Viability of Historical ET-based Irrigation Strategies for St. Augustinegrass Lawns in Texas

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Introduction

- ET-based irrigation is an effective method for estimating plant water needs of numerous crops including turf.
- The relationship between meteorological data and water use of a reference crop (ETo) can be adjusted using crop coefficients (Kc) to estimate a crop's water consumption.
- Effective use of Kc's requires real-time meteorological data which increases the difficulty of ETo-Kc irrigation programs.
- Historical ET-based irrigation is a simpler estimator of plant water needs which could conserve water compared to non-ET-based irrigation scheduling (Haley et al., 2007).

Objectives

1) Quantify St. Augustinegrass turf performance under varying irrigation adjustments to historical ET.

2) Compare water conservation among historical ET-based versus actual ET-based irrigation strategies.

Methods

Location:
Texas A&M Urban Ecology Center, College Station, TX

Duration:
July 1 to Sept 30 of 2011 and 2012

Surface:
'Raleigh' St. Augustinegrass maintained similar to residential lawns irrigated on a MWF schedule

Experimental design:
Randomized complete block

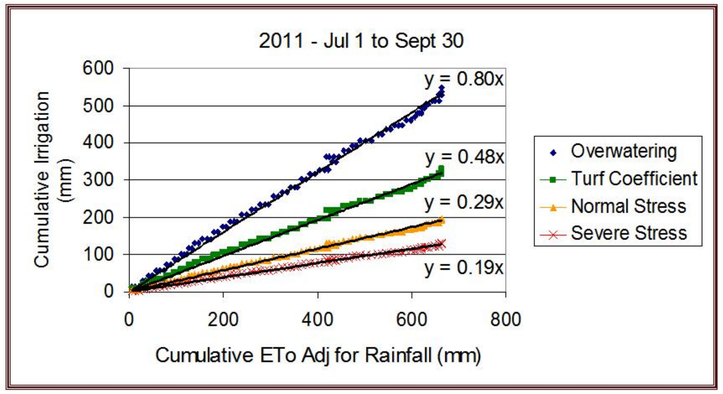
Treatments (Adj monthly to 47 yr - historical average):

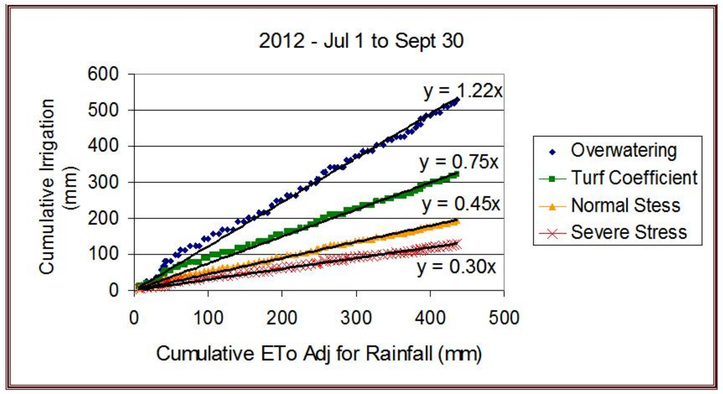
1. 'Overwatering' (1 x Historical ETo)
2. 'Turf coefficient' or 'Tc' (0.6 x Historical ETo)
3. 'Normal stress' (0.6 x Tc)
4. 'Severe stress' (0.4 x Tc)

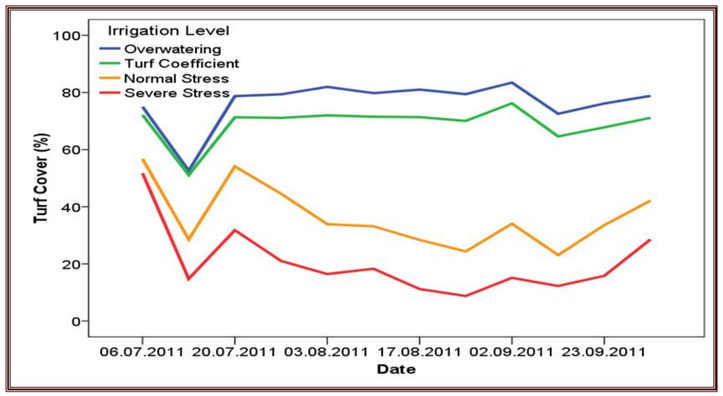
} Deficit Irrigation

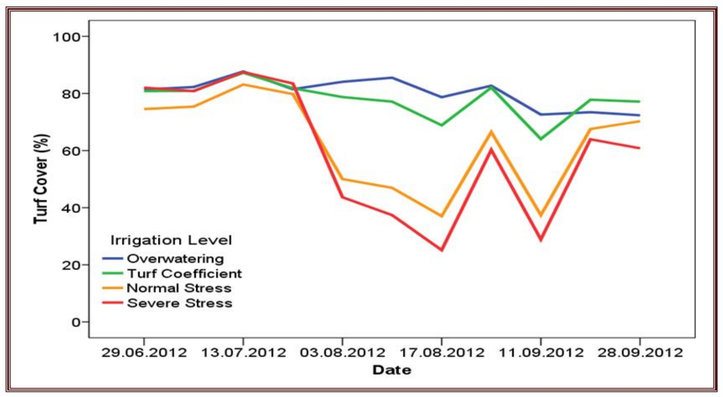
Measurables:

- Visual turf quality (1 - 9, 6 = minimally acceptable)
- Percent Cover (digital image analysis)
- Volumetric water content (7.6 cm depth)
- Clipping yield (monthly)
- Soil nutrient content (Nov)





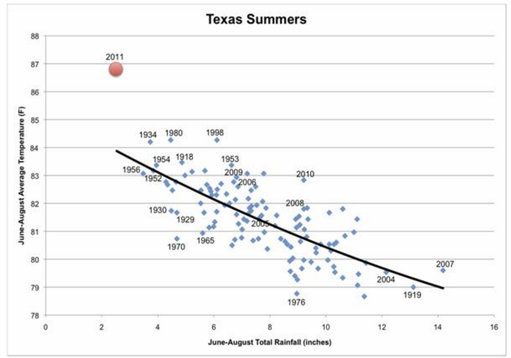




Results

2011 (dry year):

- Historical ET-based irrigation under-irrigated by 20%.
- Turf density was substantially reduced by deficit irrigation.
- Crown survival was adequate to allow full fall/spring recovery (even under the worst single-year drought in TX history).



Credit: John Nielsen-Gammon 2011

2012 (wet year):

- Historical ET-based irrigation over-irrigated by 22%.
- Turf density was not substantially reduced by deficit irrigation.

Conclusions

- Averaged over both years, historical ETo was similar to actual ETo, although annually they differed by approximately ± 20%
- During a dry year (when conservation is critical), historical ETo resulted in 20% water savings compared to actual ETo.
- Where temporary turf density reductions can be tolerated, irrigation levels as low as 0.19 x actual ETo can maintain adequate turf cover for recovery.

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References

- Haley, M., M. Dukes, G. Miller. 2007. Residential irrigation water use in central Florida. J of Irrigation and Drainage Engineering. 133:5(427-434).
- Nielsen-Gammon, J. 2011. Texas drought: spot the outlier. Climate Abyss (blog). blog.chron.com. Aug 29, 2011.