

LANDSCAPING IRRIGATION

WATER REQUIREMENTS AND IRRIGATION SYSTEM MANAGEMENT

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Lawn irrigation accounts for nearly half of homeowner water usage. Many homeowners irrigate too often and for too short a period to meet lawn and especially landscaping (tree and shrub) needs, often compromising health and vigor of their landscapes plant community. Others tend to leave the water running too long, resulting in wasted water and high water bills. Properly adjusting automatic watering systems is an important practice generally overlooked or often done incorrectly.

FACTORS AFFECTING PROPER IRRIGATION SCHEDULING

Irrigation requirements are a function of four things: Evapotranspiration Rate, Precipitation, Plant Adaptation, and Soil Properties. For the purposes of this discussion, let's deal with these factors beginning with the least important from the perspective of common home landscapes.

Plant Adaptation: Of course, there are plants adapted to dry environments, while others are adapted to more moist environments. Unless you've consciously adopted a xeriscape strategy for your landscape, most of the landscape components have similar moisture requirements and will thrive given the irrigation strategy suggested here.

Soil Properties: Soils can vary tremendously in their effective depth and composition (of clays, silts, sands, and organic content). These factors affect the amount of water holding capacity. Coarse (sandy or gravelly) soils do not hold as much water as finer (silt or clay) soils, water infiltration is quicker, and water may move beyond rooting zones in the coarse soils. Water holding capacity determines the relative length of time between irrigations. Infiltration rate affects the speed at which we can effectively apply water.

Table 1. Available Soil Moisture Holding Capacity for Various Soil Textures.

Available Soil Moisture Soil Texture	(inches/foot)
Coarse Sand and Gravel Sands	0.2 to 0.7 0.5 to 1.1
Loamy Sands Sandy Loams	0.7 to 1.4 1.3 to 1.8
Fine Sandy Loams Loams and Silt Loams	1.7 to 2.2 2.0 to 2.8
Clay Loams and Silty Clay Loams	1.7 to 2.5
Silty Clays and Clays	1.6 to 2.2

Adapted from:
<http://www.ag.ndsu.edu/pubs/ageng/irrigate/eb66w.htm>

Table 2. Infiltration rates for common soil textures

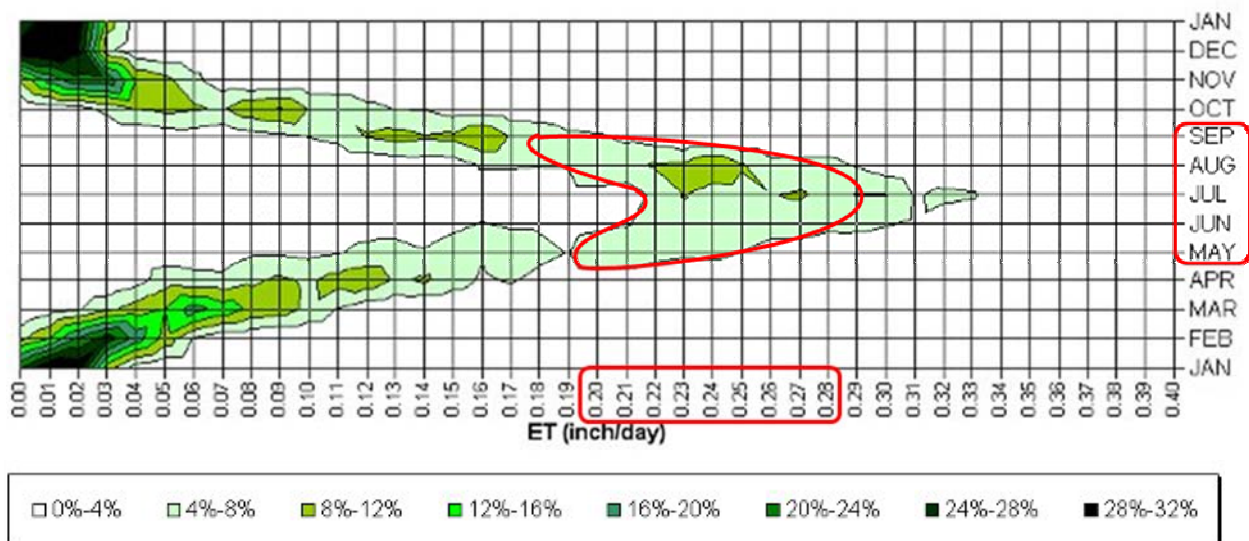
Soil Texture	Infiltration rate (inches/hour)
Coarse Sand	0.75 - 2
Fine Sand	0.5 - 1
Fine Sandy Loam	0.5 - 0.75
Silt Loam	0.25 - 0.04
Clay Loam	0.1 - 0.25

Adapted from:
<http://extension.oregonstate.edu/catalog/html/pnw/pnw287/#table1>

Precipitation: Regardless of whether you look at irrigation as supplemental to precipitation, or vice-versa; clearly precipitation and irrigation, in sum, constitute the water “applied” to the soil. Rains can (and should) enter into the decision process regarding the need to irrigate. Homeowners very often overestimate the amount of precipitation in an event if they do not have a means to measure precipitation. Rain gauges are inexpensive and can provide information critical in properly scheduling irrigation.

Evapotranspiration: Evapotranspiration is an indication of the disappearance of moisture from the soil through surface evaporation and the consumption of soil moisture by plant transpiration. Evapotranspiration is affected by many factors including temperature, wind, and relative humidity. It follows, then, that evapotranspiration rates will vary over the course of the year. Evapotranspiration rates for Afton, WY are presented in Figure 1.

Figure 1. Afton Daily ET Frequency (1988 – 2002)



from: <http://www.wrds.uwyo.edu/sco/climateatlas/evaporation.html#104>

MAINTAINING SOIL MOISTURE IS KEY

The amount of moisture available in the rooting zone (0 – 12 inches) of most small-stature landscape plants, when balanced against the evapotranspiration rate indicates that most lawns only require irrigation once every 4 to 8 days to stay healthy and green. Providing periodic irrigation sufficient to thoroughly wet the top 12 inches of the soil profile virtually guarantees deep percolation sufficient to meet the needs of large-stature landscape plants, like shrubs or even trees. Allowing the water in that soil profile to be depleted (not quite to the point of wilting small-stature plants) provides oxygenation to the soil’s micro-flora and fauna, and encourages plants to extend root systems deeper into the soil.

The resulting balance of the important irrigation factors might look something like this:

$$\text{Soil Moisture Availability} = (\text{Precipitation} + \text{Irrigation}) - (\text{Evaporation} + \text{Transpiration} + \text{Percolation})$$

(From Table 1) Measured Scheduled (from Figure 1)

For example, 12 inches of a well wetted Sandy Loam soil should hold between 1.3 and 1.8 inches of moisture (Table 1). Assuming no rainfall, the water in the soil should be sufficient to last for 5 to 7 days in an average July, when evapotranspiration is 0.25 inches per day. Setting the program to apply 1.25 inches on 5 day intervals will meet needs, while a 4 day interval provides extra insurance. Of course, this prediction should be periodically fine tuned, depending upon observed weather conditions, and particularly sprinkler zone variations in aspect, slope, shading, etc.

WHY CUSTOM PROGRAM THE AUTOMATIC IRRIGATION SYSTEM

A preponderance of water-related landscaping issues can be traced back to the settings programmed in the automatic watering system. Often, the contractor sets up the system to irrigate for a few minutes, every morning. The strategy, no doubt, pleases the homeowner who has invested in a system with such capabilities. It is a great strategy for establishing turf from seed. It is, however, absolutely the incorrect program for established plants. The installer's error is in not encouraging the landowner to alter the schedule to a more proper regime. Many systems default to this program after power outages.

Shallow rooted plants result from irrigating every day. Irrigating less often and applying more water per irrigation results in deeper rooted plants and a healthier turf. Plant roots grow deeper into the soil and the plants become stronger if enough water is applied when you do irrigate. Deeper rooted plants are mining nutrient resources from a larger volume of soil, more efficiently utilizing nutrient resources and are well prepared to withstand occasional neglect and short-term drought conditions (or system outages). As a guide, if grass doesn't spring back after being stepped on, it's probably time to irrigate. It takes less water to maintain a green lawn if soil fertility is high and weed levels also tend to be lower in a well fertilized lawn.

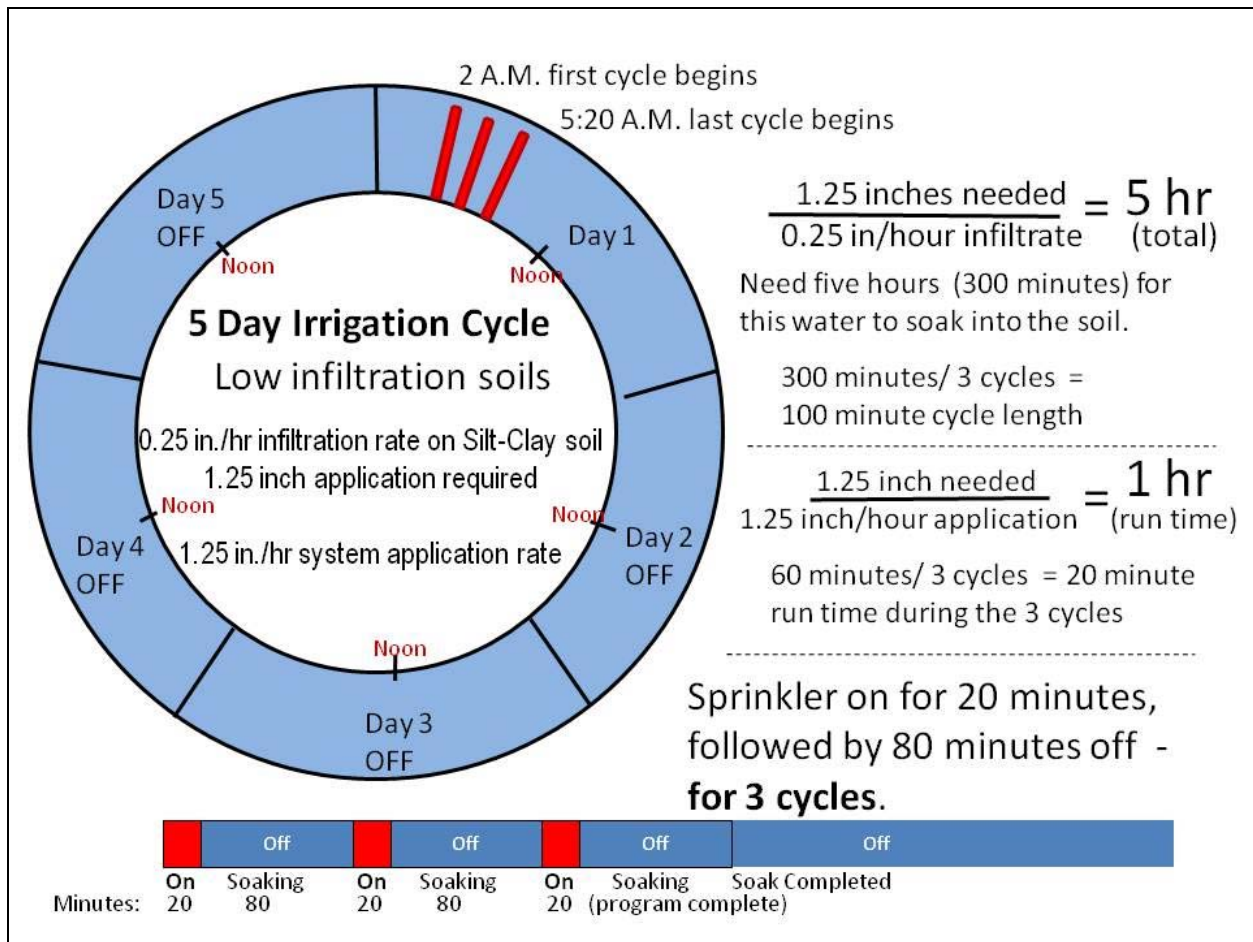
The system's application rate is easily determined by placing something as simple as empty cans in the sprinkler zone and measuring the time it takes to accumulate a measured depth of water. If soil properties are such that they aren't capable of absorbing recommended irrigation volumes (Table 2) runoff will occur. Run-off water is wasted water, so the rate of application must be managed. One strategy is to change to smaller, lower output sprinkler nozzles and longer run times. A more practical solution is to split irrigation into shorter time segments, alternating run time with soak periods to accommodate application of the proper irrigation volume during the scheduled irrigation day (Figure 2).

Also, automatic irrigation system owners and managers should change controller run times to meet seasonal plant needs. Plants require less water in cool spring and fall periods, and more water in the heat of summer. For example, bluegrass lawns may require 0.6 to 0.9 inches of water per week in spring and fall, but need 1.25 to 1.5 inches per week in midsummer. Some controllers allow watering a percentage of peak summer run time settings. With one setting change, they can easily be reset to 60 percent for spring and fall watering.

Practicing seasonal adjustments not only conserves water, it results in healthier plants by matching water application to plant needs. Too much water is often applied to clay soils depriving plant roots of the oxygen they need to function. Applying the right amounts of water produces healthier roots.

Again, observe and use your judgment. A shady or northern exposure sprinkler zone will likely require only 1/2 the water of a level, sunny landscape. A south or west-facing slope may require two times the water of a level landscape area that is in full sun. Adjust zone run times on the controller accordingly.

Figure 2. Alternating Apply/Soak Cycle Example



Sources:

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