2. Choose plants appropriate for USDA Zones 3-5
3. Select landscape plants designated as very low to moderate water use
4. Limit the use and size of thirsty lawns and landscape plants

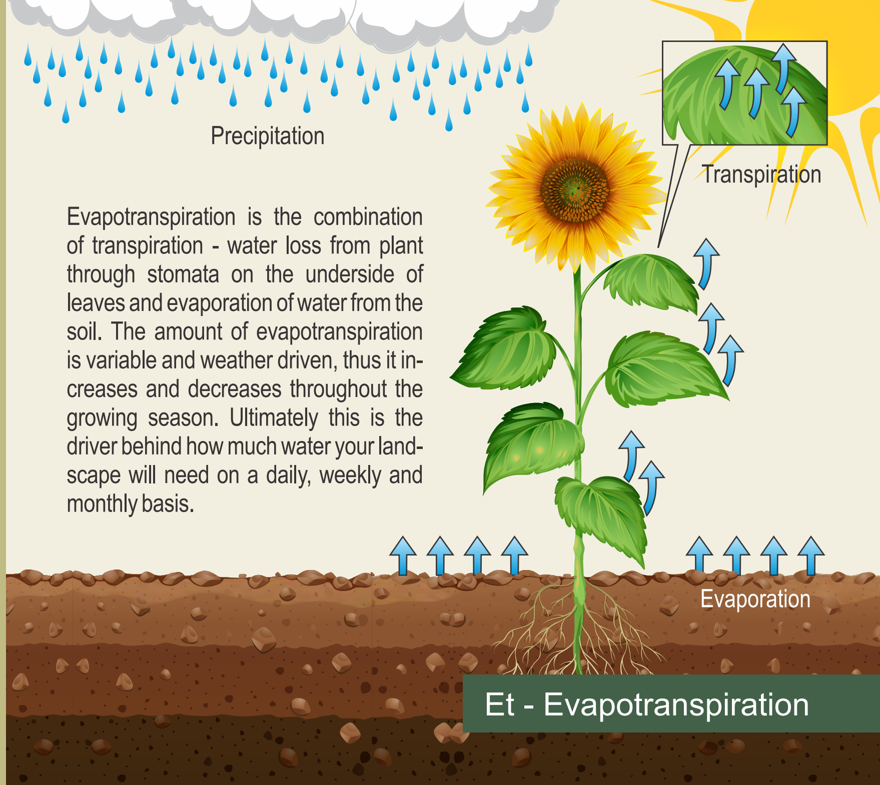
PRO TIPS EXAMPLE

Knowing the following:

- Weekly ETo for July is **1.5”** per week
- K_L for cool season lawn is **0.8**
- Area is **1,000** square feet
  (**1.5”** x 0.623) x **0.8** K_L x **1,000** SF = 747.6 gallons per week

Despite the diverse low water plant palette, landscape plants with high water requirements like ornamental trees, shrubs, and lawn are sometimes a preferred choice. This can be okay if incorporated appropriately for a High Desert climate. For example, a large backyard of 3,000 square feet (SF) could be 3,000 SF of the cool season lawn previously mentioned. Or, a more water conscious approach could be 1,500 SF of a more drought tolerant lawn like turf-type tall fescue surrounded by 1,500 SF of low water perennials and shrubs on a drip irrigation system. The difference in water requirements is significant, not to mention the reduction in time spent mowing, fertilizing, and weed eating the now smaller lawn space. Remember, water isn't all you save!

The weekly water amount required to keep a landscape looking healthy largely depends on how much water was lost due to evaporation and transpiration. The combination of these two, evaporation and transpiration, equal total **evapotranspiration** (ET) for a plant or landscape. Ultimately, replenishing this water that has evaporated from soils and transpired from plants is the goal of an irrigation system. It is up to the irrigation scheduler to ensure the proper amount of water is being delivered to the landscape – no more and no less.



WATERWISE LANDSCAPE BALANCE

Take time to consider the balance between the water needs of a landscape versus the amount of time you want to spend maintaining it. Landscapes with more native and non-native desert adapted plants require less water and regular maintenance than their more thirsty counterparts. Landscapes that include lawn have significantly greater water needs and require more regular maintenance that includes mowing, edging, fertilizing, aeration and dethatching.

Irrigation controllers are the management tool used to deliver efficient irrigation. The technology and capability of controllers varies greatly and changes regularly as technology improves and becomes more affordable and accessible. Options range from a standard irrigation controller with very basic program settings to a smart irrigation controller that automatically adjusts programmed schedules in response to weather conditions. Many smart irrigation controllers require data to be entered into the controllers such as zip code, sprinkler type, and slope. Others may have a separate weather module that detects rain, wind, and solar radiation. All irrigation controllers can be programmed and operated to deliver water efficiently, but none will fix a broken, leaky, or poorly designed irrigation system.

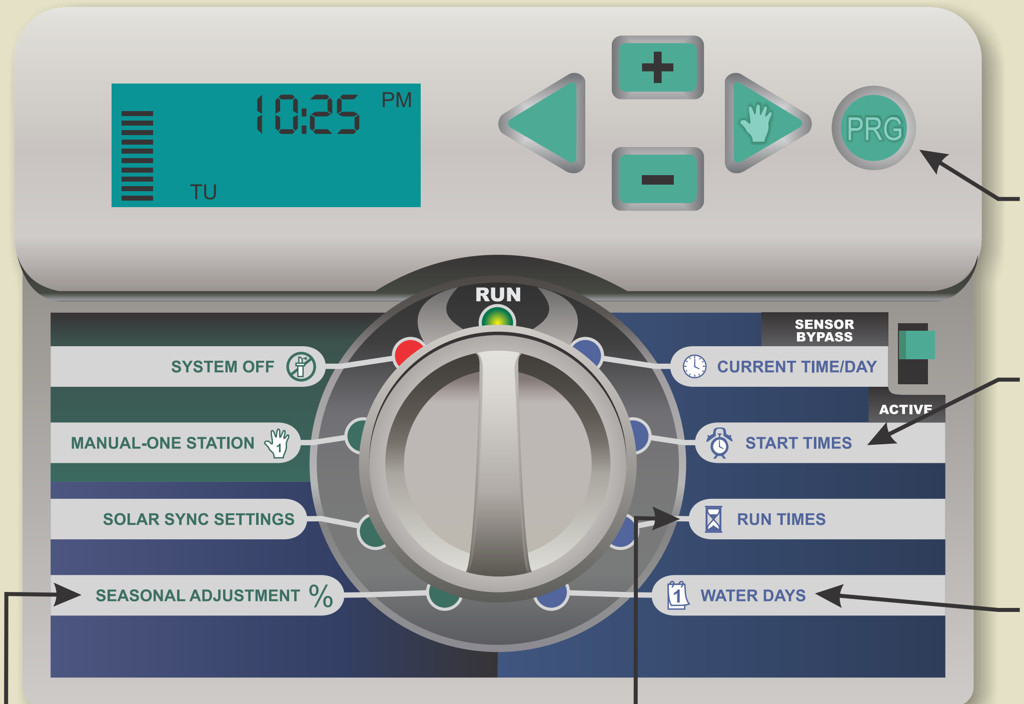
Standard Irrigation Controllers

Standard irrigation controllers usually have features such as: Programs, Start Time, Watering Days, Runtime, and Seasonal Adjust %. These are the basic features needed to deliver water efficiently throughout the growing season. One of the most effective ways to irrigate efficiently with a standard irrigation controller is to enter a program for a peak summer schedule (late July) and then adjust runtimes throughout the growing season utilizing the Seasonal Adjust % feature. This feature will reduce the runtime minutes of each zone on that program by a selected percentage. For example, an established landscape may require 20 minutes of runtime on each zone in order to remain healthy in late July.

CONTROLLERS

CONTROLLER TAKE-AWAY TIPS

1. An irrigation controller cannot overcome a poorly designed or maintained system
2. Standard irrigation controllers can be water efficient with frequent adjustments
3. Smart irrigation controllers require more programming, but adjust schedules automatically



Standard Controllers

The basic features offered for scheduling:

Programs
(A,B,C,D varies by model)
Allows you to set different watering schedules for hydrozones within your yard

Start Times
(1-4 varies by model)
Start times commence an irrigation cycle which runs all zones on the program; it does not correspond to individual stations

Watering Days
(M, T, W, TH, F, S, SU; even / odd; interval varies by model)
Set the days you wish to irrigate; Bend Code has even/odd watering days based on the address number of your home

Seasonal Adjust %
This feature allows you to seasonally adjust your **runtimes** on a program by a percentage, eliminating the arduous process of reprogramming individual runtimes each month

Station Runtimes
Allows you to set the number of minutes each station requires

Add-On Smart Sensor

On-Site Weather Data

WiFi Enabled

Weather Data Subscription

However, this amount of runtime isn't necessary in spring or fall when temperatures are considerably cooler. Utilizing the Seasonal / Percent Adjust feature, the system owner can reduce the programmed runtimes to 50 percent for April, 60 percent for May, 80 percent for June, and so on. This will reduce the runtimes for each zone. The key is to make regular adjustments to the irrigation schedule as weather changes.

Smart Irrigation Controllers

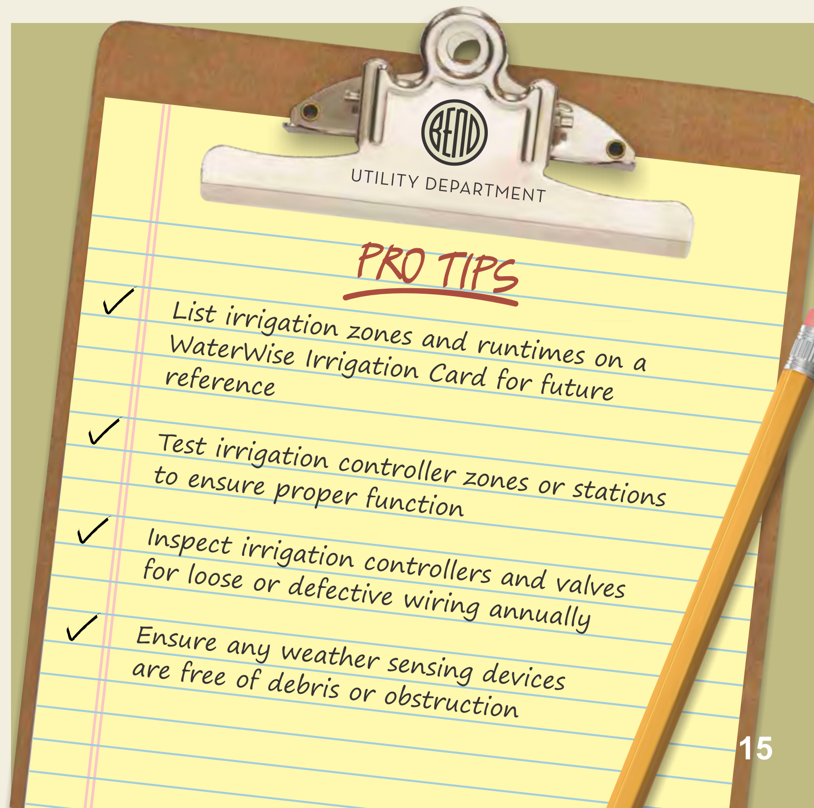
Smart irrigation controllers are designed to automatically adjust programmed irrigation runtimes based on information they receive from a compatible sensor, on-site weather sensor, WiFi signal, or through a cellular data subscription.

Compatible Sensor – Many irrigation controllers can be modified with add-on sensors. Some sensors are universal and can be added to any controller with a rain sensor port. These might include a rain sensor, a freeze sensor, or a soil moisture sensor. Some sensors are more advanced and are designed to make a standard irrigation controller a smart controller capable of automatically adjusting scheduled runtimes.

On-site Weather Sensor – On-site weather sensors come in wired and wireless versions and generally provide temperature, wind, and solar radiation data to the irrigation controller. Smart irrigation controllers then adjust programmed irrigation runtimes based on this information.

WiFi Signal – WiFi signal based smart irrigation controllers are becoming more common as technology improves and becomes more accessible. These controllers are programmed to connect to a WiFi network. Once connected to the network, controllers receive regular weather updates through an online source such as the National Oceanic Atmospheric Association (NOAA) or a local airport. Most WiFi signal based irrigation controllers are paired with a downloadable App allowing access to the irrigation controller from a mobile device such as smartphone or tablet.

Cellular Data Subscription – Cellular data subscription controllers receive weather data through an external provider. Once received, weather data is processed and adjustments to the programmed irrigation schedule are made. Subscriptions are usually monthly or annual and range in cost.



SCHEDULING

Scheduling irrigation runtimes takes into account all the information in the preceding chapters. In fact, there are a wide variety of factors that influence how we irrigate our landscapes that often go unnoticed. Challenges like slopes, soil compaction, and exposure create site specific microclimates that often play a much larger role in landscape water use than we realize. The key is to understand how much water the irrigation system actually delivers to each hydrozone. Then adjust irrigation runtimes to match the water needs and specific characteristics of each area.

Know the Flow

Knowing the flow, or precipitation rate of an irrigation zone can be fairly simple for lawn areas using the **irrigation gauge method**. This method involves using a simple rain-type gauge to measure sprinkler output at various sections of the lawn over a short period of time. See the 4 Steps to Efficient Lawn Irrigation included here for step by step instructions. This method can be used to measure overhead irrigation of landscaped areas too, but may be less accurate depending on sprinkler placement.

4 STEPS TO EFFICIENT LAWN IRRIGATION

Follow these four steps to increase your lawn water efficiency using an irrigation gauge.

1. Place irrigation gauge in an irrigated area making sure that it is at least 24" away from the closest sprinkler.
2. Run sprinklers for exactly 10 minutes (1/6 hour). Measure water accumulation in gauge.
3. Calculate precipitation rate (PR) in inches per hour using this formula:

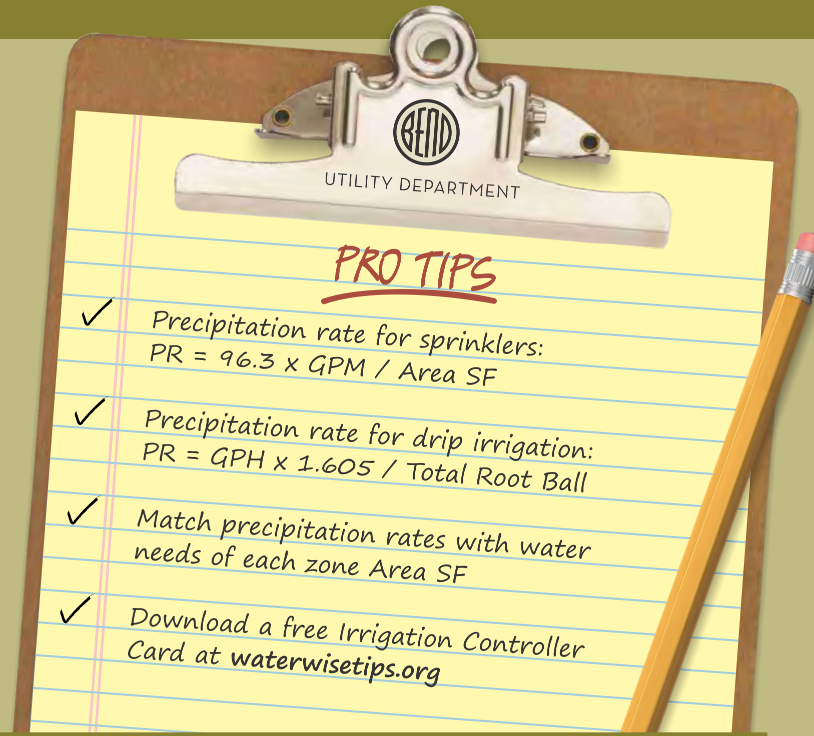
   Accumulation ____ in x 6 = ____ in / hr

4. Calculate weekly runtime minutes using this formula:

   [**Weekly Water Needs** ____ in / PR] x 60 = _______ Minutes per week

Weekly Water Needs

APR	0.75" / week
MAY	1.00" / week
JUN	1.25" / week
JUL	1.50" / week
AUG	1.25" / week
SEP	1.00" / week



PRO TIPS EXAMPLE

Example: Calculating runtime minutes per week for 1,000 SF of cool season lawn in late July.

Runtime minutes per week = (ETo / PR) x 60
Runtime minutes per week = (1.5" / 2.0 in / hr) x 60 = 45 minutes per week
Runtime minutes per cycle = 45 minutes / 3.5 days = 12 minutes per cycle

In this example, the 1,000 SF of cool season lawn requires 12 minutes of scheduled runtime every odd (or even) day of the calendar during the peak of summer. Evaluate the lawn in the following weeks to see if the moisture is getting to where it is needed – in the root zone.

Assuming the schedule calculated here works and the lawn stays healthy during the peak of summer, making adjustments to the schedule can usually be made with a single adjustment of the seasonal / percent adjust feature. Simply enter your peak season runtimes for each zone while this feature is set to 100 percent. Then, depending on the current month, adjust the seasonal / percent adjust feature to reflect the percentage for that month. This will reduce or increase the runtime minutes already programmed for each zone.

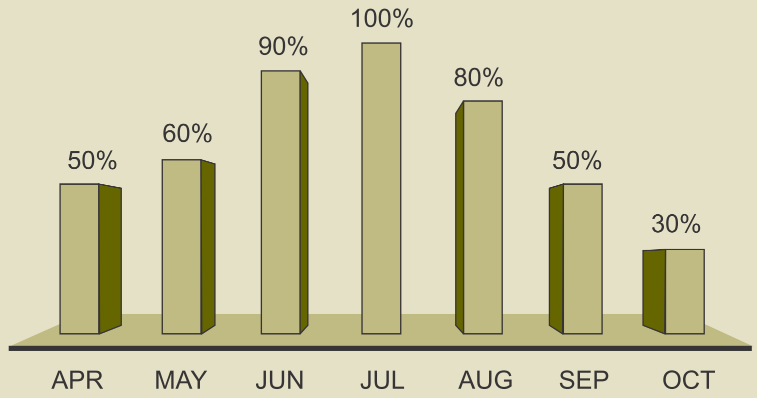
Creating a Schedule

The City of Bend Utility Department recommends programming standard irrigation controllers for peak summer schedules (late July) and then adjusting run-times throughout the growing season utilizing the controller's Seasonal / Percent Adjust feature. This allows system owners to make easy, frequent schedule changes to all zones on a specific program with just a single adjustment to the controller.

For example, the peak summer water needs for 1,000 SF of cool season lawn was calculated earlier to be roughly 750 gallons per week in late July. If we know that the irrigation zone serving this lawn area has a precipitation rate (PR) of 0.75 in/hr we can calculate a runtime required to deliver 750 gallons to the lawn over the course of this peak week when weekly water requirements (ETo) are at 1.5" per week.

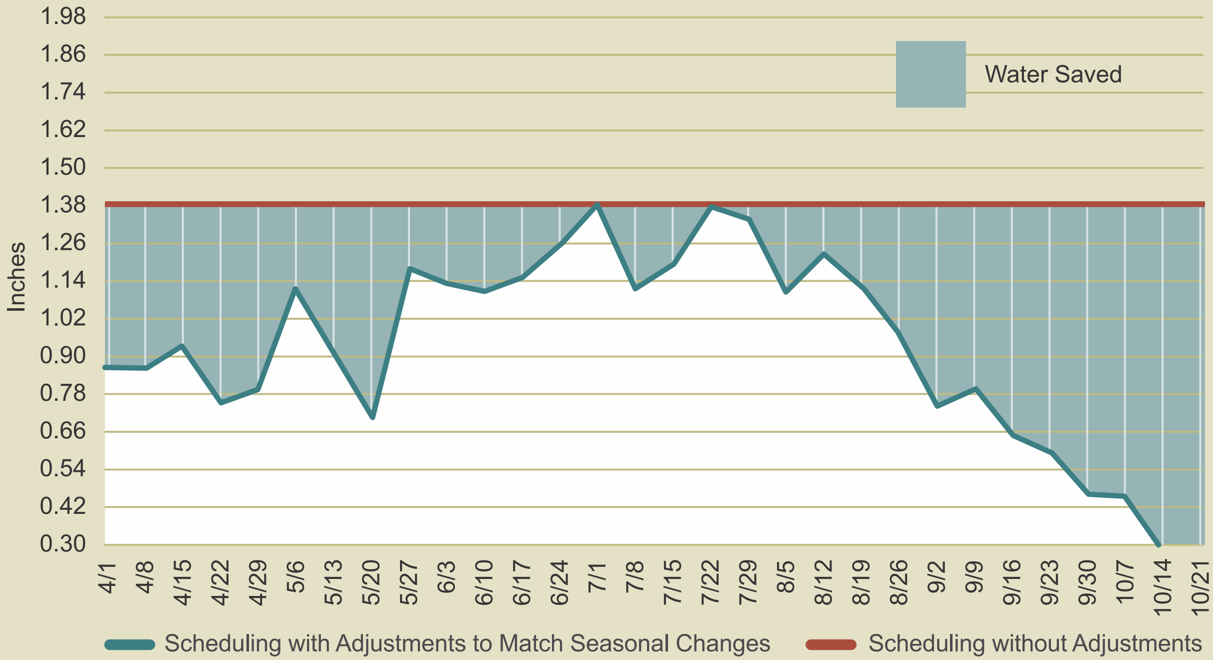
[1.50" / 0.75] x 60 = 120 Minutes per Week

SEASONAL ADJUST %



Most irrigation controllers have a Seasonal Adjust % feature that allows the user to easily increase / decrease runtime minutes for all zones. Adjusting the percentage will add or remove runtime minutes to ALL irrigation zones. Use the bar chart as a guide to make changes to your irrigation schedule each month.

WATER SAVED WITH FREQUENT ADJUSTMENTS



As seasonal ETo changes so does the water need of our landscapes. An efficient irrigation schedule is adjusted to reflect that need. An unchanged schedule can result in large amounts of wasted water through overwatering. This overuse is typically done in the transition seasons of fall and spring.

SCHEDULING TAKE-AWAY TIPS

1. Determine the precipitation rate for each irrigation zone
2. Know the seasonal water need for the specific time of year
3. Calculate the runtime minutes per week for each zone
4. Divide the weekly runtime minutes by 3.5 for even / odd days to determine zone runtime
5. Use the seasonal adjust % to make adjustments throughout the year.

MAINTENANCE

The maintenance and upkeep of an irrigation system is as important as the design and installation. Not even the smallest and most efficient irrigation equipment can make up for a lack of maintenance. These systems take a lot of abuse depending on where they are located. Winter snow shoveling and plowing are regular culprits, but even regular mowing, foot traffic, and freezing and thawing can cause damage to irrigation components. Perform these system checks regularly:

System Checks:

Controller

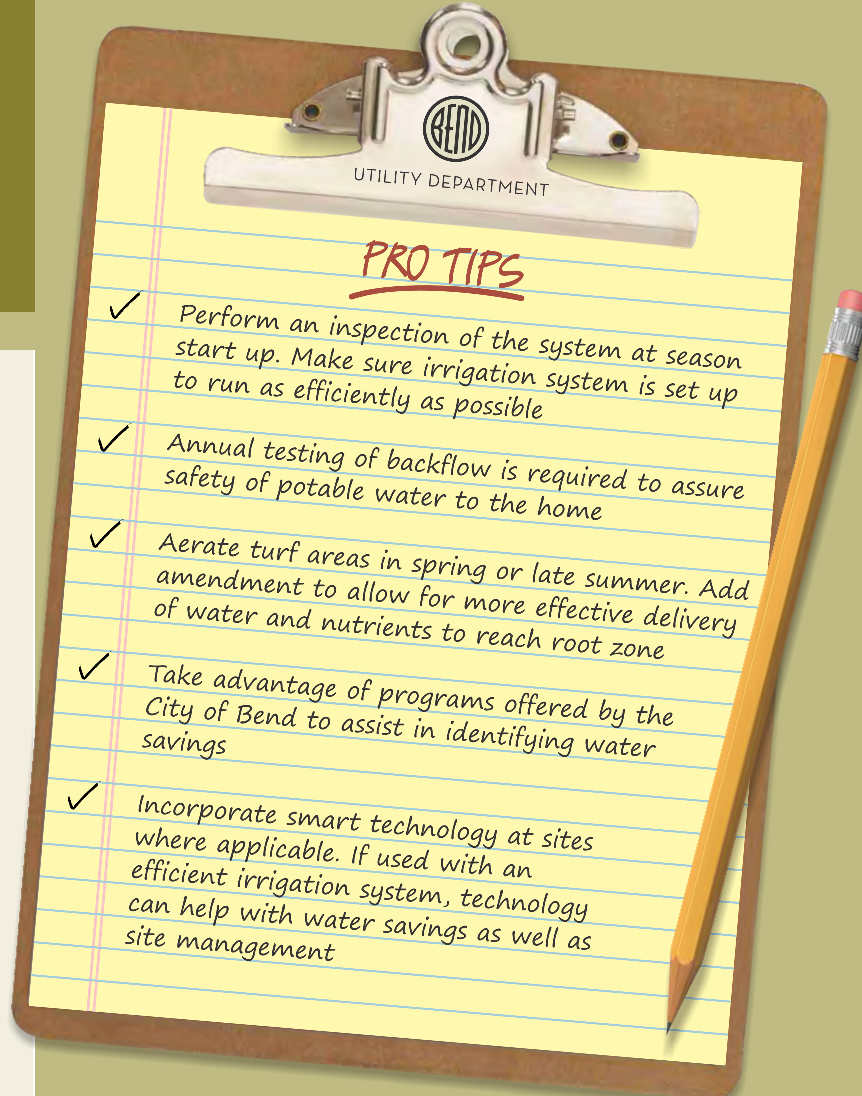
- ☐ Controller is functional with no signs of damage
- ☐ Backup battery for controller is good
- ☐ Controller's manual function properly opens/closes valves
- ☐ Irrigation schedule is appropriate for season (use Seasonal Adjust %)

Valves

- ☐ Valve boxes are accessible and free of pests, debris or dirt
- ☐ Wiring and solenoids are intact and secure
- ☐ No visible leaks from valve or valve fittings

Sprinklers

- ☐ Observe each irrigation zone operate and note overspray or runoff
- ☐ Replace broken sprinklers and nozzles as necessary
- ☐ Straighten tilted and raise sunken sprinklers for proper coverage
- ☐ Clear obstructions in sprinklers spray path

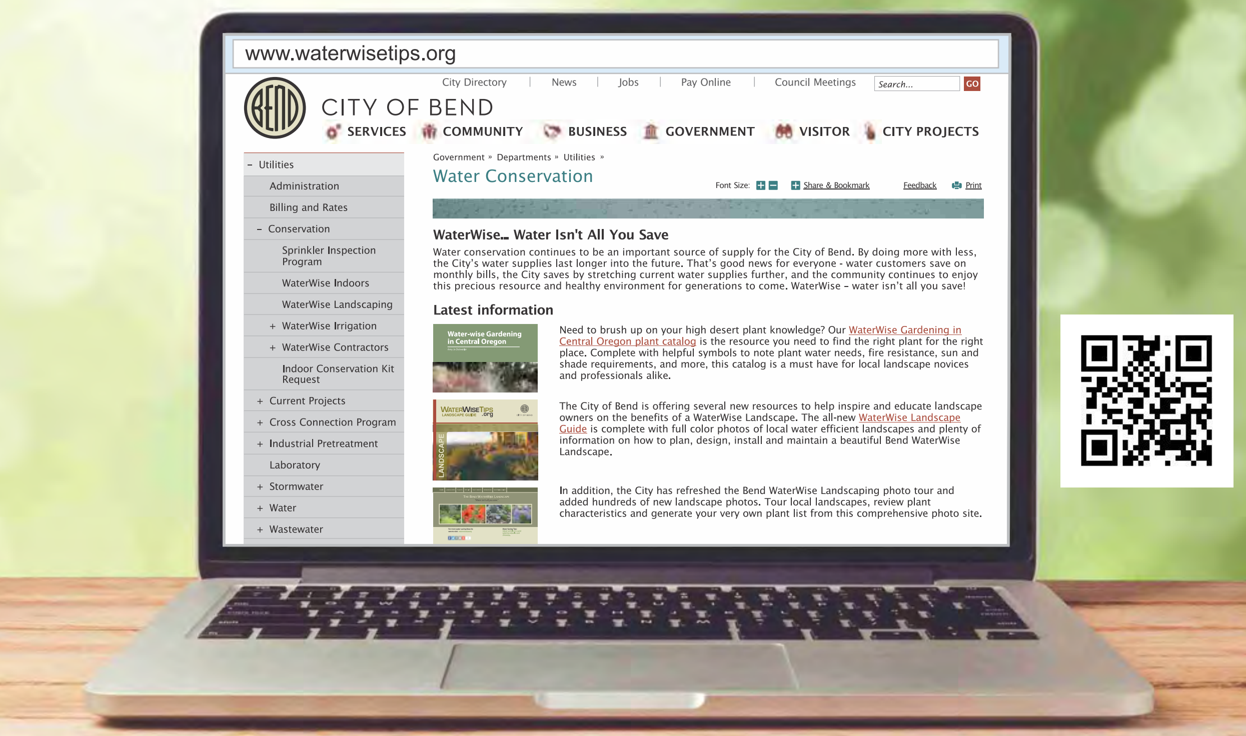


Additional Resources

City of Bend WaterWise Program	**waterwisetips.org**
City of Bend Stormwater Program	**bendoregon.gov/cleanwaterworks**
Oregon State University Extension Service	**extension.oregonstate.edu**
EPA WaterSense	**epa.gov/watersense**
Irrigation Association	**irrigation.org**
Alliance for Water Efficiency	**allianceforwaterefficiency.org**
U.S. Bureau of Reclamation	**usbr.gov/pn/Agrimet**
American Water Works Association	**awwa.org**

Ready For More Bend WaterWise Landscapes?

Visit waterwisetips.org for hundreds of photos of local Bend WaterWise landscapes.



Credits & Acknowledgements

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Photo & Graphic Credits

Hunter Industries
Rachio Inc.
Rain Bird
WeatherTrak
North of South Landscapes
City of Bend

Oregon Rain Garden Guide

One of the best ways to retain stormwater is through a rain garden.

Visit waterwise tips.org to download your free copy of *The Oregon Rain Garden Guide: A Step By Step Guide to Landscaping for Clean Water and Healthy Streams*.

EPA WaterSense PARTNER

Alliance for Water Efficiency MEMBER

Irrigation ASSOCIATION™ Member

Accommodation Information for People with Disabilities. To obtain this information in an alternate format such as Braille, large print, or electronic, please contact 541-317-3000 ext. 2 or email utilities@bendoregon.gov.

CITY OF BEND

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