



G A R D E N I N G S E R I E S

Colorado MASTER GARDENER

Water-Wise Gardening: Watering Efficiently

no. 7.755

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Of the seven principles of water-wise gardening, attention to irrigation efficiency has the greatest potential for water conservation for most residents. In the typical home yard, extra attention to irrigation system design, maintenance, and management could reduce water use by 20 to 70 percent; 40 percent being average.

Irrigation Zones Reflect Water Need

Unfortunately in the design of many home irrigation systems, little attention was given to zoning by water need.

- **Zone by irrigation demand** – The following examples each have different water requirements and should be independent irrigation zones.
 - High input lawns (routinely irrigated to maintain green growing conditions).
 - Reduced input lawns (allowed to dry during hot dry weather).
 - Low input lawns (non-irrigated lawns that brown in summer heat).
 - Shrub areas.
 - Routinely irrigated flowerbeds.
 - Limited irrigation flowerbeds.
 - Vegetable gardens.
- **Zone by exposure** – Since exposure to sun, heat, and wind also plays a significant role in water requirements, irrigation zones should reflect exposure levels. For example a lawn area on a southwest-facing slope will have considerably higher water requirements than other full-sun lawn areas.

Areas in full or partial shade may have lower irrigation needs than areas in full sun. (Note: If the shady area is free of roots from large trees, water use may be 30 to 50 percent lower. If the shady area has roots from large trees, water use will be similar to sunny areas.)

Irrigation zones should reflect site needs.
- Drip irrigation in shrubs, flowerbeds, small fruits, and vegetable gardens can reduce water usage by 50 percent. For details on drip, microsprayers and bubblers, refer to fact sheet 7.756, *Irrigation Management: Types of Sprinklers*.

Design Criteria for Uniform Water Distribution

Sprinklers do not deliver a uniform quantity of water over their distribution area. Thus to keep the dryer spots green (i.e., spots that receive less water) the rest of the area receives more water than needed. Designing



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sprinkler head layout to provide a more uniform water delivery can significantly reduce water use. Many home lawn sprinkler systems have a 40 to 60 percent efficiency rating, while a 70 to 80 percent rating is very achievable with attention to design and management.

Sprinkler design criteria for more uniform water distribution includes the following:

1. **Head-to-head coverage** – Designs with head-to-head coverage (i.e., the water from a sprinkler head reaches the neighboring sprinkler heads) generally give the most uniform coverage. To fit the space, water distribution from heads may overlap slightly, but in a professional quality design, it is rarely acceptable to spread heads further apart in an effort to reduce installation cost.
2. **Line out the edge** – In the design process, start by lining-out the edges (i.e., run a line of sprinkler heads down the edge of the lawn or irrigated area) spraying onto the lawn but not onto the sidewalk, street, or non-irrigated area.

In sprinkler head design, avoid layouts where sprinkler heads spray from the center of the lawn area out onto the sidewalk. It either wastes 20 percent of the water as it over-sprays onto the sidewalk or creates a dry lawn area along the edge.

3. **Arrange heads in triangle or square patterns** – In the next step of the irrigation design process, fill in larger areas with sprinkler heads in triangle or square patterns. Square and triangle head patterns give the most uniform water delivery.

In irregularly shaped areas, heads easily fall into a pentagon (five-sided) patterns. Avoid these as it creates an area that receives less water than other parts of the lawn. With a five-sided pattern the rest of the lawn will be over-watered to compensate for the lower delivery in this dryer spot.

4. **Avoid irrigating small irregularly shaped areas** – It is basically impossible to sprinkle irrigate small areas (less than 10 feet wide) and irregularly shaped patches without applying water where it's not needed. In small or irregularly shaped areas, consider replacing lawns and other plant materials that require frequent irrigation with low or non-irrigated options. For example, in the narrow side yards

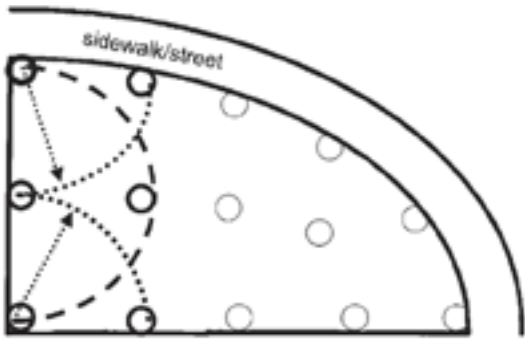


Figure 1. Head-to-head sprinkler coverage.



Figure 3. Avoid placing sprinkler heads in the center of the lawn.

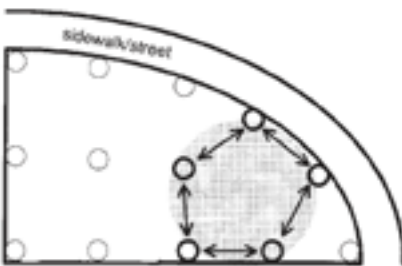


Figure 5. Avoid pentagon-like patterns in your sprinkler design. This formation creates an area that receives less water than other parts of the lawn.

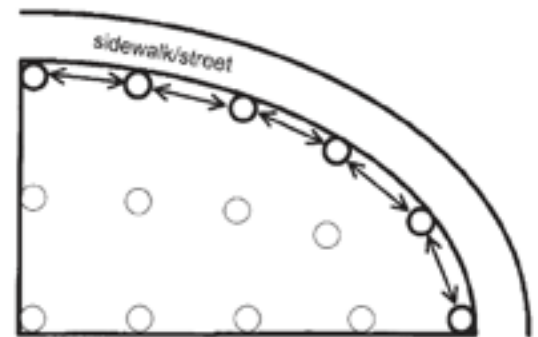


Figure 2. Line the outer edge of the lawn and spray onto the property to reduce water usage.

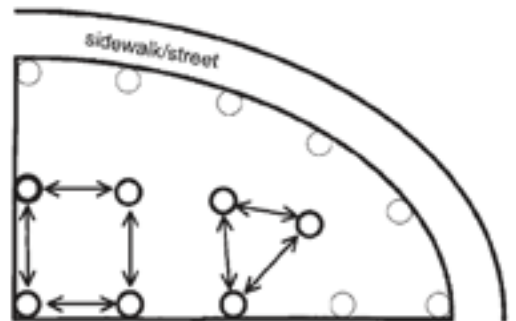


Figure 4. Square and triangle head patterns give the most uniform water delivery.

around urban homes, consider a low water requiring ground cover or a nonirrigated mulch area.

5. **Use recommended water pressure** – Water distribution patterns change with pressure. Use the pressure recommended for the specific sprinkler head in use. Most sprinklers in the home garden trade are designed to operate at 30 to 50 psi. While commercial heads typically operate at 40 to 100 psi. Some heads have a built-in pressure regulator.
Some communities have pressure regulators on home water lines. In situations where the irrigation pressure is too high, install a pressure regulator on the main distribution line for the irrigation system.

Maintenance Criteria for Uniform Water Distribution

We've all noticed that blown sprinkler head down the street that goes unfixed for weeks. A problem with automatic sprinkler systems is the gardener may not be aware of a system malfunction. Check the irrigation system's operations frequently.

As water-wise gardening concepts spread in our community, we need to adapt the practice of alerting neighbors to popped sprinkler heads and other system malfunctions. With an automated sprinkler system, many residents or landscape managers may be unaware of the mechanical failure.

Maintenance issues for uniform water distribution include the following:

- **Adjust delivery angle** – Sprinkler head (particularly rotor type heads) frequently require adjustment of delivery angle to keep water on the irrigated areas and off non-irrigated areas.
- **Adjust sprinkler heads to vertical** – Distribution patterns change when the head tilts off vertical alignment.

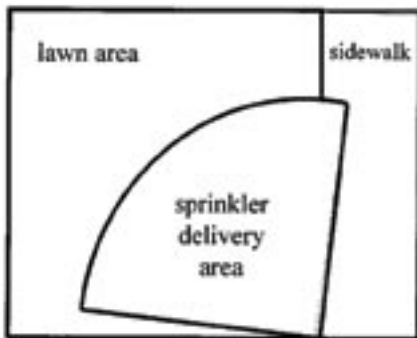


Figure 6. Adjust sprinkler heads regularly to ensure proper water distribution.



Figure 7. Make sure to monitor sprinkler performance often as the water distribution can change when the head tilts.

- **Adjust head height** – When water flow doesn't clear the grass height, the distribution pattern can be distorted. Raise heads to release water above grass height. On the other hand, an excessively high sprinkler head can be a trip hazard and can interfere with mowing.
- **Replace worn heads** – As sprinkler heads wear, distribution patterns change giving a

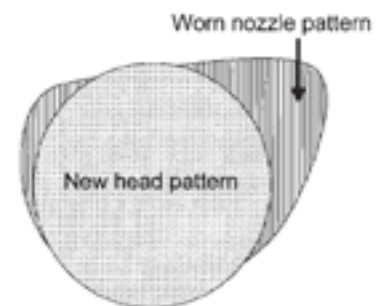




Figure 8. Make sure all sprinkler heads clear the grass height.

less uniform water delivery. Periodically replace old worn nozzles/heads.

- **Adjust pressure** – A mist cloud around a sprinkler head indicates that the water pressure is too high for the head. Reduce pressure to avoid wasting water. When adjusting pressure, slowly drop the pressure until you see water flow just start to drop, then up the pressure just a touch.
- **Replace leaky valves** – In an irrigation valve, the rubber diaphragm that actually turns water on and off ages over time. Valves that don't shut-off completely need the diaphragm or entire valve replaced.

Management Criteria for Water-Wise Irrigation

- **Know the precipitation rate for each irrigation zone** – The first step in irrigation management is to calculate the precipitation rate for each zone. For details, refer to fact sheet 7.757, *Irrigation Management: Converting Inches to Minutes*.
- **Adjust run times to match water needs of each zone** – Since distribution patterns and precipitation rates generally vary from zone to zone, run times should be set for each irrigation zone based on precipitation rates. Most irrigation controllers are set with all zones receiving the same run time. This results in zones that need less water being overwatered.
- **Adjust irrigation controller for the season** – As summer temperatures increase, water use goes up; as cooler fall weather moves in, water use goes down. Unfortunately, most gardeners have their controller set for the summer, and never adjust the controller. Most lawns and gardens are grossly overirrigated in the spring and fall, wasting around 40 percent of the water used over the season. Iron chlorosis is a common symptom of springtime overwatering. Several methods can be used for irrigation scheduling. For details, refer to fact sheet 7.758, *Irrigation Management: Methods to Schedule Irrigation*.
- **Try applying water at 80 percent ET** – With issues of water shortages, many residents will find satisfactory lawns irrigating at 80 percent of ET. Watch how the grass is doing over a period of time. If stressed areas show up before the next watering, you are probably managing the application about right. In hot weather, the bluegrass lawn may go dormant, but will green up when cooler weather returns. For details about ET refer to fact sheet 7.758, *Irrigation Management: Methods to Schedule Irrigation*.
- **Turn off sprinklers in rainy weather** – Manually shutting off the sprinkler system during rainy weather is another effective management tool. An inexpensive investment (around \$25) to help manage the irrigation system is a rain shut-off sensor. In many parts of the country, but not Colorado at this time, local ordinances require rain shut-off sensors.
- **Soak and Cycle** – On slopes, and compacted or clayey soils that restrict water infiltration, use multiple short irrigation periods. This allows the water to soak in without creating wasteful runoff. Most clayey and compacted soils can't absorb water as quickly as sprinklers apply it. Many clayey soils, typical of the Front Range, absorb about 1/4 inch of water per hour. Therefore, the most effective watering schedule on these soils would be to set each zone to deliver no more than 1/4 inch per cycle with multiple cycles. For example, if the lawn is to have 1/2

As the gardener fine-tunes the management of his irrigation system, dry spots will show-up. This indicates that he is successfully walking the edge on ideal irrigation management.

inch of water, set the controller to apply ¼ inch of water and then an hour later apply the second ¼ inch. If the lawn is to have ¾ inch, set the controller to apply ¼ inch per cycle with 3 cycles set an hour apart.

- **Dry spots** – The common approach for managing dry spots is to increase the amount of water applied. While it may green-up the dry spots, it also overwaters the rest of the lawn, wasting water. To evaluate a dry spot, first place some identical, straight-sided, flat bottom cans out to measure the water applied, comparing the amount of water received in the dry spot to other green areas. The gardener will quickly know if correcting the dry spot is a water delivery problem (like a malfunctioning head or design problem) or a soils/plant problem (like compaction, thatch, and root damage) and can then take appropriate corrective action.
- **Aeration** is a key tool to increase water infiltration. Aeration may be useful spring and fall on lawns with a lot of traffic (children and dogs), compacted clayey soils, and slopes.
- **Water deeply and infrequently** to develop a deep root system that gives the plants more resilience in hot dry weather.
- **Water in night or early morning hours** – To reduce water loss from evaporation, water between 9:00 in the evening and 9:00 in the morning. Water pressure is typically better in the night or early morning hours. In many areas, wind drift is less in the early morning hours. (Note: Some cities find peak water use from 4 to 6 in the morning as automatic sprinkler systems come on. To help the community avoid spikes in water demand, remember the suggested watering window is 9 in the evening to 9 in the morning, not just 4 to 6.)
- **Change out heads** – Most brands of sprinkler heads have adjustments on the distance watered OR a variety of nozzles that can be interchanged to change the distance of water distribution or change the delivery rate. Often just a change in nozzle can improve performance.
- **Manually activate the controller** – A simple method to manage lawn irrigation and conserve water is to manually activate the controller. Turn the controller to off. When the lawn shows signs of water stress (color change from green to grayish-blue and foot prints remaining), turn on the controller to run through the irrigation cycles. Then turn the controller off again. This management technique was strongly encouraged by many cities during the drought of 2002.

Colorado Master Gardener training is made possible, in part, by a grant from the Colorado Garden Show, Inc.

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