THE UNIVERSITY OF GEORGIA
COOPERATIVE EXTENSION
Colleges of Agricultural and Environmental Sciences & Family and Consumer Sciences

Turfgrass Water Management

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Turfgrasses, like all living plants, need water for growth and survival. Since rainfall patterns are quite variable, seasonal droughts are common in Georgia and periodic irrigation is needed to maintain a healthy, actively growing turf.

Although irrigation may be costly, a green and growing turf improves environmental conditions better than a brown, dormant turf. For example, the main benefits of a healthy turf are water and wind erosion control. Actively growing turf may have a surface temperature that is 20 degrees cooler than a dormant turf during the summer. However, water may become a major cost in lawn maintenance. In fact, it is presently estimated that 9 percent of the total annual water consumption in our nation is used on turf and ornamentals in urban areas. Therefore, as water becomes more costly and/or supplies decrease, it will become more important to use good irrigation practices.

Factors Affecting Water Use

Water use, also called *evapotranspiration,* is the total amount of water needed for turfgrass growth plus the quantity evaporated from the soil surface. Turfgrass water use rates depend on soil type, grass species and/or cultivar, management level and atmospheric conditions. Atmospheric water loss increases as temperature and solar radiation increase. Water loss also increases with increasing winds up to 4 miles per hour and as humidity decreases. In general, most turfgrasses grown in Georgia use about 1 inch of water per week to maintain normal growth and color. But under some conditions such as shallow rooting and high nitrogen levels, water use may be 2 inches per week.

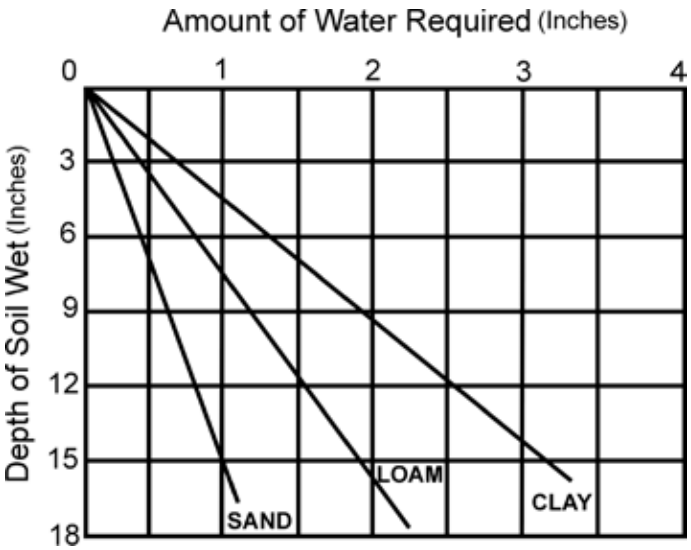

Figure 1. Water applications. Example: 1 inch of water will wet a clay soil to more than 4 inches deep, a loam soil to 8 inches deep, and a sand soil to more than 15 inches deep.

Sandy or coarse-textured soils absorb water (also called *infiltration*) much faster than clay or fine-textured soils. However, sandy soils retain less water and, there-fore, need water more often than clay soils. Since clay soils absorb water slowly, irrigation rates should be slow and extend over a longer period. Thus, infiltration rate and water retention vary with the sand and clay content of soil (Figure 1).

Most turfgrasses grown in Georgia need about 1 inch of water per week during the summer to remain green and growng (Table 1, page 2). Some turfgrasses, like bermudagrass, develop deep root systems to obtain the needed water. Other turfgrasses, like some Zoysiagrasses, have shallow root systems and need weekly irrigation to remain green.

Table 1 provides summer water use rates/drought resistance rankings and irrigation frequency for turfgrass species in Georgia. The water use rate and drought resistance ranking is based on the amount of water used through evapotranspiration and the relative rate the turf begins to show drought stress. The days between irrigations are for mid-summer high evaporative conditions. The differences between grasses reflect differences in daily evapotranspiration, root depth, viability and quality, and turfgrass drought resistance. Under non-irrigated conditions, the relative drought tolerance (or ability to survive without water) becomes more important. Generally, turfgrasses with high water use rates tend to have low drought tolerance.

Table 1. Summer water use rates/drought resistance rankings and irrigation frequency of turfgrasses used in Georgia.

Common Name	Water Use/Drought Resistance	Days between Irrigations
Bermudagrass	1	14-21
St. Augustinegrass	2	12-18
Centipedegrass	3	8-12
Tall Fescue	4	6-8
Zoysiagrass	5	5-7

Turfgrass management practices also influence the amount of water needed to maintain a healthy, green turf. Frequent nitrogen fertilization and excess thatch increase the amount and frequency of irrigation needed. During moisture stress periods, raising the mowing height and mowing often enough so no more than $^1/_3$ of the leaf tissue is removed can increase turf survival. Raising the mowing height helps the grass maintain a deeper root system, which helps it find more water.

Thatch is a layer of plant material between the soil and the green leaves of a turf (Figure 2). Thatch can slow water movement into the soil, thus increasing water loss through run-off and evaporation, and thatch can also help create a shallow root system. Thatch development is a natural process; but excess thatch formation is fostered by excess fertilization, high mowing heights, frequent and short irrigation, and excess pesticide application.

When a thatch layer exceeds $^1/_2$ inch, dethatching with a vertical mower or other equipment is recommended or topdressing with soil or sand. Core aeration also slows down the rate of thatch development, and, more importantly, will also increase water infiltration and reduce run-off by relieving soil compaction. Coring compacted soils at least twice a year is needed to improve these soil problems.

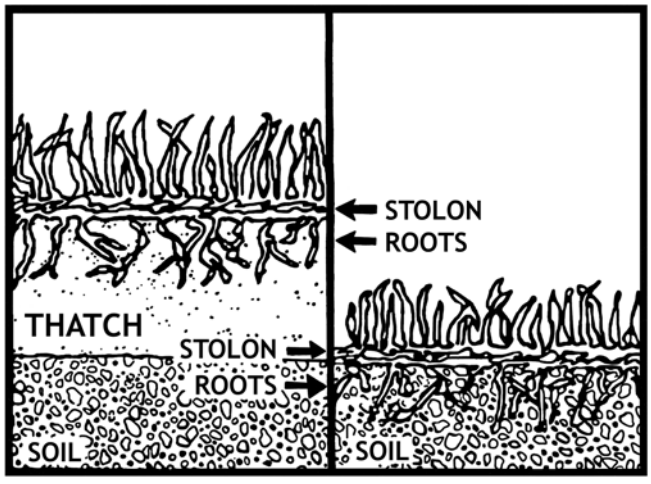

Figure 2. Thatch is the accumulated plant material between the soil surface and the green leaves of a turf.

When to Irrigate

Timely irrigation is needed for effective and efficient water use. Irrigate at the first sign of moisture stress. When a turfgrass is under moisture stress, it becomes dull and bluish-green, the leaf blades fold or roll, and footprints remain after you walk over the area. If dry conditions continue, the grass wilts. Begin irrigation on that portion of the lawn that first exhibits these signs.

When water is applied also influences its effectiveness. Before sunrise is considered the best time to irrigate because of low wind and temperature. Research shows water losses at night from irrigation are 50 percent less than from midday irrigation. Studies also indicate that irrigating after dew develops on a turf will not increase disease problems. However, irrigating prior to dew formation or after the dew has dried from the morning sun and/or wind extends the period of free surface moisture and may enhance disease development.

How Much Water?

Applying the proper amount of water is one maintenance practice often done wrong. Light, frequent irrigations produce shallow, weak root systems (Figure 3). The shallow root system prevents efficient use of plant nutrients and water in the soil. Roots generally grow where the soil is moist, and some turfgrass roots do seek out water deeper in the soil as the surface moisture is depleted.

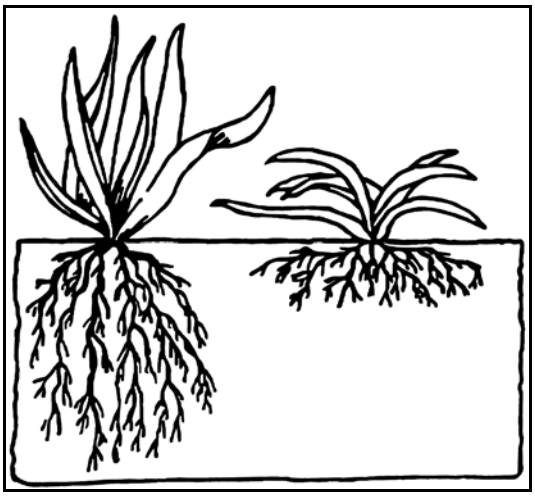
Figure 3. The grass on the left has received adequate moisture at all depths. The grass on the right has not received enough water to develop a healthy, deep root system.

Apply enough water to soak the soil to a depth of 6 to 8 inches. This is usually equivalent to about 1 inch of rainfall or 600 gallons per 1000 square feet, but this will vary with different soils. A sand would require 0.5 inch of water while a clay would need 1.75 inches to wet the soil to an 8-inch depth (Figure 1, page 1). Most sprinklers apply about $^1/_4$ inch of water per hour and so must be on in one spot for 2 to 4 hours to apply 1 inch of water.

Do not irrigate until run-off occurs. If water is being applied faster than the soil can absorb it, either move the sprinkler to a new location or turn it off and allow the water to soak into the soil. To determine the depth of water penetration, use a spade or sharp probe to push into the soil 2 to 4 hours after irrigation. The probe will move into the soil very easily where it is moist. The probe becomes harder to push when it hits dry soil.

To test your sprinkler output and application uniformity, place several open-top containers of the same size under the sprinkler. After running the sprinkler for an hour, measure the amount of water in each container. The difference between containers provides an estimate of water distribution and application rate.

Summary

The key to successful irrigation of home lawns is to prepare the grass to use as little extra water as possible and remain green and growing. This is done by developing a deep-rooted turfgrass. Listed below are the guidelines that will help develop a deep-rooted turfgrass that is more tolerant to seasonal drought.

- Select a turfgrass that is well-adapted to your location
- Irrigate as infrequently as possible. Irrigate when the turf starts turning a dull bluish-green, the first sign of drought stress.
- Apply enough water to drench the soil 6 to 8 inches deep.
- Raise the height of cut during stress and mow more often.
- Use an irrigation system that provides an even distribution of water at about $^1/_4$ to $^1/_3$ inch per hour.
- Fertilize lightly in the summer months, especially on cool-season grasses.

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Learning for Life

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