

Water Smart Innovations 2008

October 8-10, Las Vegas, NV

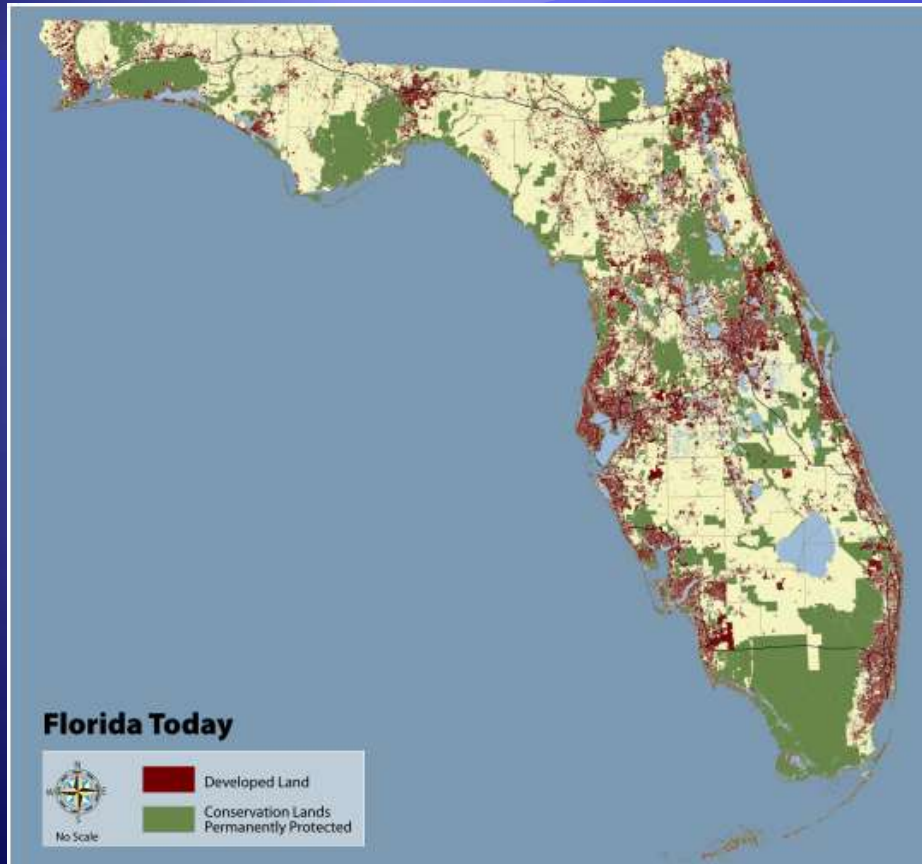
# **SUMMARY OF SMART CONTROLLER TESTING IN FLORIDA & LESSONS LEARNED**

Michael D. Dukes, Ph.D., P.E.

University of Florida, Agricultural & Biological Eng. Dept.

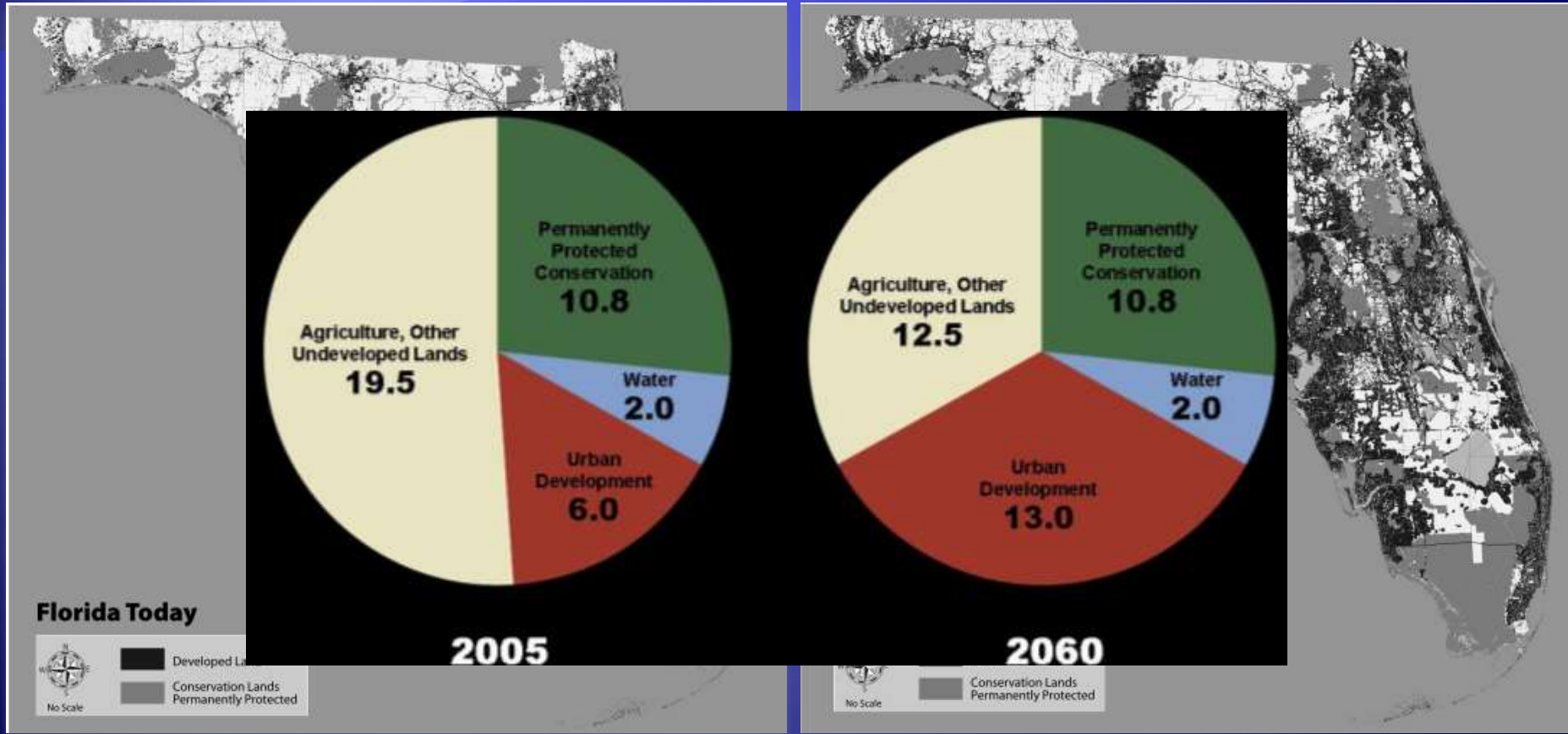
Institute of Food and Agricultural Sciences (IFAS)

# Development of Land in Florida



Maps from 1,000 Friends of Florida  
<http://www.1000friendsofflorida.org/planning/2060.asp>

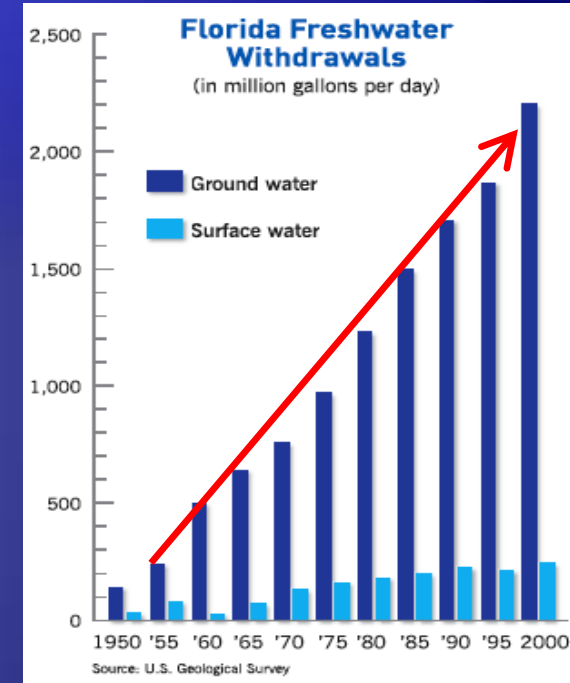
# Development of Land in Florida



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# Significance of Irrigation in FL

- ◆ Population served by public supply
  - ◆ 5.4 million 1970
  - ◆ 17 million 2004
  - ◆ 20 million 2020 (est.)
- ◆ 11% U.S. new home construction in FL
- ◆ + ~1,000 people/day
- ◆ FL uses the most groundwater in the U.S.
- ◆ Most new homes in FL include irrigation
- ◆ ~60% household water use for irrigation
- ◆ High quality landscapes and low water holding capacity



# Irrigation is a Standard "Appliance"



# Smart Irrigation Controller Technology

- ◆ Substantial wasted irrigation is due to wrong time & wrong amount of irrigation
  - ◆ Homeowner convenience issues
  - ◆ Lack of understanding of plant water needs
  - ◆ Irrigation system is an “appliance” to maintain a desired landscape
- ◆ Smart Irrigation Controllers aim to automate these decisions based on feedback from the irrigated system

# Overall Objectives



*Evapotranspiration (ET) based controllers*

*Soil moisture controllers (SMS)*



Compare irrigation applied & turf quality on SMS, ET & RS controlled irrigation to time clock irrigation

*Rain sensors (RS)*



# SMS Testing 2004-05, Normal Rainfall Frequency

- ◆ 1 d/wk four brands SMS
  - ◆ 2 d/wk four brands SMS
  - ◆ 7 d/wk four brands SMS
- 3 SMS frequencies

- ◆ Time 2 d/wk with rain sensor
  - ◆ 60% of time 2 d/wk with rain sensor
  - ◆ Time 2 d/wk without rain sensor
  - ◆ Non-irrigated
- Comparisons





# Soil Moisture Control Sensors



**Water  
Watcher**



**Irrrometer**



**Rainbird**



**Acclima**



Acclima



Rain Bird



Irrrometer



Water Watcher

# TIME vs. SMS Control 2004+05

Treatment	TOTAL (mm)*	Savings compared to 2-WORS (%)
2-WORS	1514	0
2-WRS	995	34
2-DWRS	623	59
Sms Avg	420	72

WRS = With Rain Sensor

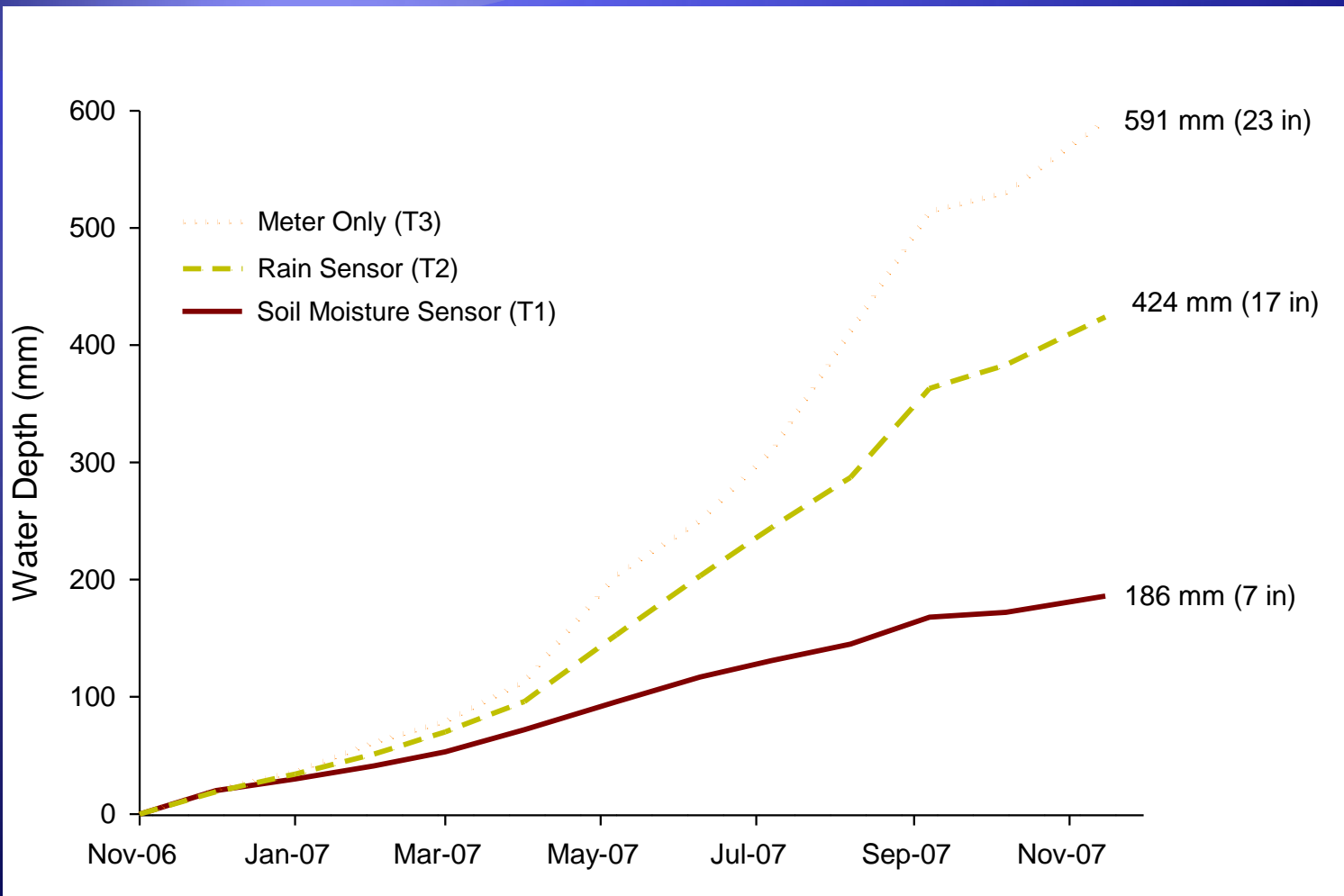
DWRS = 60% Deficit With Rain Sensor

Avg = Average

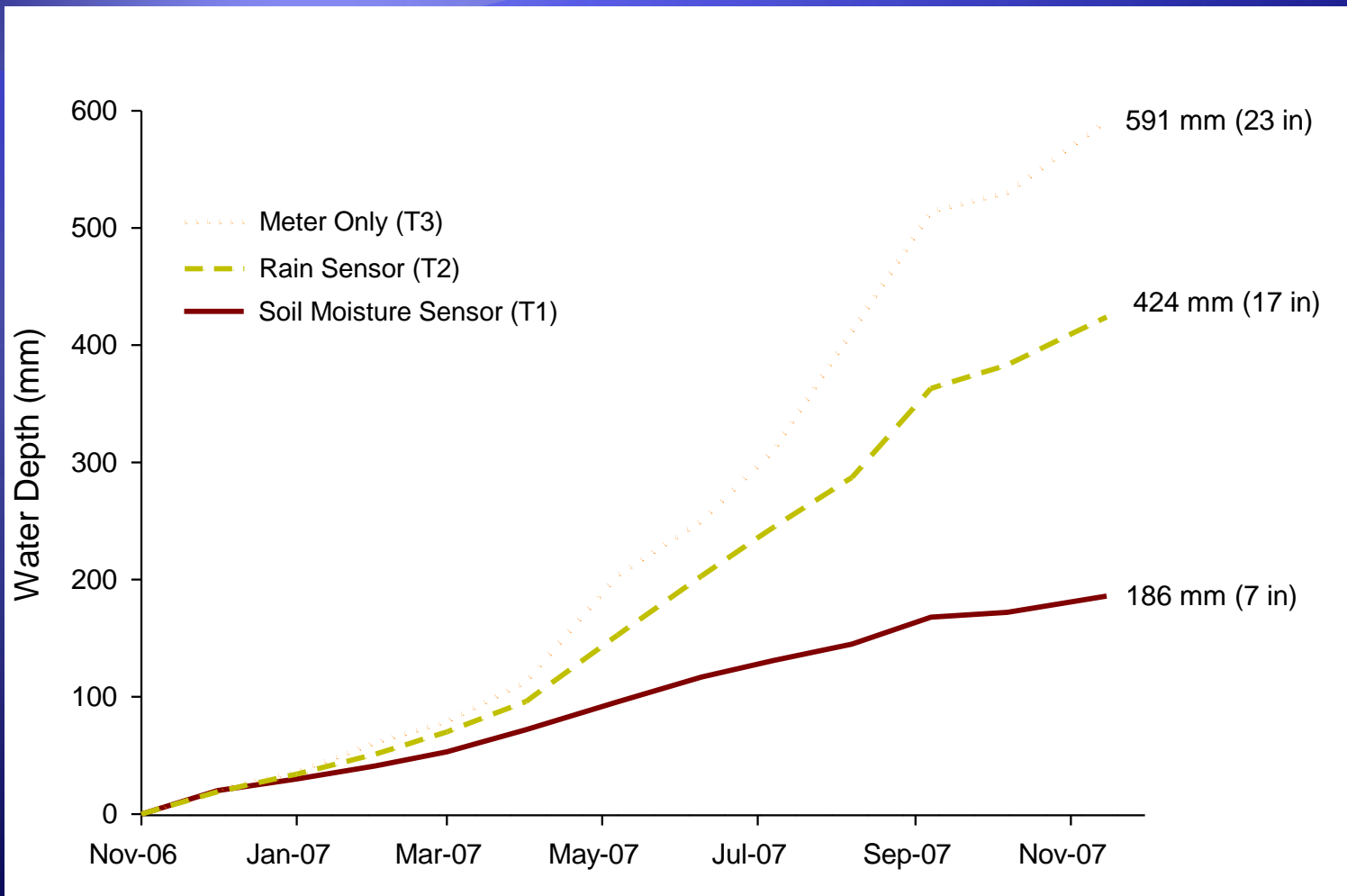
WORS = Without Rain Sensor

Sms = Soil Moisture Sensors

# SMS Controllers on Homes in Pinellas Co.



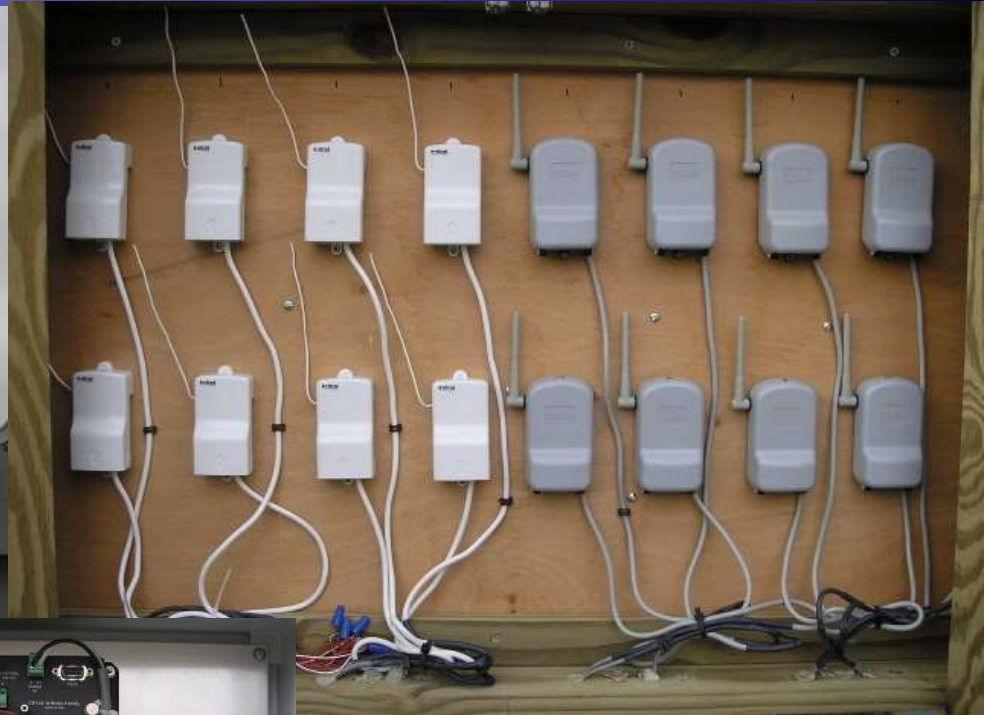
# SMS Controllers on Homes in Pinellas Co.



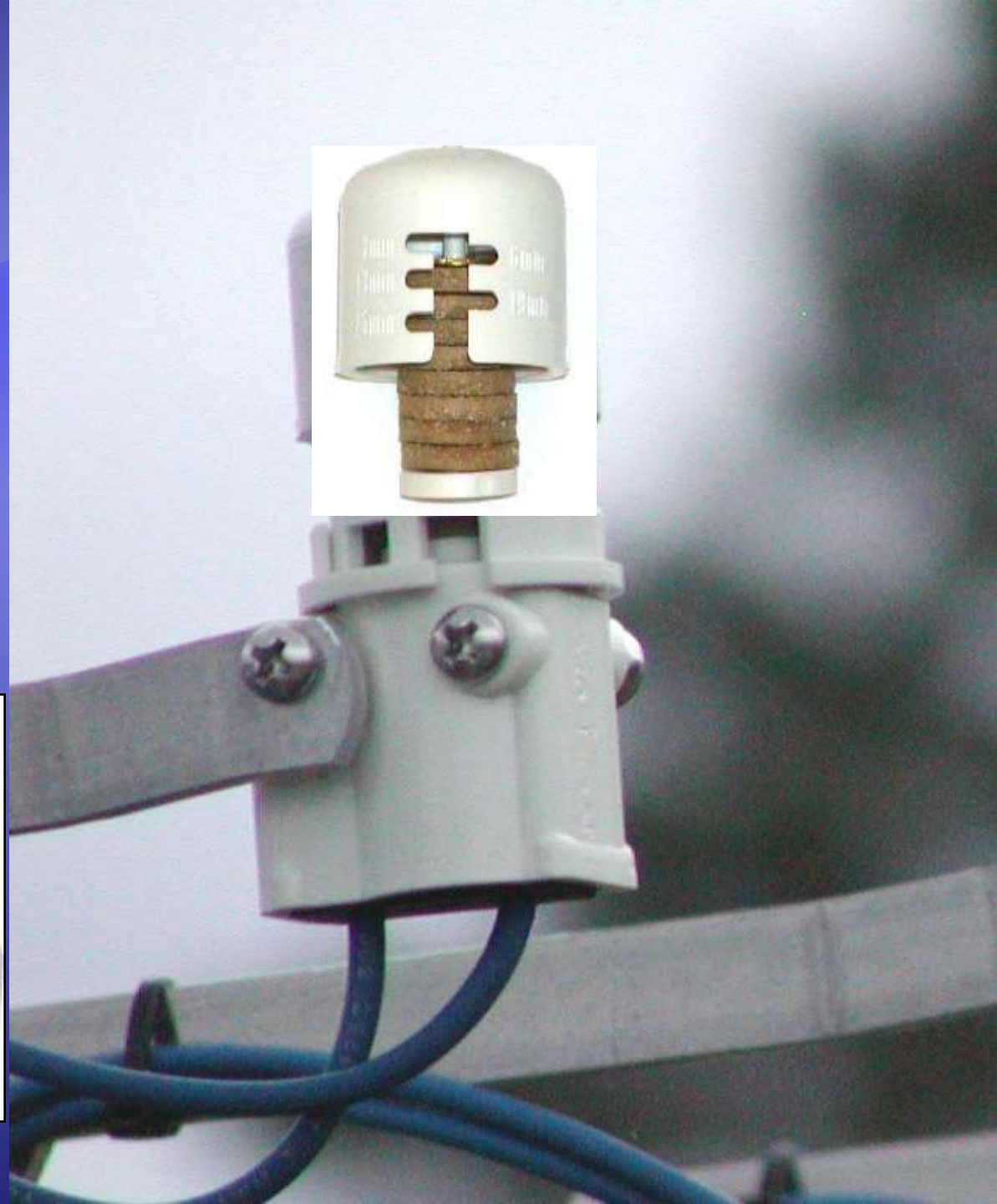
56%

69%

# Rain Sensor Testing, 2005

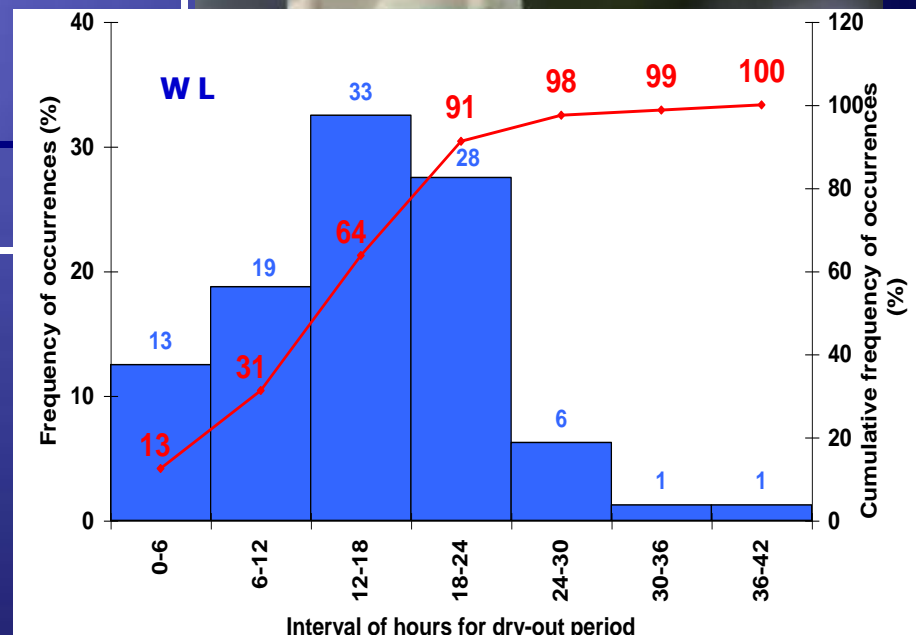


# Expanding Disk Rain Sensor



# Rain Sensor Performance

Treatment	Water savings vs. WORS (%)
WL	44
1/8-MC	30
1/2-MC	17
1-MC	3
WORS	0
WORS = without RS	





# SMS/ET Controllers 2006-07, Drought Conditions






St. Augustinegrass  
testing ongoing since  
March 2006



Photo May 2006, M.L. Shedd

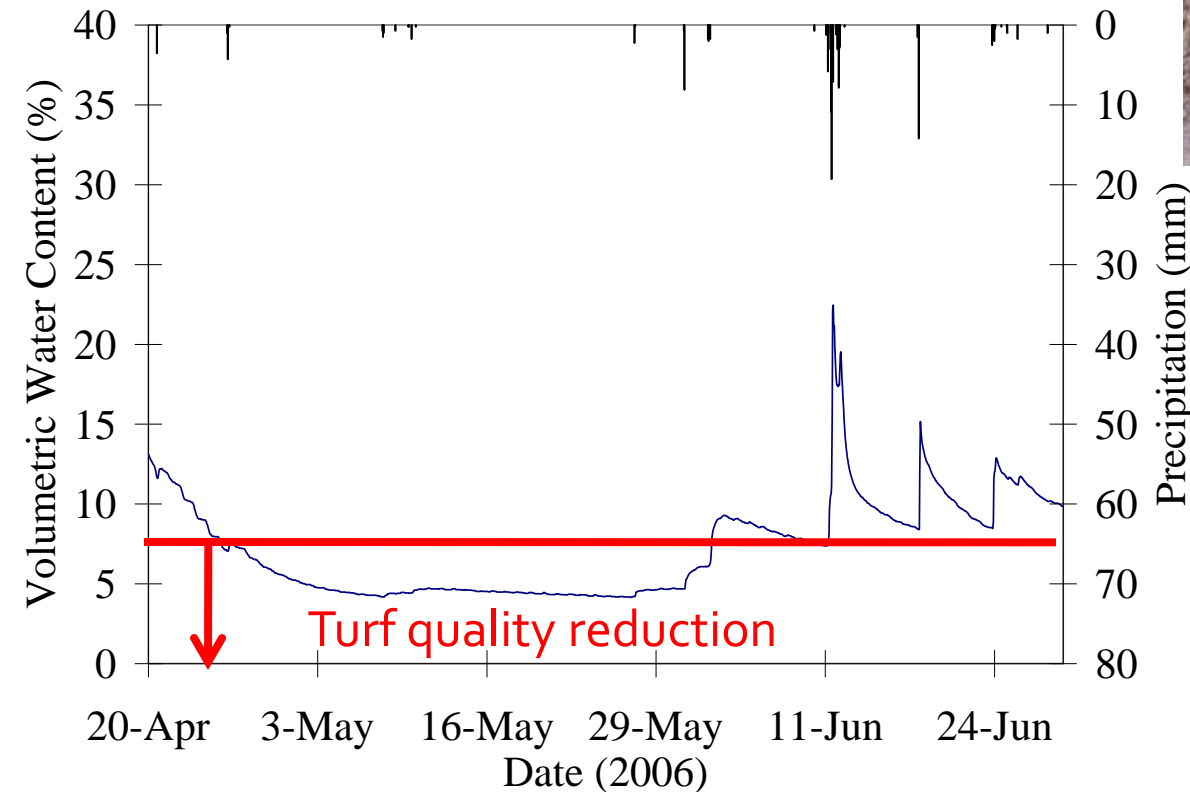
72 plots  
18 treatments & 4 replicates  
A: Rain Sensors  
B: Soil Moisture Sensors  
ET Controllers

# Technology Being Tested

Soil Moisture Sensors	Rain Sensors	ET Controllers
<p>Lawn Logic® LL1004</p> 	<p>Hunter Mini-Clik®</p> 	<p>TORO Intelli-sense TIS612</p> 
<p>Acclima Digital TDT® RS500</p> 		<p>RainBird ET Manager™</p> 
<ul style="list-style-type: none"><li>▪ 2 days/week</li><li>▪ 3 levels of soil moisture content (Low, Medium and High)</li></ul>	<ul style="list-style-type: none"><li>▪ 1, 2, or 7 days/week</li><li>▪ 2 depths of rainfall</li></ul>	<ul style="list-style-type: none"><li>▪ 2 days/week</li><li>▪ Signal from a weather station to calculate ET</li></ul>

# Volumetric Water Content, Spring 2006

- ◆ Each plot monitored individually with TDR probes



- Non-irrigated plots
- Shows rainfall events
- Dry Spring Season

# SMS/ET Testing Results

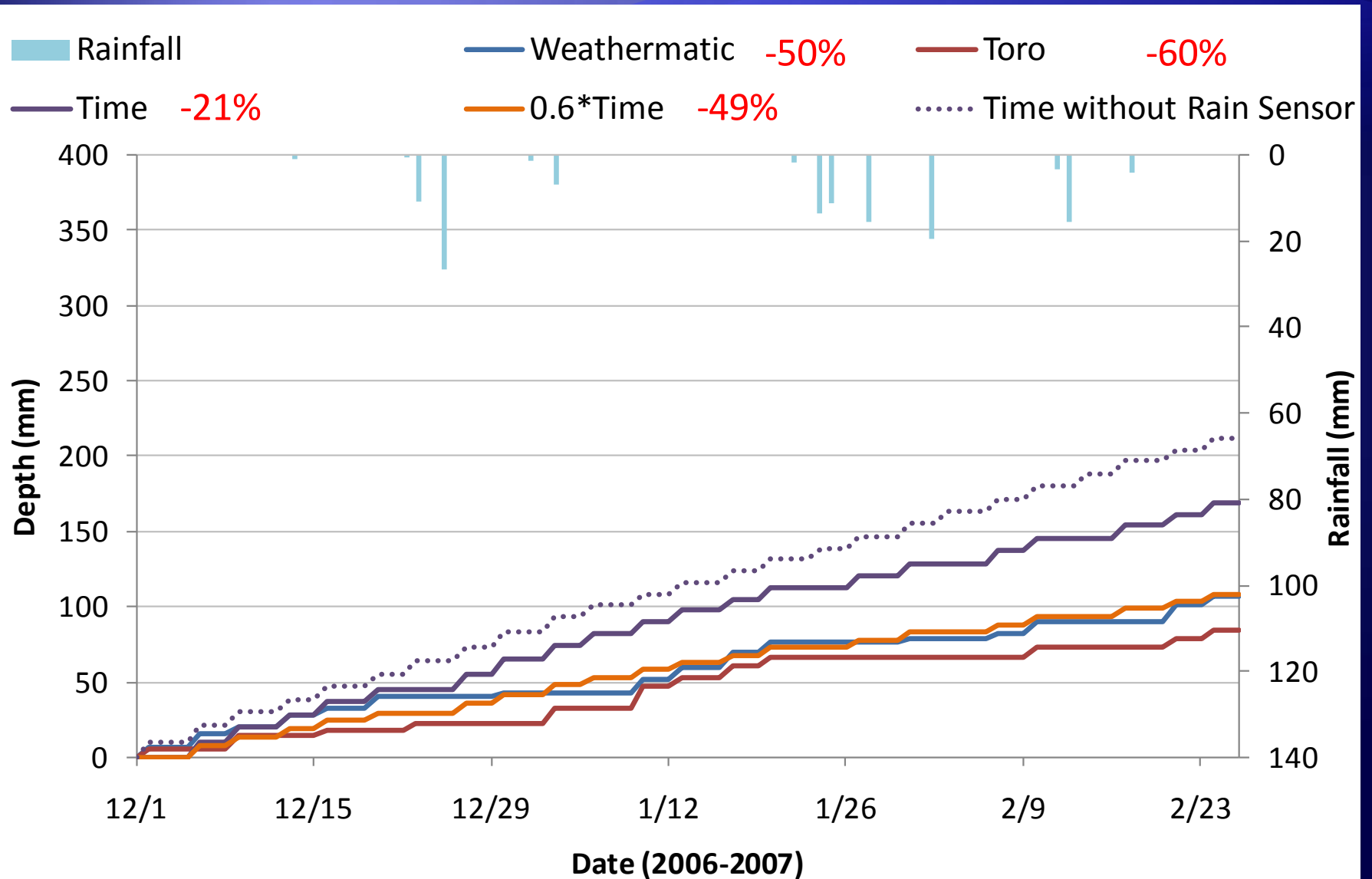
- ◆ Sandy soil threshold, 10% volumetric water content
- ◆ 1 d/wk may lead to poor turf quality
- ◆ Savings
  - ◆ SMS: 18-53%
  - ◆ ET: 25-63%
  - ◆ RS: 7-30%



# Hillsborough Co. Test Plots



# Controller Performance Example



# Hillsborough Co. Testing Results

- ◆ Savings compared to time schedule adjusted monthly & no rain sensor
- ◆ Spring: 9-30%
- ◆ Summer: 11-49%
- ◆ Fall: 15-17%
- ◆ Winter: 50-60%

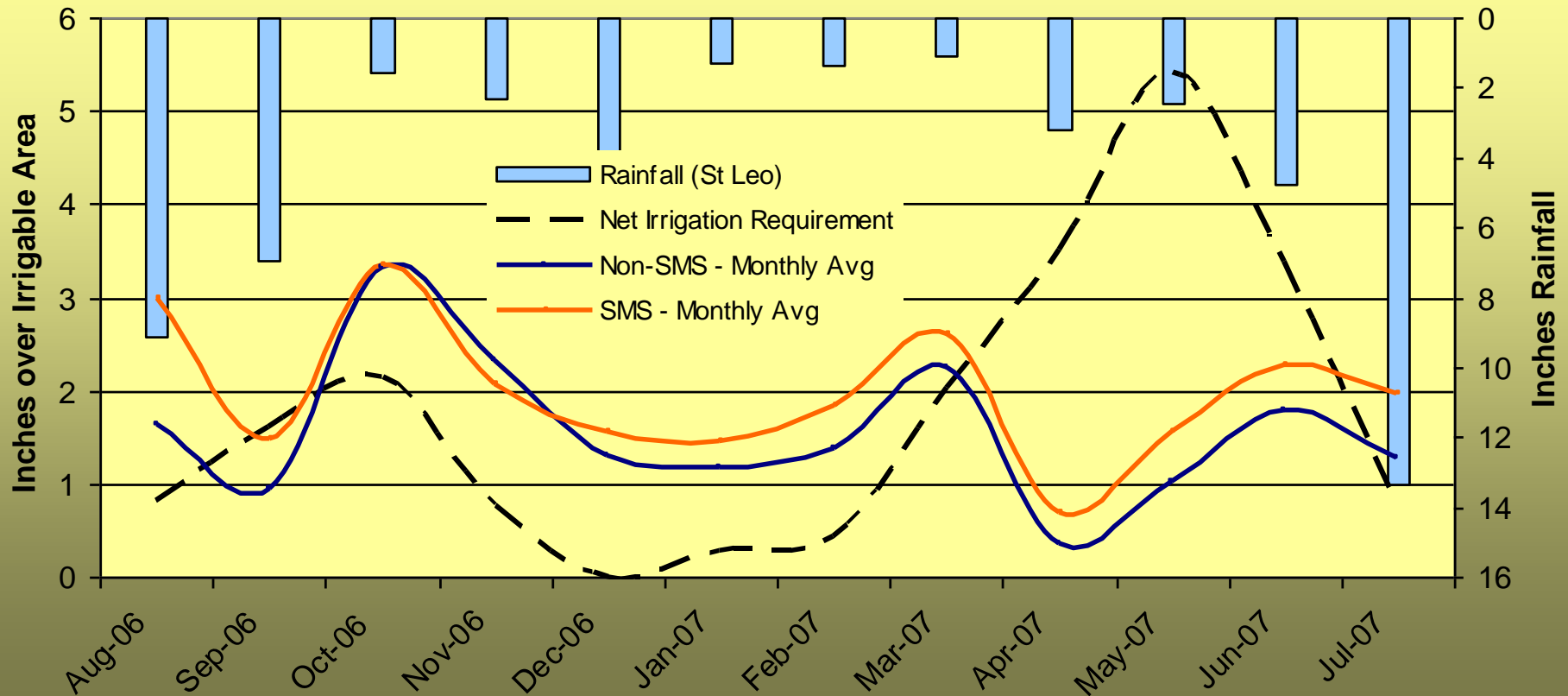


# SMS Implementation Example Lake Jovita, Pasco Co.

- ◆ Fall 2005: Requested variance from 50/50 county landscape ordinance
- ◆ All new homes required to have SMS irrigation control
- ◆ Fully irrigated landscapes installed under variance
- ◆ Extensive SMS installs began in 2006
- ◆ SMS controllers did not seem to be effective initially

# Lake Jovita SMS Performance

## Water Usage versus Net Irrigation Requirement



# SMS Controller Installations

- ◆ Original “indoor” controllers installed outside

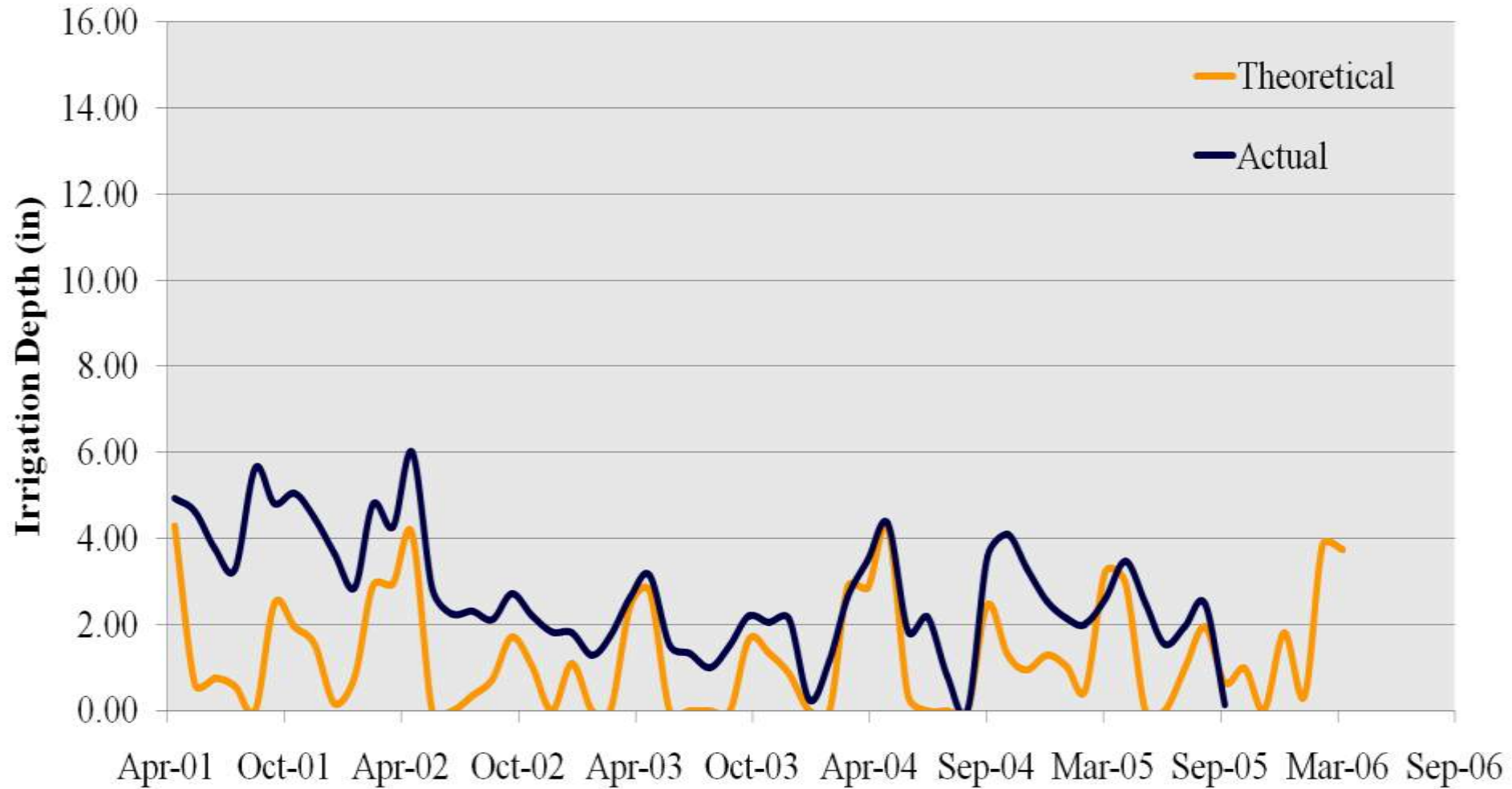


# Lake Jovita Case Study

- ◆ Mapped as Arredondo, Sparr, Kendrick fine sands
- ◆ Actual soil significantly disturbed

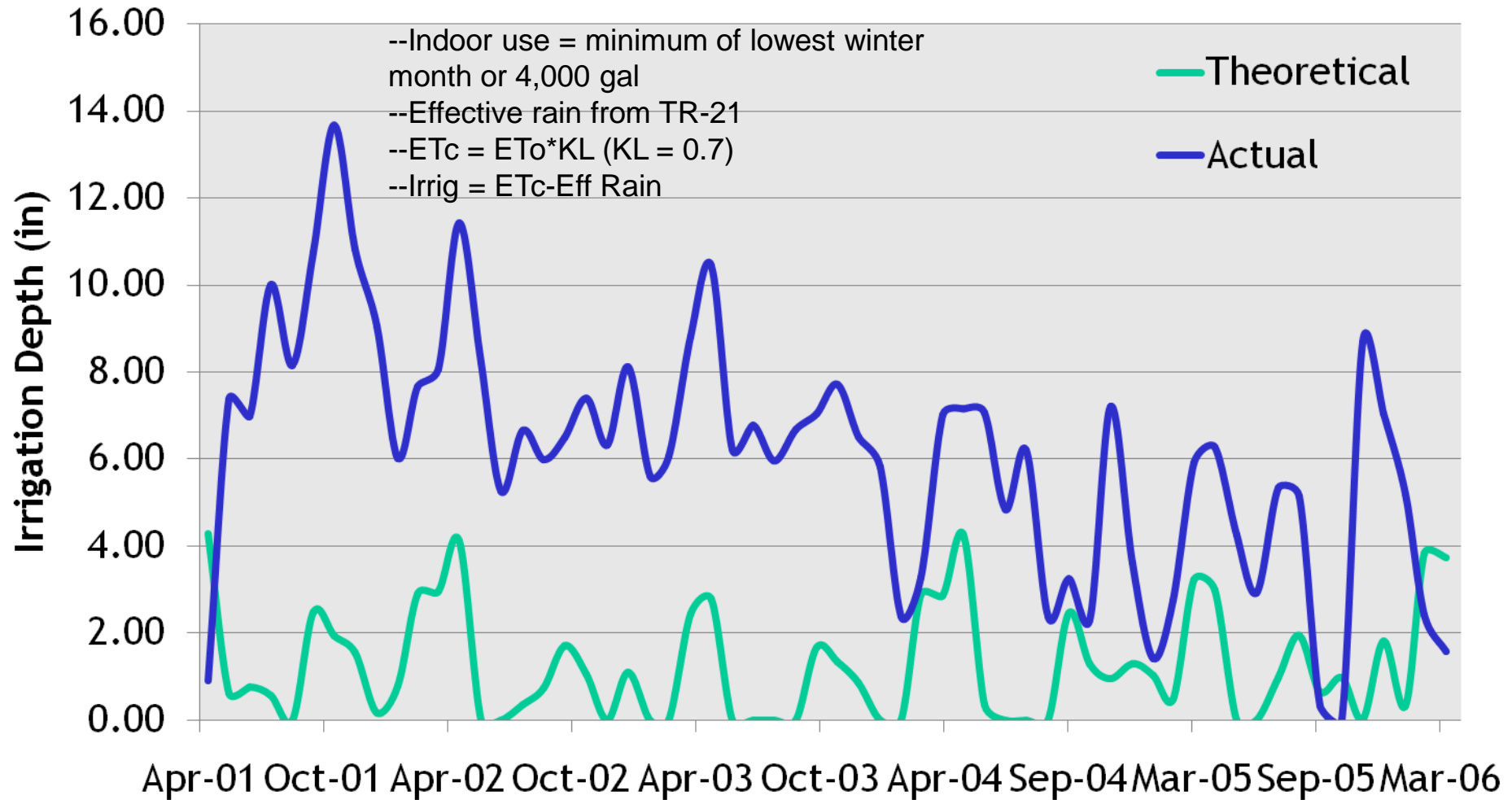


# Lake Jovita Water Use



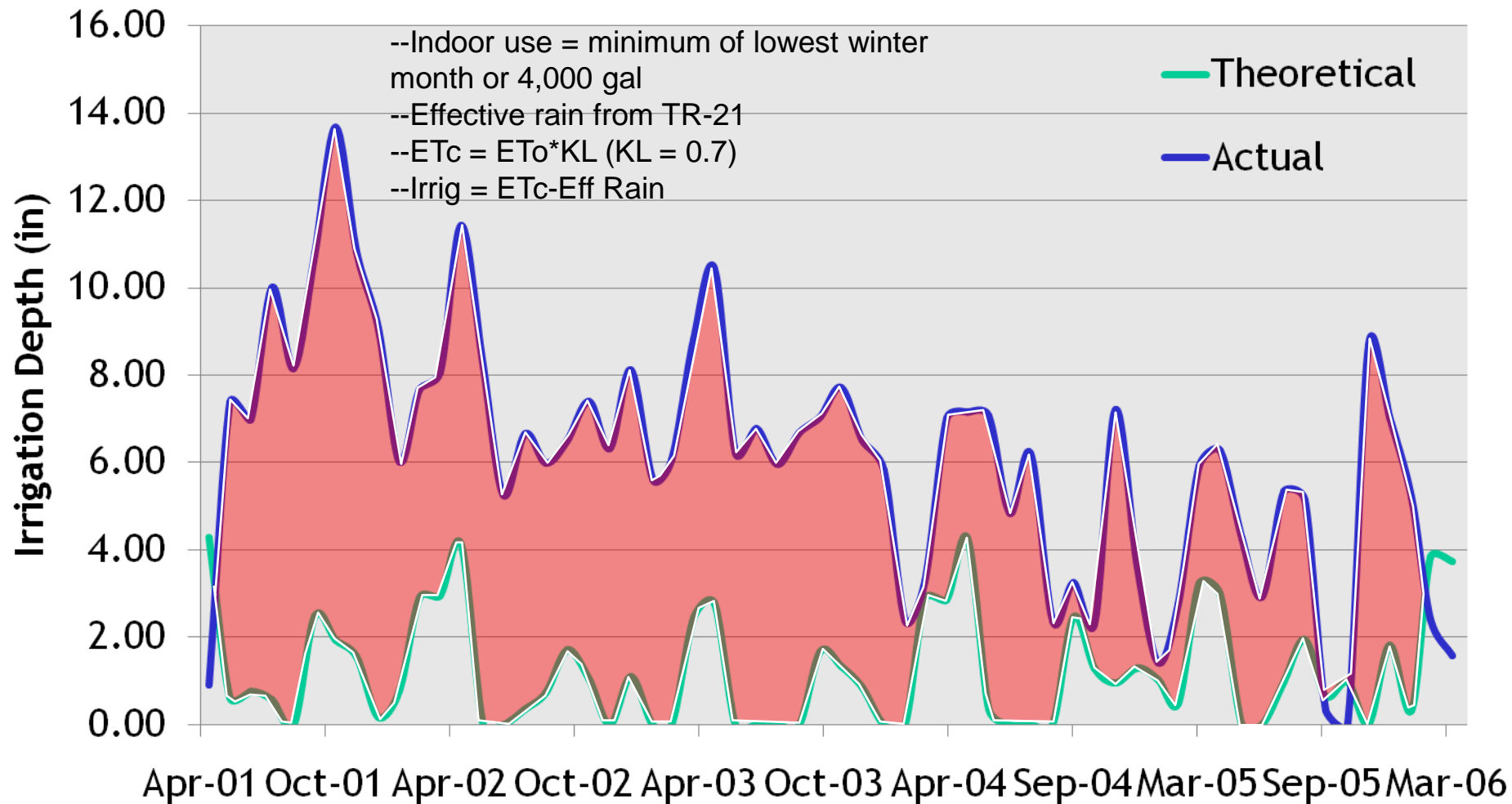
# Development Example

## Key Vista, Pasco Co. ~700 homes



# Development Example

## Key Vista, Pasco Co. ~700 homes



# Development Water Use Characteristics

## ◆ Lake Jovita

- ◆ The 25% highest water use records result in 60% of the irrigation water
- ◆ The 50% highest water use records result in 90% of the irrigation water

## ◆ Key Vista

- ◆ The 25% highest water use records result in 42% of the irrigation water
- ◆ The 50% highest water use records result in 85% of the irrigation water



# Implementation Examples

- ◆ Municipal Water District of Orange County
  - ◆ 899 Smart Controllers (ET based) on single family homes
  - ◆ 8 brands
    - ◆ 33% → decreased use
    - ◆ 18% → increased use
    - ◆ ~50% no change
  - ◆ Similar trends on commercial installations

# Implementation Examples (cont'd)

- ◆ San Antonio Water Systems
  - ◆ No change between “water efficient homes” and comparison group
  - ◆ Actual use (~170 kgal/yr) double water budget (~80 kgal/yr)
- ◆ Irvine Ranch
  - ◆ After pilot program ended, 50% of homeowners refused to pay controller subscription fee of \$5/month
  - ◆ Statewide ET network in development
- ◆ Otay Water District
  - ◆ Nearly half of Smart Controllers not set up properly

# Smart Irrigation Controller Irrigation Reduction *Potential*

Method	Location	Irrigation Savings	Weather	Funding agency
Time clock adjustment w/ rain sensor	Homes in Central Fla.	30%	Normal to rainy	SJRWMD
Rain sensor	Plots in Gainesville	34%	Normal to rainy	SWFWMD
		15%	Dry	
Soil moisture sensor control	Plots in Gainesville	70-90%	Normal to rainy	SWFWMD
		Up to 40%	Dry	
	Homes in Pinellas Co.	Up to 70%	Dry (1 d/wk)	SWFWMD
ET controllers	Plots in Hillsborough Co.	Up to 60%	~Normal	Hillsborough Co./FDACS
		Up to 40%	Dry	

# The Answer is **NOT** Only Smart Controllers

- ◆ Smart Controllers have **potential**
- ◆ Should be targeted to “**high**” water users
- ◆ Must be implemented with **hands on training** of contractors
- ◆ Ongoing **certification/verification** program should be implemented

# Funding Partners

- ◆ Irrigation efficiency study
  - ◆ SJRWMD
- ◆ Soil moisture sensor research
  - ◆ Pinellas Anclote Basin Board, SWFWMD
  - ◆ Florida Dept. Ag. and Consumer Services
  - ◆ Florida Nursery Growers & Landscape Association
  - ◆ Florida Turfgrass Association
- ◆ ET controller research
  - ◆ Hillsborough County Water Dept.
  - ◆ Florida Dept. Ag. and Consumer Services
  - ◆ Florida Nursery Growers & Landscape Association
  - ◆ Florida Turfgrass Association
- ◆ Industry Partners

# Questions?

[mddukes@ufl.edu](mailto:mddukes@ufl.edu)  
<http://irrigation.ifas.ufl.edu>