EXTENSION FACT SHEET

TURFGRASS CONSUMPTIVE USE: PAYSON, AZ

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Introduction

Irrigation of turfgrass is an issue of growing concern in northern Arizona cities and towns as population growth places increasing demands on limited water supplies. Understanding the water requirements of turfgrass is essential if we are to improve irrigation management and better plan for future urban growth. Consumptive use (CU) curves (e.g., Brown, 2003) that provide average rates of turfgrass water use (evapotranspiration; ET_T) provide this much needed information. The University of Arizona, through its TRIF[1] Water Sustainability Program, is presently developing new and/or updated information on turfgrass CU for northern Arizona. This Fact Sheet provides turfgrass CU curves and related data for the Payson area.

Turf CU Methodology

Turfgrass CU values (ET_T) were estimated by applying crop coefficients (Kc) appropriate for acceptable (parks and lawns) and high quality (golf course) turf to average daily values of reference evapotranspiration (ETos; Brown, 2000) for each month of the year:

$$ET_T = Kc * ETos$$

ETos was computed using the standardized reference evapotranspiration procedure appropriate for a short crop and daily computational time step (see Brown, 2004). Meteorological data used in the ETos computation included monthly mean values of maximum, minimum and dew point temperature; wind speed; solar radiation; and estimates of soil heat flux computed from monthly mean temperature data

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(see Walter et al., 2004). The meteorological data used to compute ETos were obtained from multiple sources, including the National Oceanic and Atmospheric Administration (temperature and wind; WRCC, 2003), Solar Energy Research Institute (solar radiation; Knapp et al., 1980) and by estimation (dew point; Walter et al., 2004).

Crop coefficients for high and acceptable quality turf were set to 0.95 and 0.80, respectively during the primary growth months of April through October (Albrecht, 1993; NCWCD, 2003). Crop coefficients were decreased to 0.625 (high quality) and 0.55 (acceptable) during the months when the grass 1s transitioning to (November) or from (March) dormancy (NCWCD, 2003). Crop coefficients were set equal to 0.3 irrespective of turf quality during the winter months when the turf is dormant (December through February).

Turfgrass CU for Payson

Monthly totals of ETos, precipitation (PPT) and turfgrass CU are presented in Table 1 for the Payson area. CU values are provided in units of inches per month (0/Mnth) and inches per day (0/Dy). PPT is presented in units of 0/Mnth and as a % of CU for the two indicated levels of turf quality. The CU data are presented graphically in Figure 1 in the form of annual CU curves.

CU of high quality turf during the growing season (March - November) varies from ~1.8" in November to ~8.4" in June and totals 48.75". Calendar year CU, which includes evaporation from dormant turf during the winter months, totals ~50.8". Acceptable quality turf exhibits a lower rate of consumptive use during the growing season with monthly totals ranging from ~1.5" in November to ~7.1" in June. Growing season and calendar year CU for acceptable quality turf total ~41.2" and 43.3", respectively.

It is important to note that the CU values provided in Table 1 and Figure 1 represent gross evaporation rates from turf and do not take into account PPT which can reduce or eliminate the need for irrigation in some months. To use this CU information to determine the amount of water required for irrigation, one must first subtract the amount of effective PPT (PPT not lost to deep percolation and runoff) to determine the net water requirement for any period. PPT during the growing season (March to November) in the Payson area averages 15.65" (32 - 38 % of CU) and should reduce irrigation water requirements substantially. PPT often exceeds CU in the winter and should greatly reduce or eliminate the need for irrigation in most years.

The final step in determining the irrigation water requirement involves making adjustments to: 1) account for system nonuniformity and 2) ensure leaching is sufficient to maintain soil salinity at acceptable levels. Adjustments for nonuniformity and salinity management increase the amount of irrigation water required and vary dramatically with location due to differences in irrigation design, topography, local weather conditions, and water quality. An irrigation audit is required to assess and properly correct for irrigation nonuniformity. Water tests are required to determine how much water must be applied in excess of CU to facilitate leaching.

References

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Table 1. Reference ET (ETos), precipitation (PPT) and consumptive use values (CU) for high and acceptable quality turf for the Payson area. ETos and CU values are presented in units of inches per month (0/Mnth) and inches per day ("/Dy). PPT is provided both as monthly totals (0/Mnth) and as a percentage of turf CU.

Month	ETos		PPT	Turf CU: High Quality			Turf CU: Acceptable Quality		
						PPT			PPT
	"/Mnth	"/Dy	0/Mnth	"/Mnth	"/Dy	% CU	"/Mnth	"/Dy	% CU
JAN	2.15	0.07	2.33	0.64	0.02	>100	0.64	0.02	>100
FEB	2.66	0.10	2.34	0.80	0.03	>100	0.80	0.03	>100
MAR	4.05	0.13	2.68	2.53	0.08	>100	2.23	0.07	>100
APR	5.81	0.19	1.15	5.52	0.18	21	4.65	0.16	25
MAY	7.57	0.24	0.66	7.20	0.23	9	6.06	0.20	11
JUN	8.85	0.30	0.37	8.41	0.28	4	7.08	0.24	5
JUL	7.79	0.25	2.42	7.40	0.24	33	6.23	0.20	39
AUG	6.70	0.22	2.97	6.37	0.20	47	5.36	0.17	55
SEP	5.73	0.19	1.81	5.44	0.18	33	4.58	0.15	40
OCT	4.35	0.14	1.89	4.13	0.13	46	3.48	0.11	54
NOV	2.80	0.09	1.70	1.75	0.06	97	1.54	0.05	>100
DEC	2.12	0.07	1.75	0.64	0.02	>100	0.64	0.02	>100
TOTAL	**60.59"**		**22.07"**	**50.83"**			**43.30"**		

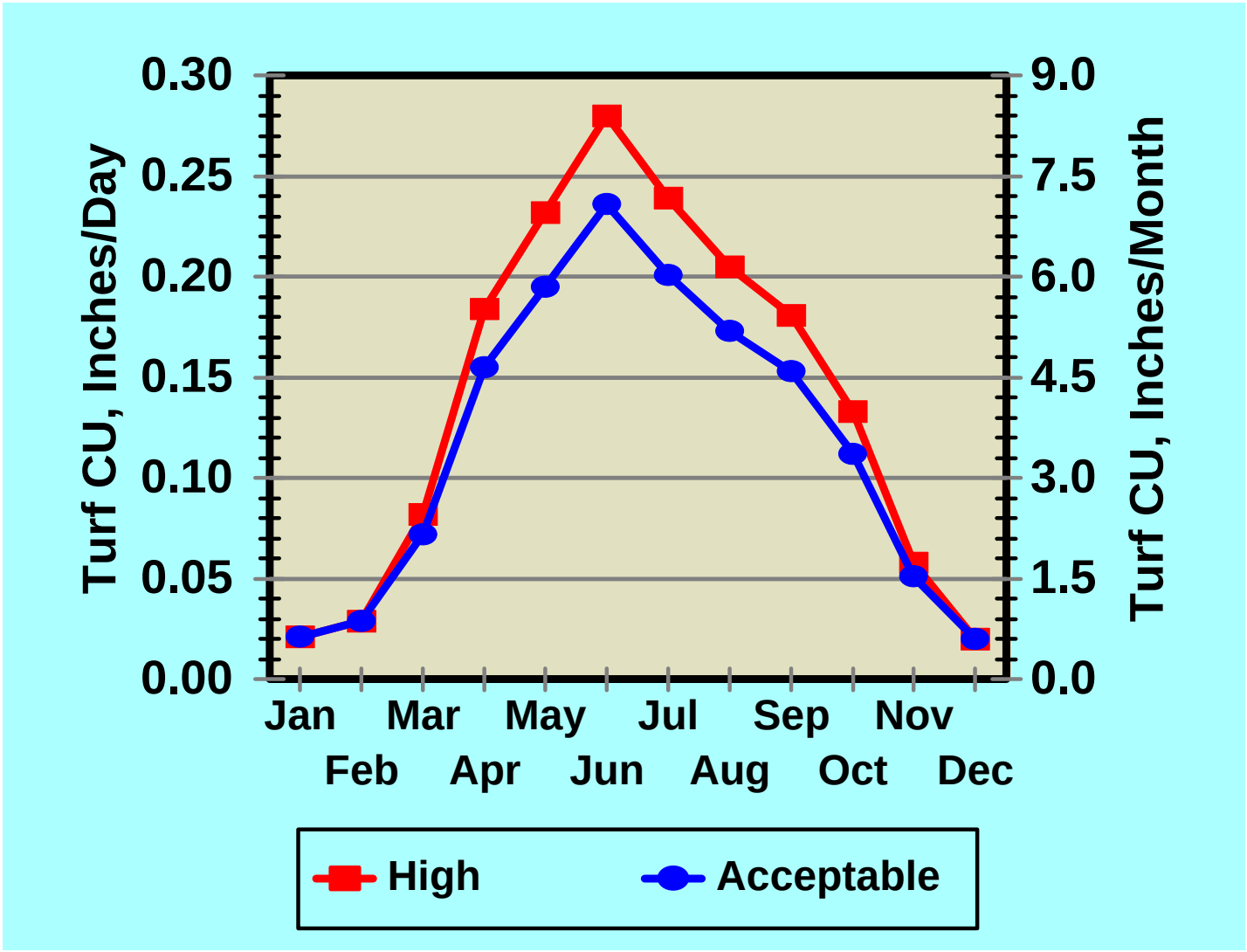

Figure 1. Turfgrass CU for high and acceptable quality turfgrass grown in the Payson area.