The Homeowner's Guide to Landscape Irrigation Design & Installation

Provided by

MEDFORD WATER COMMISSION

200 S. Ivy St. Room 177

Medford, Oregon 97501

541.774.2430

Table of Contents

Overview

A beautiful landscape is not only enjoyable to the homeowner, but it adds to the value of the home and surrounding properties. However, in our local area where very little rain is received for much of the summer, most properties rely on supplemental irrigation to sustain landscapes. Landscape irrigation systems have in turn become popular for the convenience they provide for their owners. Logically, these systems should also provide water savings through their potential for uniform water application and ability to water during nighttime hours. However, these systems can often fail to live up to this potential due to a combination of poor design, equipment issues, improper installation and scheduling practices. While no sprinkler system will ever apply irrigation water perfectly, a well-designed, well-maintained automatic sprinkler system can provide dependable irrigation and water savings for years to come.

If you are contemplating making changes to your existing landscape or installing a new one, we hope that making it water-wise will be among your objectives. Here are just a few of the many benefits of a water-wise landscape:

- **Beautify Your Property –** A well designed water-wise landscape adds aesthetic appeal to your property, and can be customized into any style you desire - from formal courtyards to edible gardens to lush backyard retreats.
- **Reduce Maintenance –** Plants that are appropriate for our local climate, such as drought tolerant and native species, require less frequent care and maintenance.
- **Save Water –** Water-wise landscaping uses less water than traditional landscaping, which can save you money on your water bill.
- **Protect Natural Resources and the Environment –** Improved water efficiency can reduce carbon pollution and delay expensive water infrastructure expansions.

When you begin to plan your landscape installation or modification, the first matter to decide is who will be performing the work. There are essentially three options for installing your landscape and/or irrigation system: you can perform the entire design and installation yourself, a professional can be hired to design and install your system, or some combination of the two. This guide is intended to help you achieve a quality landscape and irrigation system if you do it yourself, as well as to provide helpful tips if you plant to hire a professional to design and/or install your system. Knowing up front what you should be requesting will make it easier to assess whether prices quoted are a good deal or reflect cutting corners that you will later regret.

Landscape and sprinkler system installations are major projects that are not easily modified later. Thoughtful planning before installation is therefore important. Whether you decide to install a new

landscape and irrigation system yourself or hire a professional to assist, doing it correctly from the start will be much less costly and time consuming in the end.

Make sure you research all materials and installation procedures ahead of time. **If your budget is limited, complete your project in phases.** Doing so will ensure that up-front costs will not prevent you from having a quality project. If you feel confused or uncomfortable doing any portion of the project, it is probably best to hire a professional for that portion. Remember, a landscape professional will only do the work you ask of him or her. You can always install some of the system yourself and hire out only the parts you are unsure about. You can also hire someone separately to prepare your irrigation design.

Design

Landscape

When planting a new landscape, starting with a good plan is crucial. This will save time and ensure the long-term success of your landscape. It is a good idea to **call 811** to have underground utility lines marked before you design your landscape (and ultimately your irrigation) plan. A utility worker will come out and mark the underground lines that are owned by that utility free of charge. In many cases, this will result in lines being marked all the way to the house. However, because the water line between the meter and the house is owned by the property owner, the water utility won't know its location and typically will only locate their line to the meter.

Knowing where the utility lines are ahead of time you avoid them in your plans. Make sure all trees are as far away from utility lines (both underground and overhead) as possible to prevent root or branch interference. Additionally, be aware of all property lines and easement restrictions.

To create your landscape plan, consider all the elements that could affect function and plant survivability. How much sun does your yard receive? Does your property have any slope? What type of soil do you have? Are there any areas with drainage issues? These are all essential questions to answer when designing your landscape plan. *Gathering as much information about your yard as possible before work starts will help with your design.*

A key part of landscape design is referred to as "hydro-zoning." This means grouping plants together that have similar sun and water needs. Do your research on the needs of all plants you want to use and group them accordingly. *Groundcovers, shrubs and trees have very different water needs than lawns. Thus, lawns and other types of plants should never be grouped into the same hydro-zone.*

How will you use your new landscape? Will you want spaces for a vegetable garden or children's play structure? Also, consider stepping stones or paths in locations such as side yards, which will naturally be used as walkways. While it may be quick and easy to roll out sod everywhere, lawns

demand much more water, maintenance and fertilizer than other types of landscaping. *Therefore, if lawn in a given area is not functional, consider other alternatives.* Decks, gazebos, pavers, ground covers, trees or shrub beds can be attractive options. In addition, planting lawns in small, narrow, or irregularly shaped areas is not advised, as these lawns are very difficult to maintain and irrigate efficiently.
If the property has a steep slope, installing terraces with retaining walls is highly recommended. Minimizing slope as much as possible will reduce soil erosion and greatly improve water's ability to soak in, rather than run off.

Also evaluate the amount of time you can spend on your yard to the amount of time the plants will demand. If you only have a few moments to spare each week, water-efficient plants may be for you. They are generally low-maintenance as well as requiring less watering than other alternatives. If you plan to use a landscape maintenance company, low-water plants will still save on maintenance and water costs. **For more information about landscaping ideas and information about water-efficient plants and lawn alternatives, please visit:**

www.medford.watersmartgardening.com

Once you have an idea of desired plant types and locations, you can begin drawing landscape plans. These are aerial outlines of your property upon which you will add planned landscape elements, including plants and hardscapes (walls, walkways, decks, etc.). Carefully measure your yard, house and existing features and plot them onto graph paper. You may want to make several copies to enable you to view a variety of options. Begin filling in your desired landscape. Avoid placing plants so close to your house that the gutters or overhanging roof will block the natural rainfall. *Be sure to include accurate dimensions, providing plants with enough room to accommodate their size at maturity.*

Initially, rough sketches identifying potential locations of general components will be fine. Eventually, however, the layout decided on should be drawn as an accurate landscape plan. Completing a landscape plan before planning an irrigation system is essential; it will impact nearly every aspect of the irrigation design, from types and locations of sprinklers to how the space can be divided into appropriate zones.

Irrigation system

After your landscape plan is complete and landscape watering needs are known, it is time to begin designing your irrigation system. *It is important to plan smart from the start – even if it means you can only afford to construct the project in phases.* Quality design, workmanship and materials will be less expensive and time-consuming in the long run.

A drawing of your irrigation design, like your landscape plan, will not only better assure a good design, but will be extremely helpful when installing the system. *Keep in mind the locations of underground utility lines – you may be unable to dig pipe trenches in or across these areas.* Be very thorough with your measurements, as they will guide your entire installation. Label all pipes, valves, and sprinkler locations, as well as where the main irrigation line will connect with the backflow prevention device and household waterline.

Some home improvement and irrigation supply companies will provide you with a custom system design and shopping list in exchange for purchasing all necessary parts from them. They usually ask for some basic information about your water system and an accurate sketch of your property and landscaping. This can be a helpful service if you aren't comfortable designing the system yourself or if you were going to buy the supplies from that particular company anyway. However, you should still be watchful that the design meets the objectives outlined in this booklet.

System pressure and design considerations

The most important factor when designing your irrigation system is **pressure,** which differs considerably between properties**.** Water pressure, expressed in pounds per square inch (PSI), is what drives the hydraulics of your entire system, so an accurate pressure reading needs to be obtained before any irrigation design begins. Reducing high pressure is as important as accommodating low pressure. Taking a measurement from a hose bib on the house may seem like an easy way to get a pressure reading, however many homes with high pressure have a pressure regulator under their house (some owners might not even know it's there). *This may give you a false measurement of the pressure that is actually available for your irrigation system.* The most accurate way to find how much available pressure you have is to call your water supplier. During the planning process, pressure will ultimately influence a number of decisions:

- ***Excessive pressure -*** As a rule of thumb, if your system pressure is above 65 PSI, you will need a pressure regulator for parts or all of your sprinkler system. High water pressure can exert excessive force on a system, resulting in faster wear and more frequent breaks. It will also distort spray patterns and turn spray into fine particles that simply blow away. Pressure that exceeds the range specified for the sprinklers leads to significant water waste. Using pressure-reducing valves in conjunction with a main pressure regulator is highly recommended.

- **Low Pressure -** If your system pressure is below 40 PSI, you will need to keep sprinkler zones small, or if pressure is extremely low, you may wish to consider a booster pump. ***PLEASE NOTE: Pumps cannot be directly connected to public water systems.*** The pump is not allowed to pull water faster through the meter. Doing so reduces pressure at nearby

properties and may eliminate the positive pressure that normally inhibits dirty water from getting into pipes in case of leaks or breaks. In general, the water must be collected in a tank before moving through the pump. If a booster pump is necessary, contact your water purveyor for specific installation requirements and permits.

- **Static vs. Operating Pressure –** Static pressure is the pressure available before water starts moving through pipes and fittings. Operating pressure is the pressure available to work the sprinklers when the water is moving. It will be less than static pressure based on what the water passes through on its way to the sprinklers. For example, there will be pressure losses from friction as the water passes through every component from pipes to valves.

- ***Valve locations* -** Valves connect the irrigation mainline to downstream lateral sprinkler lines. If low pressure is an issue, valves need to be placed as close to the sprinkler heads as possible. This may mean that the valves end up farther away from the controller location, which would necessitate more wire to connect them to the controller.

- ***Sprinkler types* -** In general, there will be a pressure loss of 15 PSI from static pressure as water flows through the meter, backflow prevention device(s) and valves before it reaches the sprinkler heads. Keep this in mind when selecting sprinkler types, as different sprinklers require different operating pressures. Sprinklers with a standard spray pattern work best with pressures between 25-30 PSI. Sprinklers with rotating streams perform best within a pressure range of 35-45 PSI. Gear driven rotors operate best above 30 PSI, with an optimum pressure around 45 PSI. Drip systems work best between 20-30 PSI. Attempting to operate sprinklers outside these pressure ranges will result in unsatisfactory coverage. As noted earlier, significant water waste will occur if pressure is higher than recommended as water drops will atomize into a fine mist, which is easily blown away.

- ***Sprinkler spacing* -** A good irrigation system will provide sprinkler overlap, referred to as "head-to-head coverage." This means that the spray from one sprinkler head reaches to all the adjacent heads. For any given lawn area, coverage should come from at least two sprinklers, ideally three, with a maximum of four. Obtaining complete coverage may prove difficult in curved, narrow or irregularly-shaped lawn areas.

  Keep in mind that he longest throw radius listed on sprinkler packages can only be obtained with a very specific operating pressure at the sprinkler head. Your system's operating pressure will most likely be above or below this desired pressure, which will affect the sprinklers' throw radius. Make sure you plan accordingly and adjust your sprinkler locations as needed to ensure head-to-head coverage in lawn areas.

If overhead watering will be utilized in shrub areas, complete head-to-head coverage may not be necessary, as shrub roots can reach for water even if it isn't applied perfectly. However, shrubs can also obstruct spray patterns to the extent that even more sprinklers would be needed to obtain coverage. Using drip irrigation in shrub areas is therefore more efficient than overhead irrigation.

- ***Sprinkler locations –*** Head to head coverage is best achieved by placing sprinklers in corners and around the periphery of lawn areas, not just in the interior spraying outward. All sprinkler heads should be approximately equidistant from every surrounding head. Placing heads solely in the center or on only one side of a lawn area causes poor coverage that can lead to water waste and/or loss of landscape elements.

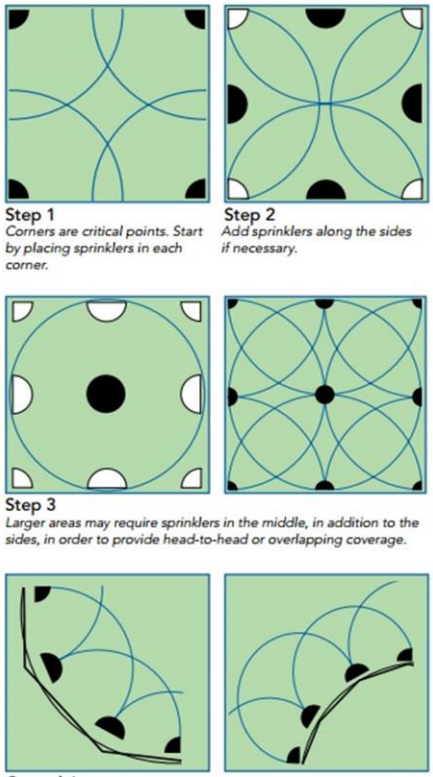
  If you have an existing landscape, draw it out with accurate dimensions, then determine where you will need to place sprinkler heads or drip emitters to accommodate your plants. Pay close attention to necessary coverage, immoveable obstructions and corner angles. If locating sprinklers in a certain landscape area is not feasible, it may warrant a modification of your current landscape and/or irrigation plan.

- ***Number of sprinklers in each zone*** **-** The more water you run at one time, the lower your pressure will be. This is critical when determining how many sprinklers to include in each zone. If too many sprinklers are included in a sprinkler zone, your sprinklers might not even have enough pressure to pop up. **It is always best to leave a little extra capacity in each zone to accommodate some pressure fluctuation and future modifications.**

  In the case of high pressure, some may think that creating a large zone with lots of sprinkler heads is great and will work in lieu of a pressure regulator. However, doing so will result in a large pressure difference between sprinklers in the zone. Pressure at the heads closest to the valve will only

Design Tip

When locating sprinklers for turf areas, ideal coverage can be obtained by following these simple steps (Photo courtesy of Hunter Industries):



Step 1
Corners are critical points. Start by placing sprinklers in each corner.

Step 2
Add sprinklers along the sides if necessary.

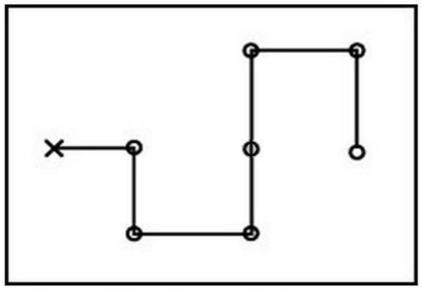
Step 3
Larger areas may require sprinklers in the middle, in addition to the sides, in order to provide head-to-head or overlapping coverage.

Curved Areas
Convert curved areas to a series of straight lines; place sprinklers the same as you would in square or rectangular areas. Adjustable arc nozzles on spray heads work very well in curved areas.

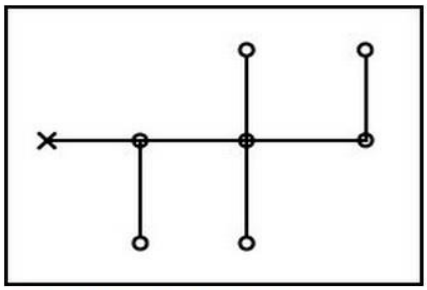
slightly reduced, while heads at the end of the line may not receive enough pressure to function properly. Zones with many sprinklers may also exceed maximum safe flow standards. So again, **it is better to keep sprinkler zones modest in size.** The improvement in performance will more than make up for the small additional expense for more valves and pipe.

- ***Length of pipe*** - *Keep in mind that pressure will dissipate as water moves further away from the valve*. Installing long, winding lengths of pipe will negatively affect system pressure and in turn, sprinkler performance. The correct method of piping a zone minimizes the distance that water has to travel to each sprinkler, thereby reducing pressure losses.

The following diagram might help when planning your pipe layout:



Wrong Way To Lay Pipe



Right Way To Lay Pipe

Determining zones

Your irrigation system will need to be divided into zones, which are groups of sprinklers or drip irrigation served by separate valves. At a minimum, the front and back yards are generally placed in different zones. Most yards will require additional zones. Also, keep in mind that all plants on a zone will have the same watering schedule. This means that all plants within a given irrigation zone should have similar water and sun needs. As lawn areas tend to need more frequent watering than other plants, they should always be in different zones than shrubs and trees. **Also, because different sprinklers apply water at very different rates, only one sprinkler type should be used within a zone.**

Once you have divided your landscape into basic zones based on weather needs and sun exposure, determine if you will need to subdivide into further zones based on hydraulic factors such as the maximum safe flow rate that can be run at a time. Each sprinkler model or drip emitter flows at a certain rate defined by gallons per minute (GPM). This can be found on product packaging or the manufacturer's website.

To determine the amount of water needed in a given area, add the GPM of all sprinklers or drip emitters that will be serving the area. The maximum safe flow that can be run at one time, without

undesirable pressure losses, is usually around 8-12 GPM for residential properties (assuming the property has a typical 5/8" meter).

To find the **minimum** number of zones a landscape area will need, divide the total GPM of sprinklers in the area by the design capacity:

Sum of all sprinklers GPM ÷ Max GPM per zone = MINIMUM number of zones required

If your answer has a decimal, always round up to the next nearest number. For example:

40 GPM ÷ 12 GPM = 3.33 = MINIMUM 4 zones needed

However, as a rule of thumb, *each zone should only use around 75% of design capacity.* So, in the example above, 4 zones would technically work, but 5 zones would be a safer choice. This would mean each zone would be running 9 GPM, which is 75% of the maximum design capacity of 12 GPM. Setting up your zones this way will ensure that there is still some capacity left for household uses and possible future irrigation modifications. Down the road, it is much easier if you can add a sprinkler to an existing zone than having to create an entirely new zone. Regardless, you should avoid adding too many sprinklers to a zone, since high flow rates can create undesirable pressure losses and reduce performance of the entire zone.

If you are completing your project in phases, make sure you include future zones in the plan. It's much easier to add in new zones when the space and connections are already laid out. Also, make sure you get all the necessary basics installed in the first phase – controller, valve boxes, backflow prevention devices, etc. This may also include some pipes, so that you won't be forced to tear up portions of earlier phases to extend irrigation in a later phase. If your plan requires placing pipe under a hardscape (such as a driveway or patio), include pipe sleeves under or through the paved areas in your design. Installing these sleeves during early phases will be very appreciated later, providing an easy route to send sprinkler pipes through when completing later phases.

Selecting materials

Backflow prevention device - Every irrigation system is required by state health law to have backflow protection. "Backflow" is a reversal in the direction of normal water flow. This can sometimes happen if there is a city mainline break or fire hydrant use in the area. If a backflow prevention device is not present, contaminated water in irrigation piping can be pulled back into the house and public supply. *Backflow assembly devices require a plumbing permit, as well as testing and inspection, since irrigation systems are tied to household and public water supplies.*

In order to assist you with choosing a backflow prevention device, the Medford Water Commission has developed a complete backflow prevention guide, which is available via the "Backflow Prevention" link on its website at www.medfordwater.org. You can also obtain the information by

calling 541-774-2450. In addition, call your local water supplier and building department to inquire about any permitting and backflow prevention regulations they may have.

There are many different types of backflow prevention devices available, but some types provide better protection and some types are not permitted in certain circumstances. If you would like the device to be installed underground and out of sight, choose a double check valve. Other options, including Atmospheric Vacuum Breaker (AVB) and Pressure Vacuum Breaker (PVB) assemblies require a minimum installation height above the highest downstream piping, which means the devices will be highly visible and may be vulnerable to weather or damage.

When comparing costs , you should avoid making initial cost the only deciding factor. Remember that a separate AVB is required for each irrigation zone, so savings will diminish with each additional zone. Also, AVBs are not testable, so there is no way to be sure if they are actually working. For this reason, AVBs are not recommended, and are not allowed at all in some areas.

Pipe - In our climate, where we usually don't have to worry about deep freezes, PVC pipe is the most common pipe used for irrigation systems. White PVC piping is not resistant to UV radiation, so it should always be buried to prevent it from becoming brittle. There are two common types of PVC pipe: class pipe, which refers to the maximum amount of pressure the pipe can withstand, and schedule pipe, which refers to the thickness of the pipe walls. The most commonly used PVC piping for residential irrigation is schedule 40 or class 200 PVC.

The preferred pipe to use for an irrigation system is "Schedule 40" PVC. While the initial one-time cost is more than class 200 pipe, its thicker walls will cut down on the frequency and severity of future problems. **Using quality materials from the start will greatly contribute to the longevity of your system.**

"Class 200" means the pipe can withstand a maximum of 200 PSI of internal pressure. Some people will choose this pipe because a residential sprinkler system will never reach 200 PSI, and because it is a cheaper option. However, class 200 pipe is not rated for static pressure conditions, so the 200 PSI limit does not apply in these situations. For this reason, class 200 pipe should not be used for irrigation mainlines that are under constant pressure. Its walls are relatively thin, so it is also more likely to crack if dropped during transport or hit with a shovel. Many times, small cracks in Class 200 pipe are not even discovered until they are in the ground and pressurized.

Another pipe characteristic to consider is the diameter, or size of the pipe. The bigger the pipe, the more water it can carry at once. Smaller pipes have more pipe surface contact area relative to the volume of water transported. This causes more friction, resulting in more pressure loss as compared to a bigger pipe. Recognize that the diameter of the pipe is based on the outside diameter. The thicker the pipe wall is, the smaller the inside diameter will be. *Therefore, irrigation mainlines should generally be no less than 1" in diameter, and preferably be 1¼" piping*. Similarly,

1” piping for all lateral lines is preferred. This will generally assure sufficient GPM for the zone without causing too much pressure loss.

Isolation valves – It is **highly advised** to install a master shutoff valve as close as possible to the point where the main irrigation line connects to the main water line serving your house. These simple shut-off devices are relatively inexpensive, extremely useful, and a valuable addition to any irrigation system, yet often are not included. These will enable you to easily turn off the water supply to your sprinklers without having to shut off water to your house as well. This is beneficial when winterizing and when making repairs to the sprinkler system. In addition, an isolation valve upstream of each manifold (group of valves) will enable you to work on sections without having to turn off the entire system. Ball valves are good choices as they open and close with only a quarter turn, making them durable enough to stand up to frequent use. Shutoff valves should always be placed in valve boxes where they can be easily accessed.

Sprinkler valves - The size of sprinkler valve needed is directly dependent on the maximum GPM that will flow through the zone. Most residential applications can use a 1” valve, which will typically handle ½-30 GPM.

Additionally, some valves come with manual flow controls rather than just being fully opened or closed. These valves have a handle or screw that can be turned to adjust the amount of water that flows into the zone. This can be a very useful feature and can enable you to reduce pressure somewhat to tailor it to each sprinkler zone. It will also be useful to increase or decrease flows if you decide to add or cap sprinklers in the future. **Adjustable valves do not cost much more than non-adjustable types, so choosing them is a worthwhile upgrade.**

If your irrigation water comes untreated from a stream, lake or irrigation canal, choose filtering or “scrubbing” valves. These types of valves have filters that are automatically scraped clean when the zone is turned on and off in order to keep the valves operating properly.

When choosing valve boxes, make sure you have an idea of the locations and dimensions of the valves once they are in the ground. The valve box should be large enough to fully cover valves with at least 2 inches of working space around each valve and between valves and the valve box walls. All handles and levers should be able to fully turn without obstruction.
Sometimes multiple small valve boxes will better fit the site than a single larger box. Valve boxes should also have cut-outs on the sides for pipes to enter. Rest the box on a brick or block and not directly on top of the pipe, as that can put pressure on the pipe and may result in leaks.

Sprinklers - There are many sprinkler models available, and selecting the right ones will help you tailor irrigation to almost any landscape. First, measure the area to be irrigated. This will determine how far your sprinklers need to reach. When selecting sprinklers, consider the following:

- Standard sprays: These sprinklers are best for covering relatively small or irregularly shaped lawn zones. However, spray sprinklers are the most likely to atomize and waste water under excessive pressure. Spray distance generally ranges from 4'-15' at 20-30 PSI.
- Rotating sprinkler nozzles: Covering the medium range of about 8'-30' at 25-50 PSI, these nozzles can be installed on existing spray sprinkler bodies. They are available in similar nozzle sizes as sprays, but apply water less quickly (which helps water soak into the soil instead of running off or pooling).
- Gear-driven rotors: These sprinklers can cover distances of 13'-50' at 60 PSI, making them best for large lawn areas and/or higher pressure situations. Impact rotors are another option; however, their internal parts are exposed, so dirt, bark, or grass blades may cause damage to them.
- All sprinkler pop-ups should have a **minimum pop-up height of 4 inches** in lawn areas to provide enough clearance above the grass.

Selecting spray nozzles can be somewhat complicated, but it can be made easy with an accurate landscape plan and a little knowledge about spray patterns. The graphic to the left can help you visualize fixed spray patterns *(Photo courtesy of Rain Bird®).*

Sometimes, sprays need to water areas that fall somewhere between the standard arc options. To solve this issue, many manufacturers have developed adjustable spray nozzles, which allow you to easily adjust the spray patterns to your landscape. While adjustable nozzles can be adjusted to spray patterns from 1 to 365 degrees, they do not apply water as accurately as fixed nozzles. Variable arc spray nozzles also often have higher application rates than fixed patterns. Therefore, it is best to only use them where fixed nozzles would not work.

Most rotary nozzles are adjustable by default. Gear-driven rotors can be adjusted to any spray pattern using the adjustment screw on the top of the sprinkler.

Shrubs, trees, groundcovers and flowers will usually be better served by drip and/or micro-spray irrigation, which can apply water directly to roots. Using drip will also prevent the issues of obstructed spray and watering on bare dirt.

Since sprays, rotors and drip irrigation have very different application rates, they should never be mixed within a single zone. Also, it is not recommended to mix sprinklers from different manufacturers within a zone as each company's product can have different flow rates. Mixing sprinkler models will result in water application that is not consistent throughout the zone.

If you will be using gear-driven rotors, water output and degree of rotation should be balanced between all heads as much as possible. While it may not be possible to perfectly balance output and spray distance, keep in mind that if a sprinkler will be covering a full circle, it should have a nozzle that applies close to twice the volume of the nozzle on a sprinkler spraying a half circle with the same radius, and so forth. Rotor nozzles are sized in GPM, so for example, if you have a half-circle rotor that applies 2 GPM, then a full circle nozzle on the same zone should apply close to 4 GPM, and a quarter nozzle should apply around 1 GPM.

It can also be helpful to utilize low angle nozzles for the higher volume sprinklers, and use the adjustment screw as this can provide a shorter spray distance while still increasing water output. Replacing nozzles is not difficult, but since nozzle selection can be complicated, you may wish to obtain some assistance from an irrigation dealer or professional.

Drip irrigation - Trees, groundcovers and shrub beds can be attractive alternatives to lawns. They add interest, color and privacy, while also being easier to maintain and irrigate than lawns. However, trees and shrubs have very different water needs than lawns, so serving these areas with a drip system is often the best option. Drip irrigation applies water directly to the plant roots, which not only uses less water, but

Design Tip

If your property has any slope, the lowest sprinkler on each valve will drain the water remaining in the pipe for the entire zone every time it turns off. This is called "low head drainage" and is a significant waste of water. In addition, the resulting need to refill lines every time the system turns on can put a lot of stress pipes and sprinkler heads. It is therefore recommended to select sprinkler models that have built-in check valves whenever some sprinklers will be lower than others. These models have an extra seal that prevents low head drainage. It is best if all sprinklers in a sloped zone are equipped with check valves to stop low head drainage completely. At a minimum, equip all the lower sprinklers, realizing that part of the pipe will still drain through any lower sprinkler that lack check valves. If only the lowest sprinklers have check valves, the water will inevitably find its way out through the next lowest sprinkler.

This same situation can occur if automatic drain valves are installed. These are sometimes installed to prevent water from freezing within pipes during cold months. However, after a zone shuts off, the drain valve opens to allow the remaining water to flow out every time the zone runs, whether it's hot or cold. This wastes water in the same way that low head drainage does. In addition, auto drains will often fail to close, creating pressure loss in the system.

Therefore, if you are thinking about installing drain valves, it is best to install manual ones. These will retain pipe water during normal months of operation while still allowing you to drain the system during winterization. These drains should always be placed at the lowest point(s) on the pipeline, preferably within a small round valve box so that they are easy to access.

also virtually eliminates problems experienced with overhead sprinkling such as obstructed spray patterns, moldy leaves and watering a lot of bare ground, which in turn leads to weed growth. As a bonus, drip irrigation is very "user-friendly," meaning it is much easier to install, expand and customize than traditional sprinkler types.

The most popular form of drip irrigation consists of flexible black tubing that lies above or just under the soil surface. In general, there are two sizes of drip tubing: ½ inch and ¾ inch. Which size to use is mostly personal preference, but the chosen size should be consistently used throughout the drip system, as the two sizes are not compatible with each other. Be mindful of which size you will use when purchasing tubing, fittings and other components.

Near each plant, smaller tubes with drip emitters on the end come off the larger tube. Emitters may be installed directly into ½" tubing, but doing so will eliminate some of the customizability of the system. The emitters apply water directly above the plant's root area, which results in far more efficient water application when compared to sprinklers. With drip irrigation, there is often much less fertilizer/nutrient loss due to leaching and soil erosion. Water distribution can also be closely tailored to the needs of each individual plant.

It is best to have more than one emitter per plant in order to distribute water around the roots evenly. Drip irrigation operates in gallons per hour (GPH), in contrast with overhead irrigation that operates in gallons per minute (GPM). Therefore, drip irrigation is intended to be operated a few days a week with fairly long run times. Additionally, it is generally recommended that drip systems be equipped with filters and pressure regulators. Consider adding these components to prevent emitter clogging or related problems.

There are many factors used in determining the size and number of emitters each plant needs, and emitter selection may be somewhat complicated. To simplify this process, you can use the Rain Bird® "Point Source Emitter Calculation Tool," which can be accessed at:

softwarerepublic.com/rainbirdps

Enter the required information about the particular plant you would like to water, and the tool will calculate size and number of emitters needed for your plant.

While using emitters with smaller "spaghetti" tubing is one option with drip irrigation, there are many more to choose from. For instance, many stores have "laser" tubing available, which is tubing with small holes punched in every 6-12 inches. This can be useful in annual flower beds or garden boxes where plants are installed in fixed patterns. Another similar option is called "soaker" tubing, which allows water to soak out slowly through the entire length of the tube. If you prefer your plants to have overhead watering, use spaghetti tubing with "micro-spray" emitters. These emitters provide overhead watering that is much gentler on plant foliage than standard sprays.

Wire – Irrigation wire is used to connect electric valves to the controller, and is normally buried under the mainline pipes. Wire must be rated UF (Underground Feeder), which is specially made to stand up to damp, underground conditions. Additionally, waterproof wire connections should be used in valve boxes to prevent wire corrosion. These special wire nuts are filled with a gel substance that seals out water.

Controller / Timer box – The controller is the brain of your entire irrigation system, and choosing one that will fit your needs is particularly important. While controller selection is mostly a matter of personal preference, there are many convenient features available. Look for these in a potential purchase:

- **Multiple programs -** Since water needs differ from one part of a landscape to another, most timers provide the ability to run two or more distinct irrigation programs or schedules. These control the watering days and start times for all zones placed within the program. For example, you could include all lawn zones in Program A, running four days per week with three start times per watering day, while placing shrub areas on Program B for two days a week with four start times each watering day. Then within Program A, you might run a sunny lawn zone for six minutes each start time, a shady lawn zone for four minutes, and not include any watering of these zones in Program B.

- **Multiple start times** - This provides a simple way to run irrigation cycles more than once each watering day. It is particularly helpful in sloped areas and/or in clay soils (as is the case in much of our local area). This feature allows you to apply water in layers, giving it time to soak in between cycles. As an example, instead of irrigating with a single long cycle, you could schedule irrigation to run three consecutive short cycles, with start times beginning at 1:30 a.m., 3:00 a.m. and 4:30 a.m. Total watering time will be the same, but by breaking it up, water will soak in better and less of it will be lost to runoff.

- **Percentage** or **Seasonal Adjustment -** This feature allows you to adjust the watering times for all of your sprinkler zones at once with a single button, making frequent adjustments very easy. This enables you to increase or decrease watering times in 10% increments. Having a controller with seasonal adjustment can prove very useful in the spring and fall, when temperatures and rainfall can vary widely from day to day.

- **Weather-based "Smart" controllers -** While fairly new and not yet common, this style of sprinkler timer automatically adjusts watering times based on current weather conditions. While these timers provide precise and appropriate scheduling, they require more expertise for initial setup and fine tuning.

Installing your irrigation system

Once your irrigation plan is complete and all materials have been purchased, you can begin the installation process. Before any work starts, these two steps must be completed:

- **Call 811 three days BEFORE any digging begins to re-mark utility lines (unless the original markings are still clearly visible).**
- **Contact your local water supplier and building department to make sure any required permits are obtained.**

When this is done, begin your installation by marking all planned sprinkler, valve and backflow device locations with flags. Use line marking spray paint to outline trench locations. The lines you mark will be the exact location of your trenches, so be precise and refer to your irrigation plan often. Since PVC piping is rigid, it should not be forced to bend around curves. Doing so can cause future problems that are difficult to repair. Rather, always put pipes in straight trenches, and use glued fittings to make changes in direction. Although there are fittings with different angles, those that turn 90 degrees are the most common, and it is usually best to use them to make perpendicular turns.

Trenching

When digging pipe trenches, it is best if the soil is slightly moist. It is difficult to work with soil that is either wet or totally dry. Additionally, it is much easier and faster to use a mechanical trencher than to dig by hand. These can be rented from local equipment dealers. Mainline trenches should be dug to a minimum depth of 18 inches, while lateral lines should be at least 12 inches deep. If the trencher hits any large rocks it will begin to bounce, in which case the trencher should be turned off and the rock should be dug out and removed with hand tools. No large/sharp rocks or debris should remain in trenches. Also, if you are in doubt, allow the trencher to dig deeper because it is easier to place dirt back into a trench than dig the trench deeper by hand if it is not deep enough.

If pipes or wires will be going under paved surfaces, either now or in the future, install larger pipe sleeves in these locations before these areas are paved. Without sleeves, hard pavement will rest directly on the pipe and may cause frequent breaks. If later repairs or changes are necessary, a pipe sleeve will also provide a much-appreciated pathway to feed pipes and wires through.

If tunneling under an existing concrete path or driveway is necessary, pipe sleeves should be installed at that time. There is a chance that pipe sleeves may have been put in place for future uses when the existing concrete was poured. To determine if this is the case, it may take some digging around to find them.

Laying wires & mainline piping

First, you will need to shut off the water at the meter and cut into your service line in order to connect the irrigation mainline. This is called the "point of connection" (POC) and it should be as close to your water meter as possible. *If you are not comfortable doing this, you can hire a licensed plumber or backflow certified landscape contractor to do this portion of the project.* Make sure a shutoff valve is installed at the POC, so that the irrigation system may be turned off without affecting the household water. This very inexpensive addition is too often forgotten. Place this in a small round valve box so it is easy to access.

If you will be using a double check backflow prevention assembly, it is best to connect it to the mainline within the first six feet of downstream piping from the POC. No sprinkler valves should be located upstream of a double check assembly. In addition, double check backflow assemblies should always be placed in valve boxes below the soil surface. There should also be a minimum of 12 inches of clearance underneath it (for testing and servicing). If the clearance underneath is achieved by simply digging out below the backflow device, the soil will eventually work its way back in and will have to be dug out again. An easy way to avoid this problem and get the clearance underneath is to bury a second valve box upside down under the backflow assembly, then place the original valve box on top of it.

If your property's water pressure is higher than the manufacturer's specifications for your sprinklers, a pressure regulator should also be installed. It is a good idea to install it after the backflow assembly and before the electric valves.

Electric wires need to extend from the controller to each electric valve. Wires and pipes can be buried in the same trenches, and in fact, pipes placed over wires can help protect the wires from shovel strikes or otherwise being accidentally cut or nicked. It is a good idea to leave a good amount of slack in the wire instead of pulling it taut in the trenches. A different colored wire should be installed from the controller to each valve solenoid, and a common neutral (white) wire should connect all solenoids to the controller. "Multi-strand" wire, which is a bundle of different colored wires in one sheath, is a good option.

When laying your pipes, start with the irrigation mainline. This pipe connects your house's service line to each sprinkler valve or set of valves (referred to as a manifold). The irrigation mainline will be continuously under pressure, whereas lateral lines (the pipes that connect the valves to the

sprinklers) are only under pressure when the zone it serves is operating. If you plan to have valves in more than one location, the mainline will need to extend to each manifold.

It is possible to have more than one pipe in a trench, as long as they lay side-by-side so each pipe can be easily accessed. Pipes should be "snaked" through the trenches at a rate of six inches per 100 feet to allow room for expansion/contraction. If needed, it is possible to bury multiple pipes in the same trench, as long as they are side-by-side with one pipe-width between them. This will ensure that each pipe can be accessed easily in case repairs are needed.

Use standard PVC cement glue to connect lengths of pipe and fitting joints. Although some pipe glues do not call for it, primer should **always** be applied to the surface of all mainline pipe and fittings. It is a good idea to use primer for lateral lines, though not always essential.

Dirt, debris, excess glue and PVC shavings can cause problems in valves and sprinklers**.** Therefore, the mainline should be flushed before the electric valves are installed. **IMPORTANT: Let all glue dry for at least 24 hours before pressurizing the pipe.** Flush the pipes after all connections are complete, and make sure no dirty water gets back into the pipes after flushing.

Connecting valves & lateral piping

Consider installing unions (fittings that allow quick disconnection of pipes and valve for maintenance or fixture replacement) on both ends of each valve, or at least on the downstream side of the valve. This will make the valve easier to service or replace in the future. Having a union on each side will allow you to replace a valve without having to cut and re-glue any PVC, as it simply screws on-and-off. Installing a union on only the downstream side will require more effort to change out the valve, but will eliminate the need to cut & glue any PVC. Installing a union only on the upstream side of the valve means a valve repair can keep your entire system turned off longer than necessary. While not mandatory, union installation is a relatively small one-time expense that can be much appreciated in the future.

Valves should be installed with at least 2 inches of space between each valve as well as the wall of the valve box. This will ensure there is adequate space to properly operate and repair the valves. If you will be using valves with built-in AVB backflow prevention devices, be sure they are installed meeting required height standards of 6 inches above any downstream piping. Similarly, when using a PVB for backflow protection, the PVB must be 12 inches above downstream piping, though the valves can be lower. More information in this regard is available from the MWC backflow prevention guide mentioned earlier. Be aware that if backflow protection is provided by AVBs or a PVB, these devices MUST be located above ground and may have to be well above grade, particularly if the site slopes upward from the location of these devices. For this reason and others, the double check valve assembly is often the preferred choice for backflow protection.

Once the valves are installed, you can begin laying your lateral piping. Use the same "snaking" method as you did with the mainline. Let all glue dry for at least 24 hours, and be sure to flush the lateral lines before connecting sprinklers.

Connecting sprinklers and drip components

Wherever a sprinkler is going to be located, you will need to cut the pipe and add a PVC fitting with female threads. While this can be placed in the exact location of the sprinkler, with threads facing upward for the sprinkler to screw into, it is better to use "swing joints" to connect sprinklers to the PVC fittings. This makes it easier to move sprinklers and adjust them to ground level now and in the future. When using this connection method, the PVC fitting is usually installed with threads facing sideways, into which one end of the swing joint is screwed. The sprinkler is then screwed into the other end of the swing joint.

When installing your drip system, the main drip pipe can be buried up to 4 inches below the soil if desired. Many people prefer to place them close to the soil surface where they are easier to find later and will be less likely to get pinched by plant roots. All emitters should be above ground and staked in place. Drip emitters are most effective when located midway between the plant's trunk and the "dripline" (the outer limit of the plant's branches). Since the dripline expands as the plant grows, it is best to move and expand the emitter array every year or two. It is good practice to provide two or more small volume emitters per plant rather than a single large volume emitter. This will provide water more uniformly to the root area, and will assure that the plant still receives some water if an emitter malfunctions or clogs. It is also recommended that drip systems be equipped with a filter to prevent clogging issues, and with a pressure regulating valve to prevent leaks and blowouts. Note that if a drip zone is some distance away from its valve, it is best to use PVC to pipe to the zone, and then attach the flexible drip tubing once there.

Once all sprinklers are connected, remove the insides from the farthest sprinkler on each zone and turn on the system zone-by-zone to flush them once more. Then, reinstall the sprinkler insides and run through the zones again under full pressure to check for leaks or other problems. This should be done before completely covering all your pipes, as **it is much easier and less expensive to correct any problems before the system is buried.** Rather, put some dirt on the pipes so they don't move around, but leave all glued joints exposed, known as "shade backfilling." Turn each zone on and look for leaks from pipe joints or wet spots near the pipe, which may indicate a crack or poor connection.

This will also enable you to operate the system on bare dirt, allowing you to see the wetted sprinkling patterns on the ground to confirm proper water coverage. You can make any sprinkler position and flow adjustments as necessary to obtain head-to-head coverage. You may want to do

a catch-can test now. It is the best way to measure sprinkler system volume and uniformity. For instructions on conducting a catch-can test, please visit:

http://www.tampagov.net/sites/default/files/water/files/Efficiency/Do-It-Yourself-Sprinkler-System-Checkup-Guide.pdf

Take your time and ensure the whole system is operating to your complete satisfaction before covering it up. When backfilling your system, the soil should be compacted moist (but not wet) in order to reduce settling. The soil in the trenches should match the surrounding ground level.

Finishing touches

Mount your controller in a logical place and leave adequate space around it for easy access. If you will be mounting your controller outside, be sure the controller is rated for outdoor use. The electrical connection for an outdoor controller is something that should be done by a licensed electrician.

Getting a thorough irrigation analysis from a third party can save you a lot of money and hassle before you finish your landscaping. If you are a Medford Water Commission customer, you can receive a free sprinkler system analysis after the system is installed. A trained irrigation specialist will inspect the entire system and check for leaks, pressure and coverage problems, and will do a "catch-can" test to provide an irrigation schedule for your lawn areas. For more information, or to schedule an appointment, call **541-774-2436**.

Once your irrigation system is finished and in the ground, it's time to beautify your landscape!

Planting your landscape

Soil preparation

Most soils in this area have a very high percentage of clay. Clay absorbs water so slowly that the water will run off if applied too quickly. It can impede plants' ability to absorb water and nutrients from the soil. Therefore, soil improvement is very important for both plant health and water efficient landscaping. The entire area to be landscaped should have the soil prepped, not just individual plant holes. This avoids the issues associated with landscapes that are not properly done. Follow these steps to prepare your soil for planting:

- Make sure soil is relatively dry before starting
- Spread any desired topsoil
- Open, or "rip" the soil to a depth of twelve or more inches
- Remove any sharp rocks or debris over an inch in diameter
- Apply soil amendments. Fully aged compost is highly advised. Use a minimum of 3 cubic yards per 1000 square feet, up to 6 cubic yards for best results.

- Adding a similar amount or more of sand will also help keep pore spaces open in the soil for water and air to penetrate
- Till soil and compost mixture to a minimum depth of six inches

In addition to the previous steps, you may want to address any pH or nutrient issues before planting. At-home soil testing kits are an inexpensive way to check for soil problems. They can be found at local garden supply or home improvement stores.

A recent practice that has also been shown to benefit new plants is the addition of "mychorrizae" during planting. Mychorrizae are a special fungi that attach to plant roots, enabling plants to absorb water and nutrients better, which can improve plant health with less water and fertilizer. Undisturbed soils are often full of beneficial soil organisms such as mychorrizae, but these tend to be lost through compaction, tilling and pesticides. Adding them back in the planting process can provide a natural means of improving plant health. Mychorrizae are now available at many stores that sell gardening products.

Installing plants

Contrary to the popular belief that spring is the best time to install new landscaping, **fall** is actually the time that is most recommended for planting. The weather and precipitation patterns in our area during that time give plants the best opportunity to adapt to their new surroundings. Plants can establish themselves before the heat of summer sets in. Additionally, there are fewer weeds growing during the fall and winter, so your plants will not have to compete with them.

Lawns – There are two common ways of planting a lawn. The first method consists of broadcasting grass seed over freshly prepared soil. While this is the less expensive option, it takes more time, work and water to establish a lush, green lawn. In addition, growing a full lawn from grass seed takes time, and the seeds have to be kept moist.
The second method is rolling out strips of sod, which provides an instant lawn any time of year, but is much more expensive and still requires the same prepared soil as a seed lawn.

Shrubs and Trees – Dig holes the same depth as the root balls and twice as wide. Remove any sharp rocks or debris bigger than an inch in diameter. Make the bottom edges of holes a little deeper and place a bit of soil in the center of the holes to create small mounds for the plants to sit on. This will cause any excess water to drain away from the roots and prevent rotting. Your soil should already have been amended, so adding additional soil amendments should not be necessary. Fill the planting hole with water and allow it to soak into the soil completely. If the roots of the plant are tightly packed, spread them out gently. Place the plant in the hole and fill in with the soil mix, lightly compacting it. Make sure the plant has the same relation to the surrounding grade as it did in the container before it was transplanted. Be sure to give adequate water and

ensure the root ball stays moist, **but not wet**, for its first full season or two. A soil moisture meter is a good tool to help determine what is happening underground.

Next, place two inches of mulch on top of the entire area that was dug out, except for a few inches around the base of the plant. This will help keep the soil under it moist and cool. Place drip emitters halfway between the base and dripline, expanding as needed after future growth.

Although staking of new trees is sometimes done, the general recommendation is not to stake new trees because they need to move around with the wind in order to develop a strong, anchoring root system. If you feel a new tree would benefit from staking, use two stakes and a flexible tie material that won't cut into the trunk. Place the tie material midway on the trunk and leave a little slack to allow the tree to sway in the wind. As soon as the tree is strong enough to stay upright on its own, remove the stakes.

Groundcovers – Plant groundcovers from cuttings, plugs, or pots in a uniform pattern to ensure even thickness across the desired area. Spread mulch around the plants to discourage weeds, but be sure to move the mulch out from underneath the plant as it grows.

Weed Inhibitors – The use of fabric or plastic ground coverings is not beneficial for good weed control, as they create more problems than they solve. If you want help with weeds, there are chemical and organic methods available. These used in conjunction with at least two inches of mulch will substantially inhibit weed growth.

Scheduling your irrigation

Sprinkler timer basics

Sprinkler timers are the command center for the entire irrigation system, but often have many features that are misunderstood or not utilized. When your timer is properly set, your landscape health can be enhanced while you save thousands of gallons of water each month. On the other hand, an improperly set timer can result in drowned plants, soggy lawns and large amounts of wasted water.

It is important for homeowners to understand how to operate their timers and to realize that they are not "set it and forget it" tools. Rather, watering schedules should be modified throughout the sprinkling season, based on current weather and plant growth periods.

Even if a hired gardener does the sprinkler scheduling, homeowner knowledge is key to providing guidance, communicating expectations and making changes. Ultimately, it is the homeowner who is responsible for the sprinkling schedules, as they pay the water bill and it's their landscape that is impacted.

The easiest way to learn about how to use your controller is to read the instruction manual. If you will be using an existing sprinkler controller and don't have a manual, you can find replacement manuals for most controllers online.

For each timer zone, determine where the valve is located, the type of sprinkler it operates, the plant material it waters and the average sun exposure for the zone. It's then time for scheduling:

- Place lawn in separate programs from other plants. Lawns typically need more water applied more frequently than other plant types. It's best to schedule lawn zones no more than 4 days per week, and shrub zones only 2-3 days per week.
- Running sprinklers during the daytime can cause a lot of the water to evaporate or be blown away. The recommended watering window is between 9 p.m. and 6:00 a.m. when the air is cool and calm.
- Different sprinklers apply water at different rates. For example, standard spray sprinklers apply water much faster than rotating sprinklers, so sprays should be run less than half as long as rotating sprinklers. Drip zones typically are run longer but less frequently. This means that if you have different sprinkler types, their respective zones should not have the same run times, even if the plants and sun exposure are the same.
- Once you've determined how long to water a specific zone for the current week, divide the total weekly minutes by the number of days you will be watering. This will give you the number of minutes to run the zone each watering day.
- It is best to further divide your daily minutes into multiple short cycles, as mentioned previously. For example, divide your daily watering time by three, and enter the resulting minutes into the run times for the appropriate zone(s). Then, set three start times for the program, each spaced only an hour or two apart. This means your sprinklers should come on three brief consecutive cycles each watering day to achieve the total daily watering time needed.
- Be aware that with most timers, **a start time applies to the group of zones included in the selected program, and the zones will run one after the other.** People often mistakenly assume that a separate start time needs to be set for each zone. That usually results in sprinkling starting over and over again.
- Why water your landscape when nature can do it for you? If rain has been received, use the rain delay feature or temporarily turn the timer to the off position.
- Remember to adjust your sprinkling as the weather changes throughout the irrigation season. **Don't fall into the "set it and forget it" trap!**

Lawns

How much do I water?

Your ideal lawn watering schedule will depend on a variety of factors, including current weather, the water application rate of your sprinklers and the amount of sun or shade in the specific locations being watered. We realize that keeping on top of this information can be time consuming, so the Medford Water Commission has developed several resources to help you with your irrigation scheduling.

Our "Sample Lawn Watering Schedule" is based on over 10 years of local weather data. It serves as a good starting point when setting your schedule. To find this schedule online, visit **www.medfordwater.org** and click on the "Sprinkle Smart" link on the left side. You may also call 541-774-2436 to have a copy mailed to you.

As current weather may not match historical average, we operate a "Lawn Watering Infoline" that gives current lawn water needs and sprinkler run times based on recent weather. The Infoline is updated weekly during the irrigation season, and can accessed from the homepage of our website or be heard by calling 541-774-2460. Keep in mind that Infoline numbers are for lawn in full sun. Other plants and shady areas will need less.

These resources assume an industry standard water application rate for spray and rotor sprinklers. Your particular sprinklers may apply water slower or faster than average. If you are a Medford Water Commission customer, you can tailor your irrigation schedule most closely to your individual lawn by calling the Medford Water Commission to schedule a free sprinkler survey. During the survey, the rate at which your sprinklers apply water will be precisely measured and you will be provided with a custom sprinkler schedule for your lawn.

When should I water?

Sprinkling between sunset and sunrise is preferred. If you finish watering by 6:00 a.m., your sprinkling will not compete with other morning water uses and water pressure should be more consistent. Sprinkling during daylight hours is discouraged because sun and wind significantly increase evaporation. Midday watering may even damage your grass. While watering in the early evening is popular, high temperatures and wind are often still a problem at that time of day. Additionally, daytime temperatures often peak around 4:00 p.m. and evening breezes are common, so wait until at least dusk if you prefer evening sprinkling.

Some people water during the day because they believe that watering at night can cause fungus problems. While this can be a concern in parts of the country that have high humidity, this does not tend to be an issue in regions with low humidity, such as the Rogue Valley.

Other people water in the afternoon believing they are "cooling" their landscape, especially turf grasses. Any such benefit is minimal and unnecessary. Additionally, sprinkling in the afternoon

wastes water because winds blow away the water from the landscape target, and the water that does hit the target evaporates more readily in the afternoon heat.

Reduce or eliminate irrigation whenever there is measurable precipitation. This can often be done easily by setting your controller to “RAIN” or “OFF” to shut it off manually until dry weather returns. There are also automatic rain shut-off devices available that are inexpensive and not difficult to install. After sufficient rainfall, the sensor tells the controller to skip the next scheduled watering session. When the rain stops, the controller returns automatically to its regular program.

How should I schedule my watering times?

If your controller has multiple start time capability, utilizing it will allow you to split a day’s watering into two or more cycles. This can be particularly beneficial in our region where clay soils absorb water very slowly. “Cycle and soak” irrigation allows water from each cycle to percolate into the soil before more water is applied. To achieve this, try splitting a day’s watering into three cycles by setting the timer for three start times per watering day, each spaced about an hour apart. You want to make sure to leave enough separation between start times to allow all zones on that program to finish running before the next cycle begins, yet still have cycles spaced close together, **not** one in the morning and another in the evening.

Soil in the landscape area provides not only water to plants, but air as well. Over-watering can be just as damaging as under-watering, since it can potentially cut off the air supply in the soil. Lawns should never feel soggy or “squishy” when walking across them; this is a sign of over-watering. Thus, lawn watering should generally take place no more than 4 days a week. This will allow the soil to dry out some and increase oxygen availability.

Shrubs and trees

How much do I water?

The amount of water needed varies between plants. Therefore, a benefit to using drip systems is that the amount of water applied can be tailored to each plant through varying the size and number of the drip emitters used. With rotor or spray sprinklers, output is measured in gallons per minute (GPM) and the amount of water applied over the area is relatively the same. Drip emitters are measured in gallons per hour (GPH). Using drip, trees get emitters with higher GPH than small shrubs or groundcovers. In this way the differing plant material receives the correct amount of water when all these plants are watered on the same drip zone, as long as you pay attention to how many GPH each emitter discharges and adjust accordingly.

Inexpensive soil moisture meters can help you determine if plants are getting too much or too little water. The great part about drip irrigation is that it’s very easy to change and modify; if you find a

certain plant is getting too much or too little water, you can add emitters to / remove emitters from that plant or change its emitters to ones that have a different GPH.

When should I water?

The main reason to avoid watering lawns during daylight hours is to decrease that amount of water that is lost to evaporation and wind. However, since drip irrigation is applied very slowly and directly to the root area, wind is not a factor. Evaporation is greatly reduced during all hours of the day, so watering only during nighttime hours is not necessary. As with lawn irrigation, reduce or eliminate irrigation when water needs are met by rain.

How should I schedule my watering?

Shrubs typically need 1/3 to 2/3 the amount of water as lawns, and with their larger and more robust root systems, neither require nor prefer water as often as turfgrass. They do best with deeper, less frequent watering. This means that shrubs on a drip system should be watered with fairly long run times no more than 2 or 3 days per week. If all plants on a drip zone seem too dry, add extra watering time, not extra watering days. Shrubs and trees get their oxygen from the soil in the same way that grass does, so skipping irrigation days is very important.

Ongoing maintenance

Landscape

Lawns – With the clay soils typical in our area and the tendency for soil compaction, we recommend that lawns be aerated yearly, generally in the spring, fall or both. It reduces soil compaction, increases air exchange and allows water to infiltrate more quickly into the soil profile. You may also wish to consider top dressing with a light soil mixture such as compost and sand after aeration. Raking this mixture in will help it filter into the aeration holes and should gradually improve your soil. Applying a layer of compost after aeration can further reduce compaction and add beneficial organic material to the soil. Using this method once a year can help you achieve a healthy, green lawn without the reliance on fertilizer or pesticides.

While the use of some fertilizer is generally considered to be helpful, recognize that the more you fertilize, the more you will need to water and mow. Applying fertilizer too frequently can make your lawn fertilizer-dependent, which may result in the inability to bounce back from pest infestations or adverse weather patterns. You may wish to consider organic or slow release fertilizers, and limit how often you apply them. Beginning to run sprinklers and/or fertilizing early in the spring can result in plants diverting energy towards top growth and away from developing roots. Without deep roots, more water is needed to keep plants green throughout the summer. Therefore, it is important to hold off on fertilizer application until May to give the grass a chance to

form strong, deep roots. Fertilization is effective when done immediately following aeration. The aerated soil will absorb fertilizer directly into the root zone.

In our area, cool season turf grasses are the dominant grass species used for lawns. “Cool season” refers to grass that stays green through winter but goes dormant (brown) in the summer if not irrigated. These types of grasses should be mowed no shorter than two inches in the cooler months and three inches plus in the heat of summer. Keeping grass height above these levels will prevent excessive moisture loss from the soil and help promote a healthy, full lawn.

Shrubs and Trees – These usually do not require as much maintenance as lawns, but there are still things you can do to ensure their overall health. Keep mulch replenished as needed, as it can be broken down into the soil or washed away by rain. Maintenance needs are very specific to plant species, so make sure you are fully aware of the care practices each of your plants may need throughout the year. For example, some species, like roses, do best when cut far back during the winter months, while other plants may be damaged by pruning. If you are unsure of how to care for a plant, consult your local gardening store or extension service. In general, keeping an eye on your plants for signs of stress can help you identify problems and work to correct them.

Here are some warning signs to watch out for (from “Xeriscape Handbook” by Gayle Weinstein):

- Changes in plant growth patterns, either sudden or long-term
- Continuous dieback of twigs and stems
- Yellowing of foliage, especially on one side
- Unusual or early leaf and twig color
- Abnormal areas of damaged or loose bark, often caused by mowers, weed-eaters, or other mechanical means
- Unhealthy roots – brown, dry-looking roots may be indicative of dry soil or toxic chemicals; black roots may indicate wet soil or root rot

Groundcovers – Don’t be discouraged if a cold winter causes your groundcover to turn brown. Chances are the roots are still alive and will send out green shoots in the spring. Dead leaves can often be mowed off to create room for new growth and keep groundcover beds looking tidy. Some groundcovers require cutting to the ground every two to three years to maintain their health. Be sure you know the needs of the groundcover you plant.

Irrigation

Well-designed modern automatic sprinkler systems can provide years of dependable service. However, they still contain many mechanical and electrical parts that can fail over time. Other components can be knocked out of alignment or even broken during routine landscape

maintenance. To complicate matters, if you follow our scheduling advice, much of your irrigation system's operation will occur during non-daylight hours. This makes it easy to miss sprinkler system problems.

The following may be helpful in avoiding water waste and the loss of landscape elements:

- Sprinklers can change direction over time. Shrubs and trees may grow and block some of your sprinkler heads. Pipes can break or crack, and rotary edgers can damage sprinkler heads. **That's why it's a very good idea to occasionally observe your sprinkler system's operation.** The easiest way to do this is to use the "manual" operation feature on your controller at a day and time most convenient for you. Then just walk the entire yard looking for leaks, sprinklers spraying the sidewalk, and anything else that looks wrong. **At a minimum, a visual inspection should be performed when the system is activated in the spring, and at least once again during mid-summer, if not once per month.** Remember to space out drip emitters as your plants grow!

- If you have landscape maintenance done by a contractor, you might make this one of his/her duties, particularly if they are responsible for the operation of your sprinkler system. While many gardeners are not irrigation experts, nor licensed to perform sprinkler repairs, they can still help identify problems requiring immediate attention.

- Pay close attention to changes in the appearance of your lawns, shrubs and trees. No one knows your landscape quite as well as you do. If a plant or patch of turf looks wilted or droopy, or is turning yellow or brown, it may be a water-related problem. However, recognize that it could just as easily mean you are giving it **too much** water. In addition, landscape problems may be due to pests or disease, not the amount of water received. Again, a moisture meter can help you determine whether too much or too little water is the actual problem.

Remember: If left unchecked, minor issues can only get worse. Periodically observing your system in operation can mean the difference between a small maintenance issue now and a large, costly problem later. The sooner you take steps to correct landscape problems, the better.

Winterizing

The expense and inconvenience that can result from frozen pipes is one we hope to help you avoid. While there are many winters during which we have no extreme cold spells, they do occur from time to time. Therefore, winterizing your sprinkler system after the irrigation season is over is important; water left sitting in irrigation pipes can freeze, expand and cause an array of problems.

Follow these steps to properly winterize your irrigation system:

- Turn controllers off. You may also wish to disconnect the common wire for the winter to assure that the system can't activate accidentally.
- Shut off water to your sprinkler system. If there isn't a valve to isolate the irrigation system from the main household supply, consider adding one. Valves from backflow prevention devices should not be used for this; they should be left open so they can drain.
- Drain sprinkler components as much as possible. If your system isn't equipped to be professionally blown out with air, briefly removing sprinkler risers or propping them open will help them to drain. This is particularly important for any sprinklers equipped with check valves.
- Installing drains at low points can be helpful. However, if you do so, consider selecting manual drains, rather than automatic drains. That way, you control when the system is drained rather than it occurring after every irrigation cycle.

Selecting a landscape / irrigation contractor

Hiring a trained, licensed landscape professional can give you landscape/irrigation plans to install yourself or provide installation bids if you are unable to design or install your own landscape/irrigation system. While having family or neighbors install your system might be tempting, you should consider hiring a professional to do the work. Partnering with a licensed professional will give you a high-quality system that will keep your landscape looking beautiful while saving you time, money and hassle. It also provides surety bond protection in case problems arise.

When working towards making changes to your irrigation system, please make sure that the person or people you hire to do the work have the appropriate level of license. A Standard Landscape License is not sufficient to install a sprinkler system or make large repairs to an existing system; the contractor must have an "All Phase License" or an "Irrigation Only License". In addition, a special certification is required to install, repair or replace backflow devices, as these connect into your household water supply. Anyone doing work who is not properly licensed risks being fined a civil penalty by the Landscape Contractors Board. You can search for a licensed professional by name or service area at:

http://www.oregonlcb.com/contractorsearch.aspx

In addition to searching the internet or phone book, ask people you know for recommendations, and ask contractors for a few references you can call. Reputable contractors will be happy to provide a list of their satisfied customers. Also, it is suggested that you get a price quote from at

least three different contractors before you make a hiring decision. Be wary of any quotes that are significantly higher or lower than the others. Don't just accept the lowest bid! The contractor may cut corners in order to get you that low price. *A poorly designed or installed system will be more expensive in the end due to costly repairs or redesigns.*

The most important step in choosing a contractor is to ask specific questions ***before*** *you sign anything.* If the contractor dodges your questions or doesn't seem confident when answering, you may wish to find another contractor who is more knowledgeable.

A good contractor will ask questions of you as well. He or she will want to make sure you are comfortable with all design aspects, pricing and functionality before work begins, during installation and after completion. Good communication with your contractor ensures your ultimate satisfaction, and can be well worth a little extra money.

Contracts

According to the Oregon Landscape Contractor's Board (OLCB), a contract for landscaping and/or irrigation work must be comprised of the following:

- Landscape contracting business name, license number, business address and telephone number
- Consumer's name and address
- Address or location of work to be performed (if different from consumer's address)
- General description of work to be performed and materials to be installed
- Estimated time for completion or estimated completion date,
- Price and payment schedule
- Description of guarantee (look for at least a 1-year guarantee on all materials and workmanship). If no guarantee is offered, this should be stated in the contract.
- Signatures of the authorized business representative and consumer
- Statement that the business is licensed by the State Landscape Contractor's Board and the current address and telephone number of the board.
- If subcontractors will be used for the performance of landscaping work, the contract must include a statement notifying the consumer that there will be subcontractors used to perform landscape work.
- Any change or amendments to landscaping contracts and subcontracts shall identify the scope of the change or amendment and be agreed to by both parties in writing.

If you are wondering if an offered landscaping / irrigation contract is in compliance with the OLCB's minimum standards, the OLCB will review your contract for free. Simply send them a blank, unsigned contract and they will send you feedback. Signed contracts are not reviewed.

For more information, contact:

Oregon State Landscape Contractor's Board 2111 Front St. NE, Ste 2-101 Salem, OR 97301

503-967-6291 lcbinfo@lcb.state.or.us

The following checklists can be helpful regardless of whether you will be installing your landscape and irrigation system yourself or if you will be hiring a professional to do the work for you. If you will be hiring someone, the checklists are a great way to ensure that the bids you receive include all the elements that YOU want, and that you will be able to compare bids for the same product and installation. It should help to reduce the chance that the contractor will cut corners in order to save costs and lower the price of your bid.

Materials Checklist

Pipe Materials and Sizes

Optimal configuration (based on zones with 12 GPM or less):

- ☐ Mainline and all lateral lines: Schedule 40 PVC
- ☐ Mainline: 1.25” diameter
- ☐ All lateral lines: 1” diameter

Alternate options:

- ☐ Mainline: Schedule 40 PVC, all lateral lines: Class 200 PVC
- ☐ Mainline and all lateral lines: Class 200 PVC **(not recommended)**
- ☐ Mainline: 1” diameter
- ☐ All lateral lines: 0.75” diameter

Isolation Valves

Optimal configuration:

- ☐ Mainline isolation valve and isolation valve upstream of each valve box

Alternate options:

- ☐ Mainline isolation valve only
- ☐ No isolation valves **(not recommended)**

Backflow Protection (REQUIRED for all systems)

Optimal configuration:

- ☐ Double-Check Valve Assembly (DCVA) on main irrigation line

Alternate options:

- ☐ Pressure Vacuum Breaker Assembly (PVBA) on main irrigation line
- ☐ Reduced Pressure Backflow Assembly (RPBA) on main irrigation line
- ☐ Atmospheric Vacuum Breakers (AVB) on all valves **(not recommended)**

Electric Valves

Optimal configuration:

- ☐ 1” diameter valves
- ☐ Manual flow controls on each valve
- ☐ Union fittings upstream and downstream of each valve

Alternate options:

- ☐ 0.75” diameter valves
- ☐ “Filtering” valves (if necessary)
- ☐ No manual flow controls **(not recommended)**
- ☐ Union fitting on only downstream side of each valve
- ☐ No union fittings

Wire

- ☐ UF rated
- ☐ Waterproof wire nuts in valve boxes

Sprinklers

Optimal configuration:

- ☐ Minimum 4” pop-ups in lawn areas
- ☐ Check valves on every sprinkler
- ☐ Swing joints on every sprinkler

Alternate options:

- ☐ No check valves **(not recommended)**
- ☐ No swing joints **(not recommended)**

Controller

Optimal configuration:

- ☐ Multiple programs
- ☐ Multiple start times
- ☐ Seasonal adjustment

Pressure regulation (if necessary)

Recommended configuration:

- ☐ Pressure regulator on main irrigation line
- ☐ Pressure-regulating sprinkler valves

Alternate options:

- ☐ Pressure regulator only on main irrigation line
- ☐ Pressure-regulating sprinkler valves only **(not recommended)**

Design & Installation Checklist

Before installation

- ☐ Obtain required permits for backflow device(s).
- ☐ Call 811 to have underground utility lines marked.
- ☐ Research sun/shade, water and soil needs for plants. Compare to yard conditions.
- ☐ Develop an accurate dimensional layout of the property and its structures.
- ☐ Design landscape plan. Leave room for plants at mature size.
- ☐ Check water pressure and design irrigation system. Ensure head-to-head coverage.
- ☐ Make a complete shopping list for materials and purchase them. Use quality materials.

During installation

- ☐ Install in phases if budget is limited.
- ☐ Mark trench, backflow, valve and sprinkler locations.
- ☐ Create trenches. Mainline minimum depth = 18”. Lateral minimum depth = 12”.
- ☐ Cut into main service line and make point of connection.
- ☐ Install master backflow device (if not using valves with backflow protection).
- ☐ Lay wire in trenches to connect controller and valves. Leave slack for easy repairs.
- ☐ Lay pipe for mainline. Use primer before applying PVC cement glue to connect.
- ☐ Allow glue to dry for at least 24 hours, then flush lines.
- ☐ Perform a pressure check of mainline, looking for leaks.
- ☐ Install electric valves (with backflow protection, if not using master backflow device).
- ☐ Install drip zone filter & pressure regulator (if applicable).
- ☐ Lay lateral pipes. Connect to electric valves.
- ☐ Allow glue to dry for at least 24 hours, then flush lines.
- ☐ Attach sprinklers with swing joints.
- ☐ Lay drip pipe and install emitters, micro-sprays, etc.
- ☐ Shade backfill pipe and pressurize, check for leaks.
- ☐ Make alignment and flow adjustments as necessary.
- ☐ Attach wires and ensure proper controller operation.
- ☐ Fill in trenches with moist soil and compact to match surrounding grade.

After Installation

- ☐ Thoroughly prepare soil for planting.
- ☐ Install landscape plants.
- ☐ Place emitters / micro-sprays around plant material.
- ☐ Determine appropriate watering schedules and program controller.
- ☐ On occasion, run the system zone-by-zone to check for problems.