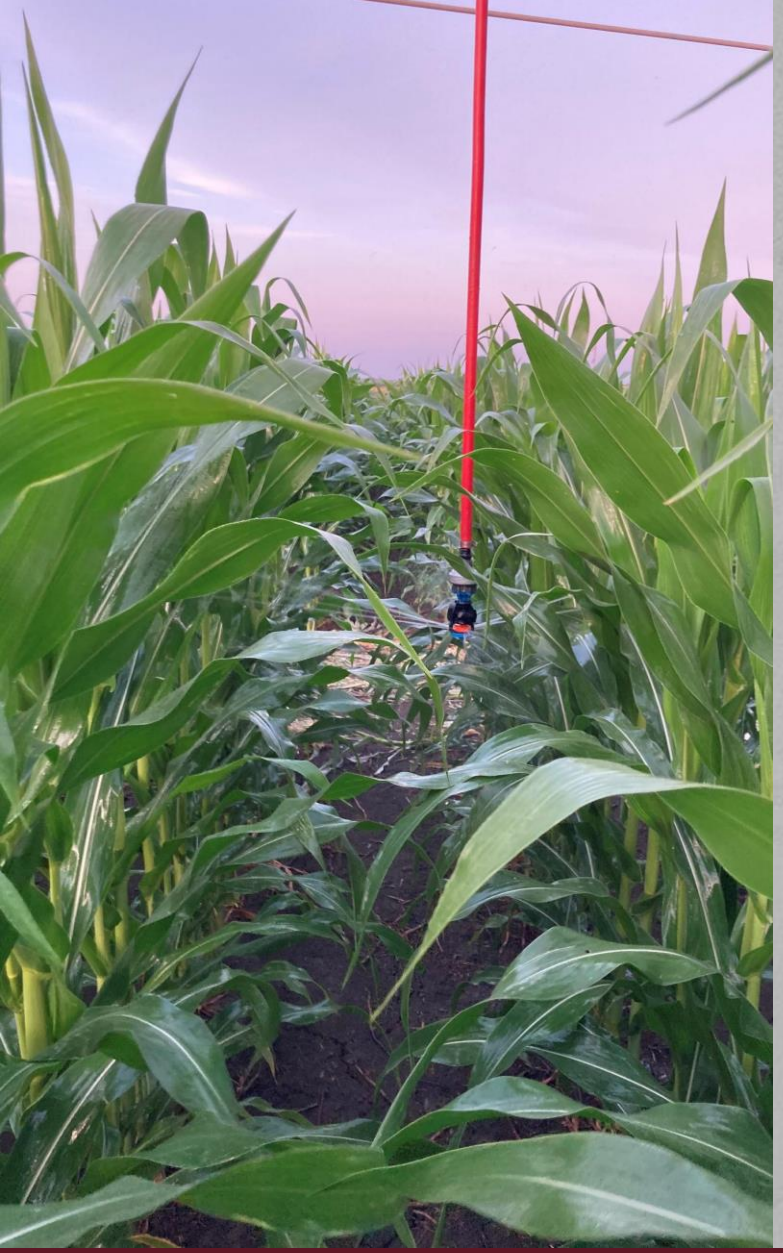


Pivot Irrigation Strategies to Maximize Yield and Profitability

Dave Spencer
Mississippi State University

Pivot Basics

Sensor use and placement	• In pivot-irrigated field • In relation to crop row
When and how much	• Sensor thresholds • Low volume/fast spin vs more volume/slow spin
Adapting to your scenario	• Pivot capacity • Full circle vs partial circles

When to Irrigate

Goal: Never stress crop

When to Irrigate

Goal: Never stress crop

How do you determine how close to stress?

When to Irrigate

Goal: Never stress crop

How do you determine how close to stress?

When to Irrigate

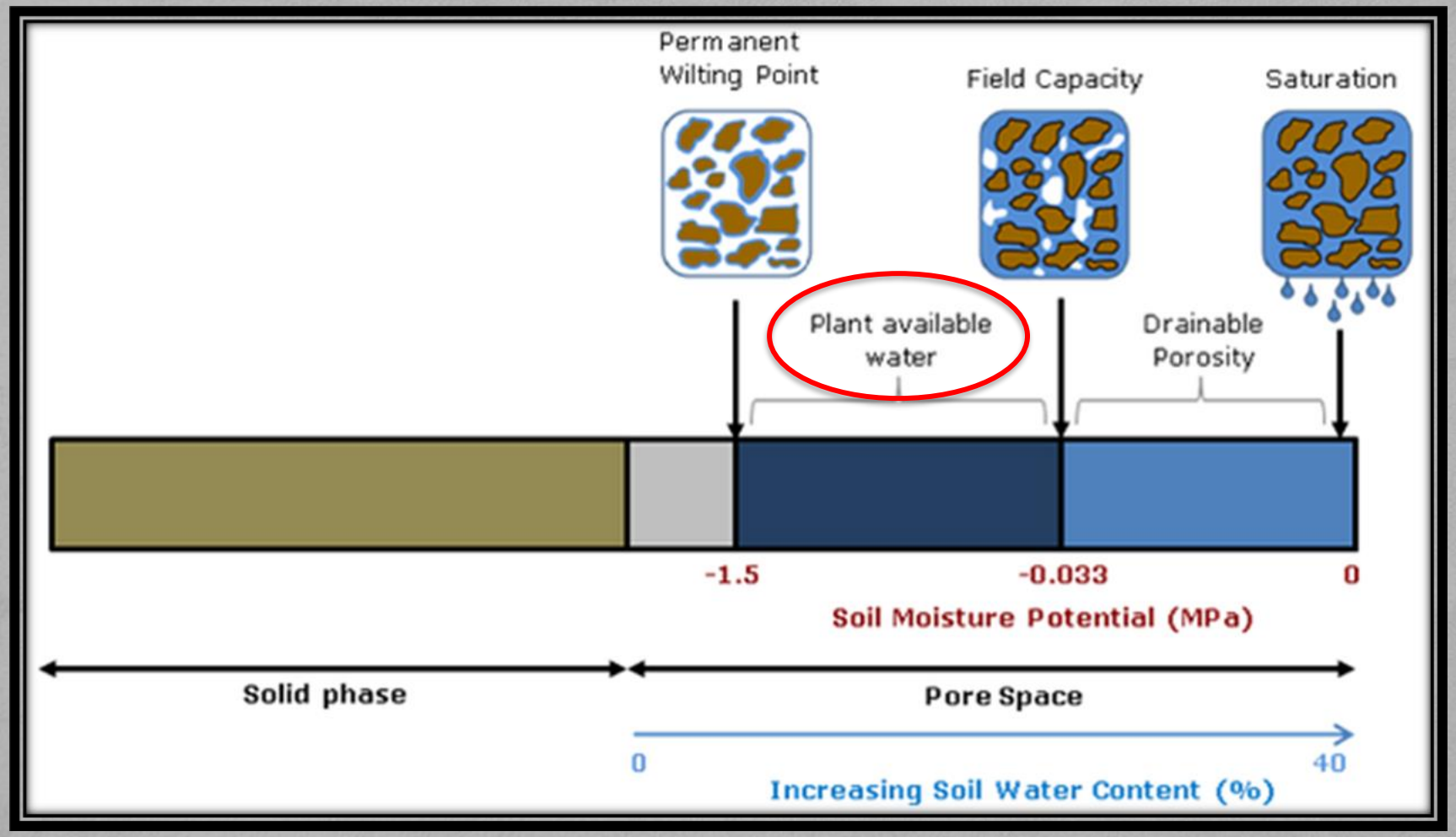
Goal: Never stress crop

How do you determine how close to stress?

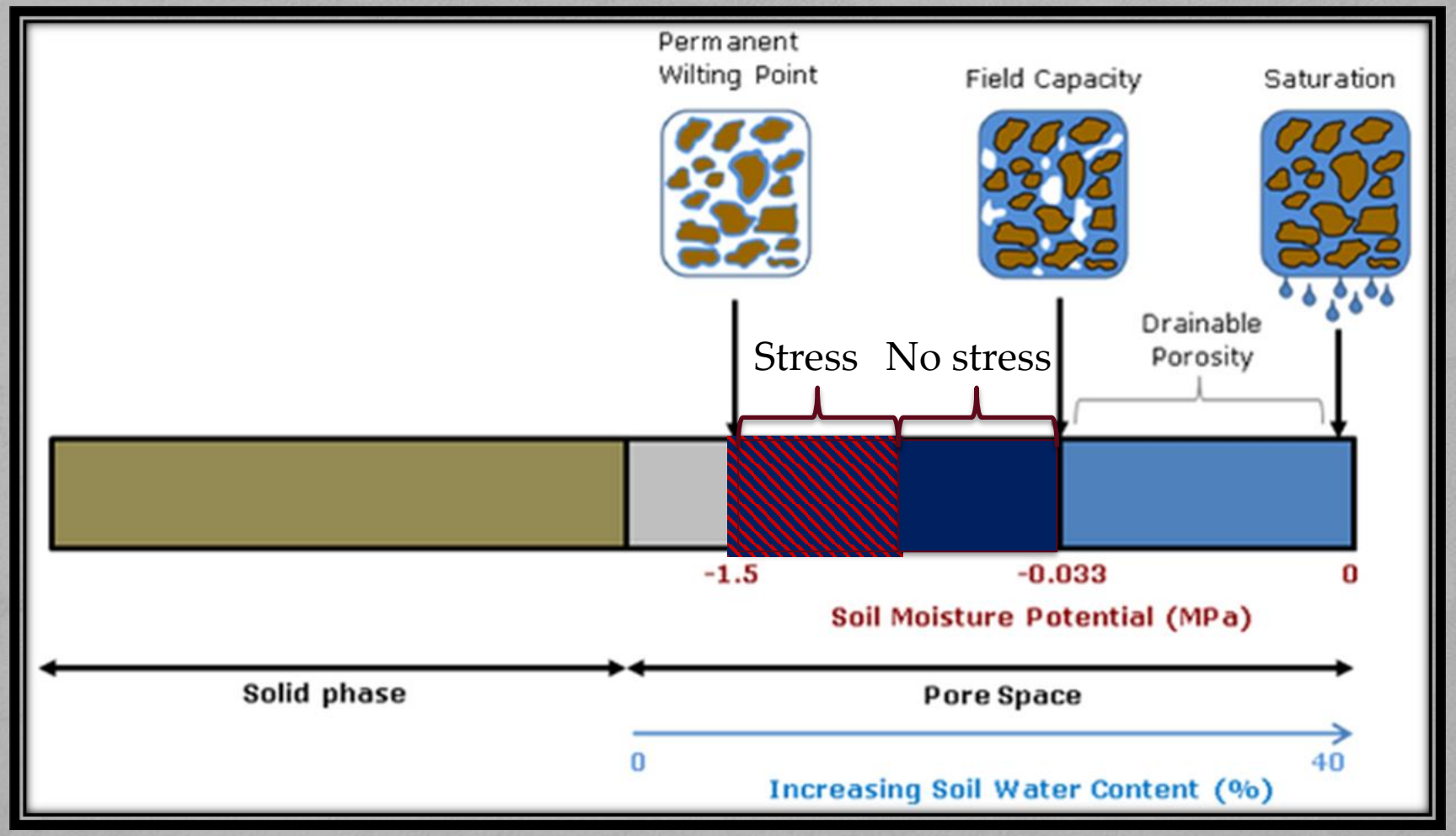
When to Irrigate

- Most accurate: in-situ measurement
- Soil moisture sensors
- Soil water tension – how hard is it to extract water from soil
- Placement affects performance

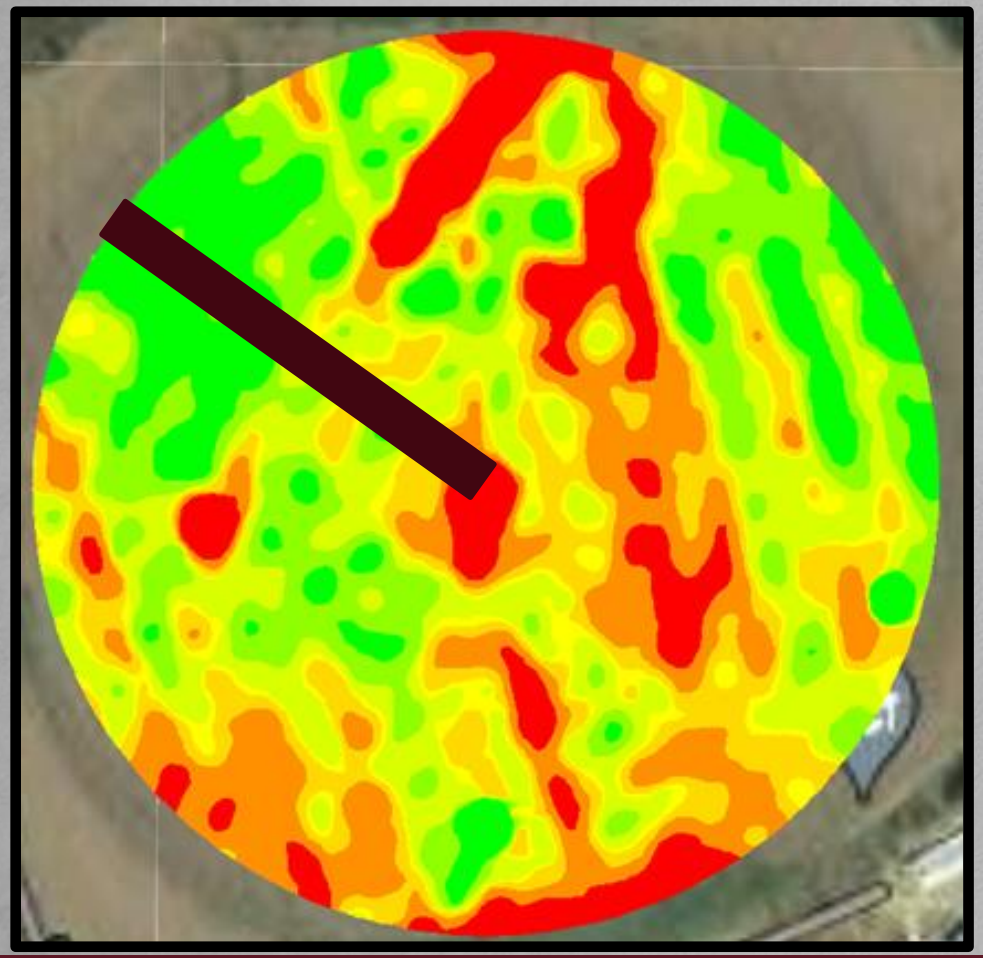
When to Irrigate – Water in Soil Profile



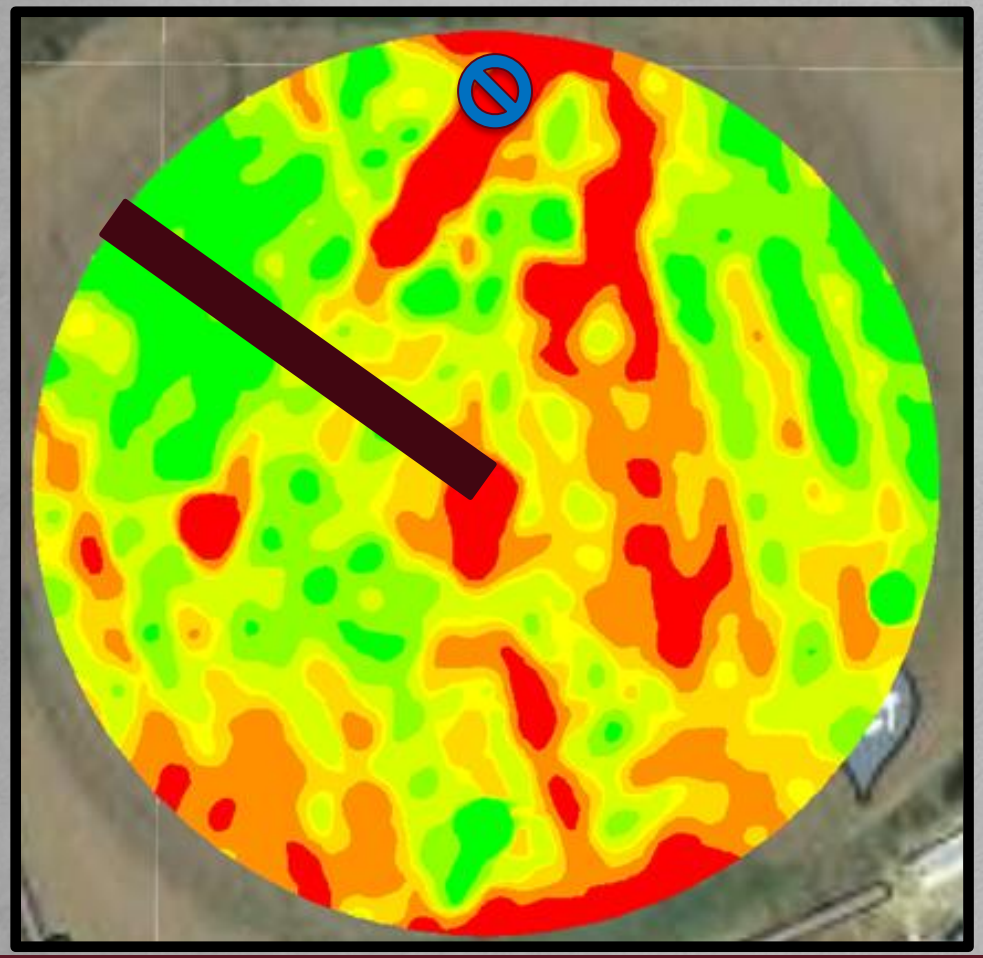
When to Irrigate – Water in Soil Profile



Sensor Placement

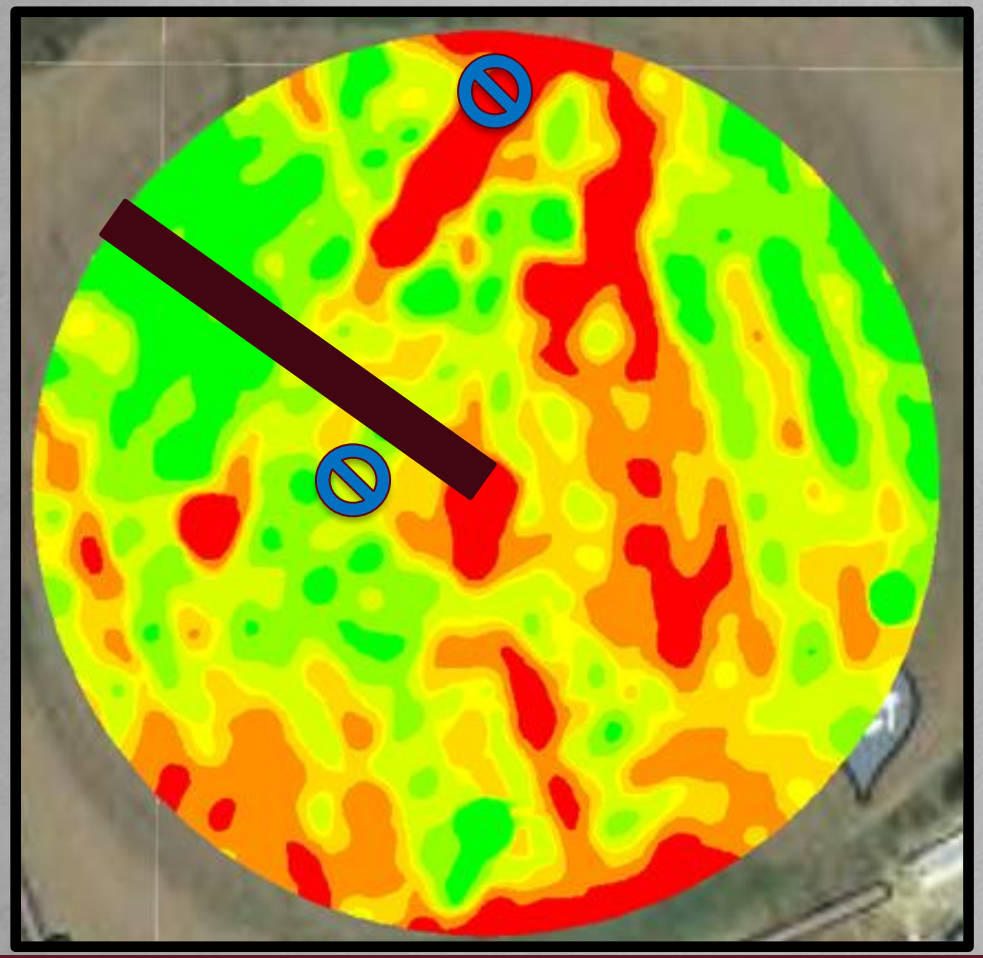


Sensor Placement



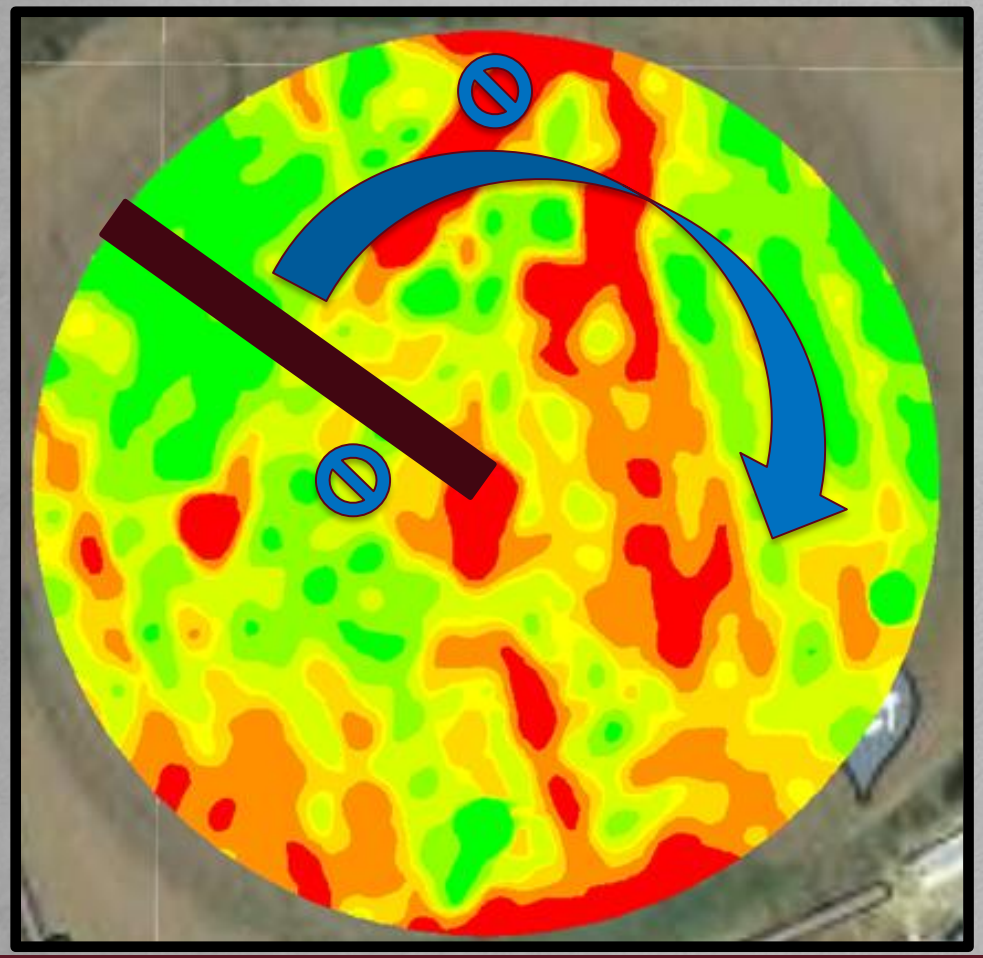
- Representative yield area

Sensor Placement



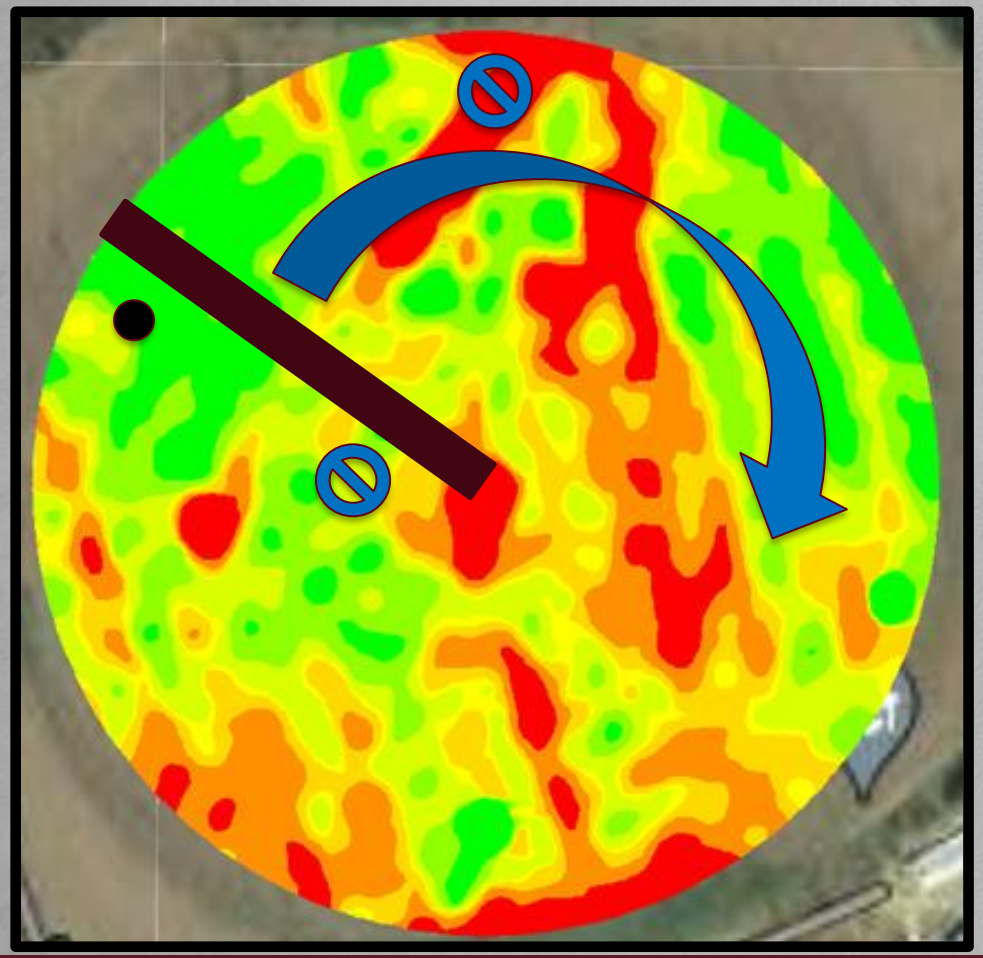
- Representative yield area
- Outer spans (not last span)

Sensor Placement



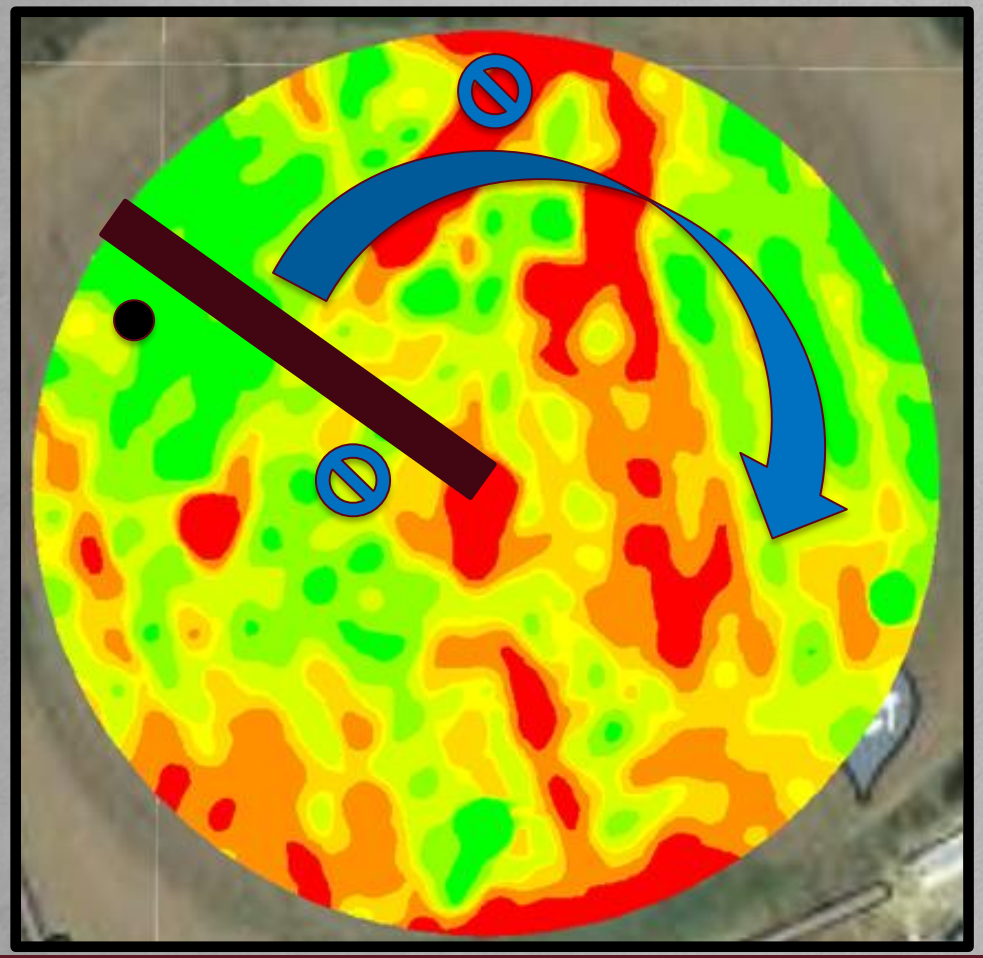
- Representative yield area
- Outer spans (not last span)
- End of pivot spin

Sensor Placement



- Representative yield area
- Outer spans (not last span)
- End of pivot spin
- On top of bed

Sensor Placement



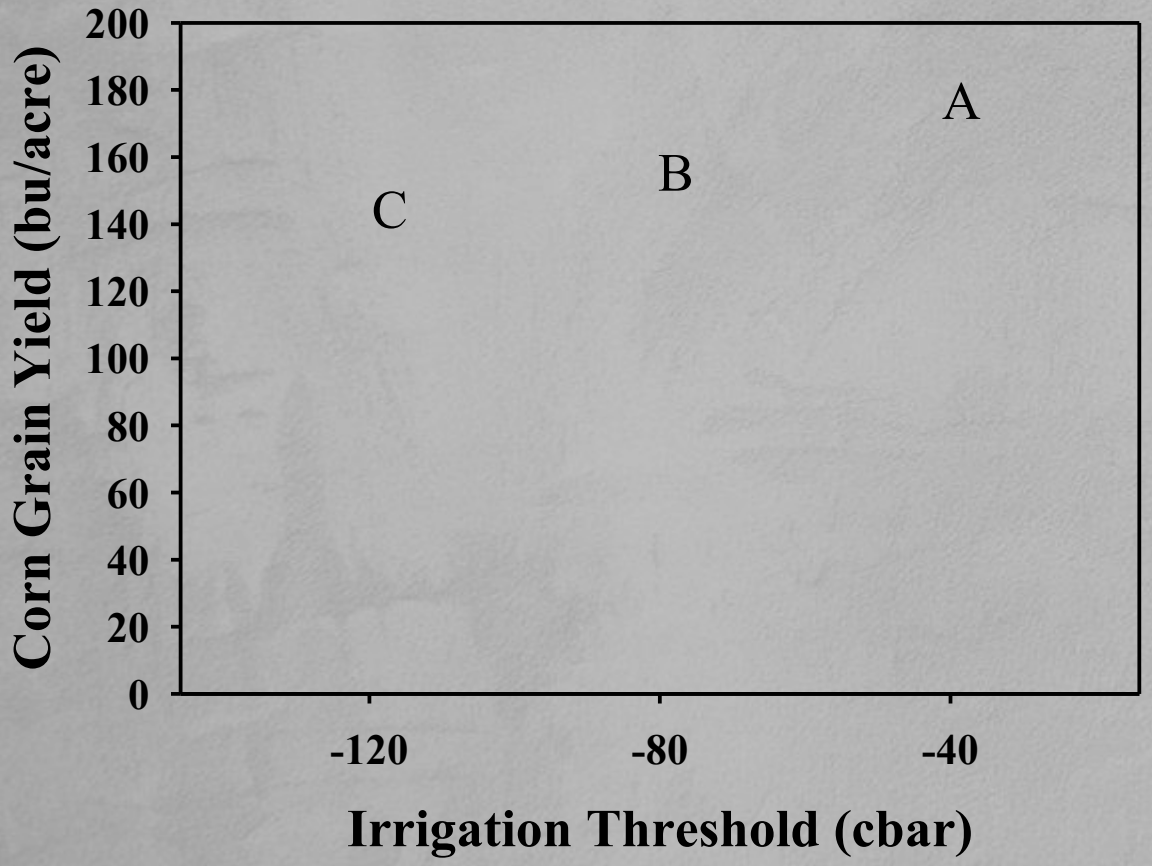
- Representative yield area
- Outer spans (not last span)
- End of pivot spin
- On top of bed
- Good stand, not traffic row

Pivot Basics

Sensor use and placement	• In pivot-irrigated field • In relation to crop row
When and how much	• Sensor thresholds • Low volume/fast spin vs more volume/slow spin
Adapting to your scenario	• Pivot capacity • Full circle vs partial circles

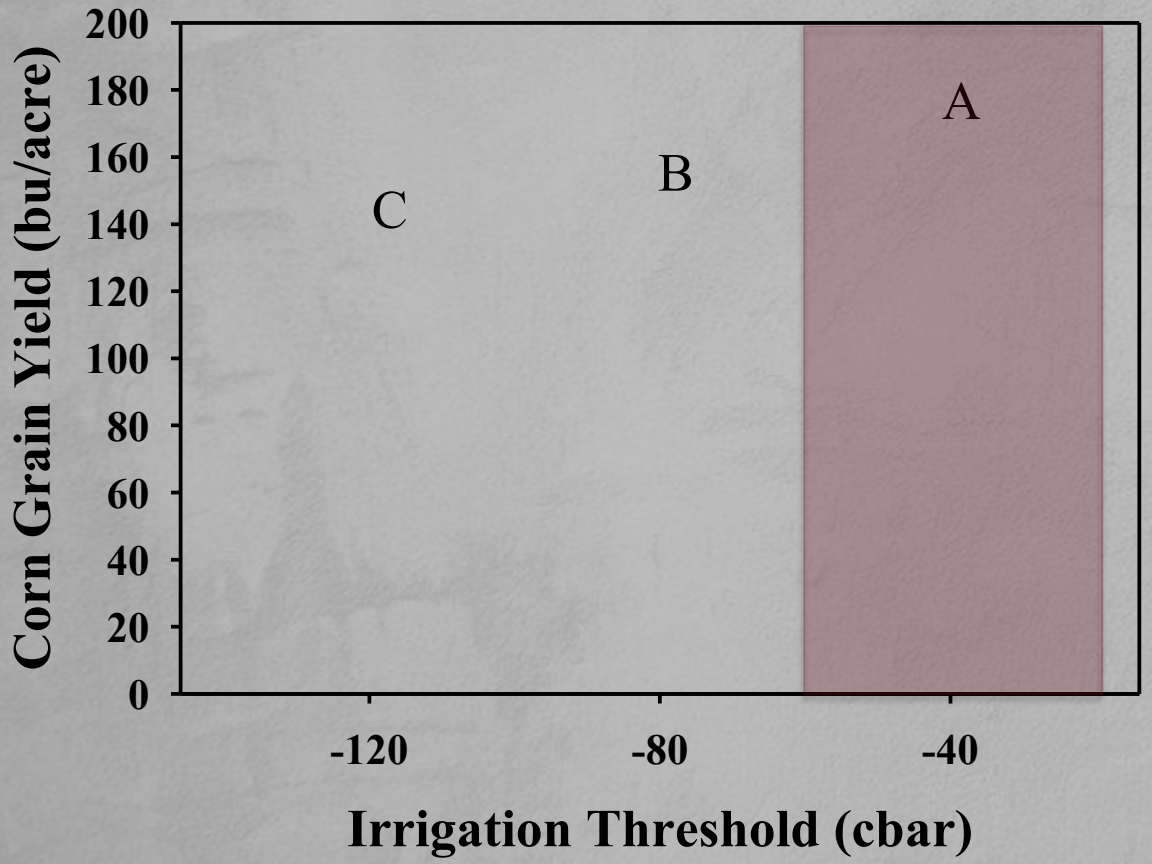
When to Irrigate – Threshold Choice

Pivot – Blackland Prairie



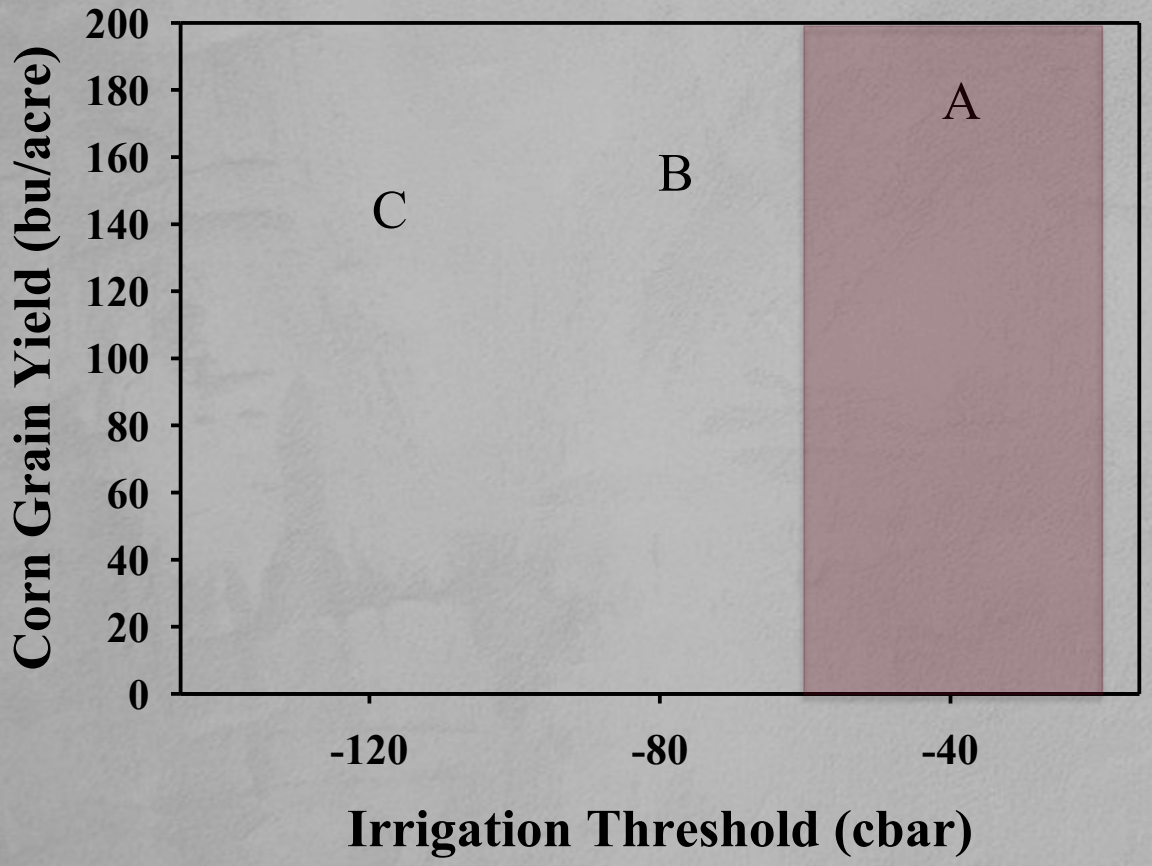
When to Irrigate – Threshold Choice

Pivot – Blackland Prairie



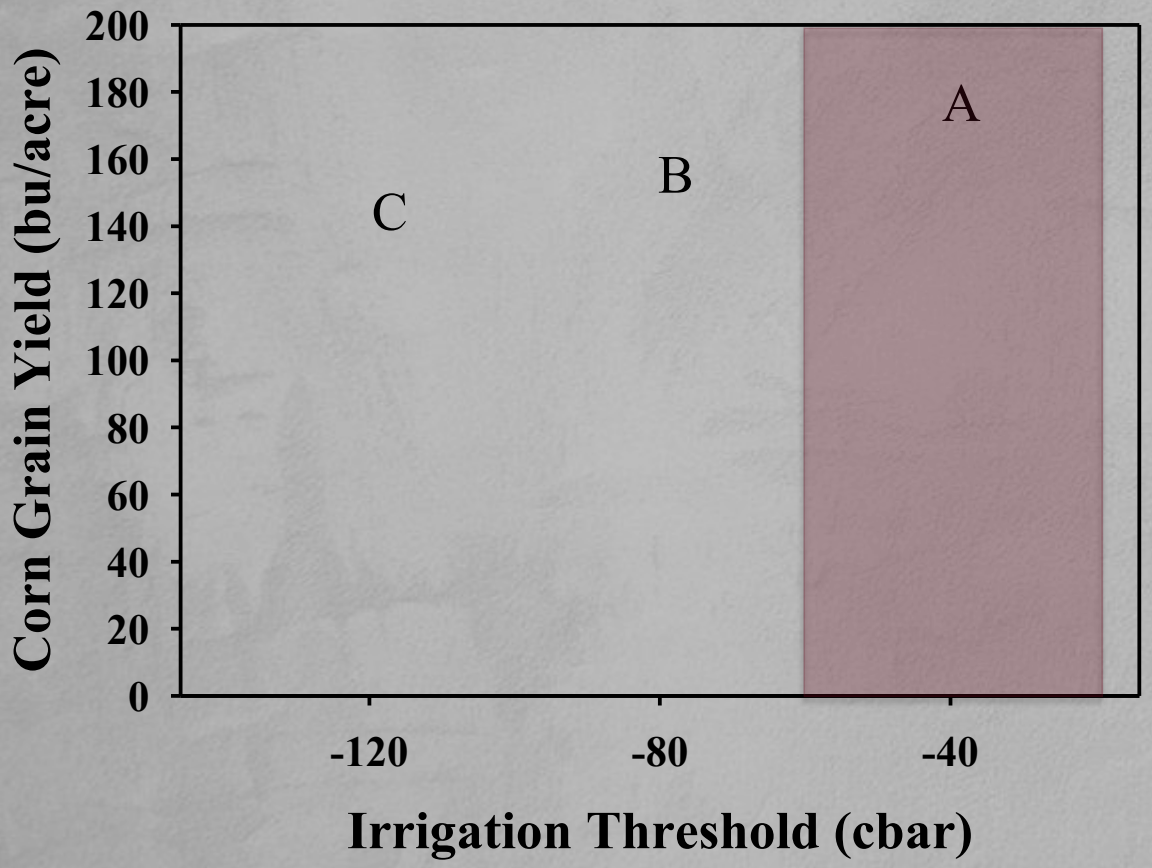
When to Irrigate – Threshold Choice

Pivot – Blackland Prairie



When to Irrigate – Threshold Choice

Pivot – Blackland Prairie



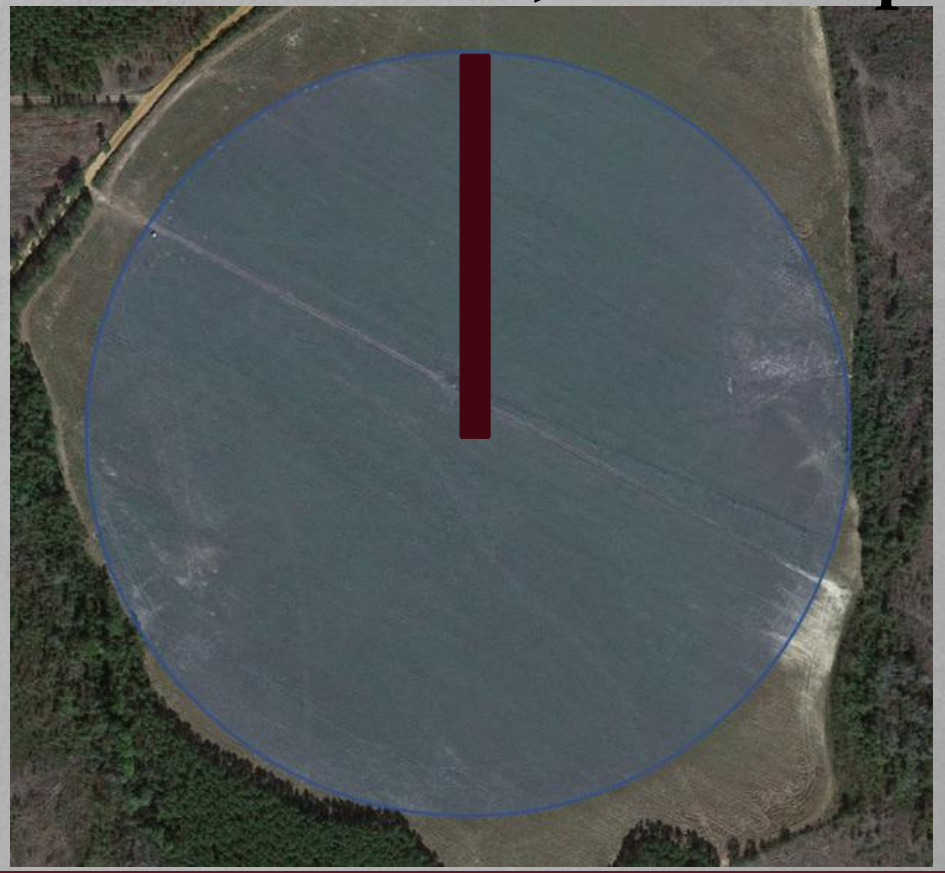
-30 cbar
No Yield Loss

-90 cbar
Yield Loss

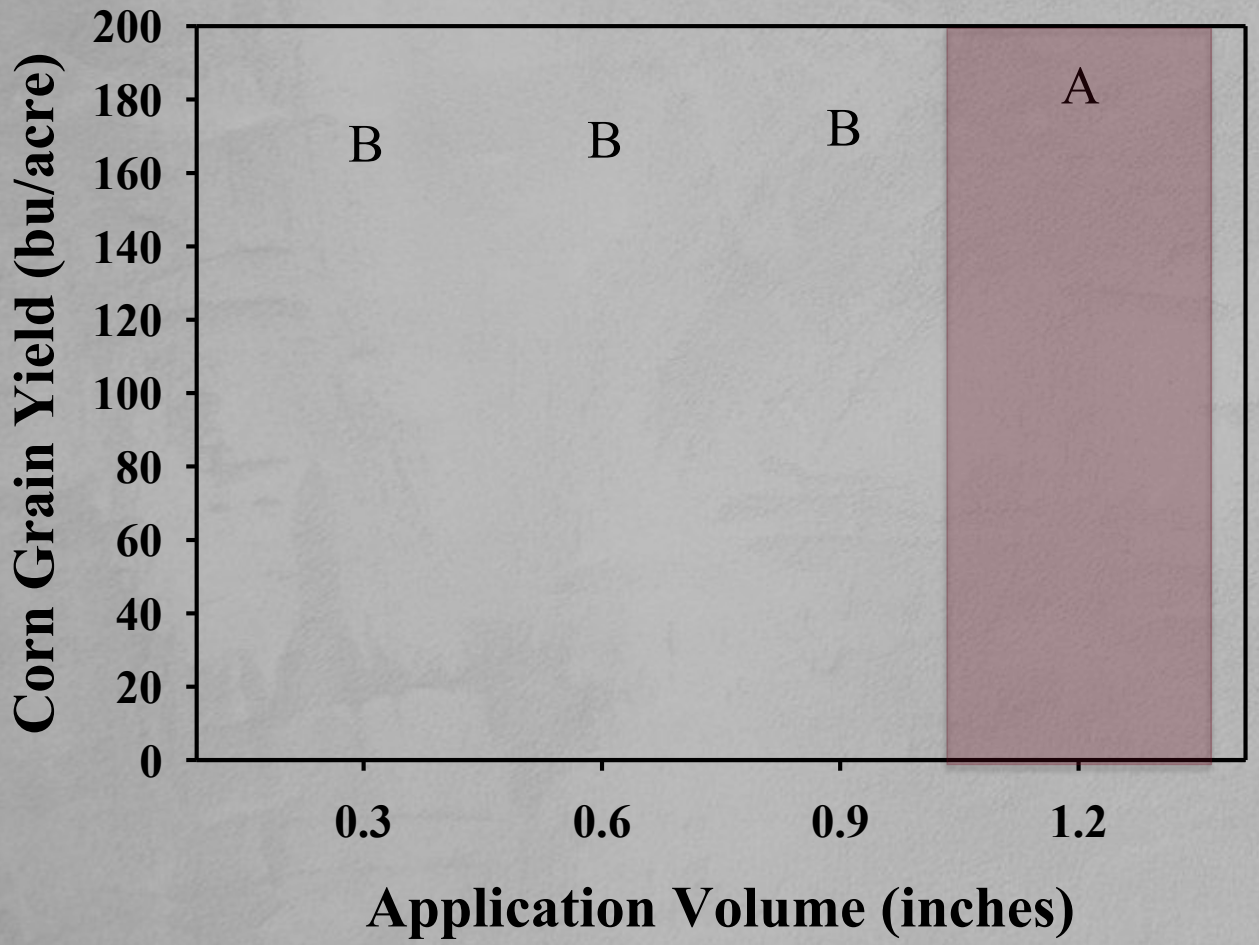
How Much – Application Volume

Less volume, faster spin

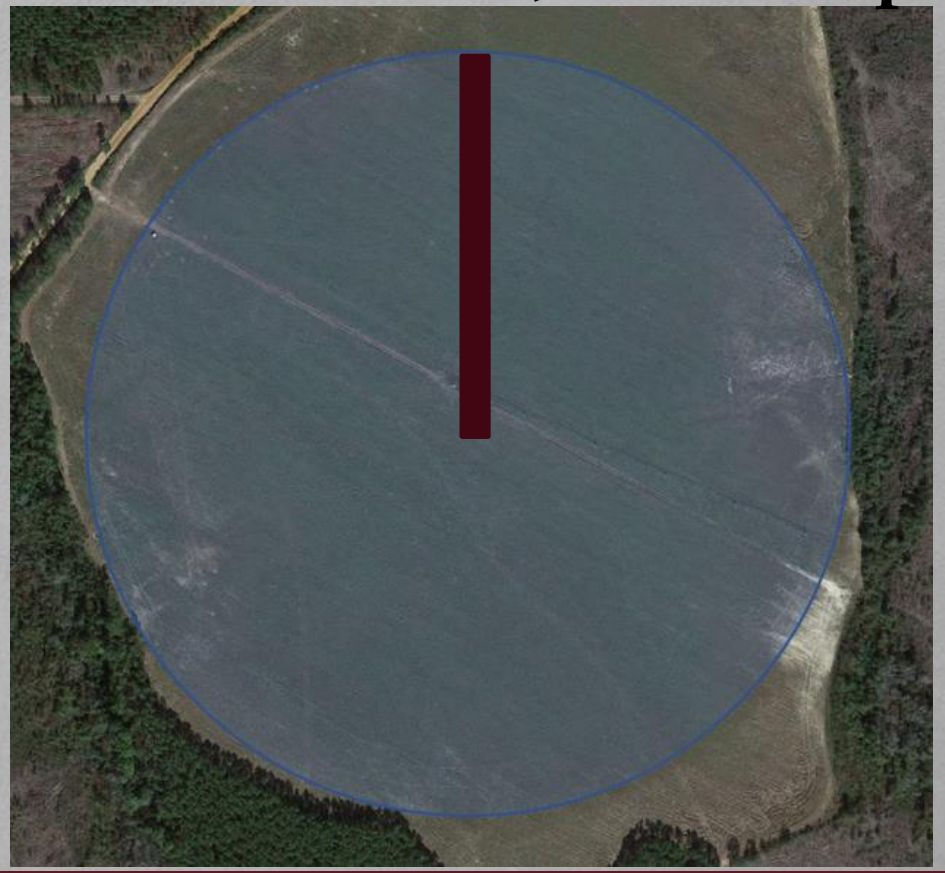
Greater volume, slower spin



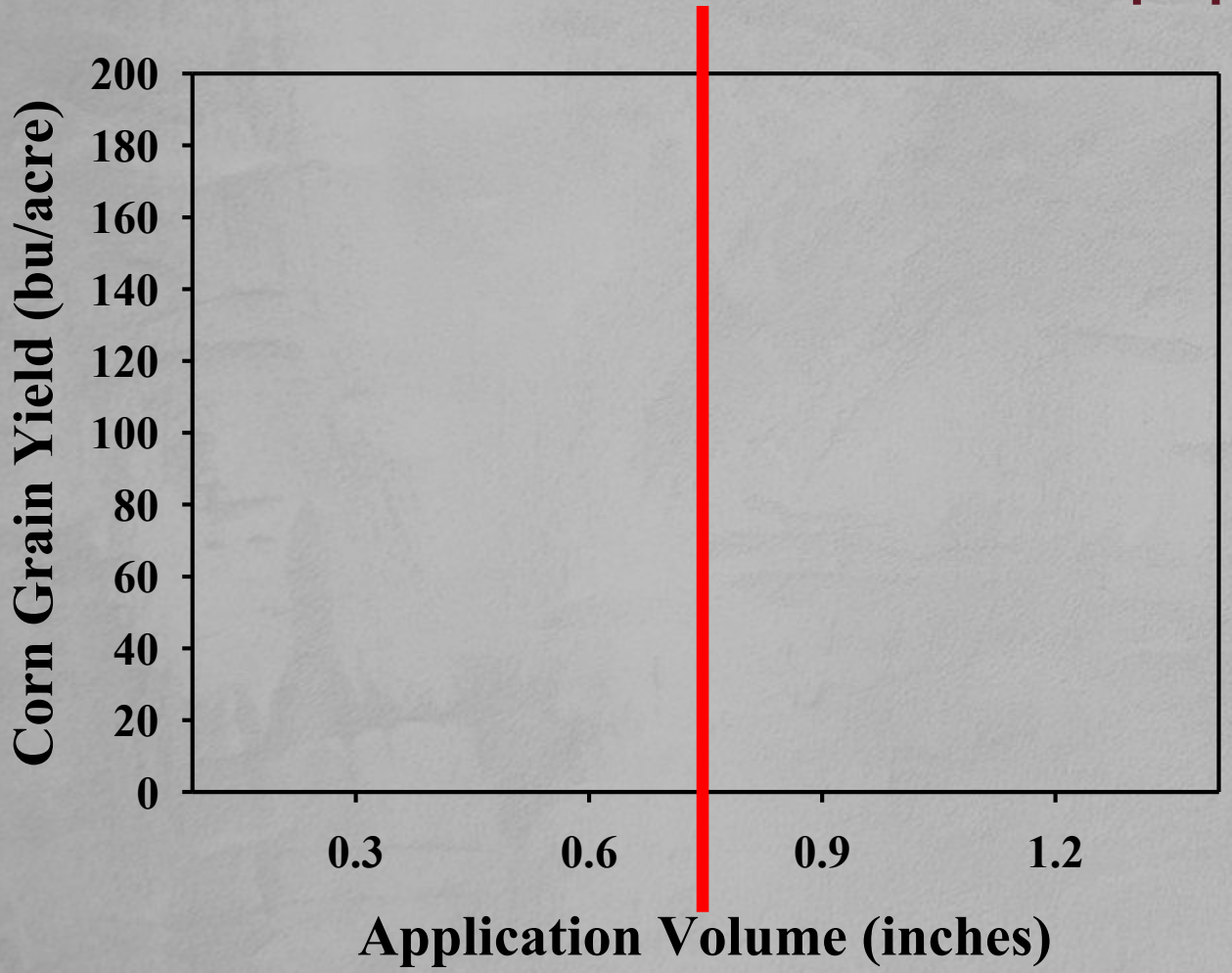
How Much – Application Volume



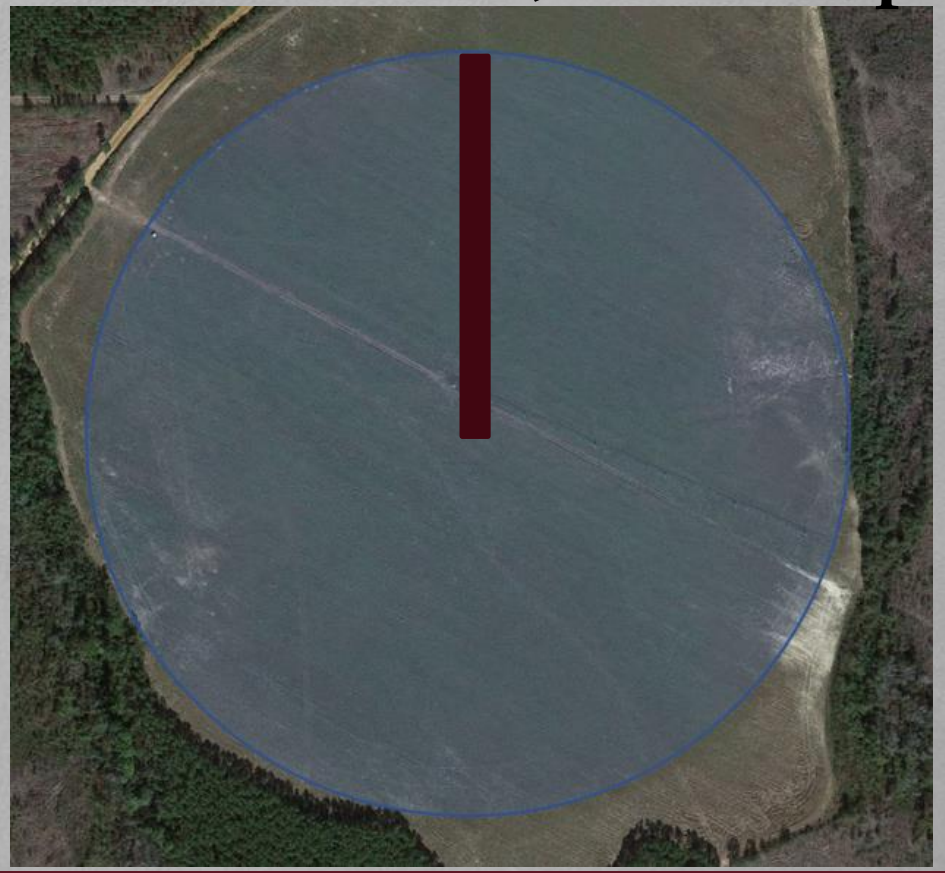
Greater volume, slower spin



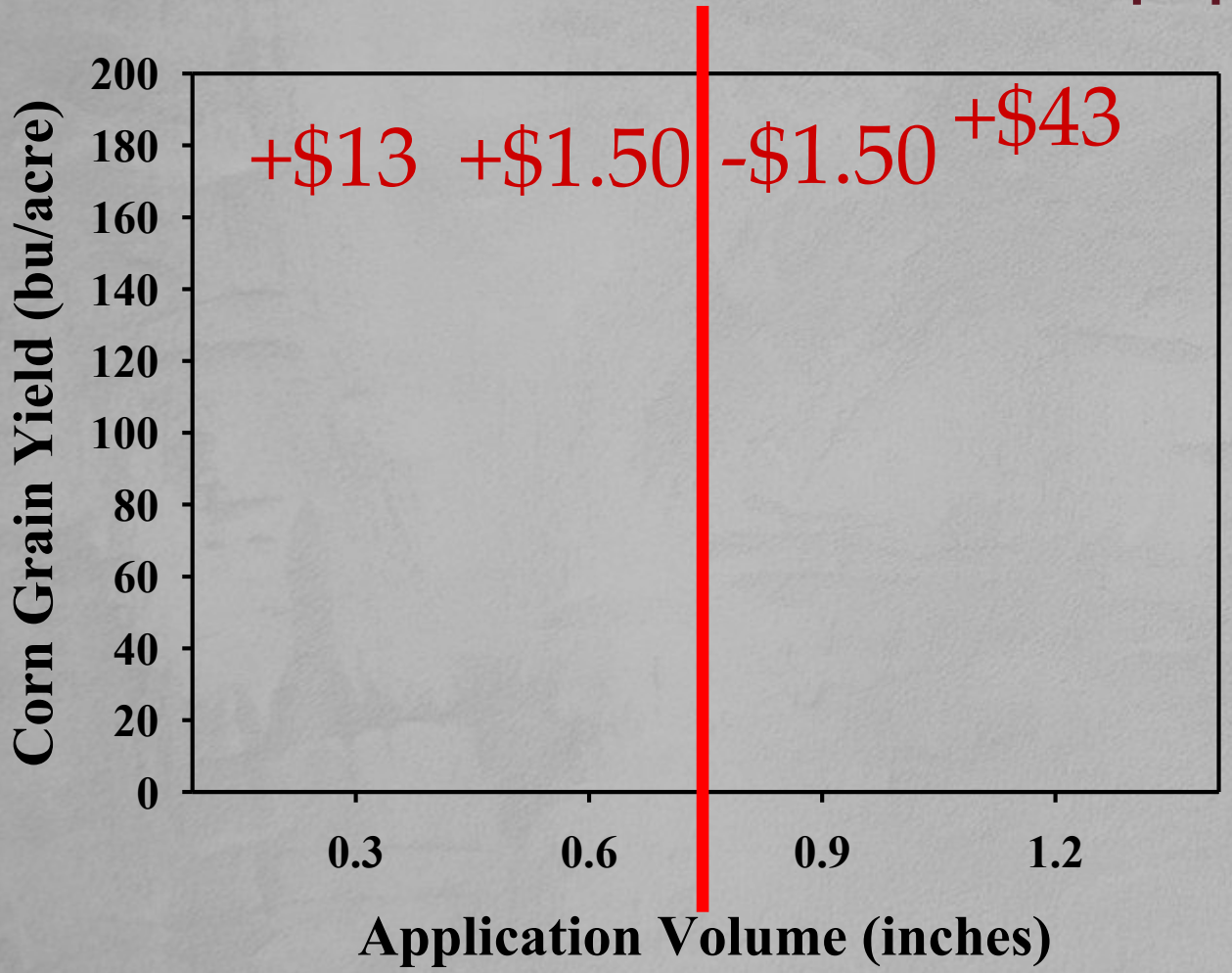
How Much – Application Volume



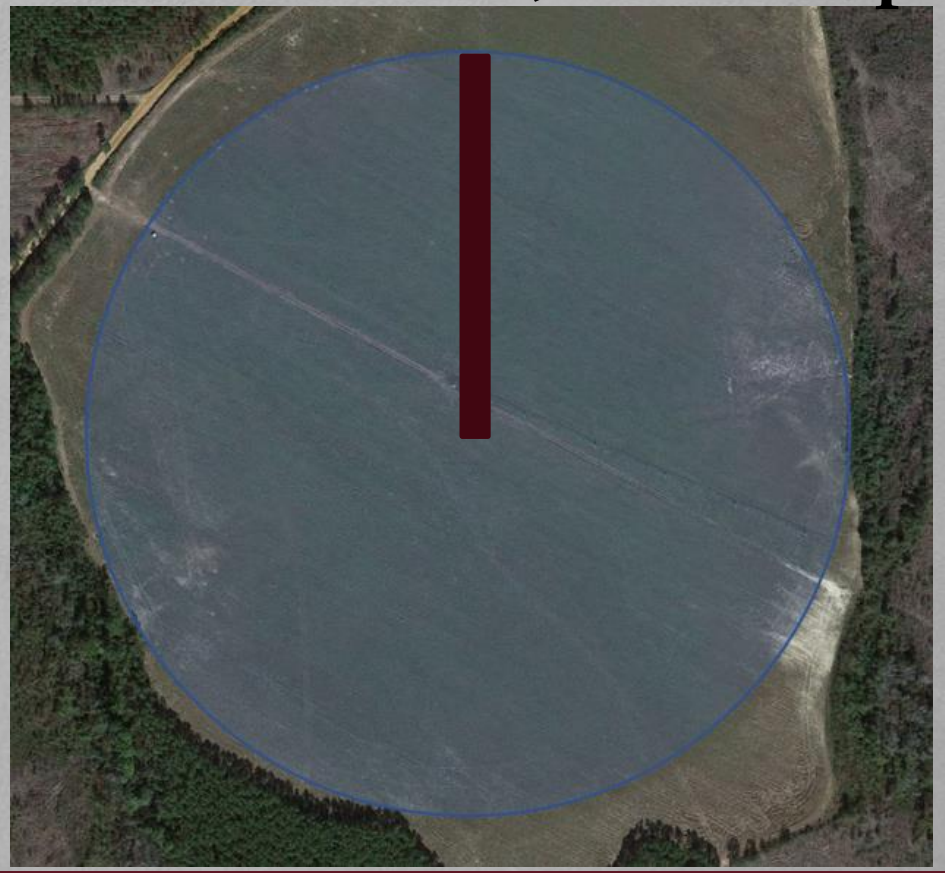
Greater volume, slower spin



How Much – Application Volume



Greater volume, slower spin



Pivot Basics

Sensor use and placement	• In pivot-irrigated field • In relation to crop row
When and how much	• Sensor thresholds • Low volume/fast spin vs more volume/slow spin
Adapting to your scenario	• Pivot capacity • Full circle vs partial circles

What is your pivot capacity?

What is your pivot capacity?

GROSS APPLICATION (INCHES)	MAIN PANEL TIMER (PERCENT)	REVOLUTION TIME (HOURS)
0.1	100.0	7.8
0.1	100.0	7.8
0.2	56.7	13.8
0.3	37.8	20.7
0.4	28.3	27.6
0.5	22.7	34.5
0.6	18.9	41.4
0.7	16.2	48.3
0.8	14.2	55.3
0.9	12.6	62.2
1.0	11.3	69.1
1.1	10.3	76.0
1.2	9.4	82.9
1.3	8.7	89.8
1.4	8.1	96.7

What is your pivot capacity?

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1.1	10.3	76.0
1.2	9.4	82.9
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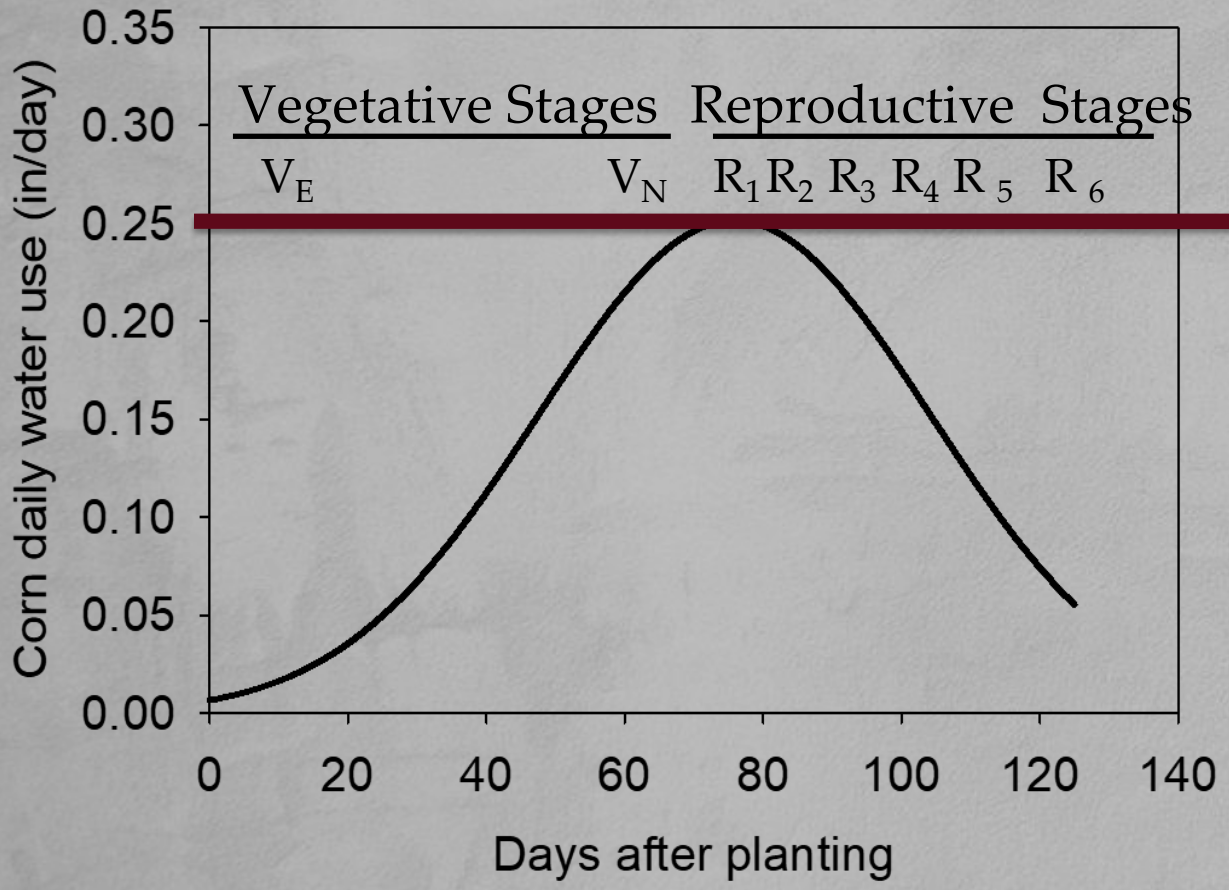
1.4	8.1	96.7

Crop Water Demand



0.3 inch/day

Does your pivot meet crop demand?

GROSS APPLICATION (INCHES)	MAIN PANEL TIMER (PERCENT)	REVOLUTION TIME (HOURS)
0.1	100.0	7.8
0.1	100.0	7.8
0.2	56.7	13.8
0.3	37.8	20.7
0.4	28.3	27.6
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1.3	8.7	89.8
1.4	8.1	96.7
1.5	7.6	103.6

Does your pivot meet crop demand?

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1.2	9.4	82.9
1.3	8.7	89.8
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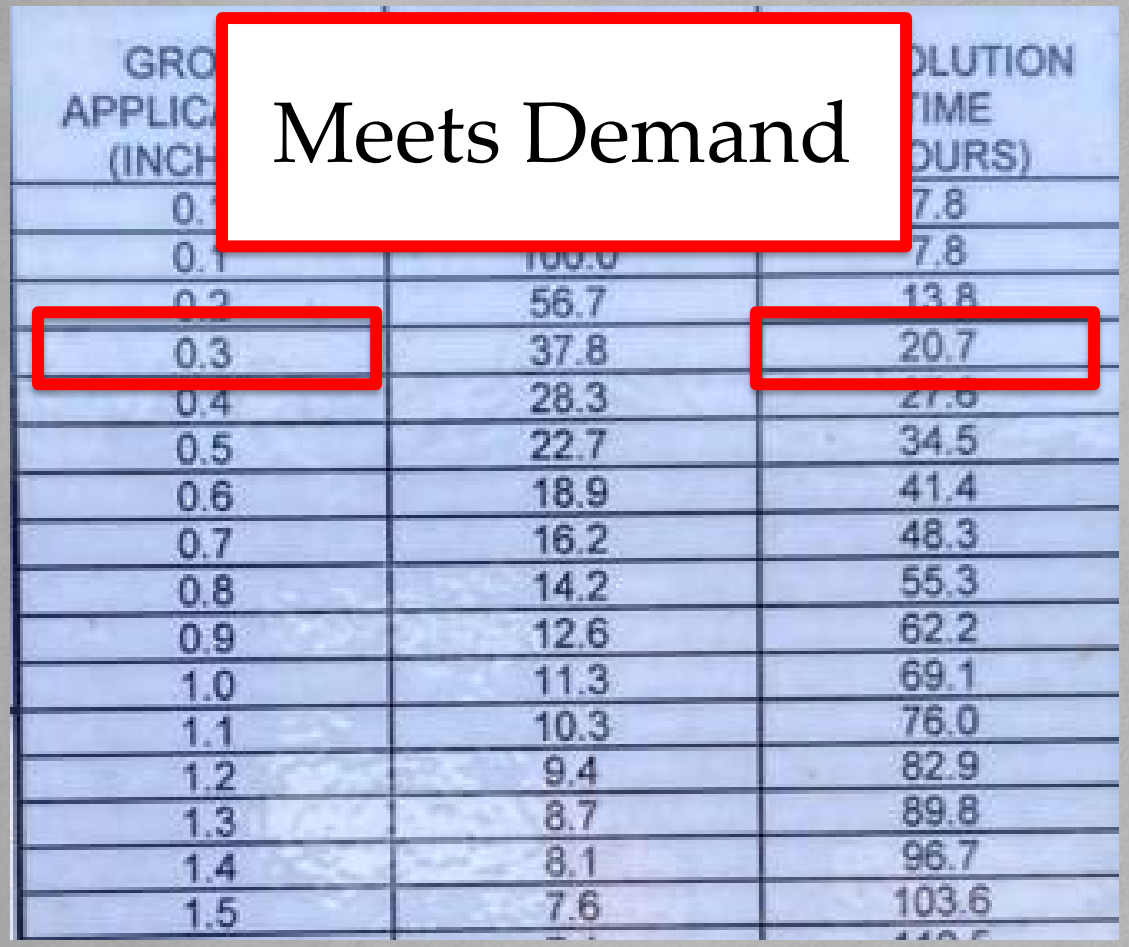
1.5	7.6	103.6

Does your pivot meet crop demand?



GRO APPLIC (INCH		OLUTION TIME OURS)
0.1		7.8
0.1		7.8
0.2	56.7	13.8
0.3	37.8	20.7
0.4	28.3	27.6
0.5	22.7	34.5
0.6	18.9	41.4
0.7	16.2	48.3
0.8	14.2	55.3
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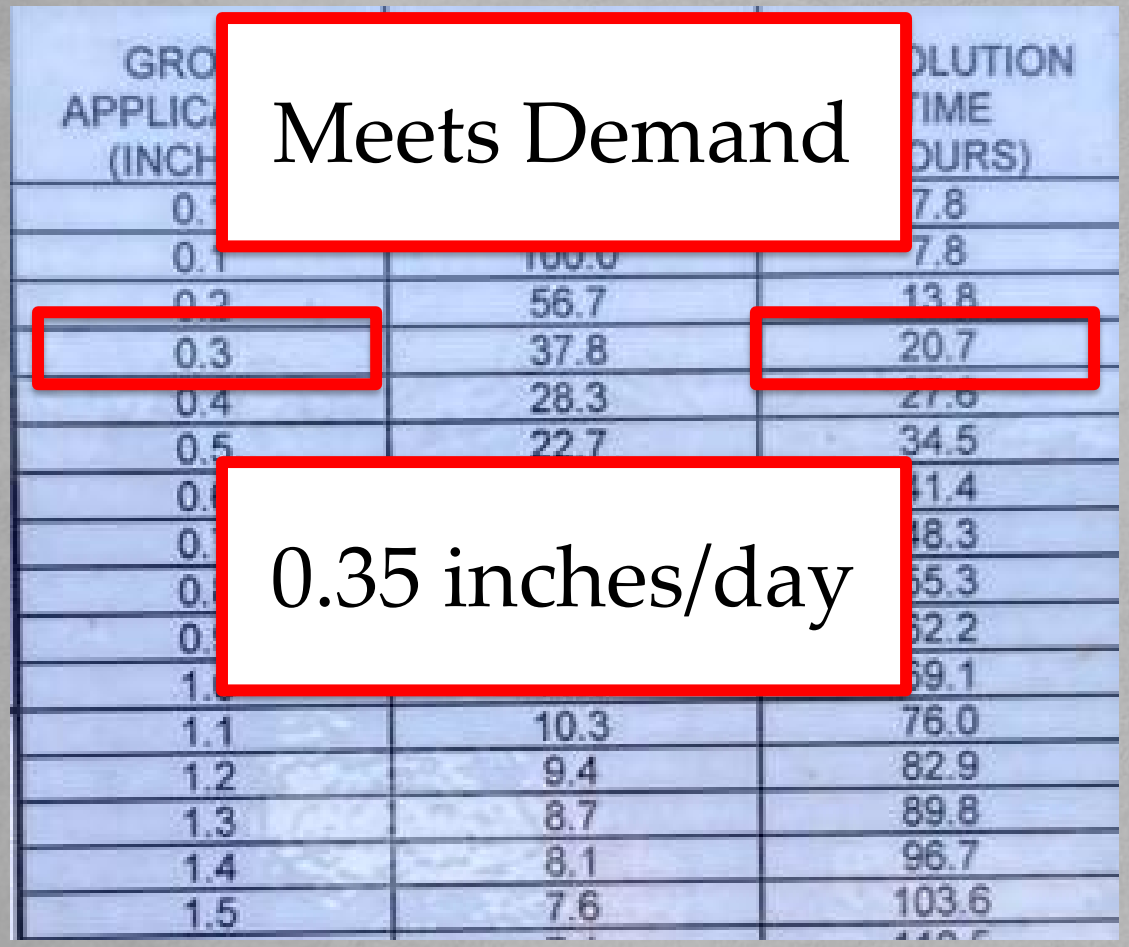
Meets Demand

Does your pivot meet crop demand?



GRO APPLIC (INCH		OLUTION TIME OURS)
0.1		7.8
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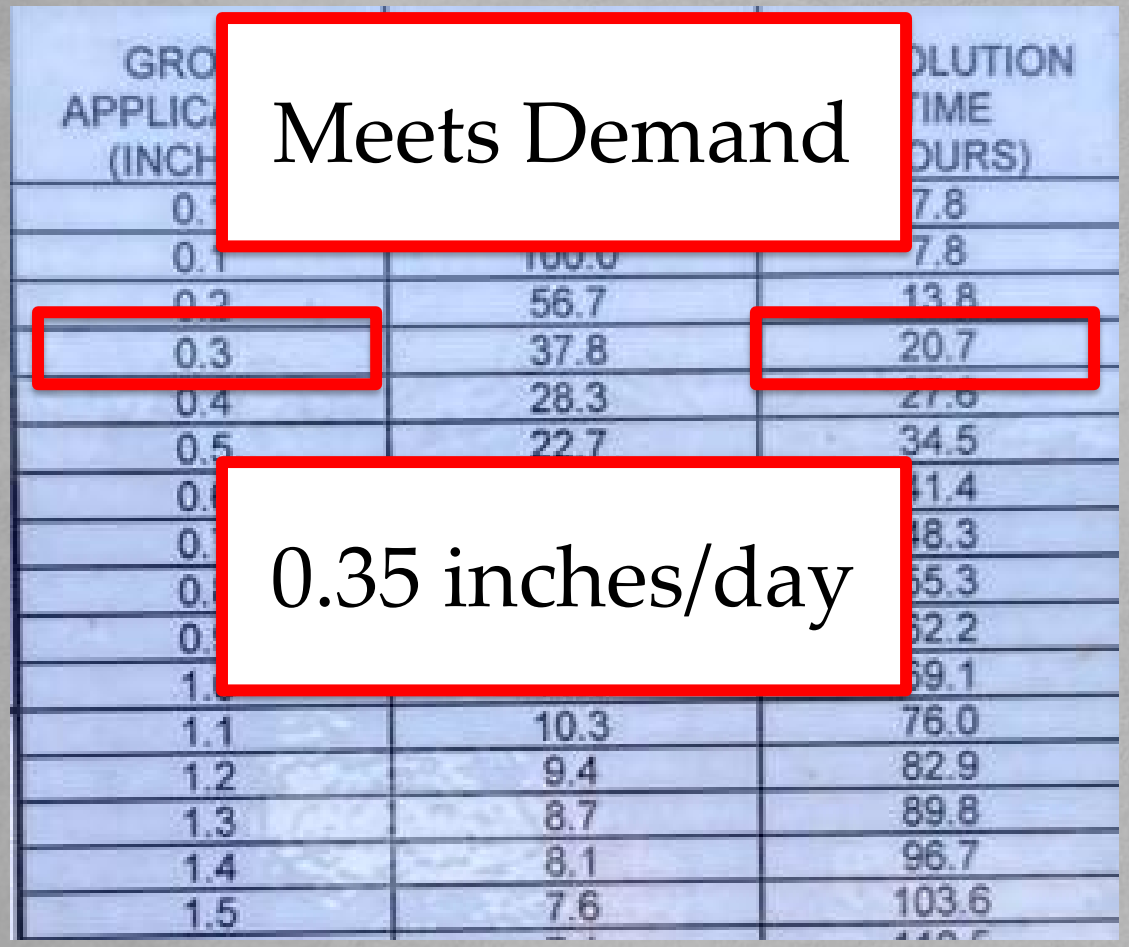
Does your pivot meet crop demand?



Meets Demand

0.35 inches/day

GRO APPLIC (INCH		OLUTION TIME OURS)
0.1		7.8
0.1		7.8
0.2	56.7	13.8
0.3	37.8	20.7
0.4	28.3	27.6
0.5	22.7	34.5
0.6		41.4
0.7		48.3
0.8		55.3
0.9		62.2
1.0		69.1
1.1	10.3	76.0
1.2	9.4	82.9
1.3	8.7	89.8
1.4	8.1	96.7
1.5	7.6	103.6

GROSS APPLICATION (INCHES)	MAIN PANEL TIMER (PERCENT)	REVOLUTION TIME (HOURS)
0.10	100.0	15.2
0.10	100.0	15.2
0.20	52.3	29.0
0.30	34.9	43.5
0.40	26.1	58.0
0.50	20.9	72.6
0.60	17.4	87.1
0.70	14.9	101.6
0.80	13.1	116.1
0.90	11.6	130.6
1.00	10.5	145.1
1.10	9.5	159.6
1.20	8.7	174.1
1.30	8.0	188.7
1.40	7.5	203.2
1.50	7.0	217.7
1.60	6.5	232.2
1.70	6.2	246.7

Does your pivot meet crop demand?

Meets Demand

0.35 inches/day

GRO APPLIC (INCH		OLUTION TIME OURS)
0.1		7.8
0.1		7.8
0.2	56.7	13.8
0.3	37.8	20.7
0.4	28.3	27.6
0.5	22.7	34.5
0.6		41.4
0.7		48.3
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0.9		62.2
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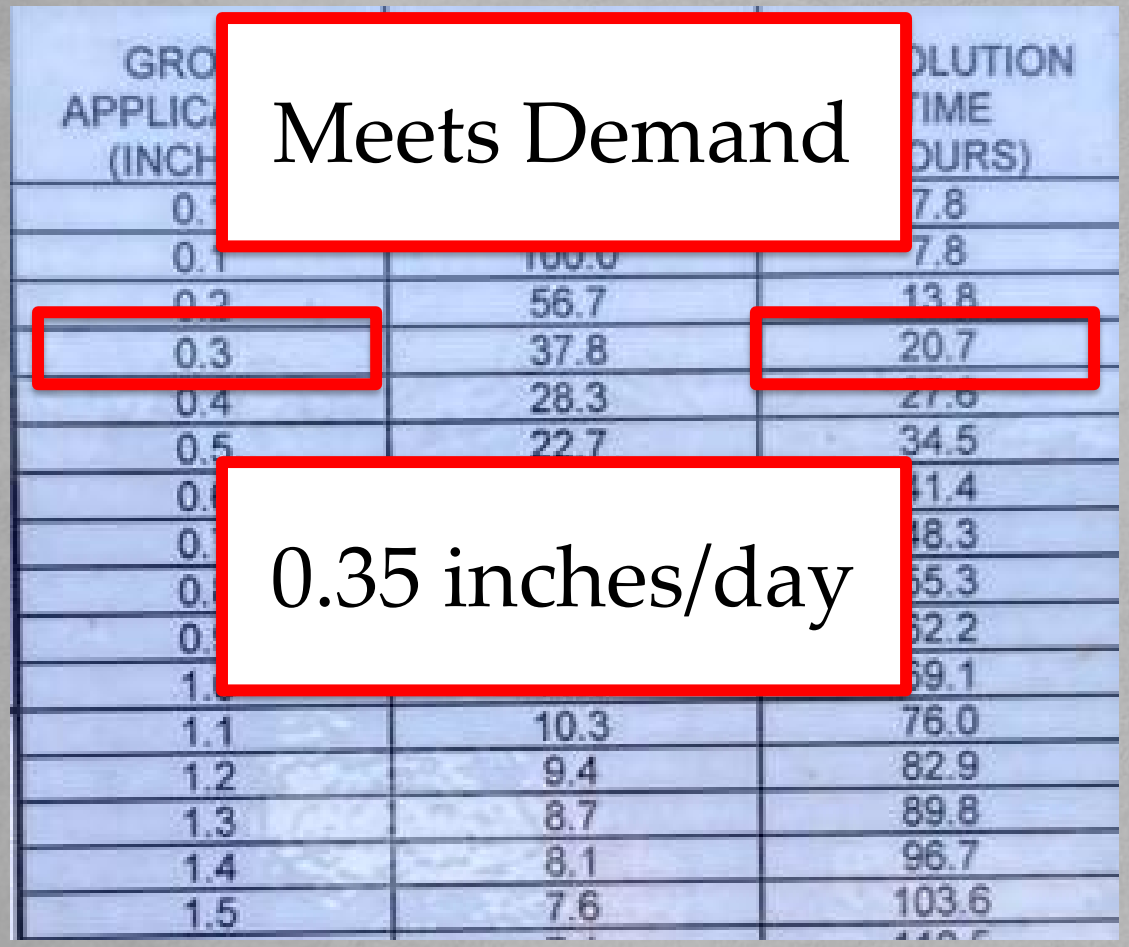
Does your pivot meet crop demand?



Meets Demand

0.35 inches/day

GRO APPLIC (INCH		OLUTION TIME OURS)
0.1		7.8
0.1		7.8
0.2	56.7	13.8
0.3	37.8	20.7
0.4	28.3	27.6
0.5	22.7	34.5
0.6		41.4
0.7		48.3
0.8		55.3
0.9		62.2
1.0		69.1
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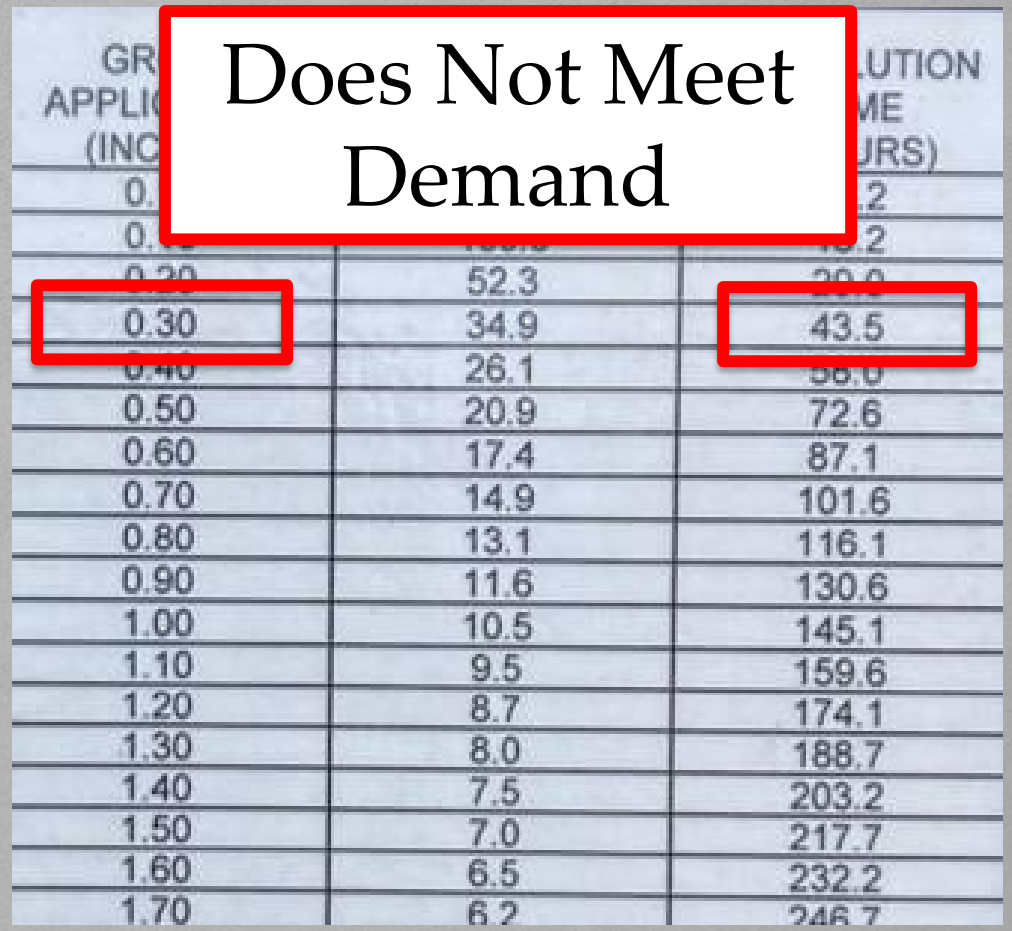

Does Not Meet Demand

GR APPLI (INC		UTION ME URS)
0.		.2
0.		.2
0.20	52.3	29.0
0.30	34.9	43.5
0.40	26.1	58.0
0.50	20.9	72.6
0.60	17.4	87.1
0.70	14.9	101.6
0.80	13.1	116.1
0.90	11.6	130.6
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1.50	7.0	217.7
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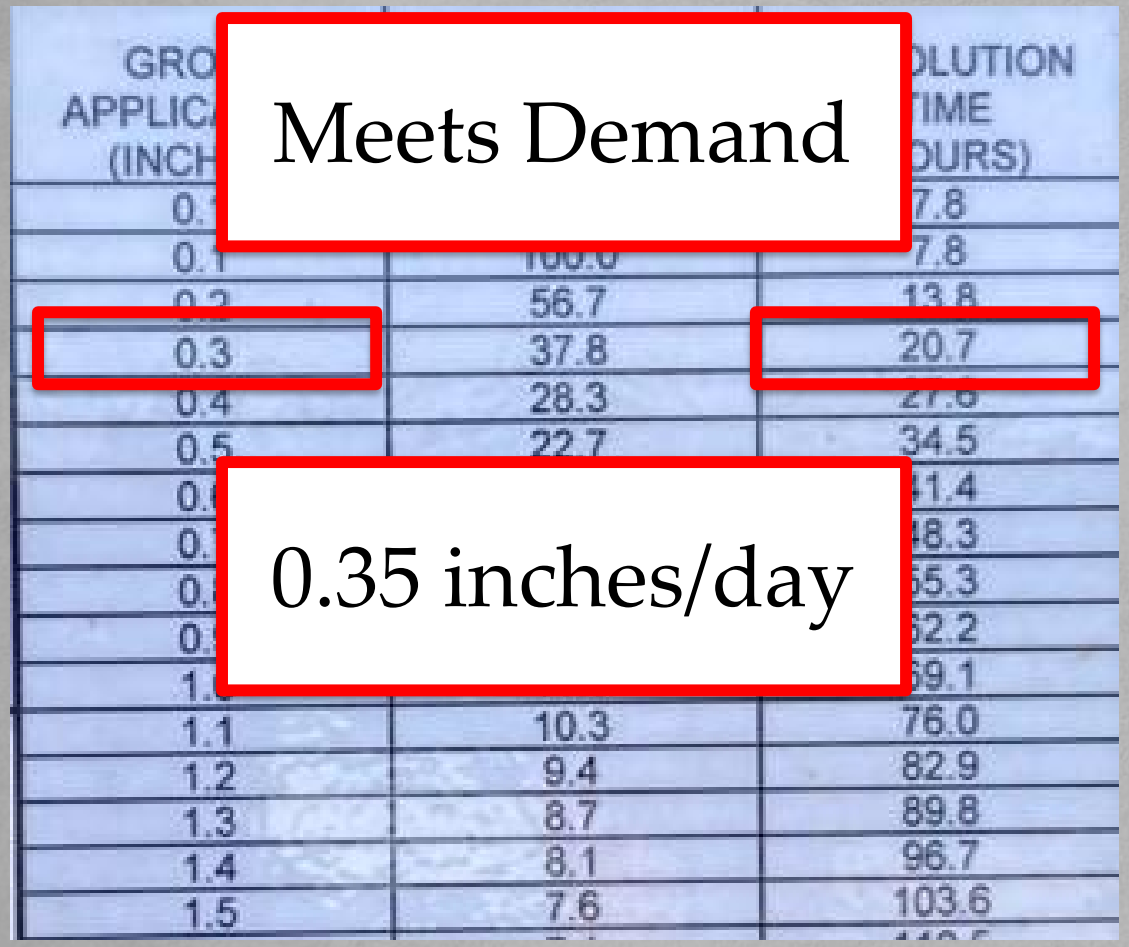
1.70	6.2	246.7

Does your pivot meet crop demand?



Meets Demand

0.35 inches/day

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0.1		7.8
0.2	56.7	13.8
0.3	37.8	20.7
0.4	28.3	27.6
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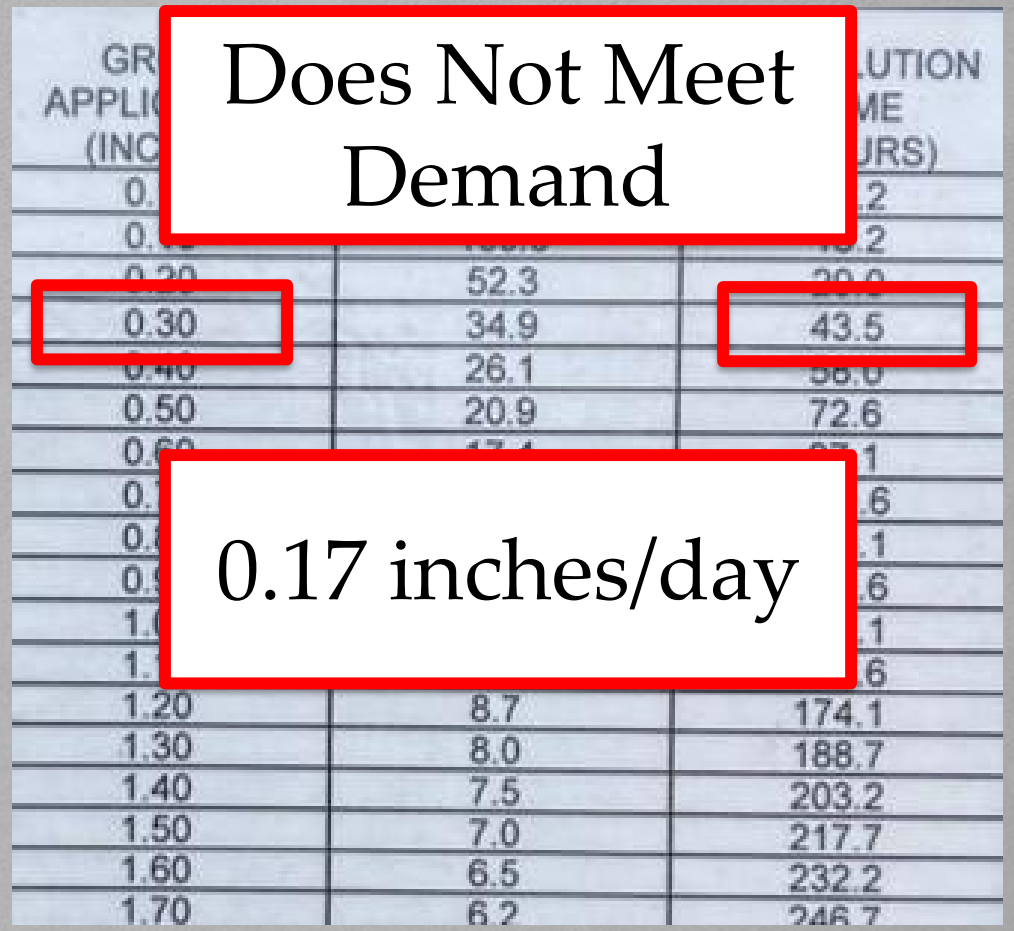

Does Not Meet Demand

0.17 inches/day

GR APPLI (INC		UTION ME URS)
0.		.2
0.		.2
0.20	52.3	29.0
0.30	34.9	43.5
0.40	26.1	58.0
0.50	20.9	72.6
0.60		87.1
0.		.6
0.		.1
0.		.6
1.0		.1
1.		.6
1.20	8.7	174.1
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1.40	7.5	203.2
1.50	7.0	217.7
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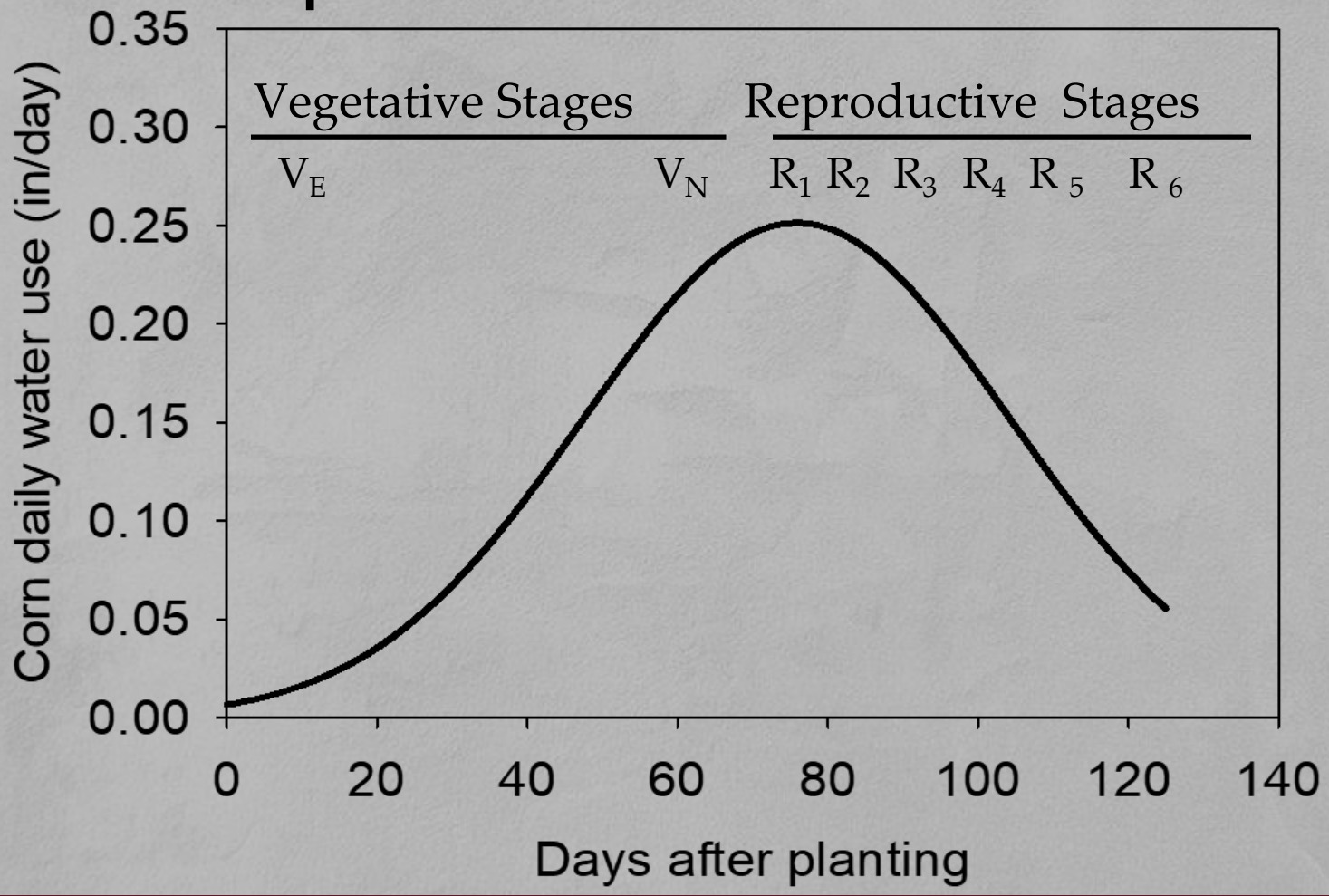
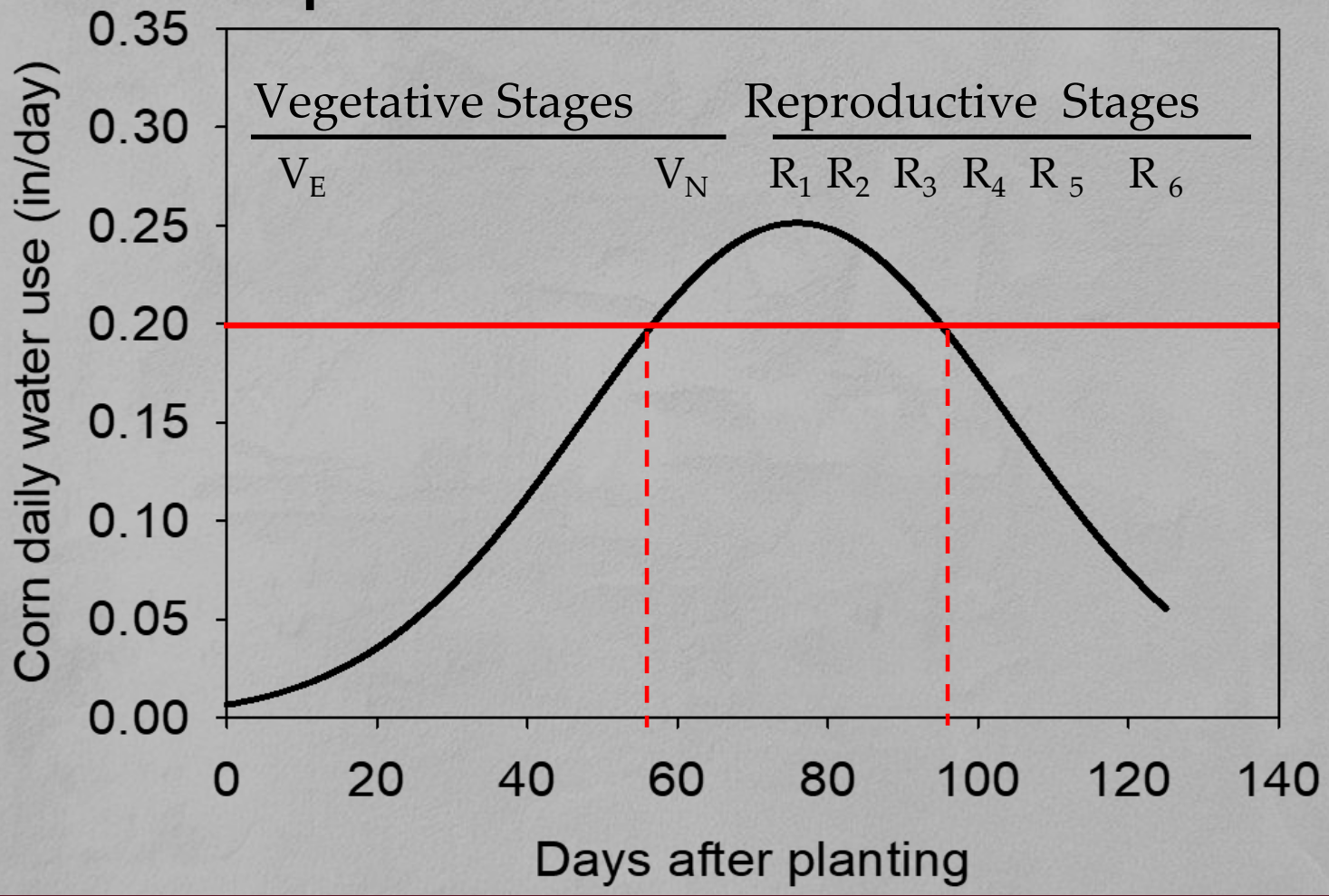
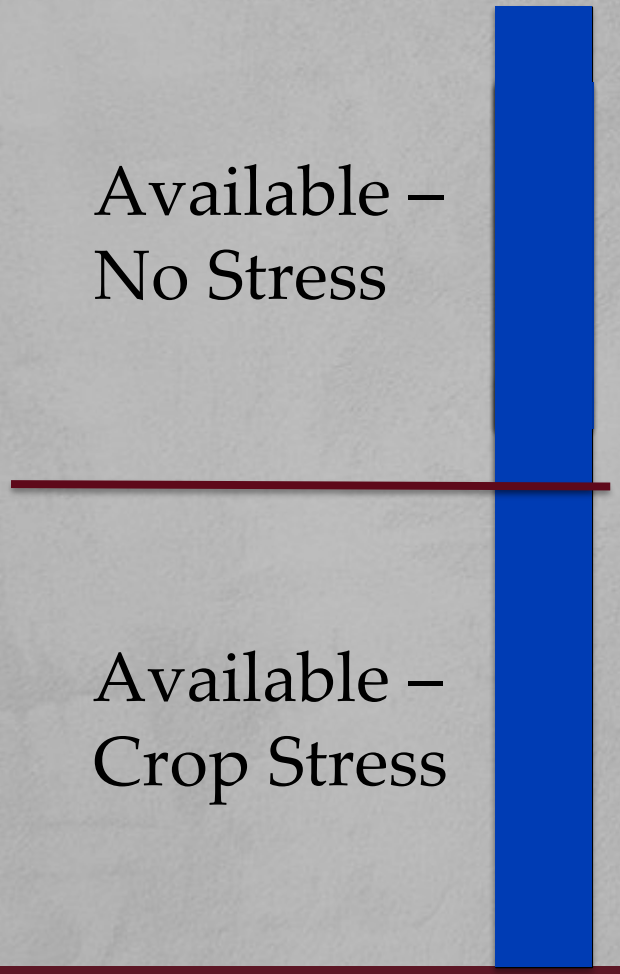
Crop Water Demand



Crop Water Demand



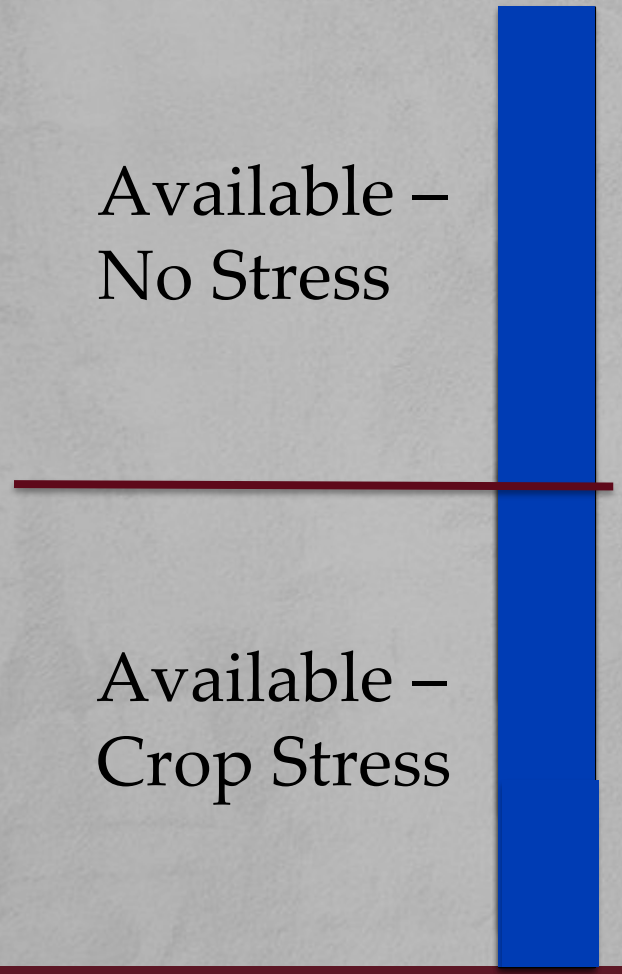
Scenario #1: Full Circle, Meets Demand



Available – No Stress

Available – Crop Stress

Scenario #2: Full Circle, Doesn't Meet Demand

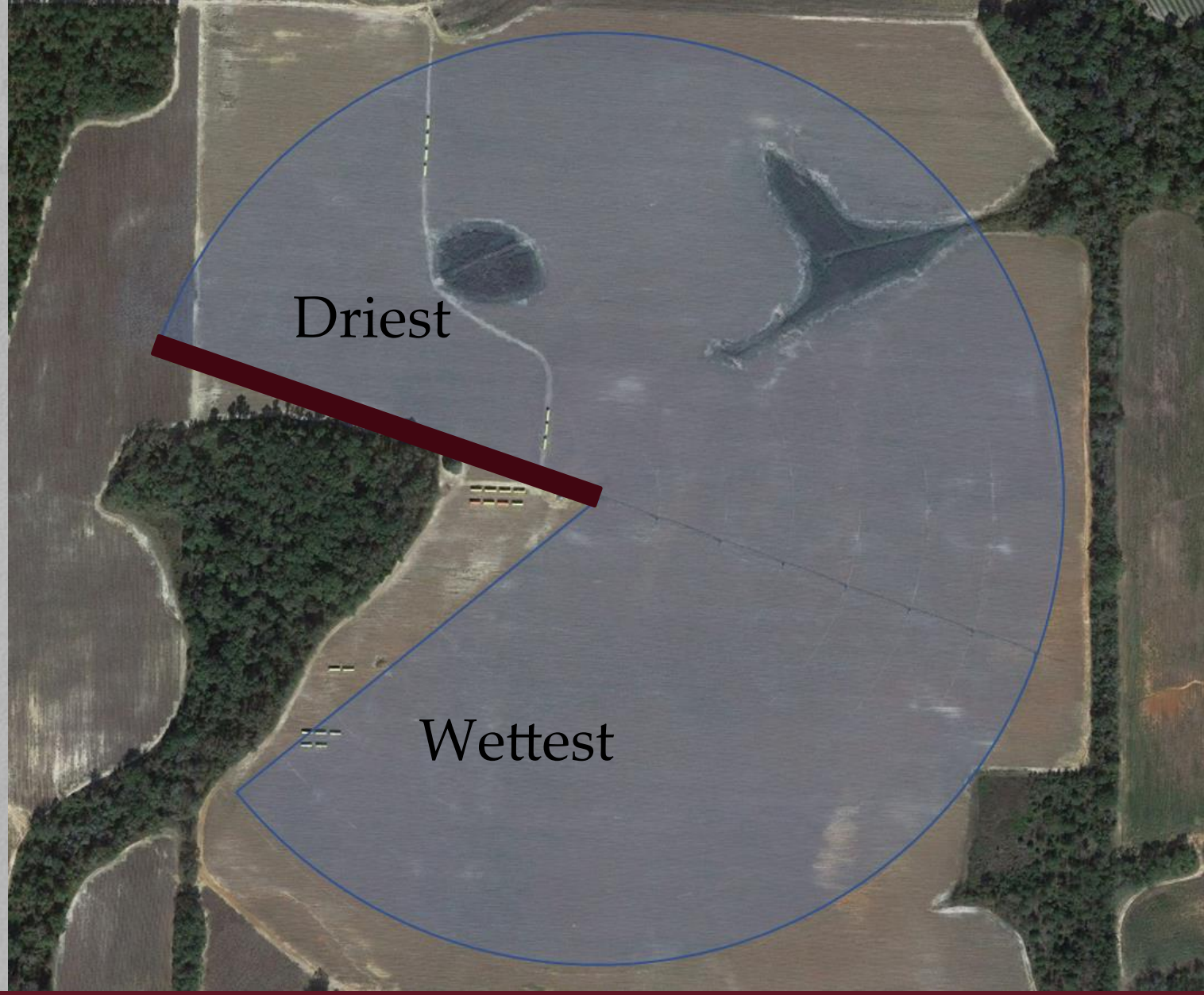


Available –
No Stress

Available –
Crop Stress

Scenario #3

- Semi-circle pivot
- Pivot designed to meet crop water demand on one spin



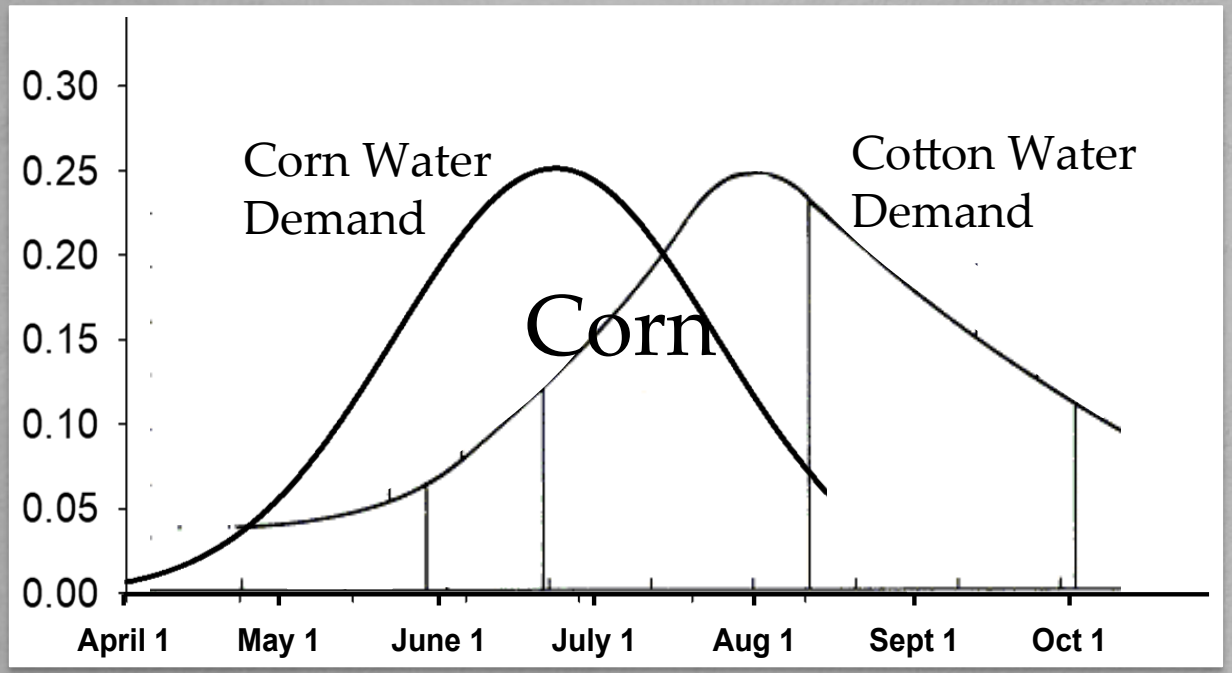
Scenario #3

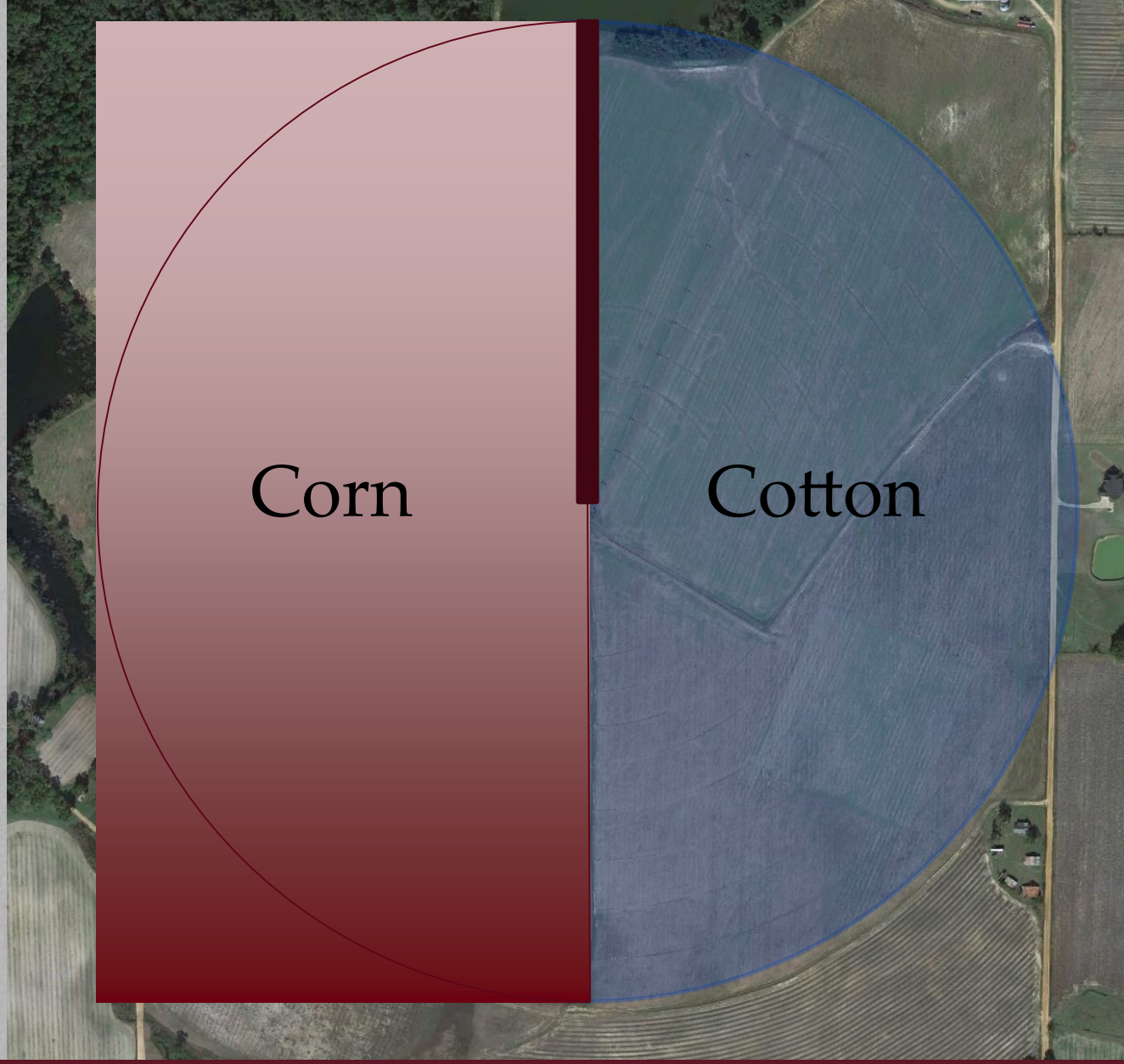
- Semi-circle pivot
- Pivot designed to meet crop water demand on one spin

Other Management Options

- Full-circle pivot
- Pond is undersized or application rate too low

Other Management Options





Summary

- Don't guess – measure soil moisture
- Keep bank full with pivots
  - Start early – don't fall behind!
  - Apply as much as you can
- Adapt management to your pivot design
  - Semi-circle: consider different sections
  - Consider crop mix

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