TURFGRASS WATER USE IN UTAH

Robert W. Hill, Extension Irrigation Specialist
Kelly L. Kopp, Extension Turfgrass and Water Conservation Specialist

June 2002 ENGR/BIE/WM-36

The goal of turfgrass irrigation is to maintain quality by replacing water lost to the atmosphere from the soil by evaporation, and from leaf surfaces by transpiration. The combination of evaporation and transpiration is referred to as evapotranspiration (Et), or simply water use. Turfgrass water use is normally presented in units of inches of water per day, week or month. Inches of water is a useful measure since it can be directly related to the inches of water applied by a sprinkler system over time to determine irrigation scheduling.

Turfgrass water use is affected by seasonal variations in air temperature and other weather conditions. Water use is relatively low in the spring, increases in late June through July and early August, then decreases through the end of August into September and October. Table 1 summarizes monthly turfgrass water use rates for various locations throughout Utah. To calculate daily water use, divide the Table 1 monthly estimates by 30. For example, daily turfgrass water use for the month of June in Beaver would be approximately: 4.67 inches ÷ 30 days ≈ 0.16 inch per day. The information from Table 1 is based on long term average water use for each location. Several communities also provide real time water use data from local weather stations. Contact your local County Extension Office to find out if this information is available in your area.

SOIL WATER STORAGE

The amount of water in the soil available for turfgrass use depends on the rooting depth and soil type. Unless there is a limiting layer, most turfgrass roots will be found in the top 1 to 1 ½ feet of soil. Water holding capacities vary from about 1 inch per foot of depth in a sandy soil to about 2 inches per foot of depth in a loam soil. Therefore, in a sandy soil, 1 inch of water is available for plant use in a 1 foot turf root zone. In a loamy soil, 2 inches of water would be available for the turf to use in the same 1 foot root zone. To prevent drought stress, ***irrigation is recommended when 50 percent of the water has been used from the root zone***. In a sandy soil, irrigation should occur when approximately ½ inch of water has been used by turfgrass with a 1 foot rooting depth. In a loam soil, approximately 1 inch of water could be used from the 1 foot root zone between irrigations.

IRRIGATION SCHEDULING

As an example of irrigation scheduling, assume turfgrass uses 0.16 inch of water per day in June at Beaver (see above example). To maintain grass with a 1 foot rooting depth in a sandy soil, an irrigation of ½ inch would be needed every 3rd day (0.5 inch water ÷ 0.16 inch use per day ≈ 3 days). In a loam soil, 1 inch of irrigation could be applied every 6 days (1.0 inch water ÷ 0.16 inch use per day ≈ 6 days). The irrigation depths and frequencies calculated here assume uniform application of water by the system and a 1 foot root zone. If water is not applied uniformly, actual irrigation amounts (inches applied) may be higher to insure that areas receiving less water from the system are irrigated adequately. For more information about irrigation scheduling, see the Utah State University Extension web site: extension.usu.edu/drought.

Table 1. Monthly and total seasonal water use estimates (in inches) for turfgrass from various Utah locations.

Location	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Season total
Beaver	–	–	1.35	3.77	4.67	5.31	4.16	2.64	–	–	21.90
Blanding	–	0.30	2.22	3.55	4.28	4.85	4.12	2.87	1.24	–	23.43
Brighton (Silver Lake)	–	–	–	1.25	3.24	3.77	3.23	1.12	–	–	12.61
Castle Dale	–	–	1.77	3.42	5.21	5.62	4.50	3.44	1.23	–	25.21
Cedar City	–	0.32	2.37	3.91	4.69	5.06	4.32	3.26	1.35	–	25.27
Corinne	–	0.27	2.10	3.63	4.76	5.40	4.76	3.17	1.69	–	25.78
Delta	–	0.59	2.39	4.01	4.92	5.59	4.69	3.20	1.07	–	26.45
Farmington	–	0.73	2.10	3.43	4.56	5.13	4.33	2.77	1.44	–	24.49
Heber	–	–	0.88	3.42	4.25	4.91	4.20	2.87	0.56	–	21.10
Kamas	–	–	0.50	3.13	4.07	4.41	3.83	2.61	–	–	18.55
Kanab	–	1.25	2.64	4.20	4.93	5.25	4.46	3.36	2.03	0.19	28.32
Logan	–	0.29	1.90	3.41	4.31	4.78	4.20	2.66	1.14	–	22.68
Manti	–	–	1.36	3.87	4.72	5.32	4.64	3.35	1.05	–	24.32
Moab	0.16	1.77	2.68	4.05	5.00	5.44	4.64	3.58	2.22	0.41	29.95
Nephi	–	–	1.29	3.39	4.36	5.02	4.25	2.88	1.08	–	22.27
Odgen (Sugar Factory)	–	0.64	2.23	3.61	4.78	5.21	4.43	2.74	1.93	–	25.57
Panguitch	–	–	0.30	3.47	4.56	4.73	3.99	3.00	0.37	–	20.43
Park City	–	–	0.48	2.94	3.81	3.96	3.70	2.29	–	–	17.17
Pleasant Grove	–	0.31	2.19	3.70	4.56	5.22	4.25	2.94	1.50	–	24.68
Richfield	–	–	1.82	3.84	4.63	5.15	4.46	3.01	0.99	–	23.90
Roosevelt	–	–	2.20	4.11	4.96	5.38	4.48	2.87	1.25	–	25.25
Salt Lake (Airport)	–	0.31	1.89	3.39	4.64	5.39	4.53	2.72	1.38	–	24.26
St. George	0.12	2.21	3.09	4.83	5.75	6.27	5.01	3.36	2.15	0.69	33.79
Tooele	–	0.45	2.07	3.86	4.73	5.08	4.23	2.59	1.25	–	24.28
Vernal	–	–	1.91	3.88	4.78	5.21	4.46	2.91	1.69	0.13	24.97

Adapted from *Consumptive Use of Irrigated Crops in Utah*. Utah Agriculture Experiment Station Research Report No. 145. Oct 1994. The complete set of crops and sites can be found on the web at: http://waterrights.utah.gov/techinfo/consumpt/default.htm

IRRIGATING BY INTERVALS

A simplified method of turfgrass irrigation scheduling involves applying the same amount of water each time the system is operated, but varying the interval between irrigations based on the water use estimates described in Table 1. For turfgrass, adjust the sprinkler system clock duration (minutes) to apply ½ (0.50) inch of water each irrigation. The interval between irrigations then varies depending on how long it takes turfgrass to use ½ (0.50) inch of water. System intervals for various Utah locations are presented in Table 2. As an example of irrigating by intervals, in Beaver the irrigation season would begin in April and would require irrigating once every five days. The interval would then vary over the growing season from 5 days to as short as 3 days and as long as 9 days depending on the month. The irrigation intervals shown in Table 2 ignore the occurrence of rainfall.

Table 2. Monthly recommendations for irrigation interval (number of days between irrigations) for various Utah locations, based on the replacement of ½ (0.50) inch of water at each irrigation and ignoring rainfall.

Location	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
Beaver	–	5	4	3	3	3	5	9
Blanding	–	5	4	3	3	4	5	9
Brighton (Silver Lake)	–	7	5	4	4	4	6	10
Castle Dale	–	6	4	3	3	3	4	7
Cedar City	–	5	4	3	3	3	4	7
Corinne	–	7	4	3	3	3	6	12
Delta	–	5	4	3	3	3	5	9
Farmington	–	6	4	3	3	3	5	9
Heber	–	7	4	3	3	4	5	10
Kamas	–	7	5	4	4	4	6	10
Kanab	8	5	3	3	3	4	5	7
Logan	–	6	4	3	3	4	6	12
Manti	–	6	4	3	3	3	5	8
Moab	7	5	4	3	3	3	4	6
Nephi	–	6	4	3	3	3	6	10
Odgen (Sugar Factory)	–	6	4	3	3	3	6	10
Panguitch	–	8	4	3	3	4	5	10
Park City	–	7	5	4	4	4	6	10
Pleasant Grove	–	6	4	3	3	3	6	10
Richfield	–	6	4	3	3	3	5	9
Roosevelt	–	6	4	3	3	4	5	10
Salt Lake (Airport)	–	6	4	3	3	3	6	10
St. George*	8	5	4	3	3	3	5	7
Tooele	12	6	4	3	3	3	5	9
Vernal	11	6	4	3	3	3	5	9

*In St. George the recommended irrigation intervals are based on the application of 5/8 (0.63) inch of water at each irrigation.

ACKNOWLEDGMENTS

This fact sheet was adapted from material presented at the Landscape Irrigation Auditors training held in May 2001 and 2002 at the Jordan Valley Water Conservancy District under the direction of Earl Jackson, Salt Lake County Extension. The word processing and publication skills of Melanie Christoffersen and Donna Falkenborg are appreciated.

APPENDIX

The intervals shown in Table 2 for each site and month were determined by dividing the monthly turfgrass water use estimates (Et) in Table 1 by ½ (0.5) inches or by the desired amount of water replacement (in the case of St. George: 5/8, 0.63 inch). The resulting value was then divided into the number of days per month to obtain the irrigation interval. In equation form:

$$\text{Irrigation interval} = \text{days in month}/(Et/0.5)$$

The recommendation of the ½ (0.5) inch replacement value is based on a consensus reached by experts from USU Extension, the U.S. Bureau of Reclamation, the Utah Division of Water Resources, and the representatives of several Utah water conservancy districts.

Available Water-holding Capacity of Soils

Soil Texture	Inches of available water per foot of moist soil	Permeability rate[1] Inches/Hour
Sands and fine sands	0.5 - 0.75	1.0 - 10
Very fine sands, loamy sand	.8 - 1.0	1.0 - 3
Sandy Loam	1.2 - 1.5	0.5 - 3
Loam	1.9 - 2.0	0.3 - 0.8
Silt loam, silt	2.0	0.2 - 0.4
Silty clay loam	1.9 - 2.0	0.01 - 0.
Sandy clay loam, Clay loam	1.7 - 2.0	0.1 - 0.6

Note: Allowable depletion to avoid crop water stress is usually about 50% of available water holding capacity for plants.

[1]Normal ranges. Intake rates vary greatly with soil structure and structural stability.

Robert W. Hill, Extension Irrigation Specialist,
Biological and Irrigation Engineering Department,
Utah State University, Logan, UT 84322-4105

Kelly L. Kopp, Extension Water Conservation Specialist,
Plants, Soils, and Biometeorology Department,
Utah State University, Logan, UT 84322-4820

This publication is issued in furtherance of Cooperative Extension work. Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, Jack M. Payne, Vice President and Director, Cooperative Extension Service, Utah State University. (EP/DF/06-02)