W161-F

Turfgrass Maintenance Irrigation

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Although water vapor accounts for less than 2 percent of the atmosphere's total volume, it is of utmost importance from the standpoint of weather and climate. It is the primary absorber of solar energy and radiant energy from the earth. It is also the source of all forms of precipitation and condensation. Water vapor contains energy important for atmospheric circulation and affects the rate that water moves through plants into the atmosphere.

Turfgrasses vary in water-use rate, or the total amount of water required for growth, plus the amount of water transpired from the plant and evaporated from both the plant and soil surfaces. The water-use rate is usually reported as evapotranspiration, or ET, and is measured in millimeters per day. For example, bermudagrass, centipedegrass and *Zoysia* have a relatively low ET rate (about 6 to 7 mm per day) compared to annual ryegrass, creeping bentgrass, Kentucky bluegrass and tall fescue (often more than 10 mm per day).

Generally, the higher the air temperature and the drier the air, the greater the ET. Wind accelerates water loss from turf. Growth rate, aerial shoot density, leaf area and leaf position influence the resistance of a turf canopy to water loss.

How Much Water? Turfgrass water use can be estimated using local weather-pan evaporation and crop coefficient information (Kopec, D. M. and C. Throssell. 1995. Irrigation Scheduling Techniques. Golf Course Superintendents Association of America Seminar Manual).

Turfgrass ET = crop coefficient x pan evaporation

The crop coefficient, with a value most often less than 1, varies among turfgrasses and geographic locations.

If, for example, the pan evaporation rate is a reported 1.9 inches / week and the tall fescue crop coefficient is an estimated 0.8, the weekly water requirement of a tall fescue turf is 1.9 inches x 0.8 or 1.52 inches. One and one-half inches (41,000 gallons per acre) of irrigation or rainfall are required to replace the amount of water lost through evapotranspiration during the week.

How Often? Many variables deserve consideration when deciding how to set an automatic irrigation system. These include turfgrass species, season and soil texture. Actively growing turfs generally contain more than 70 percent water and, depending on species, may use from 1/10 inch to 3/10 inch or more of water daily. In Tennessee, precipitation during early spring may meet the water requirement of actively growing, cool-season turfgrasses and warm-season turfgrasses recovering from winter dormancy. However, turfgrasses most often require supplemental irrigation to maintain growth and color during hot, dry summer months. Fine-textured, clayey soils usually hold more water for a longer period of time than coarse-textured, sandy soils.

One irrigation philosophy is to water thoroughly and infrequently in an effort to encourage turfgrass plants to develop deep roots. The soil is moistened to a depth of at least 6 inches and the turf is not irrigated again until symptoms of drought stress begin to appear. Many industry professionals managing turfgrasses in loam soil keep this philosophy in mind and set irrigation systems to apply ½ inch (about 320 gallons per 1,000 square feet) of water no more than twice each week. When thoroughly irrigating turfs maintained on slopes or in heavy clay soils, it may be necessary to activate sprinkler heads in each zone several times to avoid runoff.

Another irrigation philosophy, based, in part, on research conducted at Michigan State University, is to irrigate lightly and often (e.g., 1/10 to 2/10 inch of water every other day) during the summer. A goal is to meet the daily water requirement of shallowly rooted turfgrasses while conserving water by preventing runoff and the percolation of water below the turfgrass root zone. Damage from certain diseases and insects may be reduced when water is applied by light, frequent rather than deep, infrequent irrigation.

Moisture Sensors. Several manufacturers market soil moisture sensors that, when installed below the soil surface, can automatically activate an irrigation system before the turf becomes drought-stressed and shut the system off before the soil becomes saturated.

Monitoring Soil Moisture and Turfgrass Drought Stress. The relative moisture status of a soil can be estimated by using a pocket knife to probe the soil, noting the resistance to penetration by the blade. Many soils contain large amounts of clay and become very hard as they dry. Wilting of plants and foot-printing signal the need to irrigate. Turfs often appear bluish-gray as they wilt and may fail to spring back when compressed by foot-traffic.

When Is the Best Time of Day to Irrigate?
Since excessively wet turfs are prone to disease, watering at night should be avoided whenever possible. Turfs irrigated during midday often dry quickly; however, much of the applied water may evaporate. The compromise is to irrigate during early morning hours (e.g., from 5:00 to 9:00 a.m.). Irrigating in the morning will reduce evaporative water loss and limit the amount of time the turf canopy is wet.

Resources:

Kim, K. S. 1983. Comparative Evapotranspiration Rates of 13 Turfgrasses Grown Under Both Limiting and Non-limiting Soil Moisture and Progressive Water Stress Conditions. M. S. Thesis. Texas A&M University, College Station, Texas p. 64.

Lyman, G. T., P. E. Reike and J. M. Vargas Jr. 2002. Turf Tips For the Homeowner – Irrigation Practices to Preserve Water Quality, Michigan State University Extension, Bulletin E09TURF http://www.turf.msu.edu/docs/turftipsE09.pdf

McCann, S. and Huang, B. 2007. Water Conservation in Cool-season Turfgrasses: The Impact of Irrigation Scheduling and PGR Application. in *Proceedings of the Sixteenth Annual Rutgers Turfgrass Symposium*.

Turgeon, A. J. 1999. "Chapter 5. Primary Cultural Practices" in *Turfgrass Management*, 5th Edition, Prentice Hall, Upper Saddle River, NJ. pp. 155-206.

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