Using Blue Dye Tests and Soil Moisture Sensors to Optimize Your Irrigation Management

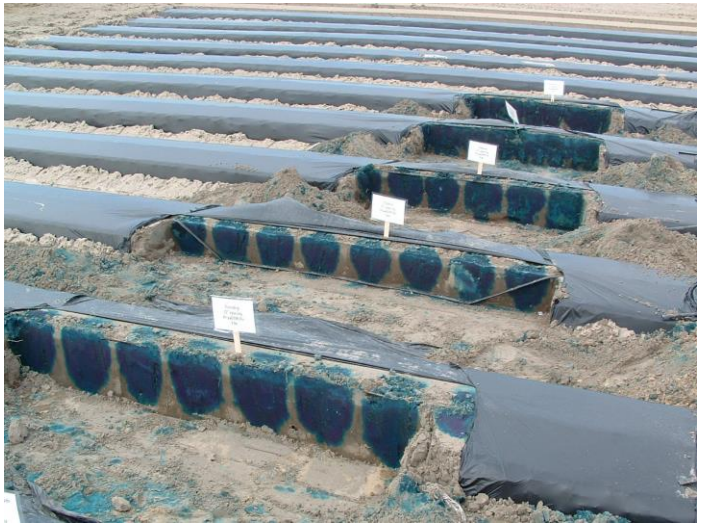
Bob Hochmuth

Regional Extension Agent- Vegetable Crops

North Florida Research and Education Center- Suwannee Valley

Live Oak, Florida

Thanks to Sudeep Sidhu and County Extension Agents.



UF | IFAS Extension
UNIVERSITY of FLORIDA

OPTIMIZING WATER MANAGEMENT IN IRRIGATION SYSTEMS

- Know root zone of the crop
- Know the soil water-holding capacity
- Know the capacity of overhead systems (ex. inches/hr.)
- Drip tape emitter spacing and flow rate
- Placement of drip tape in the bed (center or offset)
- Know crop's stage of growth
- Know crop ET

- Answer: when to start the irrigation system?
- Answer: how long to run the irrigation system

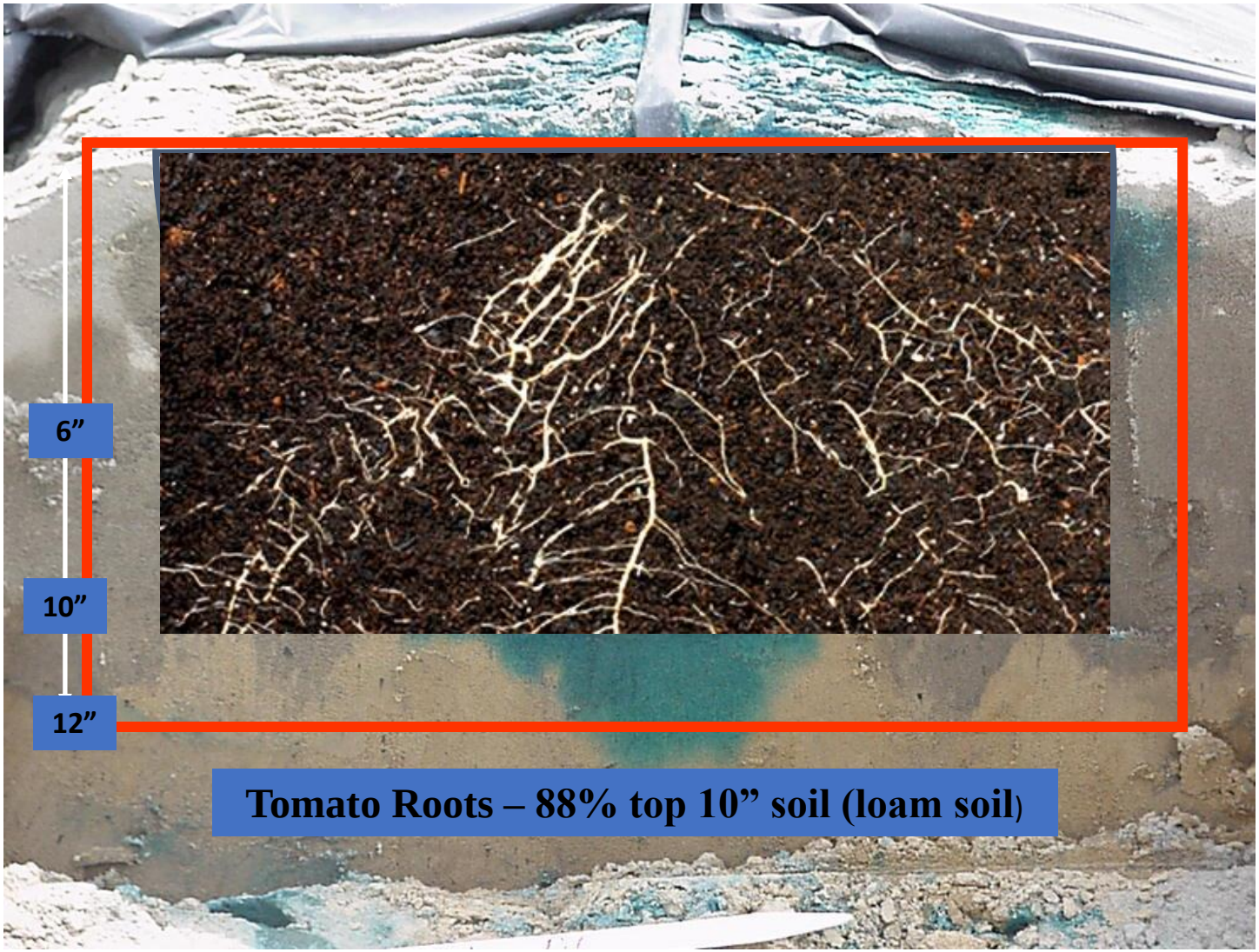
IRRIGATION MANAGEMENT- WHY?

- Conservation of water
- Control movement of soluble nutrients like N and K

UF | IFAS Extension
UNIVERSITY of FLORIDA

BLUE DYE TESTS PROVIDE THE OPPORTUNITY TO "SEE" REAL DATA

UF | IFAS Extension
UNIVERSITY of FLORIDA



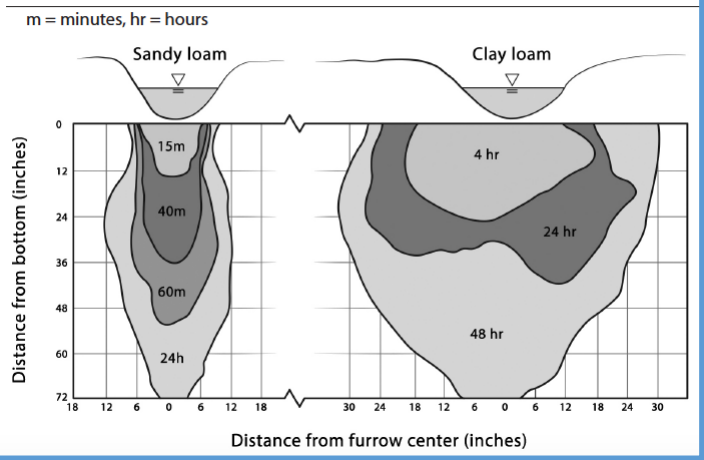
Tomato Roots – 88% top 10” soil (loam soil)

Soil texture influences permeability and infiltration

TABLE 2.7 | SOIL PERMEABILITY CHART
THESE ARE NORMAL VALUES FOR NON-COMPACTED SOILS, SUCH AS IN GRASSLAND SITUATIONS

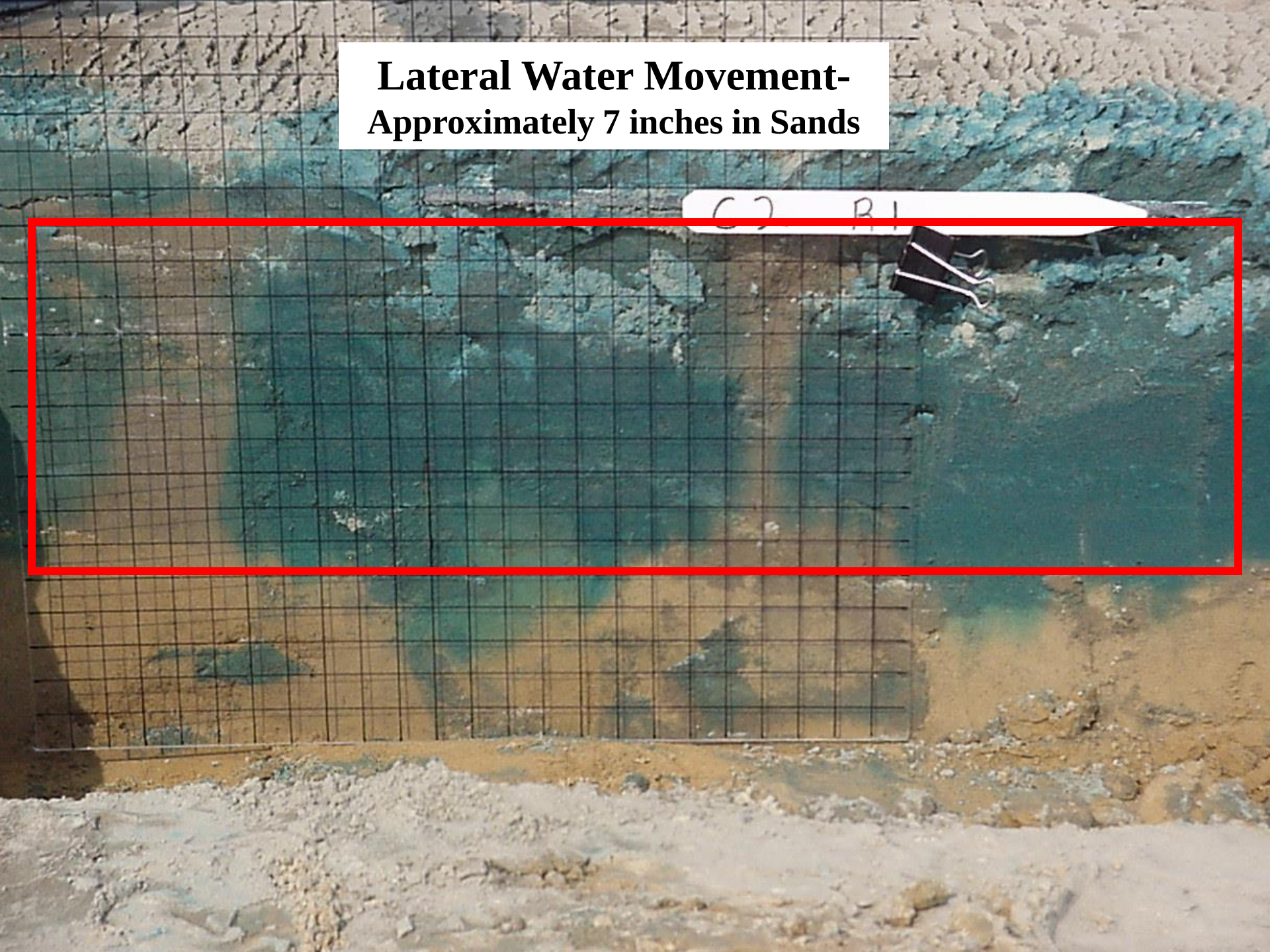
TEXTURE CLASS	TEXTURE	PERMEABILITY RATE	PERMEABILITY CLASS
Coarse	gravel, coarse sand sand, loamy sand	> 20 inches/hour 6 – 20 inches/hour	very rapid rapid
Moderately Coarse	coarse sandy loam sandy loam fine sandy loam	2 – 6 inches/hour	moderately rapid
Medium	very fine sandy loam loam silt loam silt	0.60 – 2 inches/hour	moderate
Moderately fine	clay loam sandy clay loam silty clay loam	0.20 – 0.60 inches/hour	moderately slow
Fine	sandy clay silty clay clay (<60%)	0.06 – 0.20 inches/hour	slow
Very fine	clay (>60%) clay pan	< 0.06 inches/hour	very slow

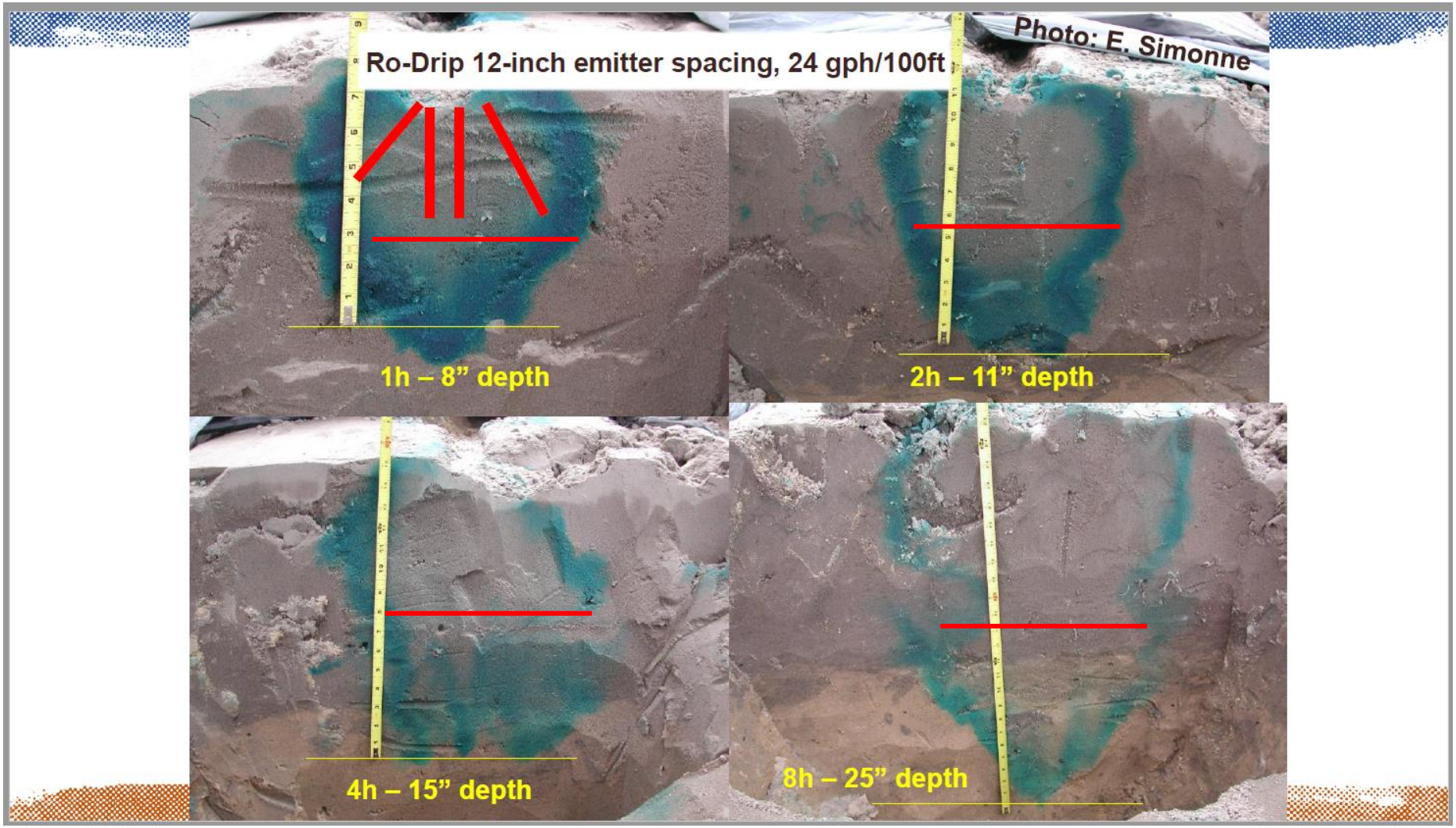
FIGURE 2.5 | MOVEMENT OF WATER THROUGH SANDY AND CLAY SOILS



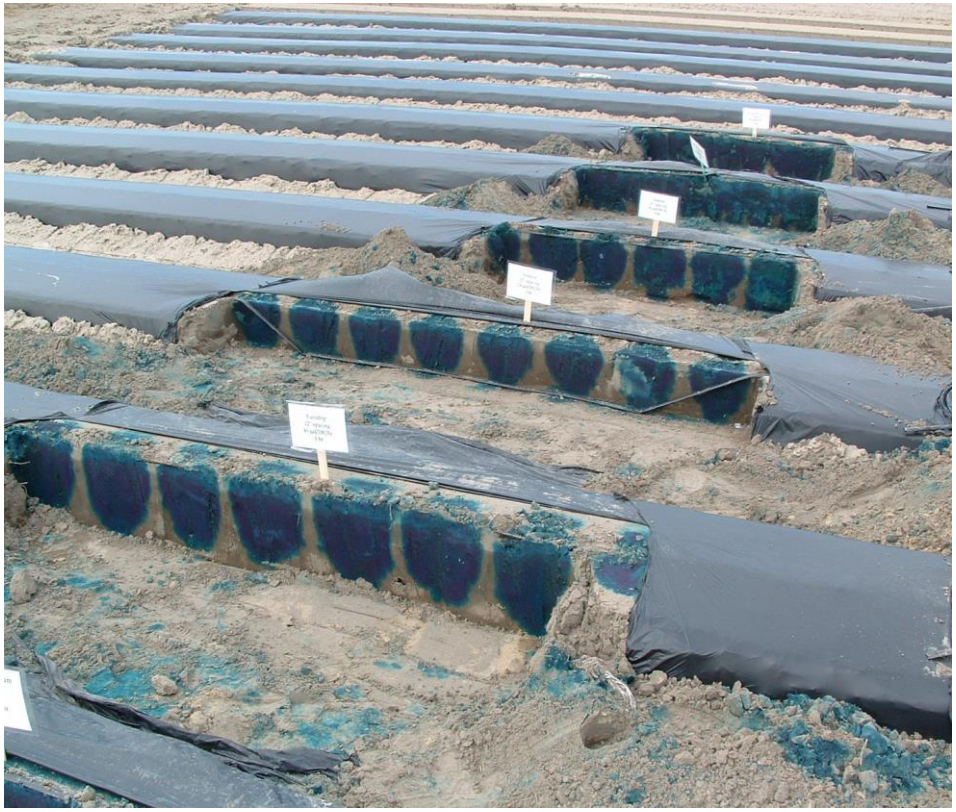

2.5 hours
1.5 hours
45 min

Lateral Water Movement-
Approximately 7 inches in Sands





UF | IFAS Extension
UNIVERSITY of FLORIDA



Dye demonstration, UF Live Oak Center, E. Simonne and B. Hochmuth

8” Spacing, .67 GPM/ 100’

8” Spacing, .50 GPM/ 100’

12” Spacing, .45 GPM/ 100’

12” Spacing, .34 GPM/ 100’

12” Spacing, .20 GPM/ 100’

1 Hour

Spacing affected pattern, but flow rate/ volume did not. UF and Clemson research suggest 12-inch spacing is optimum in sandy soils.

UF | IFAS Extension
UNIVERSITY of FLORIDA

DRIP TAPE BED PLACEMENT-
CENTER IS PREFERRED FROM A SOIL/WATER STANDPOINT.
PLACE FERTILIZER IN WETTED ZONE

LESSONS LEARNED FROM DRIP IRRIGATION AND BLUE DYE TRIALS

- Early Season (first 4 wks)
  - ❖ greatest risk of leaching
  - ❖ irrigation was generally reduced by 50%
- Mid Season
  - ❖ Irrigation sensors “caught” rapid increase in water demand (late April – early May)
- Late Season
  - ❖ Very difficult to over irrigate
  - ❖ Lowest risk of leaching

➢ **Single irrigation events in sands should be no longer than 1½ hours**

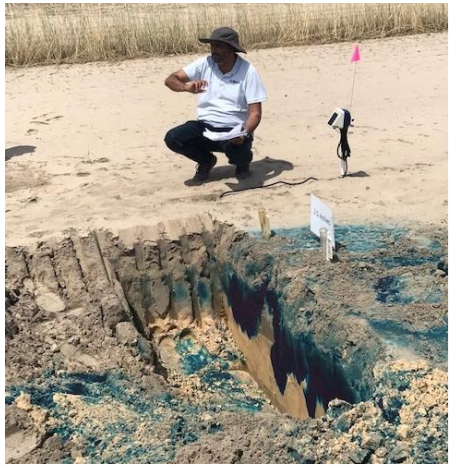
➢ **“Blue Dye Don’t Lie”**

➢ **Videos available at http://vfd.ifas.ufl.edu**

UF | IFAS Extension
UNIVERSITY of FLORIDA

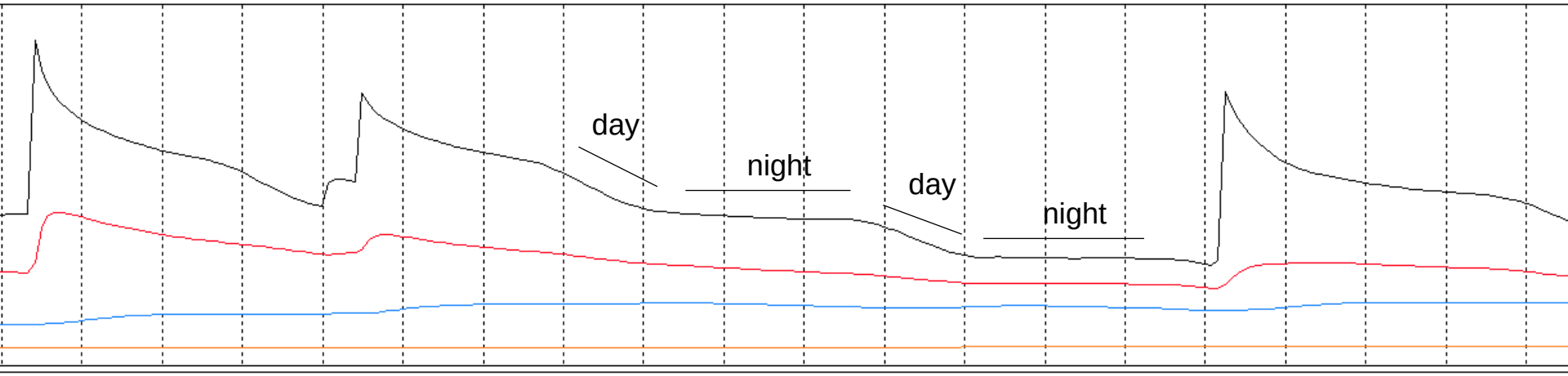
Blue Dye *"Don't"* Lie

Blue dye tests: Overhead irrigation



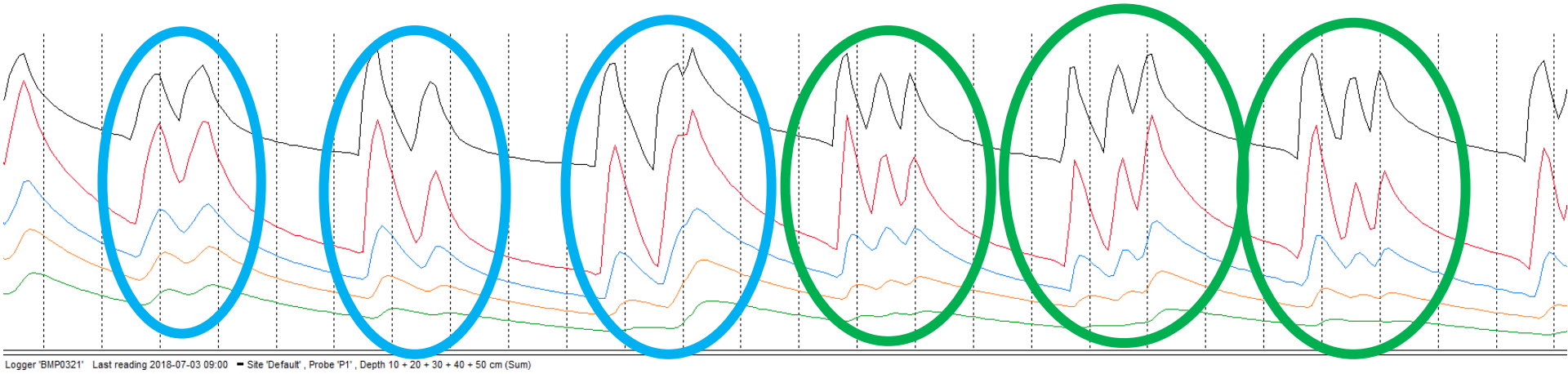
UF | IFAS Extension
UNIVERSITY of FLORIDA

Learning to read the SMS lines

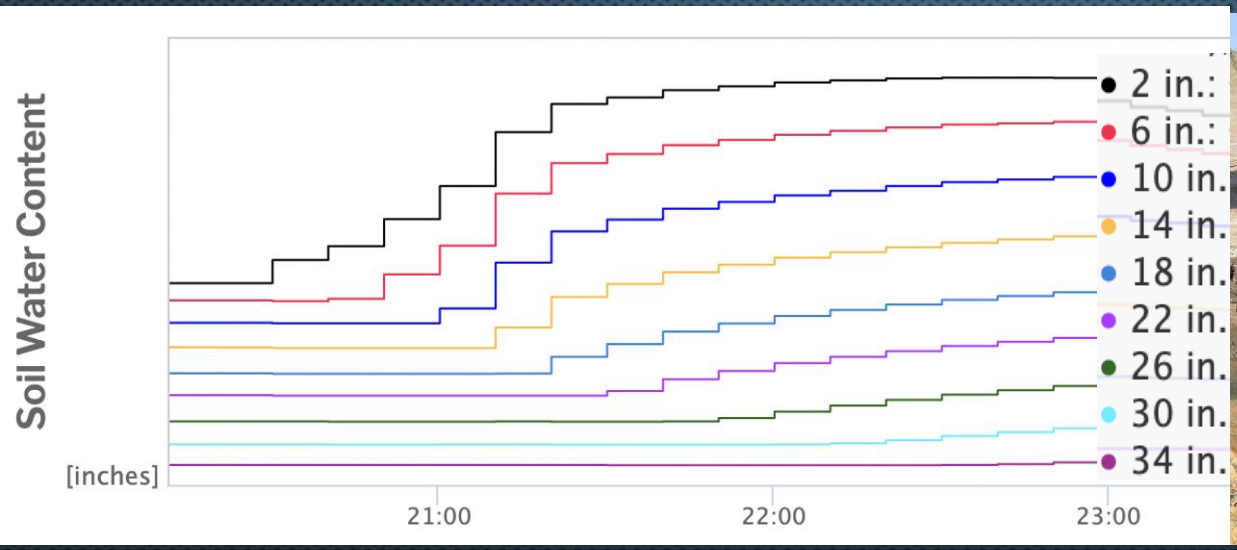


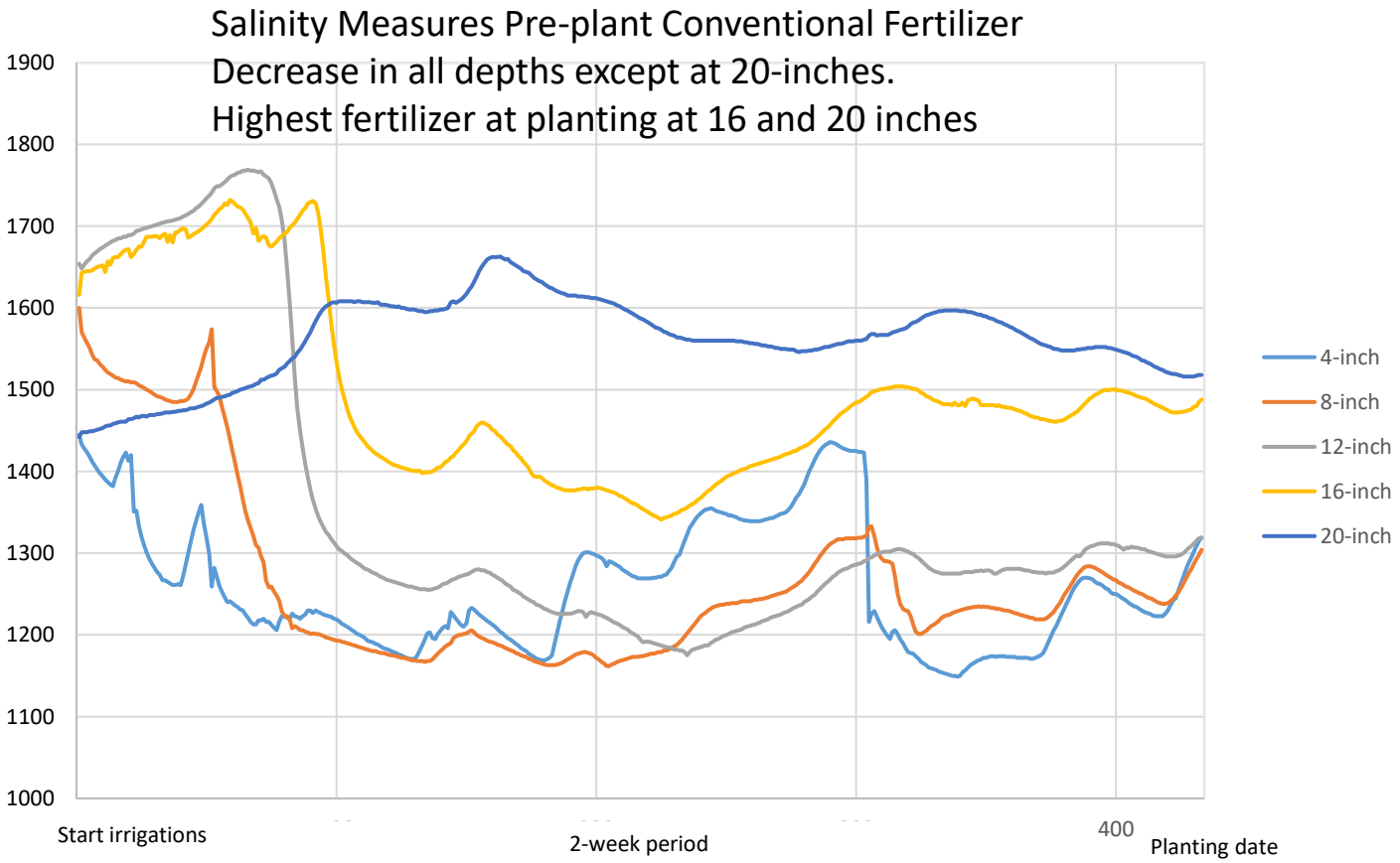
0 Site 'Default' , Probe 'P1' , Depth 3.9 + 7.9 + 11.8 + 39.4 Inches (Interpolated Sum)

What do the lines tell us?



Blue dye/SMS Connections : Overhead irrigation

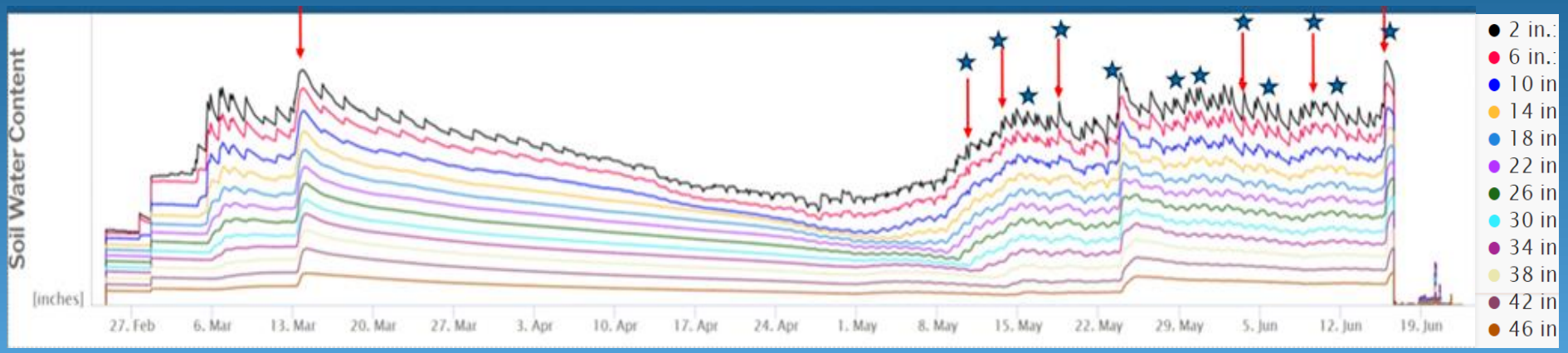


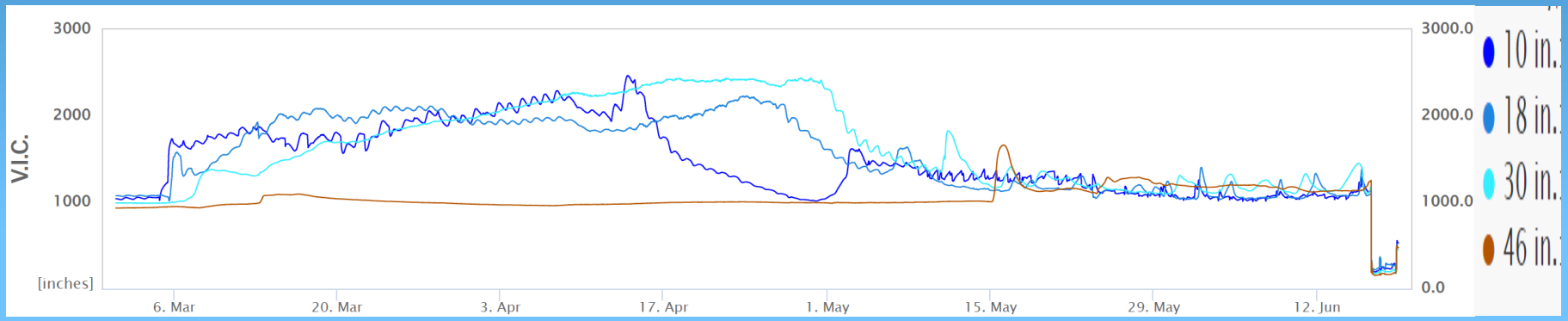

Salinity Measures Pre-plant Conventional Fertilizer
Decrease in all depths except at 20-inches.
Highest fertilizer at planting at 16 and 20 inches
1900
1800
1700
1600
1500
1400
1300
1200
1100
1000
Start irrigations
2-week period
400
Planting date
4-inch
8-inch
12-inch
16-inch
20-inch

= Rainfall Events >0.25" According to FAWN

★ = Fertigation Events

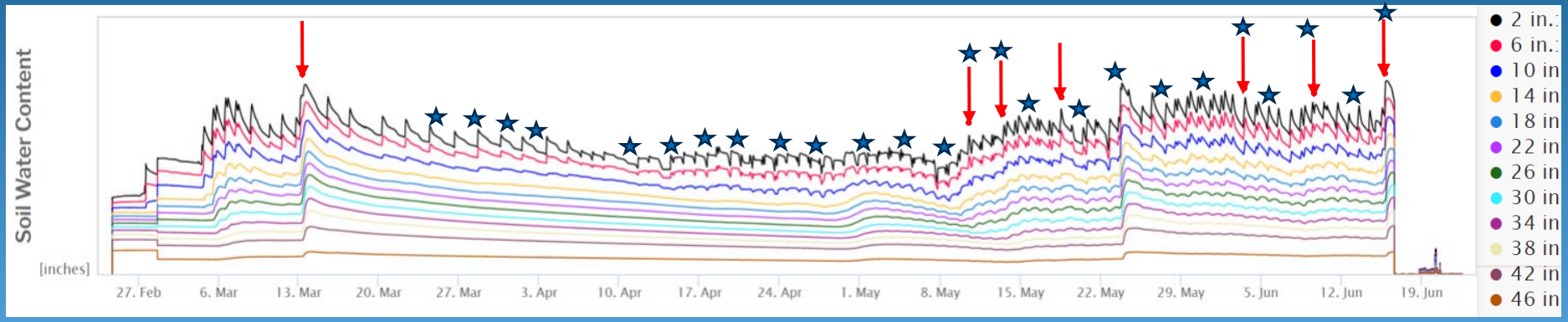
Producer 1 CRF Sensor– Pursell – 100%

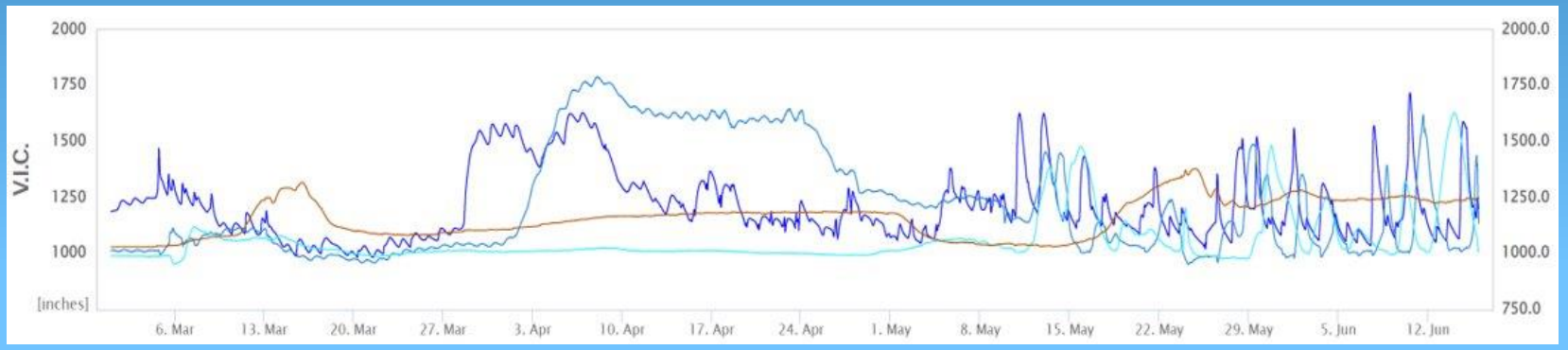




↓ = Rainfall Events >0.25" According to FAWN
★ = Fertigation Events

Producer 1 Conventional Sensor

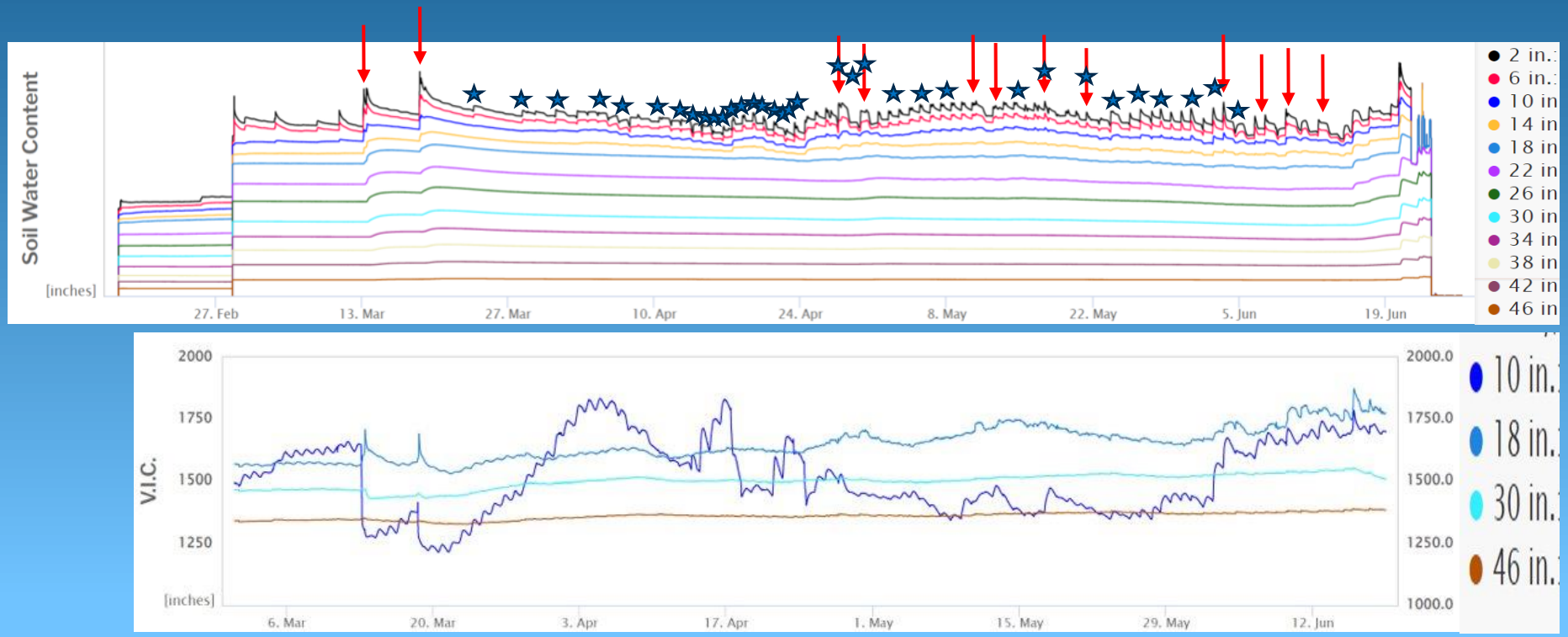




= Rainfall Events >0.25" According to FAWN

★ = Fertigation Events

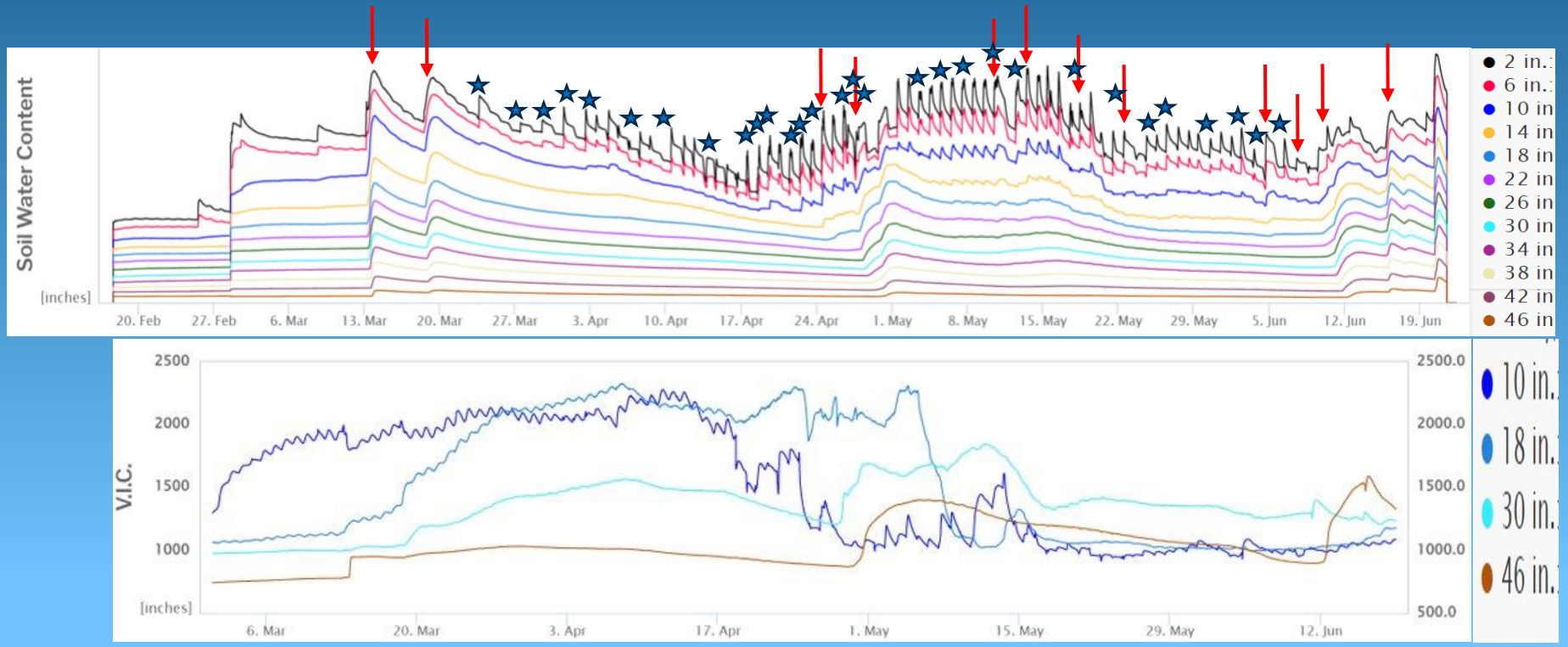
Producer 5 1M BR CRF Sensor



= Rainfall Events >0.25" According to FAWN

= Fertigation Events

Producer 5 Conventional Sensor



THANK YOU AND GOOD LUCK

Bob Hochmuth

Regional Extension Agent,

Assistant Center Director

UF/IFAS NFREC-Suwannee Valley

bobhoch@ufl.edu

UF | IFAS Extension
UNIVERSITY of FLORIDA