

# Water-Smart Irrigation Guidelines

## The Importance of Outdoor Water Efficiency and Conservation

Outdoor water use accounts for approximately 50% of Bozeman's total residential water use annually. Properties that have large landscaped areas and are maintained with irrigation can add as much as 30% to the water bill during an irrigation season. In many cases, outdoor water use can be minimized by the install of a properly designed landscape and irrigation system. Proper seasonal maintenance techniques of your irrigation system and the installation of innovative irrigation technologies can help reduce your outdoor use. This guide was created to help you assess and improve your irrigation system and optimize your outdoor water efficiency.

## The City of Bozeman's Outdoor Rebate Program

Keep your landscape colorful while reducing your water bill by applying for compensated landscape upgrades! The City of Bozeman's Water Conservation Division offers outdoor rebates that pays Bozeman water customers to install high efficiency irrigation technology! See the list of products offered below or visit [www.bozemanwater.com](http://www.bozemanwater.com) for more information.

- WaterSense® Labeled Smart Controller
  - o Uses local weather and landscape conditions to automatically adjust your irrigation schedule to better match plants' water needs. If programmed properly, it can reduce your outdoor water-use by 25%.
- Rotating Multi-Stream, Multi-Trajectory and H<sub>2</sub>O Chip Technology Nozzles
  - o These sprinkler head nozzles deliver water more efficiently than standard spray nozzles (reduces water-use by 50%) and reduces water lost through wind-drift and evaporation.
- Rain Sensors
  - o Can override the irrigation schedule and automatically shut it off when a certain amount of rain has fallen. Could save up to 18% of outdoor water-use if triggered during a watering event.
- Drip Irrigation
  - o Delivers water directly to plant roots and minimizes water lost through wind-drift and evaporation. Is 75% more efficient than overhead spray irrigation!
- Drought Tolerant Plants
  - o Require less maintenance and uses approximately 75% less water than turfgrass.

## Visual Inspection

A quick visual inspection is a great way to ensure your irrigation system is running efficiently. To minimize water waste caused by faulty systems, it is recommended that a visual inspection be completed once a month during the irrigation season.

Turn on each zone individually to identify sprinkler head issues within each zone – common issues are provided in a chart on page 4. Most controllers have a test or manual run option that, when held down, will allow you to set run time and zone/station number using arrow buttons.

Drawing out a map of your sprinkler head types by zone can be helpful in properly identifying heads that may need adjustments or repairs (figure 1).

Take note of, and adjust sprinkler heads that overthrow water onto pavement surfaces. **If run-off is caused by a damaged head or nozzle, prioritize the repair of those sprinkler heads first to reduce water waste immediately, or turn zone run-time to zero for this zone until repairs can be made.**

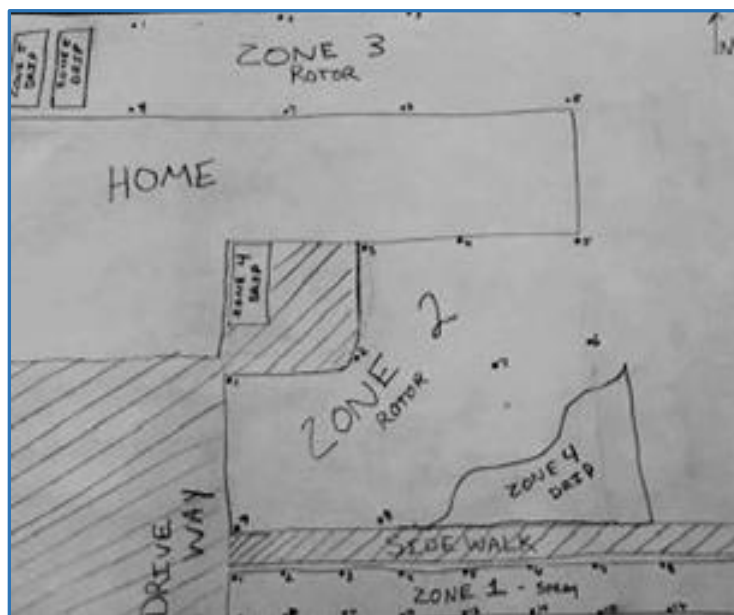





Figure 1: Example irrigation system map

**TIP:** Most sprinkler heads can be easily adjusted by using specialized manufacturer tools. There are many helpful video resources available online (by searching the make and sprinkler type) which cover a variety of sprinkler head types and their adjustment options.

## Types of Sprinkler Heads and Why They Matter

Knowing what type of sprinkler heads are in each zone can help you understand how long run times should be set for and what type of adjustment tools/extra parts you may want to keep nearby when performing a visual inspection.

Below are photographs of the three main types of sprinkler head types that you might encounter. Drip lines are typically located below the soil or mulch surface of perennial plants and shrubs and are not shown in the images below.

Fixed and Variable Arc Nozzle Pop-ups	Rotor Sprinkler Heads	Rotating/MSMT Pop-ups
 <ul style="list-style-type: none"> <li>- Fixed nozzles are most common, but having variable arc nozzles within fixed sprinkler zones can result in a mixed zone and uneven water distribution.</li> <li>- Fixed pop-ups are best used in smaller areas ~ 4'-15' wide.</li> <li>- Average flow of about 1.5"-2" per hour.</li> </ul>	 <ul style="list-style-type: none"> <li>- Outputs water at ½ the rate of fixed pop-ups.</li> <li>- Designated for larger areas 16'-40' wide.</li> <li>- Average flow of about .5" per hour.</li> </ul>	 <ul style="list-style-type: none"> <li>- Nozzles can be installed on spray head bodies and are the most water efficient pop-up for Bozeman's clay rich soils.</li> <li>- Ideal for areas 8' -30' wide or greater.</li> <li>- Average flow of about .5" per hour.</li> </ul>

\*Photo Credit: Outdoor Water Assessment Guidebook, Aurora, CO Water, Water Conservation Division.






[https://www.auroragov.org/UserFiles/Servers/Server\\_1881137/File/Residents/Water/Water%20Conservation/Outdoor-water-assessment-guidebook.pdf](https://www.auroragov.org/UserFiles/Servers/Server_1881137/File/Residents/Water/Water%20Conservation/Outdoor-water-assessment-guidebook.pdf)

Fixed and variable arc nozzles are some of the highest water using nozzles that can be installed on pop-up sprinkler heads. Because Bozeman has clay rich soil, water may run-off quickly from irrigation if water is applied too fast.

Most pop-up nozzles are interchangeable and can be removed simply by pulling up the sprinkler riser and clamping it in place while the system is off. Then simply twist off the top nozzle piece.

For maximum water efficiency, it is recommended that any fixed or variable arc nozzles be replaced with the appropriate rotating or multi-spray, multi-trajectory nozzle. **Check out the City's Outdoor Rebate Program!**

## Common Irrigation Issues and Fixes to Maximize Outdoor Water Efficiency

Issue	What To Look For	What To Fix
<p><b><u>Broken or Damaged Sprinkler Components</u></b></p> 	<ul style="list-style-type: none"> <li>- Spewing water</li> <li>- Water pooling</li> <li>- Water flowing quickly</li> <li>- Low pressure</li> <li>- Heads that might be trickling</li> </ul>	<ul style="list-style-type: none"> <li>- Replace broken head body or nozzle</li> <li>- Replace broken or damaged piping below the surface</li> <li>- If minor sputtering is caused by debris inside the nozzle - remove and clean the nozzle before replacing</li> </ul>
<p><b><u>Mixed Sprinkler Head Types Within a Zone</u></b></p> 	<ul style="list-style-type: none"> <li>- Different sprinkler head types within the same zone (Drip, pop-up spray, and rotor sprinkler heads should all be on separate zones)</li> </ul>	<ul style="list-style-type: none"> <li>- Select the most appropriate sprinkler head type for the zone and replace any sprinkler head types that do not match with the selected type</li> </ul>
<p><b><u>Sunken or Buried Sprinkler Heads</u></b></p> 	<ul style="list-style-type: none"> <li>- Heads that are not visible when system is off</li> <li>- Heads that cannot spray above the surrounding turf</li> <li>- Water spewing at the ground surface</li> </ul>	<ul style="list-style-type: none"> <li>- Dig up sprinkler body until you reach the main connection pipe and install appropriate extension/riser between the main pipe and sprinkler body</li> </ul>
<p><b><u>Tilted or Misaligned Sprinkler Heads</u></b></p> 	<ul style="list-style-type: none"> <li>- Heads are not aligned perpendicular to the ground</li> <li>- May be indicated by yellowing areas (hot spots) or overthrow onto pavement</li> </ul>	<ul style="list-style-type: none"> <li>- Dig up sprinkler head and align the body upright in the ground – this may require the installation of additional soil for support</li> </ul>
<p><b><u>Obstructed Sprinkler Heads</u></b></p> 	<ul style="list-style-type: none"> <li>- Shrub, tree, and plant limbs, lampposts, electrical boxes, fences, furniture, toys, and mailboxes that might be in the path of sprinkler head's throw</li> </ul>	<ul style="list-style-type: none"> <li>- Remove the obstruction if possible or move the head away from the obstruction – turf removal surrounding obstruction might also be an option if sprinkler head is also converted to drip for any additional plantings</li> </ul>

\*Photo Credit: Outdoor Water Assessment Guidebook, Aurora, CO Water, Water Conservation Division.

[https://www.auroragov.org/UserFiles/Servers/Server\\_1881137/File/Residents/Water/Water%20Conservation/Outdoor-water-assessment-guidebook.pdf](https://www.auroragov.org/UserFiles/Servers/Server_1881137/File/Residents/Water/Water%20Conservation/Outdoor-water-assessment-guidebook.pdf)

## Programming Your Controller

### Why We Irrigate

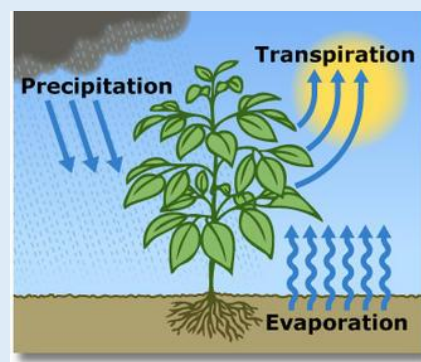
Irrigation controllers help regulate watering times and days within a week.

Supplemental water applied to your landscape through irrigation is used by the vegetation on your landscape to replace water lost through evapotranspiration.

**Knowing how to properly program and adjust seasonal watering schedules into your controller can potentially save thousands of gallons of water per irrigation season!**

#### Evapotranspiration (ET)

ET is the water lost by **evaporation** from the land surface and **transpiration** which is water lost by plant water uptake (through roots) and release (through leaves).



[https://www.usgs.gov/special-topic/water-science-school/science/evapotranspiration-and-water-cycle?qt-science\\_center\\_objects=0#qt-science\\_center\\_objects](https://www.usgs.gov/special-topic/water-science-school/science/evapotranspiration-and-water-cycle?qt-science_center_objects=0#qt-science_center_objects)

### Basic Features of Irrigation Controllers

Many irrigation controllers allow for add-on technology that can convert a traditional controller into a weather-based or smart irrigation controller. If you already have a weather-based 'smart' irrigation controller then make sure to change the default efficiency settings. In most cases the default efficiency is set to 75% which can result in application of more water than your lawn may need.

Does your controller need an upgrade? **Save water and money by Checking out the City's Outdoor Rebate Program!**

Irrigation controllers should be monitored and adjusted regularly for seasonal changes. It is recommended that your controller's basic feature settings be checked at the beginning of the season to ensure all features are programmed properly for the watering season. Most traditional irrigation controllers have the basic features that are listed on the following page.

#### 1. Stations/Zones

A set of sprinkler heads or dripline in a given area that are connected to the same irrigation valve.

## 2. Programs

- Allow you to create more than one watering schedule that could be turned on or off for seasonal changes.
  - o **Example:** program A could be scheduled for spring/fall season watering needs and program B could be scheduled for the peak watering needs.
- If scheduled correctly, programs can allow you to group zones that have similar watering needs into the same program.
  - o **Example:** turf grass may need to be on a 3-day watering schedule whereas shrubs/perennials may only need a 2-day watering schedule.

**CAUTION:** Many controllers will run all programs scheduled regardless of their overlap with another programmed schedule.

Double check and/or remove all watering days from any scheduled programs that you DO NOT wish to utilize to avoid overwatering your landscape.

## 3. Watering Days

Programs can be set to run on specific days of the week. Some controllers have pre-set watering day schedules that will water once in a specified number of days.

## 4. Start Times

The start time is the programmed time that your irrigation schedule will start running on a watering day. You'll want your watering schedule to be complete by 8am. Most irrigation controllers have multiple start time options which is beneficial when utilizing a cycle and soak schedule. Cycle and soak watering schedules are ideal for Bozeman's clay rich soils (cycle and soak is discussed on page 7).

**CAUTION:** if there are 2 start times scheduled then the run time scheduled will run twice in a watering day.

Check to make sure that your start times correspond with your run time if you utilize a cycle and soak schedule.

## 5. Run Times

Run time is the amount of time that a zone is scheduled to run on a watering day based on the type of sprinkler head.

- **Example:** Rotors can run twice as long as pop-up spray heads and still deliver the same amount of water (see general run time guidance on page 9)

## 6. Seasonal Adjustment

This feature allows you to quickly adjust every zone's run time by a percentage. The most water you will need to irrigate takes place in July and August – seasonal adjust can be utilized in spring and fall to easily adjust your scheduled run-time. Typically, seasonal adjust set to 100% will run each zone for the set run time (some models of controllers have a hundred percent of scheduled minutes running when seasonal adjust is set to 0% so you may need to research this in advance). 50% seasonal adjust would cut the scheduled run time of each zone in half. Some controllers allow you to adjust up to 200% which would double the scheduled run time for each zone.

## Programming Basic Features of an Irrigation Controller

Irrigation controllers can often times be intimidating, but most controllers are relatively simple to program once you understand the basics. Below are some general tips to get you started!

- Make sure that the proper date/time are set on your irrigation controller to ensure your scheduled start times are accurate.
- Decide/verify what programs you are going to utilize and only schedule features for those chosen programs. Writing down the seasonal schedules will be helpful in making minor adjustments as weather conditions change.
- Check the start times that are scheduled and make sure they correspond with the run times and watering days that are scheduled.

### 1. Stations/Zones

- These might be listed as numbers on a dial OR under “Run Times” depending on the make and model of your controller.

### 2. Programs

- Sometimes these are buttons labeled A, B, C, and D, or can appear as a switch on your controller (smaller units may not have more than one programming option).
- If you are new to taking control of your irrigation controller then you may want to stick to using only 1 program option for now (select the program you want to use and make sure all other programs have either 0 run days, 0 run times, or 0 start times scheduled).
- Using multiple programmed watering schedules can be useful if all features under each program are appropriately set.

### 3. Watering Days

- Most controllers allow you to customize the days you wish to water and many have pre-set options (or both). It is recommended that you only water 3 days per week in the peak watering season to reduce overwatering.
- Most controllers allow you to turn on or off watering days and are sometimes indicated by a water droplet on days that will water and a circle with a line through it for days that are NOT scheduled to water.

### 4. Start Times

- You will want the start times to begin after 6pm for afternoon watering schedules and no later than 6am for a morning watering schedule. It is recommended that from 8am until 6pm no irrigation schedules be ran to avoid water loss through evaporation.
- Start times can typically be changed using arrow or plus/minus buttons and can be set to 0 by passing 12am.
- Cycle and Soak methods are highly recommended and use multiple start times (see page 8).

### 5. Run Times

- While on the run time option, many controllers have an advance button that helps you move through zones, and arrow or plus/minus buttons to add minutes to the zone.

## Cycle and Soak Method

Majority of Bozeman soil is a clay-loam texture and has very fine particles that form dense clusters and are unable to absorb large quantities of water at one time. Due to this clay-rich soil type, water takes a relatively long time to make its way through the soil towards the plant roots. A cycle and soak watering schedule will slow down water application and minimize water run-off waste. Efficient application of water onto your landscape starts with seasonal adjustments to your controller's run times and by applying a *cycle and soak watering method*.

'*Cycle and soak*' is a term for breaking one run time into two or three shorter run times.

**Example:** A 20 minute run time on your watering day would translate into 2 cycles of 10 minutes, with at least 45 minutes of soak time between cycles (if you have more than 8 zones, you may need to decrease the amount of 'soak' time to accommodate the efficient watering window from 4am to 8am).

The cycle and soak method can improve turf health and resiliency while applying less water to your landscape.

**TIP:** Run each zone and monitor the amount of time it takes before you start to see water run-off onto the pavement. This will help you gauge how many cycles you may need to apply to your landscape to minimize water waste via run-off.

## Determining Turf Watering Schedule

To reduce irrigation waste to evaporation, it is best to only irrigate between the hours of 4am and 8am. Each lawn is different and may require different watering times depending on the efficiency of your irrigation system. To determine how much water your turf grass needs you can complete a DIY catch can test! Free catch can test rentals are available at 20 E. Olive St – call 406-582-3220 or visit [www.bozemanwater.com](http://www.bozemanwater.com) and select the Water Conservation button for more information!

### Follow the steps below to complete your own catch can test!

You can use tuna cans, graduated cylinders, or any low container with a flat bottom— all containers must be the same size for proper measurements and calculations. To find out how much water your sprinkler system delivers, follow the steps below:

1. Identify what sprinkler 'zone' you are going to test. Zones with rotor spray heads deliver less water than zones with pop-up spray heads so you will want to complete a test for each zone separately.
2. Place 12 flat bottomed containers evenly within the zone. The number of containers needed will vary based upon the size of the zone and the number of sprinkler heads within the zone.
3. Run the sprinkler zone for 15 minutes.
4. At the end of the 15 minutes, use a ruler to measure how much water is in each container, add it all up, and document the total inches of water.
5. Divide the total amount of water measured by the number of containers you used to get the amount of water your sprinkler zone used in 15 minutes.



6. Use the chart below to find out how much time you need to water your lawn to ensure it is getting no more than 1" of water per week.

HOW LONG TO RUN YOUR SPRINKLER ZONE EACH WEEK								
The amount of water your sprinkler zone uses in 15 minutes (from step 5 above)	0.2in	0.3in	0.4in	0.5in	0.6in	0.7in	0.8in	0.9in
How many minutes you need to water each week	75	50	37	30	25	22	19	16

## Recommended Generalized Watering Schedule

The generalized watering schedule below was created using specifications of water output based on sprinkler head type and takes into account turf-grass water demand as well as weather conditions. The schedule below represents a cycle and soak method of watering and watering times are adjusted for average climate changes that take place within an irrigation season.

WATERING MONTH	NUMBER OF CYCLES	TRADITIONAL POP-UP	ROTOR	ROTATING POP-UP NOZZLE
May	2 start times 2-3 days/week	4 minutes	14 minutes	10 minutes
June		6 minutes	18 minutes	12 minutes
July		9 minutes	23 minutes	18 minutes
August		7 minutes	20 minutes	15 minutes
September		4 minutes	14 minutes	10 minutes

**NOTE:** Your irrigation system may require more or less run time based on its actual performance, distribution uniformity, precipitation rate, and weather conditions. **Monitor your grass!** If areas of stress appear just before the next watering day begins, your watering times should be about right. This will save our water resources and your money without seriously affecting your lawn's appearance!

Interested in a customized watering schedule? Schedule a free sprinkler system assessment with our trained staff by calling 406-582-3220! We will check your system and develop a customized report including system repair needs, ways to improve efficiency, and a watering schedule specific to your property and sprinkler system.