Precision Agriculture: Sensors for Irrigation Management

Cotton Inc.
Crop Management Seminar 2010

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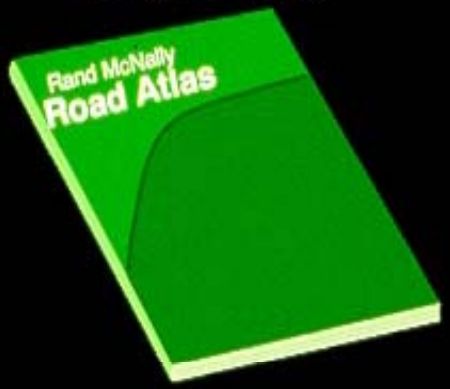
West Tennessee REC

Cotton Incorporated

Water and Fuel Management

Historical Crop Water Use



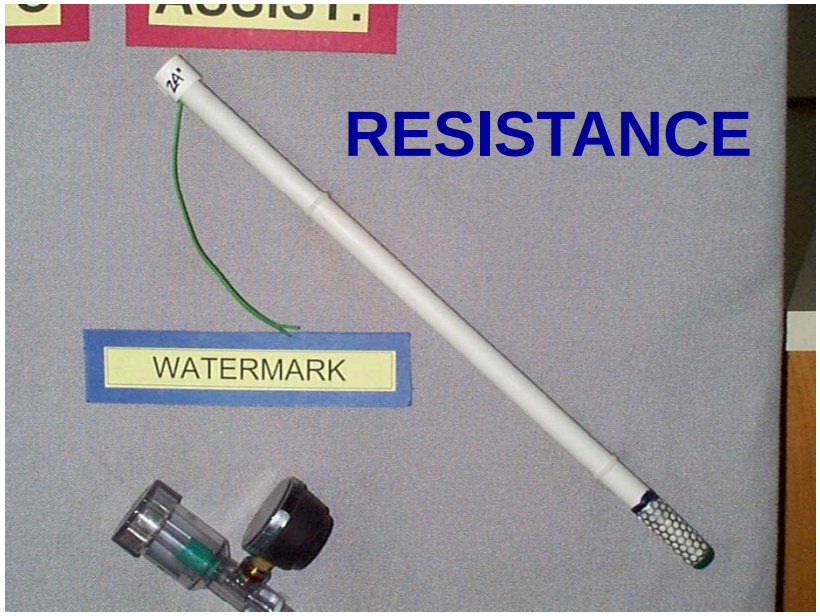
Actual Crop Water Use

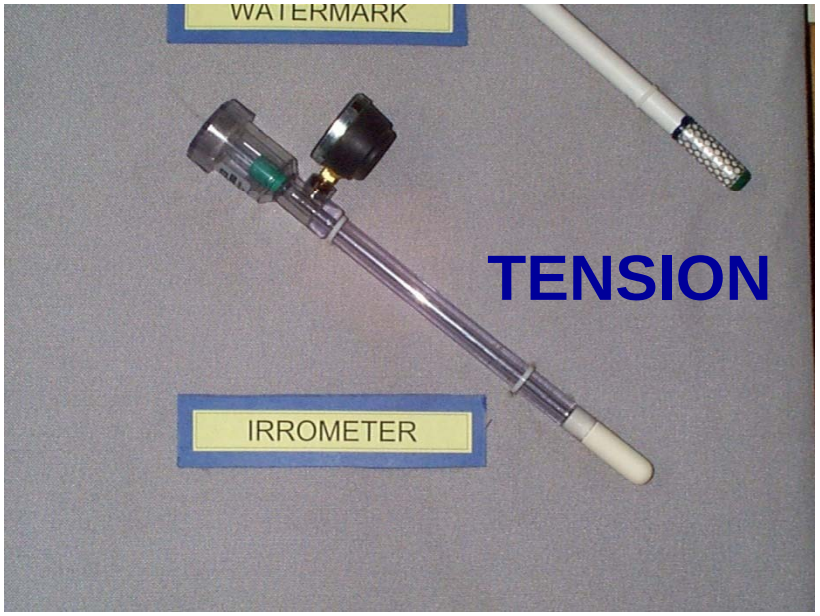
Soil Moisture Measurement

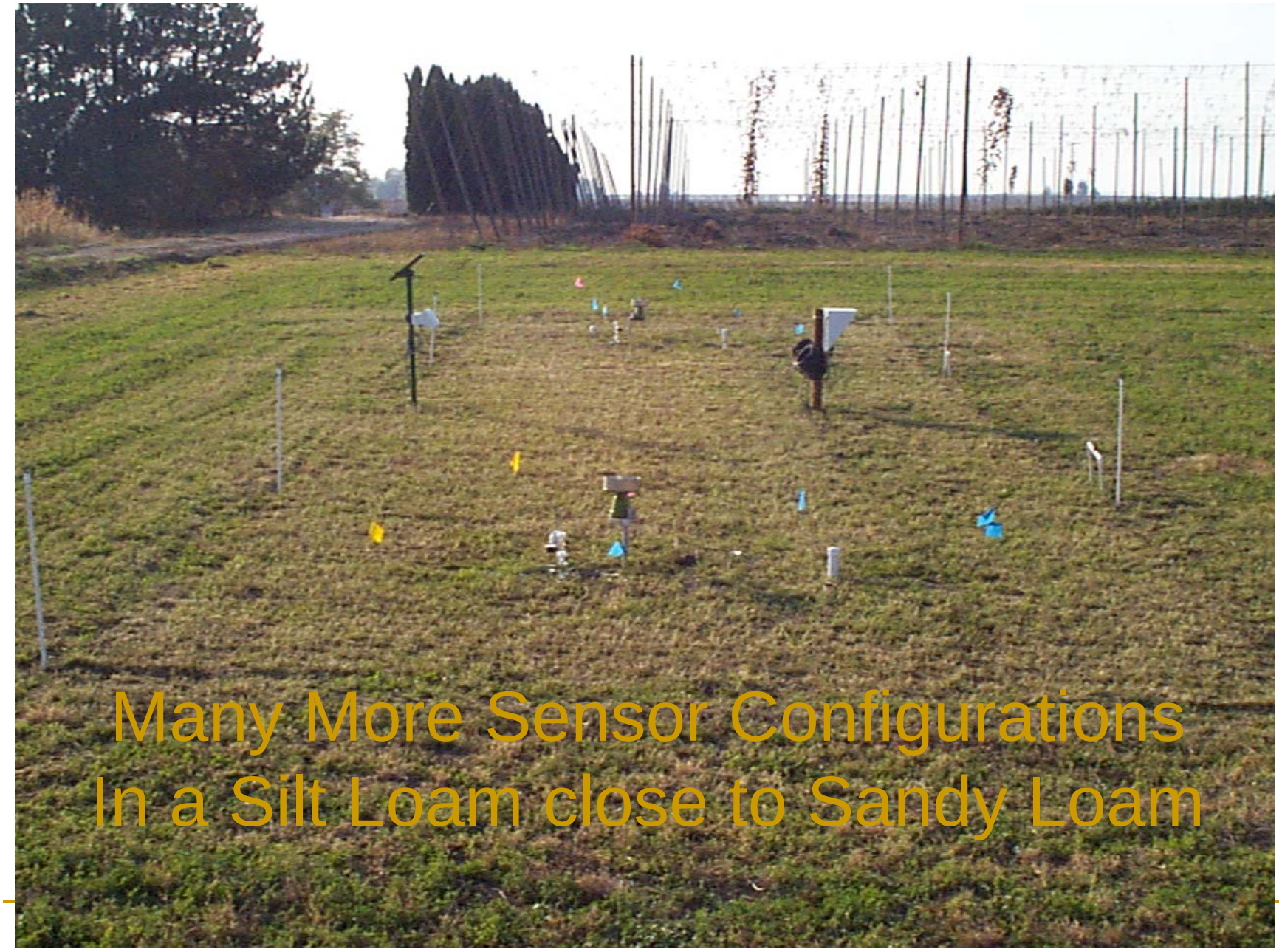
Irrigation System

Soil Water Holding Capacity

Soil Water Sensing Methods

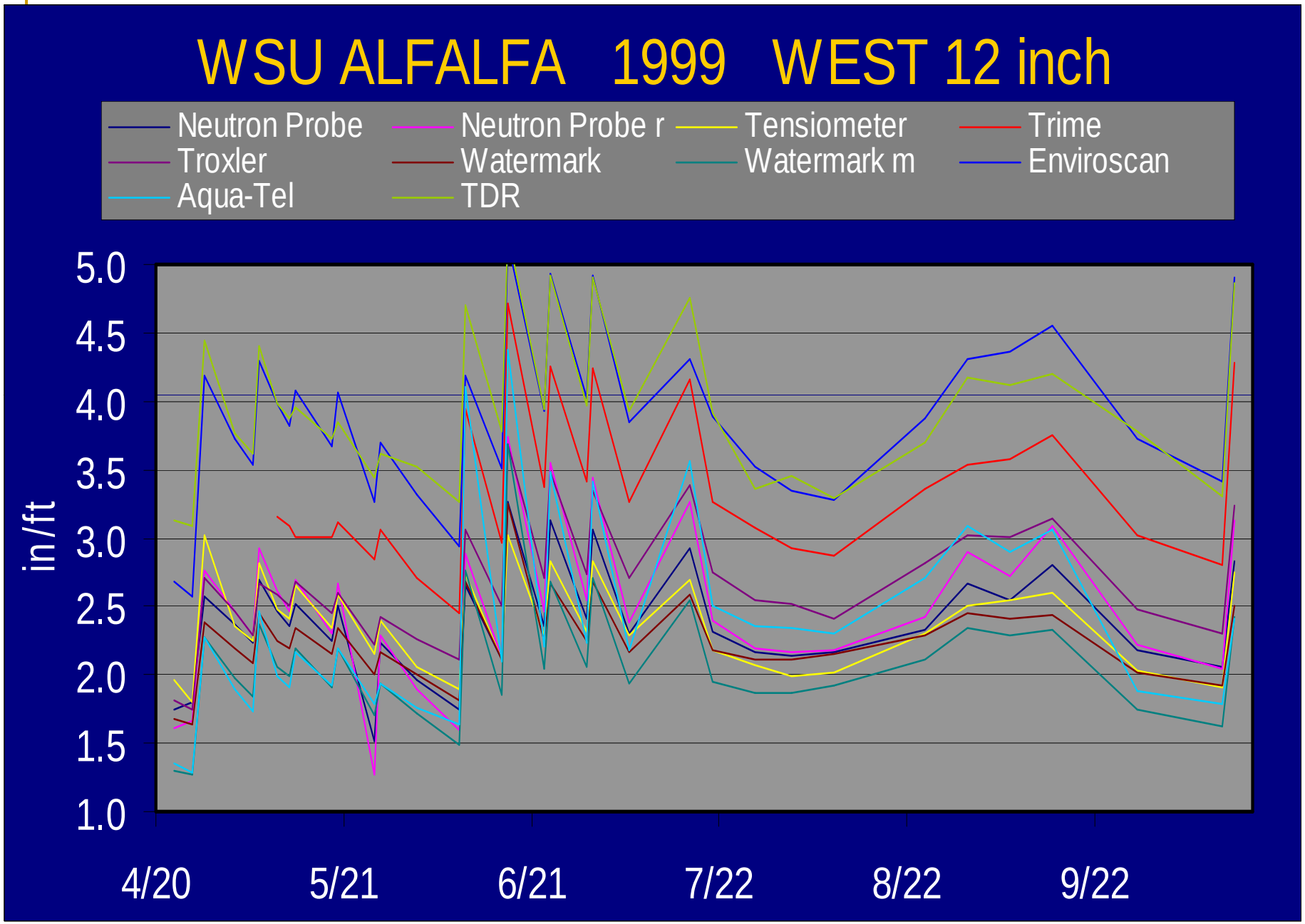





Many More Sensor Configurations
In a Silt Loam close to Sandy Loam

WSU Alfalfa on 9/1/99

EnviroSCAN	4.31 in/ft
TDR	4.17 in/ft
Trime	3.53 in/ft
AquaTel	3.08 in/ft
Troxler RF	3.08 in/ft
Neutron Probe	2.90 in/ft
Tensiometer	2.51 in/ft
WaterMark	2.45 in/ft

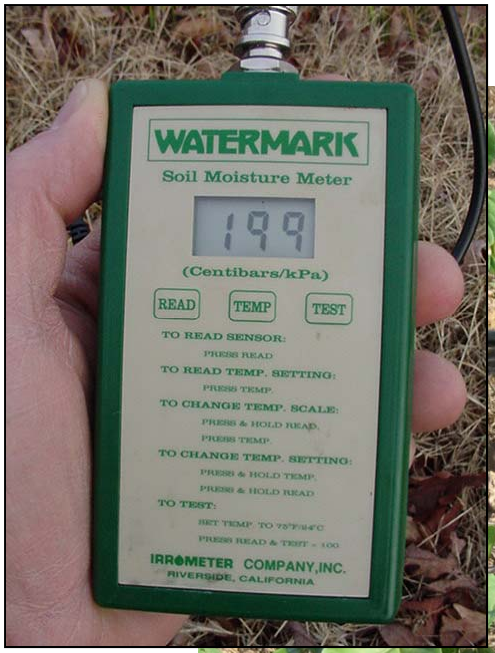

WSU ALFALFA 1999 WEST 12 inch
Neutron Probe
Neutron Probe r
Tensiometer
Trime
Troxler
Watermark
Watermark m
Enviroscan
Aqua-Tel
TDR
in/ft
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
4/20
5/21
6/21
7/22
8/22
9/22

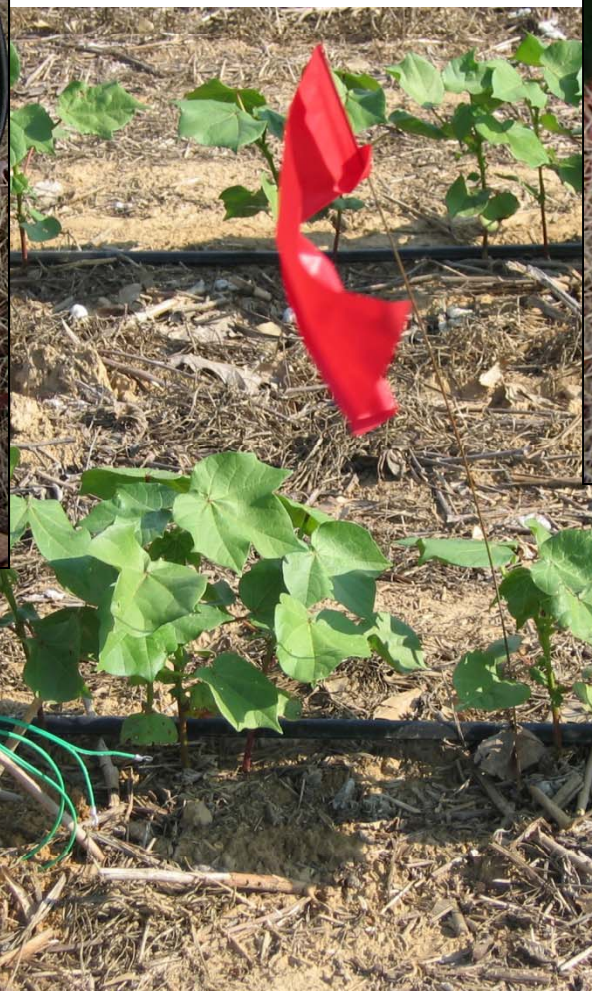
Application in Irrigation Scheduling

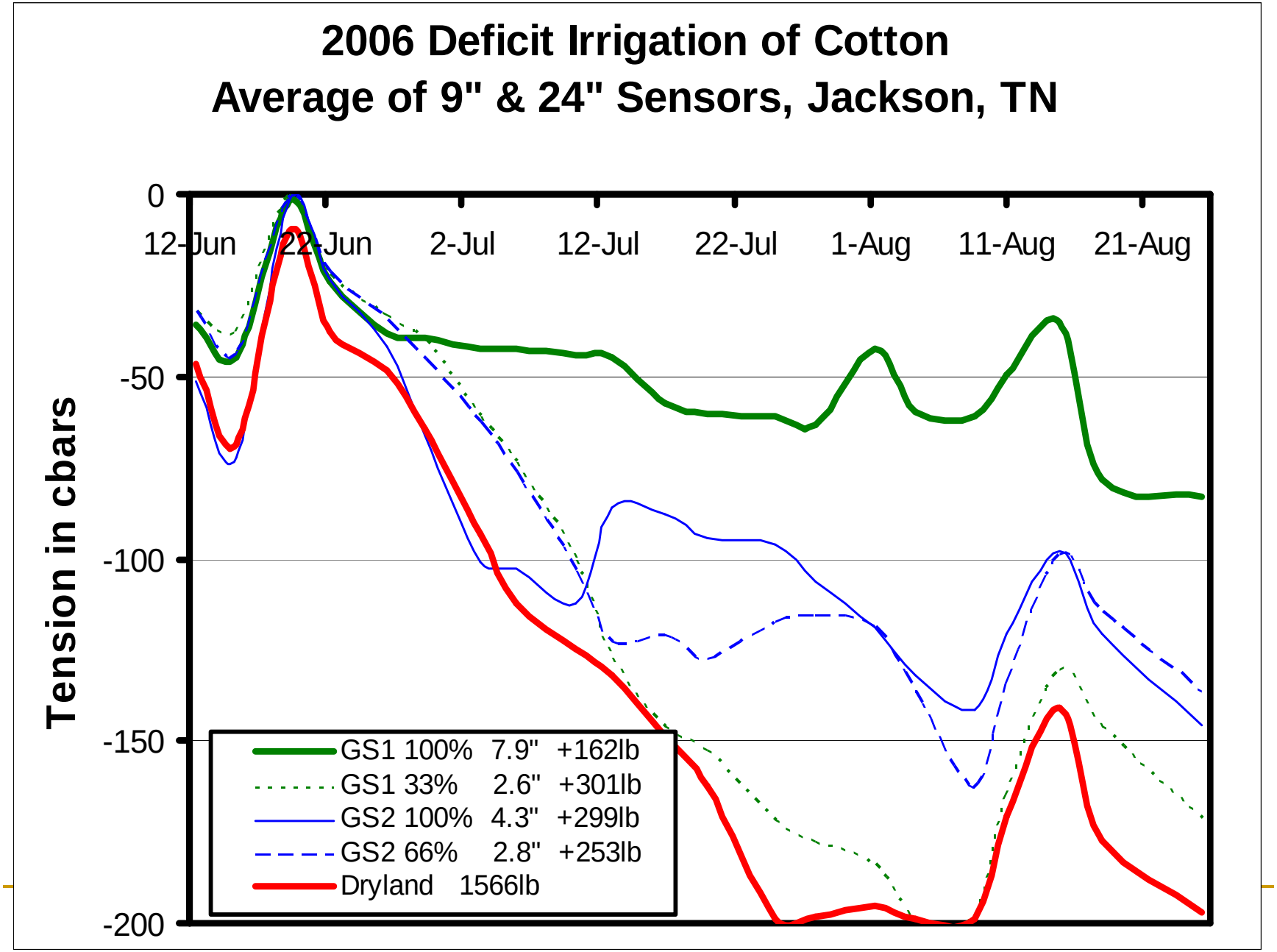
- As a marker, sensor must be consistent.
- Measure changes in soil water, sensor must have relative accuracy of scale.
- Best communication with others, sensors must be calibrated absolute accuracy.

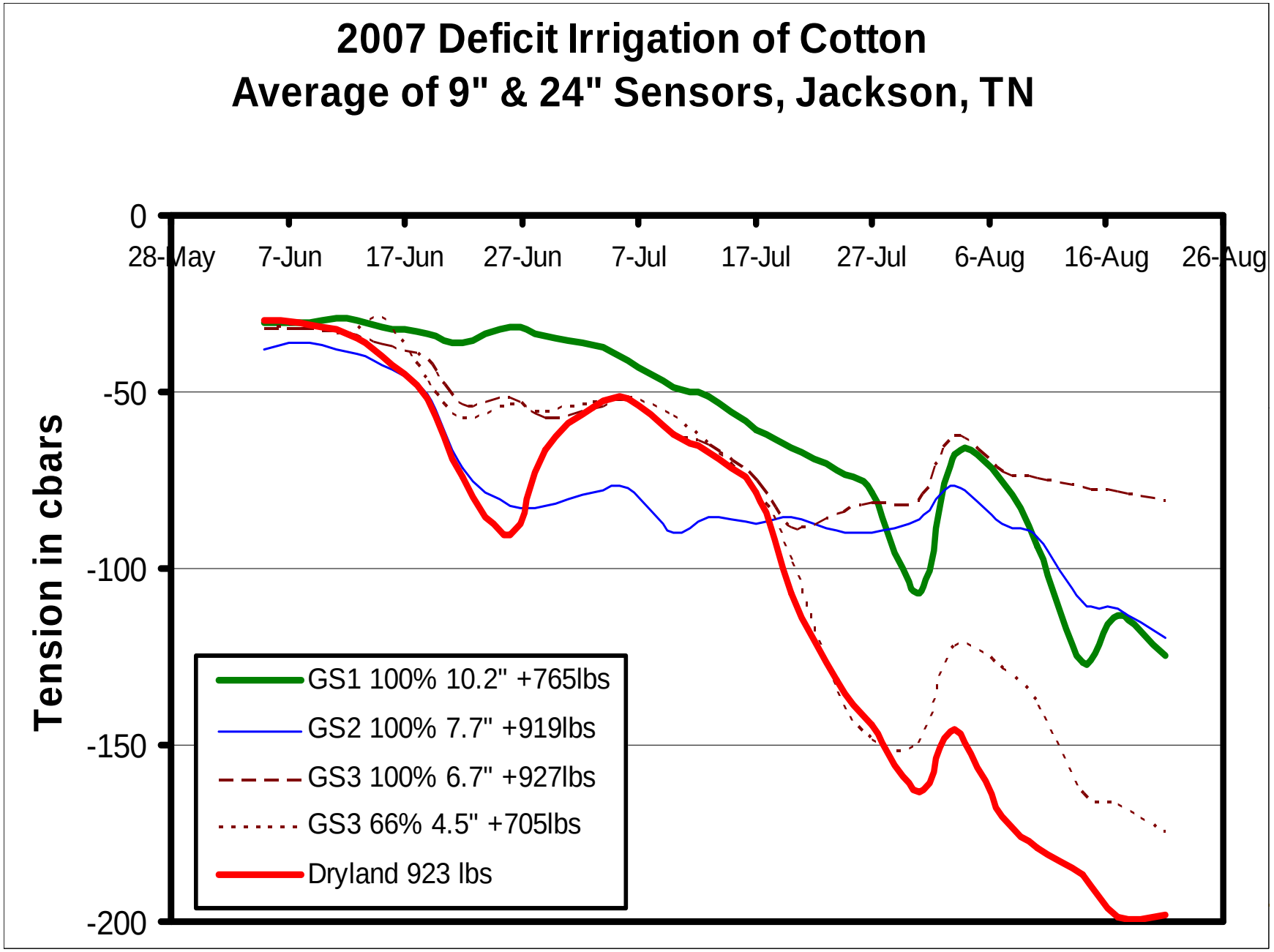
Soil Water Sensors in Cotton Irrigation Experiment, WTREC, Jackson, TN

Soil Tension with WaterMark Sensors in Deficit Cotton Experiment



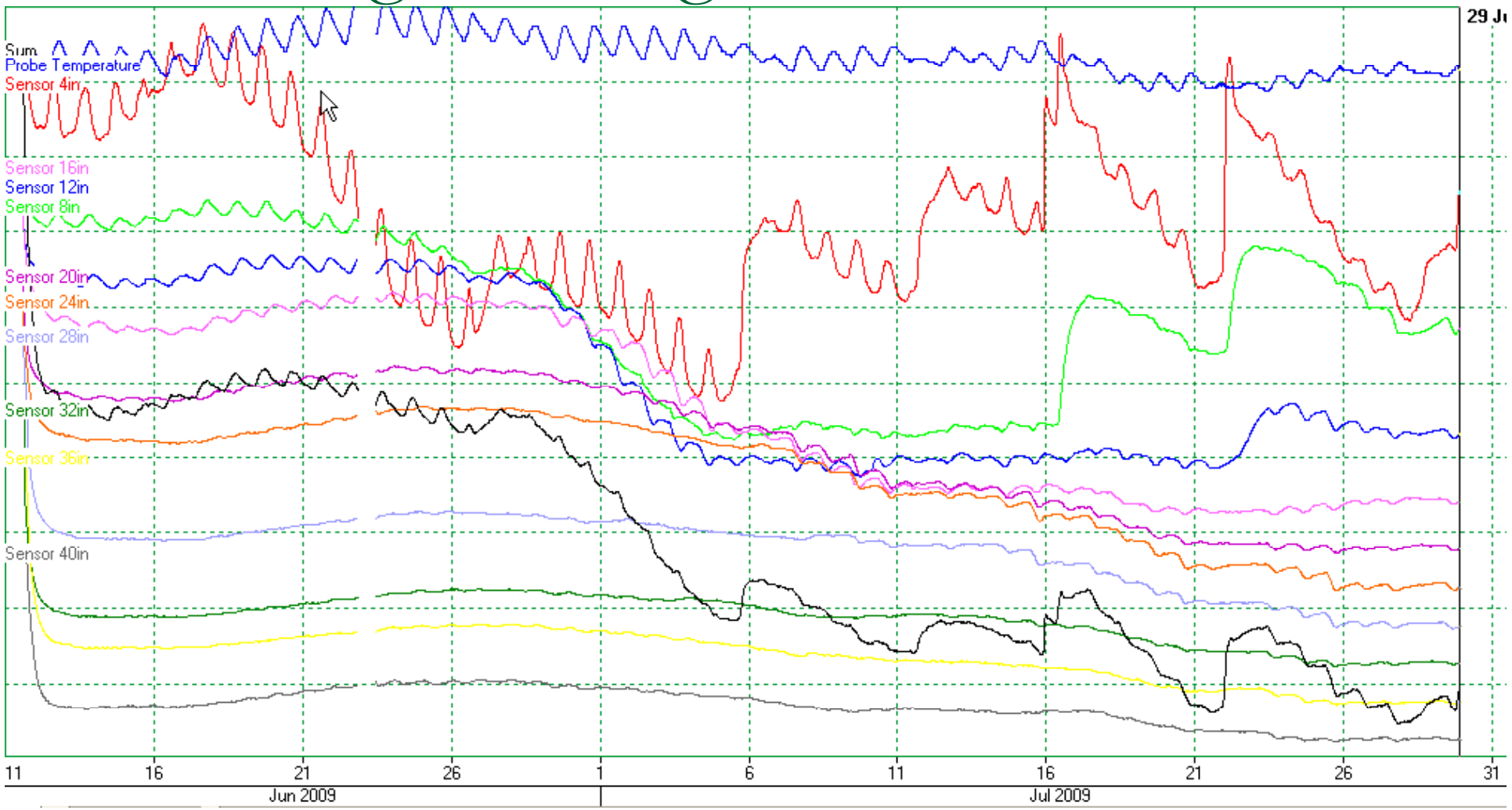



2006 Deficit Irrigation of Cotton
Average of 9" & 24" Sensors, Jackson, TN
Tension in cbars
0
-50
-100
-150
-200
12-Jun
22-Jun
2-Jul
12-Jul
22-Jul
1-Aug
11-Aug
21-Aug
GS1 100% 7.9" +162lb
GS1 33% 2.6" +301lb
GS2 100% 4.3" +299lb
GS2 66% 2.8" +253lb
Dryland 1566lb


2007 Deficit Irrigation of Cotton
Average of 9" & 24" Sensors, Jackson, TN
Tension in cbars
0
-50
-100
-150
-200
28-May
7-Jun
17-Jun
27-Jun
7-Jul
17-Jul
27-Jul
6-Aug
16-Aug
26-Aug
GS1 100% 10.2" +765lbs
GS2 100% 7.7" +919lbs
GS3 100% 6.7" +927lbs
GS3 66% 4.5" +705lbs
Dryland 923 lbs

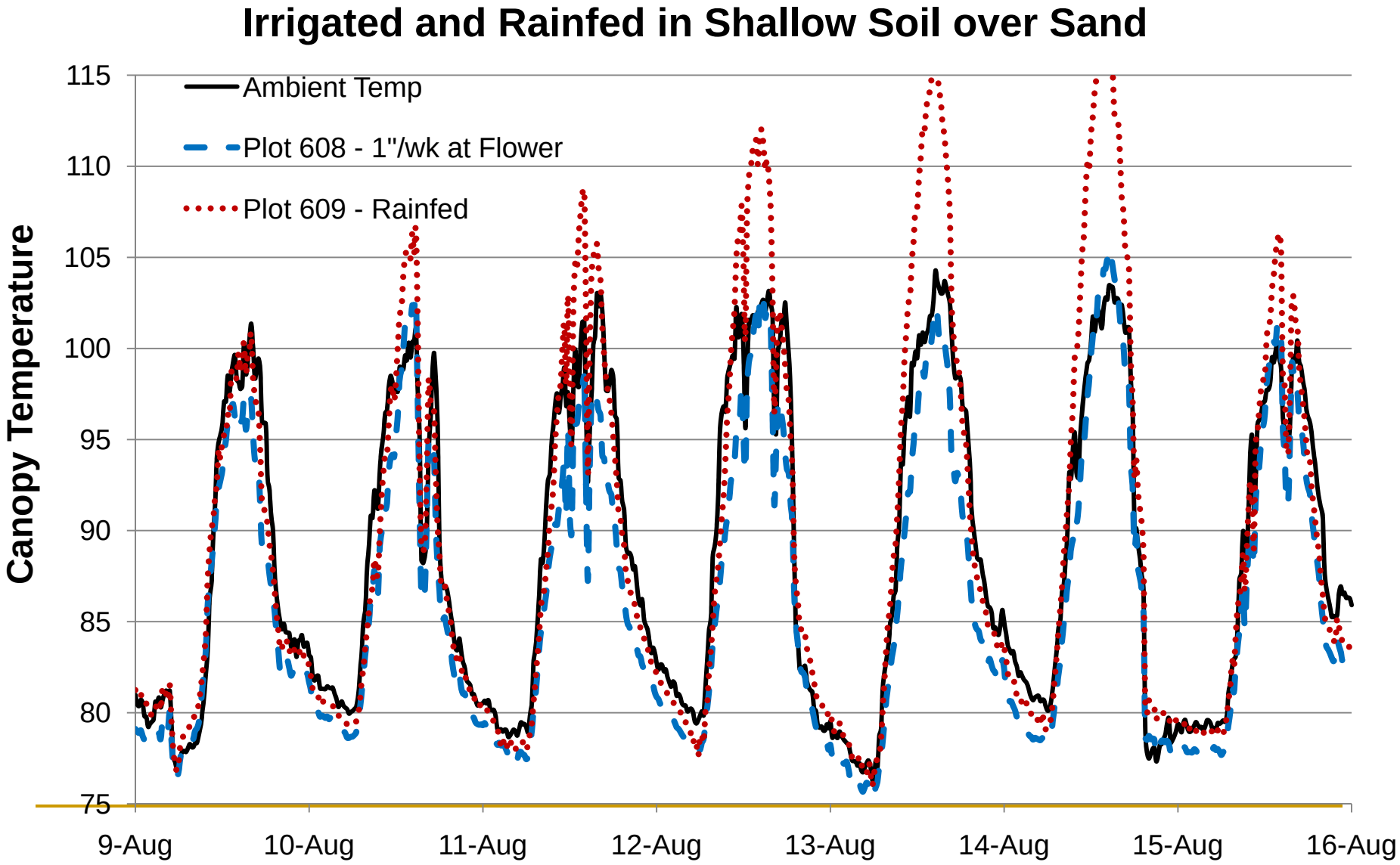
AquaSpy Capacitance Probe in Deficit Cotton Experiment

Sample of Real Time, AquaSpy Data 2009 Highest Irrigated Plot



Smartfield Canopy Temperature in Deficit Cotton Experiment

Sample of Smartfield Data in 2010



BENEFITS TO CONSIDER

- **INCREASE YIELD**
- **IMPROVE QUALITY**
- **CONSERVE WATER**
- **SAVE ENERGY**
- **DECREASE FERTILIZER**
- **REDUCE NON-POINT POLLUTION**

FACTORS TO CONSIDER

- **ACCURACY**
- **INITIAL COST**
- **SET-UP REQUIREMENTS**
- **ROUTINE READINGS**
- **INTERPRETATION OF READINGS**
- **COMPATIBLE w/ FARM PRACTICES**
- **AMORITIZED COST**

Potential Value of Well Managed Deficit Irrigation

2006-2007-2008	Gross Return on 200 ac	Gross Return Difference
Rainfed	$444,200	
		$113,400
Irrigation: 2.5” < Optimum	$557,600	
		$57,600
Optimum Irrigation	$615,200	
		$52,600
Irrigation: 2.5” > Optimum	$562,600	
		$118,600