TURF WATER USE

Victor A. Gibeault
University of California
Riverside, CA

Turfgrass has a direct effect on the way most people live. It provides the medium for play on many recreational facilities; it modifies our environment to make life easier and more pleasant; it provides opportunity for a pleasing and functional home landscape; and, in turn, the turfgrass industry has a significant direct economic impact on our economy and huge indirect impact on our tourist economy.

Turfgrass, and other landscape plant material, needs water for its growth and development. If there is insufficient precipitation on an annual basis, or if precipitation is not adequately spaced throughout the year, then supplemental water supplied as irrigation is often needed.

Water enters a turfgrass plant through its root hairs, which are located near root tips. Water then moves upward through the plant to the leaves. A very small amount of the water taken up is used for plant growth. The rest of the water goes out of the plant in transpiration and for growth, per unit time. Because the amount of water used by grasses for growth is so small, the water use rate is usually calculated as the evapotranspiration (ET) rate, which is the total of the rate of water loss by evaporation plus the rate of water loss by transpiration.

Water use is given in units such as inches (in) or millimeters (mm) per day, per week or per month. The rate of water use by turfgrass varies by species, and is modified by solar radiation, day length, wind, temperature, relative humidity, and other environmental factors, and by the cultural practices used in maintaining the turf.

Water use rates have been established for the most commonly used warm– and cool–season turfgrass species. Research at Texas A&M by Drs. J.B. Beard and K.S. Kim evaluated the comparative water use rates among turfgrasses grown in the United States. Their results for selected grasses are presented in Table 1.

The lower water use grasses are those with a low leaf blade area, including species with narrow leaves with slow vertical extension rates, and grasses having high shoot densities with high leaf numbers.

Varietal differences in water use rates have been noted. Research is now under way to develop varieties with still lower water use rates.

Table 1. Evapotranspiration rates of selected turfgrasses.

Relative Ranking	ET Rate (inches/day)	Turfgrass Cool-Season	Turfgrass Warm-Season
Very low	<.24		Buffalograss
Low	.24 – .28		Bermudagrass Zoysiagrass
Medium	.28 – .33	Hard fescue Chewings fescue Red fescue	
High	.33 – .39	Perennial ryegrass	
Very high	>.39	Tall fescue Creeping bentgrass Annual bluegrass Kentucky bluegrass Italian ryegrass	

From: Beard, J.B. and K.S. Kim. 1989. Low water use turfgrasses. USGA Green Section Record (76):12–13.

The ET of a turfgrass is not synonymous with its ability to resist drought. Drought resistance includes mechanisms of drought avoidance (i.e., of retaining moisture within the plant) and of drought tolerance (i.e., of minimizing the damage to tissues of water deprivation).

Plant characteristics that contribute to drought avoidance include deep root systems with high root length and root hair density, rolled leaf blades, thick cuticle or ability to quickly form a thick cuticle following water stress initiation, reduced leaf area, slow leaf extension rates, and leaf orientation and density that give high canopy resistance. Examples of turfgrasses with good drought avoidance mechanisms are common bermudagrass and seashore paspalum (both warm–season species) and tall fescue (a cool–season species).

Turfgrasses can tolerate drought by escape or by high dehydration tolerance.

Some turfgrasses have both low water use rates and high drought resistance mechanisms. Other turfgrasses, such as tall fescue, have high water use rates and medium drought resistance. Still others, such as the ryegrasses and bluegrasses, have high water use rates and fair or poor drought resistance.

In summary, turfgrasses differ in water use rates and their ability to resist drought. If drought cycles are common or supplemental water availability is questionable, then attention to the efficiency of water required by turfgrasses is needed.

A drought is defined as a period of abnormal moisture deficiency. This definition implies that normal moisture conditions will return to an area in time and that temporary water shortage. Attention to the details of mowing, fertilization, thatch and compaction control, and especially irrigation practices, can maximize water efficiency on a turfed site during short term drought.

In contrast, some areas face the possibility of permanent drought conditions because of jurisdictional, political or economic considerations. Under such circumstances, attention to details of design, and the selection of low water using and drought resistant species, in addition to careful cultural practices, are needed.