University of California
Agriculture and Natural Resources

Stop #12: Updates on Evapotranspiration Adjustment Factor Project (A Contract from CA Dept. of Water Resources)

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Project Contractor: William Baker & Associates, LLC

California's population exceeded 39 million by the end of 2015 and is expected to reach 45 million by 2020. This projected increase coupled with a severe multi-year drought and a statewide water distribution problem, necessitates further conservation of an already limited water supply. Landscape irrigation uses a significant amount of water. Approximately 40-50 percent of household water use is used outdoors to irrigate urban landscapes.

2016 marks the fifth year of a major drought in California State Assembly Bill 1881 resulted in California enacting a law on January 1, 2010 reducing the Evapotranspiration Adjustment Factor (ETAF) from 0.8 to 07 in new landscapes over 2,500 square feet, mandating enhanced water conserving measures in urban landscapes. In December, 2015 a revised ETAF of 0.55 ETo for new landscapes over 500 square feet replaces the previous 0.7 ETo, necessitating even greater conservation. The 0.55 MAWA represents a 21.4% reduction from 0.70. (It is important to note that in some cases recreational turf and water used to produce food crops will remain exempt.)

The goal of our California Department of Water Resources (DWR) project is to measure water use at 30 large urban landscapes in six climate zones that include a variety of ornamental plants with varying water use rates growing under a wide mixture of plant densities and microclimates. A further goal is to work with site managers to improve irrigation system distribution uniformity (DU) and overall irrigation efficiency at each site.

The Maximum Applied Water Allowance formula follows.

*Maximum Applied Water Allowance (MAWA) = (ETo) (0.7) (LA) (0.62)
ETo = Reference Evapotranspiration (inches per year)
0.7 = ET Adjustment Factor
LA = Landscaped Area (square feet)
0.62 = Conversion factor (to gallons)
*Maximum Applied Water Allowance = _____ gallons/year

Example of MAWA in Riverside, CA at 0.7 ETAF

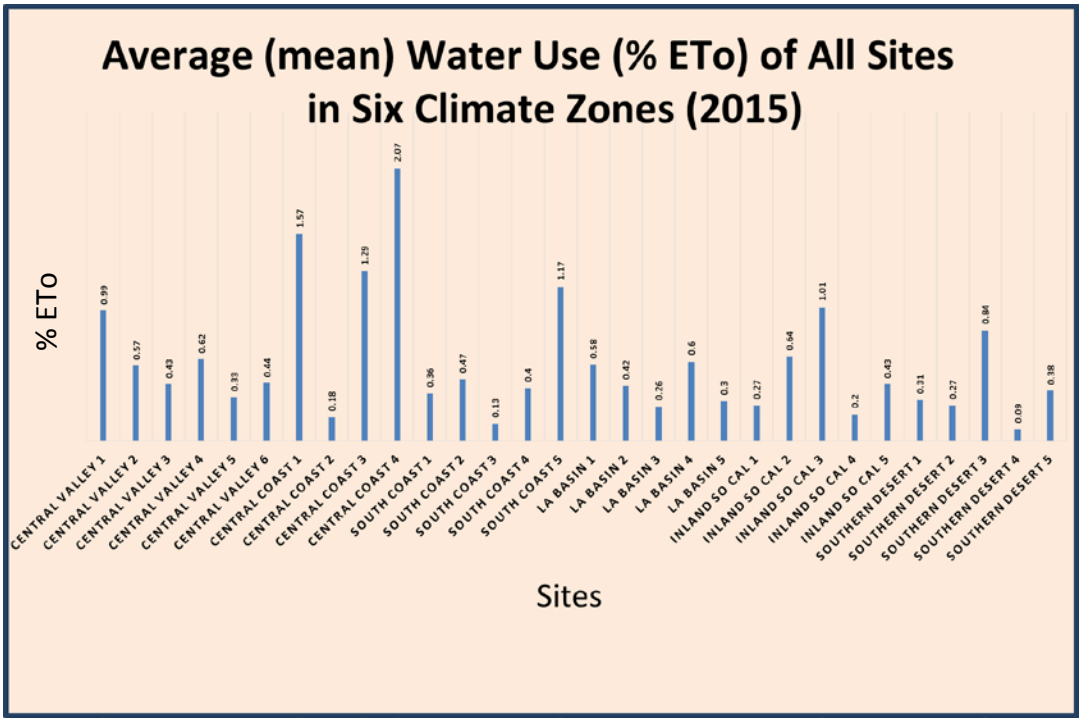
Hypothetical Landscape Area = 50,000 sq ft
MAWA = (ETo) (0.7) (LA) (0.62)
MAWA = (51.1) (0.7) (50,000 sq ft) (0.62)
MAWA = 1,108,870 gallons/year

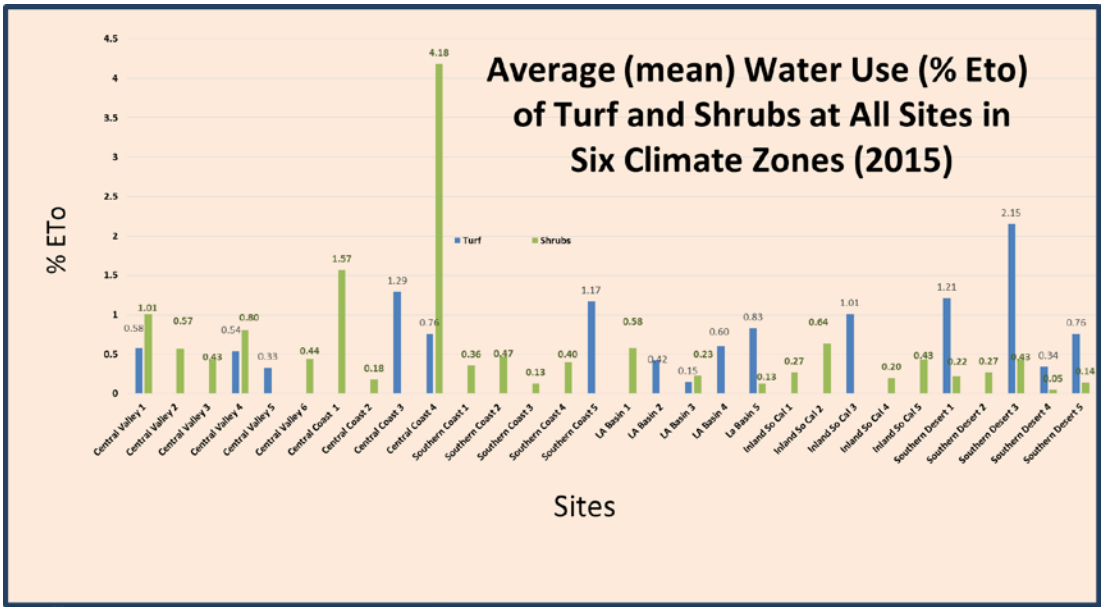
Example of MAWA in Riverside, CA at 0.55 ETAF

Hypothetical Landscape Area = 50,000 sq ft
MAWA = (ETo) (0.55) (LA) (0.62)
MAWA = (51.1) (0.55) (50,000 sq ft) (0.62)
MAWA = 871,255 gallons/year (21.4% reduction from the former 0.7 ETAF)

Results:

The average (mean) change in water use across the 30 sites in 2015 compared to 2014 was -0.29 ETo. The average decrease in water use at the 25 sites which used less water in 2015 was -0.46 Eto and the average increase in water use at the five sites which used more water in 2015 was +0.12 ETo. A combination of hands-on training that included correcting irrigation system hardware issues and scheduling irrigations based on climate zone, plant type, plant density, soil textures, and microclimate considerations led to the overall water savings in 2015 compared to 2014. Sites with turf only used the most water (0.80 % ETo) followed by combined turf and shrub sites (0.65 % ETo) and shrubs only (0.46 % ETo). Implications of this research are: California landscapes consisting solely of cool-season turf deemed non-recreational and therefore not exempt from CA water restriction laws require more water than allowed under the former 0.7 ETo and current 0.55 % ETo legislation. All landscapes consisting solely of very low and low water using plants and some mixed landscapes consisting of mostly low and very low water requiring shrubs with low to moderate levels of medium and high water using plants perform adequately at or below the mandated 0.55 % ETo. Data through 2016 are being taken before statistical evaluations are conducted.





Practical implications:

- Properly functioning irrigation systems can significantly reduce water waste. Systems with matched heads, proper spacing, proper pressure, and unclogged heads can significantly reduce landscape water waste.
- Distribution uniformity can most often be increased without major redesign and installation efforts by switching to rotary sprinkler heads.
- Properly irrigating plants based on species, density, and climate and microclimate considerations can significantly reduce landscape water waste.
- Landscapes consisting solely of cool season turf (not deemed recreational and therefore non-exempt from the regulation) use water in excess of the .7 ETAF standard.

- Landscapes consisting solely of warm season turf (not deemed recreational and therefore non-exempt from the regulation) often exceed .7 ETAF due to poor irrigation uniformity.
- Landscapes consisting of a mixture of mostly medium, low and very low water using plant species that are drip irrigated and mulched can include small areas of turf and not exceed .7 ETAF. When a greater balance of low water using plants is included, ETAF of.55 is achieved.
- A three-inch layer of mulch around ornamental plantings can significantly reduce water waste by reducing water evaporation from soil.