

Precision Agriculture: Sensors for Irrigation Management

Cotton Inc.
Crop Management Seminar 2010

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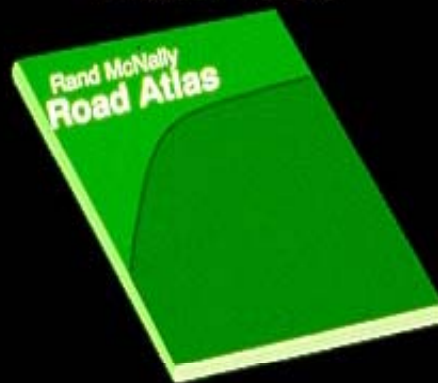
Cotton Incorporated



University of Tennessee
West Tennessee REC

Water and Fuel Management

Historical
Crop
Water Use



Actual Crop
Water Use



Soil Moisture
Measurement



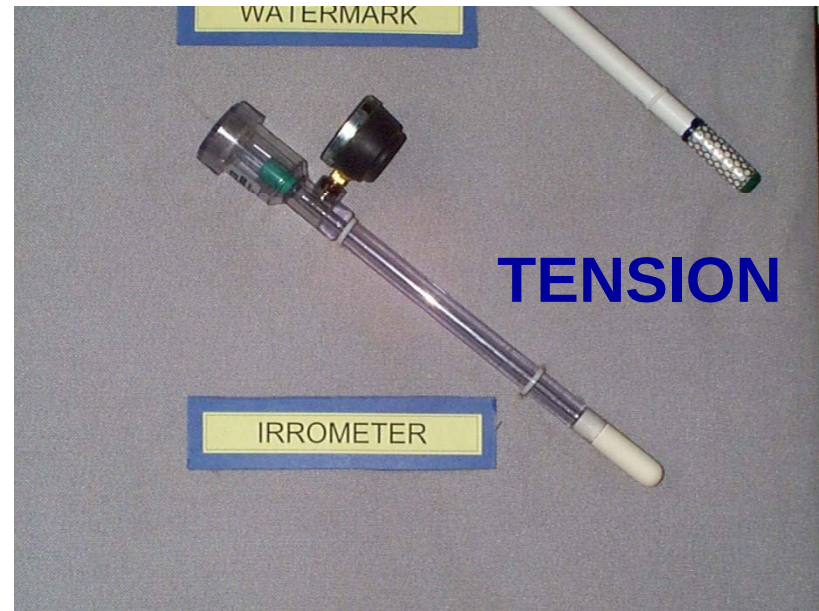
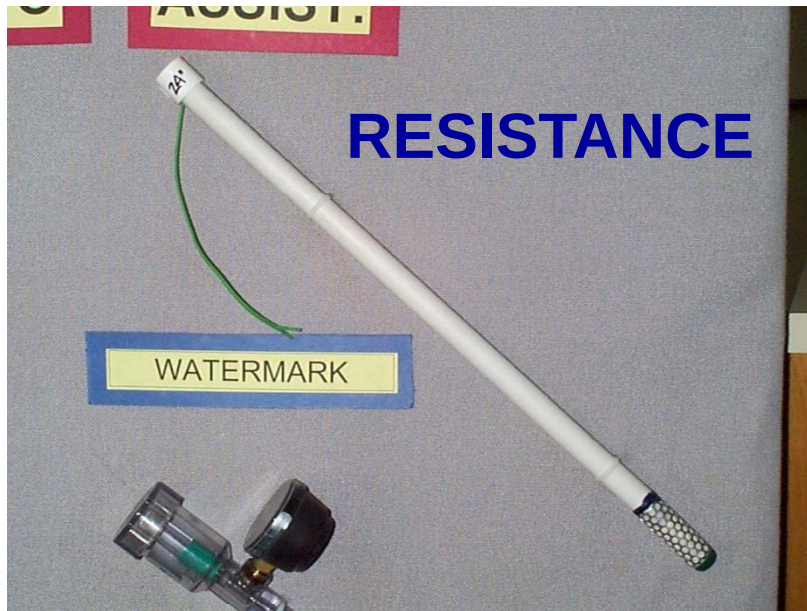
Irrigation
System



Soil Water
Holding Capacity



Soil Water Sensing Methods





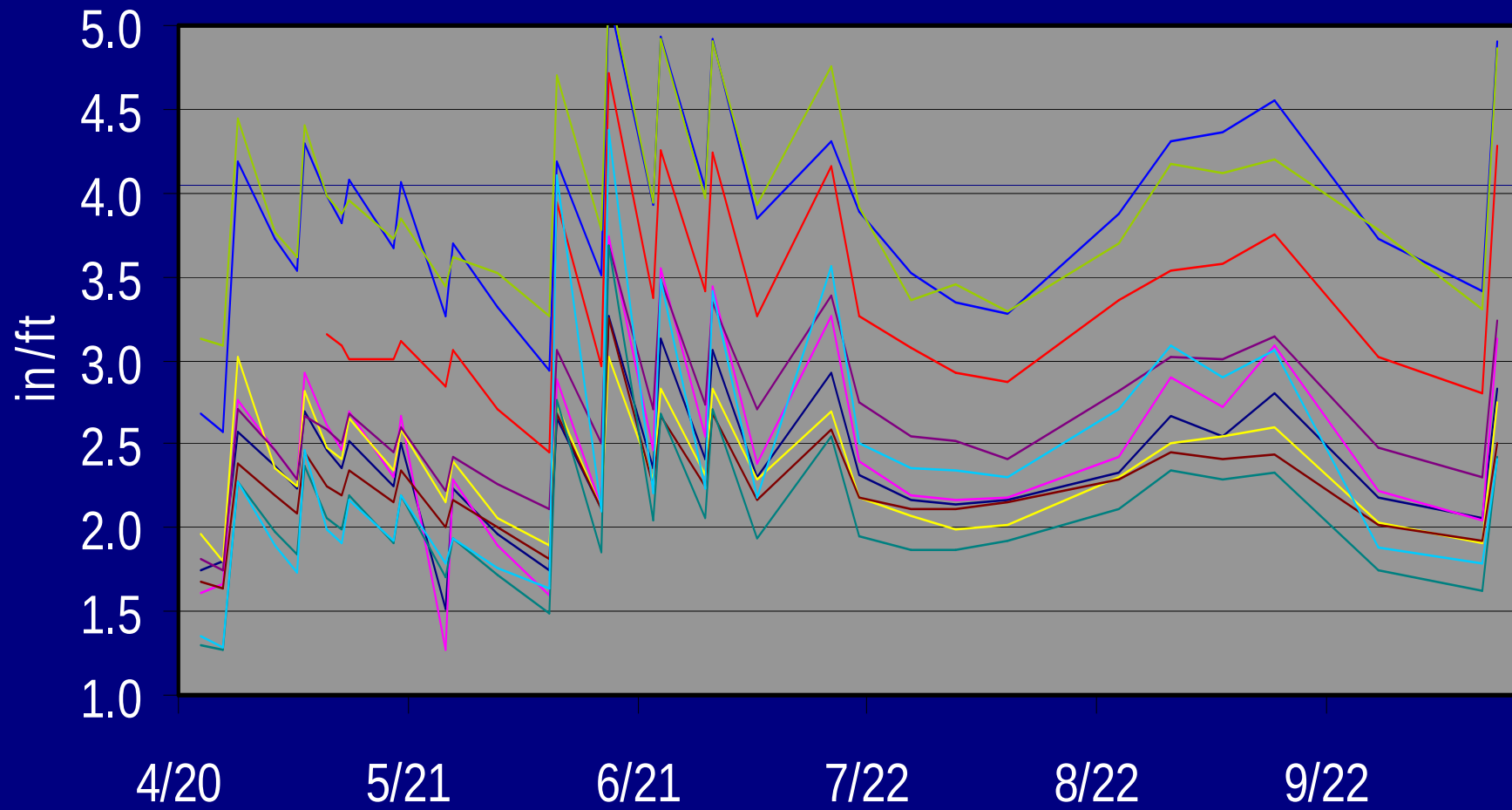
Many More Sensor Configurations
In a Silt Loam close to Sandy Loam

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



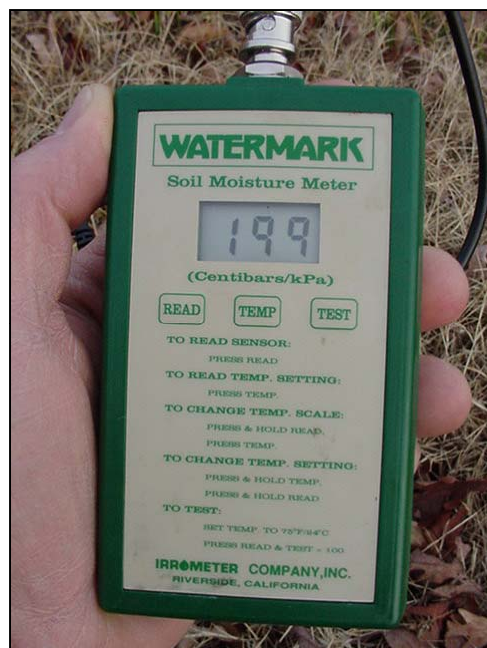
Application in Irrigation Scheduling

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

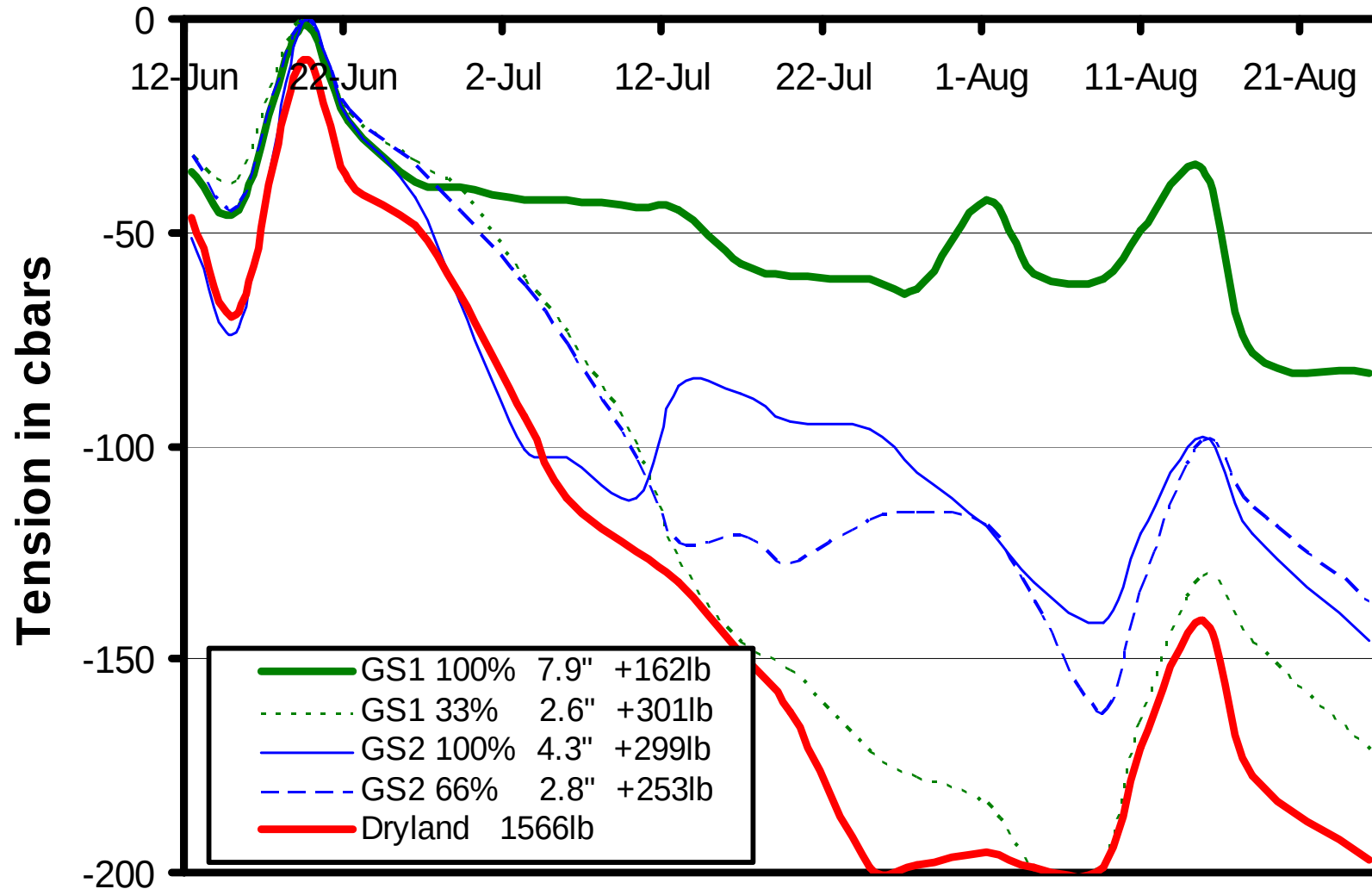


Soil Tension with WaterMark Sensors in Deficit Cotton Experiment



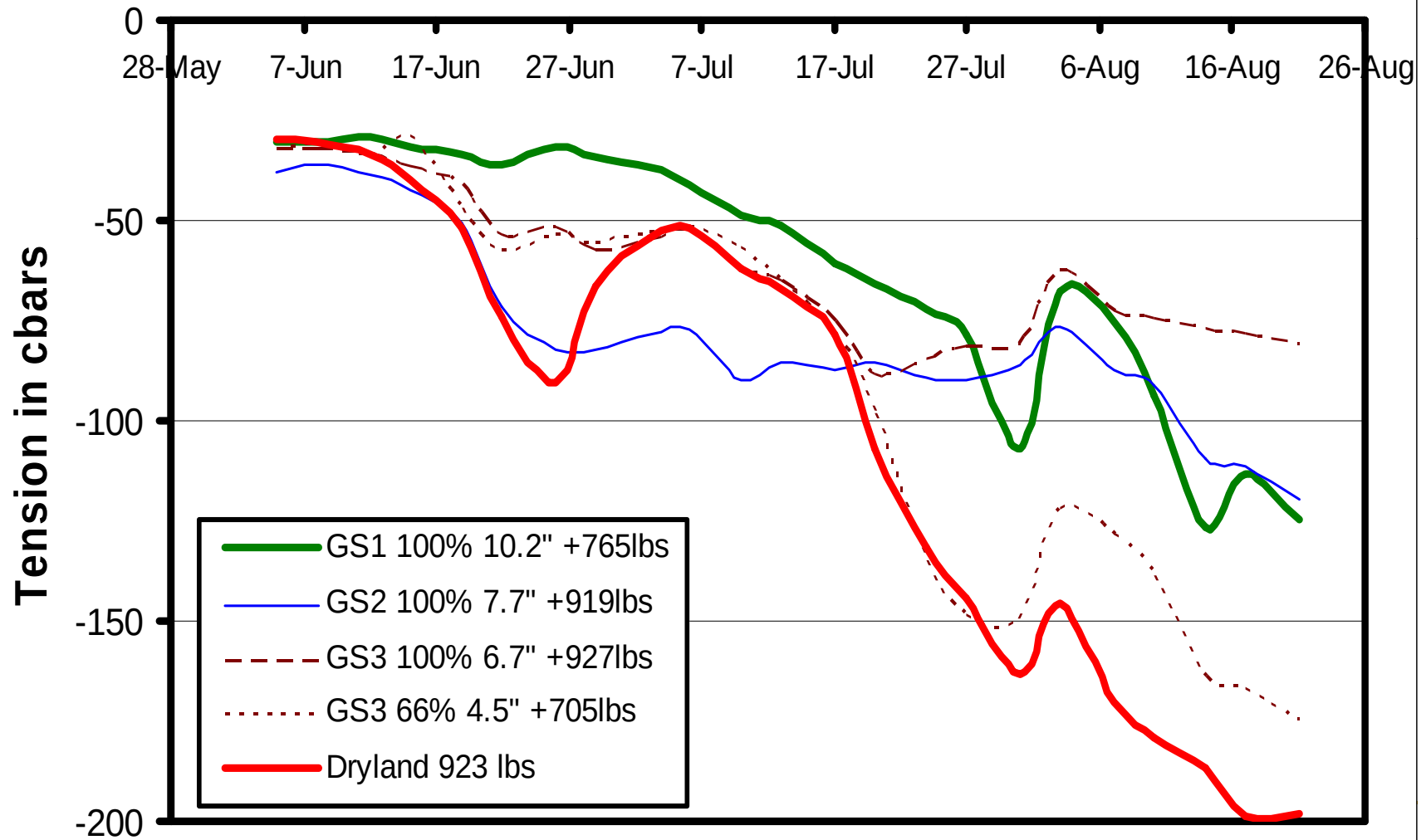
2006 Deficit Irrigation of Cotton

Average of 9" & 24" Sensors, Jackson, TN



2007 Deficit Irrigation of Cotton

Average of 9" & 24" Sensors, Jackson, TN

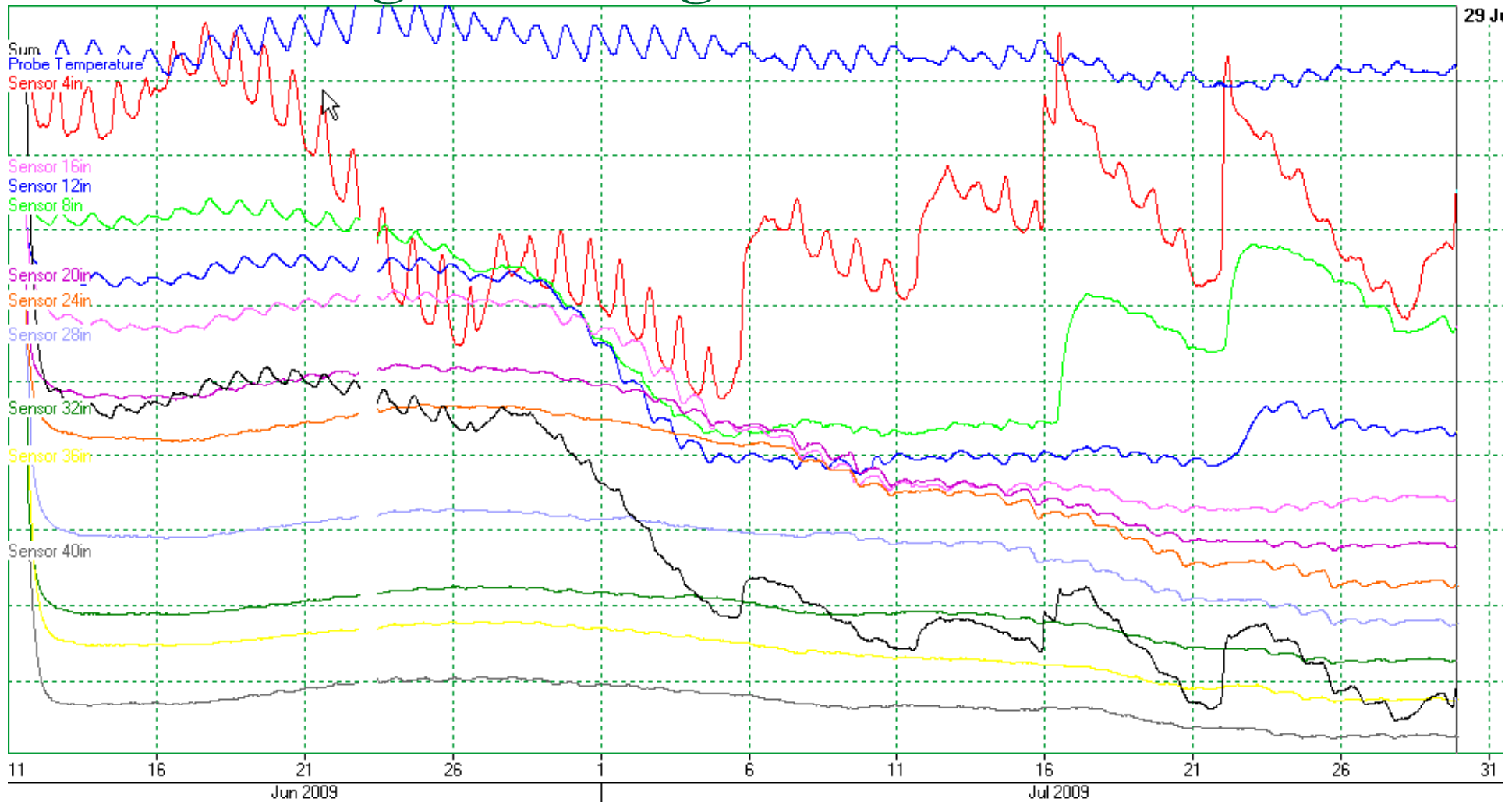


AquaSpy Capacitance Probe in Deficit Cotton Experiment



Sample of Real Time, AquaSpy Data

2009 Highest Irrigated Plot

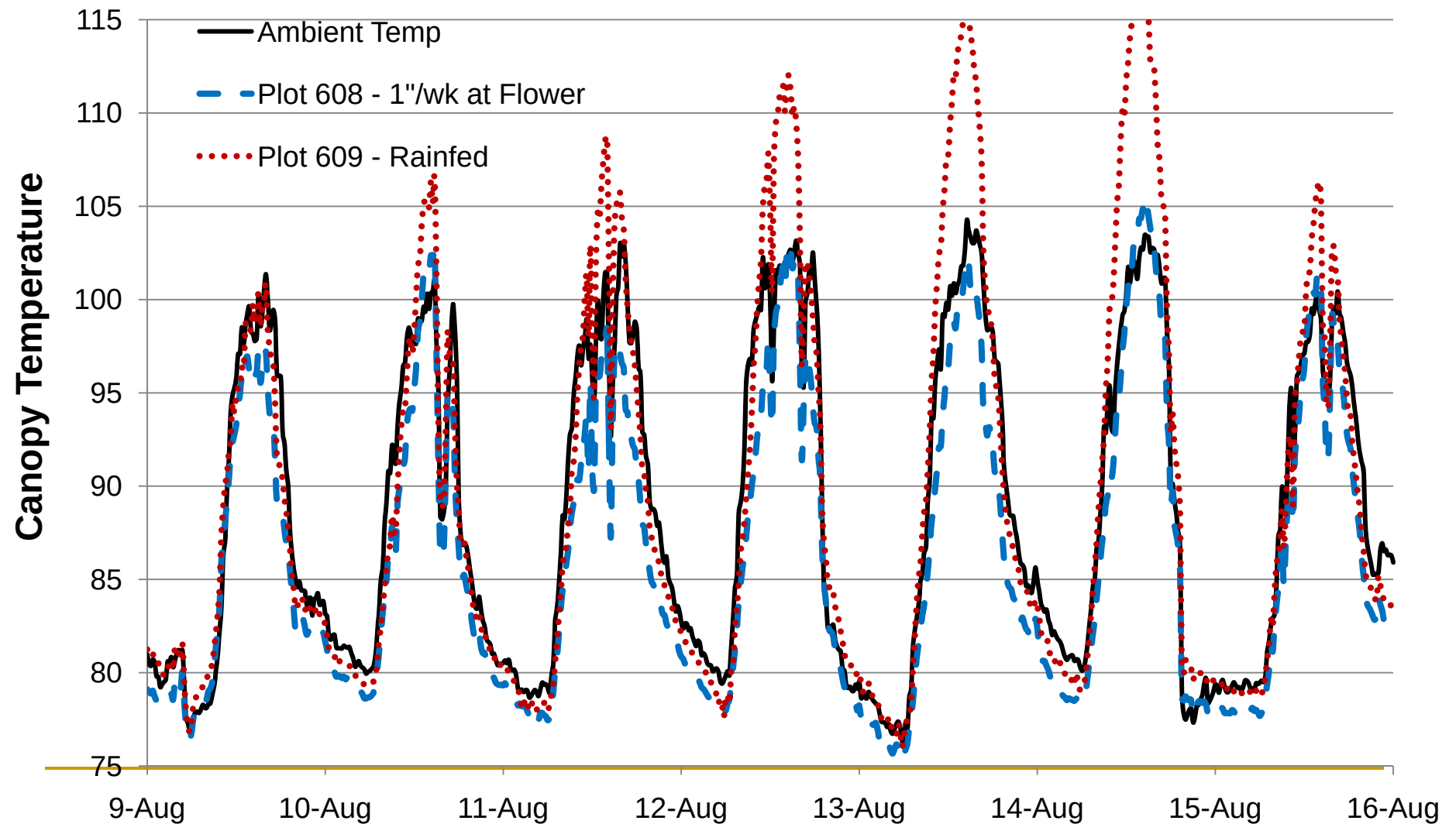


Smartfield Canopy Temperature in Deficit Cotton Experiment



Sample of Smartfield Data in 2010

Irrigated and Rainfed in Shallow Soil over Sand



BENEFITS TO CONSIDER

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

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