

Irrigation Tips to Conserve Water and Grow a Healthy Lawn

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Turfgrasses are composed of thousands of cells, all containing water, in which metabolic processes such as photosynthesis and respiration take place. Water makes up 80 to 90 percent of the total plant mass. If this level drops below 60 percent, these processes may slow and wilting will occur. Water is critically important for:

- Maintaining turgidity, which keeps plants standing upright
- Transporting nutrients and sugars through the plant
- Chemical reactions
- Transpirational cooling when water moves out of the leaves and evaporates

Water is also very important for moving pesticides and fertilizer into the root zone. Although water is essential for grass survival, because we have a limited fresh water supply, we must find a balance between keeping grass alive and conserving water.



Figure 1. Footprinting on a cool-season grass indicates the need for watering.

The Importance of Water Conservation

Although 70 percent of the earth's surface is covered with water, only about 1 percent of it is available for our use. As the human population continues to increase, our limited water resources will become even more taxed. Concern also exists that global warming will cause more frequent droughts. Due to need, overuse, lack of additional resources, and the potential for climate change to limit rainfall, water conservation should be something that every one of us takes seriously.

The Environmental Protection Agency's (EPA) WaterSense program estimates that the average household uses 320 gallons of water each day in the United States. Of this, 96 gallons are used outdoors for things like irrigation and washing cars. Landscape irrigation alone accounts for nearly 9 billion gallons of fresh water used in the United States each day.

The goal of water conservation in the landscape does not need to be as drastic as eliminating all irrigation, but we should choose plant material wisely and decide if and when irrigation is necessary. This publication is designed to promote a healthy lawn through watering while promoting water conservation through best management practices.

Grass Selection

One of the easiest things you can do to reduce the need for irrigation in your yard is to plant species that naturally need less water. The EPA WaterSense webpage (http://www.epa.gov/watersense/outdoor/what_to_plant.html) provides a number of resources for choosing drought tolerant landscape plants. When choosing plants, remember that just because a particular plant is drought tolerant does not mean that it is suitable for Kentucky's

climate. If you are not sure whether a certain plant is a good choice, contact your local extension office for clarification.

The options for lawn choices are simple. Some grasses native to North America use very little water (such as buffalograss), but unfortunately they are either not suitable as a lawn surface or they are not adapted to our climate. Warm-season grasses such as bermudagrass and zoysiagrass have excellent drought tolerance (Table 1), but you must be prepared for a dormant (brown) lawn from late fall through spring. The best choice for an attractive lawn throughout the entire year as well as one that will require less water during the summer is turf type tall fescue. This grass has much better heat and drought tolerance than Kentucky bluegrass, which means the sprinklers can stay off longer.

Is it time to water?

Look for the following clues:

- Footprints remain in the grass long after being made.
- Soil from the root zone is dry or powdery.
- No rain has occurred for at least a week during hot, dry, sunny, or windy weather.
- Turf on high spots and/or south slopes starts to show some yellowing or turns bluish gray.

The right grass is a good start, but when it comes to watering, there are several other factors that need to be considered. Table 1 lists the drought tolerance rankings of lawn grasses commonly grown in Kentucky.

Table 1. Drought tolerance rankings of lawn grasses grown in Kentucky

Season	Grasses	Ranking
Warm-Season	bermudagrass	Very good
	zoysiagrass	Good
Cool-Season	tall fescue	Medium
	Kentucky bluegrass, fine fescue	Fair
	perennial ryegrass	Very poor

Does the Lawn Need Water?

The first approach to watering lawns is to water as needed. Most lawn soils in Kentucky have adequate water-holding capacity and do not require water every day to sustain turfgrass growth. If you have to water, wait until the lawn is dry enough that footprints are left after walking on it (Figure 1). Footprinting will let you know that the lawn is just beginning to wilt. Once the first signs of wilt are apparent, water long enough to allow puddles to begin forming on the surface. At this point you have reached the maximum percolation rate of the soil. Before rewatering, allow the soil to dry again until footprints are visible after walking on it. This method will create the deepest possible root system and the healthiest plants in terms of drought tolerance. This type of irrigation scheduling is considered “deep and infrequent.”

Another method to determine when water is needed is to attempt to insert a screwdriver into the soil. If the soil is suf-



Figure 2. Unwatered Kentucky bluegrass (left) and tall fescue (right) lawns during drought.

ficiently moist, inserting the screwdriver will be fairly easy. As the soil becomes increasingly dry and hard, inserting the screwdriver will become more difficult. When you cannot insert the screwdriver and the soil in the top inch or two appears dry, consider turning on the water.

Moisture probes are also available to let you know when the soil becomes dry enough to water.

The second philosophy regarding watering lawns is to not water them at all. In many years rainfall is frequent enough that supplemental water is not required. However, in some years, the effects of drought may be visible on lawns. Kentucky bluegrass lawns will become dormant during lengthy droughts and will turn brown (Figure 2). More often than not, these lawns are not dead and will recover when rain and cooler temperatures return in the fall. Tall fescue, however, has a much deeper root system and will remain green and growing longer than Kentucky bluegrass. A concern with drought dormant lawns is that they are not competitive against weeds, thus attention may be needed to guard against invading weeds. Further, if the drought period is extensive, there is a chance that these cool-season lawns will not recover. Traffic, including mowing, should be strictly avoided when cool-season grasses are under drought stress. Permanent damage can occur when traffic is applied

to severely drought stressed grasses. Traffic during drought will also encourage warm-season weed species.

Time of Day

Whenever possible, water lawns in the very early morning hours (~4:00–6:00 A.M.). Watering in early morning will greatly reduce losses to evaporation by allowing time for infiltration before sunrise. Watering at this time will also have the largest effect on reducing the daily leaf wetness period by knocking off dew that has formed overnight. Conversely, watering in the evening will prolong the leaf wetness period. Reducing the length of the daily leaf wetness period will have a very positive impact on reducing summer disease problems. Watering during the day is not recommended as the water droplets from the sprinklers are often affected by wind and end up in areas other than where desired. Further, irrigation water during the day is lost to evaporation, which leads to the need for more water and higher water bills.

Beware of Overwatering

Excessive watering is just as bad as not watering enough. Too much soil moisture causes all the pore spaces in the soil to be filled with water, reducing space for air. Roots require oxygen to grow. If soil oxygen levels are low, the root system will become shallow. An unhealthy root

system will lead to problems with the aboveground portion of the plant, and shallow roots can be a concern if irrigation water becomes limited.

Overwatering can kill your lawn. Kentucky receives an average of about 1 inch of precipitation per week during the summer, so watering should supplement rainfall rather than providing all the moisture that the lawn needs. Automatic irrigation systems should not be programmed daily or even every other day. Besides causing shallow roots, overwatering causes nutrient loss, disease-susceptible turf, and severe problems with weeds such as nutsedge, nimblewill, bentgrass, annual bluegrass, oxalis, and crabgrass.

How Much Water?

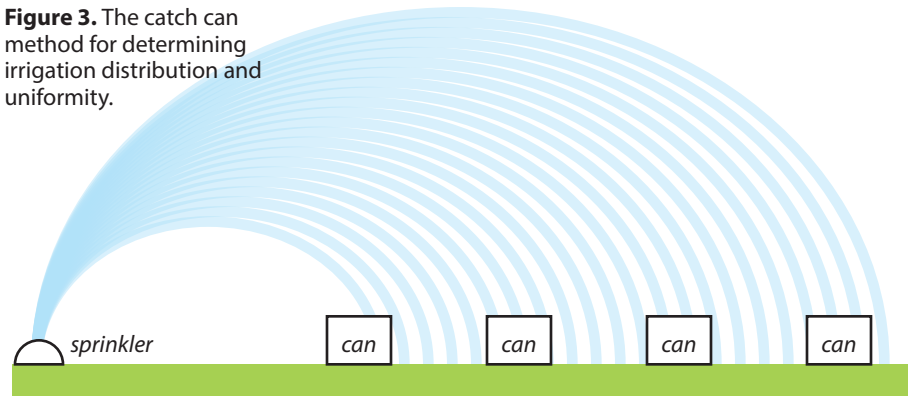
Most Kentucky soils can hold about two thirds of an inch of plant extractable water in the surface 4 inches where most turfgrass roots persist. Although this amount is less than the turf will likely use during a week, it is equivalent to about 400 gallons of water per 1,000 square feet of lawn. The difference between the total amount needed for evaporation and transpiration per week and the amount of plant extractable soil water plus weekly rainfall is approximately equal to the amount of irrigation needed to maintain maximum growth, e.g.:

$$\begin{array}{r} \text{total amount required} \\ - \text{(soil water + rainfall)} \\ \hline = \text{irrigation required} \end{array}$$

A rule-of-thumb is that turf needs about 1 inch of rainfall or irrigation water per week from May through September. Long-term weather data relating water loss and rainfall indicate that most Kentucky lawns need an average of less than one quarter inch of irrigation water per week. However, such long term weather averages mask the increased need for irrigation during periods of obvious drought.

So how do you determine how long to run the sprinklers to apply one quarter inch of water per week? The easiest way is to push a soil probe or screwdriver into the soil as described above. Another more exact method is using catch cans.

Figure 3. The catch can method for determining irrigation distribution and uniformity.



To check the irrigation rate and uniformity, place cups, soup cans, or pie pans in several areas of the lawn (Figure 3). Run your sprinklers for 15 minutes, then measure the depth of water in each can. The amount should be roughly the same in each can—if it is not, adjust the sprinklers. Multiply the average amount in the cans by four to give you the precipitation rate per hour. The result is the exact amount of time you will water to supply one quarter inch of water per week.

Sloped areas will typically require shorter and more frequent periods of irrigation to refill the soil because water runs down the slope before it has a chance to enter the soil. Water sloped areas until runoff occurs, and repeat every few hours until you can easily insert a screwdriver into the soil.

Good Judgment with In-Ground Irrigation Systems

Although you may set an automatic timer to irrigate several times each day—DON'T. Instead, use the instructions above to decide when irrigation is needed. Then use one of the following methods:

- Manually set the clock to automatically rotate through the different stations (valves/zones).
- Program the system for one irrigation to occur (for example, the next morning).
- Set the automatic timer to provide one or two irrigations per week with either automatic or manual cutoff if significant rainfall or mild weather occur. (However, it is best and most economical to initiate watering only when drought becomes evident.)

Factors that Cause Short Root Systems

- Heavy nitrogen fertilization
- Nitrogen at wrong time of year
- Poor drainage
- Heavy thatch
- Compaction
- Short mowing height
- Acidic soil conditions (low pH)
- Root injury (from pests or chemicals)
- High temperatures

Cultural Practices to Promote Lawn Health and Reduced Water Use

Because tall fescue is a deeper rooted plant than Kentucky bluegrass, by selecting tall fescue for your lawn you are already promoting water conservation. There are several other maintenance practices that will promote deep rooting and help reduce water consumption.

Fall fertilization. Most cool-season lawns only require 2 to 3 pounds of nitrogen per 1,000 square feet of lawn per year to remain healthy. This fertilizer should be applied in the fall only. Fertilizing in the spring and summer and heavy rates of nitrogen promote shallow roots and a greater need for irrigation (for more information on fertilizing lawns, see *Fertilizing Your Lawn* [AGR-212]).

Proper mowing. By mowing taller during the summer months when cool-season lawns can be under heat stress, rooting is promoted and plants are able to seek out available water in the soil (for more information on mowing, see *Mowing Your Kentucky Lawn* [AGR-209]).

Compacted soils. Hard soils will limit how much water is able to infiltrate the soil and will promote runoff. Compacted soils should be aerified to promote infiltration into the soil and percolation through it. Cool-season lawns should be aerified in the fall or spring.

Thatch reduction. Thatch layers thicker than half an inch can promote shallow rooting and summer heat stress due to elevated crowns. Dethatching or aerification should be performed to reduce thatch. Kentucky bluegrass, zoysiagrass, and bermudagrass are all high-thatch producing species. (for more information on aerifying and dethatching, see *Aerifying and Dethatching Lawns* [AGR-54]).

Limit traffic. Although not a maintenance practice, keeping pets and kids off the lawn, especially during the heat of the summer, will promote a healthier lawn. Lawns that are stressed from traffic require increased irrigation for recovery.

Taking proper care of your lawn using the above maintenance practices will result in a more dense lawn. As density increases, water lost to evaporation from the soil decreases, which results in more water savings.

Other Guidelines

The following guidelines will help you use your irrigation system effectively:

- Not all sites in a lawn will need the same frequency of irrigation. If, for example, you are watering a flower bed under a roof overhang, you may need irrigation even during rainy spells, especially on the east and north sides of buildings. Probe the soil to find out.
- When irrigation is necessary, apply about two thirds of an inch of water. If surface run-off occurs before irrigation is complete, apply only one half of the amount in future irrigations and let the system recycle after a few hours. An efficient irrigation wets only the turfgrass root zone without saturating the soil or causing run-off.
- More frequent irrigation is usually required on the hotter, south-facing slopes where a half inch or more of thatch is present, when growing Kentucky bluegrass rather than tall fescue, when mowing at 1½ inches in height rather than 2½ inches in height, and certainly during the hottest time of year.
- During summer vacations and other summer periods when close attention cannot be given to irrigation, consider not watering or setting the irrigation clock to apply about two thirds of an inch of water each week. During fall and spring, since temperatures are cooler, the lawn can usually go 2 to 3 weeks without significant rainfall or irrigation.

Quick Watering Tips

- Do not water according to a clock.
- Be sure that sprinklers are adjusted so they are not watering sidewalks.
- Do not water until the lawn needs water.
- Fertilize only in the fall to promote drought tolerance.
- Fix leaky hoses/spigots so water is not being wasted.
- Water in the early morning.

- Water can be applied anytime during the day without damaging turf. However, evaporative water loss during irrigation is much higher during the heat of day. Early morning watering is often advantageous since it removes dew and guttation water, which often encourage disease problems. If a turf disease is evident, avoid late evening watering that would prolong leaf wetness. Otherwise watering during late evening or night causes no problems.

Kentucky's continuously changing environment provides a challenge to planning an efficient turfgrass irrigation program. However, by observing the lawn for signs of drought and performing cultural practices to promote plant health, over time your lawn can become a good mix of aesthetics and function while promoting water conservation.

Other Extension Publications Detailing Water Conservation

Saving Water at Home (HENV-601)

Saving Water Saves Energy: Tips for Conserving Water at Home (HENV-704)

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