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2010 Cranberry Management Update: Plant Physiology Research

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Volumetric Water Content & Soil Water Potential as Irrigation Tools

Peter Jeranyama, Jenna
Sicuranza and Carolyn
DeMoranville



Irrigation Management Tools

Measurement type	Plant	Atmosphere	Soil
Direct	Photosynthesis		Tension
	Transpiration		
	Xylem potential		
Indirect	Leaf temperature	Evapo-transpirative demand	Water content
	Flourescence		



Indicator of Water Deficit (Sensor)

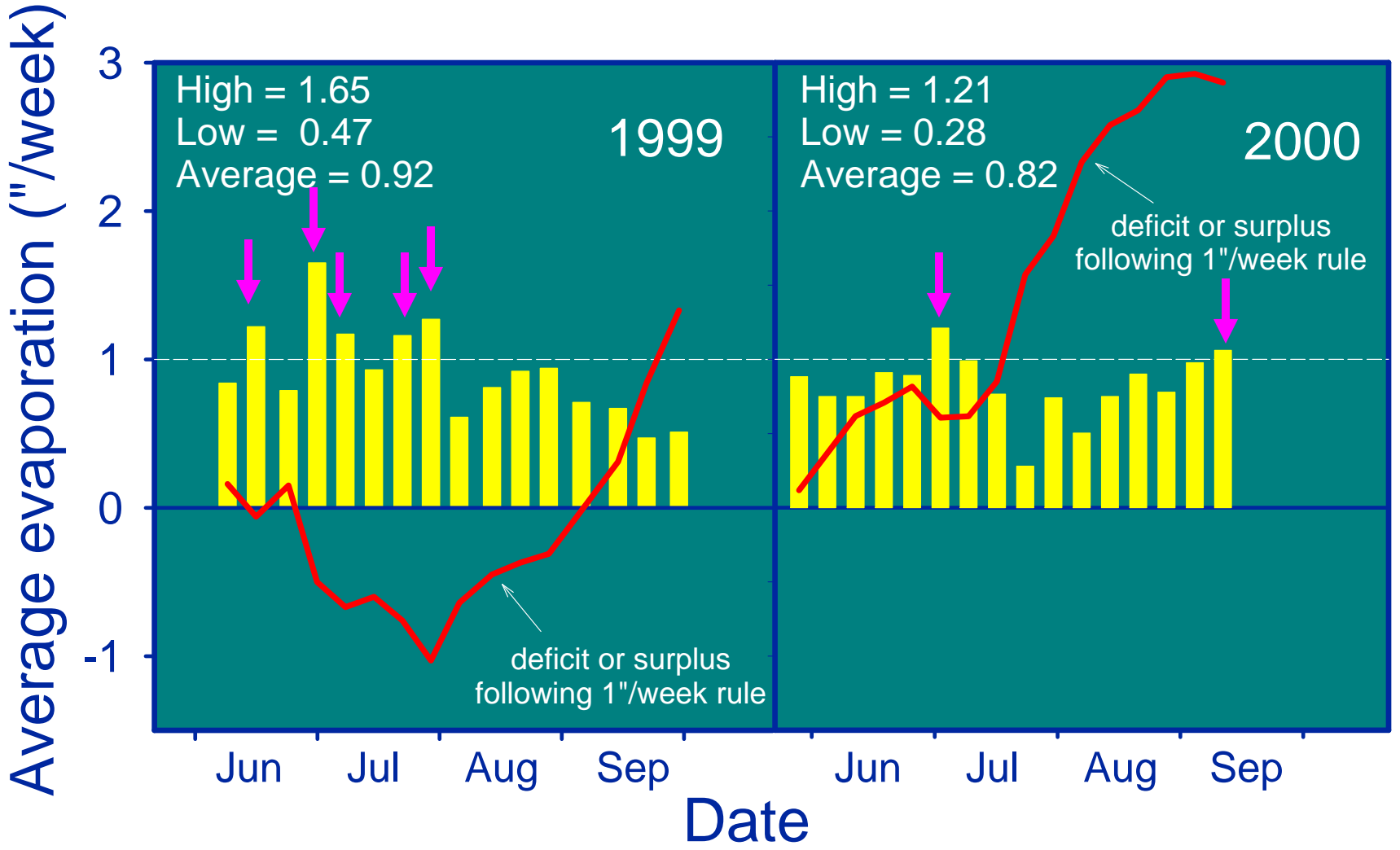
1. Detect whether plant is in fact under water stress
2. Determine the severity of water stress
3. Need to monitor & quantify stress levels



Wireless Sensors I have used

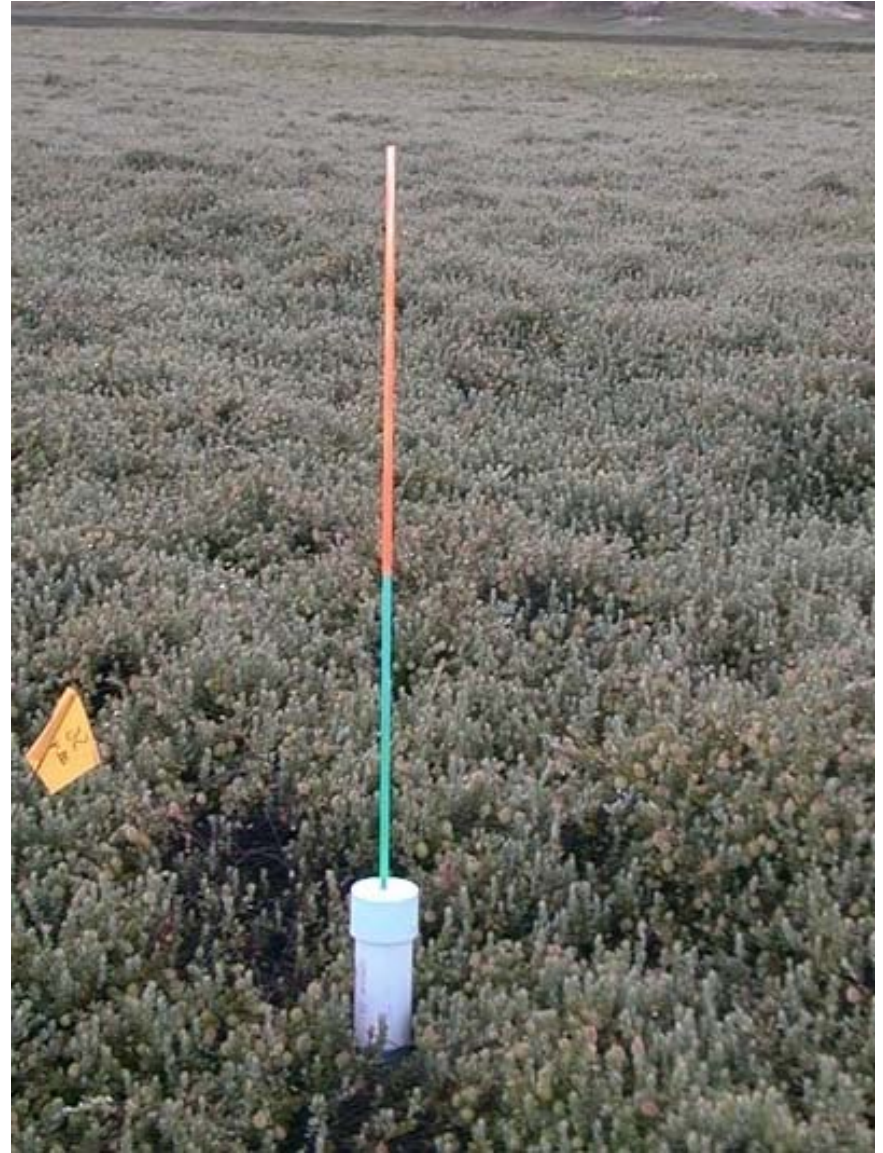
1. Decagon Soil Moisture Sensor on Onset Wireless System
2. Onset wireless system for Temp & RH
3. Hortau---Tensiometer & Soil Temp
4. KC Systems Irrolis Tensiometer







Too wet



Adequate

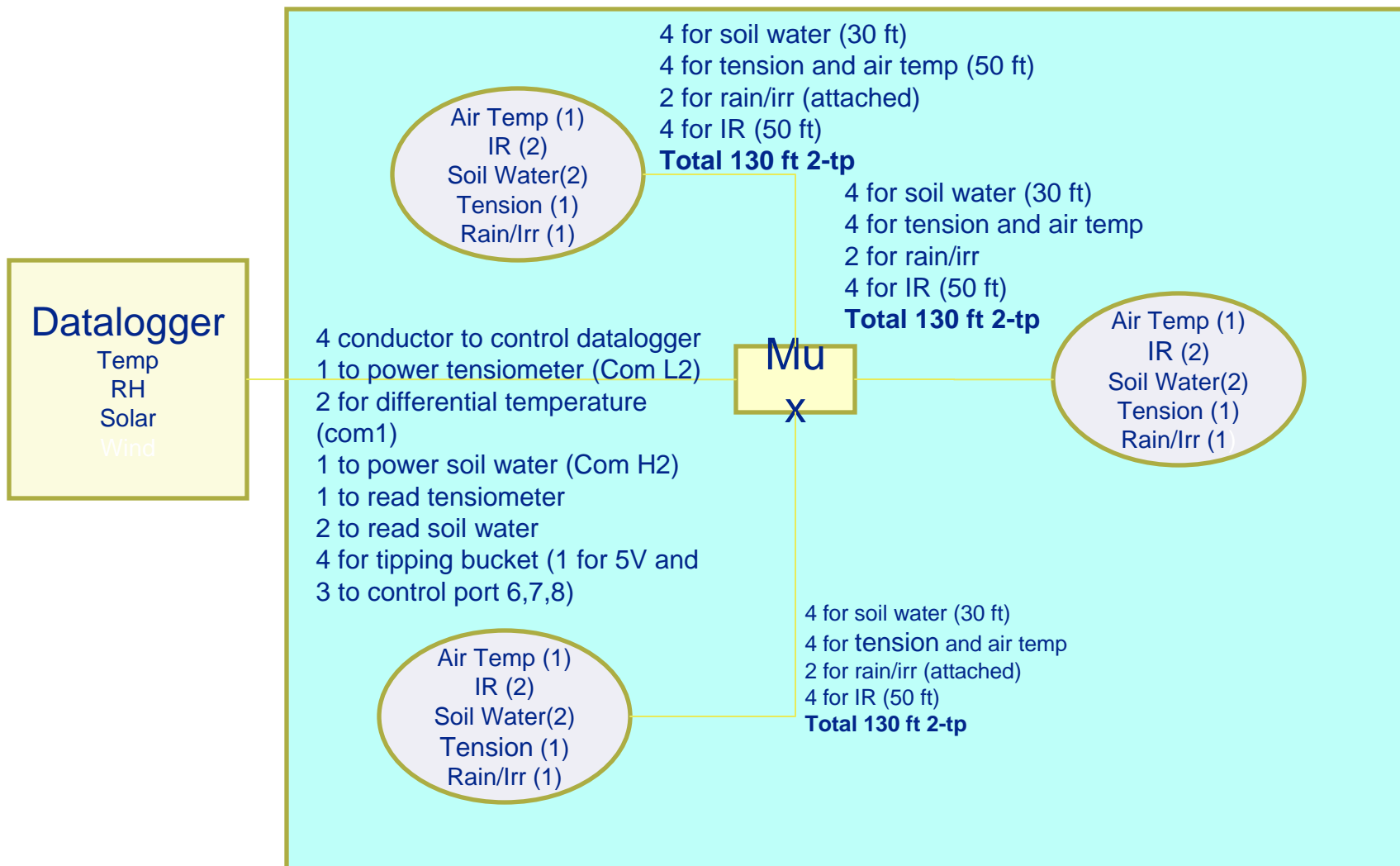


Observations - Lampinen

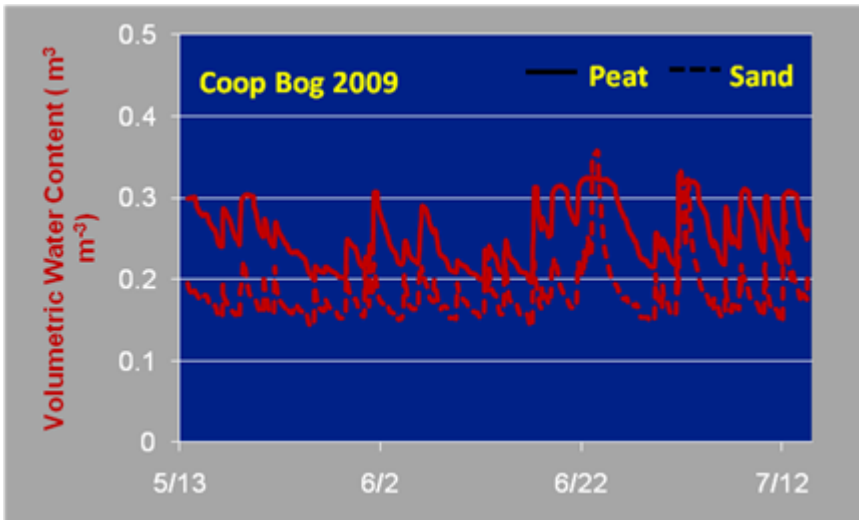
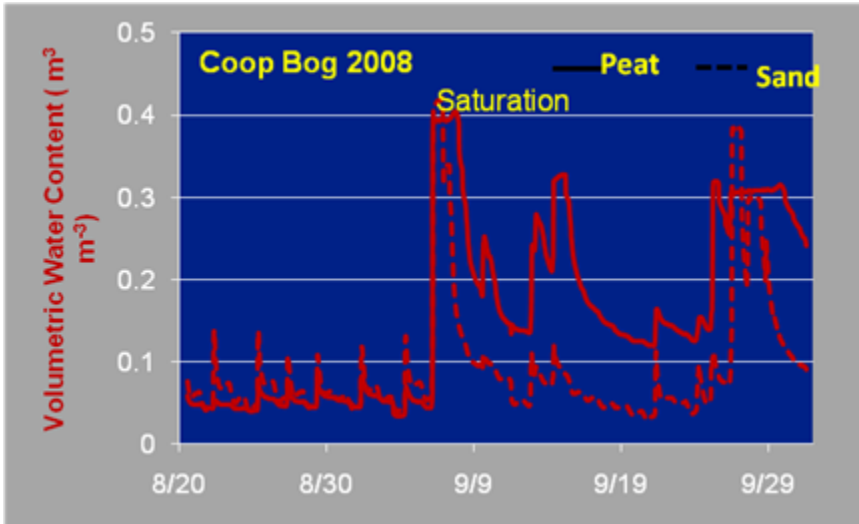
- Most MA cranberry beds appear to be too wet during much of the season
- Evaporative demand study -for many weeks in the season, cranberries require less than 1 inch applied as irrigation



Bog Instrumentation Design



Volumetric Water Content (VWC)



- Saturation on 6-Sep 08
~ 40% VWC
- Field Capacity ~ 5%
VWC in 2008
- Field Capacity ~ 15%
VWC in 2009
- differences in FC due to
variation in water
table???



Volumetric Water Content

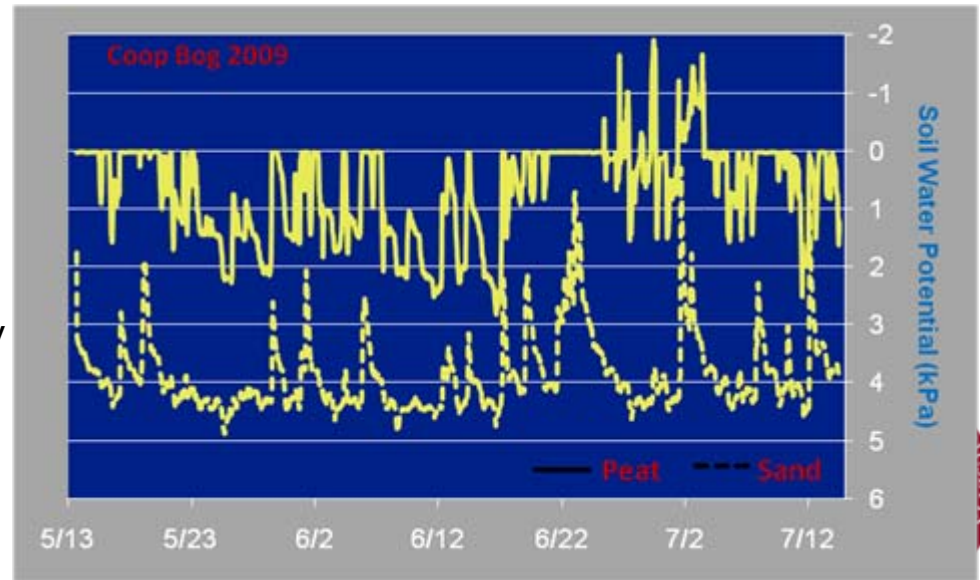
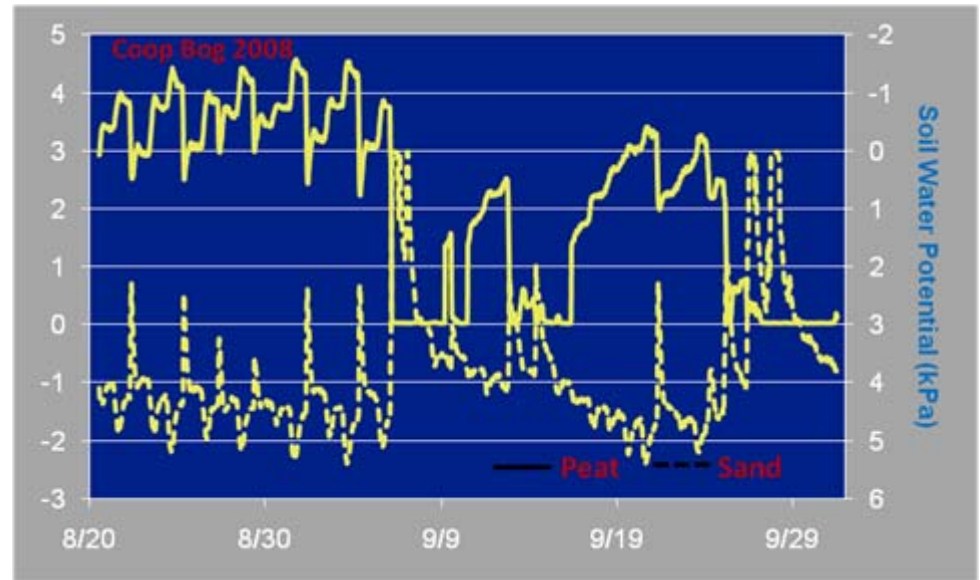
- Peat (smaller pores) reaches field capacity more slowly than sand (larger pores)
- VWC measurements are simple, reliable, and inexpensive but vary due to differences in soil compaction.



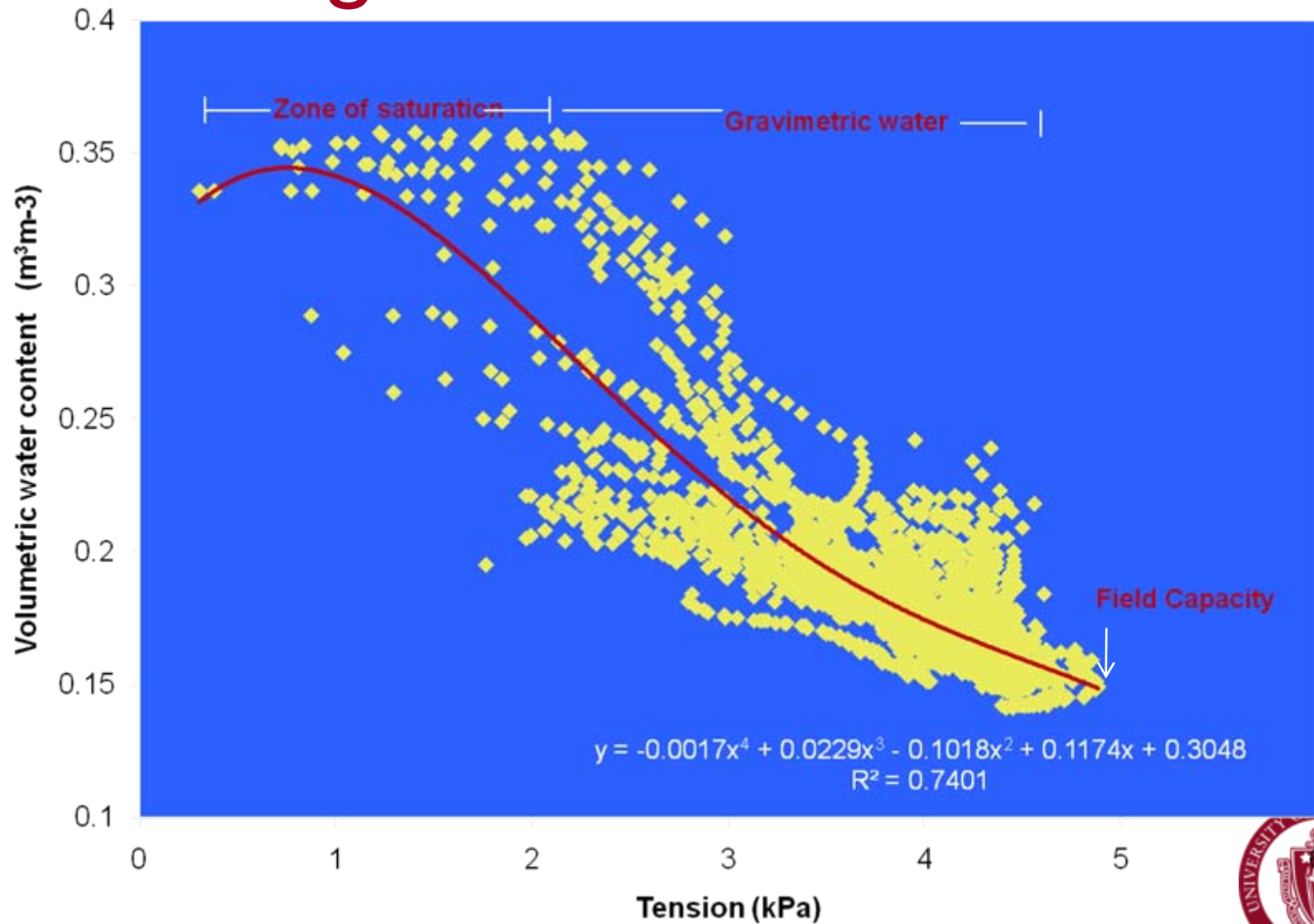


Soil Water Potential

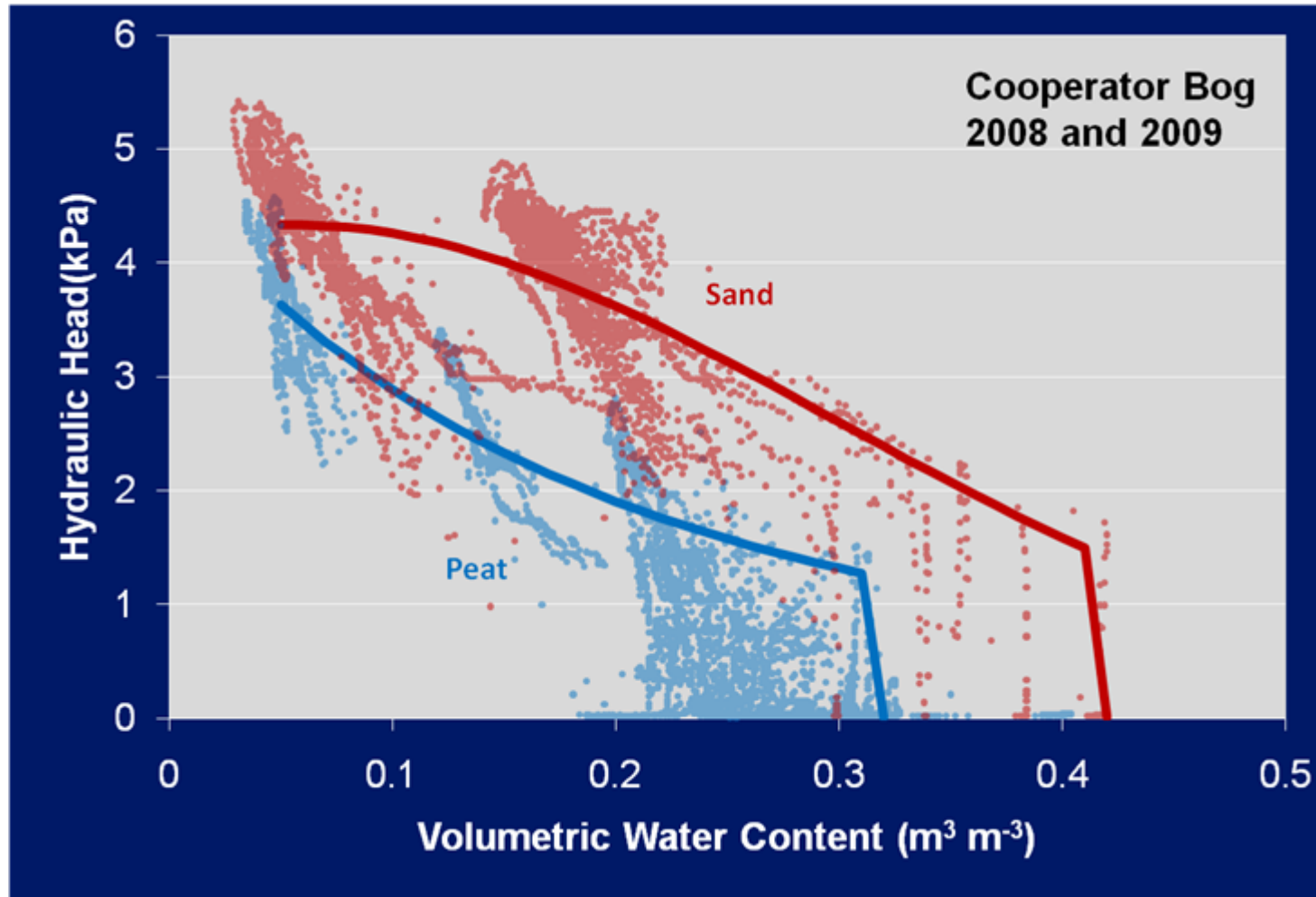
- Soil water potential is the energy required to extract water.
- 0 kPa corresponds to saturation.
- Field Capacity ~ 4 - 5 kPa
- Tensiometers measure soil water potential
 - Noise late June 2009 may indicate poor tensiometer/soil contact.
 - Measurements not influenced by changes in bulk density but provide an accurate value of effort required by plant roots to extract soil water.



Bog water retention



Water Retention Curve



Summary

1. When using Volumetric Moisture Content (VMC), field capacity is between 5 & 15%
2. Field capacity using tensiometer is between 4-5 kPa [1 PSI = 7 kPa]
3. Water saturation – at 40% VWC or 0 kPa

