MASTER GARDENER
COLORADO STATE UNIVERSITY
EXTENSION

CMG GardenNotes #265

Methods to Schedule Home Lawn Irrigation

Irrigation Scheduling

In many areas of the semiarid West, gardeners cannot count on natural precipitation to deliver moisture at the right times or in sufficient amounts to grow most introduced landscape plants. Supplemental irrigation is necessary unless the plant pallet is limited to species tolerant of natural precipitation levels. Due to limited precipitation and periodic droughts that limit available water supplies, using efficient irrigation is of interest to all.

Scheduling landscape irrigation is a critical part of lawn and garden care. When irrigating, gardeners have two goals: 1) water enough to keep plants healthy, and 2) minimize water waste.

Irrigation management comes down to two basic questions: 1) "How much?" and 2) "How often?" Gardeners often hear recommendations such as "water deeply and infrequently" or "water to adequate depth without runoff." Such advice is usually too broad to translate into effective irrigation management practices.

Rather than using broad generalizations, this CMG GardenNotes looks at several management approaches with differences in the time investment and potential water savings. **The textbook figures will need to be fine-tuned to the specific site needs, considering soils, exposure, heat, wind, and other water-use factors.**

Methods focus on cool-season turf, such as Kentucky bluegrass and turf-type tall fescue. Xeric and dry-land plants may need significantly less water.

Sprinkler-Type Method

One of the easiest ways to schedule an irrigation system is based on sprinkler type. Different types of sprinklers deliver vastly different amounts of water in the same amount of time. By considering sprinkler type, gardeners can begin to match their watering practices to the lawn's water needs. Pop-up spray heads typically apply 1-2½ inches of water per hour, whereas rotor heads only deliver ¼ to ¾ inch of water per hour. Therefore, zones that have pop-up spray heads can run for a short time, while zones with rotors will need to run longer to deliver the same amount of water.

A gardener could estimate that a zone with pop-up spray heads applies 1¾ inches of water per hour, and zones with rotor head apply about ½ inch per hour on average. **Table 1** estimates run time based on historical water use. The typical Colorado soil requires that this be split between a couple of irrigations.

Table 1.
Estimated Sprinkler Run Time Based on Sprinkler Type for Cool-Season Lawns

	Late April	May & June	July & August	September	Early October
Inches of water per week (Irrigation plus rain)	0.75"	1.0"	1.5"	1.0"	0.75"

Run Time (minutes/week)	Late April	May & June	July & August	September	Early October
Pop-up Spray Head[1]					
Irrigated 1 time per week[3]	**26**	**34**	**52**	**34**	**26**
Irrigated 2 times per week[4]	**13**	**17**	**26**	**17**	**13**
Irrigated 3 times per week	9	11	17	11	9
Irrigated every 6 days	22	29	45	29	22
Irrigated every 5 days	19	24	37	24	19
Irrigated every 4 days	15	19	30	19	15
Irrigated every 3 days	11	15	22	15	11
Irrigated every 2 days	7	10	15	10	7
Rotor Head[2]					
Irrigated 1 time per week[3]	**90**	**120**	**180**	**120**	**90**
Irrigated 2 times per week[4]	**45**	**60**	**90**	**60**	**45**
Irrigated 3 times per week	30	40	60	40	30
Irrigated every 6 days	77	103	154	103	77
Irrigated every 5 days	64	86	129	86	64
Irrigated every 4 days	51	69	103	69	51
Irrigated every 3 days	39	51	77	51	39
Irrigated every 2 days	26	34	51	34	26
Percent of July/August	**50%**	**67%**	**100%**	**67%**	**50%**

1 Pop-up spray head estimated at 1 ¾" per hour.
2 Rotor head estimated at ½" per hour.
3 Recommended for most Colorado soils in the spring and fall.
4 Recommended for most Colorado soils in the summer.

An easy tool for making seasonal adjustments is the **Percent Key** found on most controllers. The controller would be set for the July/August irrigation schedule. The percent key would be set at 50%, 67% or 100%, based on the season.

This method will need fine-tuning as described below to match the actual water need for the site based on soil, exposure, heat, wind, etc.

Although this method outlines a starting point for gardeners who want an easy approach, it does not factor in the actual water application rates for each zone.

Precipitation Rate Method

A far better approach is to do a **Precipitation Rate (Catch Can) Test** on each zone to determine the actual water delivery rate (known as ***precipitation rate***). The actual precipitation rate is determined by the sprinkler type and brand, water pressure, and head spacing. It may be slightly different for each zone.

To do the calculations you will need six identical, straight-sided, flat-bottomed cans such as soup, fruit, or vegetable cans. (Do not use short cans like tuna cans as they are too shallow, and water may splash out.) You will need a ruler, a watch and paper/pen to record your findings. Many water providers and sod growers have calibrated plastic cups specifically designed for this test. Again, six are needed.

Precipitation Rate (Catch Can) Test

Step 1. Place six identical, straight-sided, flat-bottomed cans randomly around the area between sprinkler heads in the same zone.
Step 2. Turn on the sprinklers for exactly ten minutes.
Step 3. Pour all the water into one can.
Step 4. With a ruler, measure the depth of the water in the can. **This is your precipitation rate in inches per hour.** Write it down for future reference.
Step 5. Repeat steps 1 and 2 for each irrigation zone.
Step 6. Use **Tables 2** and **3** to calculate the run time for each zone.

Note: If the amount of water in some containers is significantly more or less than others, the system is poorly designed, or head(s) are malfunctioning.

In many lawn sections, one zone waters the area from the left while another zone waters the same area from the right. In this situation, cut run times for zones in half, so that each applies half of the needed water.

An easy way to make seasonal adjustments is with the **Percent Key** found on most controllers. The controller would be set for the July/August irrigation schedule. The percent key would be set at 50%, 67% or 100% based on the season.

This method will need fine-tuning as described below to match the actual water need for the site based on soil, exposure, heat, wind, etc.

Tables on next page.

Table 2.
Minutes to Run Sprinklers PER WEEK Based on Precipitation Rates for Cool-Season Turf in Colorado

	Late April	May & June	July & August	September	Early October
Inches of water per week (Irrigation plus rain)	**0.75"**	**1.0"**	**1.5"**	**1.0"**	**0.75"**
Precipitation Rate					
1/4	180	240	360	240	180
3/8	120	160	240	160	120
1/2	90	120	180	120	90
5/8	72	96	144	96	72
3/4	60	80	120	80	60
7/8	52	69	103	69	52
1	45	60	90	60	45
1 1/8	40	53	80	53	40
1 1/4	36	48	72	48	36
1 3/8	33	44	65	44	33
1 1/2	30	40	60	40	30
1 5/8	28	37	55	37	28
1 3/4	26	34	51	34	26
1 7/8	24	32	48	32	24
2	23	30	45	30	23
2 1/8	22	28	42	28	22
2 1/4	20	27	40	27	20
2 3/8	19	25	38	35	19
2 1/2	18	24	36	24	18
2 5/8	17	23	34	23	17
2 3/4	16	22	33	22	16
2 7/8	16	21	31	21	16
3	15	20	30	20	15
Percent of July/August	**50%**	**67%**	**100%**	**67%**	**50%**

Table 3.
Conversion of Run time PER WEEK to Run Time PER IRRIGATION

Irrigations Per Week	Conversion to Run Time Per Irrigation
1 time per week[1]	minutes per week
2 times per week[2]	minutes per week / 2
3 times per week	minutes per week / 3
Every 6 days	minutes per week X 0.86
Every 5 days	minutes per week X 0.71
Every 4 days	minutes per week X 0.57
Every 3 days	minutes per week X 0.43
Every 2 days	minutes per week X 0.29

[3] Recommended for most Colorado soils in the spring and fall.
[4] Recommended for most Colorado soils in the summer.

Determining the number of irrigations per week becomes complex as soil water-holding capacity and rooting depth are factored in. For details, refer to CMG GardenNotes #263, *Understanding Irrigation Management Factors.*

However, many gardeners know by experience how often they need to irrigate. For most Colorado soils, irrigating once per week works in the spring and fall, and twice a week works in the summer.

Watering as infrequently and deeply as the soil allows gives better resilience during hot spells and helps reduce many weed species.

Adding Cycle and Soak Features

On slopes or compacted, clayey soils, water is generally applied faster than it can soak into the soil, resulting in water being wasted as it runs off-site. The ***cycle and soak*** approach cuts the irrigation period into multiple short runs with soak-in time in between. Programming a controller for cycle and soak is simply a matter of using multiple start times.

Adding Cycle and Soak

Step 1. From your catch can test information, calculate the total run time for the irrigation.
Step 2. Using **Table 4**, figure the number of cycles and soaks desired. For example, if the run time is twenty-six minutes, three cycles are suggested.
Step 3. Divide the run time per irrigation by the number of cycles to get the run time per cycle. For example, if the run time is twenty-six minutes and three cycles will be used, run time per cycle is nine minutes (26 / 3 = 8.67, rounded to 9).
Step 4. Set program with multiple start times, as needed. Generally, the controller is set to cycle again after all the zones have run. If the controller only has a few zones, keep in mind that the start times need to be at least one hour apart.

Table 4.
Estimated Number of Cycles to Reduce Surface Runoff

Type of Sprinklers	Run Time Per Irrigation	Number of Cycles
Pop-up Spray Heads	Greater than 16 minutes	2
	Greater than 24 minutes	3
Rotor Heads	Greater than 48	2
	Greater than 72	3

Observation and Manual Control Method

A simple method to manage lawn irrigation and conserve water is to manually activate the controller as needed. With careful attention, this method can maximize plant health and water savings since the gardener continually adjusts the irrigation system to actual weather and lawn needs. The downside of this method is that it takes daily attention to the lawn's water needs.

Run times on the controller are set as previously described. The difference is that the controller is turned to the "off" position. It is **manually activated** when the lawn shows signs of water stress (color change from bluish green to grayish-blue and footprints are still visible an hour or more later). After the zones run through, the controller is turned back to "off."

Using Emerging Technology

Advances in irrigation technology have led to several innovations. Emerging technology controllers and soil-moisture sensors are examples. Even though they may be more expensive or require professional installation, these products can be used to further improve water delivery to a landscape. Because they automate the irrigation controller, they can potentially reduce the amount of effort needed to water effectively.

Emerging Technology Controller

The **emerging technology controller** is a relatively new piece of equipment that automatically adjusts the irrigation to the daily **ET** (**evapotranspiration**). Emerging technology controllers are designed to water only enough to fulfill the lawn's water need, thereby reducing over and under watering.

Some models use "Historical ET," which is a multi-year average for the day. With these, dry spots will pop up with extreme heat over multiple days. They do not take into account actual rain received locally.

For a small annual fee, other models connect by cell phone, Wi-Fi, or satellite communication networks to download actual ET and rainfall from a local weather station system. On a day-by-day basis, they adjust the irrigation to match actual water needs.

For additional information on emerging technology controllers and the use of ET in irrigation management, refer to the Northern Colorado Water Conservancy District website at https://www.northernwater.org (Efficient Water Use).

Soil-Moisture Sensors

Soil-moisture sensors measure the water content of the soil, allowing the controller to run only when soil dries down to a threshold level. One of the advantages of a soil-moisture sensor is that it uses on-site soil conditions to control the irrigation system. Usually, one sensor is buried in the home landscape in a "representative" area. Run times for reduced irrigation zones or shady zones are programmed into the controller relative to the representative zone.

Rain Shut-off Sensors

Rain shut-off devices, also known as **rain sensors**, interrupt the schedule of an irrigation controller when a specific amount of rain has fallen. They are wired into the irrigation controller and placed in an open area where they are exposed to rainfall. They save water by preventing an irrigation system from running during moderate and heavy rains. Many states, but not Colorado, require rain shut-off sensors on automated systems.

Fine-Tuning Any Scheduling Method

Any scheduling method will need fine-tuning to match the actual water need of the site based on soil type, exposure, wind, heat, rooting depth, etc. This is done by careful observation of the lawn.

When adjusting all zones, the Percent Key on most controllers provides an easy method to fine-tune for the actual site by adjusting the percentage up or down in 10% increments, as needed. It can also be adjusted by increasing or decreasing the run time for each zone in 10% increments, as needed.

When adjusting a single zone, adjust the run times for that zone up or down in 10% increments, as needed.

In typical summer weather, if the lawn starts to become dry between irrigations, increase the run time in 10% increments, as needed. By trial and error, it is easy to fine-tune each irrigation zone. **On multiple days of unusually hot weather, dry spots should pop up if the controller is precisely**

fine-tuned. In unusually hot weather, if dry spots do not pop up, the lawn is over-watered. Cut back the time in 10% increments, as needed, to fine-tune each zone.

Many water providers encourage homeowners to water their yards between 9 p.m. and 9 a.m. Winds are typically less at night, and evaporation loss will be lower.

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Reviewed April 2023