Colorado Master Gardener[sm] Program
Colorado Gardener Certificate Training
Colorado State University Extension

GardenNotes #265

Irrigation Management:
Methods to Schedule Irrigation

Outline:

For most homeowners, attention to irrigation efficiency has the greatest potential for water conservation. In the typical home yard, extra attention to irrigation system design, maintenance, and management could reduce water use by 20-50%!

Unfortunately, most gardeners never adjust the irrigation controller. Settings are typically set for the higher summer water need, and without adjustments the lawn and garden are grossly over-irrigated by about 40% in the spring and fall. Iron chlorosis is a common symptom of springtime over-watering!

During the cooler weather of spring and fall, adjust sprinklers by increasing the number of days between irrigations, while keeping the amount applied (run time) the same. This infrequent, deep irrigation encourages deep root development (to the extent the soil allows), giving the lawn more resilience to summer heat. Deep infrequent watering helps the lawn compete against shallow rooted weeds.

There are several methods using evapotranspiration, ET, to calculate season adjustments. Each method has it advantages and disadvantages. A few methods, used by home gardener, are summarized in this fact sheet.

Seasonal Water Need of Cool Season Lawns

Water use of a crop is measured by ***Evapotranspiration (ET),*** the rate that a crop uses water for transpiration plus evaporation from the soil surface. Primary influences on ET include weather factors (primarily solar radiation, temperature, wind, and humidity) and the stage of plant growth. On hot, dry or windy days, ET will be higher; on cool, humid, calm days, ET will be lower. Seasonal variations in water need for cool season bluegrass and tall fescue lawns are in Table 1.

Table 1 – Typical Water Need for Cool Season Turf Based on ET

	April	May	June	July	August	September	October
Northern Colorado (Boulder, Longmont, Loveland, Fort Collins, Greeley)							
Per week	0.8” (3/4”)	1.1” (1 1/8”)	1.3” (1 1/4”)	1.3” (1 1/4”)	1.1” (1 1/8”)	0.8” (3/4”)	0.6” (5/8”)
Per day	0.12”	0.15”	0.19”	0.19”	0.16”	0.12”	0.08”
Percent of July	64%	79%	100%	100%	85%	64%	43%
Denver Area							
Per week	0.8” (3/4”)	1.1” (1 1/8”)	1.4” (1 3/8”)	1.5” (1 1/2”)	1.3” (1 1/4”)	1.0” (1”)	0.6” (5/8”)
Per day	0.12”	0.15”	0.20”	0.21”	0.18”	0.14”	0.09”
Percent of July	58%	72%	96%	100%	86%	67%	43%
Colorado Springs							
Per week	0.5” (1/2”)	0.8” (3/4”)	1.3” (1 1/4”)	1.5” (1 1/2”)	1.4” (1 3/8”)	0.9” (7/8”)	0.4” (3/8”)
Per day	0.08”	0.11”	0.18”	0.21”	0.20”	0.13”	0.06”
Percent of July	33%	50%	83%	100%	92%	59%	25%

For a reduced input Kentucky bluegrass or tall fescue lawn, irrigating at 80% ET may give acceptable results (depending on the expectation for the site, soil conditions, and grass cultivar). In Colorado, watering at 60% ET thinned both bluegrass and fescue lawns.

Irrigation Scheduling Methods

Observational Method – manually activating the controller as needed

A simple method to manage lawn irrigation and conserve water is to manually activate the controller as needed. Start by determining the amount of water to apply per irrigation. For details, refer to the CMG GardenNotes #261, *Soil Water Holding Capacity and Irrigation Managemen*t.

Turn the controller to "off". 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), turn on the controller to run through the irrigation cycles. Then turn the controller off again. This management technique was encouraged by many cities during the drought of 2002.

Historical ET Method

Historical ET (or more complicated real-time ET methods) should be the basis for any automated irrigation system.

Table 1 above gives the typical irrigation for a cool season lawn based on ***historical ET*** (average ET over a 30 year period) and normal rainfall. For the person who invests minimal time in irrigation management, historical ET is a good starting point. **Contact your city or local water provider for more localized data.**

Controllers should be adjusted monthly to reflect seasonal change in water demand. In the spring and early summer, when the lawn starts getting dry between irrigations, adjust the controller up for the month. Likewise, as weather cools in the fall, adjust controller down for the month.

Some controllers have a percent key that allows the amount of water applied in all zones to be adjusted up or down with just a few touches of the keypad. Historical ET would be the basis for seasonal adjustments. For example, in Northern Colorado, set the controller to water in June/July and then adjust down to 80% for May.

Historical ET won't accurately reflect daily changes that are significantly different than the average. Should the season be significantly warmer and/or drier than normal, adjustments may be needed.

Scheduling with real-time ET

Fixed Day Method

The ***fixed day*** method irrigates on set days, accommodating mowing schedules or regular use of the lawn, and irrigation schedules in some communities. It is easy for home gardeners to calculate.

To use the fixed day method, the gardener adds up the daily ET since the last irrigation to determine how much to apply. The controller is adjusted to apply the needed amount.

Example: Watered on Monday and Thursday nights
Last watered Thursday night

Friday	0.18 inches ET
Saturday	0.21 inches ET
Sunday	0.19 inches ET
Monday	0.16 inches ET
Total	**0.74 inches used**
Minus rain	-0.12 inches
Net water to apply Monday night	**0.62 inches**

If the sprinkler zone precipitation rate is 0.75 inches per hour, the run time is 48 minutes to apply .62 inches of water. (Refer to the CMG fact sheet #7.757, *Irrigation Management: Converting Inches to Minutes*, for details on how to convert inches to minutes.).

Fixed Amount Method

In the ***fixed amount*** method, the sprinkler run times stays the same, minimizing the constant recalculations and setting of the controller. The controller is activated to run through the cycles when the net water required reaches or exceeds the set amount of water to be applied.

Example: System applies 0.5 inches per irrigation

Carryover	0.07 inches ET
Day 1	0.14 inches ET
Day 2	0.17 inches ET
Day 3	0.15 inches ET
Total	**0.53 inches ET**
Activate irrigation	**-0.50 inches water applied**
New carryover	0.03 inches ET

ET Controllers

With the computerized irrigation management systems used on large commercial and private properties, the grounds manager can adjust water delivery in each irrigation zone to match ET with just a few strokes on the keyboard. In high tech sites, computers linked to weather station databases automatically adjust the irrigation delivery to match the daily ET.

These high-tech "***ET controllers***" will be coming into the home garden trade in a few years. Some models adjust water delivery to historical ET. More sophisticated models connect (by phone or satellite) to a local weather station database (for a small monthly fee) and match water delivery to ET.

For additional information on ET controllers and the use of ET in irrigation management see the Northern Colorado Water Conservancy District web site at www.ncwcd.org.

Sources of ET Information

In Colorado there are currently four ET networks:

- CoAgMet
- Colorado Springs Utilities
- Denver Water
- Northern Colorado Water Conservancy District

Each has a web site, but all are conveniently linked at www.coloradoet.org. This site explains more about ET and has hot links to each network for ET information.

Note: ETo is the symbol for "grass reference", the calculation use for grass crops. ETr is the symbol used for "alfalfa reference" and primarily used for agriculture crops. If only the alfalfa reference, ETr, is available, convert it to the grass reference, ETo, by multiplying it by .80. To convert ETo to ETr, multiply it by 1.25.

ET information is also found in many local papers.

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