Colorado Master Gardener

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

Colorado
MASTER GARDENER

Irrigation Management: Methods to Schedule Irrigation

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Outline. . .

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

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 percent 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.

What is ET?

Evapotranspiration (ET) is the rate that a crop uses water for transpiration plus evaporation from the soil surface. Primary influences on ET include weather factors (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. To illustrate seasonal variations, the typical evapotranspiration rates for cool season grass (ET) along Colorado's Front Range are found in the table below:

Table 1. Typical ET for cool season turf along Colorado's Front Range.

	April	May	June	July	August	September	October
Per week	0.9"	1.1"	1.4"	1.5"	1.2"	0.9"	0.6"
	7/8"	1 1/8"	1 3/8"	1 1/2"	1 1/4"	7/8"	5/8"
Per day	0.13"	0.16"	0.20"	0.21"	0.18"	0.13"	0.09"

Local ET data is available on the Web at www.coloradoet.org, or from your local water provider.

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

Colorado State University Cooperative Extension

Putting Knowledge to Work

Irrigation Scheduling Methods

Observational Method

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 fact sheet 7.754, *Soil Water Holding Capacity and Irrigation Management*. 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 realtime ET methods) should be the basis for any automated irrigation system.

The table below 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.

Table 2. Typical turfgrass water requirements in inches of water per week.

Inches Per Week	April	May	June	July	August	Sept	Oct
Northern Front Range[1]	0.9"	1.1"	1.4"	1.5"	1.2"	0.9"	0.6"
	7/8"	1 1/8"	1 3/8"	1 1/2"	1 1/4"	7/8"	5/8"
% of July	60%	73%	93%	100%	80%	60%	40%
Colorado Springs[2]	1/2"	3/4"	1 1/4"	1 1/2"	1 3/8"	7/8"	3/8"
% of July	33%	50%	83%	100%	92%	59%	25%

[1]Figures for Northern Colorado Front Range based on historical ET.
[2]Figures from Colorado Springs Utilities at www.csu.org/xeric/howto/resetmonthly.html. For additional information for Colorado Springs, refer the Web site.

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. Contact your city or water provider for localized information.

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 percent for May.

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

Scheduling with Real-time ET

Fixed Day

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.

Table 3. 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 fact sheet 7.757, *Irrigation Management: Converting Inches to Minutes*, for details on how to convert inches to minutes.).

Fixed Amount

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; and
- 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 links to each network for ET information.

ET information is also found in many local papers.

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.

CoAgMet

CoAgMet Web site, at http://ccc.atmos.colostate.edu/~coagmet/, has ET information for a variety of weather stations around the state primarily for agricultural producers. It is operated by Colorado State University. Each site includes the following areas:

North Central Colorado Area

Eaton, Fort Collins, Fort Lupton, Greeley, Longmont, Loveland, Lucerne, Peckham

Lower South Platte Area

Brush, Crook, Fort Morgan, Gilcrest, Holyoke, Kersey, Ovid, Paoli, Sterling, Wiggins, Yuma

East Central Area, San Luis Valley, & Arkansas Valley

Avondale, Blanca, Burlington, Center, Hoehne, Holly, Idalia, Lamar, Rocky Ford, Vineland

Western Slope Areas

Cortez, Delta, Dove Creek, Fruita, Grand Junction, Hotchkiss, Olathe, Towaoc, Yellow Jacket

Colorado Springs Utilities

The Colorado Springs Utility Web site has ET information for Colorado Springs at http://et.csu.org/csu/et/et.jsp. This site also contains excellent information on general lawn water management.

Denver Water

The Denver Water Web site has ET information for the Denver Metro Area at www.water.denver.co.gov/factsfigures/fact_figsframe.html.

Their general site at www.water.denver.co.gov also has other information on irrigation management, drought management, and general water conservation.

Northern Colorado Water Conservancy District

The Northern Colorado Water Conservancy District Web site has ET data for the greater Boulder, Longmont, Loveland, Fort Collins, Greeley areas and extending east along I-76 to Nebraska state line at http://www.ncwcd.org/ims/ims_weather_form.asp.

Their general Web site at www.ncwcd.org is also a great source of information on irrigation management and general lawn care.

ET is also available by phone. Call 888-NOCOH20 (662-6426) or 970-593-1605

Listen to the greeting. Press "1" when prompted to use your phone keypad. Wait for the prompt, and then enter the code for the location and report desired.

Weather Station	Yesterday's Weather & Ref. ET	Urban Today's Weather	Turf ET
Fort Collins East	101	201	301
Loveland	102	202	302
Longmont South	103	203	303
Eaton	104	204	304
Gilcrest	105	205	305
Wiggins	106	206	306
Brush	107	207	307
Sterling	108	208	308
Crook	109	209	309
Ovid	110	210	310
Johnson's Corner	111	211	311
Greeley West	113	213	313
Longmont West	114	214	314

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