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2010 Cranberry Management Update: Plant Physiology Research

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Volumetric Water Content & Soil Water Potential as Irrigation Tools

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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

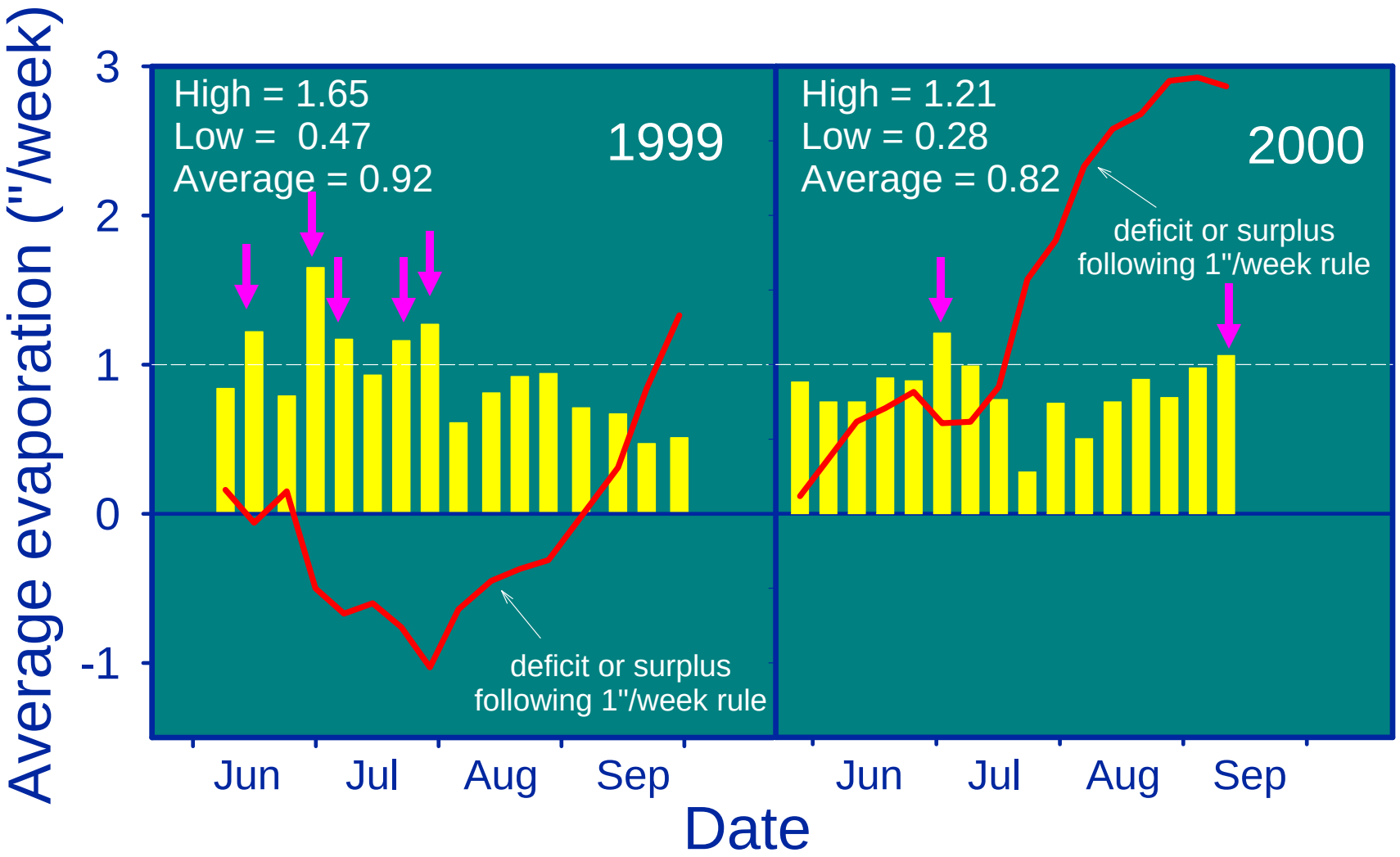
Wireless Sensors I have used

1. Decagon Soil Moisture Sensor on Onset Wireless System

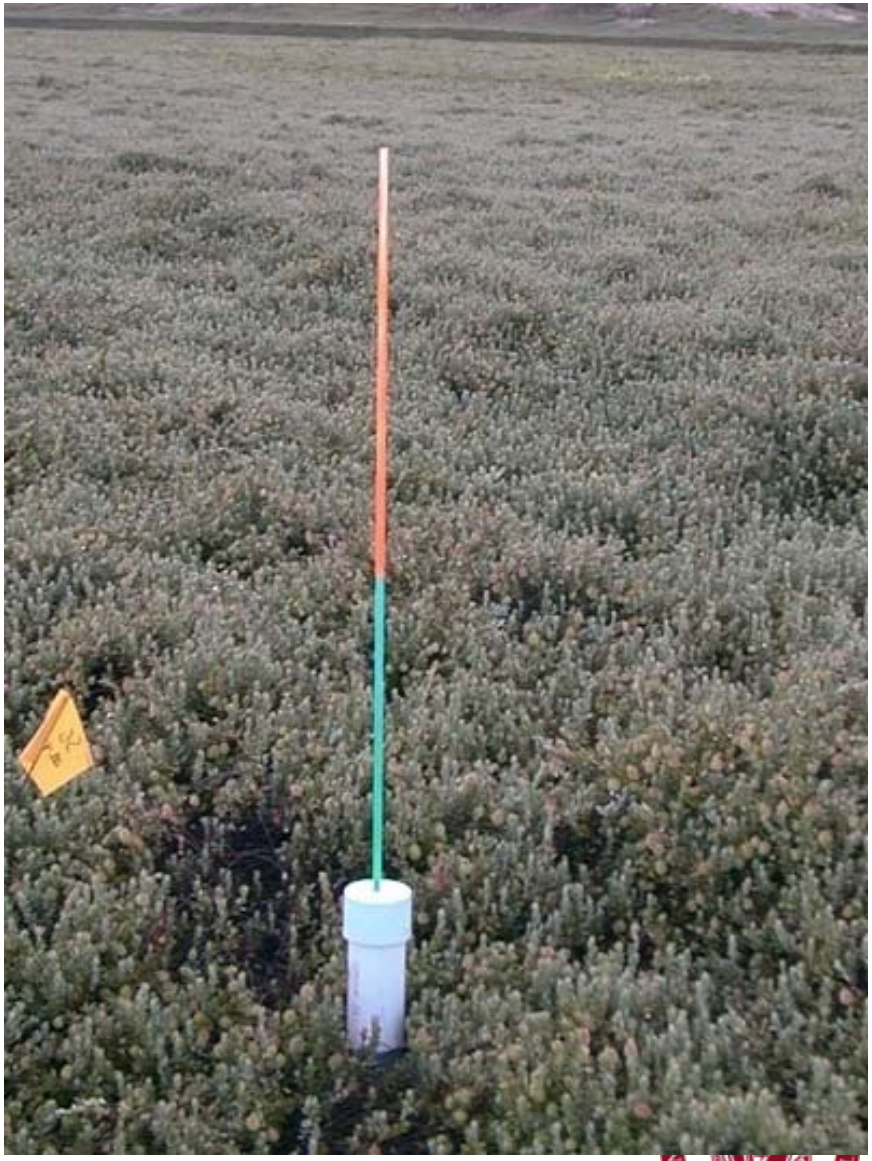
2. Onset wireless system for Temp & RH

3. Hortau---Tensiometer & Soil Temp

4. KC Systems Irrolis Tensiometer


Average evaporation ("/week)
3
2
1
0
-1
High = 1.65
Low = 0.47
Average = 0.92
1999
High = 1.21
Low = 0.28
Average = 0.82
2000
deficit or surplus
following 1"/week rule
deficit or surplus
following 1"/week rule
Jun
Jul
Aug
Sep
Jun
Jul
Aug
Sep
Date

Too wet

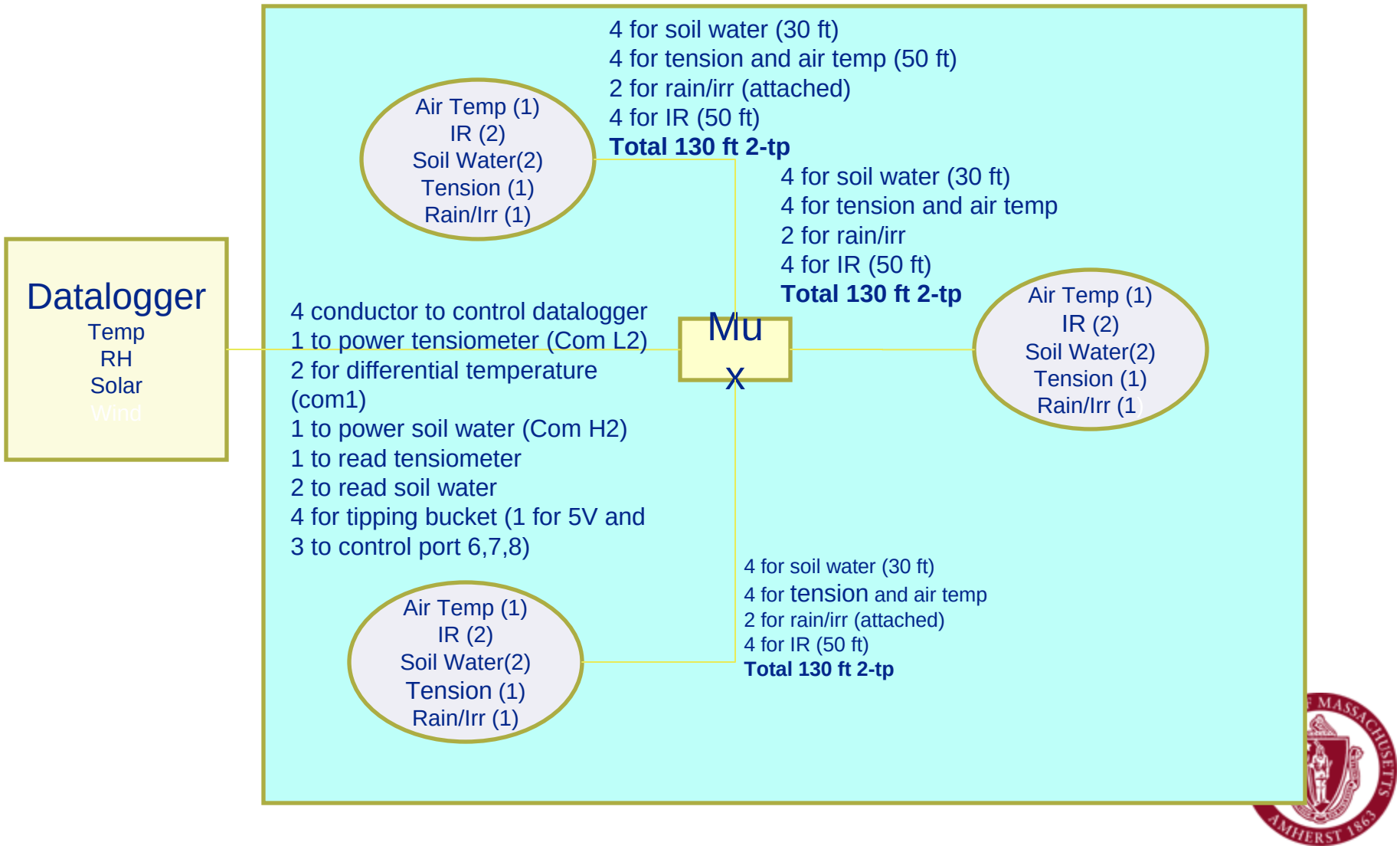


Adequate

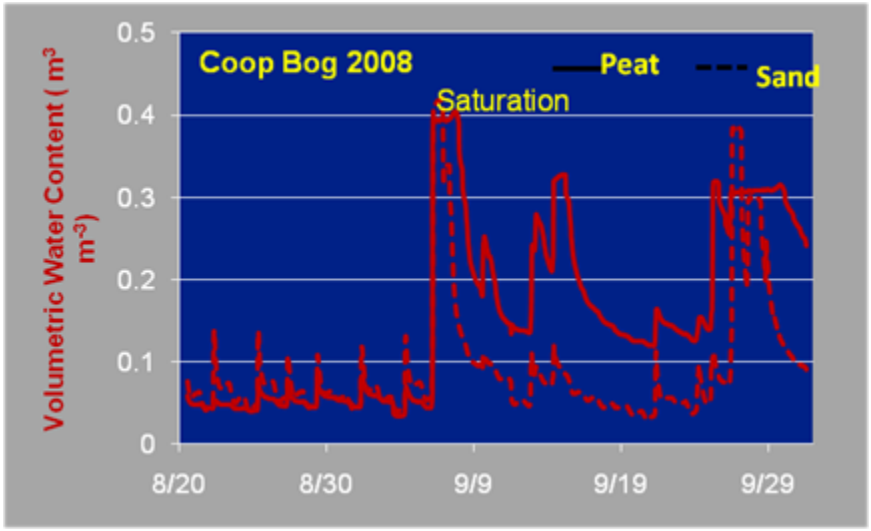
Observations - Lampinen

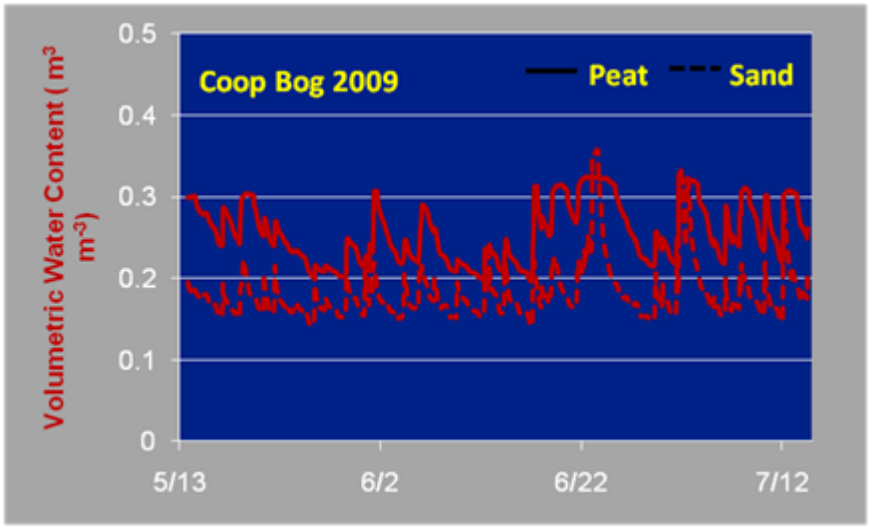
- Most MA cranberry beds appear to be too wet during much of the season
- Evaporative demand study -for many weeks in the season, cranberries require less than 1 inch applied as irrigation

Bog Instrumentation Design



Volumetric Water Content (VWC)



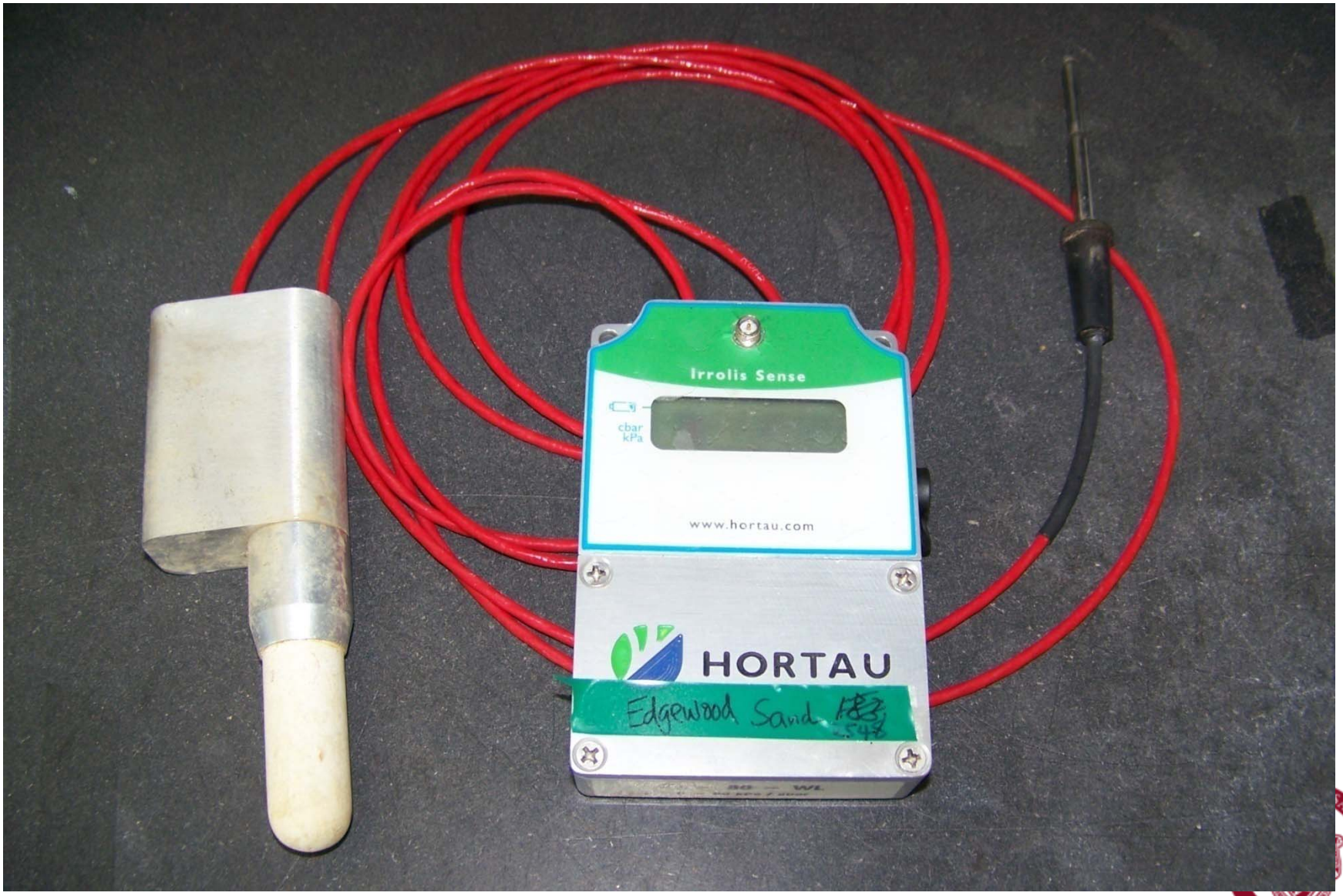


- Saturation on 6-Sep 08 ~ 40% VWC
- Field Capacity ~ 5% VWC in 2008
- Field Capacity ~ 15% VWC in 2009
- differences in FC due to variation in water table???

Volumetric Water Content

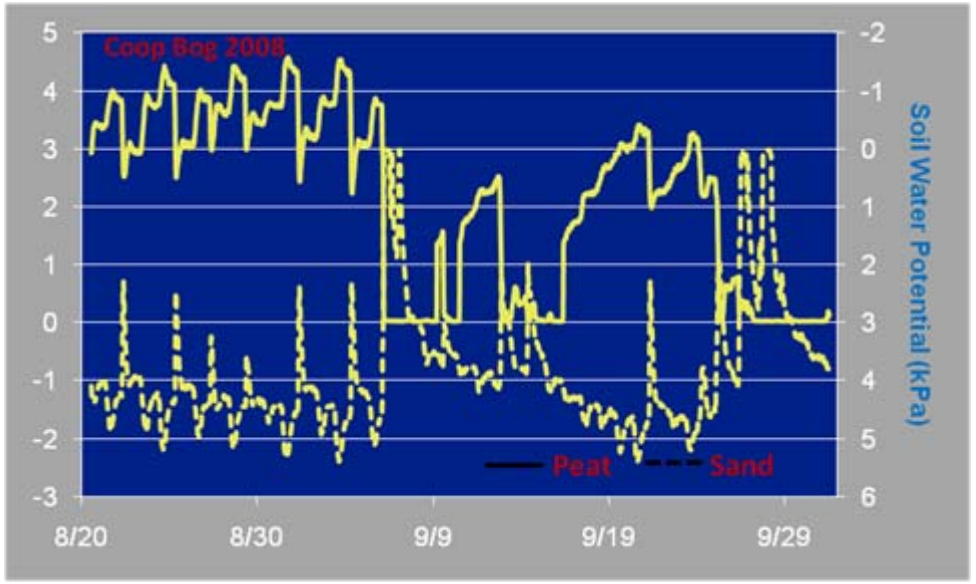
- Peat (smaller pores) reaches field capacity more slowly than sand (larger pores)

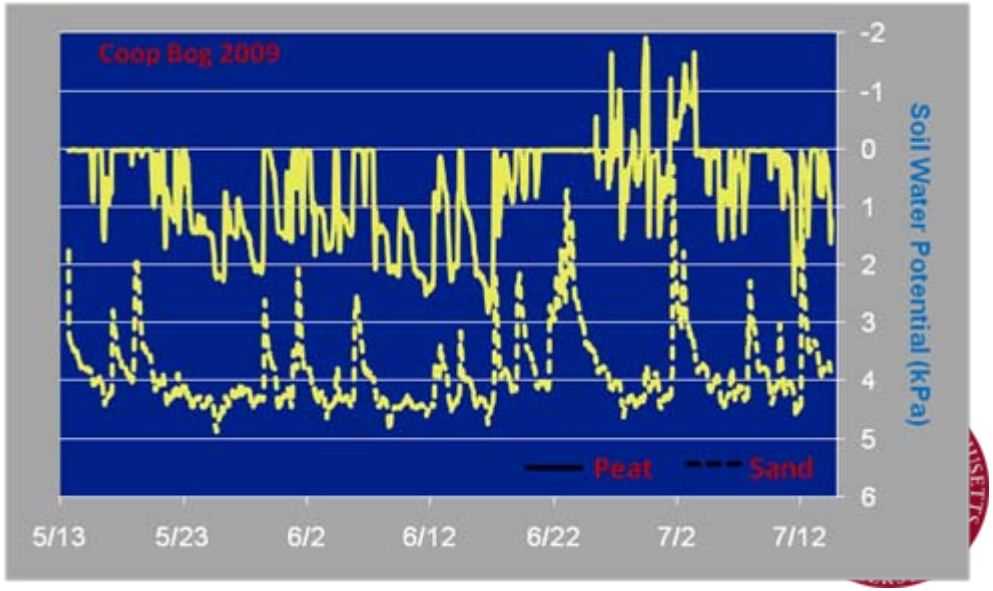
- VWC measurements are simple, reliable, and inexpensive but vary due to differences in soil compaction.


Irrolis Sense
cbar
kPa
www.hortau.com
HORTAU
Edgewood Sand

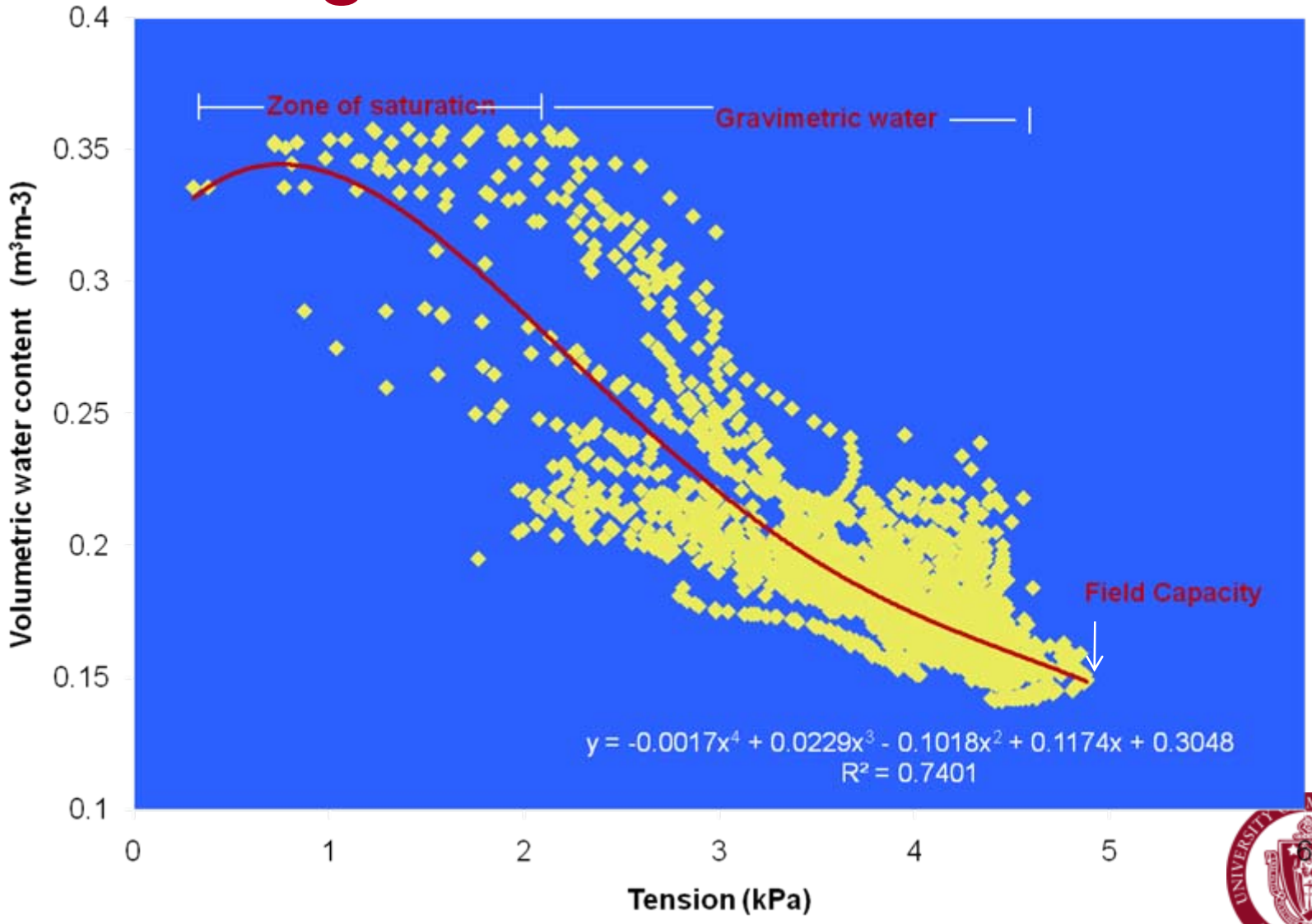
Soil Water Potential

- 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.

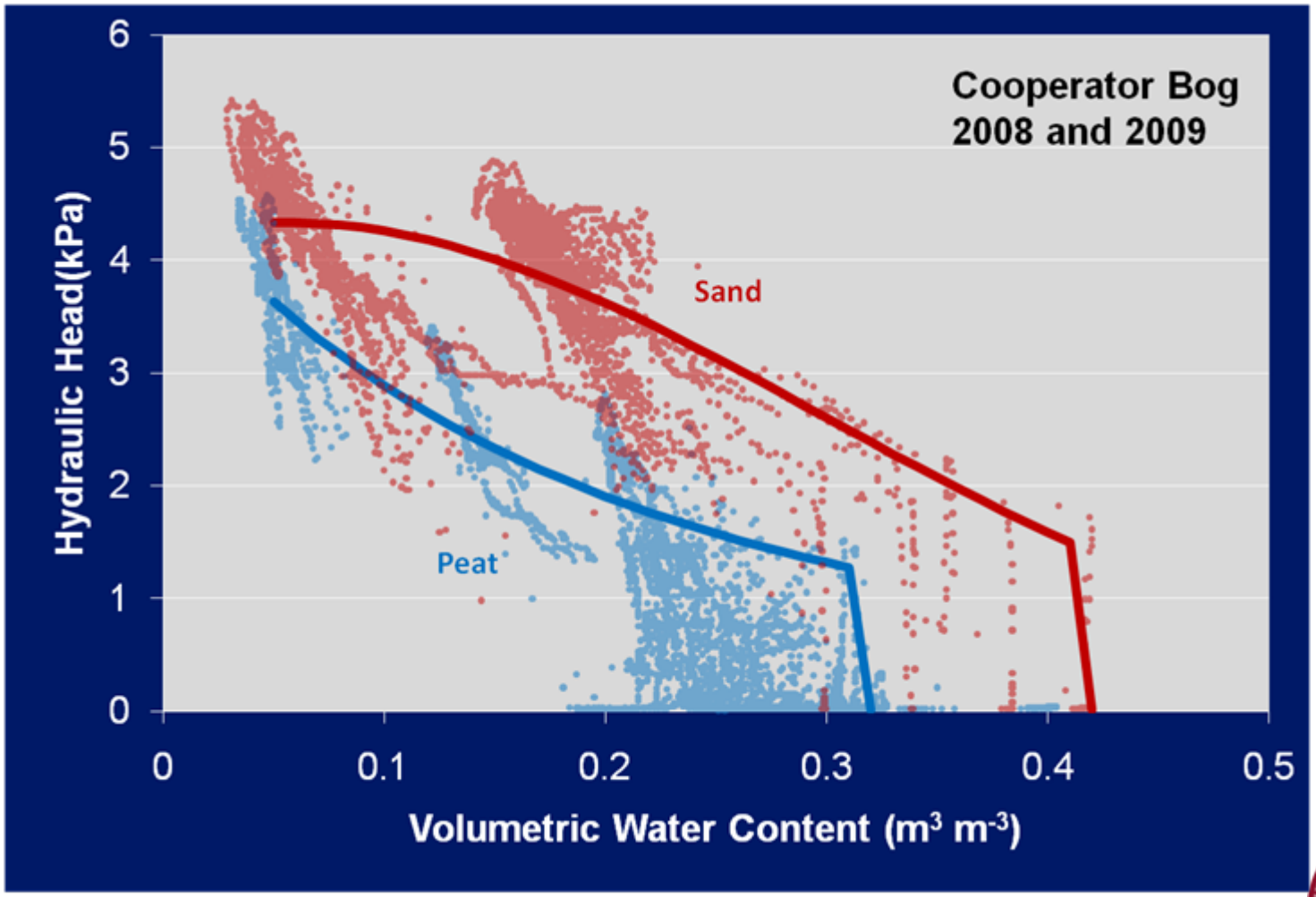




Bog water retension



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