



Real World

Conservation Potential of Smart Controllers and Essentials for Program Implementation: Orange County Florida Study

AWWA Sustainable Water Management Conference

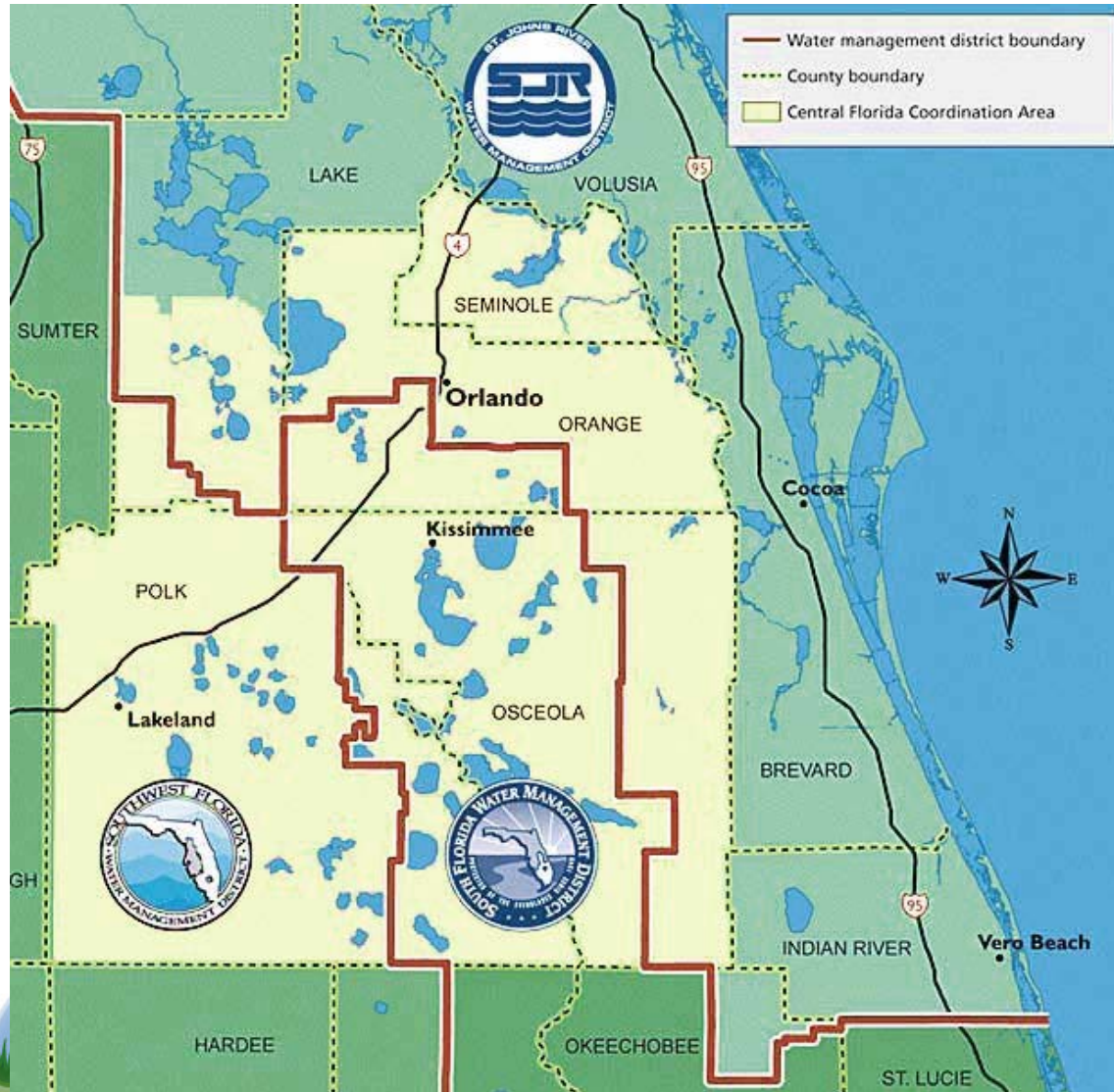
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Soil Moisture Sensor Controller



Evapotranspiration (ET) Controllers

- Some can determine runtimes and days
- Programming is key!
 - Soil type
 - Plant type
 - Microclimate
 - Application rates
 - Slope



Identifying Excess Irrigation Customers

- Historical Irrigation

- Total household water use provided by OCU from 2006-2011
- 2012-2013 indoor estimates used to estimate irrigation

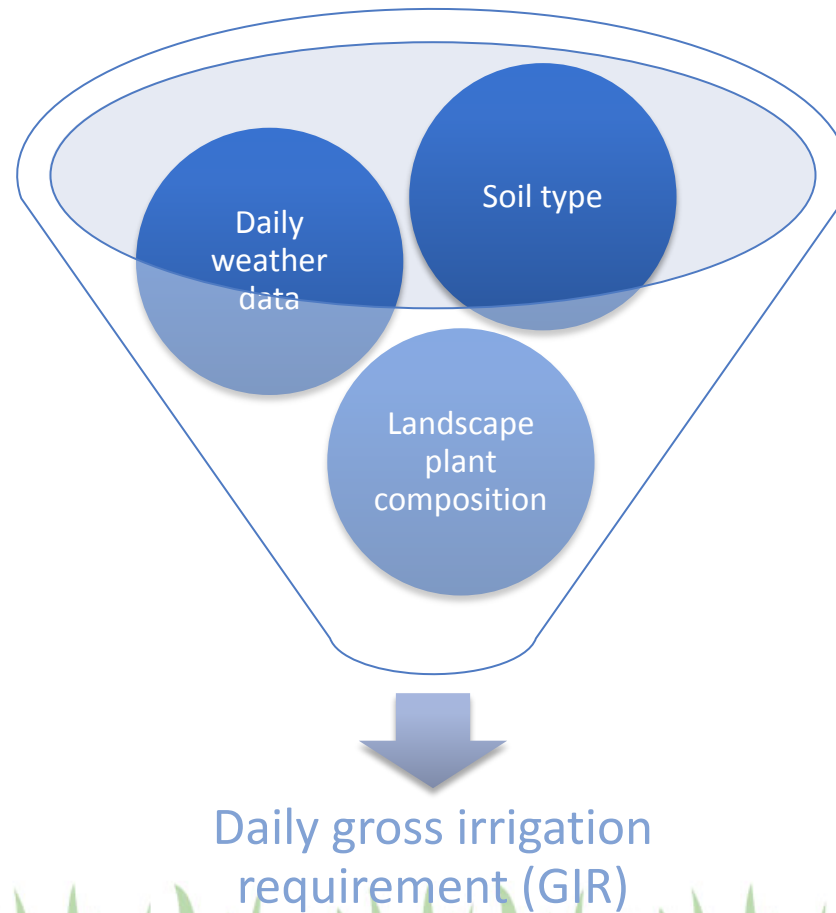
- Gross Irrigation Requirement (GIR)

- If $0.5 * AWHC$ was depleted,

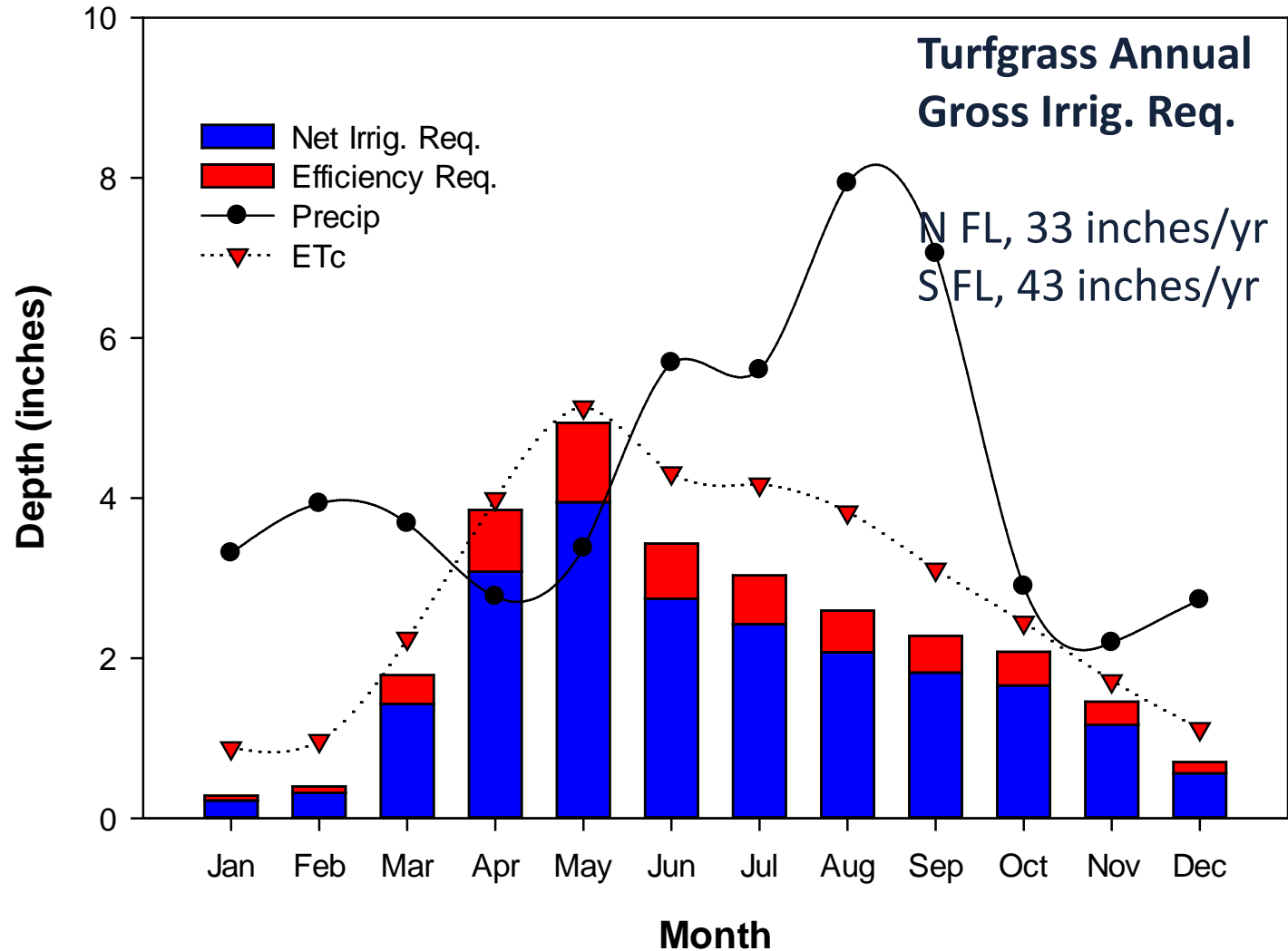
$$GIR = \frac{SW_i - SW_{i-1} + ET_C - R_e}{DU_{lh}}$$

- Assuming root depth of 8 inches,
 - AWHC was 0.56 inches (6.3%) for sand
 - AWC was 1.14 inches (14%) for flatwoods
- DU_{lh} was 80%
- GIR range selected as $1 * GIR$ to $1.5 * GIR$

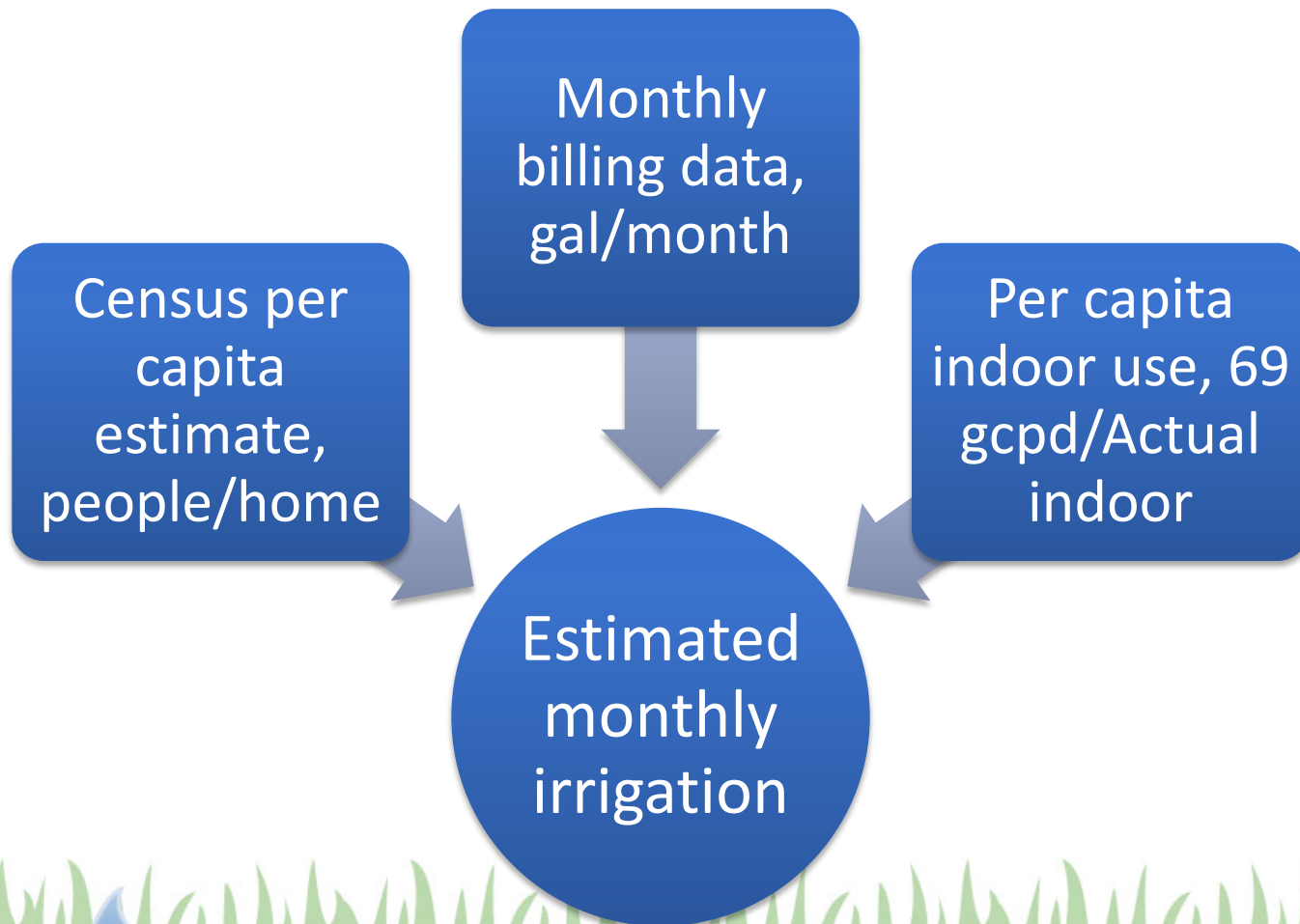
Irrigation Requirements



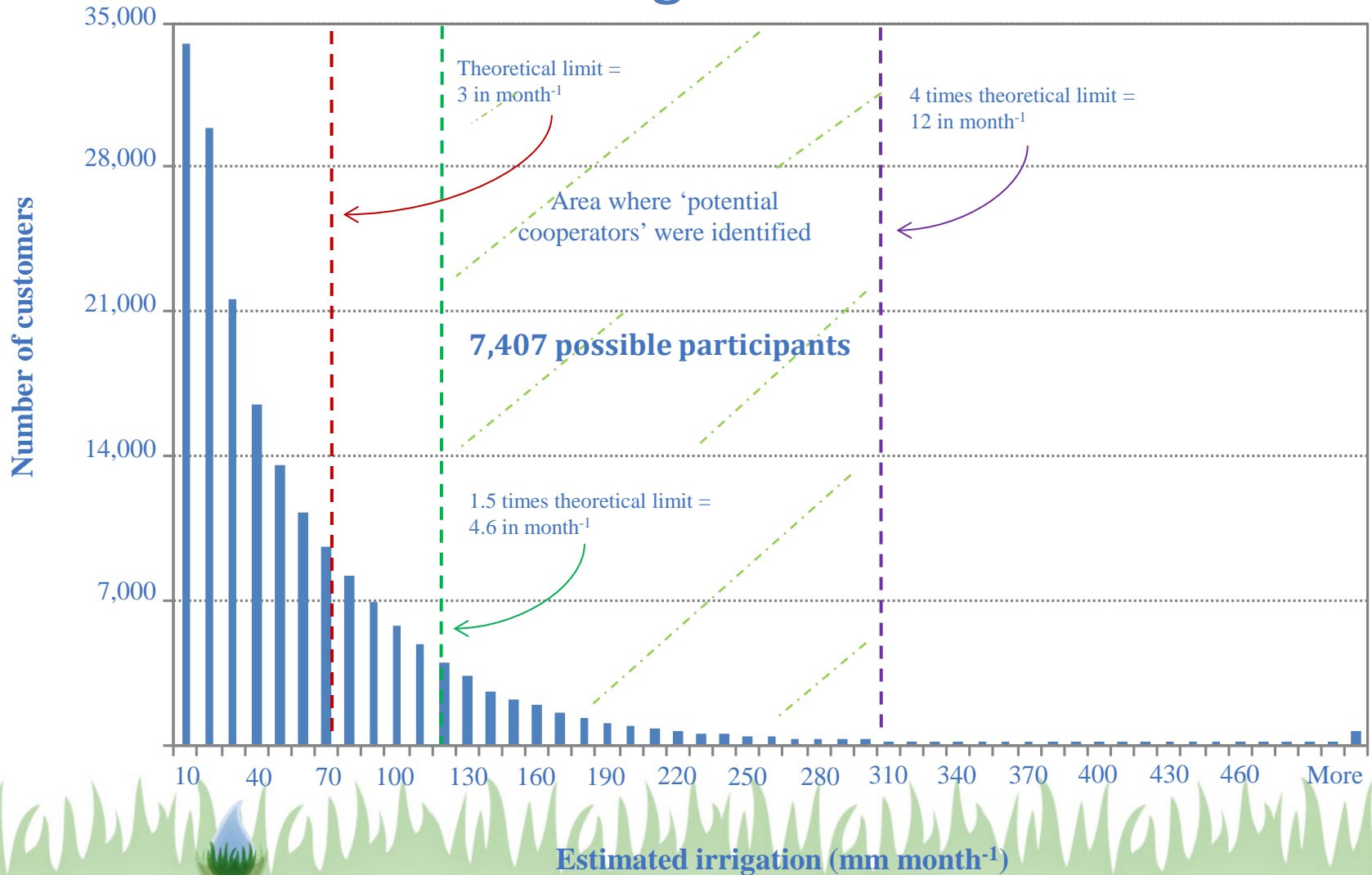
Gross Irrigation Requirements



Estimated Irrigation



Orange County Evaluation Selection of Excess Irrigators



Irrigation System Evaluation



IRRIGATION SYSTEM EVALUATION

- Address: _____ Date: _____
- Timer location: Garage Outside wall Other: _____
- Original schedule:
 - A) Start time(s): Mon _____ Tue _____ Wed _____ Thu _____ Fri _____ Sat _____ Sun _____
 - A) Run time/zone (min): 1 _____ 2 _____ 3 _____ 4 _____ 5 _____ 6 _____ 7 _____ 8 _____
 - B) Start time(s): Mon _____ Tue _____ Wed _____ Thu _____ Fri _____ Sat _____ Sun _____
 - B) Run time/zone (min): 1 _____ 2 _____ 3 _____ 4 _____ 5 _____ 6 _____ 7 _____ 8 _____
- Rain sensor: Location: Roofline Not connected Obstructed Misplaced Absent

Irrigation Zones (stations)		1	2	3	4	5	6	7	8
1. Zone location from the house	a. Front	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	b. Left	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	c. Center	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	d. Right	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	e. Back	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Sun reaching the zone	a. Full sun	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	b. Mostly sunny	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	c. Mostly shady	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	d. Full shade	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Plant type	a. Turf	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	b. Ornamentals	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	c. Mixed (%)	Turf <input type="checkbox"/>	Orn. <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Turf Quality (1=Dead, 9=TopQual.)									
5. Num. of irrigation heads	a. Sprinklers	_____							
	b. Rotors	_____							
	c. Microirrigation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Irrigated Area: Calculated (Aerial photo) _____ ft² Corrected (In situ) _____ ft²

Flow Test: Run time per zone _____ minutes Meter reading before _____ Meter reading after _____

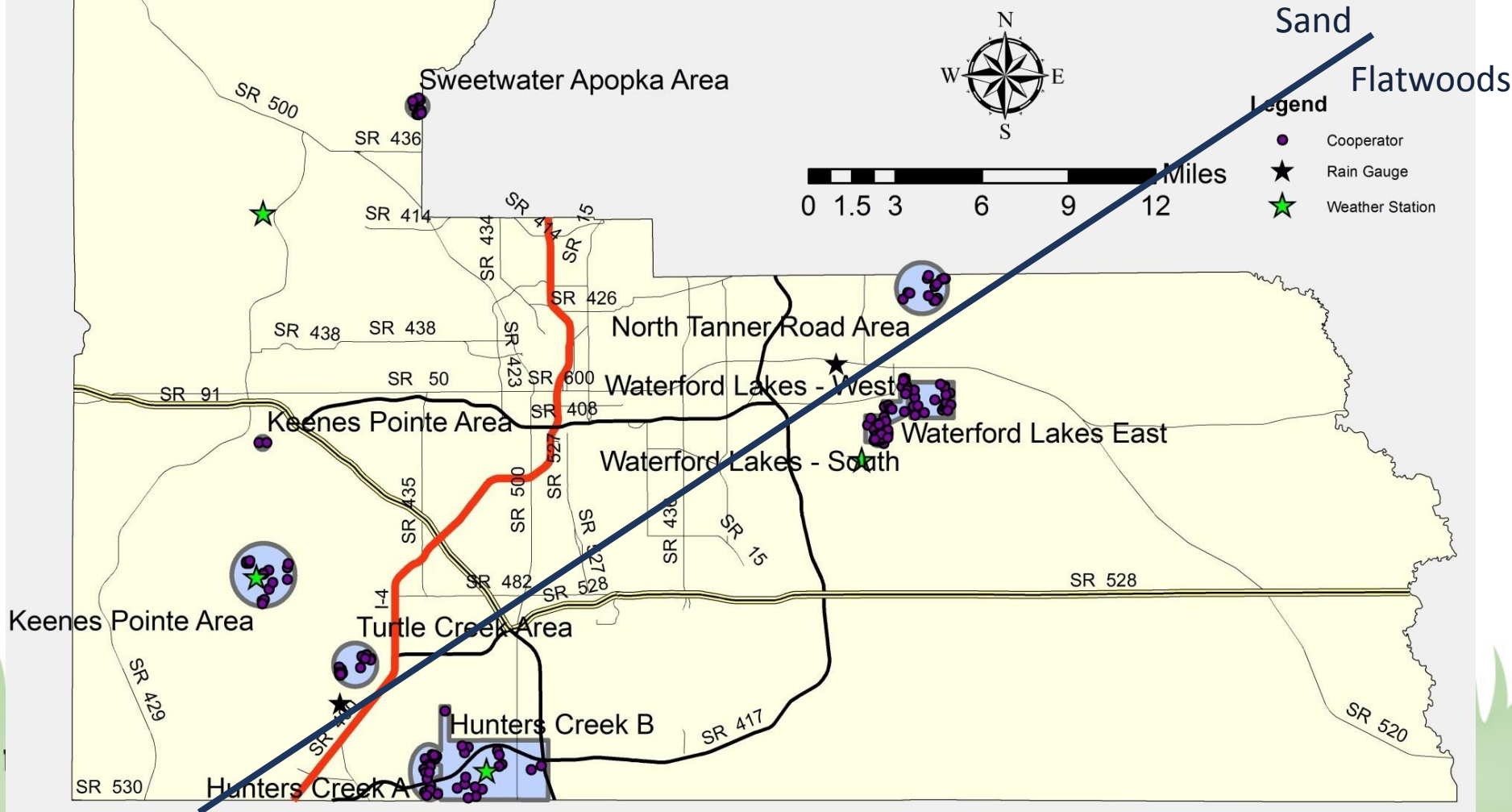
Comments: _____

Summary of Participants

Sources:

County Boundary: Orange County GIS Program (2007), Scale Unknown

Roadways: FDOT Transportation Statistics Office (2011), 1:24,000



Two Smart Controllers Evaluated

– Rain Bird ESP-SMT

- ET treatment
- Total Count = 28
- Total Locations = 7



– Baseline WaterTec S100

- SMS treatment
- Total count = 28
- Total locations = 7



Controller Groups

- ET
 - Contractor programmed with default landscape settings
 - Daily water windows
 - Rare interaction with homeowner
- SMS
 - Buried at 6 inches in minimally compacted soil
 - Re-programmed time clock schedules for daily irrigation:
 - 20 minutes spray
 - 45 minutes rotor
 - Rare interaction with the homeowner

“EDU” Groups

- Educational Training

- ET+Edu treatment

- Reprogrammed for site specifics
 - 5 minute tutorial
 - Total Count = 38
 - Total Locations = 9

- SMS+Edu treatment

- Inserted into soil column at 3 inch depth
 - Reprogrammed for 0.25” per event, 2 events per day, 3 d/wk
 - 5 minute tutorial
 - Total count = 38
 - Total locations = 9



OCU Technologies & Expt. Design

Treatment	ET	ET+Edu	SMS	SMS+Edu	Comparison
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Rain Bird ESP-SMT

Rain Bird ESP-SMT

Baseline WaterTec S100

Baseline WaterTec S100

Technology



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Locations Installed

7

9

7

9

9

Number Installed

28

38

28

38

35

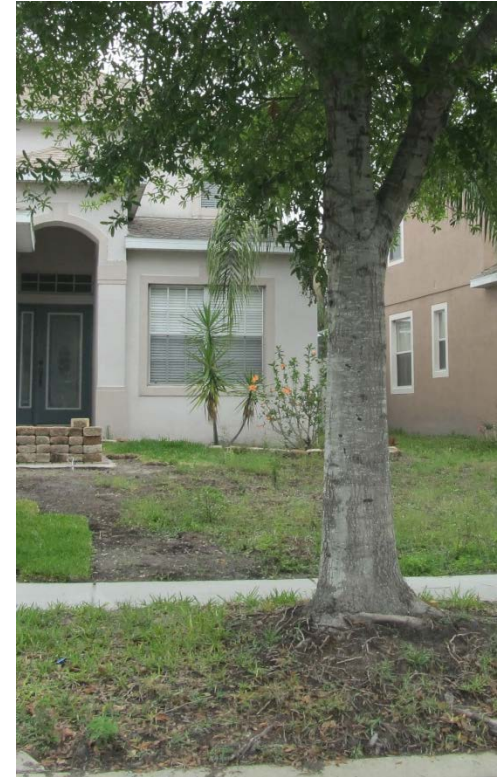


Materials and Methods

- Automatic Meter Recording devices (AMRs)
 - Separated flow meter to measure irrigation only
 - Records hourly irrigation volumes
 - Monthly downloads



Quarterly Turf Quality Assessment

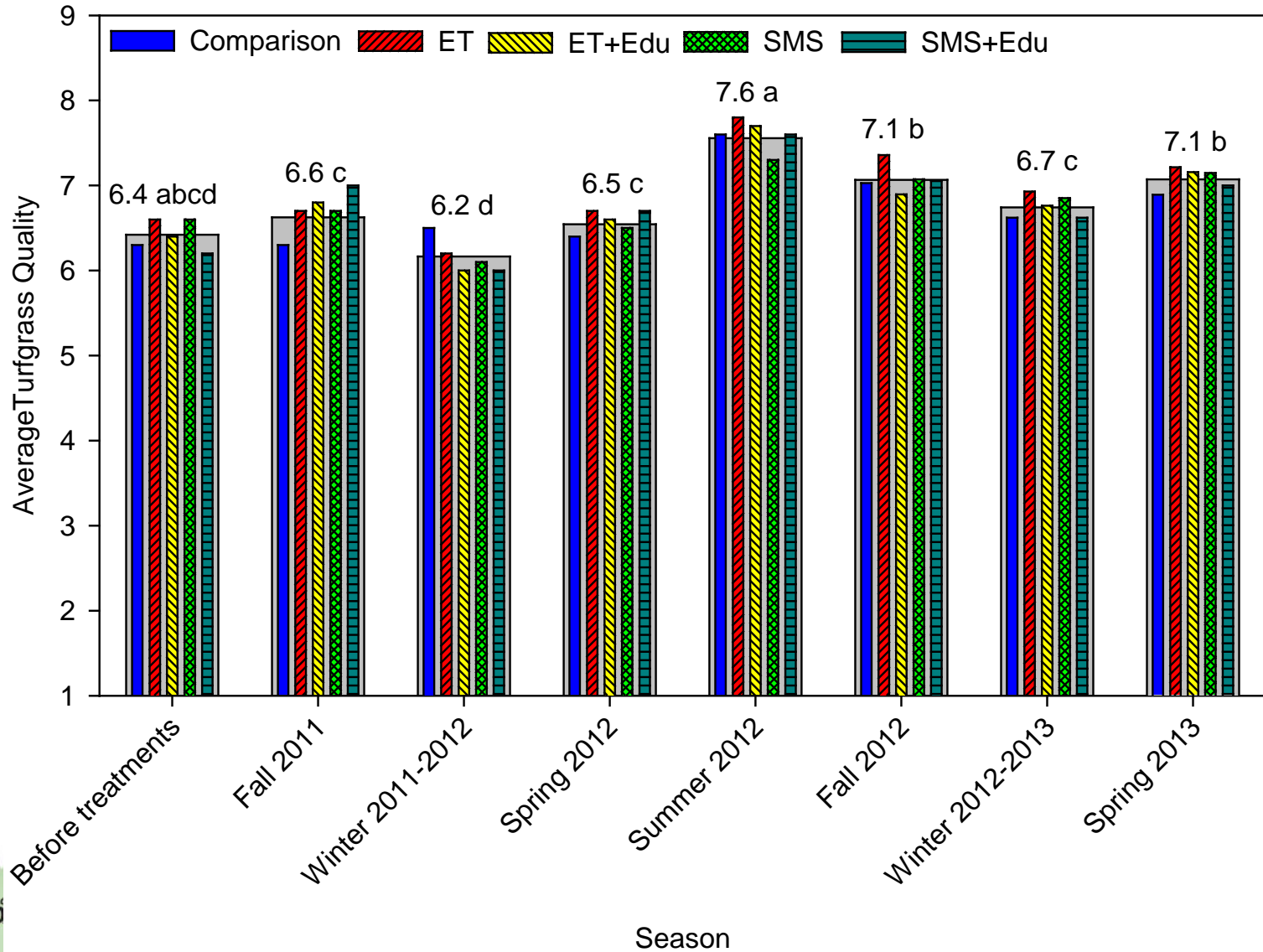


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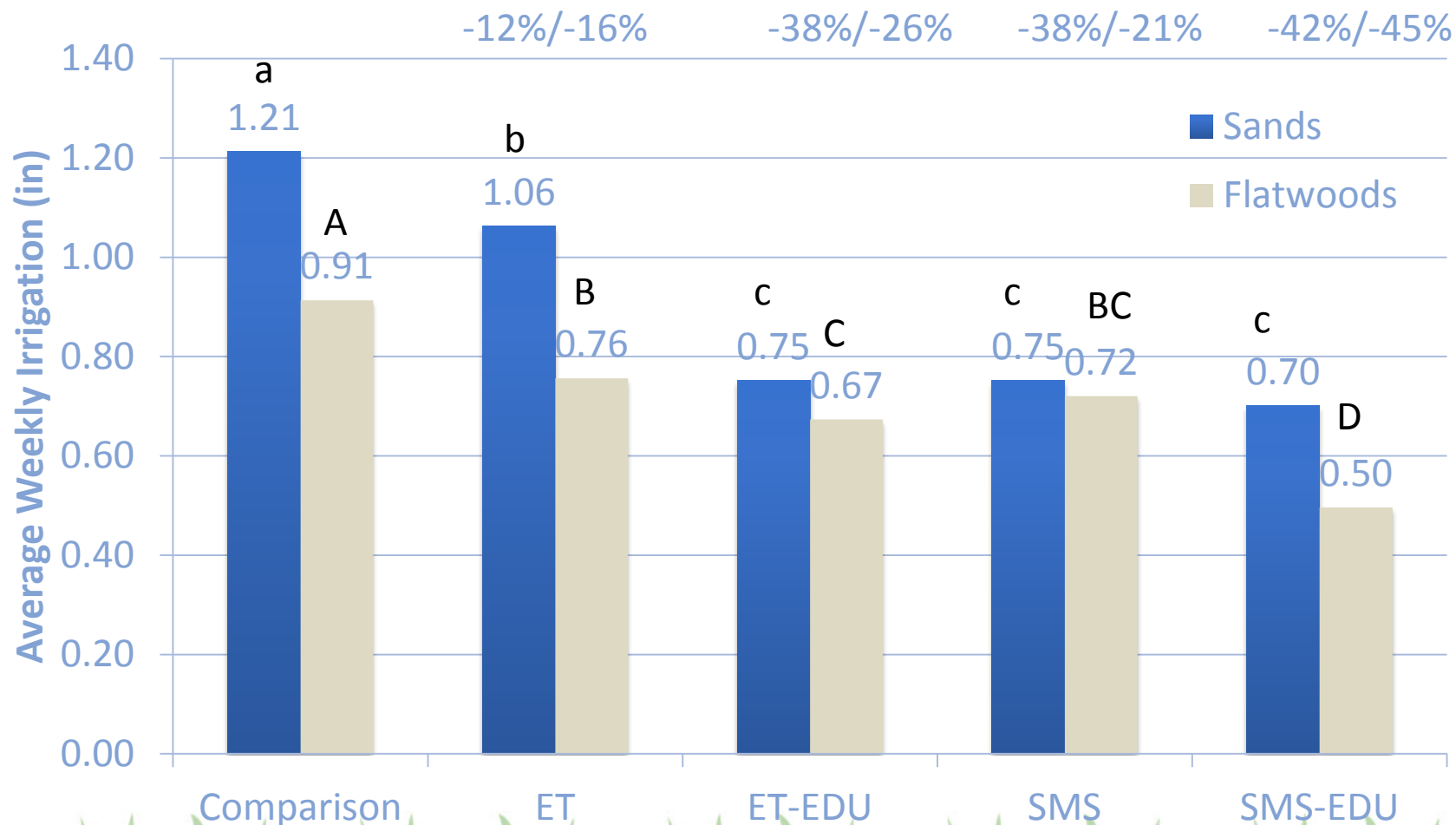
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1

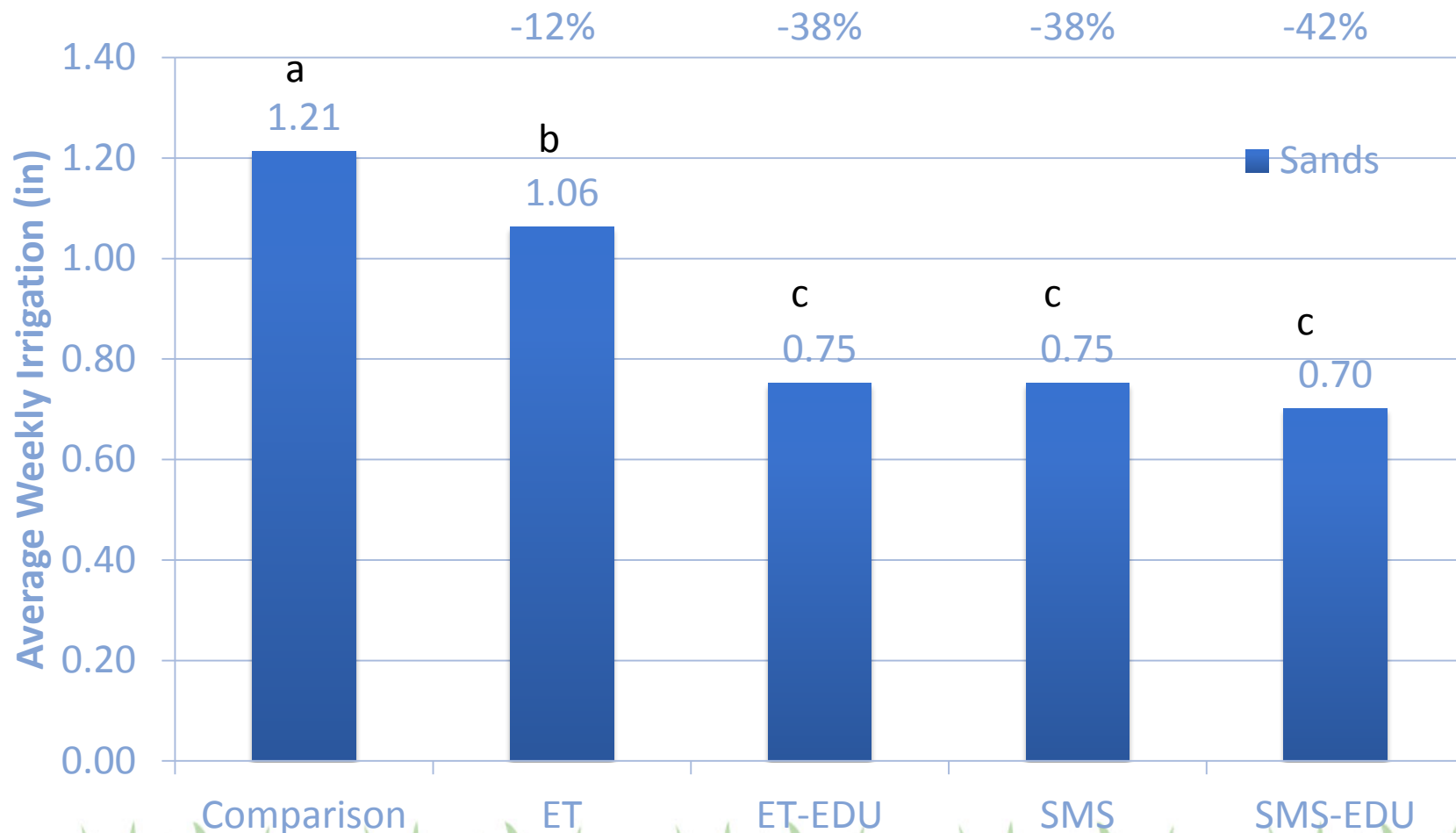
Turfgrass Quality



Irrigation Nov 2011-Nov 2014

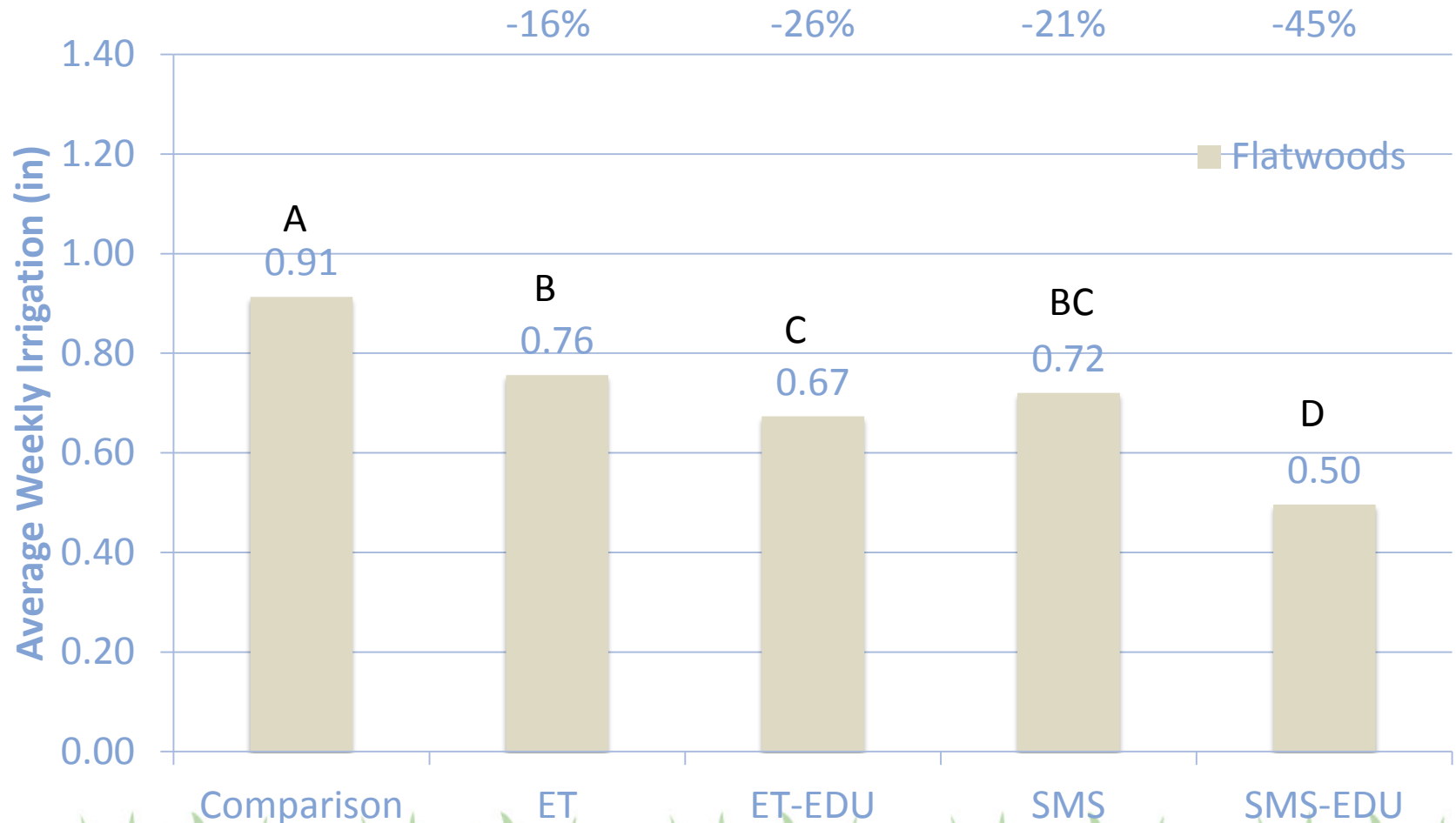


Irrigation Nov 2011-Nov 2014 Sand Sites



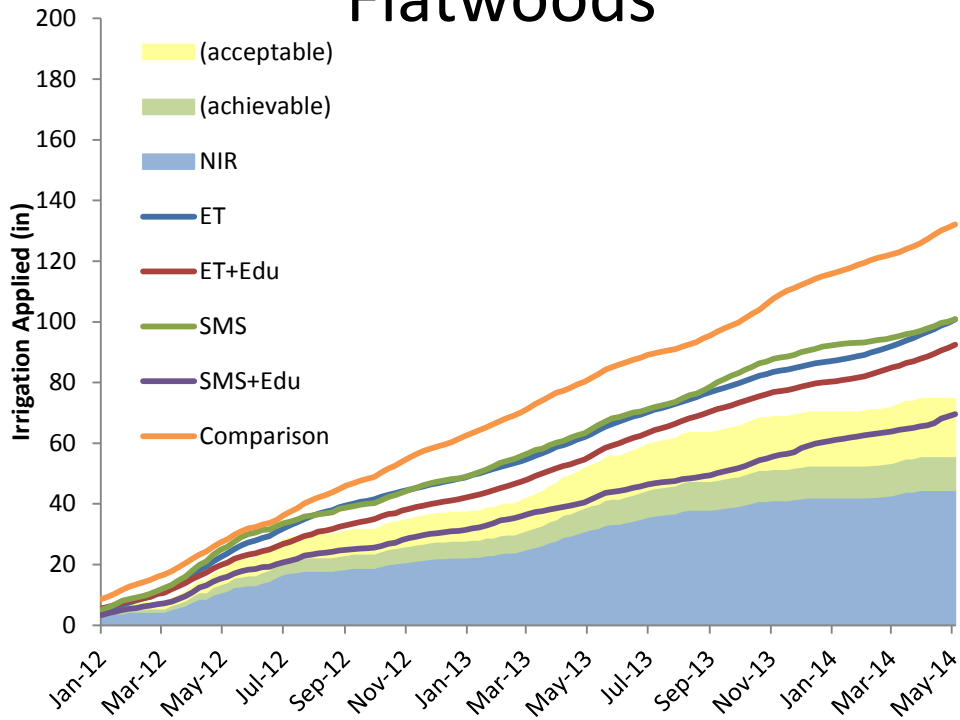
Irrigation Nov 2011-Nov 2014

Flatwoods Sites



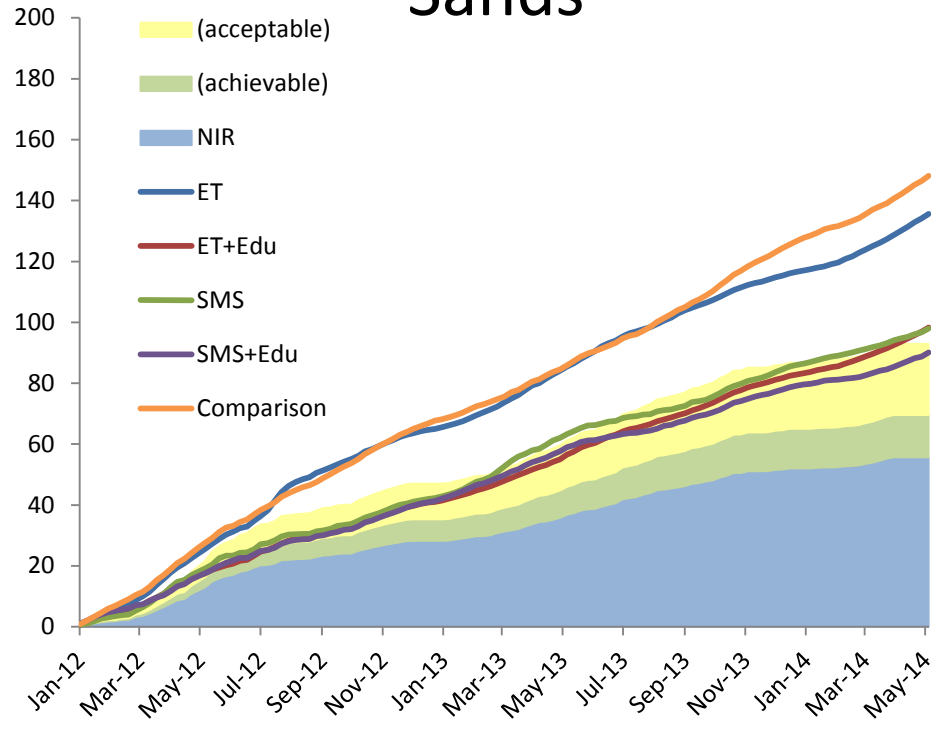
How Well Do the Controllers Perform?

Flatwoods



Jan 2012 - May 2014

Sands



Jan 2012 - May 2014



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