Welcome to today's webinar.

Computing Irrigation Costs

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Better Understanding and Managing Your Water Budget

SportsTurf Managers Association
Experts on the Field, Partners in the Game.

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Computing Irrigation Costs

Introduction

- Objective
- Background
- Why it's Important
- How to use this information

Irrigation System Operation

- Distribution Uniformity
- Irrigation Efficiency
- Preventative Maintenance and Misc.

Data and Sample Calculation

- ET data (historical, projected, and current)
- Station flow rates/run times
- Water bills
- Irrigated Areas

Objective

- Explore various options and techniques that will help other irrigation technicians/property managers develop a sound irrigation water management plan
- Provide calculations that project water usage in terms of volume and money
- Relate to the audience my experience with this topic and how I went about creating a drought restriction plan

Irrigation System Operation: Distribution Uniformity

- Distribution Uniformity is a way to measure how evenly water is applied to a given irrigated area
- Catch Can test: Minimum of twenty-four catch cans spaced evenly in a grid pattern, water is ran for specified amount of time, amounts in each can collected
- DU = Average Catch of Lower Quarter/DU Average Catch Overall
- Desirable DU for spray heads = 55%+
- Desirable DU for rotors = 65%+

*See irrigation association guidelines and procedures for further reference

Irrigation Efficiency

- Irrigation efficiency is the amount of water consumed by the plant versus the amount of water that goes through the system
- Leaks, operational pressure, deep percolation, and runoff are examples of irrigation inefficiencies
- Also, sprinkler and valve operation contribute to inefficiencies (i.e. sunken, misaligned, leaking, clogged, etc.)
- Conduct regular system checks
- Need to have system running optimally in order to control the water

Preventative Maintenance

- Conduct regular system checks. Need to have system running optimally in order to control the water
- Upgrade system when applicable with pressure regulation, retro fitting (i.e.) spray heads to rotors
- Continuing education in irrigation management and technology
- Fix problems as soon as they arise

Options and Tools to Help Save Irrigation Water

- Wetting Agent and Fertilizer
- Tracking the weather/estimating future water requirement
- Adjust stations to irrigate just above wilting point (careful monitoring)
- Establish realistic property expectations with the correct personnel
- Monitor water usage at the meter regularly
- Hand watering and spot watering

Sample Question

- 10 acres of warm season sports turf
- In need of a 20% reduction from the previous year's usage through June-August in order to meet drought restriction goal

Let's gather the information we need in order to solve this problem…

Conversion Factors, Formulas, and References

- 1 foot = 12 inches
- 43,560 square feet = 1 acre
- 7.48 gallons = 1 cubic foot
- 748 gallons = 1 HCF (hundred cubic feet)
- ET (CIMIS station, local site, historical weather data)
- Crop coefficient to use as baseline schedule
- Areas categorized in order of importance to analyze how much water to cut to meet goal
- Previous year’s water bill and rates
- System Distribution Uniformity (DU)

Evapotranspiration (ET)

Evapotranspiration (ET)

- The amount of water used through evaporation and plant transpiration
- Data obtained through (California Irrigation Management Information System) CIMIS station 184
- Historical, Current, and Projected

Average ETo Values by Station

Stn Id	Stn Name	CIMIS Region	Jan (in)	Feb (in)	Mar (in)	Apr (in)	May (in)	Jun (in)	Jul (in)	Aug (in)	Sep (in)	Oct (in)	Nov (in)	Dec (in)	Total (in)
184	San Diego II	SCV	2.24	2.73	3.83	4.32	4.71	4.97	5.43	5.24	4.45	3.31	2.43	1.91	45.57

Crop Coefficient for Baseline Schedule

- The evapotranspiration measurement is referenced to cool season grass.
- A crop coefficient is used for the specific crop we're managing (warm season turf) to get a better idea for a base irrigation schedule

ET (reference) x Kc (crop coefficient) = ET (crop specific)

Crop Coefficients for California Turfgrass

	NOT ADJUSTED FOR ALLOWABLE STRESS			ADJUSTED FOR ALLOWABLE STRESS		
MONTH	COOL SEASON	WARM SEASON	COMBINED GRASS	COOL SEASON	WARM SEASON	COMBINED GRASS
January	0.61	0.55	0.61	0.49	0.44	0.49
February	0.64	0.54	0.64	0.51	0.43	0.51
March	0.75	0.76	0.75	0.60	0.61	0.60
April	1.04	0.72	0.72	0.83	0.58	0.58
May	0.95	0.79	0.79	0.76	0.63	0.63
June	0.88	0.68	0.68	0.70	0.54	0.54
July	0.94	0.71	0.71	0.75	0.57	0.57
August	0.86	0.71	0.71	0.69	0.57	0.57
September	0.74	0.62	0.62	0.59	0.50	0.50
October	0.75	0.54	0.75	0.60	0.43	0.60
November	0.69	0.58	0.69	0.55	0.46	0.55
December	0.60	0.55	0.60	0.48	0.44	0.48

Areas Categorized in Order of Importance

- 10 acres of warm season turf:
  - 2 acres passive turf
  - 2 acres turf along fence lines/out of play
  - 6 acres turf that must be kept playable

Water Bills and System DU

- One unit of water in a water bill is one HCF
- One HCF is 748 gallons
- For our calculation purposes, water is billed at $4 a unit

- All irrigation on the property is on rotors with an average DU of .85

Projected Water Usage

- Historical ETavg for June through August is 15.64”
- Crop Coefficient to be used for 6 acres of playable turf is 0.7 (average June-August not adjusted for allowable stress)
- Crop Coefficient to be used for 4 acres of turf where water is to be rationed is 0.55 (average June-August adjusted for allowable stress)

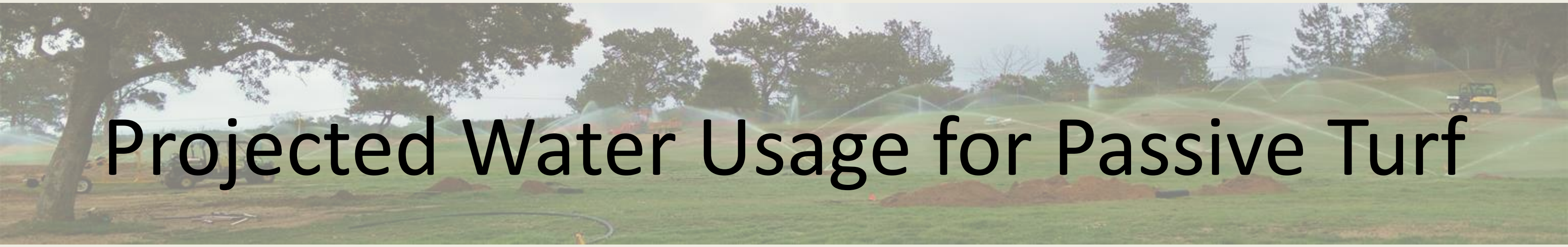
Projected Water Usage For Playable Turf

$$\frac{1ft}{12in} \times \underline{15.64in}(\text{3 month ET}) \quad \underline{6\ acres} \times \frac{43560ft^2}{1\ acre} \times \frac{7.48gallons}{1\ ft^3} \times \frac{100}{85\ (DU)} = 2165784\ gallons$$

2165784 gallons x 0.7 (Kc for warm season turf) = 1,516,049 gallons projected use

$$1{,}516{,}049\ gallons \times \frac{1\ HCF}{748\ gallons} = 2027\ HCF$$

2027 HCF x $4/unit = $8108 projected cost



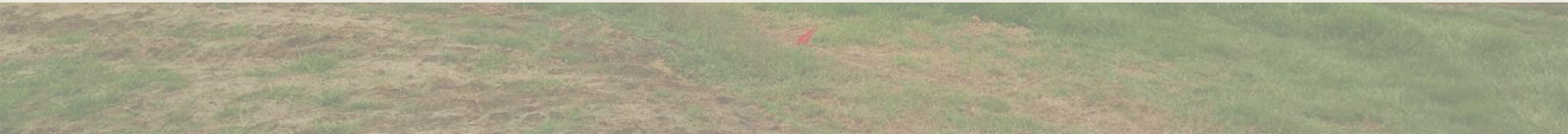
Projected Water Usage for Passive Turf

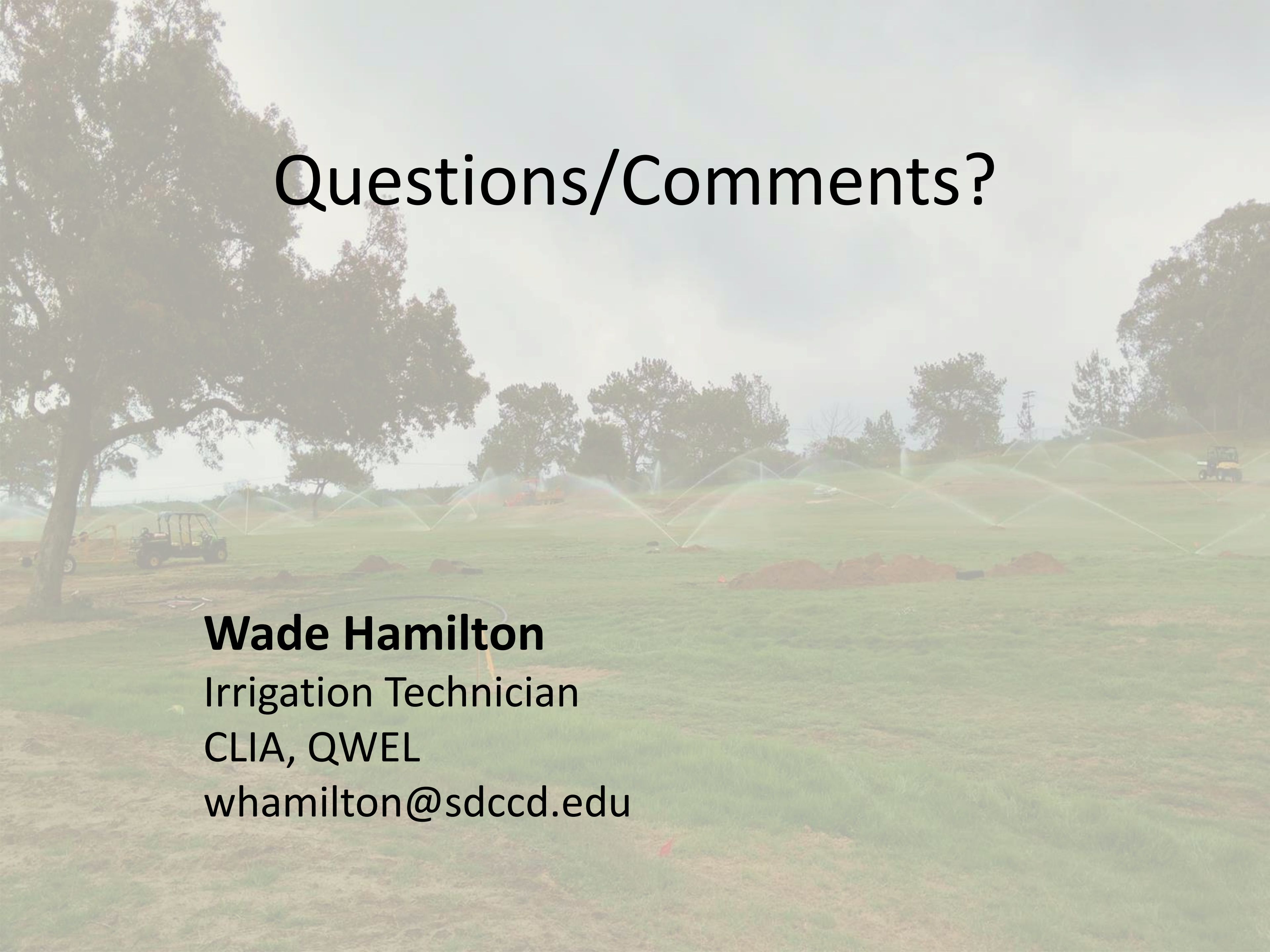
$$\frac{1\text{ft}}{12\text{in}} \times \underline{15.64\text{in}}\text{(3 month ET)} \quad \underline{4\text{ acres}} \times \frac{43560\text{ft}^2}{1\text{ acre}} \times \frac{7.48\text{gallons}}{1\text{ ft}^3} \times \frac{100}{85\text{ (DU)}} = 1{,}443{,}856\text{ gallons}$$

1443856 gallons x 0.55 (Kc for warm season turf for allowable stress) = 794,121 gallons projected use

$$794{,}121\text{ gallons} \times \frac{1\text{ HCF}}{748\text{ gallons}} = 1062\text{ HCF}$$

1062 HCF x $4/unit = $4247 projected cost





Questions/Comments?

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