

Water Needs of Landscape Plants

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Following years of below-average rainfall and very low snowmelt runoff in California, landscape managers, maintenance gardeners, and homeowners in most areas of California are now facing mandatory or voluntary water conservation targets. Water purveyors, local governments, landscape architects, and landscape management professionals are adopting the use of reference evapotranspiration (ET_o) estimates to determine precise landscape water budgets and irrigation schedules. Calculations that produce these budgets and schedules require multiplying ET_o estimates by a adjustment factor, known as a crop coefficient (K_c) or a plant factor (PF), that accounts for a particular plant's water need. These numbers are usually expressed as a percentage less than 100% or a decimal less than 1.0.

Urban landscapes are often blends of woody and herbaceous plants along with some type of turfgrass. Accurate and effective ET_o -based irrigation management of a given landscape requires reliable K_c or PF values for the plant species present. In order to maximize water conservation, an ET_o adjustment factor should represent the minimum amount of water a plant species needs to maintain its expected function and minimally acceptable aesthetic appearance (i.e. a PF) rather than the amount of water it needs for optimum growth and development (i.e. a K_c).

However, there is limited research-based data on non-turf landscape plants' water needs for achieving either optimum growth or minimally acceptable performance. Most of the available ET_o -based information provides estimates or general ranges of PFs that enable selected groups of landscape plants to maintain acceptable functional and aesthetic performance after they are established. Studies show common landscape groundcovers, shrubs, and trees vary widely and unpredictably in their minimum water needs and responses to drought, but generally maintain aesthetic and functional value when irrigated at between 20% and 80% of ET_o , typically nearer to 50% of ET_o . Currently, UC Cooperative Extension's Landscape Workgroup is conducting a field research project, coordinated among sites in Coachella Valley, Davis, Hopland, and Santa Paula, designed to expand the research-based information on water needs of landscape plant species commonly used across the state.

The following table provides PF estimates derived to date for landscape plants to provide acceptable performance after they are established. Additional information on landscape water management can be found at <http://ucanr.org/landscapewater>.

Table 1. Research-defined water needs for selected landscape groundcovers and shrubs to provide acceptable landscape performance after establishment as a percentage of reference evapotranspiration and as recommended by WUCOLS^{z,y}.

Scientific Name	Common Name	Research Defined	Percent of Reference ET (ET _o)					
			WUCOLS Climate Zone ^u					
			1	2	3	4	5	6
<i>Arbutus unedo</i> 'Compacta', L.	compact strawberry tree	18-36	20-30	20-30	20-30	20-30	40-60	40-60
<i>Arctostaphylos uva-ursi</i> 'Pacific Mist', (L.) Spreng.	bearberry	18-36	<10	20-30	20-30	20-30	NA	NA
<i>Artemisia x</i> 'Powis Castle', L.	wormwood	0-36 ^{x,y}	<10	20-30	20-30	20-30	20-30	20-30
<i>Baccharis pilularis</i> 'Twin peaks', (L.) DC.	Twin Peaks coyote bush	20	20-30	20-30	20-30	20-30	<10	<10
<i>Calliandra haematocephala</i> , Hassk.	pink powder puff	18-36	<10	<10	40-60	40-60	NA	70-90
<i>Cassia artemisioides</i> , Gaud.	feathery cassia	0-36 ^{w,x}	20-30	20-30	20-30	20-30	20-30	20-30
<i>Cerastium tomentosum</i> , L.	snow-in-summer	25	40-60	40-60	40-60	40-60	40-60	40-60
<i>Cistus x purpureus</i> , Lam.	orchid spot rock rose	0-36 ^x	20-30	20-30	20-30	20-30	20-30	20-30
<i>Correa alba</i> 'Ivory Bells', Andr.	white australian correa	18-36	20-30	20-30	20-30	20-30	NA	40-60
<i>Drosanthemum hispidum</i> , (L.) Schwant.	pink iceplant	20	20-30	20-30	20-30	20-30	NA	20-30
<i>Echium fastuosum</i> , Jacq.	pride of madeira	0-36 ^x	20-30	20-30	20-30	20-30	NA	40-60
<i>Escallonia x exoniensis</i> 'Fradesii', Veitch.	Frades escallonia	18-36	40-60	40-60	40-60	40-60	NA	40-60
<i>Galvezia speciosa</i> , Gray.	bush snapdragon	0-36 ^{w,x}	20-30	20-30	<10	20-30	?	40-60
<i>Gazania rigens v. leucolaena</i> , (DC.) Roessler.	yellow trailing gazania	50-80 ^y	40-60	40-60	40-60	40-60	40-60	40-60
<i>Grevillea x</i> 'Noell', Knight.	Noell grevillea	0-36 ^x	20-30	20-30	20-30	20-30	NA	40-60
<i>Hedera helix</i> 'Needlepoint', L.	Needlepoint english ivy	20-30	40-60	40-60	40-60	40-60	40-60	40-60

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<i>Heteromeles arbutifolia</i> , M. J. Roemer.	toyon	0-36 ^x	<10	<10	20-30	20-30	NA	NA
<i>Hibiscus rosa-sinensis</i> , L.	rose of china	40-60	40-60	40-60	40-60	40-60	NA	70-90
<i>Lantana montevidensis</i> , Briq.	trailing lantana	18-36	20-30	20-30	20-30	20-30	NA	40-60
<i>Leptospermum scoparium</i> , J. R. Forst & G. Forst	new zealand tea tree	18-36	40-60	40-60	40-60	40-60	NA	NA
<i>Leucophyllum frutescens</i> 'Green Cloud', I. M. Johnst.	Green Cloud texas ranger	0-36 ^{w,x}	20-30	20-30	20-30	20-30	20-30	20-30
<i>Ligustrum japonicum</i> 'Texanum', Thunb.	texas privet	40-60	40-60	40-60	40-60	40-60	40-60	30-50
<i>Myoporum x 'Pacificum'</i> , Banks & Sol. ex Forst. F.	prostrate myoporum	0-36 ^x	20-30	20-30	20-30	40-60	NA	NA
<i>Otatea acuminata</i> , (Munro) C.E. Calderon & Soderstr.	mexican bamboo	18-36	40-60	?	40-60	40-60	NA	70-90
<i>Phormium tenax</i> , J. R. Forst & G. Forst.	new zealand flax	18-36	20-30	20-30	20-30	40-60	NA	40-60
<i>Pittosporum tobira</i> , Ait.	mock orange	18-36	20-30	40-60	40-60	40-60	40-60	40-60
<i>Potentilla tabernaemontanii</i> , Asch.	spring cinquefoil	70-80	40-60	40-60	40-60	40-60	NA	40-60
<i>Prunus caroliniana</i> , Ait.	carolina laurel cherry	0-36 ^x	20-30	20-30	40-60	40-60	40-60	40-60
<i>Pyracantha koidzumii</i> 'Santa Cruz', Rehd.	Santa Cruz firethorn	0-36 ^x	20-30	20-30	20-30	40-60	40-60	40-60
<i>Rhaphiolepis indica</i> , Lindl.	indian hawthorne	18-36	20-30	20-30	40-60	40-60	40-60	40-60
<i>Sedum acre</i> , L.	goldmoss	0-25	20-30	20-30	20-30	20-30	20-30	20-30
<i>Teucrium chamaedrys</i> , L.	germander	18-36	20-30	20-30	20-30	20-30	40-60	40-60
<i>Vinca major</i> , L.	periwinkle; myrtle	30-40	40-60	40-60	40-60	40-60	40-60	40-60

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<i>Westringia rosamarinaformis</i> , L.	rosemary bush	18-36	20-30	20-30	20-30	20-30	NA	40-60
<i>Xylosma congestum</i> , Merrill.	shiny xylosma	18-36	20-30	20-30	40-60	40-60	40-60	40-60

^z WUCOLS = Water Use Classification of Landscape Species (Costello and Jones, 2000).

^y References:

Costello, L. R. and K. S. Jones. 2000. A guide to estimating irrigation water needs of landscape plantings in California – the landscape coefficient method and water use classification of landscape species III (WUCOLS III). Available at

<<http://www.owue.water.ca.gov/docs/wucols00.pdf>>. Viewed May 29, 2008.

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Shaw, D. A. and D. R. Pittenger. 2004. Performance of landscape ornamentals given irrigation treatments based on reference evapotranspiration. *Acta Hort.* 664: 607-613.

Staats, D. and J. E. Klett. 1995. Water conservation potential and quality of non-turf groundcovers versus Kentucky bluegrass under increasing levels of drought stress. *J. Environ. Hort.* 13: 181-185.

^x Acceptable landscape performance with no summer irrigation shown only at the immediate coast. Inland plantings may require summer irrigation applied infrequently near the maximum amount listed for the species.

^w Species typically provides unacceptable landscape performance in summer and fall months irrespective of irrigation amount.

^v Requires renovation about every 2 to 3 years to maintain acceptable performance.

^u Key to WUCOLS California climate zones

1: North-Central Coastal

2: Central Valley

3: South Coastal

4: South Inland Valleys and Foothills

5: High and Intermediate Desert

6: Low Desert

NA: Plant not appropriate for the zone