EC 1638 • October 2010

Efficient Lawn Irrigation in the Intermountain West

Brian Charlton, Rob Golembiewski, and Tom Cook

Introduction

Maintaining a healthy, aesthetically pleasing lawn depends on many variables including turfgrass species; mowing height and frequency; fertilization; and insect, disease, and weed control. Proper irrigation, despite being one of the most important factors in maintaining a healthy lawn, is the most often overlooked variable in lawn care (figure 1).

Most lawns in the Intermountain West are composed of Kentucky bluegrass, fine fescue, perennial ryegrass, tall fescue, or mixtures of these turfgrass species. Newer turf-type tall fescue varieties are being planted more frequently because of their deep root system and resilience to physical abuse. The challenge with any lawn in this region is that annual precipitation is not sufficient to meet turfgrass water needs; therefore, supplemental irrigation is needed.

When developing an optimum lawn irrigation schedule, you must account for the predominant turfgrass species, soil characteristics, nearby trees and shrubs that affect sun and shade, mowing height, potential for disease problems, and quantity of water your irrigation system can deliver. In the Intermountain West, it is also particularly important to consider the daily weather pattern. High temperatures, intense solar radiation, and frequent wind during summer months all contribute to high irrigation demand.

Proper irrigation avoids the negative effects of overwatering (excess foliar growth; nutrient leaching; shallow rooting; decreased wear tolerance; reduced soil oxygen; and increased succulence, compaction, thatch, and disease activity) and underwatering (loss of color and density, reduced vigor, increased wilting, wear damage in traffic areas, and susceptibility to patch diseases).

Figure 1. This healthy lawn is a result of proper cultural practices, which include mowing, fertilization, and irrigation.

Turfgrass Species

The following paragraphs describe general characteristics, optimum mowing heights, and factors affecting irrigation for several commonly planted turfgrasses.

Kentucky bluegrass (*Poa pratensis*) is the most widely adapted and most common lawn turfgrass in the Intermountain West. It performs extremely well in sunny locations, is very cold tolerant, and forms a dense stand when managed properly. The optimum

Brian Charlton, assistant professor, Klamath Basin Research and Extension Center; Rob Golembiewski, assistant professor, Department of Horticulture; Tom Cook, professor emeritus, Department of Horticulture (all of Oregon State University). All photos by Tom Cook, © Oregon State University.

Oregon State University Extension Service

mowing height is between 1.5 and 2.5 inches. To encourage deep root system development, set your mowing height toward the upper end of this range. Kentucky bluegrass responds well to irrigation rates of 0 to 1 inch per week in early spring and 0.75 to 1.5 inches per week in midsummer. A weakness of Kentucky bluegrass is its tendency to produce excess thatch, which results in reduced rooting in the soil (figure 2). The lack of soil rooting leads to more frequent irrigation throughout the season and an increase in the amount of water needed to produce dense, green turfgrass.

Figure 2. Thatch is a partially decomposed organic layer that develops between the green vegetation and the soil surface.

Fine fescues (*Festuca* spp.) are extremely fine textured and usually mixed with Kentucky bluegrass, perennial ryegrass, or both. Fine fescues perform best in the shade but are adapted to sunny locations if well irrigated. The optimum mowing height is 2 to 2.5 inches. Fine fescues are considered more drought tolerant than Kentucky bluegrass. However, 'Chewings' fescue quickly turns brown under drought conditions. 'Chewings' fescue also produces excessive thatch, which requires increased irrigation to avoid drought stress.

Perennial ryegrass (*Lolium perenne*) closely resembles Kentucky bluegrass in color and appearance. It tolerates wear stress but tends to be less cold tolerant and more prone to winterkill than Kentucky bluegrass. The recommended mowing height is 1.5 to 2.5 inches, and fertilization and irrigation requirements are similar to those of Kentucky bluegrass. Perennial ryegrass generally does not produce much thatch, so roots stay relatively deep in the soil.

Tall fescues (*Festuca* spp.) are more tolerant of heavy traffic than Kentucky bluegrass but slow to recover after wear injury occurs. Compared with Kentucky bluegrass, tall fescues have similar water use but more extensive root systems that allow plants to extract needed moisture from deeper in the soil profile. This allows for less frequent irrigation (figure 3). The newer turf-type tall fescues are better suited for home lawns and reportedly compatible with other turfgrass species; however, local experience suggests these varieties perform better in pure stands.

Figure 3. A tall fescue home lawn may require less water than other turfgrass species but will go dormant without supplemental irrigation.

Seed mixtures are suited for mowing heights of 2 to 2.5 inches. Higher mowing heights result in deeper root systems, maximum surface cover, and lower evaporative water loss. However, higher-cut turfgrass loses more water to transpiration and produces more thatch. For mixtures containing Kentucky bluegrass and fine fescue, higher mowing heights generally result in increased water use as a result of increased thatch production.

Recommended Seed Mixtures for Sun

- 75% Kentucky bluegrass, 25% perennial ryegrass
- 50% Kentucky bluegrass, 25% strong creeping red fescue, 25% perennial ryegrass
- 100% turf-type tall fescue

Recommended Seed Mixture for Shade

- 50% to 75% fine fescue, 25% to 50% Kentucky bluegrass

Soil Characteristics

A particular turfgrass species or mixture requires the same total amount of water no matter what type of soil it is planted in, so it is essential to determine the soil's water holding capacity. In other words, knowing how much water the turfgrass can receive from the soil will help you develop an irrigation schedule to meet the remaining turfgrass water needs.

Sandy soils do not hold much water and require more frequent irrigation. Soils with more silt and clay hold more water and can withstand longer durations between irrigation events. In general, most sandy soils in the Intermountain West hold about 1 to 1.25 inches of water per foot of soil, and heavier soils hold 2 to 2.5 inches of water per foot of soil.

The Web Soil Survey (http://websoilsurvey.nrcs.usda.gov/app/) from the National Resources Conservation Service is a good starting point for determining the type and specific characteristics of your soil.

Excavation spoils and imported soils, often referred to as topsoil fill, have altered soils at many homesites throughout the Intermountain West. In these circumstances, it is best to collect a soil sample and have a commercial laboratory conduct a full soil analysis. Contact your local Extension office for a list of commercial laboratories in your area.

Sprinkler System Water Delivery

Regardless of the type of irrigation system you have, it is necessary to understand how much water is being delivered in a given period of time. The most accurate method of determining water delivery is to identify how many gallons per minute are being discharged from each sprinkler head. Several manufacturers provide charts with this information online.

If you are unable to locate this information, you can place the sprinkler in a bucket and measure the amount of water collected after 1 minute. This method is especially useful for lawns that do not have underground irrigation systems.

Another method is to place several catch cans (e.g., tuna cans or pint-sized plastic freezer containers) or rain gauges throughout the irrigated area (figure 4). Run your irrigation system for a set amount of time, and then measure the depth of water collected in each can. Calculate the average of all measurements, and convert this number into inches per hour. Note any outlier values, which may reflect plugged or excessively worn nozzles, and replace the irrigation system hardware as needed.

Example: You place 10 catch cans in your lawn and run the irrigation system for 20 minutes. All together, the cans contain 2.5 inches of water. How much water is your irrigation system delivering per hour?

2.5 inches/10 cans = 0.25 inches in 20 minutes

0.25 × 3 = 0.75 inches per hour

Figure 4. Catch cans can be used to evaluate the water delivery rate of a sprinkler system.

How Much Water to Apply

"How often?" and "How much?" are the two most common questions associated with lawn irrigation. From June through August, irrigating from one to five times per week will provide the right amount of water, avoid runoff (a result of applying too much water too quickly), and keep the lawn green and lush. If a dense, vigorous lawn is not your priority, a single irrigation every week is sufficient. This schedule will produce a functional lawn with visible brown spots.

A useful tool for determining how much water to apply is the Pacific Northwest Cooperative Agricultural Weather Network website (AgriMet; www.usbr.gov/pn/agrimet/wxdata.html). Click the "Crop Water Use" link on the left side of the page, then click your state, and then click the name of the weather station nearest your location. Determine daily evapotranspiration (ET) rates for lawns since

Table 1. Average monthly evapotranspiration (in inches) for turfgrass lawns in central and eastern Oregon.

Location	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Total
Bend	0.6	2.8	4.5	5.6	6.8	5.2	3.4	0.6	29.5
Baker	0.4	2.1	4.7	6.0	7.6	6.2	4.2	0.2	31.4
Silver Lake	0.2	2.3	4.9	6.4	7.7	6.4	4.1	0.0	32.0
Hermiston	1.3	3.7	5.7	7.3	9.0	7.6	4.7	1.3	40.6
Klamath Falls	0.5	3.0	5.2	6.4	7.6	6.3	4.3	0.1	33.4
Lakeview	0.0	2.1	5.0	6.3	7.8	6.9	4.6	0.0	32.7
Madras	0.9	3.2	5.0	6.5	8.2	7.0	4.7	0.9	36.4
Ontario	1.6	4.0	6.0	7.3	8.7	7.5	4.9	1.1	41.1
Prineville	0.6	3.0	4.8	6.2	7.7	6.4	4.3	0.4	33.4

Note: Data are monthly averages from AgriMet weather stations (www.usbr.gov/pn/agrimet/wxdata.html) for the entire period of record; period of record varies among locations.

your last irrigation. Divide this value by the amount of water your irrigation system delivers per hour to determine how long you will need to run your irrigation system to meet turfgrass ET. Table 1 provides historical monthly averages for turfgrass ET in many central and eastern Oregon locations.

Example: Using AgriMet crop water use data, you determine that lawn ET since your last irrigation is 0.47 inches. Your irrigation system delivers 0.5 inches of water per hour. How many hours do you need to irrigate to meet lawn ET?

0.47/0.5 = 0.94 hours (56 minutes) of irrigation are needed to replace turfgrass ET

Depending on your soil type, you may need to irrigate in cycles to avoid runoff.

A simpler method is to irrigate when the lawn shows signs that water is needed, such as footprints or lawn mower tracks that remain at least 30 minutes after traffic has passed. Turfgrass also tends to turn more blue-gray in color when under moisture stress. A quick way to check soil moisture is to insert a 6-inch screwdriver into the lawn. If it penetrates the soil easily, hold off on irrigating.

When to Irrigate

In many humid climates, experts recommend avoiding irrigation between 10:00 p.m. and 6:00 a.m. to reduce disease activity. Because most locations in the Intermountain West are relatively arid with low humidity, disease problems are generally not a concern. Irrigating between 10:00 p.m. and 6:00 a.m. usually overlaps with the natural dew period, reducing the length of time that turfgrass blades are wet and lowering the likelihood of disease development. Night irrigation also avoids conflicts with local water supplies during peak demand periods during the day. In the Intermountain West, this time period is cooler and may be less windy than midday; these conditions reduce evaporative loss.

Lawn Irrigation Strategies

Apply the right amount of water at the right time.

Lawns in the Intermountain West require regular irrigation to survive, and each irrigation cycle needs to supply enough water to last until the next. If you irrigate once per week, you will have to apply enough water to last 7 days. However, if your soil contains a lot of clay or your lawn is on a slope, it may be almost impossible to supply this amount in one irrigation event because water will run off rather than infiltrate. If runoff occurs, split irrigation events into a series of short cycles, and allow the water to soak in between each cycle.

Water requirements vary dramatically from week to week. In July, August, and early September, turfgrass water requirements can range from 1 inch per week in cool weather to 2 inches per week in hot, windy weather. The best approach is to watch the lawn for signs of drought stress or wilting. Even if you have an irrigation schedule, use the screwdriver test in several areas of your lawn before deciding to irrigate. If the lawn looks healthy and the soil is easily penetrated, wait a day and check it again. Irrigate when the soil is dry. This practice will allow you to increase the time between irrigation events while maintaining an aesthetically pleasing lawn.

Use the minimum amount of water necessary.

If you have an automatic irrigation system (figure 5), you can use it to help determine an appropriate irrigation frequency and duration. Set the system to run for a specified amount of time each day for a week. Check the lawn at the end of the week; if it is uniformly moist and looks healthy, run the system for only 6 days the next week. Continue this process until you identify the fewest number of days of irrigation that will keep the lawn healthy and visually acceptable. You can run the system more or less frequently as needed depending on the weather. Most lawns in the Intermountain West will need to be irrigated from one to five times per week.

A rule of thumb is to wait as long as possible in the spring before starting to irrigate. Once you begin, irrigate consistently so the lawn never turns brown between irrigation events. As fall approaches, try to reduce the amount and frequency of irrigation. Sporadic irrigation is not much better than not irrigating at all. Irrigating daily without regard for turfgrass water use produces lush, green lawns but invariably applies too much water and produces excessive amounts of turfgrass.

Consider the surrounding landscape.

Landscaping often enhances a lawn's attractiveness. However, trees use more water than turfgrass (in some cases up to four times as much water per square foot of area covered by the root system; figure 6). Turfgrass areas around trees will require more frequent or longer irrigation events to stay green. Lawns in shady sites, where tree root competition is not a factor, will require about half as much water as turfgrass in full sun.

Cultural Practices to Maximize Water Use

In areas prone to water curtailments, begin preparing for efficient irrigation in the spring. Remove as much thatch as possible, and core as much of the lawn as possible. Fertilize with 1 to 2 pounds of nitrogen per 1,000 square feet after dethatching and coring. At this time of year, synthetic fertilizer products with both soluble and slow-release nitrogen work better than organic sources because soil temperatures tend to be cool. Plan to fertilize again in early July with a slow-release product at 1 pound of nitrogen per 1,000 square feet. Organic and synthetic fertilizers both work well at this time. In most circumstances, this is the last nitrogen application needed until September.

Set your mowing height toward the upper end of the recommended range for the turfgrass species present. This strategy will maximize root growth in the soil and support healthy, dense turfgrass that is better able to handle drought conditions. As temperatures rise, consider establishing an alternate-day irrigation schedule (i.e., water on odd or even days only). If water deliveries cease, the turfgrass will be

Figure 5. Automatic irrigation systems can be used to apply water efficiently and effectively to home lawns.

Figure 6. Tree roots have a much higher water requirement than home lawns.

in a condition to survive the drought. Expect turfgrass to look drought stressed after a week and drier zones to enter dormancy after 2 weeks (figure 7). In this situation, turfgrass loss will probably be limited to areas over shallow soil, on severe slopes, and in direct competition with tree roots. Lawns generally recover quickly once water deliveries resume.

Figure 7. A dormant turfgrass stand (below) and an irrigated home lawn (above).

Summary

Instead of following a predetermined irrigation schedule, observe your lawn, check the soil moisture regularly, and alter your irrigation schedule to better meet turfgrass needs. The key to successful, efficient irrigation is to apply only as much water as the turfgrass actually requires. In general, the healthier the turfgrass is when heat stress begins, the longer it will stay green and the better it will withstand the stress.

For More Information

Cook, T., and B. McDonald. 2005. *Fertilizing Lawns*. EC 1278. Corvallis, OR: Oregon State University Extension Service.

Stahnke, G.K., E.D. Miltner, R.C. Golembiewski, T.A. Salaiz, and W.J. Johnston. 2010. *Turfgrass Seeding Recommendations for the Pacific Northwest*. PNW 299. Pullman, Washington: Pacific Northwest Extension Publications.

VanDerZanden, A.M., and J. McNeilan. 2001. *Conserving Water in the Garden: Landscape and Lawn Care*. EC 1531. Corvallis, OR: Oregon State University Extension Service.

Published October 2010.