Research and Applications for Blueberry Irrigation Scheduling

Jason Mallard
Area Ag Water Agent
Southeast District Extension

Bacon County
Alma Blueberry Update
March 11, 2024

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- Soil Moisture Sensor and SI Blueberry App
- General Irrigation Information
- Overhead Solid Set

Cost of Pumping Irrigation

- Average Irrigation cost ~ $13.50/ac-in applied:
  - ~$7/ac-in for electric
  - ~$20/ac-in for diesel
- So for 500 acres of irrigated land @ 10 inches of irrigation:
  - $67,500
- https://agecon.uga.edu/extension/budgets.html

Blueberry Water Requirements

- Blueberries typically require 1”-1.5” of water per week during their growing season.
- This is Total Water = Rainfall + Irrigation
- The demand for water is highest from the time of fruit expansion until harvest.
- During the final stages of fruit filling uniform soil moisture is required because surges in moisture level can cause fruit splitting.
- Research has shown that proper moisture monitoring can reduce water use up to 40% without affecting yield and fruit quality.

Blueberry Water Requirements

- Traditionally irrigation is scheduled in Blueberries based on timer schedules.
- Ranges from 30 minutes to 3 hours per zone.
  - Field observations have shown that irrigation infiltrates below rooting depth if irrigation duration is longer than 20 minutes.
- Pulsed irrigation is ideal when used with an Automatic Irrigation System
- Water is applied for 15 minutes at a time
- Applied multiple times throughout the day
  - Reduce water usage
  - Reduce loss of fertilizer
  - Potentially increase yield
- However, unlike many row crops there hasn't been as extensive water use curve development for blueberries.

Blueberry Water Requirements

- Recent work and research by Liakos (et al.) has targeted developing more robust Smart Irrigation Scheduling methods for Blueberries.
- The two main areas of focus have been the development of a SmartIrrigation Scheduling App and scheduling utilizing an Unmanned Aerial System (UAS).
- This presentation is focusing on the SI App.

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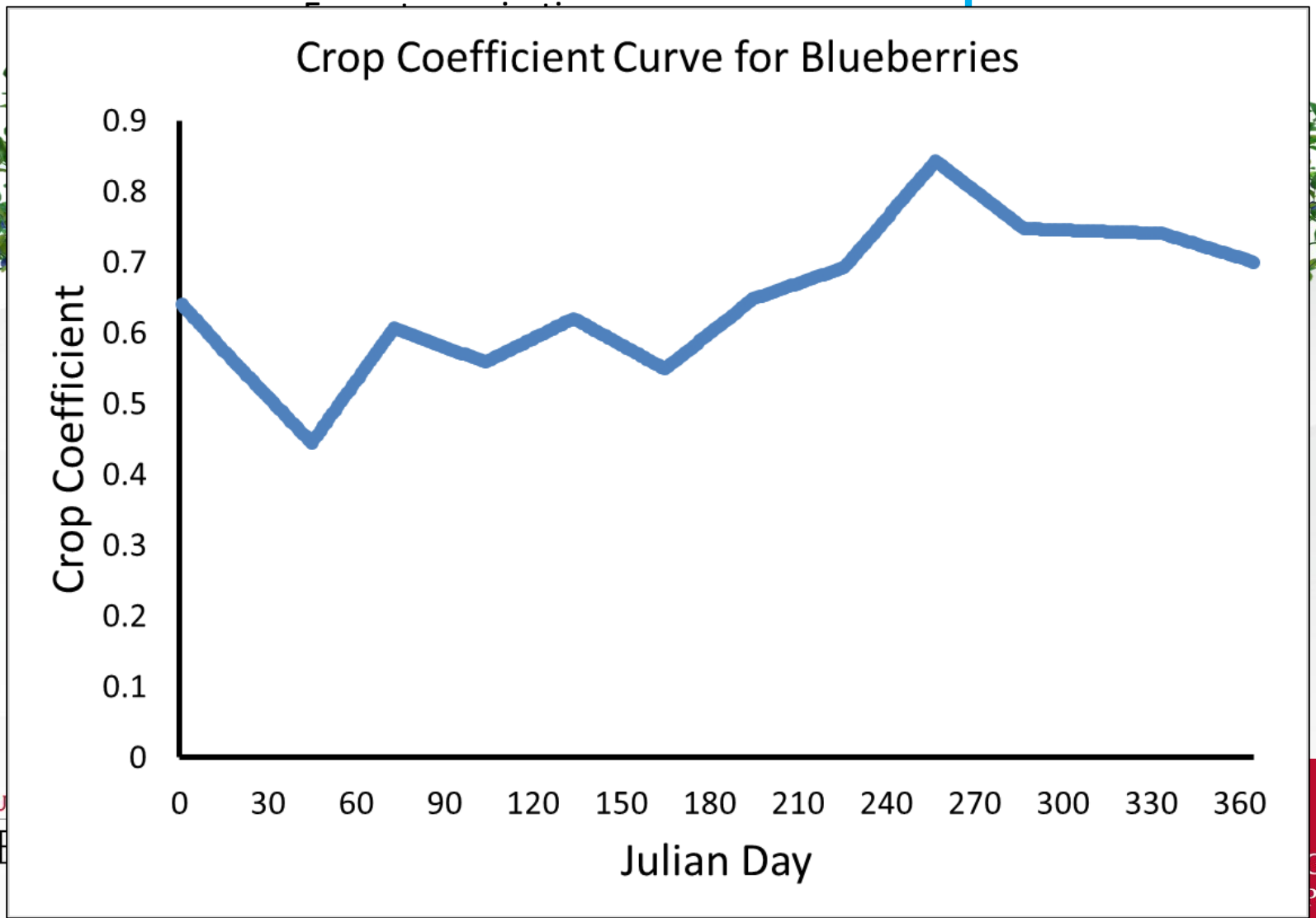
Smartphone Apps for Irrigation

- https://smartirrigationapps.org/
- Interactive ET-based irrigation scheduling tools
- Operate on a smartphone/tablet platform
- Can be used to implement both conventional and precision irrigation
- Currently free provided the user has a smartphone

Smartphone Apps for Irrigation

Rain + Irrigation

Crop



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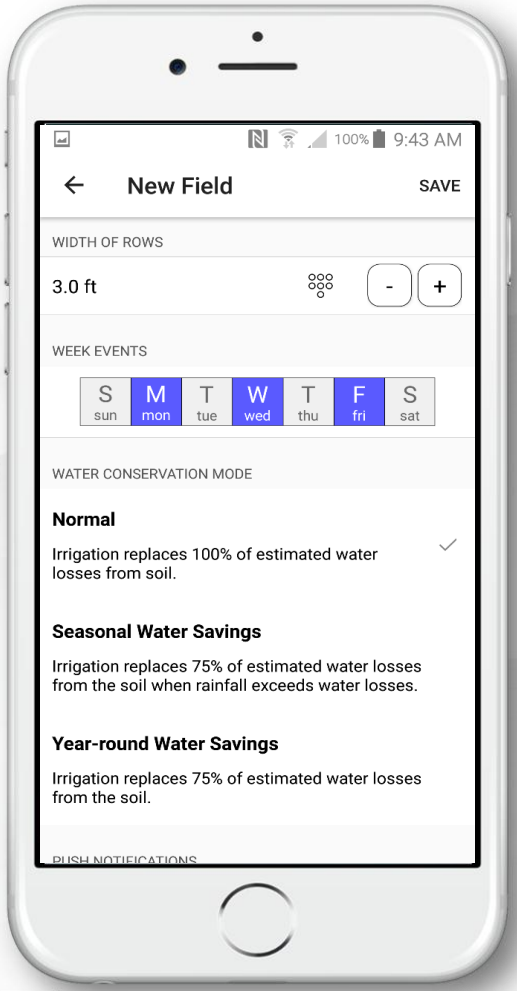
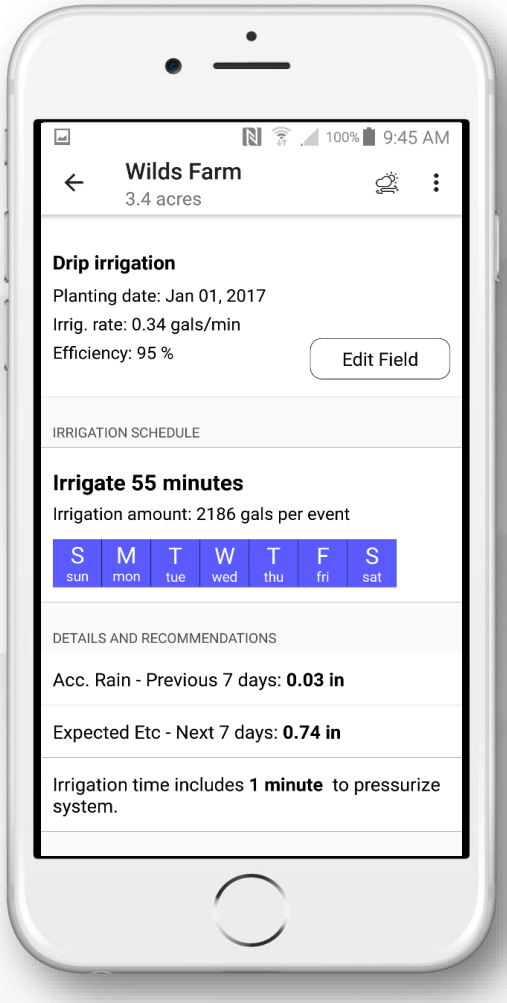
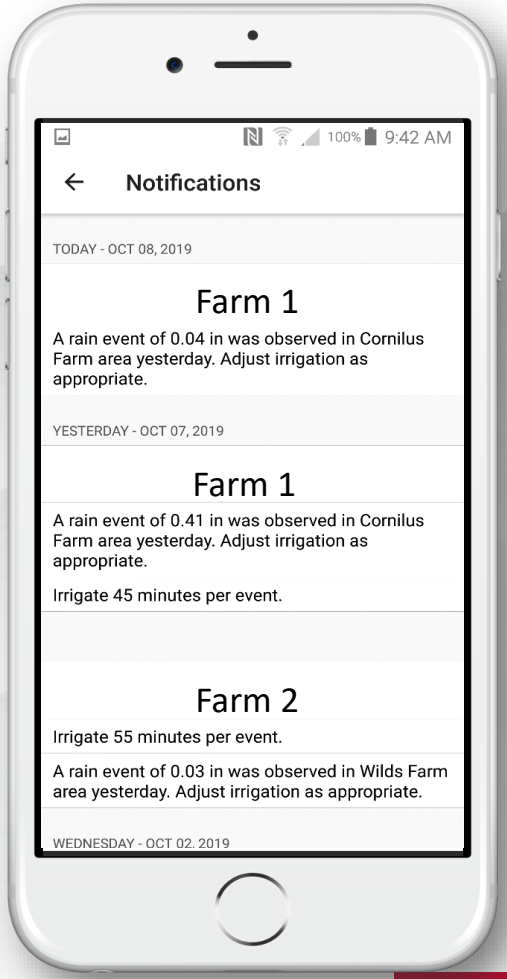
Smartphone Apps for Irrigation







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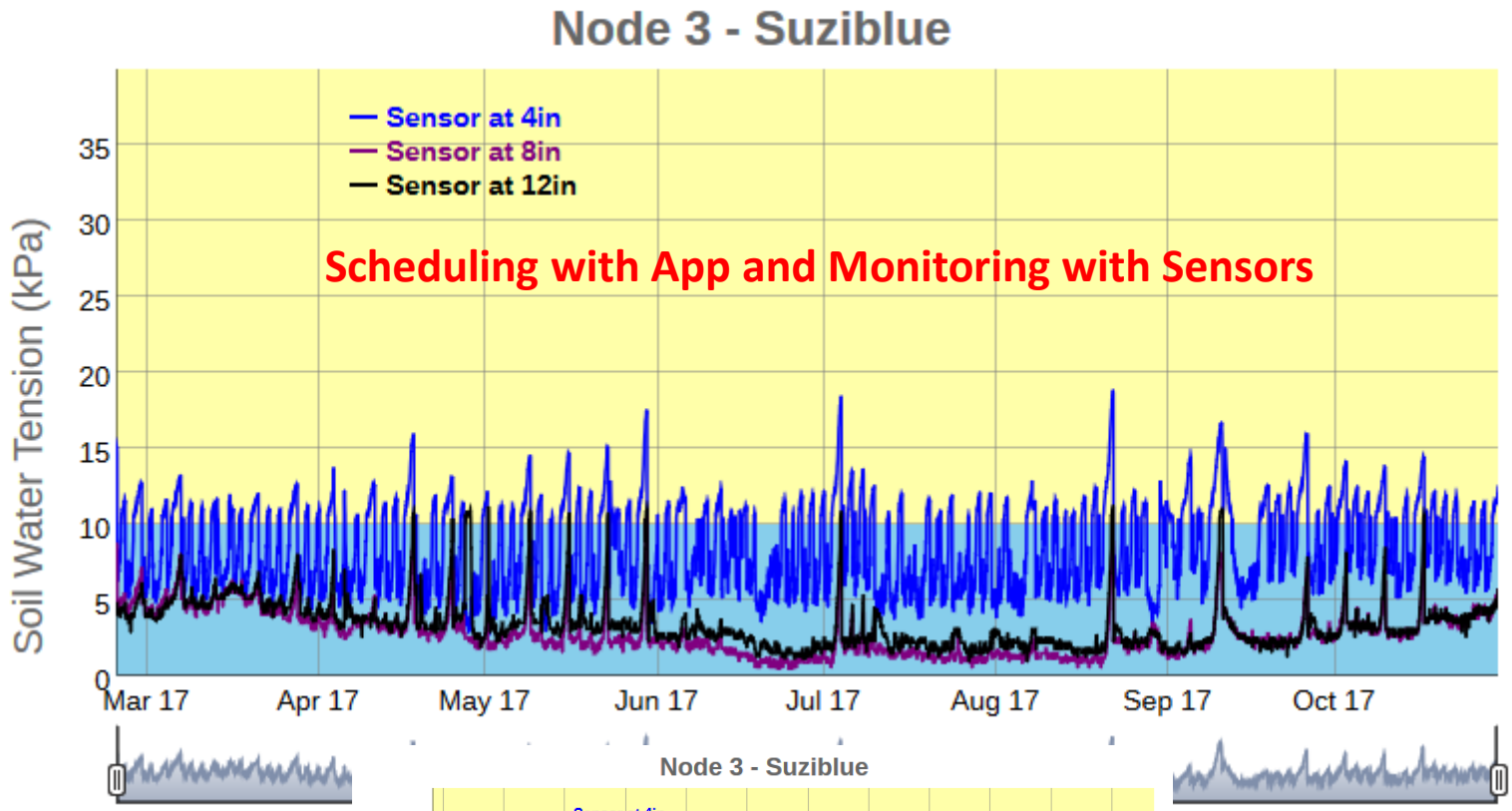
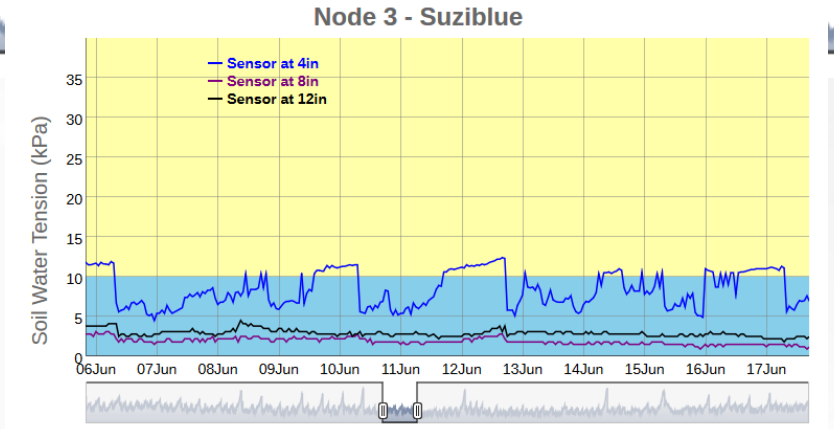
Comparison of 3 Treatments on 2 Varieties

- Suziblue
- Vernon

- Compare 3 Different Irrigation Scheduling Methods

Irrigation Scheduling App





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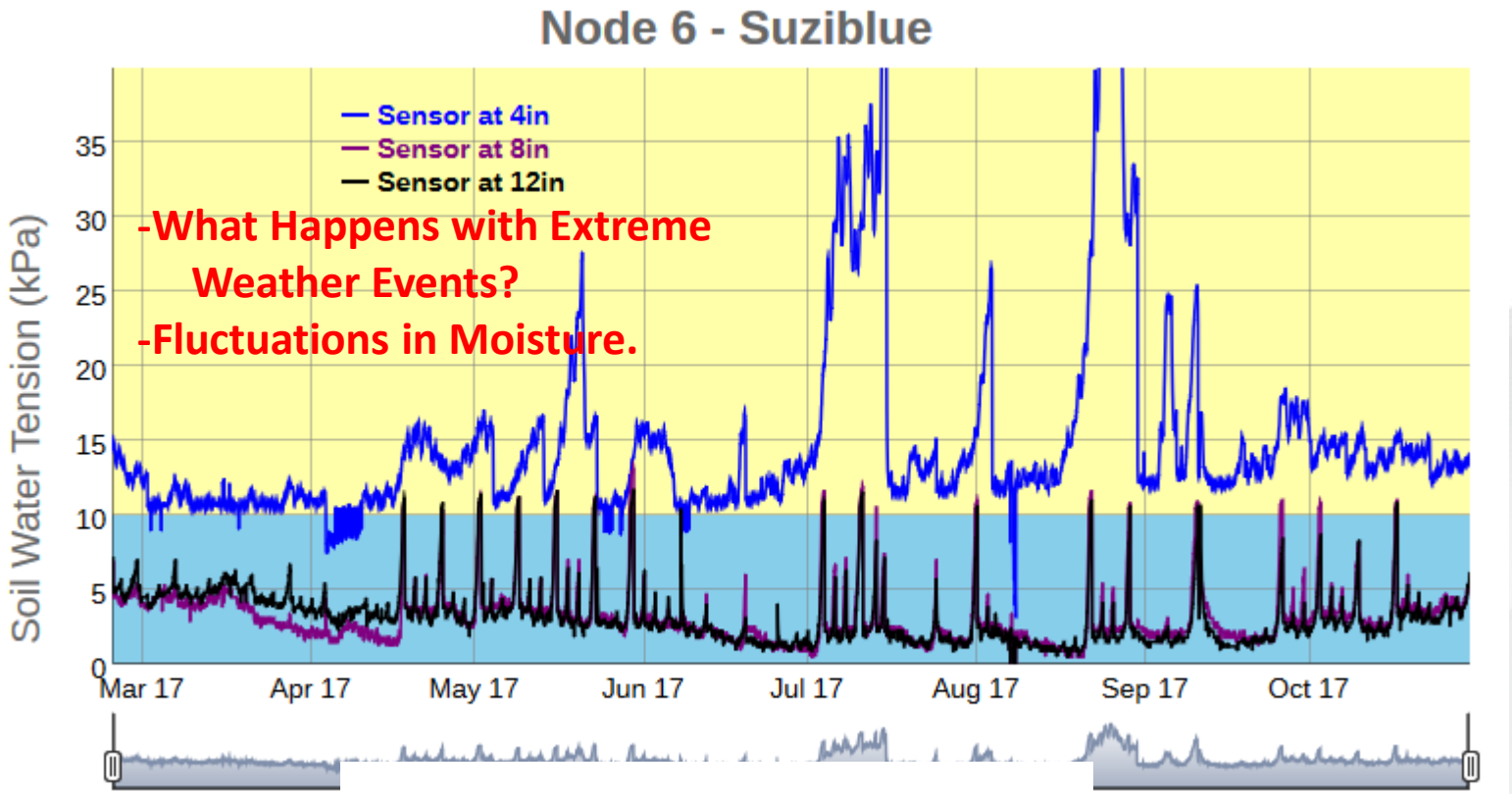
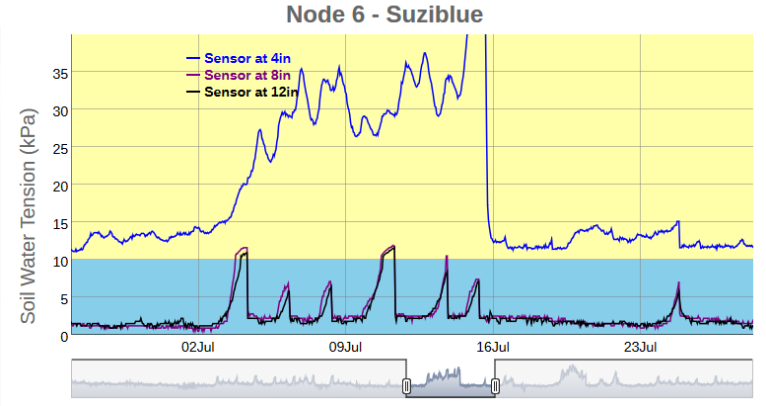
1” Per Week





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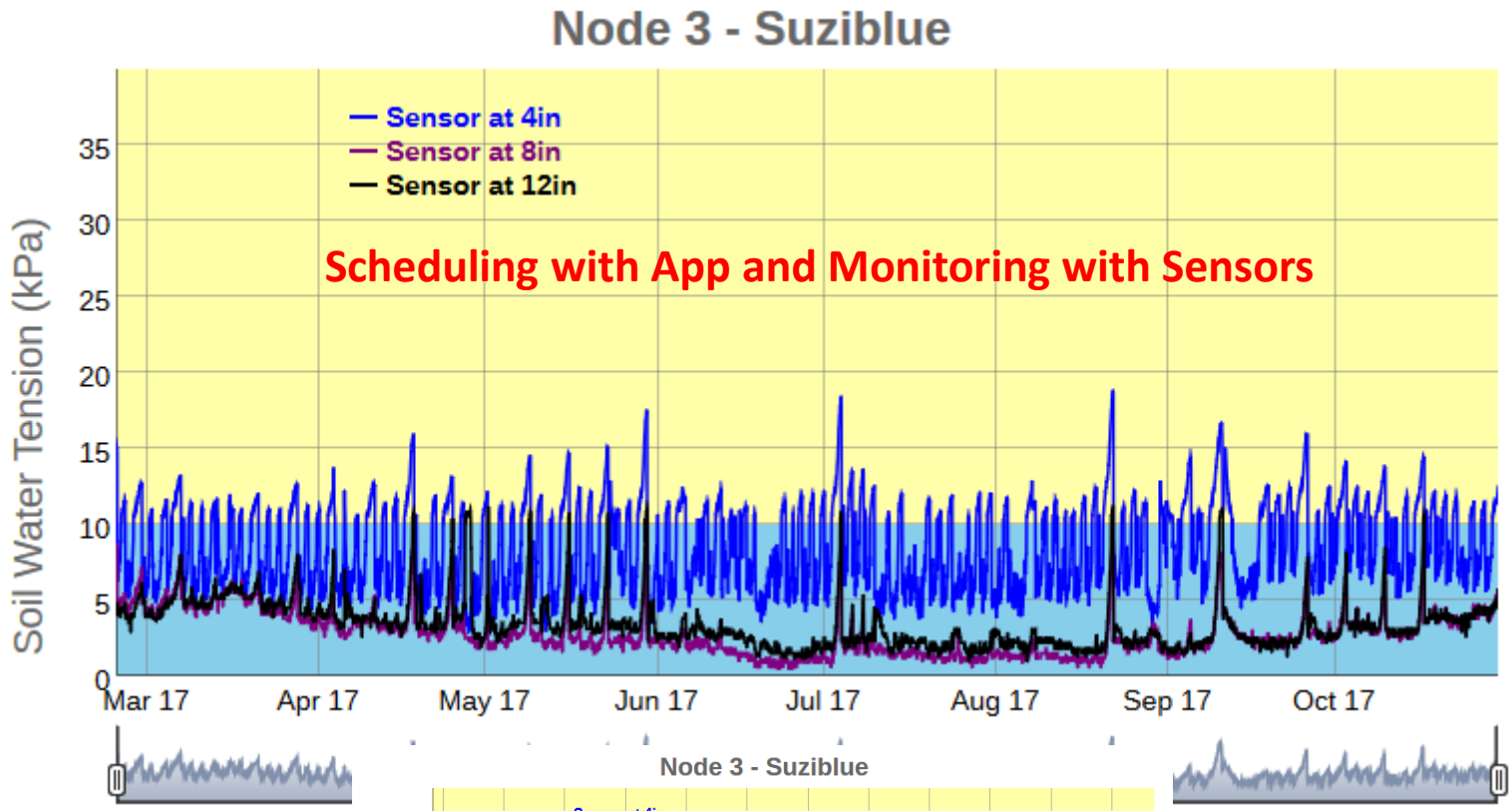
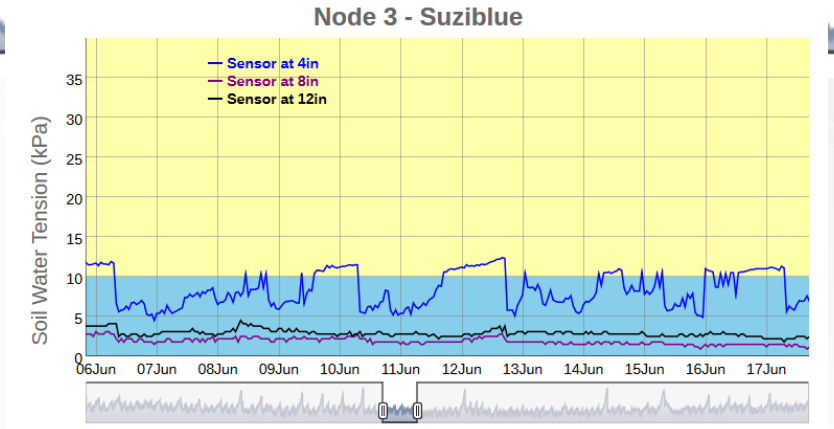
Irrigation Scheduling App





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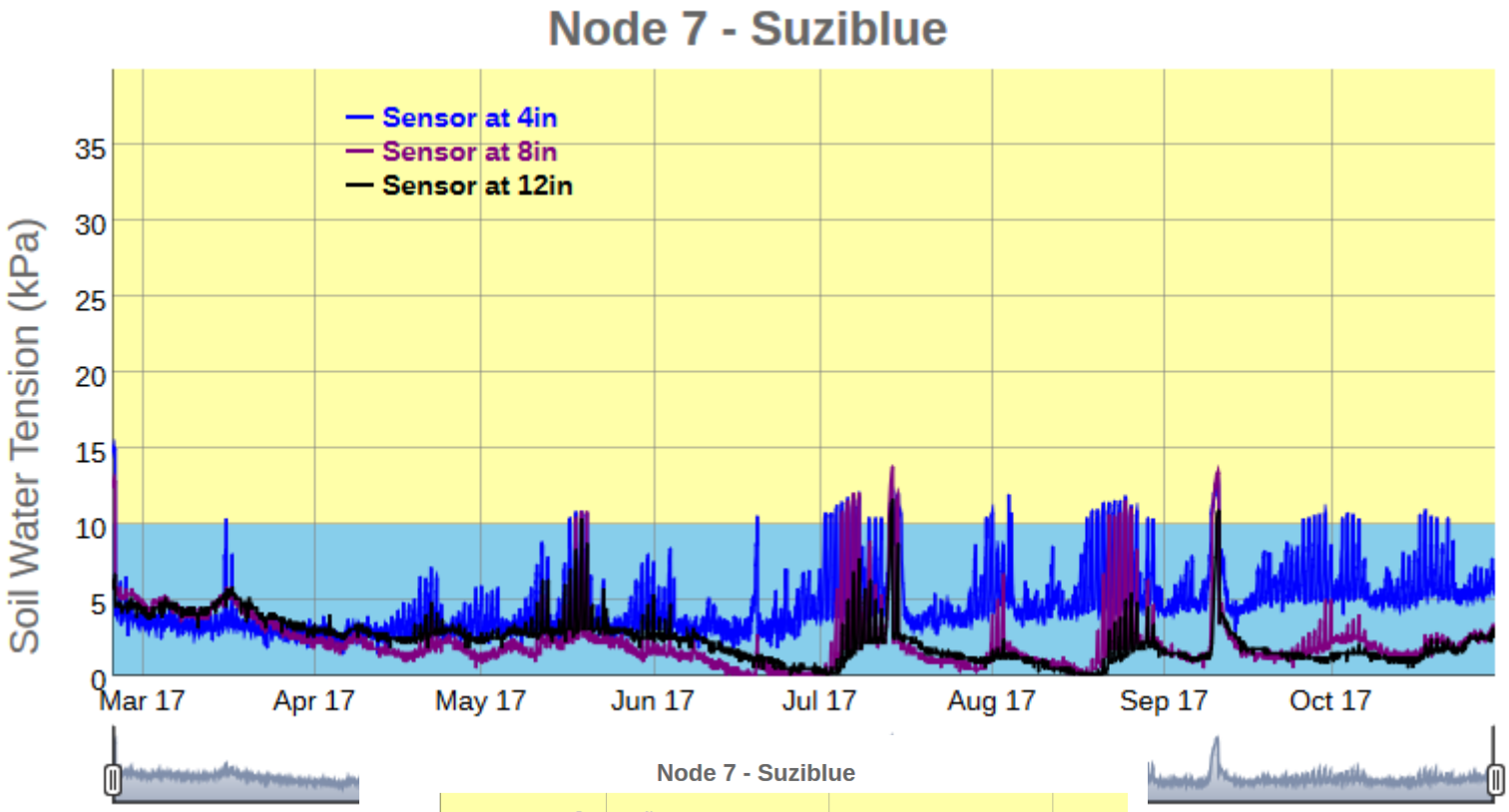
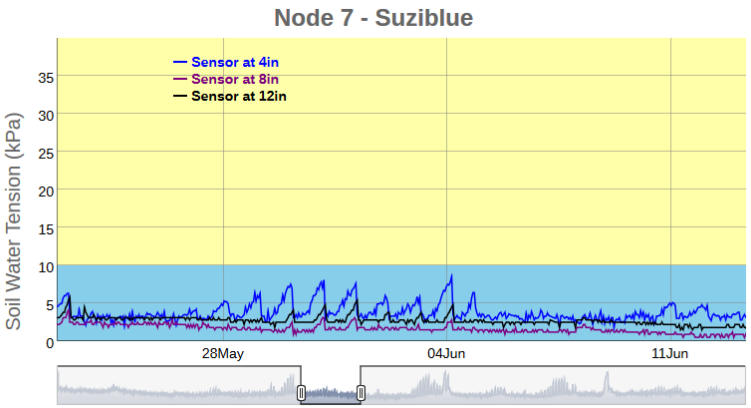
10 kPa Trigger





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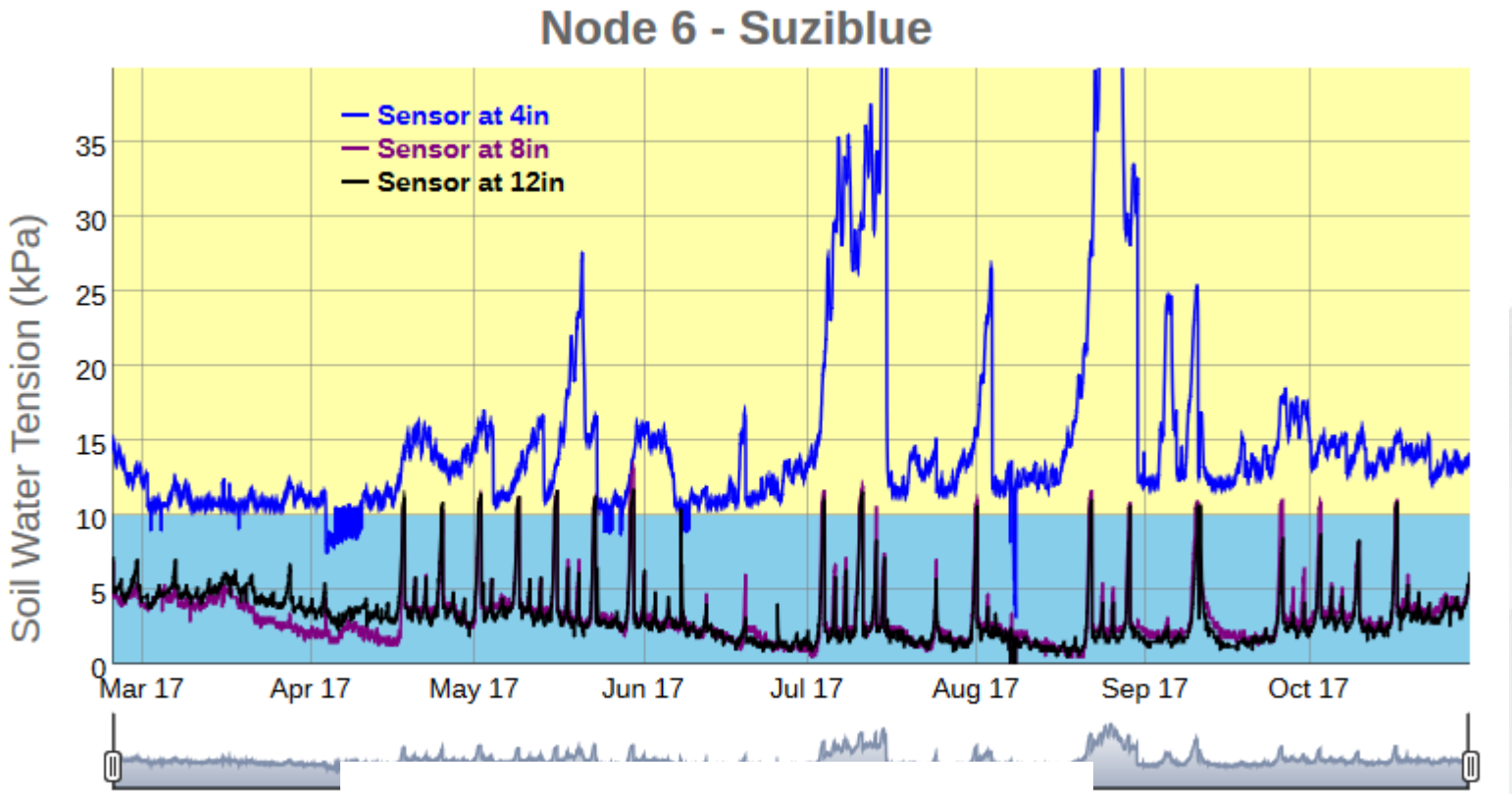

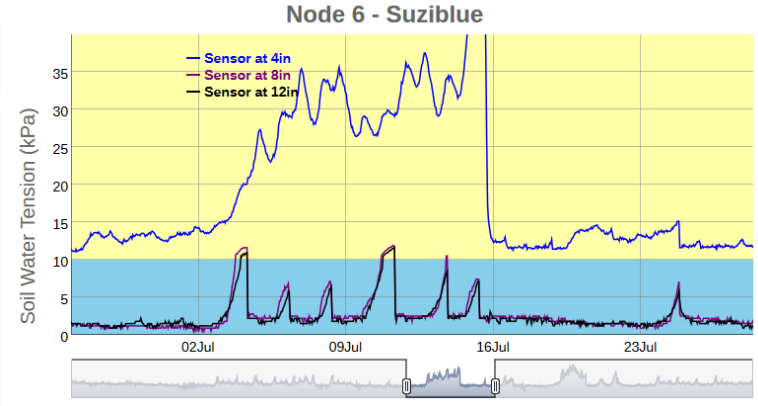

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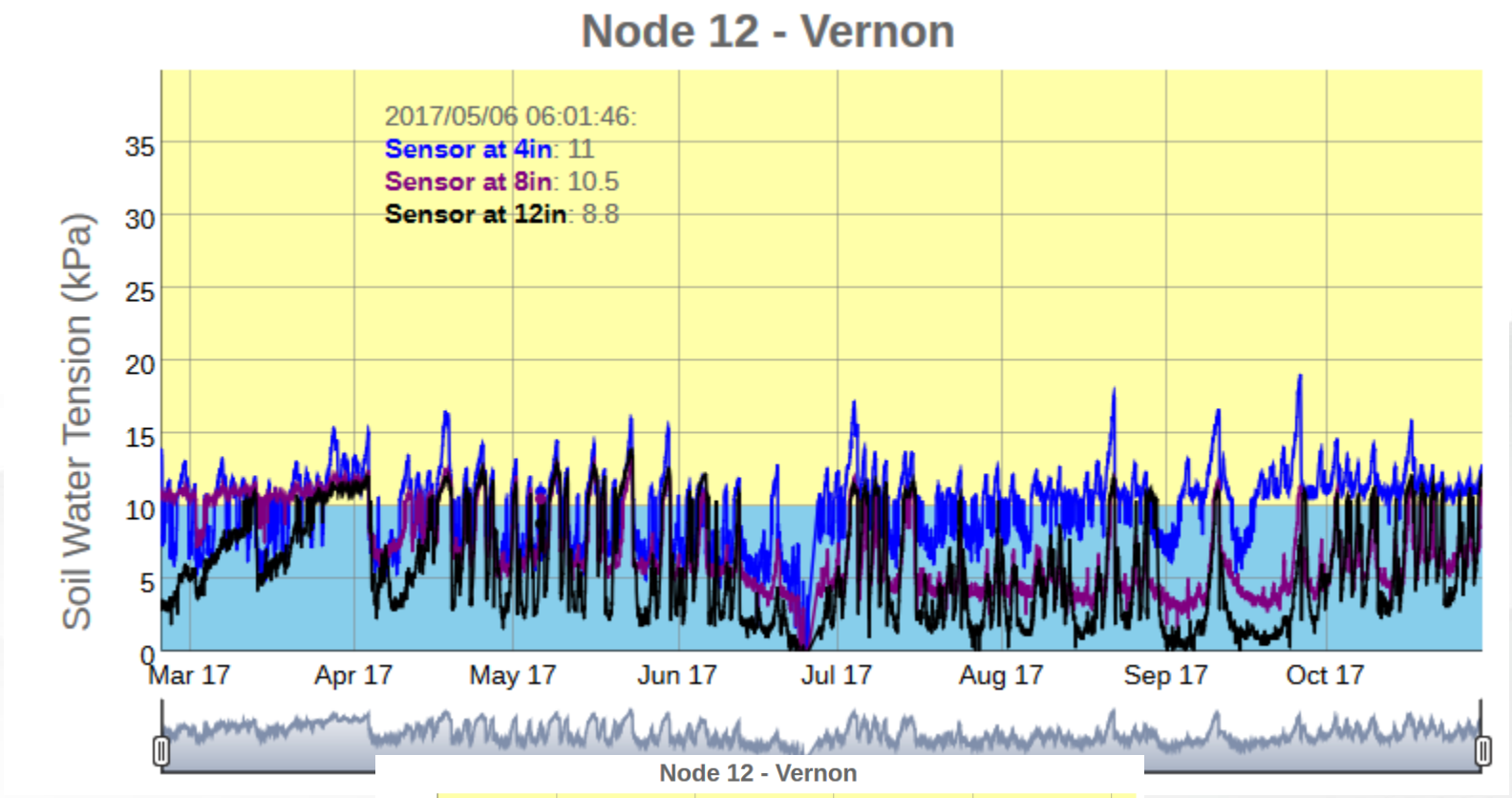
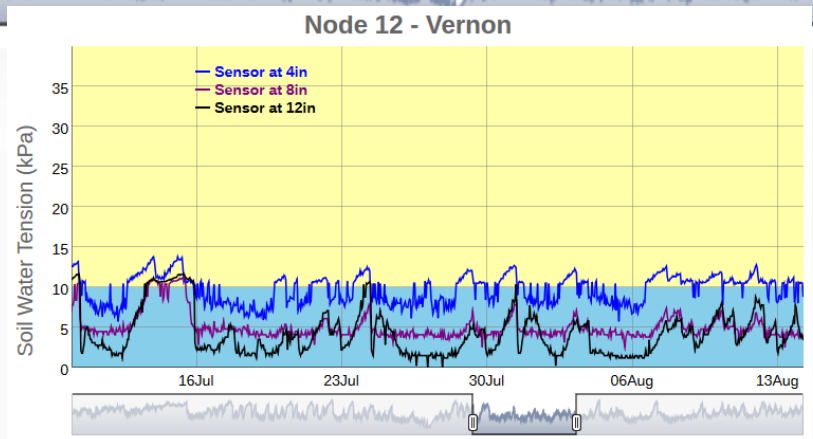
Irrigation Scheduling App





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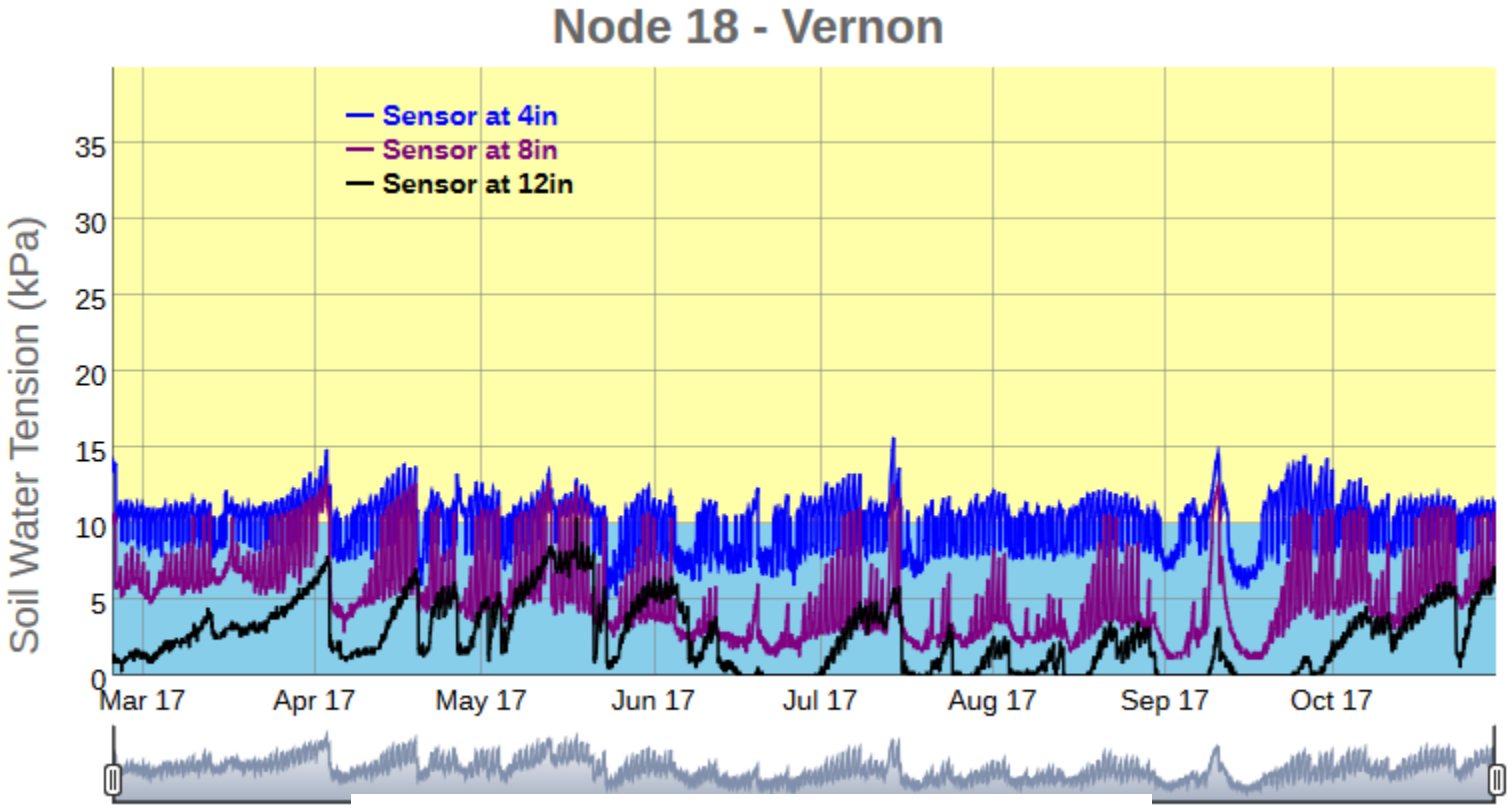

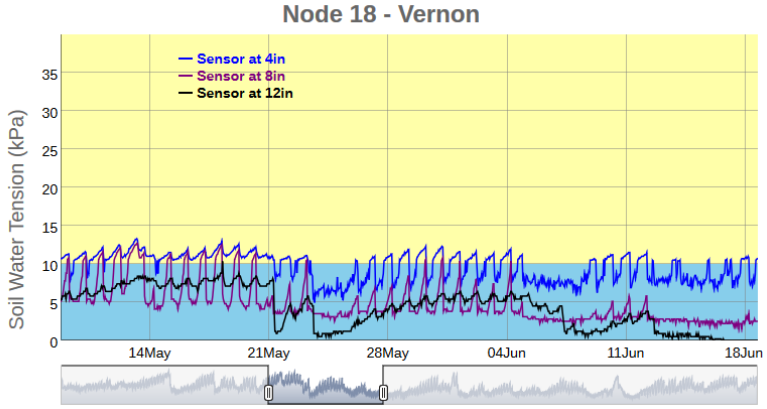

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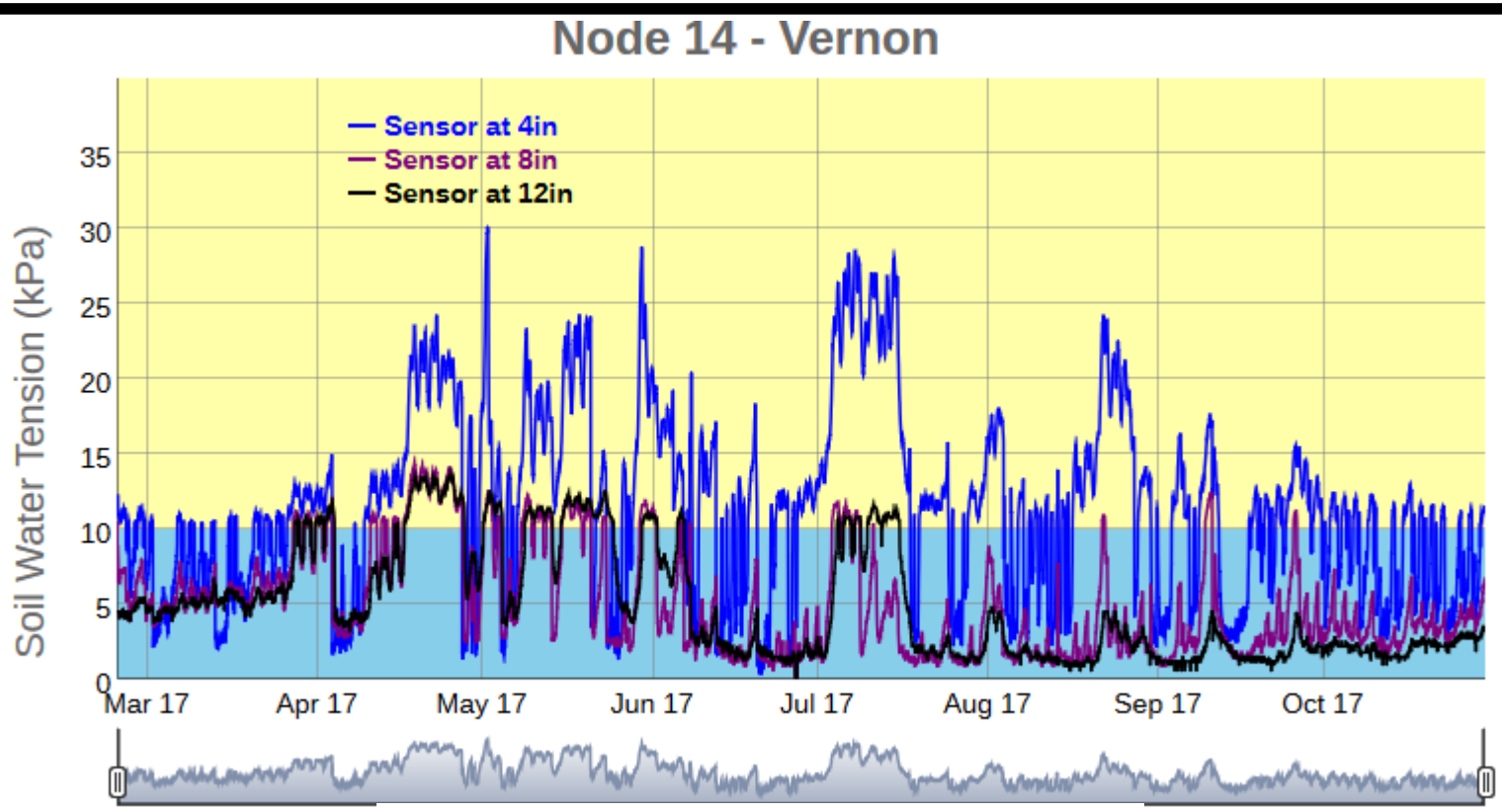

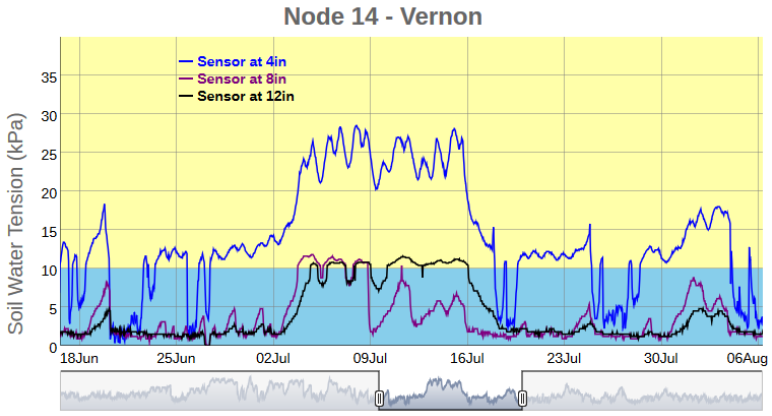

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Irrigation Scheduling App Conclusions

- The App predicts the ETc for the next 7 days
- Irrigation Recommendations = ETc for the next 7 days
  - Thus, it is up to the user to determine how to account for rainfall, the app does not do that directly.
- The App is available for download. (Search for SmartIrrigation Blueberry)
- Eliminates the use of guess work with irrigation timers and soil moisture sensors – Reduce the expenses (purchase, maintenance etc)

Irrigation Scheduling (2018)

- https://www.nass.usda.gov/Surveys/Guide_to_NASS_Surveys/Farm_and_Ranch_Irrigation/

Irrigation Scheduling Method	Entire US (%)	AL (%)	FL (%)	GA (%)	SC (%)	MS (%)
Visible Stress	78	86	83	87	89	86
Feel of Soil	40	42	36	27	22	41
Soil Moisture Sensor	12	8	16	11	12	27
Scheduling Service	8	1	5	4	3	4
Weather Report	7	1	5	8	1	4
Calendar Schedule	20	10	15	15	11	15
When Neighbor Irrigates	6	1	2	3	2	6

Irrigation Information

- **Where do farmer's get their info from??**

Irrigation Scheduling Method	Entire US (%)	AL (%)	FL (%)	GA (%)	SC (%)	MS (%)
University Extension	48	45	82	79	63	58
Private Consultant	58	34	66	36	51	66
Irrigation Equipment Dealer	41	66	47	39	35	48
Irrigation District	14	11	8	13	3	8

Barriers to Improvements in Water Conservation

1. Investing in improvements is not a priority (34%)
2. Cannot afford improvements (32.2%)
3. Improvements won't reduce costs enough to cover new costs (22.4%)
4. Risk of reduced yield (17.4%)
5. Uncertainty about future water availability (11.7%)
6. Improvements will increase management time or cost (10.3%)
7. Won't be farming long enough to justify improvements (7.7%)
8. Landlord will not share in cost (7.7%)
9. Physical Field/Crop Limits Improvements (3.5%)

Solid Set Evaluation Objectives

- Evaluation Procedures for Blueberry Uniformity
- Testing to Determine Best Operating Pressure

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Field Evaluations of Irrigation Systems: Solid Set or Portable Sprinkler Systems

Bulletin 266

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Field Evaluations of Irrigation Systems: Solid Set or Portable Sprinkler Systems[1]

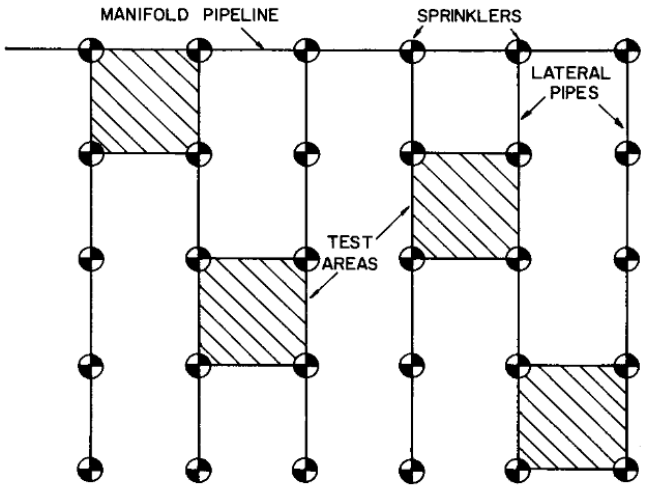

Figure 3. Example distribution of locations of catch can tests in a large irrigated field.

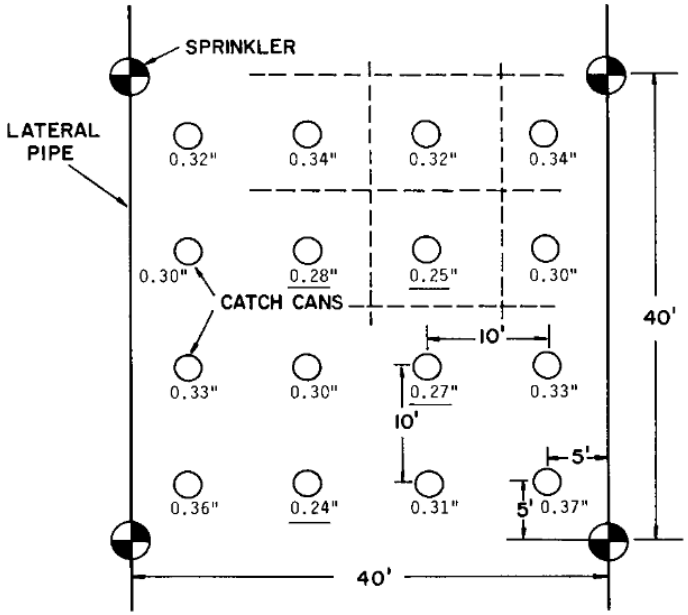

Figure 2. Typical layout of catch cans for uniformity.

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What affects uniformity?

-Lateral spacing

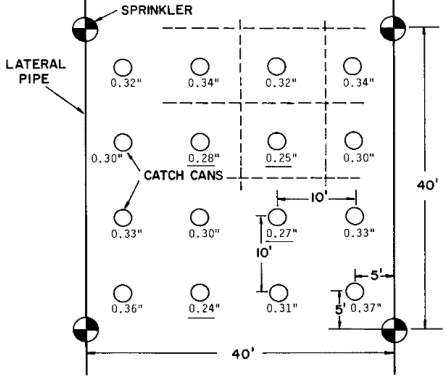
-Sprinkler spacing

-Pressure

Sprinkler Type

Main Point:
Each System is Different

Rainbird LF2400



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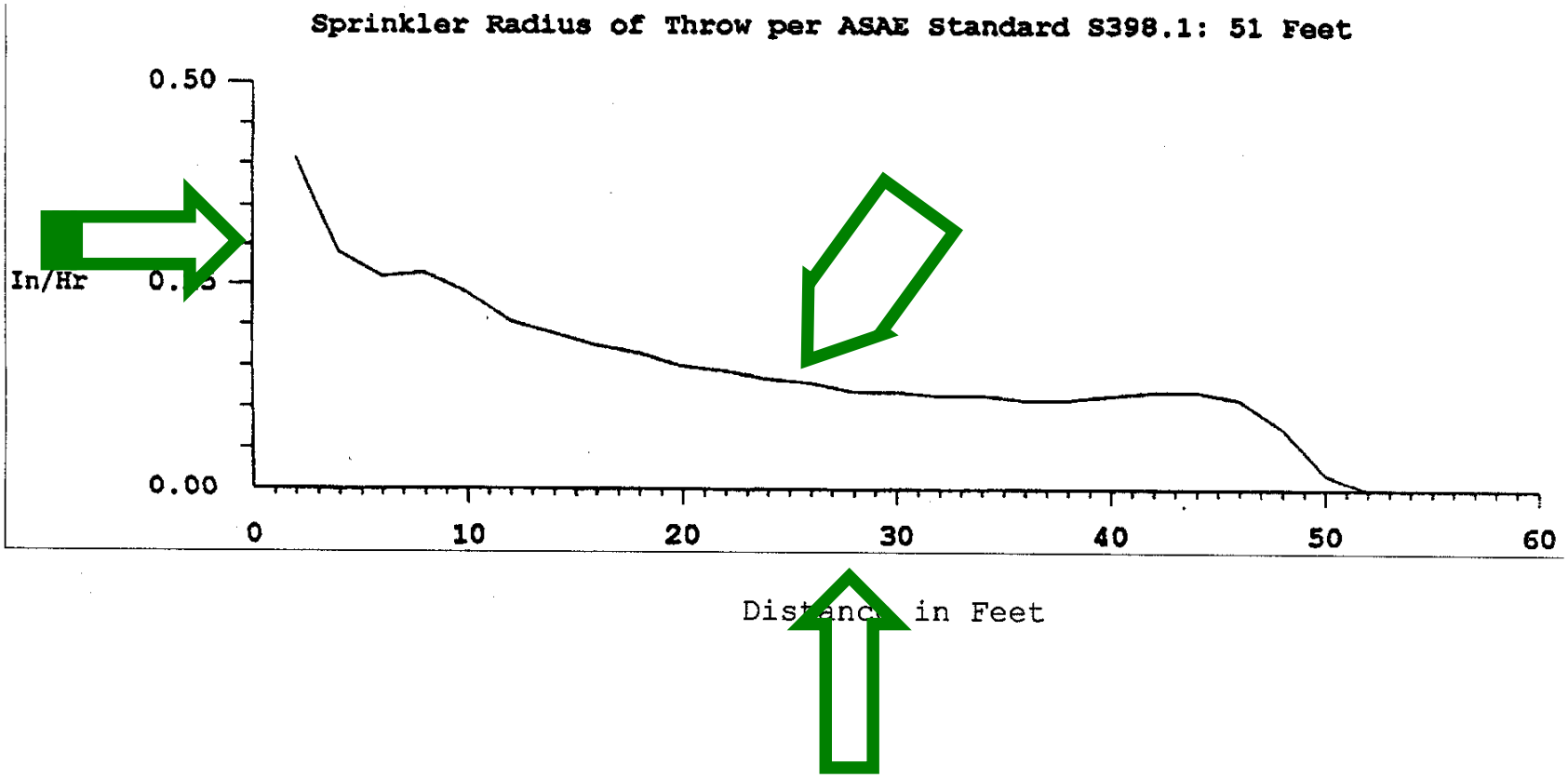
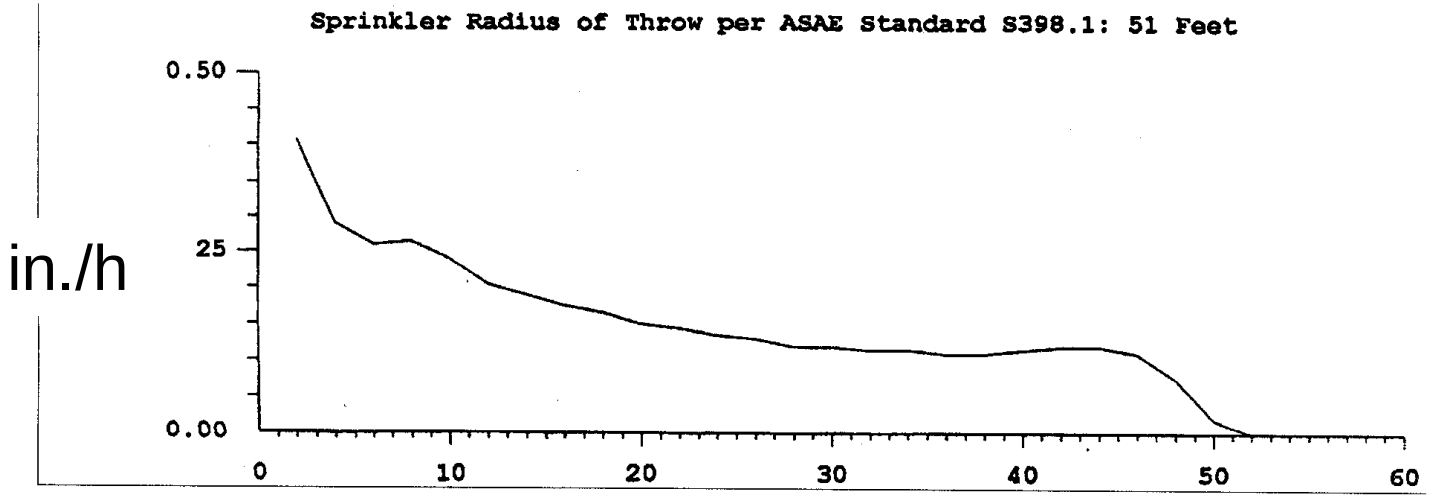
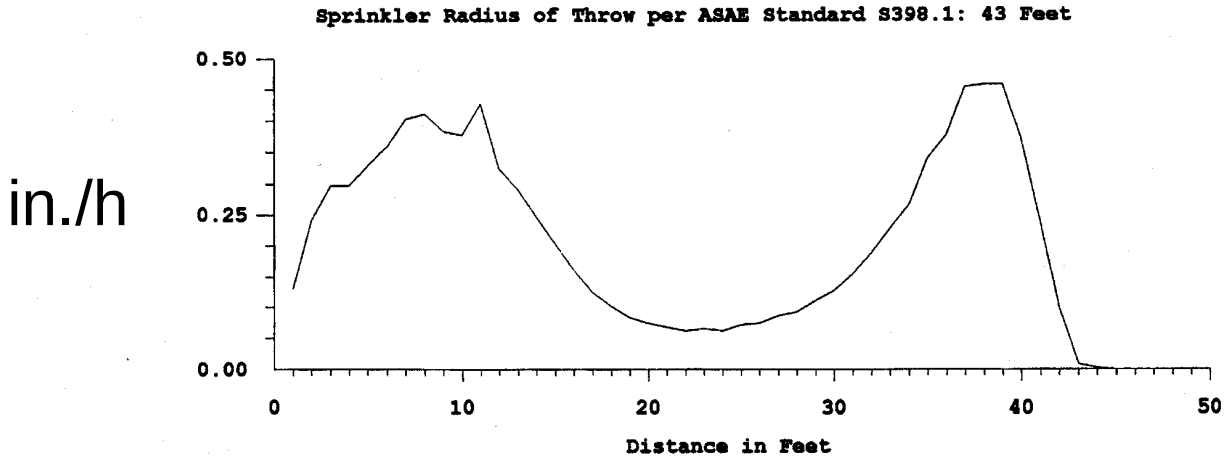
Sprinkler Profile 1



Compare Sprinkler Profiles

Better Profile





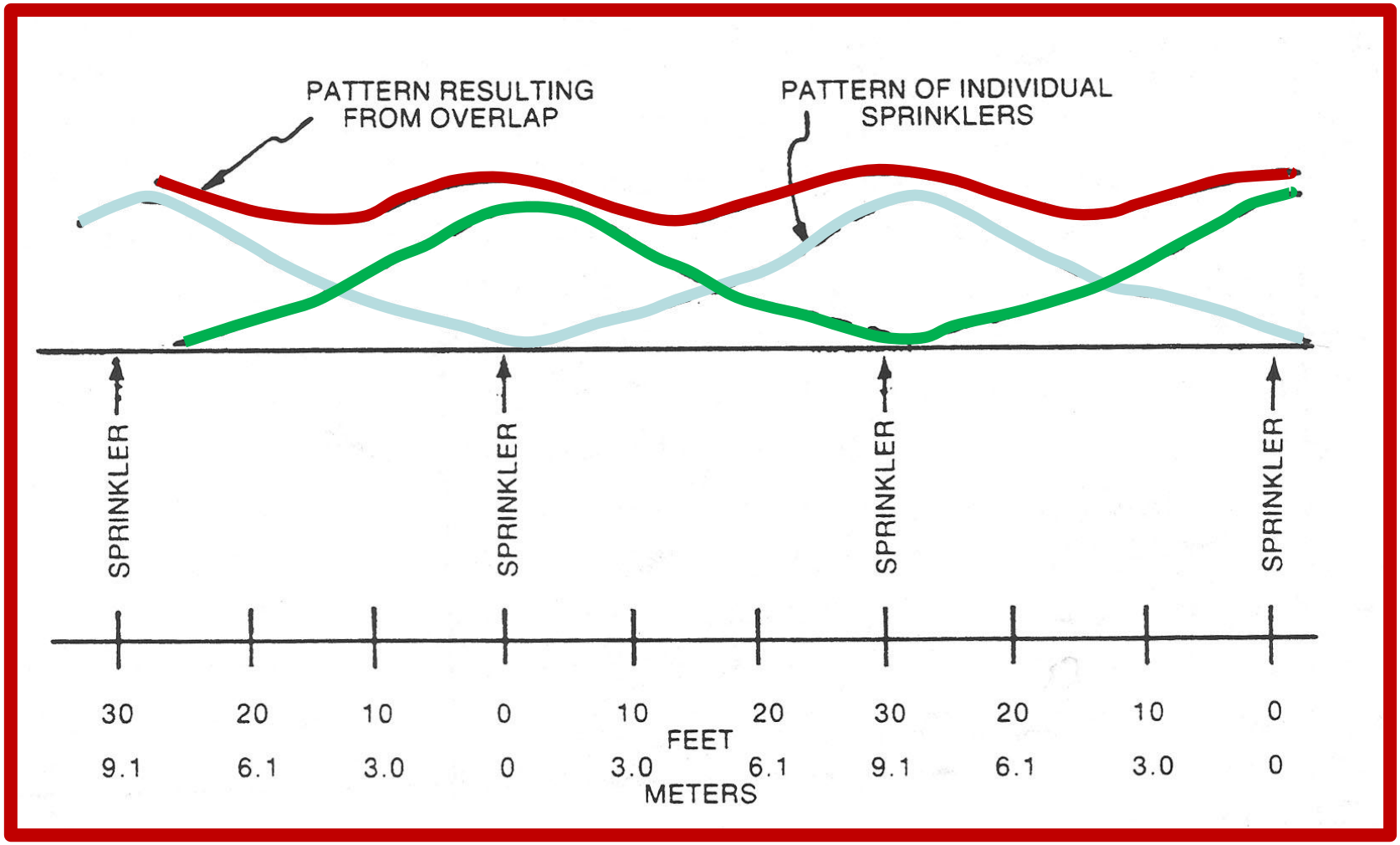
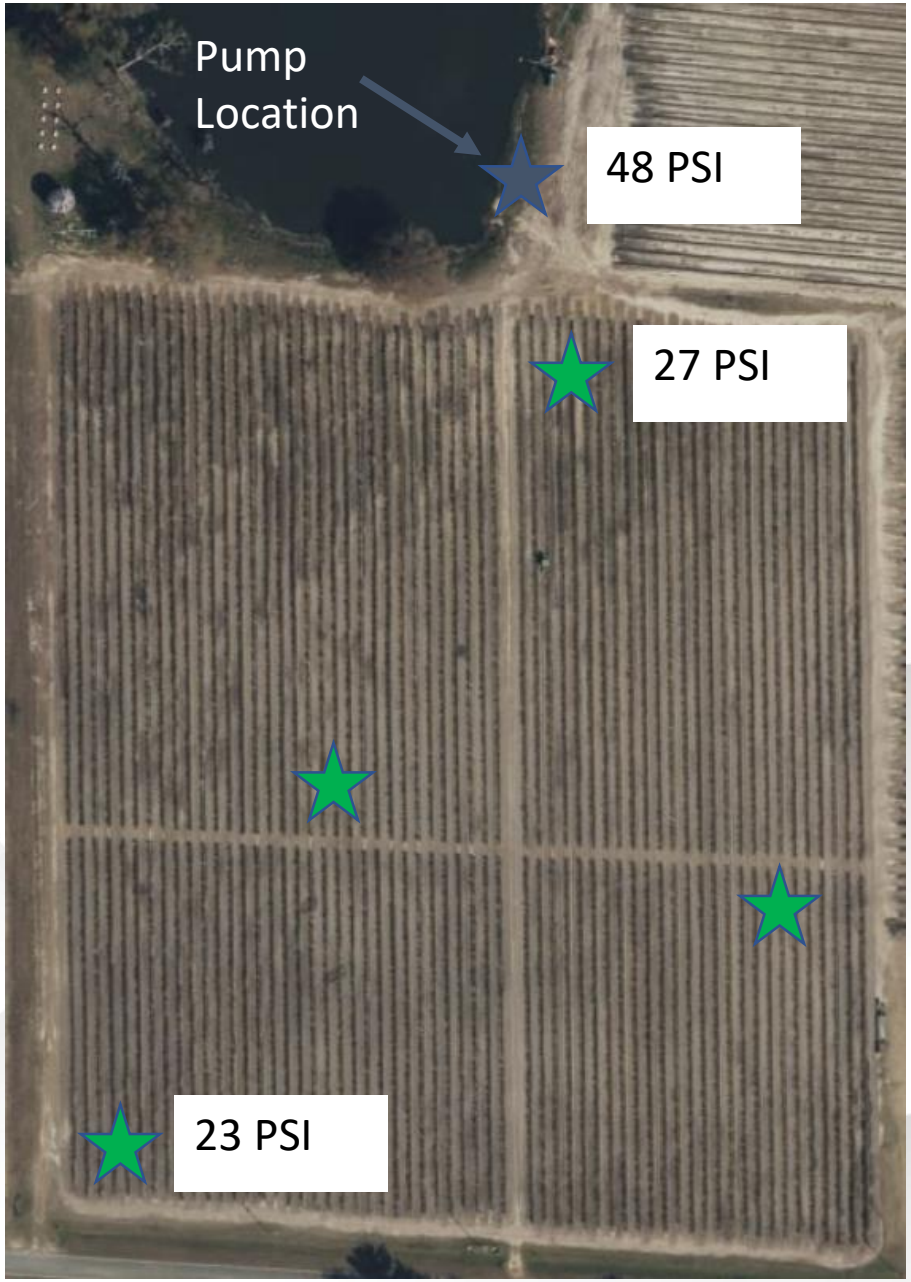


Illustration from Irrigation, 5th edition



PSI Losses
21 PSI between pump and field
4 PSI across field

Recommendation:
at least 3 pressure gauges

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Testing Methods

All Graphs are 1 Hour Run Time!!!

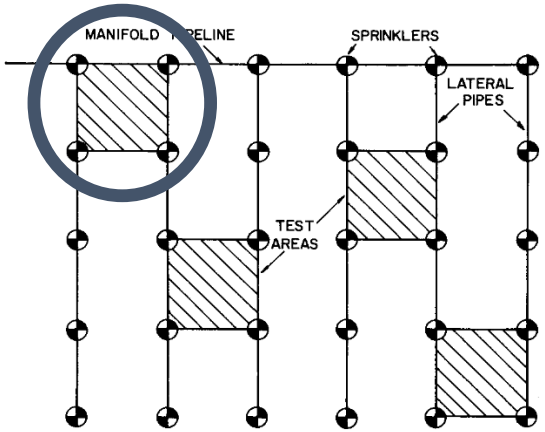
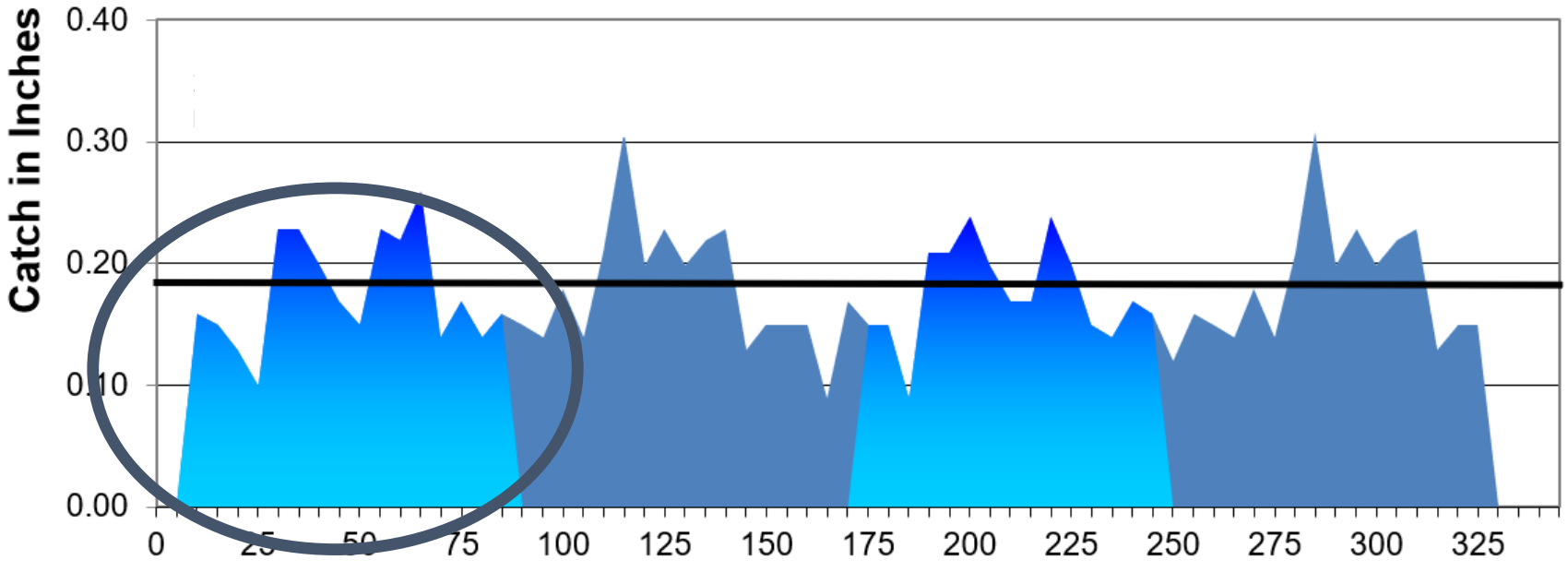


Figure 3. Example distribution of locations of catch can tests in a large irrigated field.



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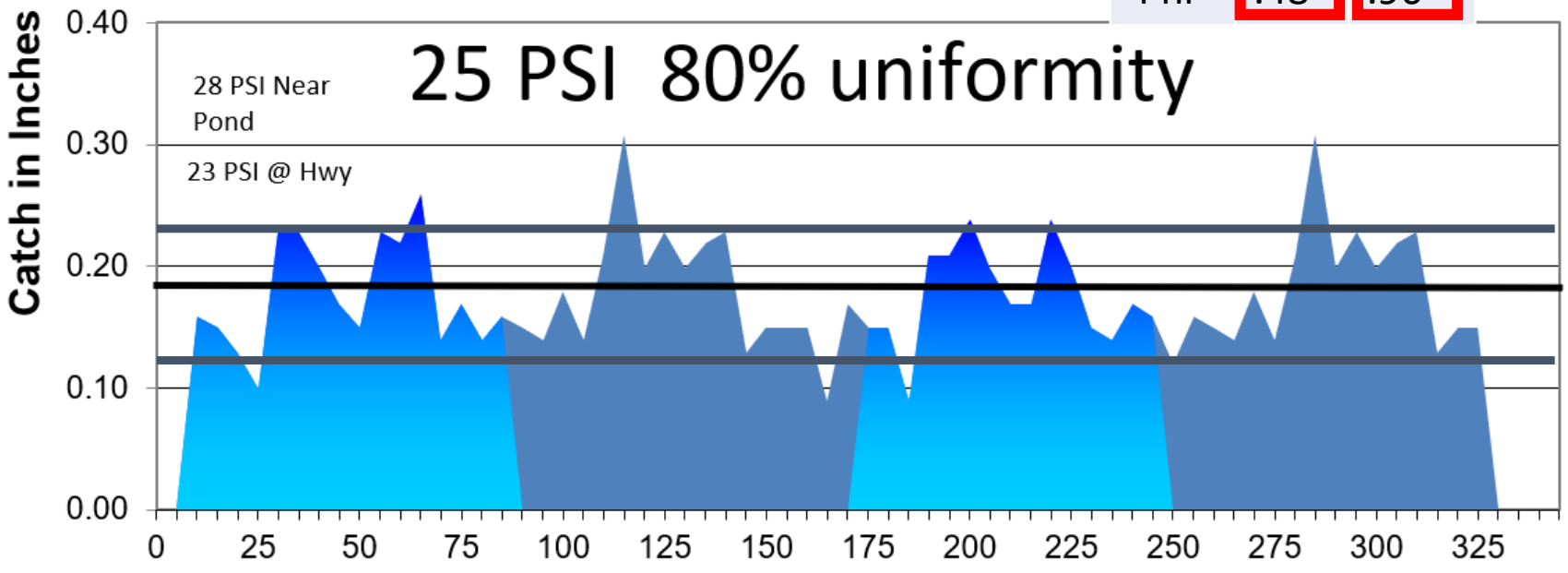
25 PSI Test

Time	Low	High
1 hr	.12	.24
2 hr	.24	.48
3 hr	.36	.72
4 hr	.48	.96



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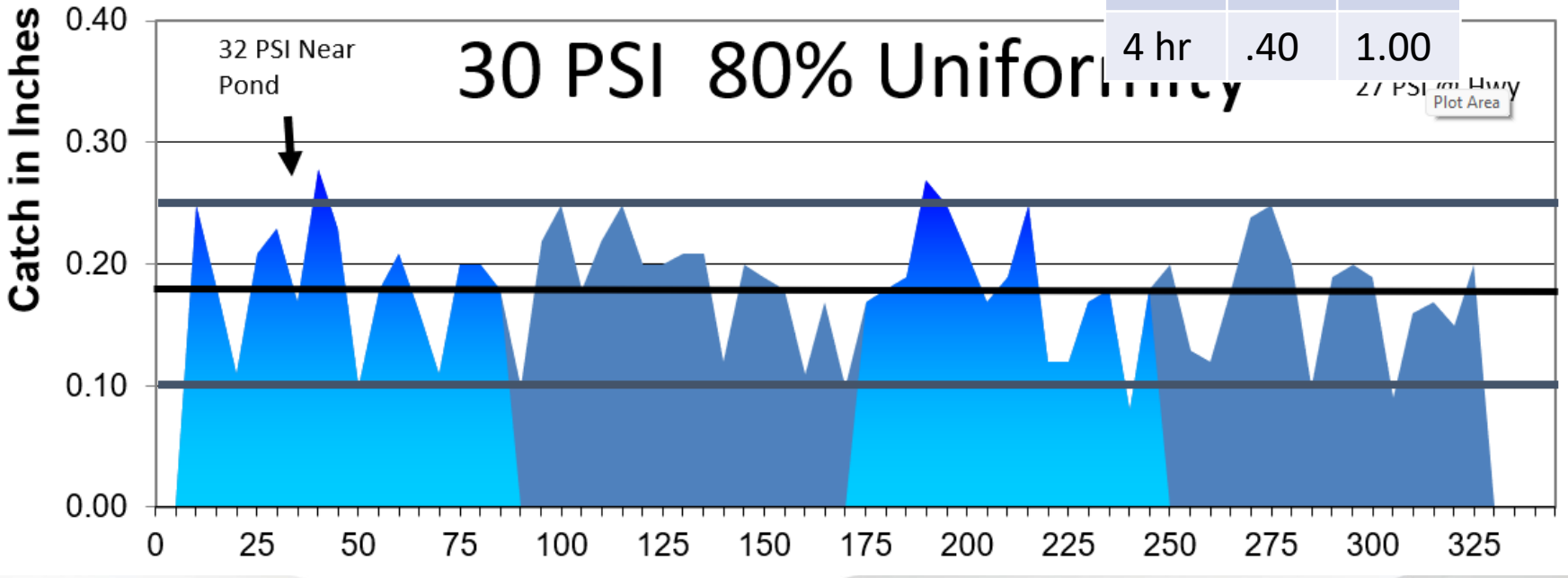
30 PSI Test

Time	Low	High
1 hr	.10	.25
2 hr	.20	.50
3 hr	.30	.75
4 hr	.40	1.00



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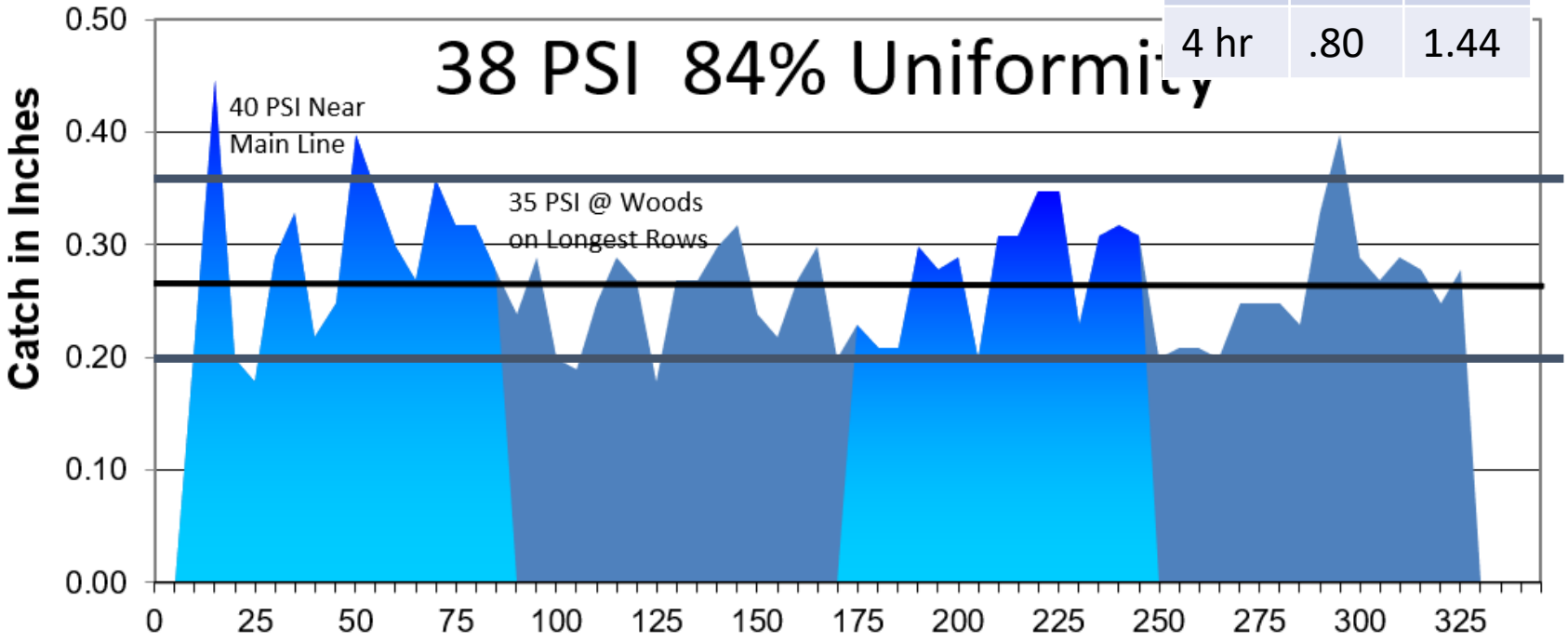
38 PSI Test

Time	Low	High
1 hr	.20	.36
2 hr	.40	.72
3 hr	.60	.1.08
4 hr	.80	1.44



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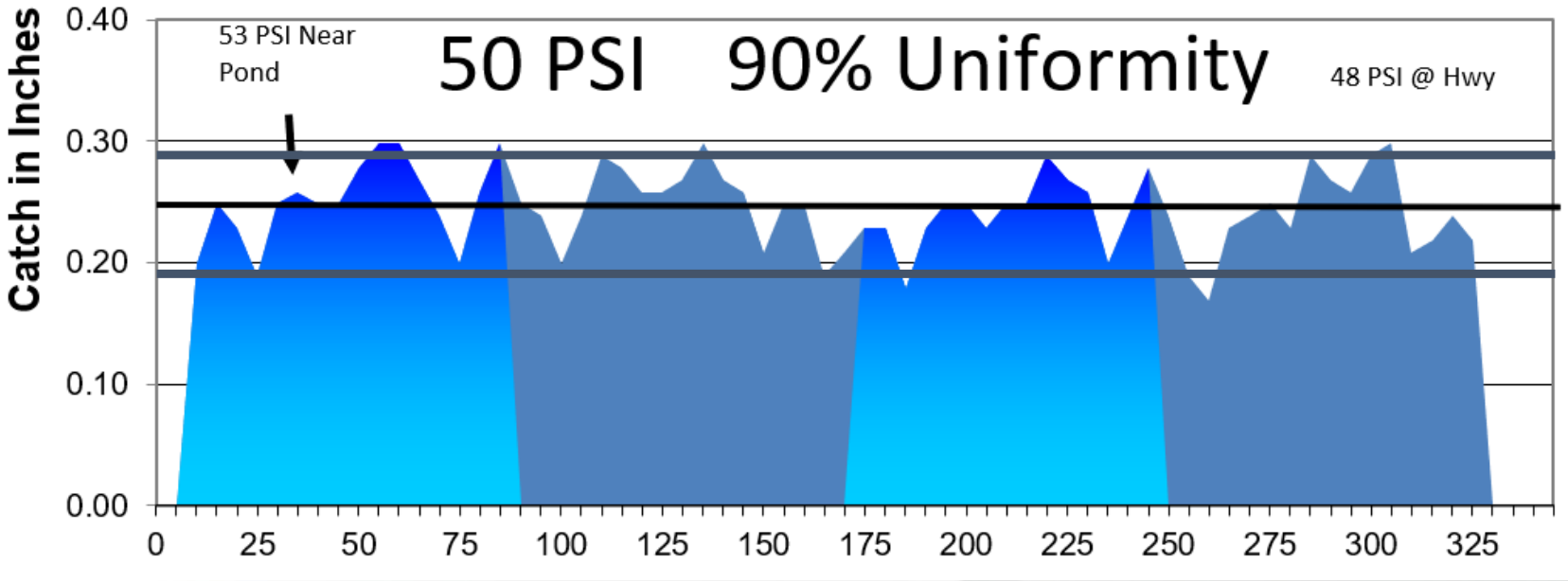
50 PSI Test

Time	Low	High
1 hr	.19	.28
2 hr	.38	.56
3 hr	.57	.84
4 hr	.76	1.12



Fertigation/Chemigation

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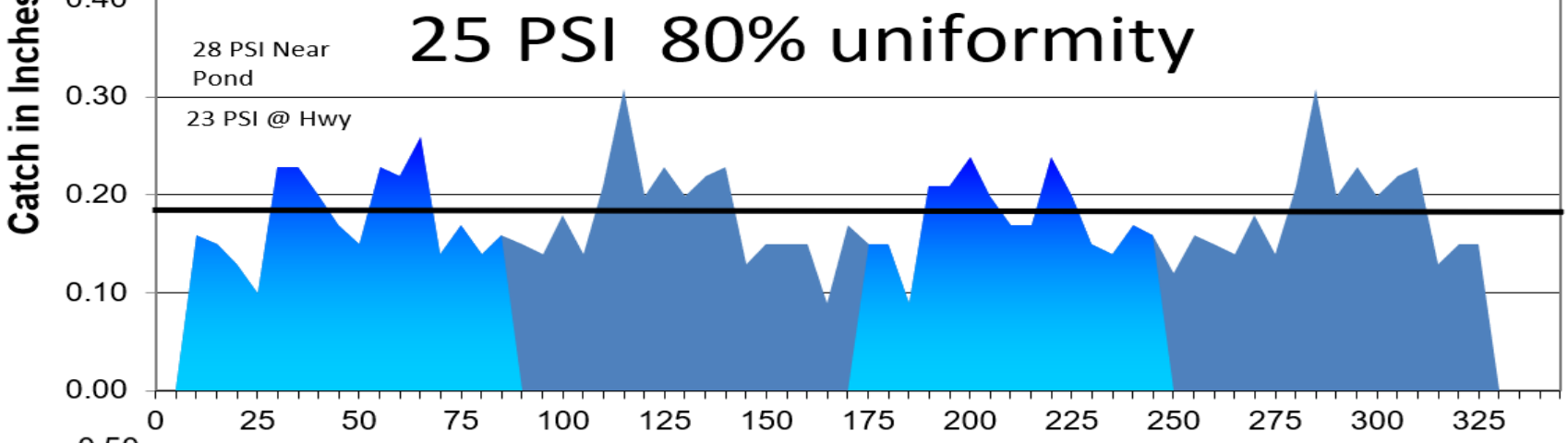
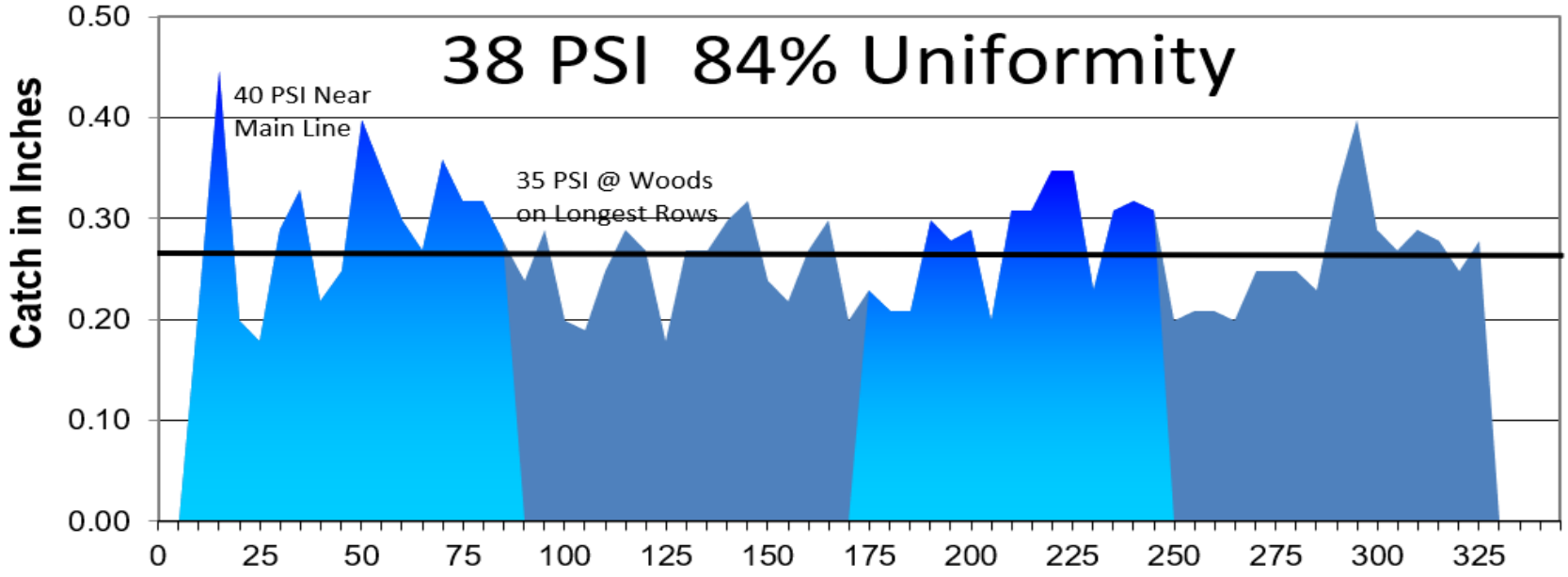
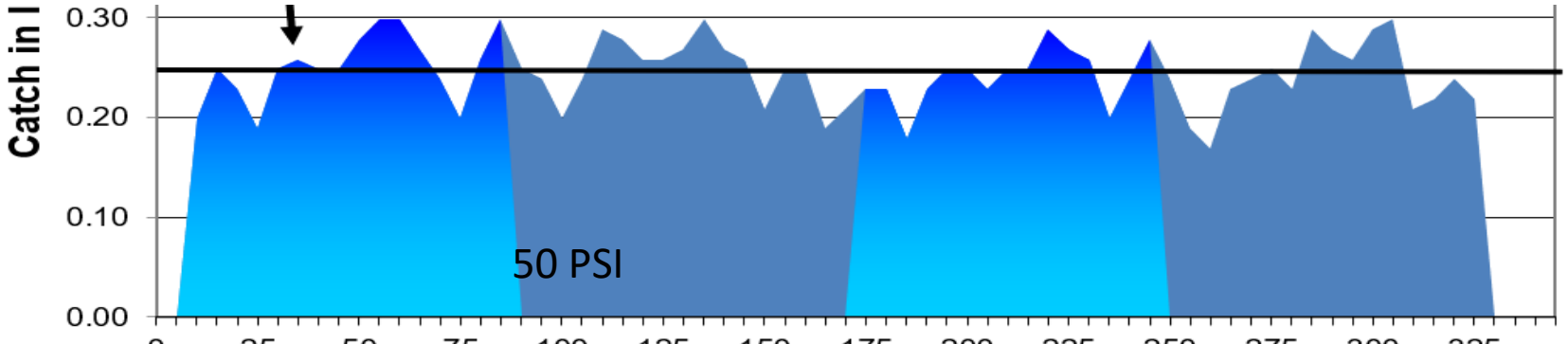

25 PSI 80% uniformity
28 PSI Near Pond
23 PSI @ Hwy
Catch in Inches
0.30
0.20
0.10
0.00
0
25
50
75
100
125
150
175
200
225
250
275
300
325


38 PSI 84% Uniformity
40 PSI Near Main Line
35 PSI @ Woods on Longest Rows
Catch in Inches
0.50
0.40
0.30
0.20
0.10
0.00
0
25
50
75
100
125
150
175
200
225
250
275
300
325


Catch in I
0.30
0.20
0.10
0.00
50 PSI

Supporters

- Dr. Wesley Porter, UGA Irrigation and Precision Ag Specialist
- David Hall, East Georgia Water Educator
- James Jacobs, Pierce County Extension Agent
- Zack Williams, Bacon County Extension Agent
- Davis Farms
- MBG, Ben Cantrell

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Thanks for your attention.

Jason Mallard

Area Water Agent
South Georgia
PO Box 8112
Statesboro, GA 30460
912-690-3001
jmallard@uga.edu

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