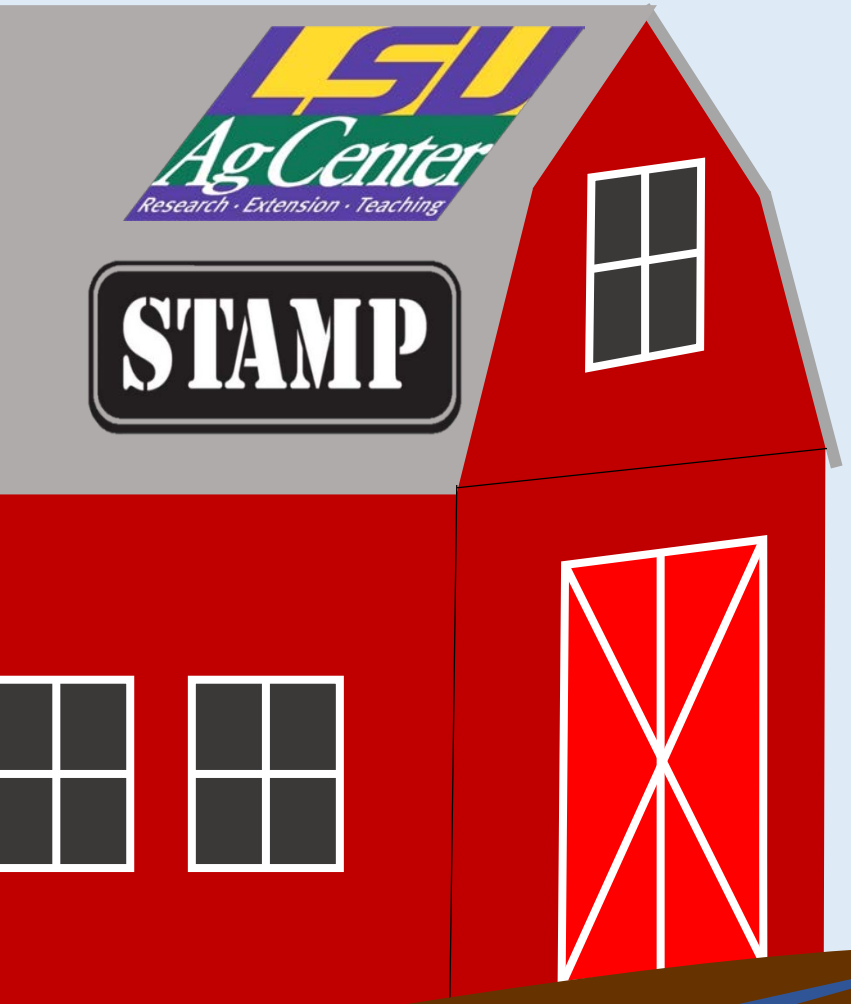

Techniques for Scheduling Furrow Irrigation: Introduction of the STAMP Decision Tool

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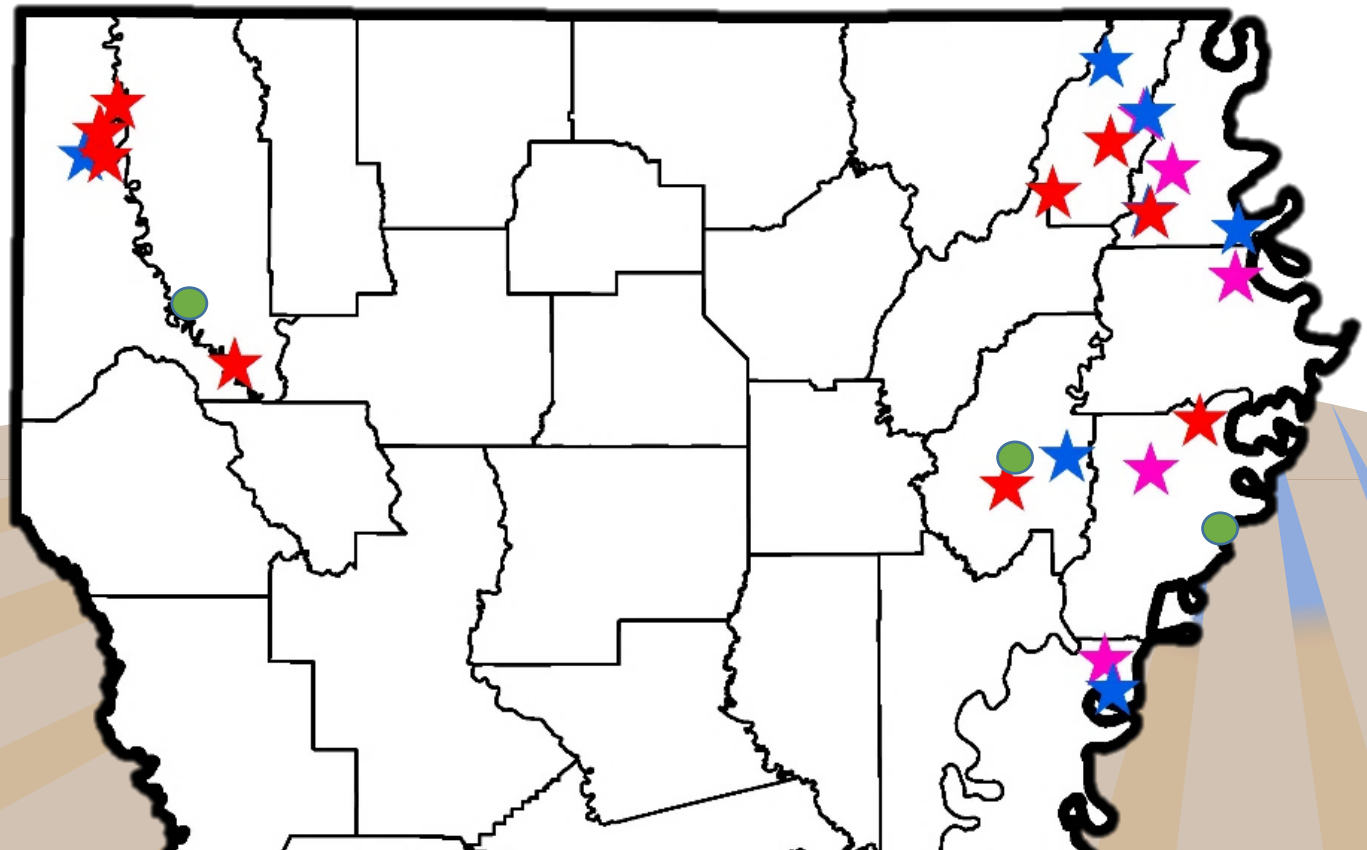
Introduction

- Irrigated acreage has increased
  - 30% in 2011
  - 49% in 2017
- Of the current acreage, approximately
  - 80% is furrow-irrigated
  - 20% is sprinkler-irrigated
- USGS estimates that irrigation consumption continues to increase despite recent wetter conditions

Key to irrigation → Right time, right place, and right amount

Introduction

- Mid-South put focus on soil moisture sensors
  - Louisiana's efforts
    - Plot studies repeated on three soil types using two sensor types in 2015/2016
    - Various demonstrations conducted with farmers across the state



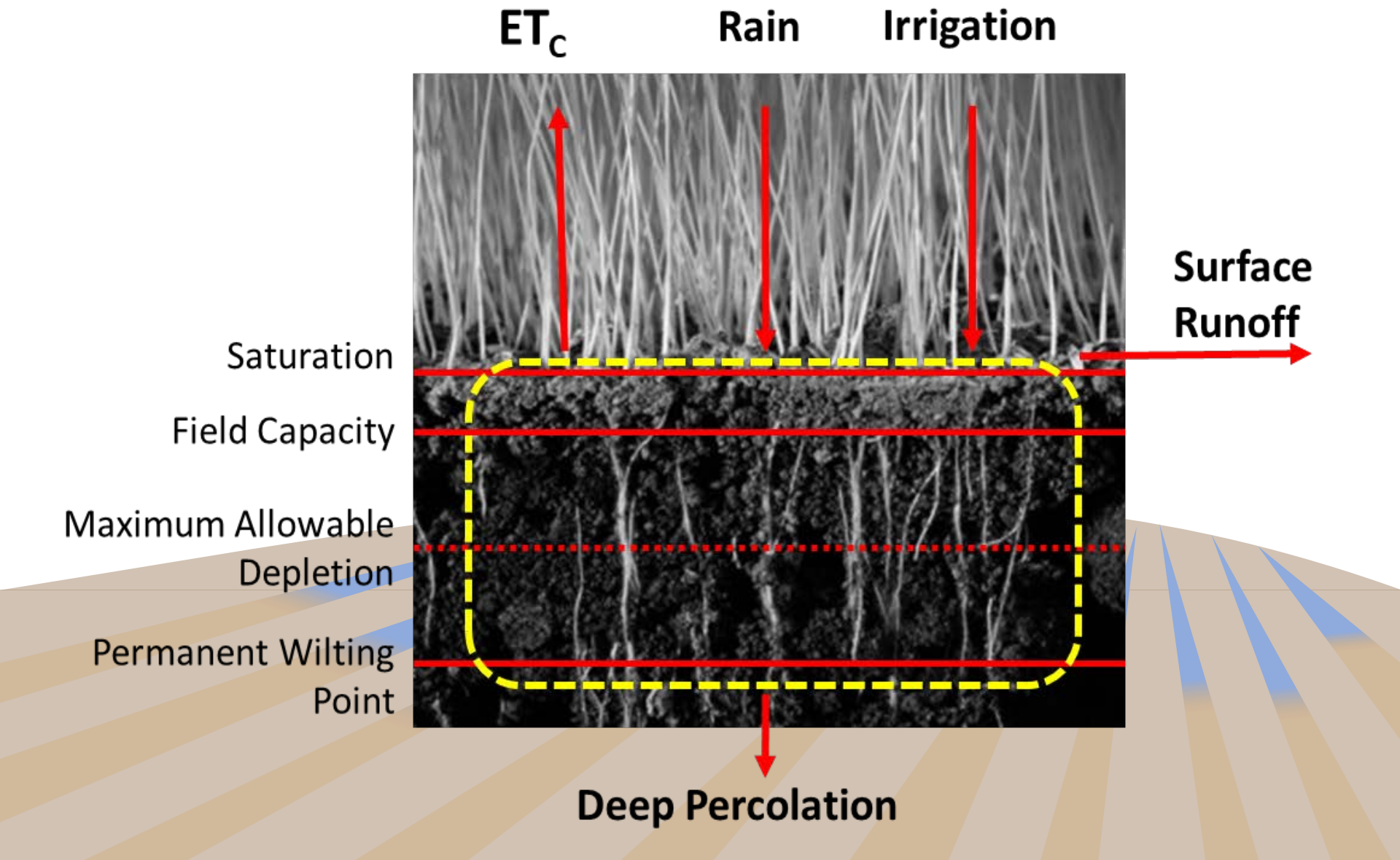
Introduction

- What needs to be considered?

Soil sensor-based system	Weather-based system
Soils information • Available water holding capacity • Compaction • Irrigation threshold • Sensor selection	Soils information • Available water holding capacity • Compaction • Irrigation threshold
Types of readings	Reliable weather data
Processing infrastructure	Processing infrastructure
Communication infrastructure	Plant variety information • Planting date • Growth stages • Crop coefficients
Installation methods/requirements	

Objective: Develop a basic decision tool to determine when to trigger furrow irrigation events based on plant water requirements for agronomic crops

Materials and Methods

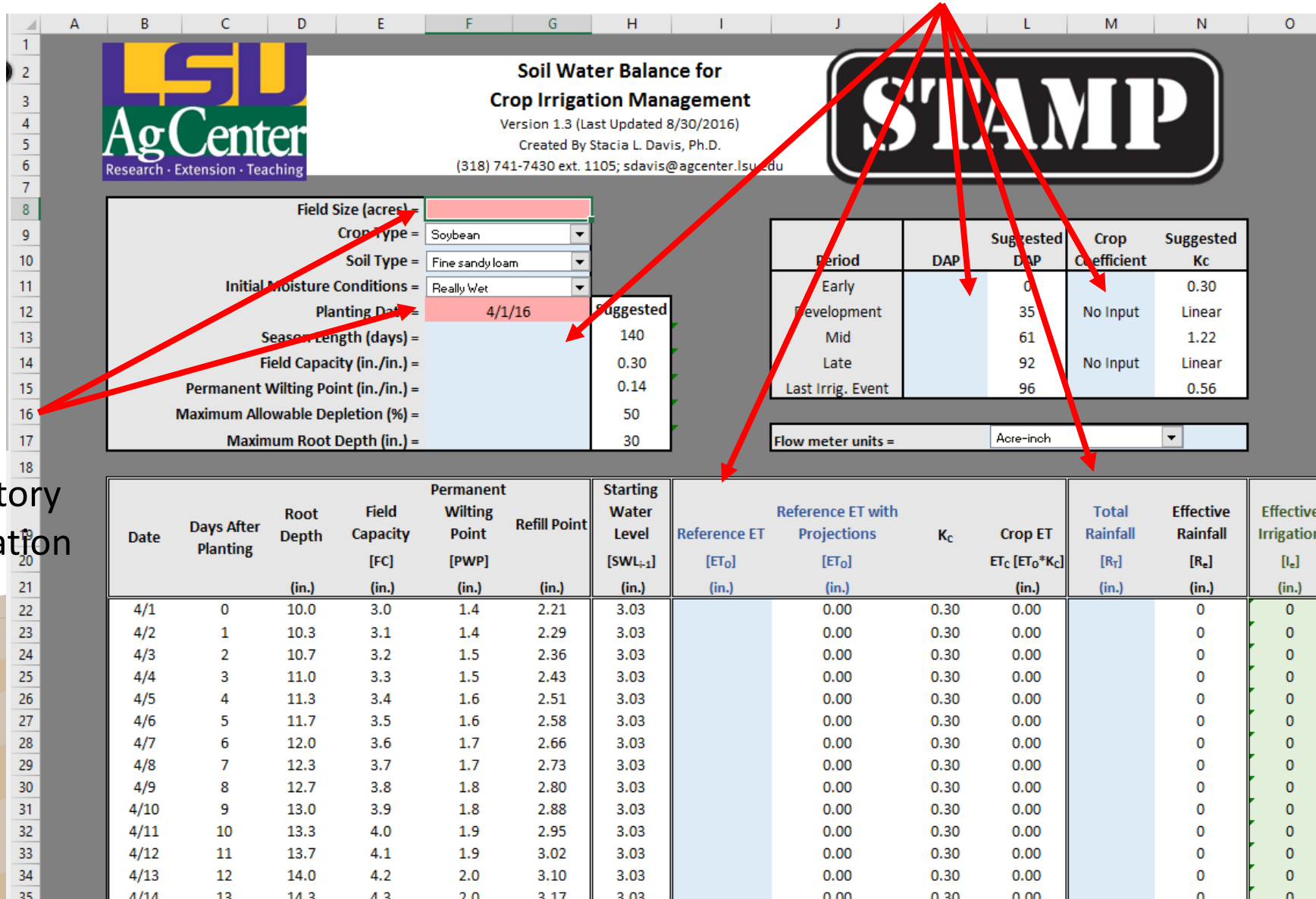


Materials and Methods

- Soil water balance

Blue: User inputs

Red: Mandatory information



Soil Water Balance for Crop Irrigation Management

Version 1.3 (Last Updated 8/30/2016)

Created By Stacia L. Davis, Ph.D.

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		Suggested
Field Size (acres) =		
Crop Type =	Soybean	
Soil Type =	Fine sandy loam	
Initial Moisture Conditions =	Really Wet	
Planting Date =	4/1/16	
Season Length (days) =		140
Field Capacity (in./in.) =		0.30
Permanent Wilting Point (in./in.) =		0.14
Maximum Allowable Depletion (%) =		50
Maximum Root Depth (in.) =		30

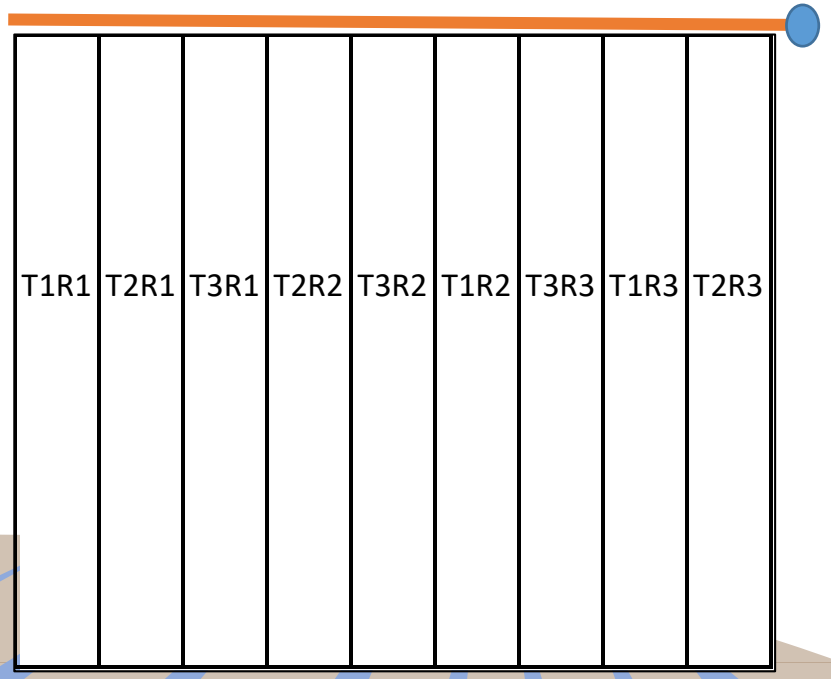
Period	DAP	Suggested DAP	Crop Coefficient	Suggested Kc
Early		0		0.30
Development		35	No Input	Linear
Mid		61		1.22
Late		92	No Input	Linear
Last Irrig. Event		96		0.56

Flow meter units = Acre-inch

Date	Days After Planting	Root Depth (in.)	Field Capacity [FC] (in.)	Permanent Wilting Point [PWP] (in.)	Refill Point (in.)	Starting Water Level [SWL_{i-1}] (in.)	Reference ET [ET_O] (in.)	Reference ET with Projections [ET_O] (in.)	K_C	Crop ET ET_C [ET_O*K_C] (in.)	Total Rainfall [R_T] (in.)	Effective Rainfall [R_e] (in.)	Effective Irrigation [I_e] (in.)
4/1	0	10.0	3.0	1.4	2.21	3.03		0.00	0.30	0.00		0	0
4/2	1	10.3	3.1	1.4	2.29	3.03		0.00	0.30	0.00		0	0
4/3	2	10.7	3.2	1.5	2.36	3.03		0.00	0.30	0.00		0	0
4/4	3	11.0	3.3	1.5	2.43	3.03		0.00	0.30	0.00		0	0
4/5	4	11.3	3.4	1.6	2.51	3.03		0.00	0.30	0.00		0	0
4/6	5	11.7	3.5	1.6	2.58	3.03		0.00	0.30	0.00		0	0
4/7	6	12.0	3.6	1.7	2.66	3.03		0.00	0.30	0.00		0	0
4/8	7	12.3	3.7	1.7	2.73	3.03		0.00	0.30	0.00		0	0
4/9	8	12.7	3.8	1.8	2.80	3.03		0.00	0.30	0.00		0	0
4/10	9	13.0	3.9	1.8	2.88	3.03		0.00	0.30	0.00		0	0
4/11	10	13.3	4.0	1.9	2.95	3.03		0.00	0.30	0.00		0	0
4/12	11	13.7	4.1	1.9	3.02	3.03		0.00	0.30	0.00		0	0
4/13	12	14.0	4.2	2.0	3.10	3.03		0.00	0.30	0.00		0	0
4/14	13	14.3	4.3	2.0	3.17	3.03		0.00	0.30	0.00		0	0

Materials and Methods

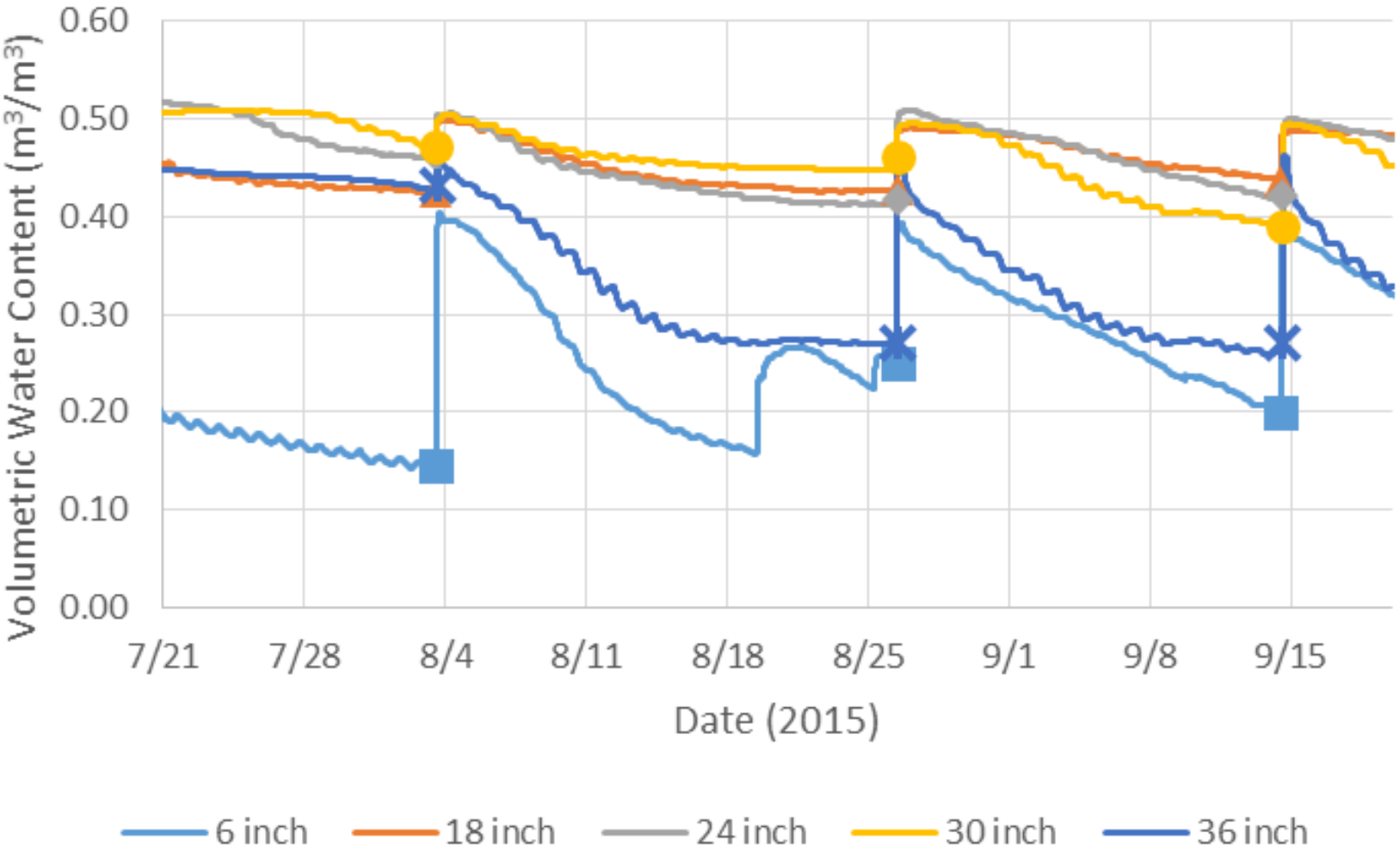
- Treatment 1 – Irrometer Watermark
- Treatment 2 – Decagon GS1 → 5 sensor depths
- Treatment 3 – Weekly irrigation



- Cotton, sandy clay loam – Bossier City
- Soybean, silt loam – Winnsboro
- Soybean, cracking clay – St. Joseph

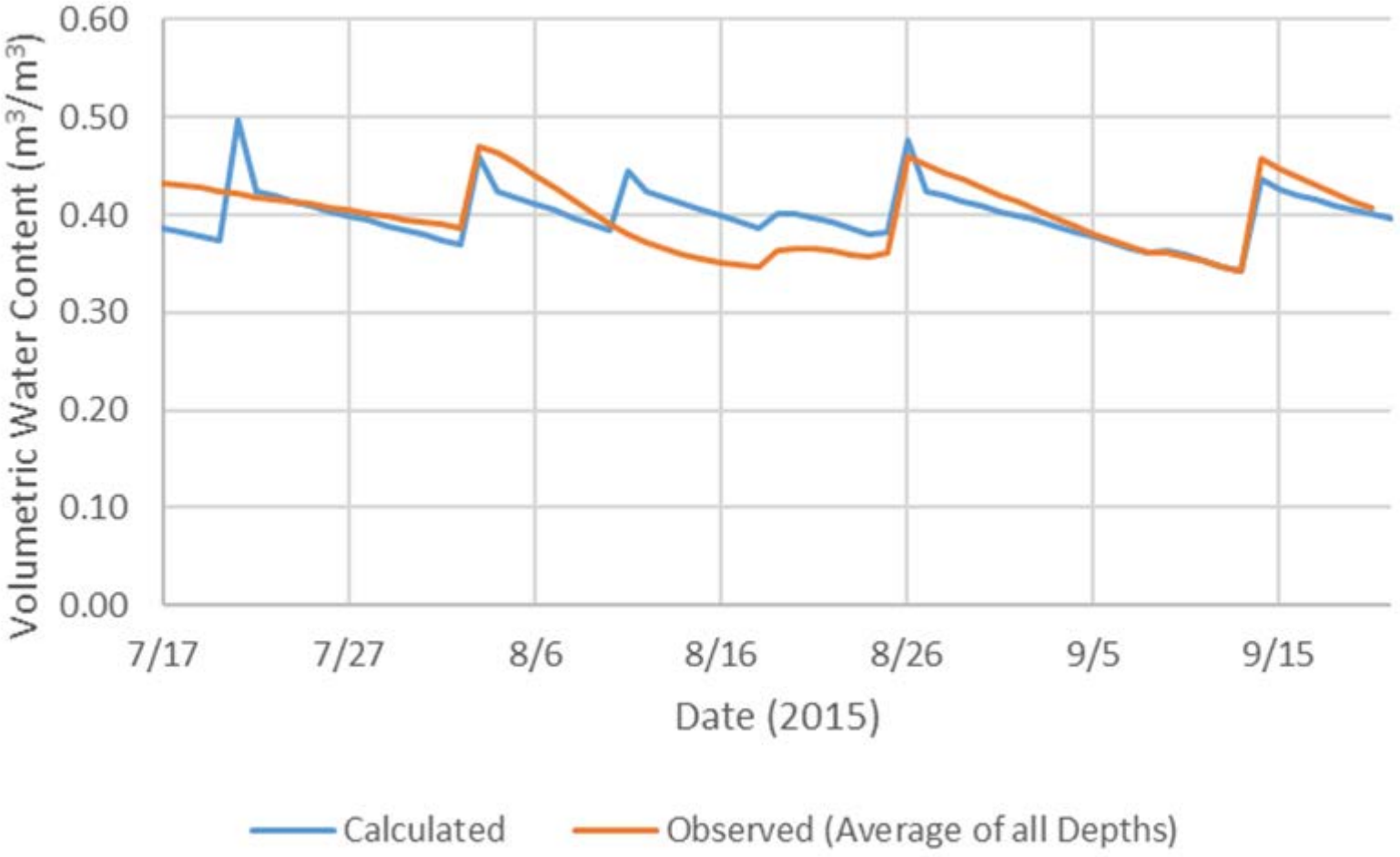
Results

- Cotton on sandy clay loam
  - Planted on June 8, 2015



Results

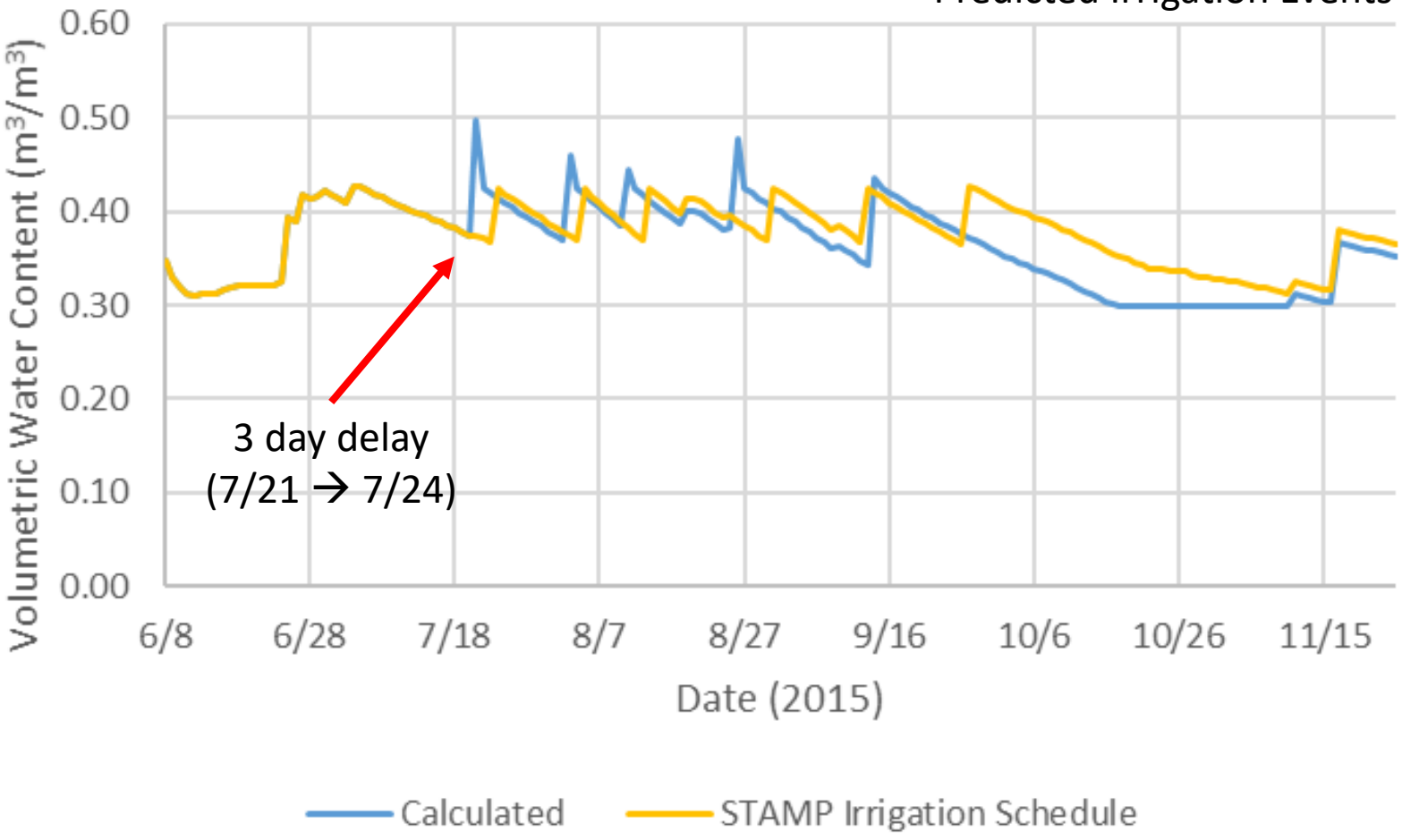
- Comparison of soil moisture sensor estimates and soil water balance
  - 2015 Cotton on sandy clay loam



Results

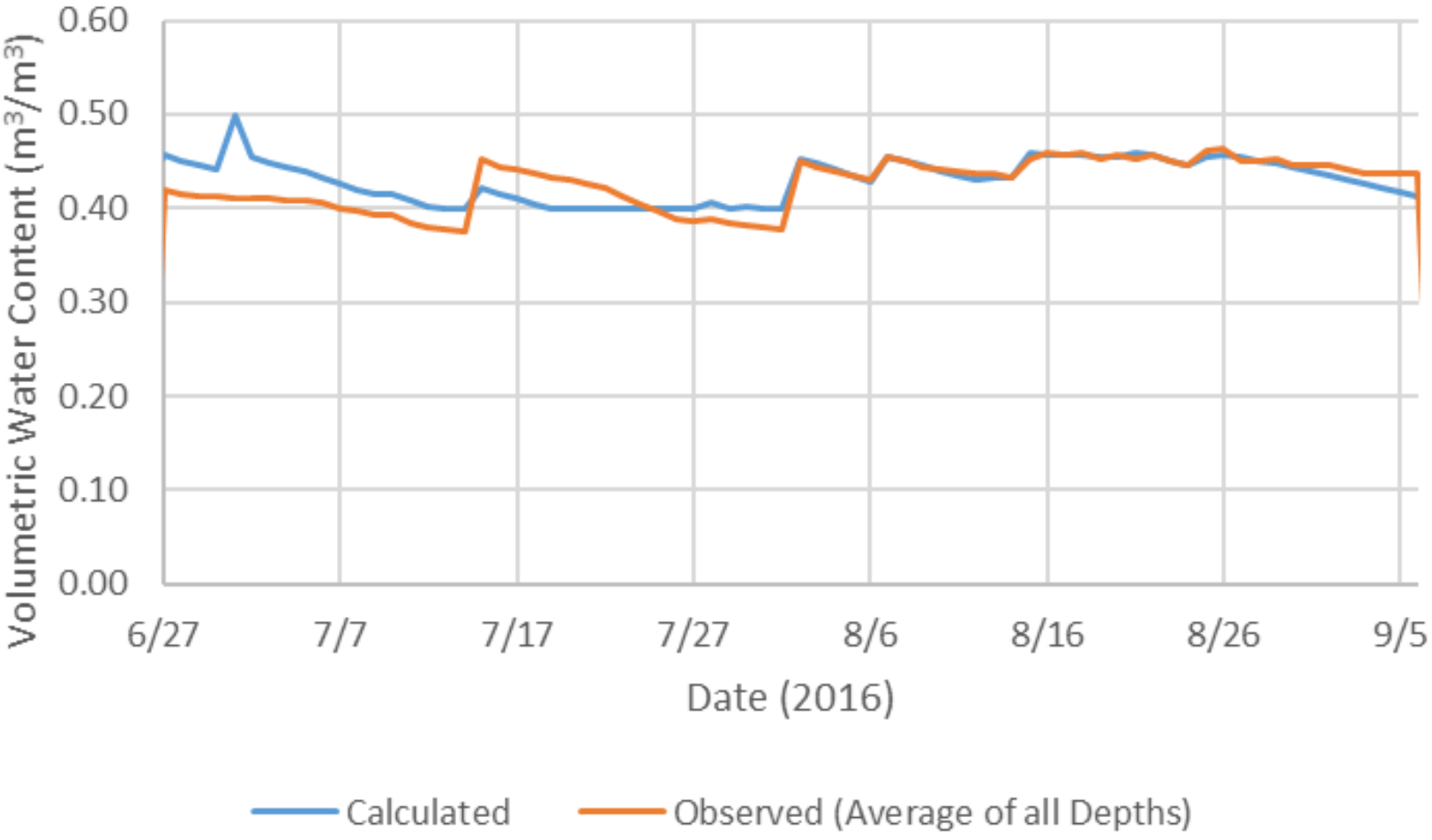
- Comparison of soil moisture sensor estimates and soil water balance
  - 2015 Cotton on sandy clay loam

Actual Irrigation Events = 5
Predicted Irrigation Events = 6



Results

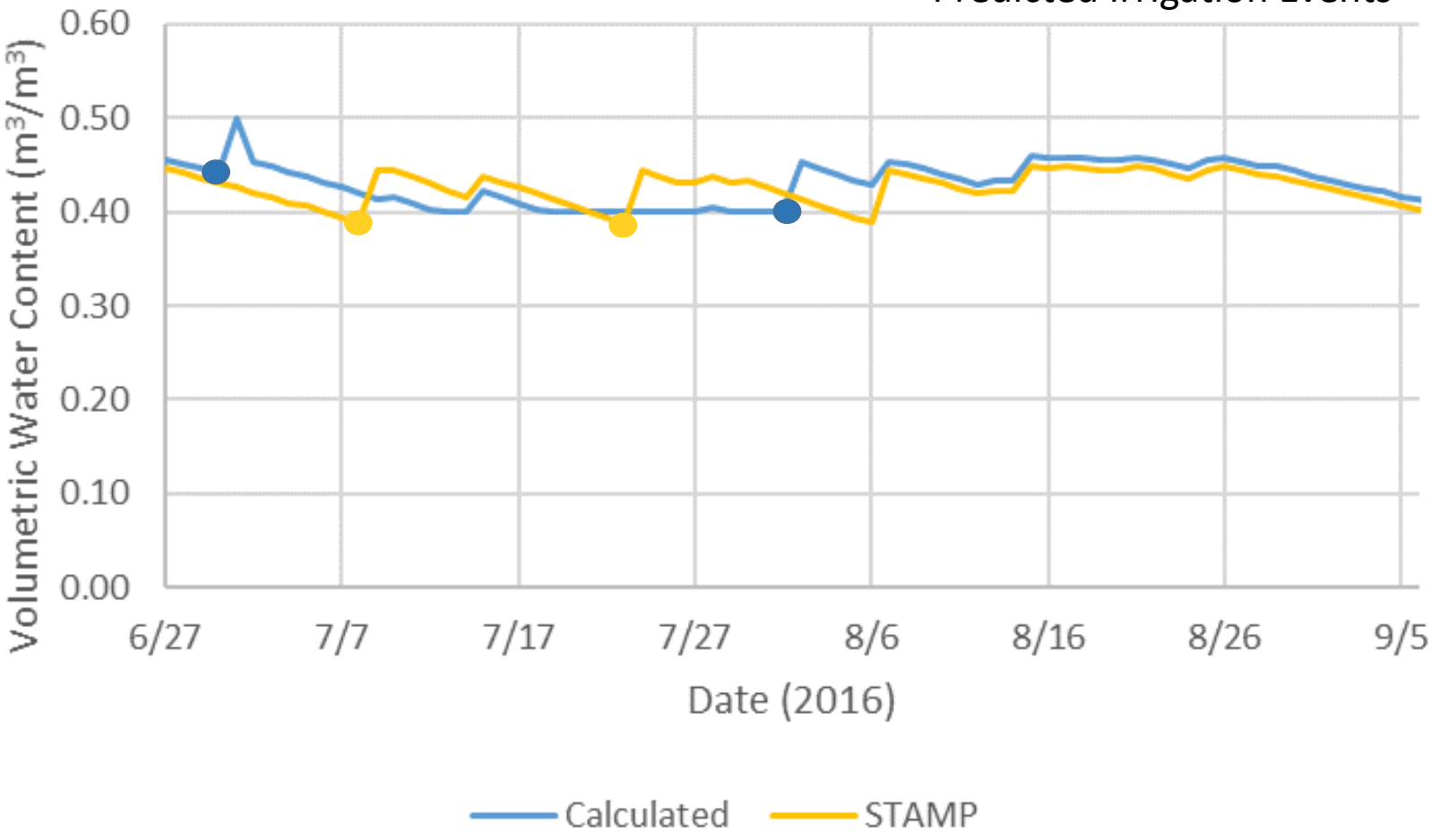
- Comparison of soil moisture sensor estimates and soil water balance
  - 2016 Cotton on sandy clay loam



Results

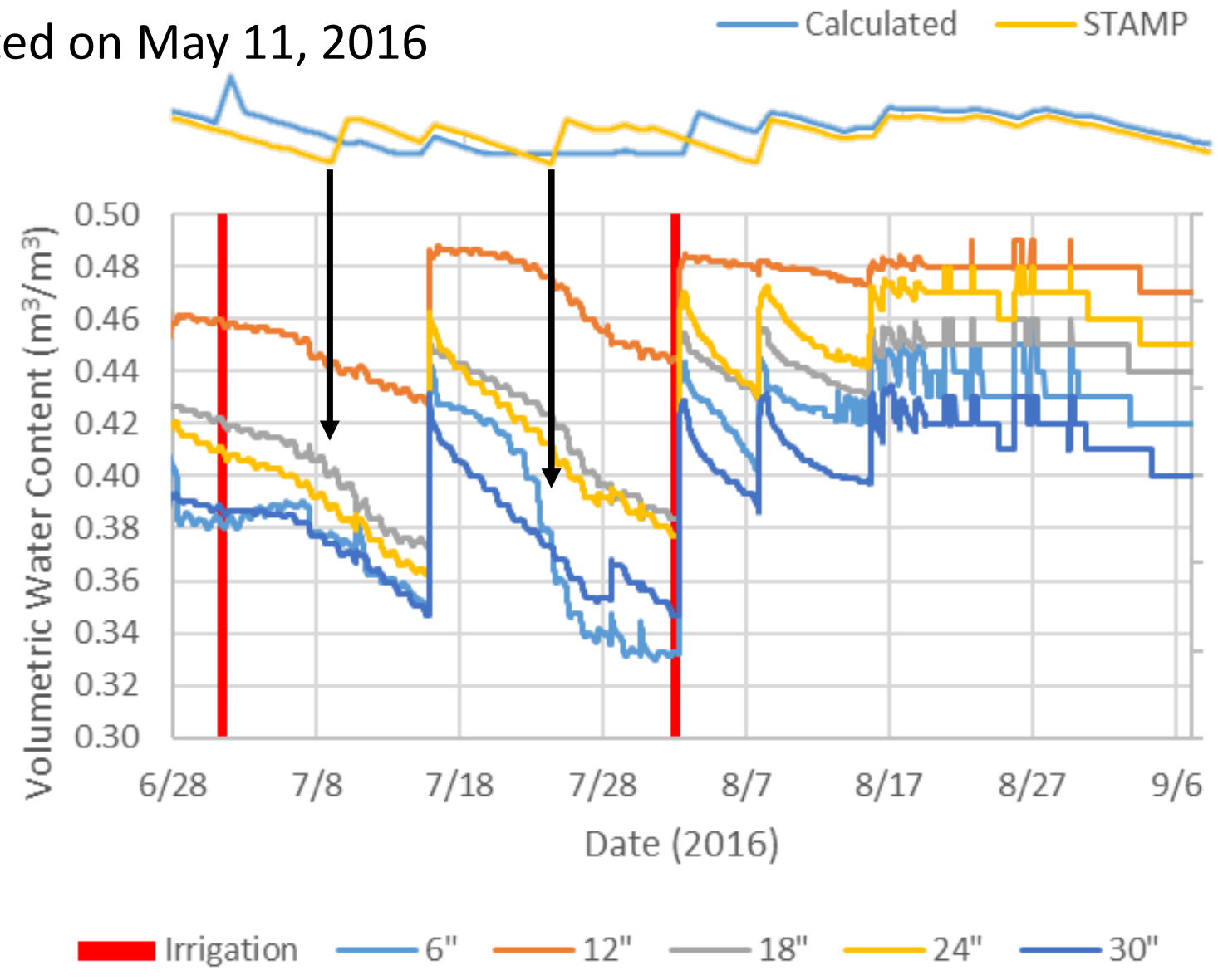
- Comparison of soil moisture sensor estimates and soil water balance
  - 2016 Cotton on sandy clay loam

Actual Irrigation Events = 2
Predicted Irrigation Events = 2



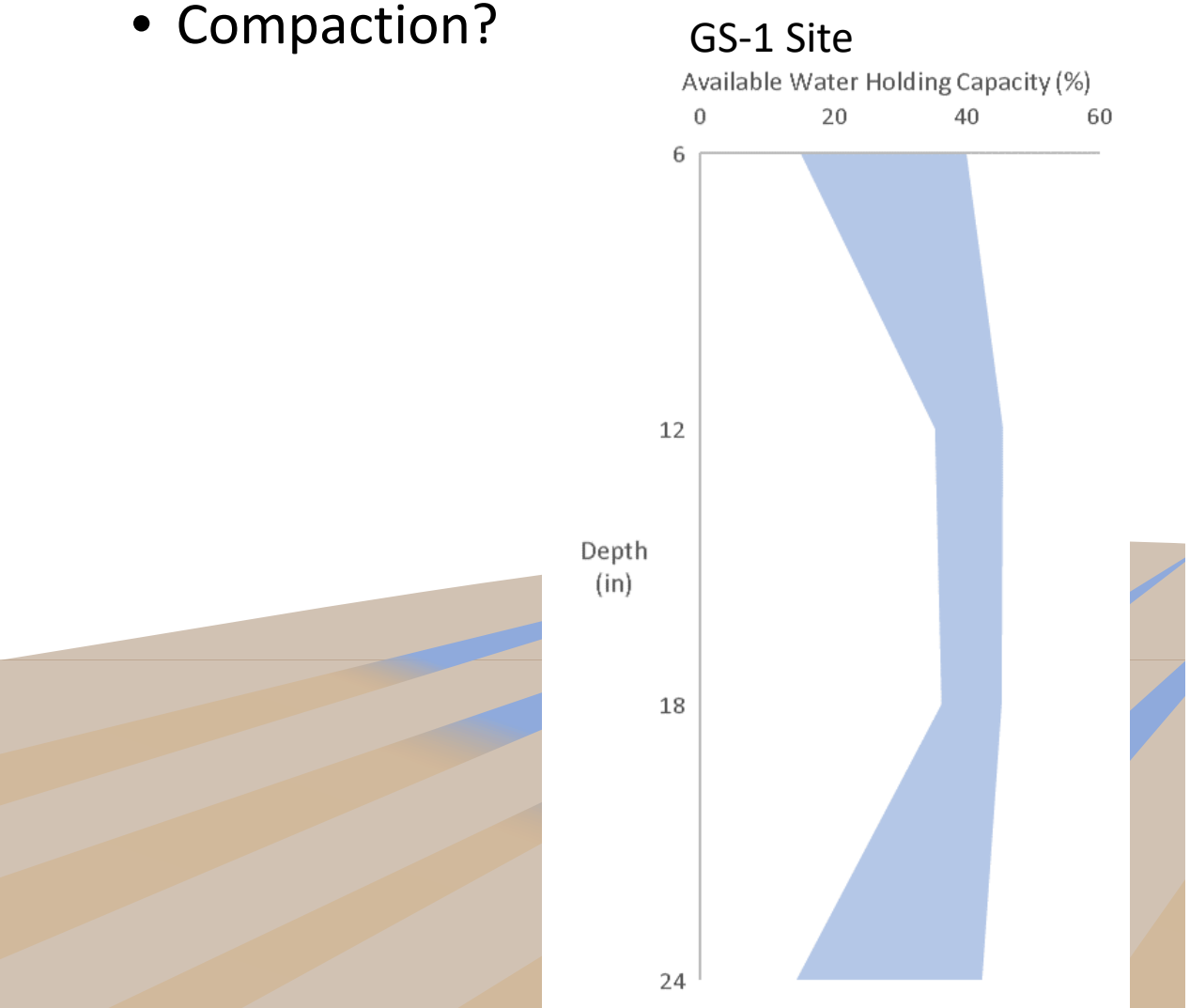
Results

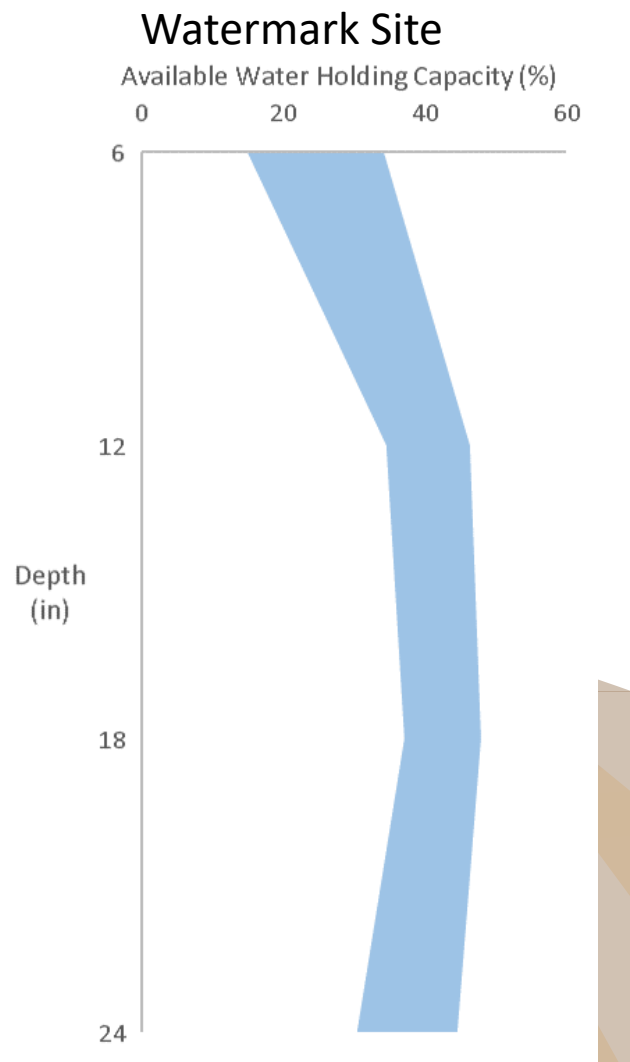
- Cotton on sandy clay loam
  - Planted on May 11, 2016



Results

- 2016 cotton on sandy clay loam
  - Conventional tillage
  - Compaction?





Preliminary Conclusions

- Cannot remove the human component to irrigation!
- A soil water balance is a decent option if sensors are impractical considering cost and management style
  - Better to incorporate field characteristics and infiltration, too
  - A combination of the two would be great!
- Need to verify model in heavier soil types!
- Simple, practical approaches to on-farm water management should be encouraged before technologies

Next Steps...

- Continue testing! Soil water retention curves…
- Write manual and provide full release of tool
- Look at incorporating furrow irrigation models, infiltration, GDD, computerized hole selection, etc.

Thank you!

Questions?

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