



Year 1 of Implementing Smart Irrigation Controllers in Orange County

**Stacia L. Davis, M.E. E.I.T. and Michael D. Dukes, Ph.D. P.E.
Agricultural and Biological Engineering
University of Florida**

Introduction

- Limited water resources in central Florida
 - Limiting groundwater withdrawals to 2013 demand
 - Increasing population past 2013 requires reductions in consumptive water use
 - Over half of residential water use goes to irrigation

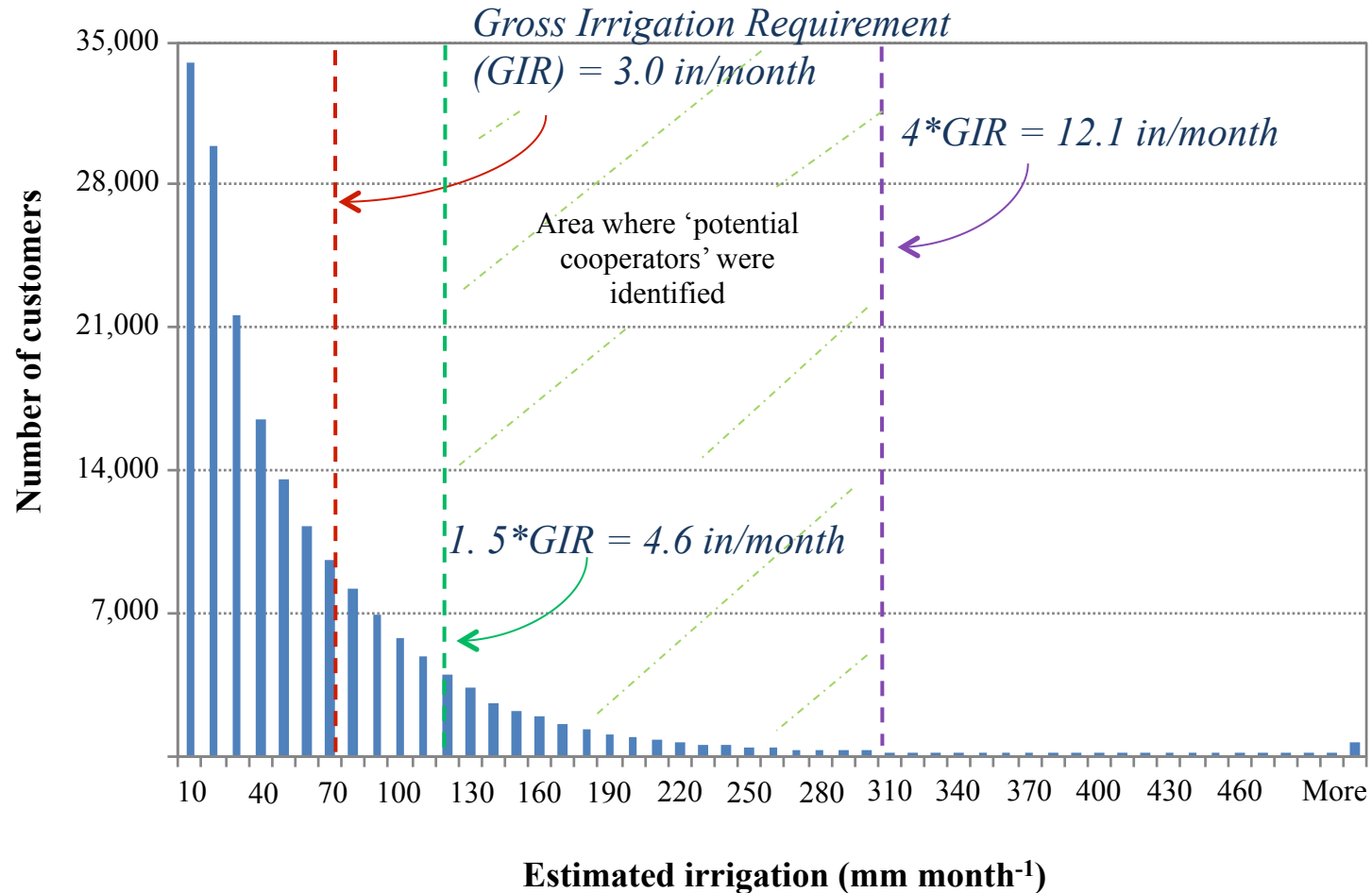


Objective

- Evaluate two types of smart controllers to determine whether they can reduce irrigation application of high water users in Orange County



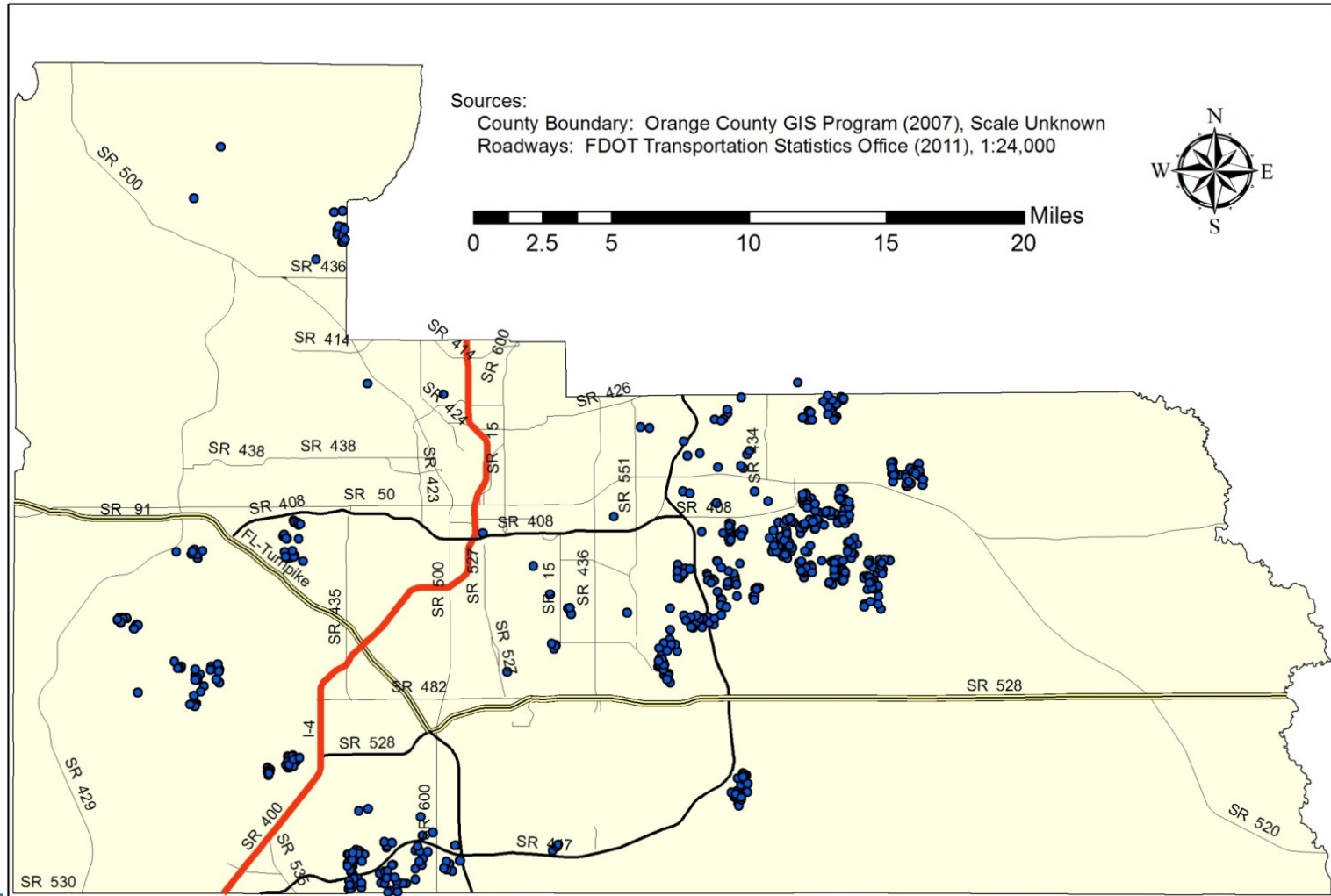
Selection of High Water Users



7,407 possible participants

Survey Respondents

- Out of the 7,407 that met the initial study requirements, 843 responded to the questionnaire



On-site Evaluations



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 _____	Orn. _____						
4. Turf Quality (1=Dead, 9=Top Qual.)									
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 _____

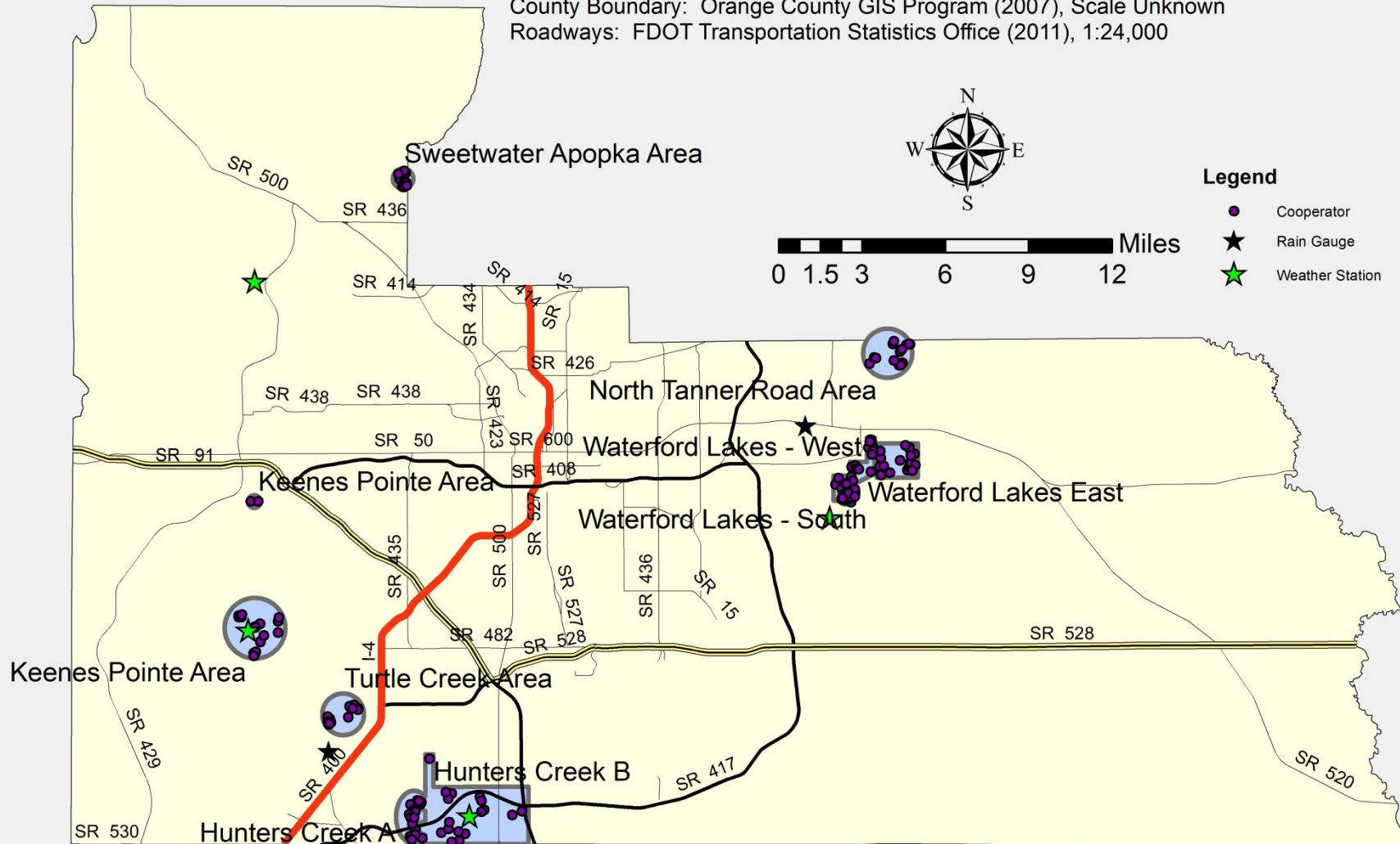
Comments: _____

Summary of Final Participants

Sources:

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

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



Smart Technologies

- ET Controller (ET)

- Rain Bird ESP-SMT



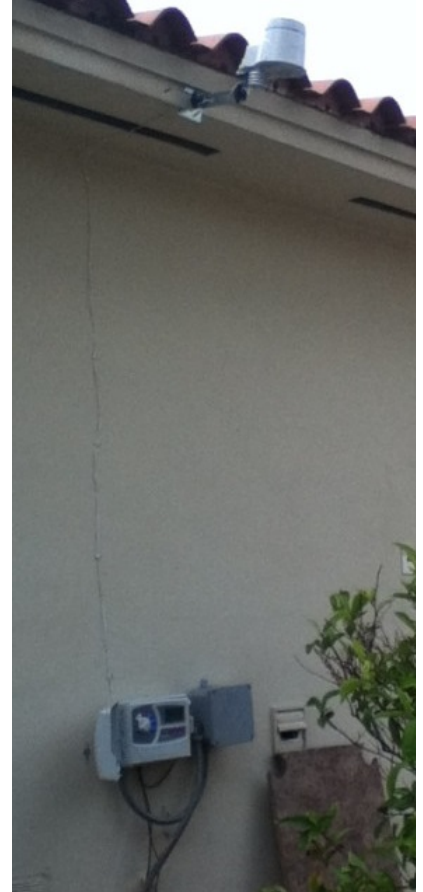
- Soil Moisture Sensor (SMS)

- Baseline WaterTec S100



Summary of Treatments

- Monitoring Period
 - 10 Nov 2011 through 14 Jan 2013
- Treatments
 - ET
 - ET + Edu
 - SMS
 - SMS + Edu
 - Comparison (MO)



Contractor Installations

- ET
 - Contractor programmed with default landscape settings
 - Irrigation allowed daily
 - Contractor rarely interacted with homeowner
- SMS
 - Contractor re-programmed time clocks for daily irrigation, 20 minutes for spray and 45 minutes for rotor
 - Burial at 6" depth by loosely packing with soil in a hole
 - Contractor rarely interacted with homeowner

Educational Training

- ET + Edu
 - On-site reprogramming by UF-IFAS
 - Approx. five minute tutorial on how to use the controller
- SMS + Edu
 - Burial at 3" depth inserted into soil column
 - On-site reprogramming by UF-IFAS
(0.25" per event, 2 events per day, 3 d/wk)
 - Approx. five minute tutorial on how to use the controller

Educational Training

Smart Controller
Quick-Start Guide:
Baseline WaterTec
S100



Smart Controller
Quick-Start Guide:
Rain Bird ESP-SMT



UF UNIVERSITY of
FLORIDA
The Foundation for The

UF UNIVERSITY of
FLORIDA
The Foundation for The Gator Nation

Summary of Final Participants

Group Name	Soil type	ET ^a	ET + Edu ^b	SMS ^c	SMS + Edu	MO ^d	Total
Hunters Creek A	Flatwoods	4	4	4	4	4	20
Hunters Creek B	Flatwoods	4	4	4	4	4	20
Keenes Pointe Area	Sand	4	4	4	4	3	19
North Tanner Road Area	Sand	0	5	0	5	5	15
Turtle Creek Area	Sand	4	4	4	4	4	20
Waterford Lakes – East	Flatwoods	4	4	4	4	4	20
Waterford Lakes – South	Flatwoods	4	4	4	4	4	20
Waterford Lakes –West	Flatwoods	4	4	4	4	4	20
Sweetwater Apopka Area	Sand	0	5	0	5	3	13
Total		28	38	28	38	35	167

^aET designates cooperators that received a Rain Bird ESP-SMT ET controller

^bEdu designates cooperators that received an on-site educational training

^cSMS designates cooperators that received a Baseline WaterTec S100 soil moisture sensor

^dMO designates cooperators that did not receive a technology

Turfgrass Quality

- What is the turfgrass quality rating?

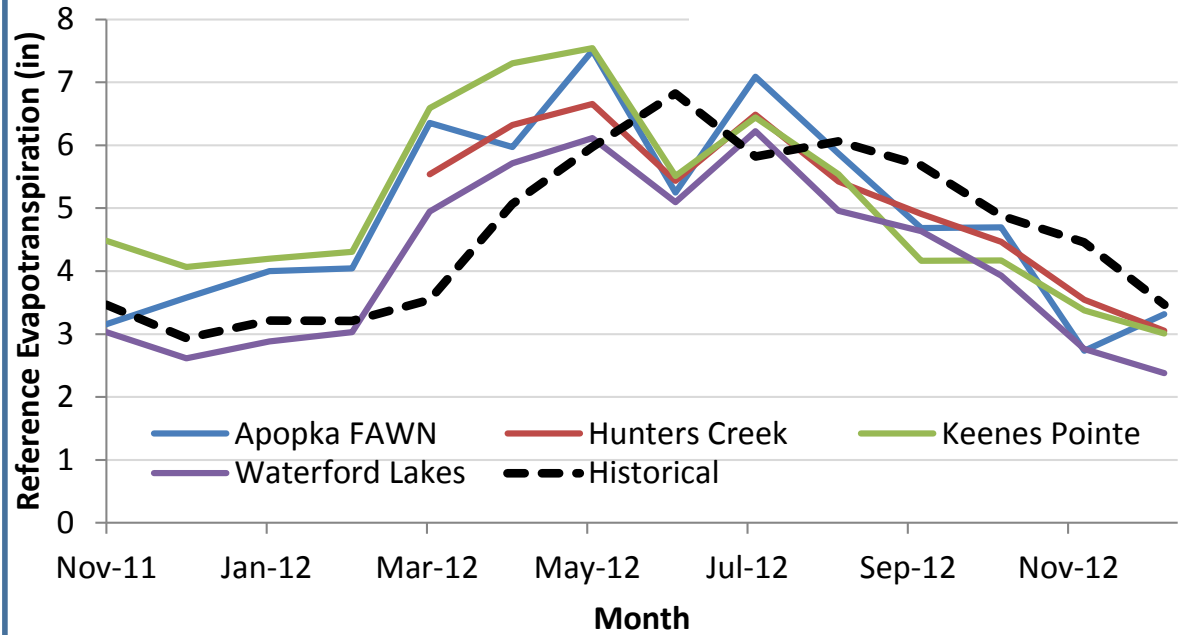
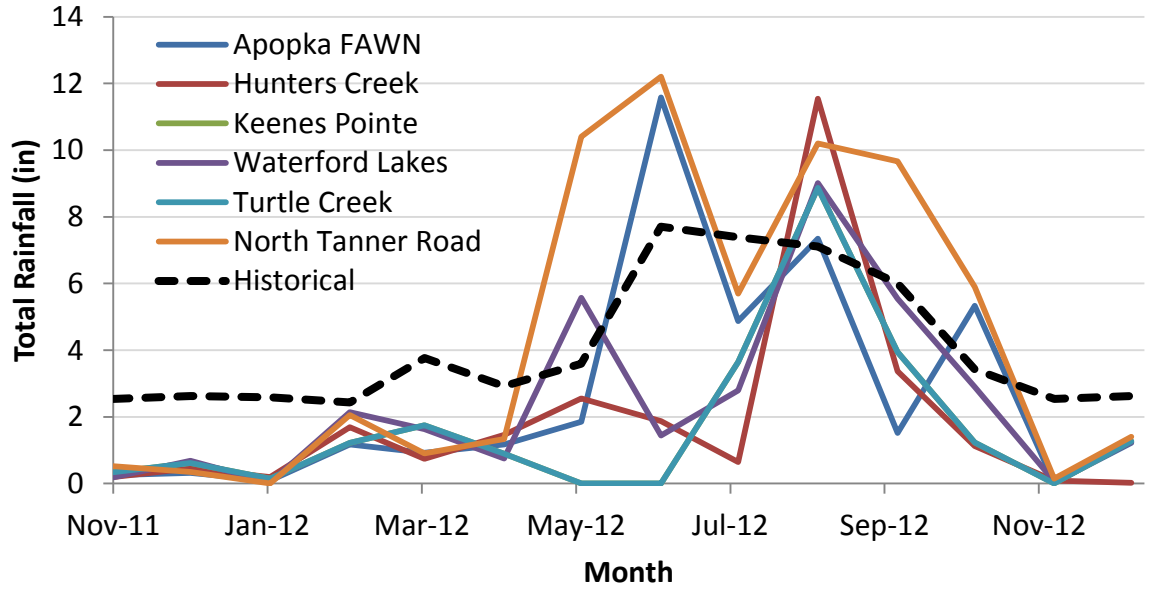


3

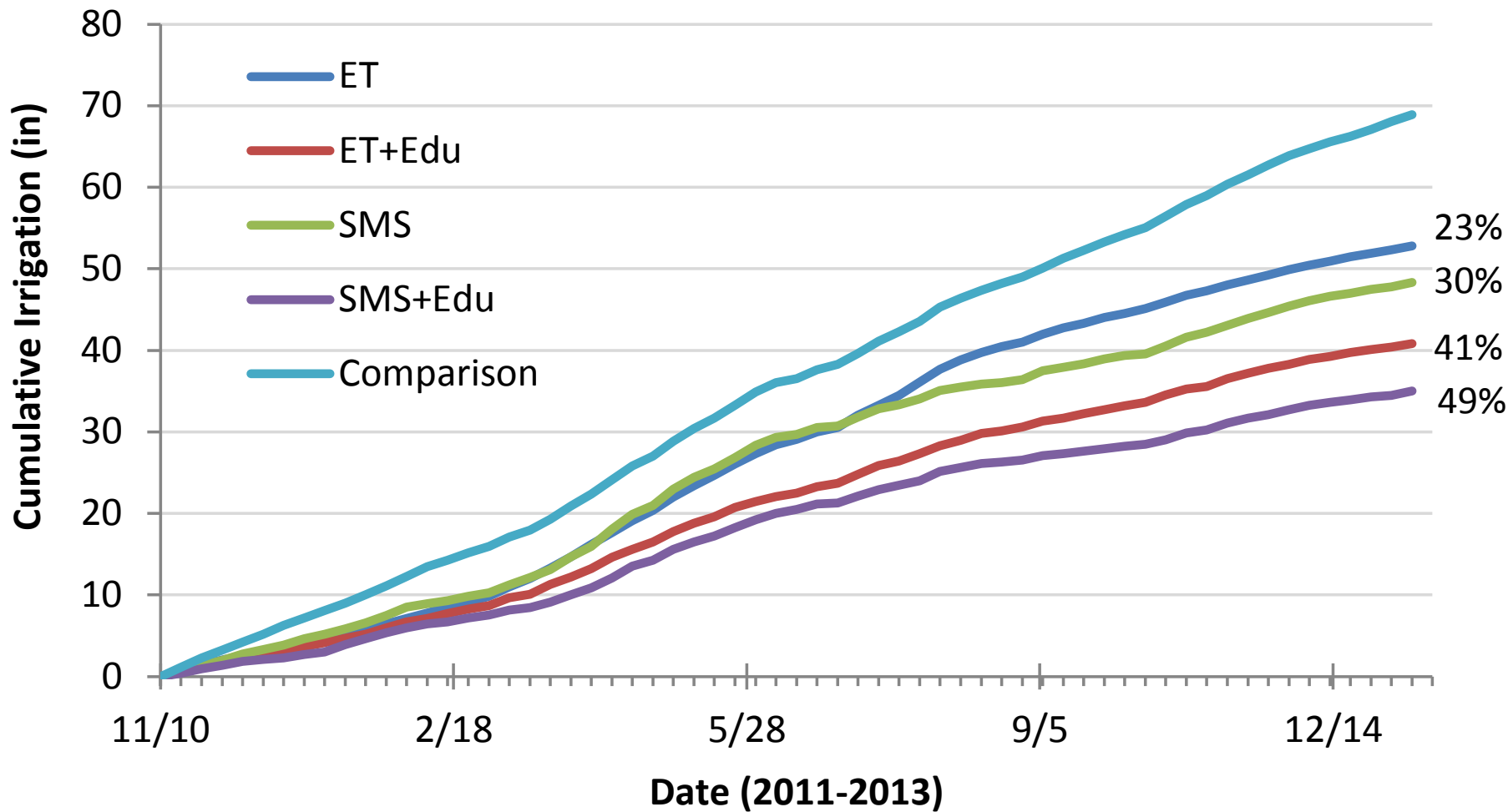


8

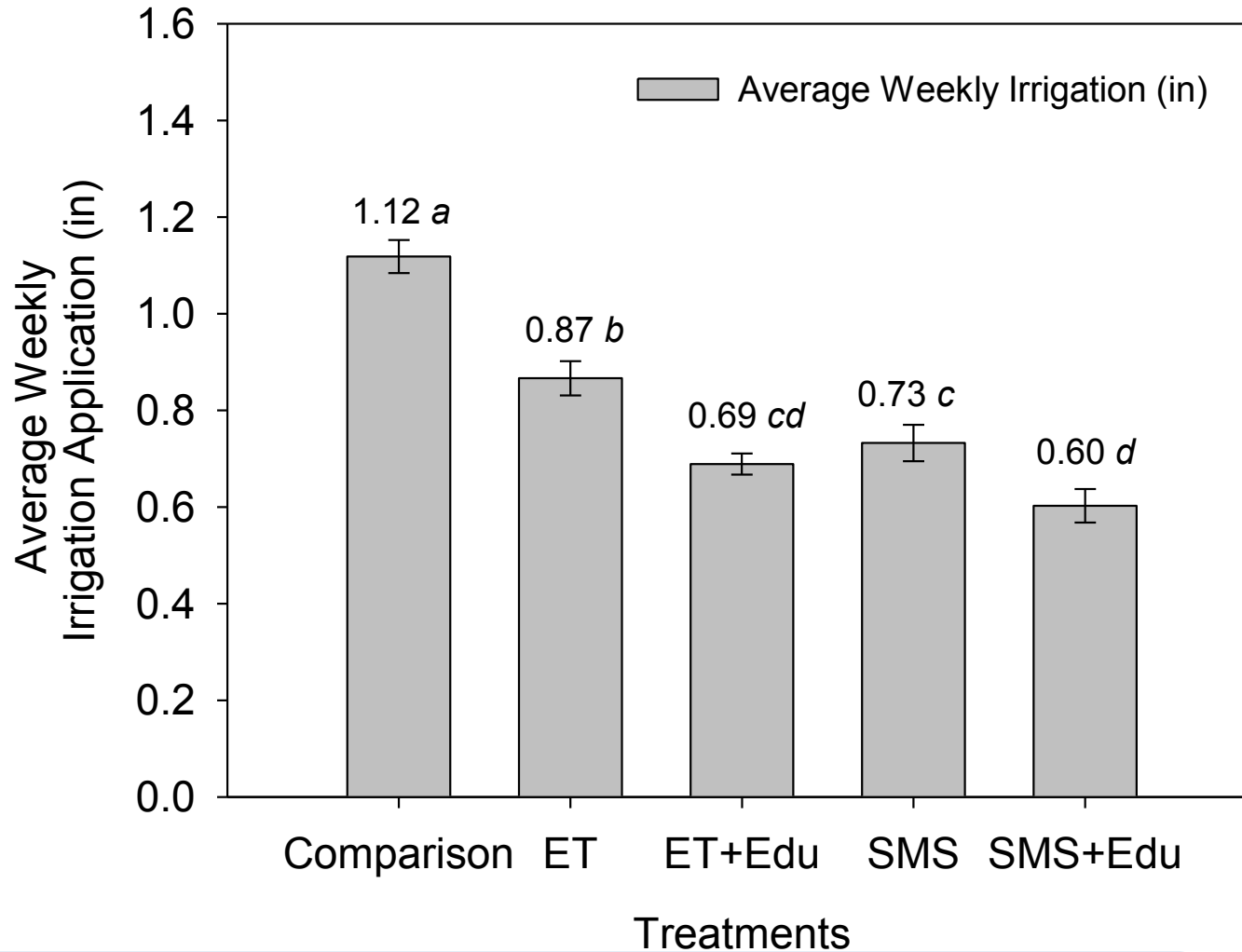
Preliminary Results



Preliminary Results

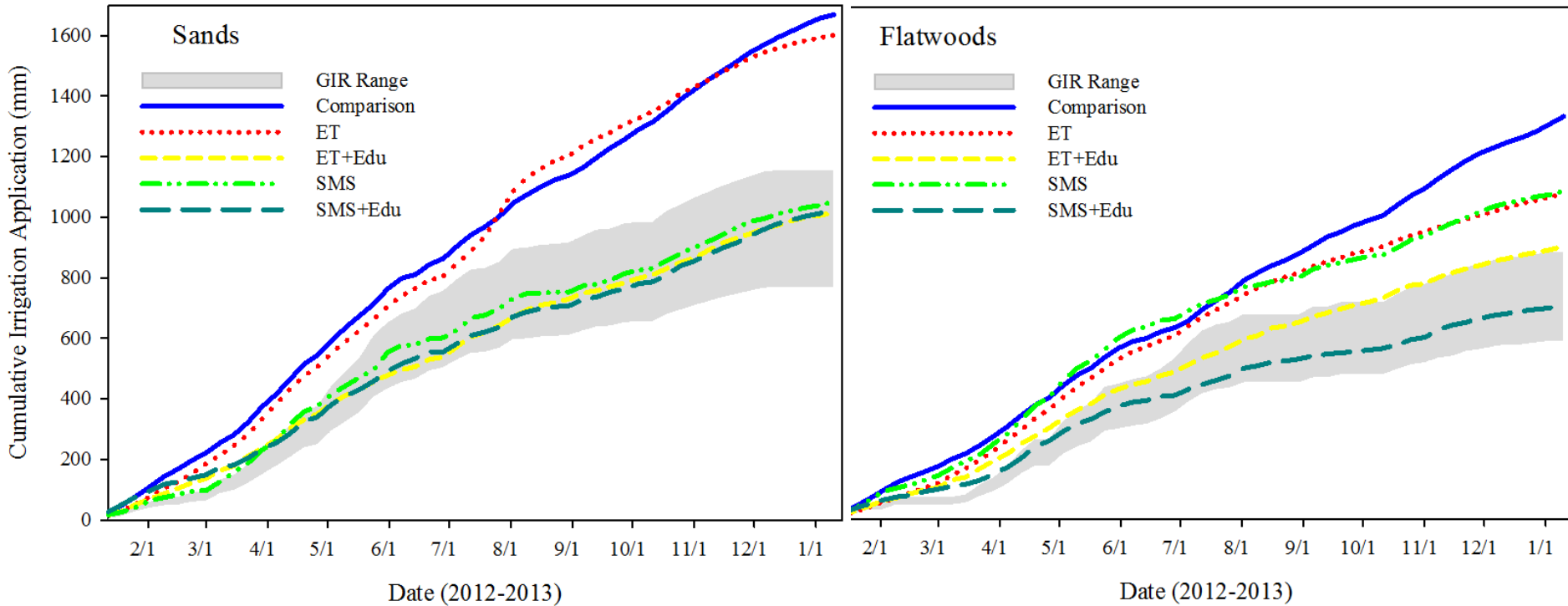


Preliminary Results



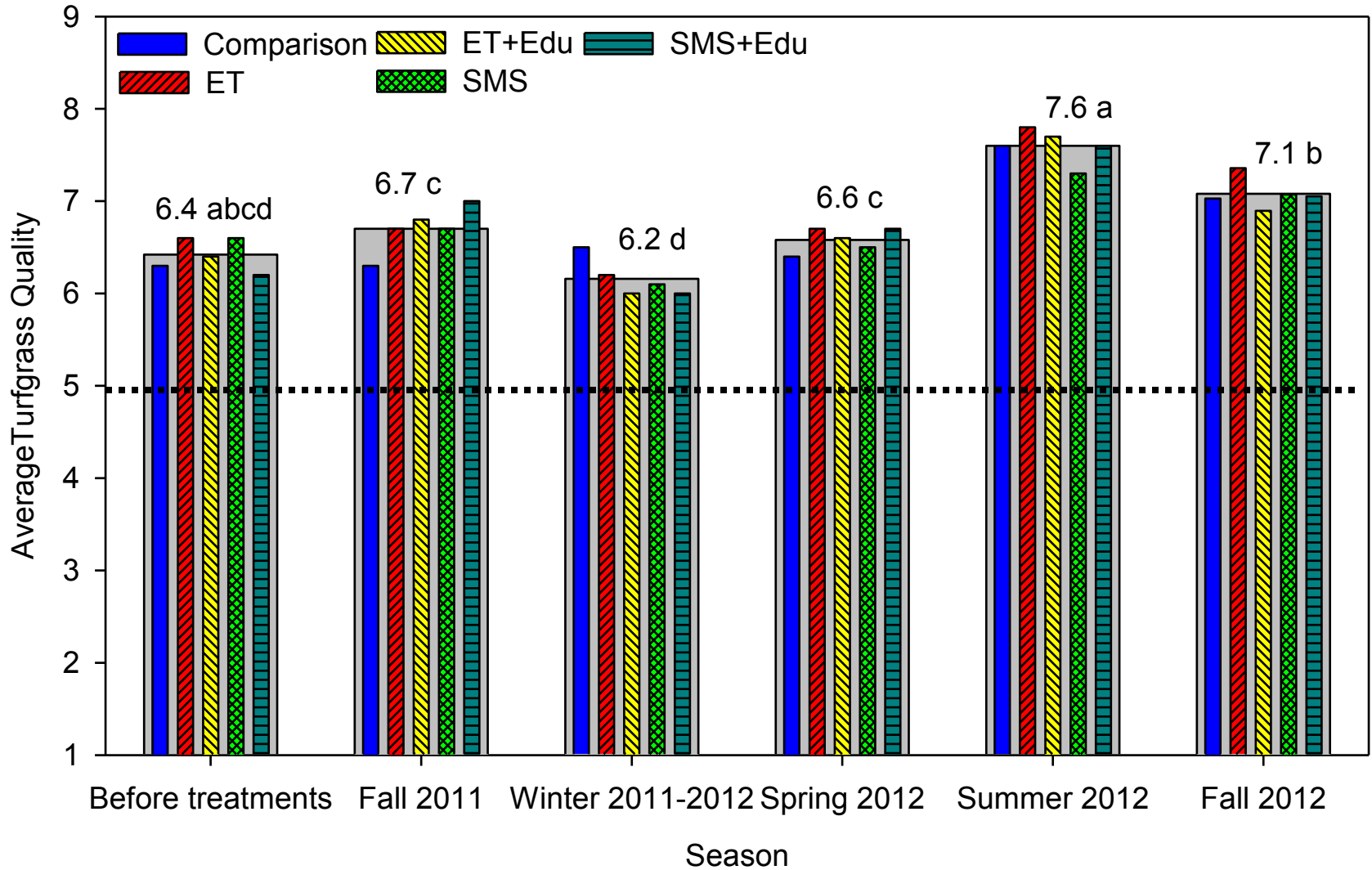
Average Ratios = 1.7-2.5 1.3-2.0 1.0-1.6 1.1-1.7 0.9-1.4

Preliminary Results



Preliminary Results

- Turfgrass Quality



Conclusions

- Water savings were achieved by adding a smart controller
- Additional water savings occurred from more accurate programming and homeowner education
- Since turfgrass quality fluctuates with weather regardless of treatment, there may be additional uncaptured water savings

Future Work

- Continued data collection and analyses → 2014
- Develop better benchmarks for over- and under-irrigation
- Commercial properties – Just installed!
 - Four properties located throughout county
 - Selected ET controllers as smart technology
 - Results will be based on comparisons to historical irrigation habits

Questions?

