

2024 Cotton Production Agent Training

Precision Ag Update

Simer Virk

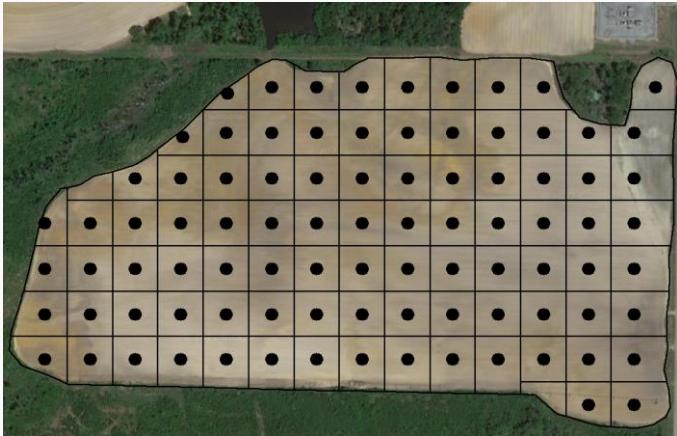
Extension Precision Ag Specialist
University of Georgia



UNIVERSITY OF GEORGIA

EXTENSION

Optimal Grid Size for Soil Sampling



1.0 ac



2.5 ac



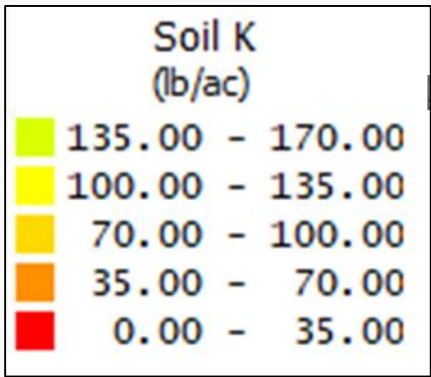
5.0 ac



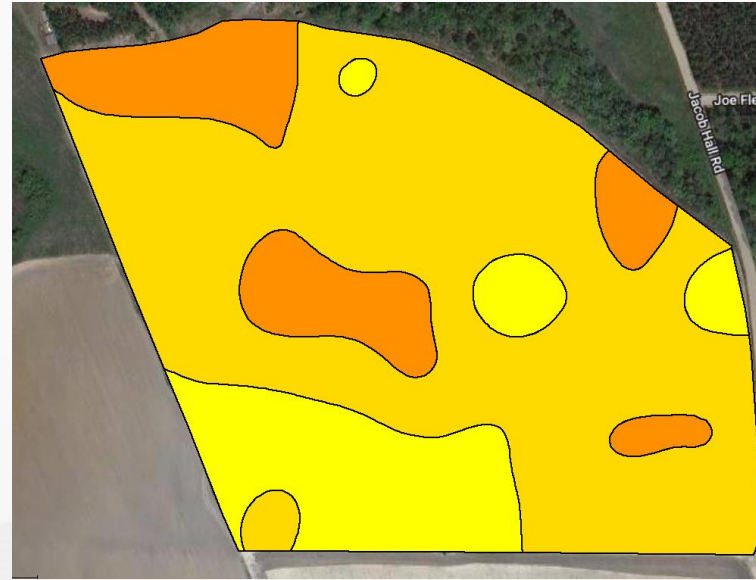
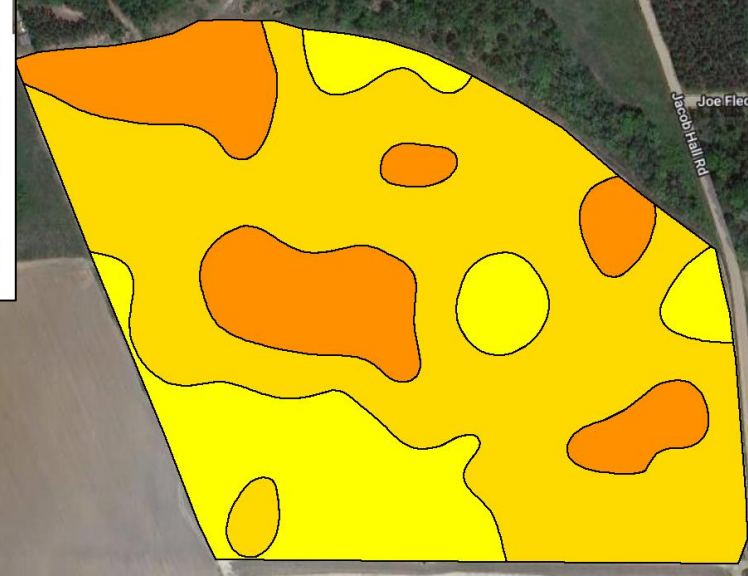
7.5 ac



10.0 ac



Actual Soil K
Variability
(100 samples)



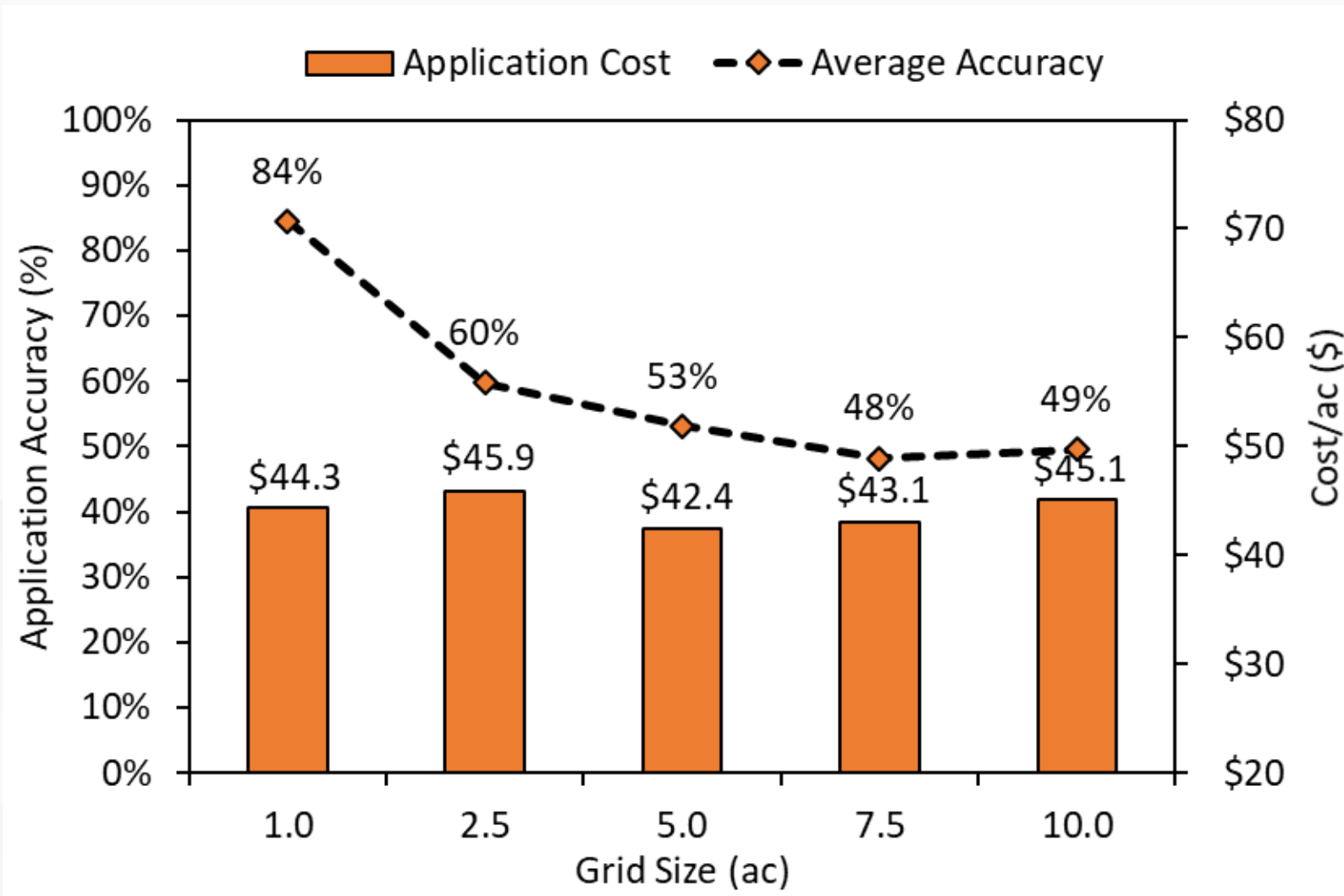
1 ac
(53 samples)

2.5 ac
(23 samples)



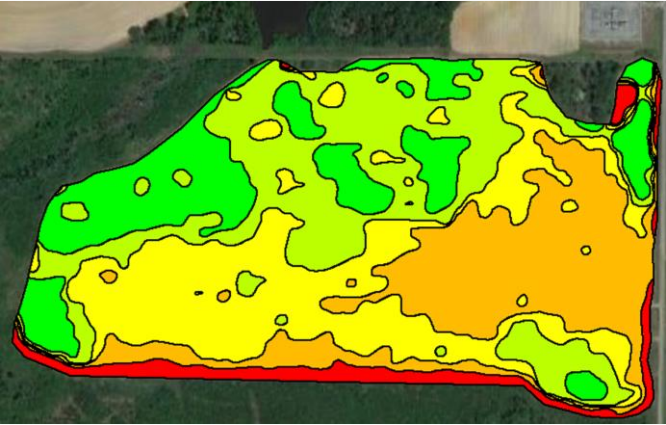
5 ac
(10 samples)

Potassium

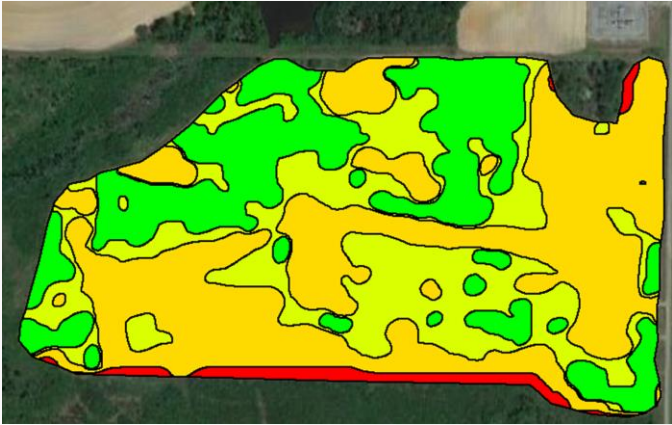


(Soil sampling = \$4/ac, Sample analysis = \$6/sample)
Lime = \$50/ton, P = \$0.67/lb, K = \$0.68/lb)

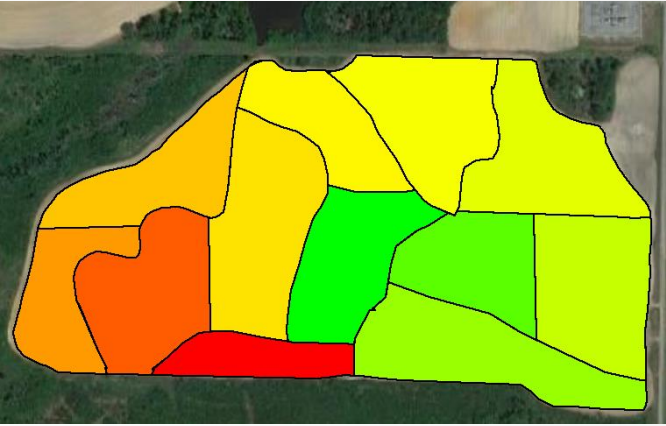
Zone Sampling Strategies



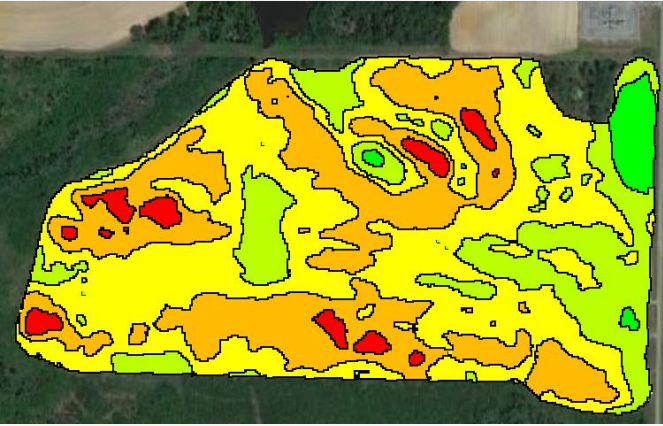
Soil Color/Brightness (5 samples)



Soil EC (4 samples)



Field Knowledge and Yield (12 samples)

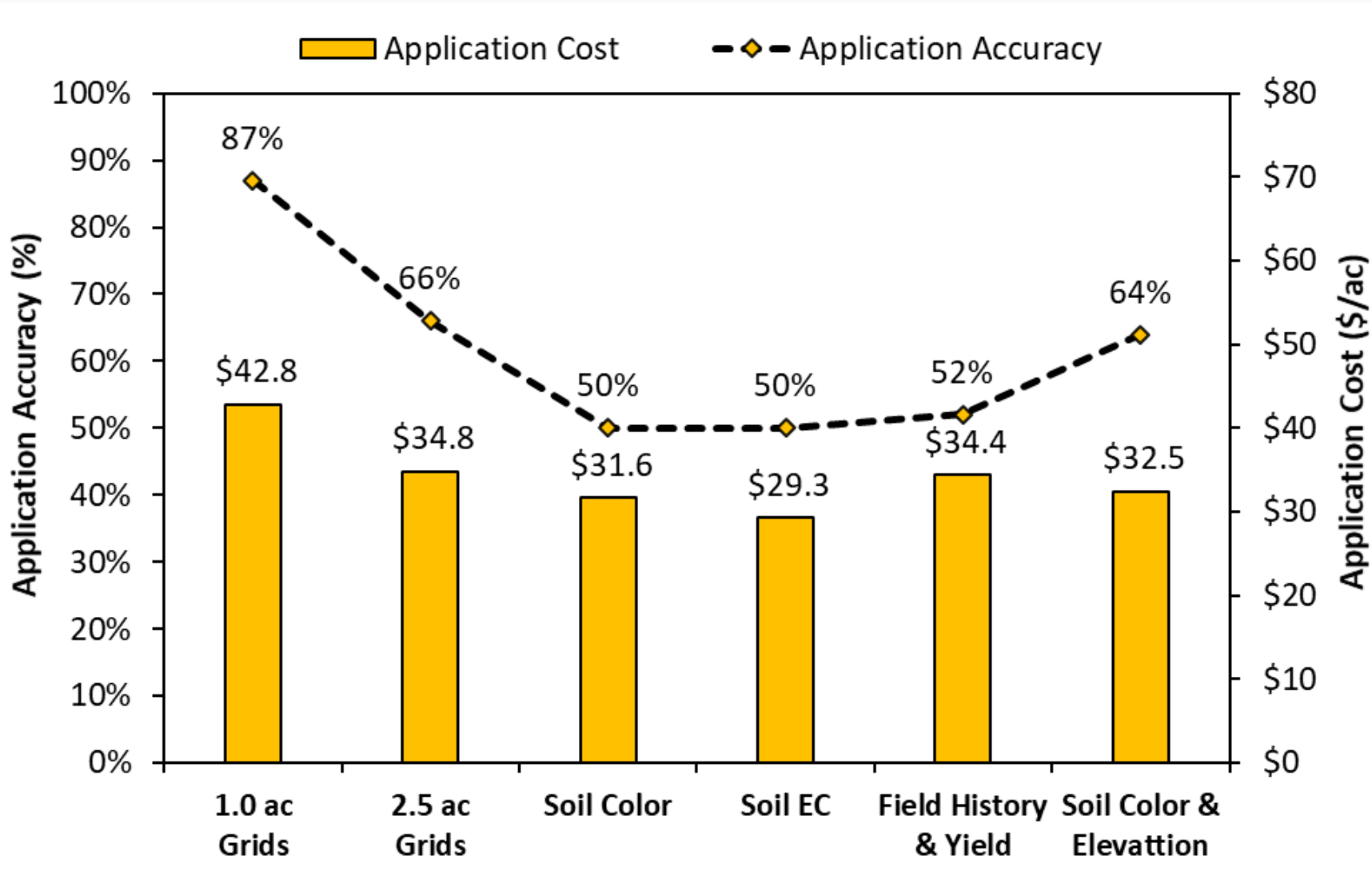


Soil Color and Elevation (5 samples)

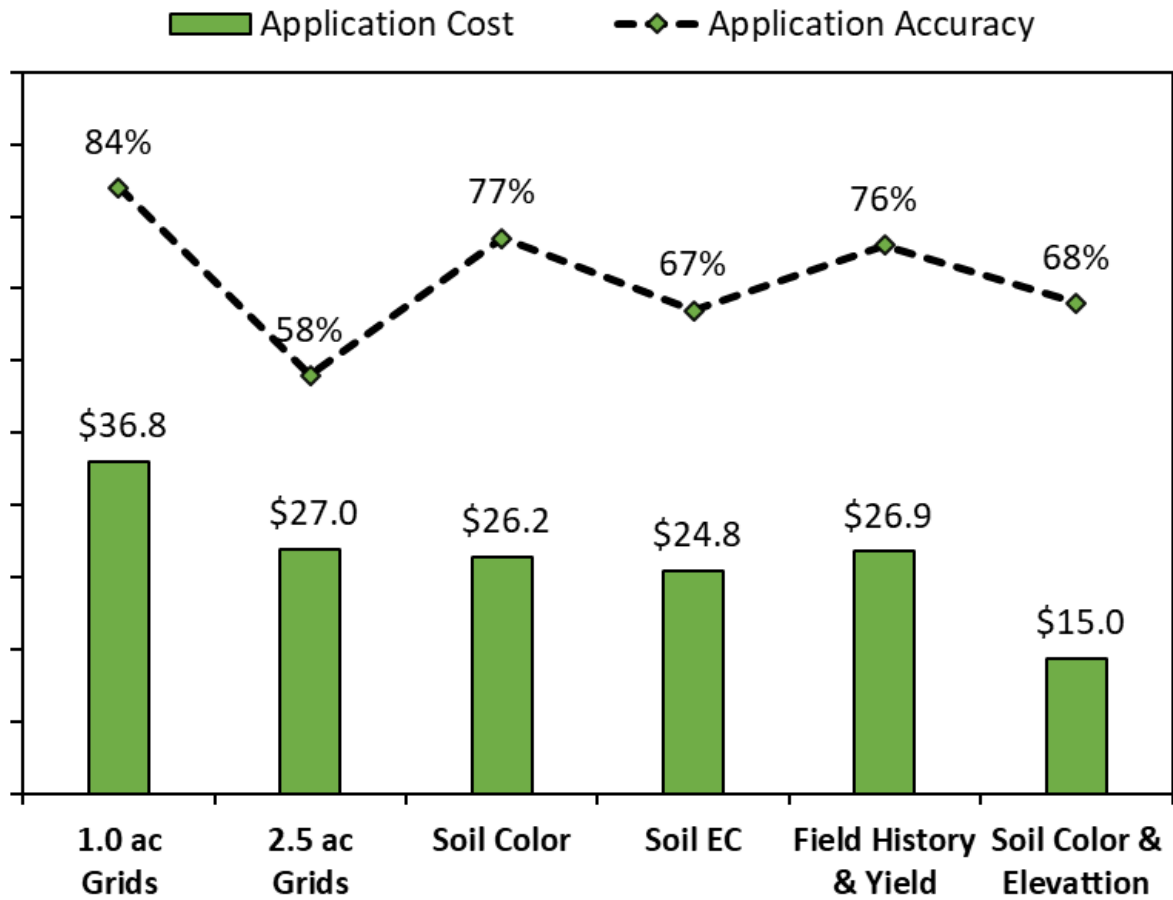
Each zone = 3 - 10 soil cores mixed together to make a composite sample

Overall less number of soil samples

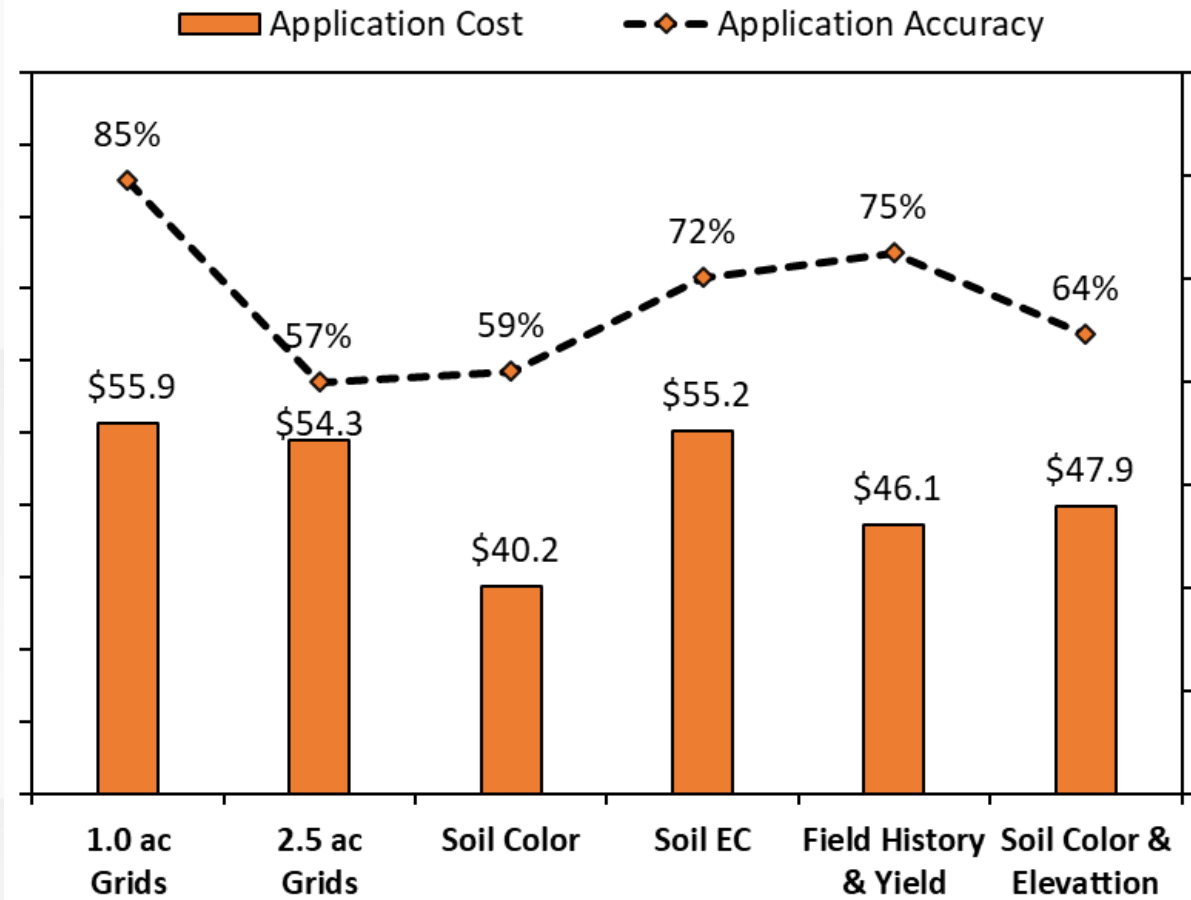
Lime



Phosphorus (P)



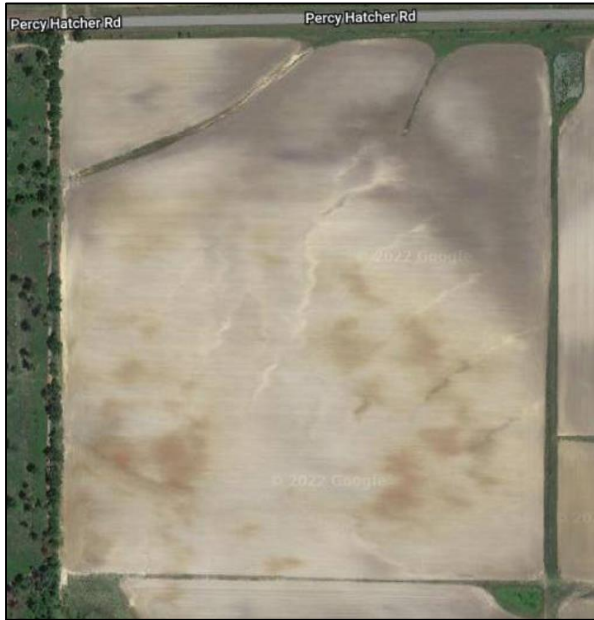
Potassium (K)



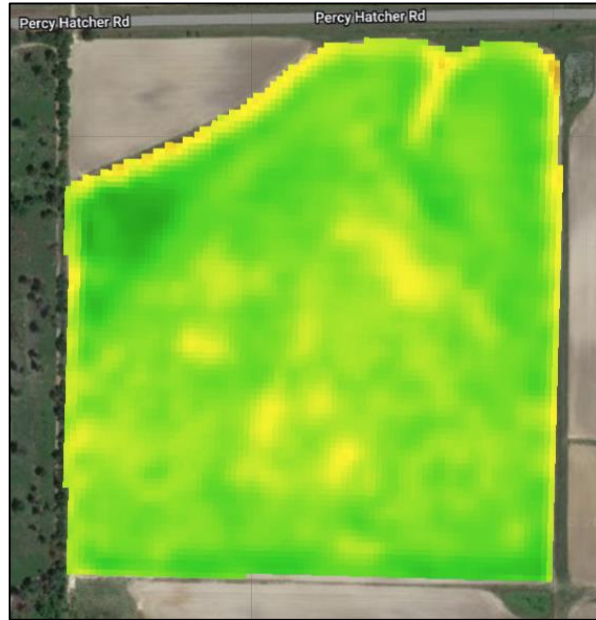
On-Farm Seeding Rate Research



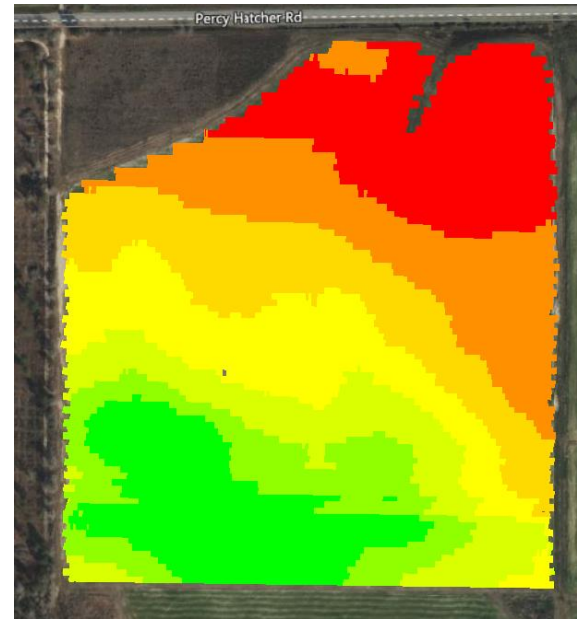
Management Zones



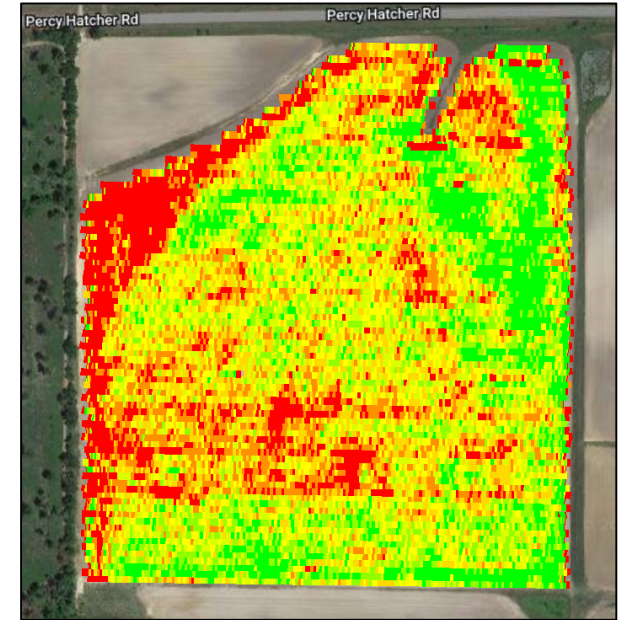
Soil Type or Texture



In-season crop imagery



Elevation

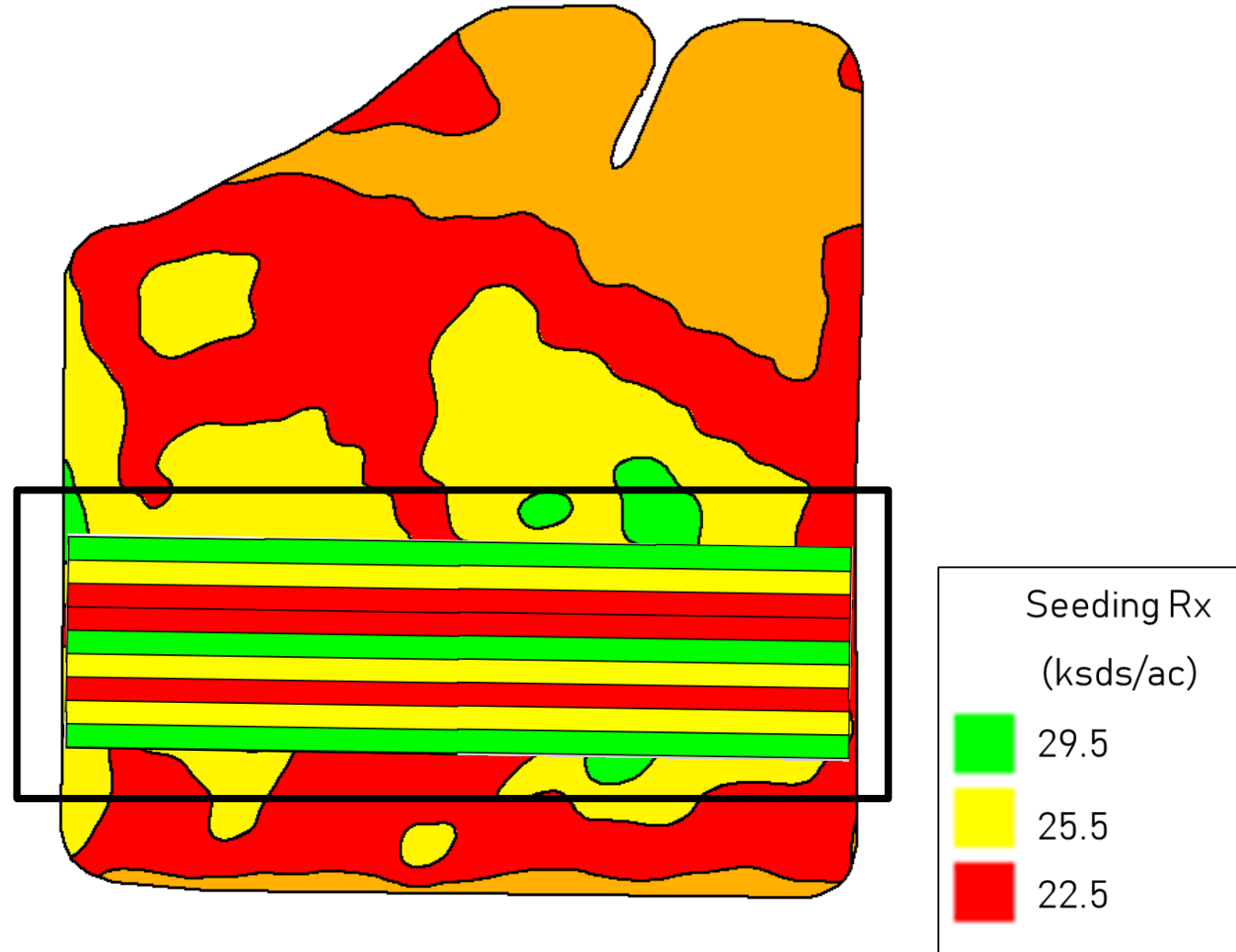


Yield Map

- Management zones were created within each field using different soil and/or crop spatial attributes

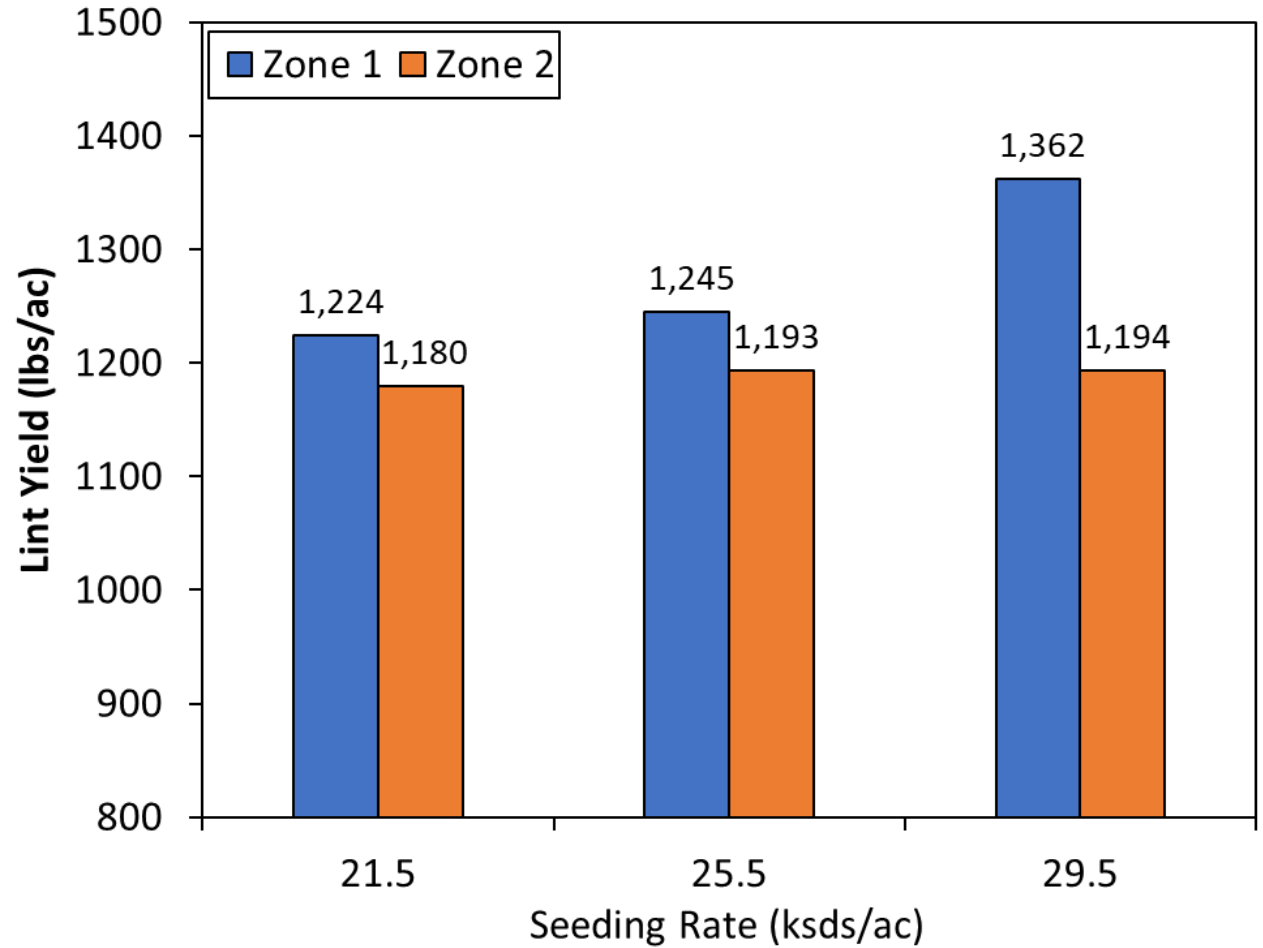
Seeding Rate Strips

- Two to three zones in each field
- Three Seeding Rates
 - 22.5 (ksds/ac)
 - 25.5 (ksds/ac)
 - 29.5 (ksds/ac) (*Grower Nominal*)
- Three replications and seeding rates randomized within each replication
- Each pass represented a seeding rate (800 - 1350 ft length)



Crop Emergence and Yield

Zone	Target Rate (ksds/ac)	Population (plants/ac)	Emergence* (%)
1	21.5	16,590 a	77%
1	25.5	19,494 b	76%
1	29.5	22,506 c	76%
<hr style="border-top: 1px dashed black;"/>			
2	21.5	17,935 a	83%
2	25.5	21,780 b	85%
2	29.5	24,119 c	82%



Cotton Seeding Rate Vs Yield Economics

Zone	Seeding Rate (seeds/ac)	Lint Yield (lbs/ac)	Gross Rev. per acre	Seed Cost (\$/ac)	Net Rev. per acre
1	22.5	1,224	\$1,004	\$62	\$942
1	25.5	1,245	\$1,021	\$70	\$951
1	29.5	1,362	\$1,117	\$81	\$1,035
2	22.5	1,180	\$968	\$62	\$906
2	25.5	1,193	\$978	\$70	\$908
2	29.5	1,194	\$979	\$81	\$898

*UGA Cotton Enterprise Budget: \$2.76/1000 seeds
Cotton price: \$0.82/lb

VR Seeding Rate Studies - 2023



VR Seeding Prescription (Rx) Map



As-Applied (Planted) Map

Population by Management Zone

Zone	Seeding Rate (ksds/ac)	Population (plants/ac) x 1000	Emergence (%)
1	24.0	19.9	82.9
2	24.0	21.2	88.3
3	24.0	21.0	87.5
4	24.0	20.8	86.6
5	28.0	24.2	86.4
6	28.0	24.4	87.1
7	29.0	25.6	88.2

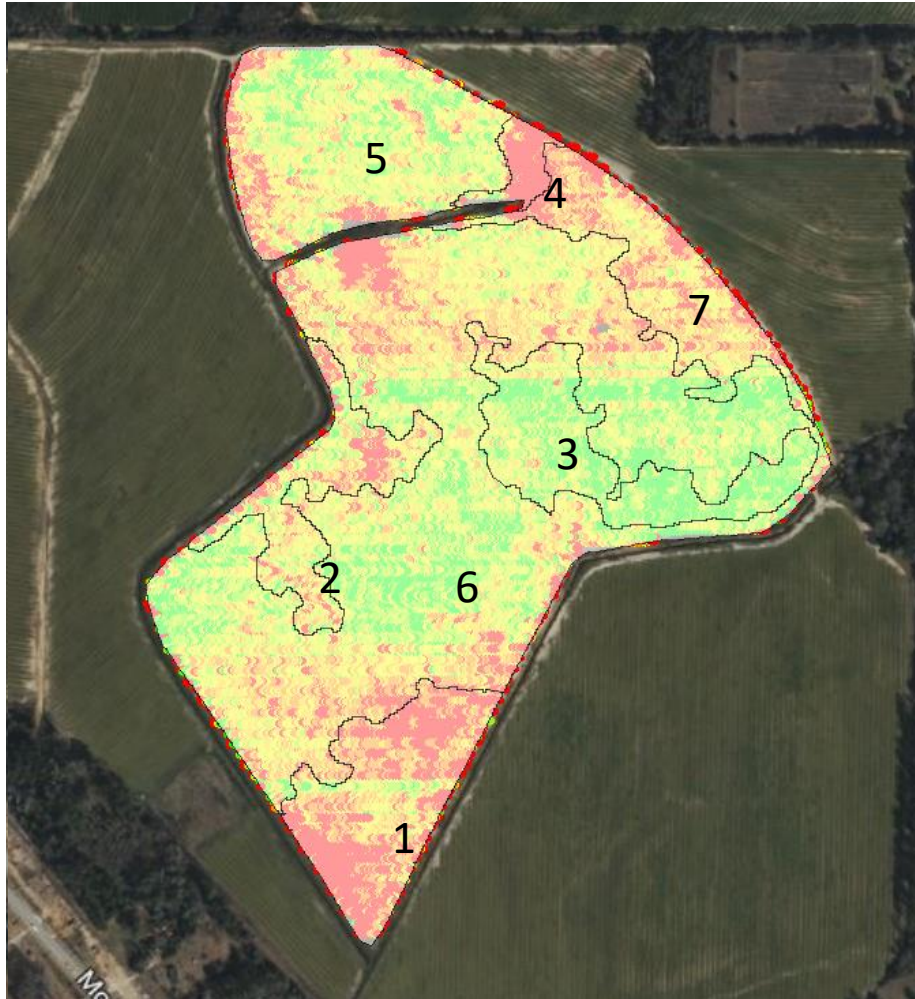


Cotton Yield



Lint Yield (lb/ac)	Area (ac)
0 - 280	0.4
241 - 480	0.2
481 - 720	0.4
721 - 960	1.3
961 - 1200	4.8
1201 - 1440	17.5
1441 - 1680	29.4
1681 - 1920	20.9
1921 - 2160	4.3

Yield by Management Zone



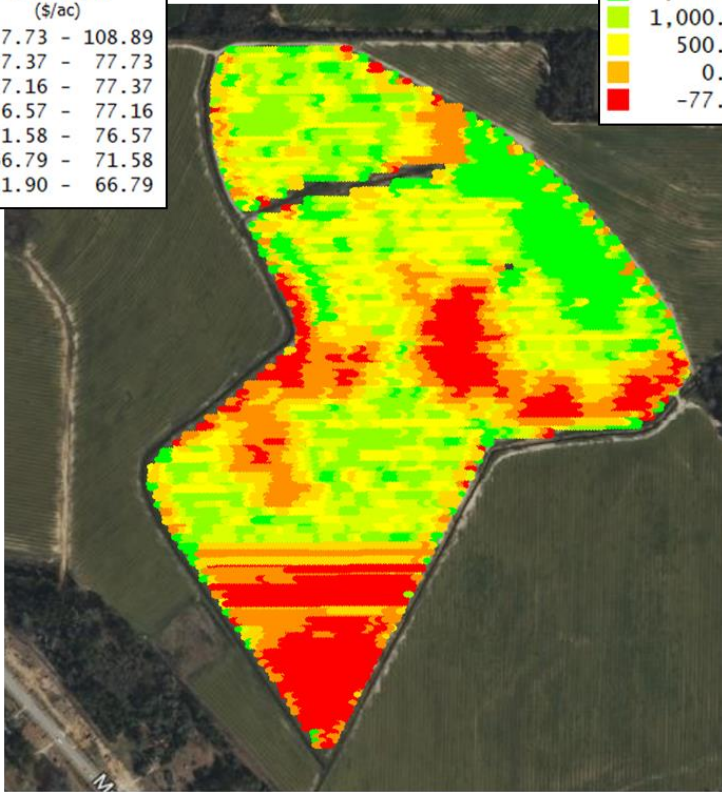
Polygon	Lint Yield (lb/ac)	Area (ac)
1	1276 ± 274	7.5
2	1460 ± 289	5.0
3	1752 ± 195	6.8
4	1063 ± 321	1.1
5	1570 ± 255	12.0
6	1587 ± 252	42.9
7	1399 ± 255	6.2
24.0	1475 ± 340	20.4
28.0	1583 ± 253	54.9
29.0	1399 ± 255	6.2

Profit-Loss Analysis

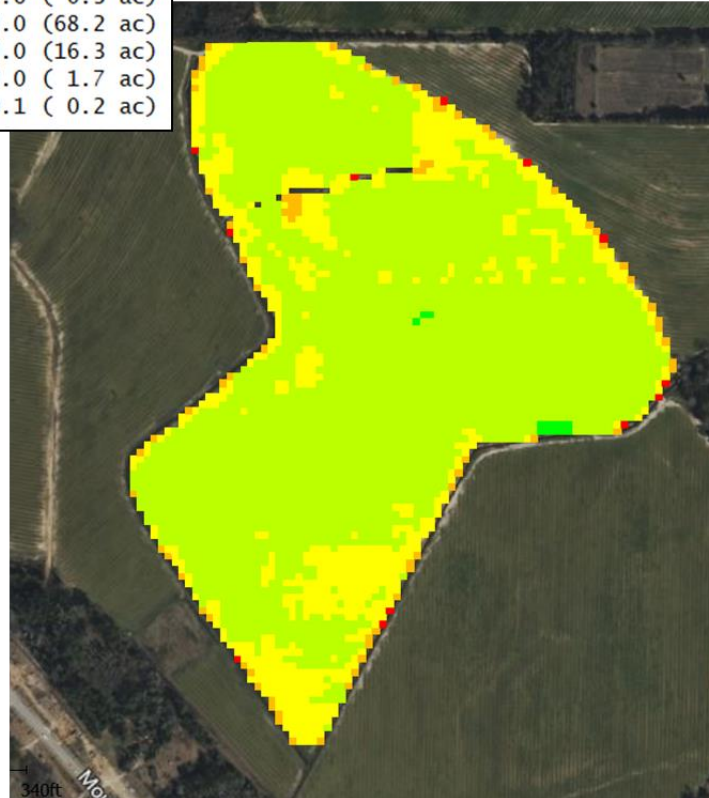
Seed Cost (\$/ac)	
77.73 - 108.89	
77.37 - 77.73	
77.16 - 77.37	
76.57 - 77.16	
71.58 - 76.57	
66.79 - 71.58	
51.90 - 66.79	

Net Rev. (\$/ac)	
1,500.0 - 2,325.6	(0.3 ac)
1,000.0 - 1,500.0	(68.2 ac)
500.0 - 1,000.0	(16.3 ac)
0.1 - 500.0	(1.7 ac)
-77.2 - 0.1	(0.2 ac)

Profit
Break Even
Loss



Seed Cost per Acre



Net Revenue per Acre

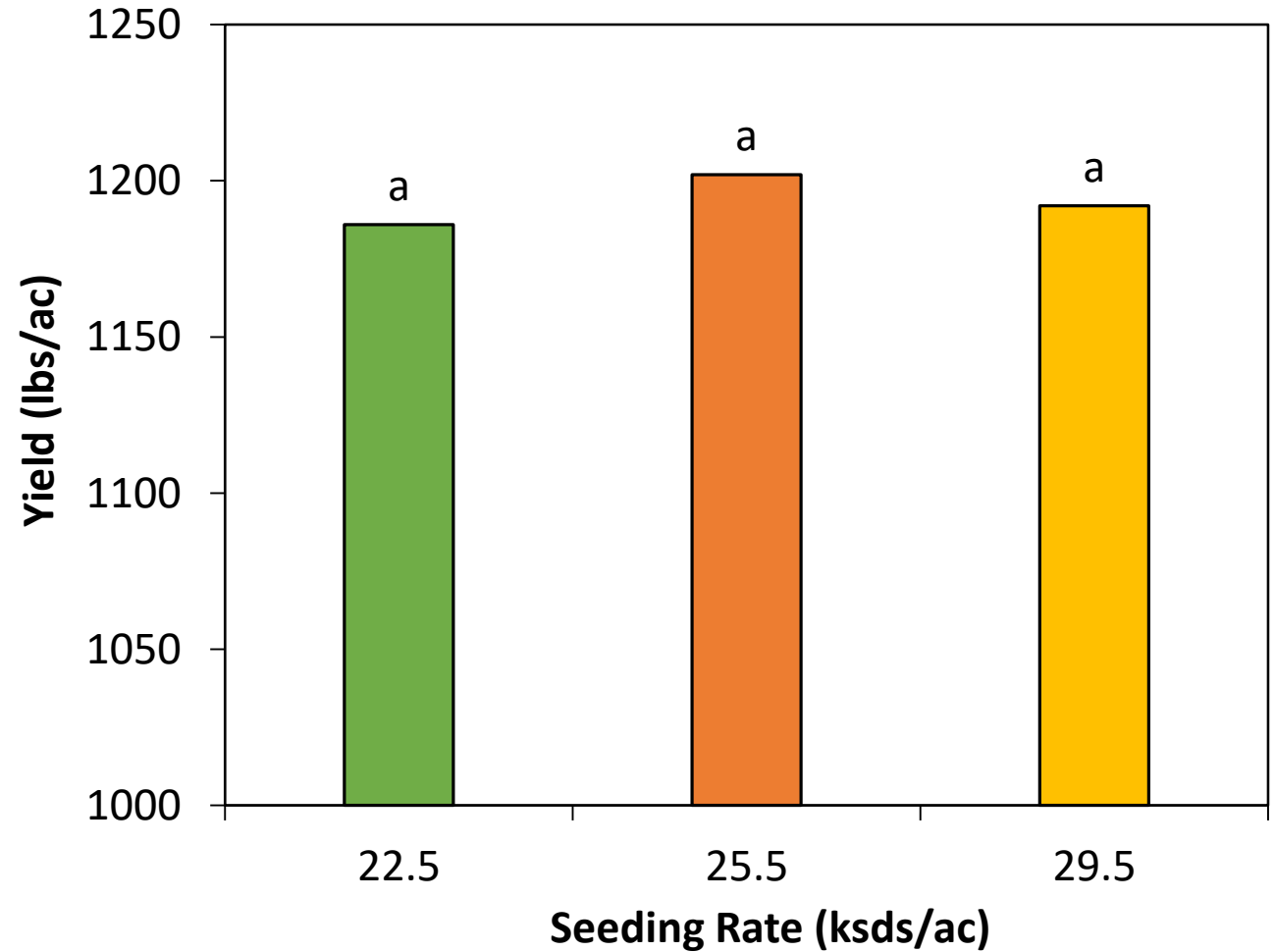


Profit/loss per acre

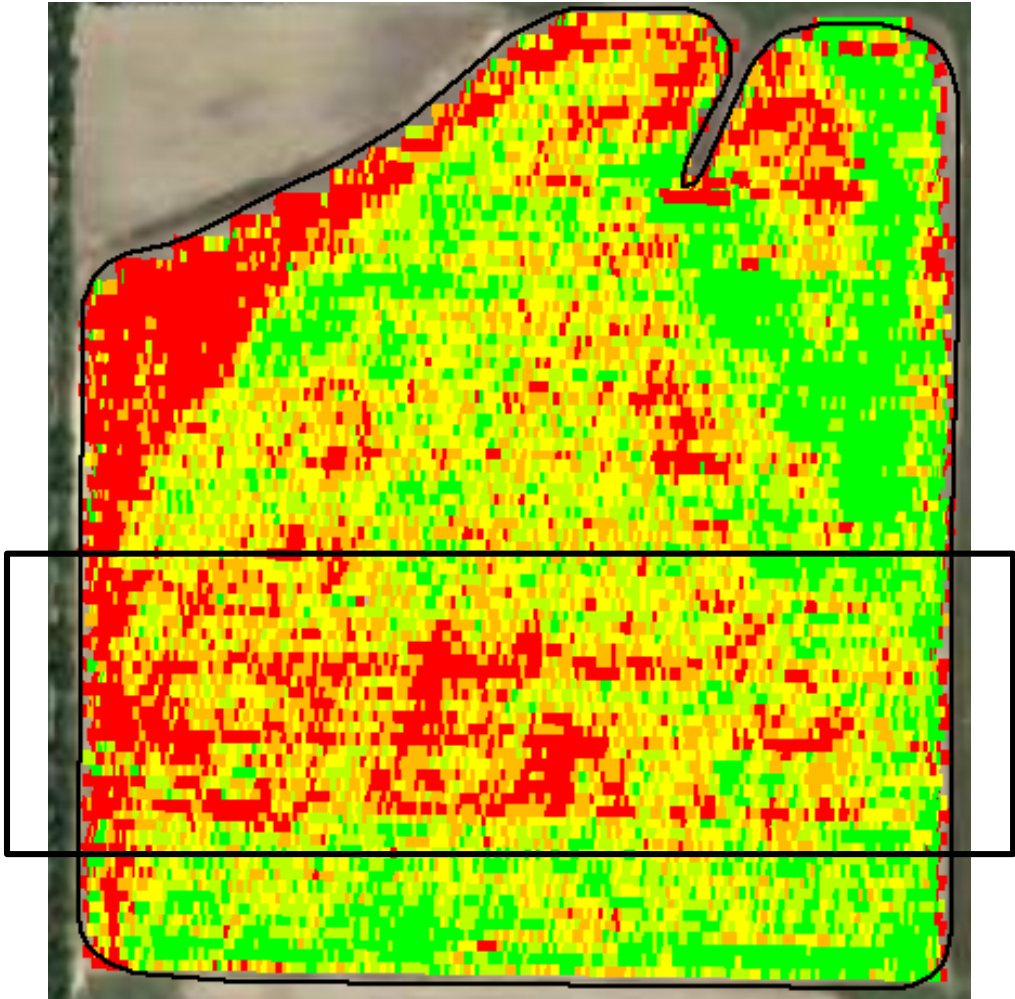
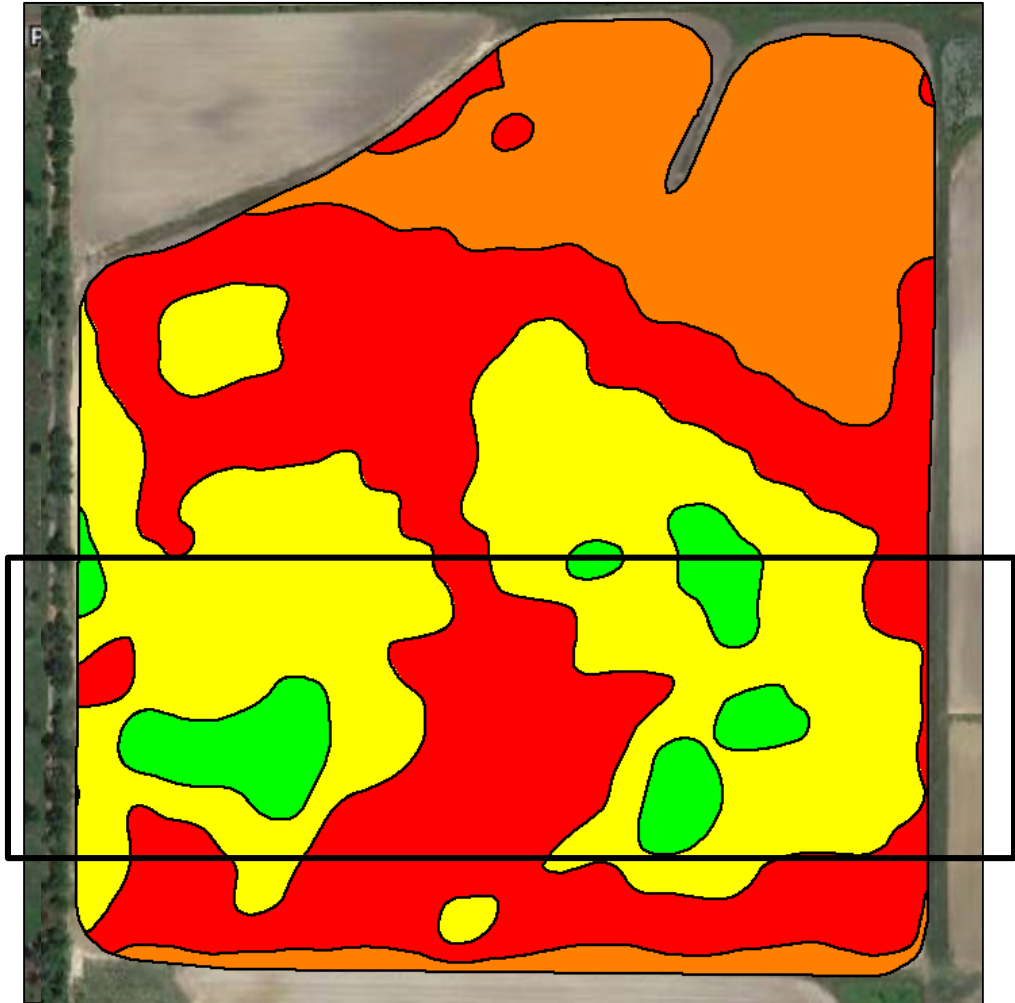
UGA Cotton Enterprise Budget: \$2.76/1000 seeds; 1 seed bag = \$635 (2,30,000 seeds); production costs = \$972.55/ac

Yield by Seeding Rate

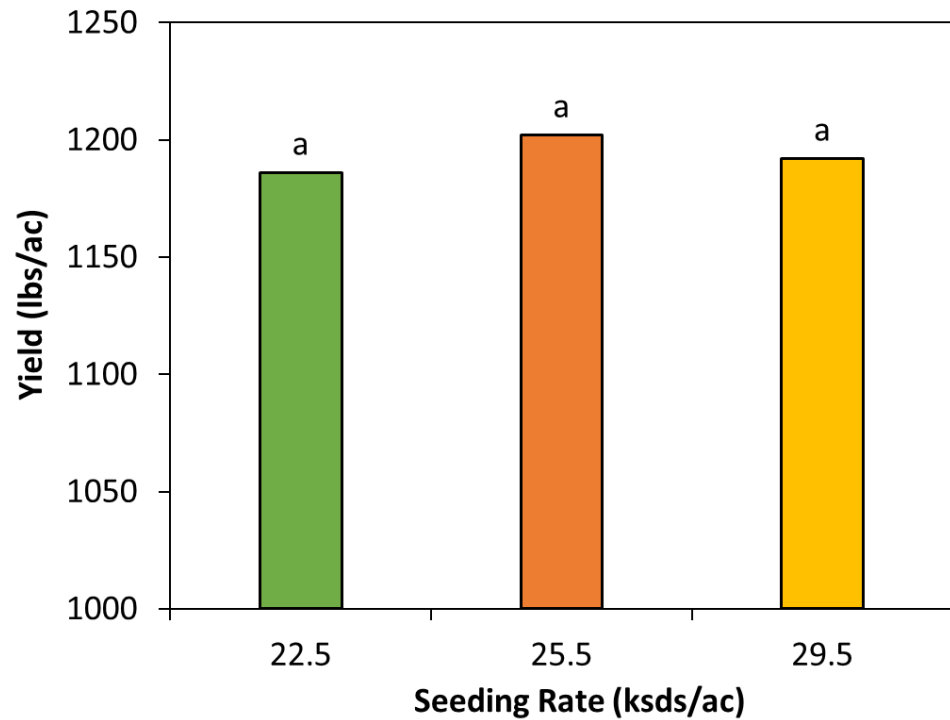
Seeding Rate (sds/ac)	Plant Population (plants/ac)	Emergence (%)
22,500	19,037	85
25,500	19,723	77
29,500	24,200	82



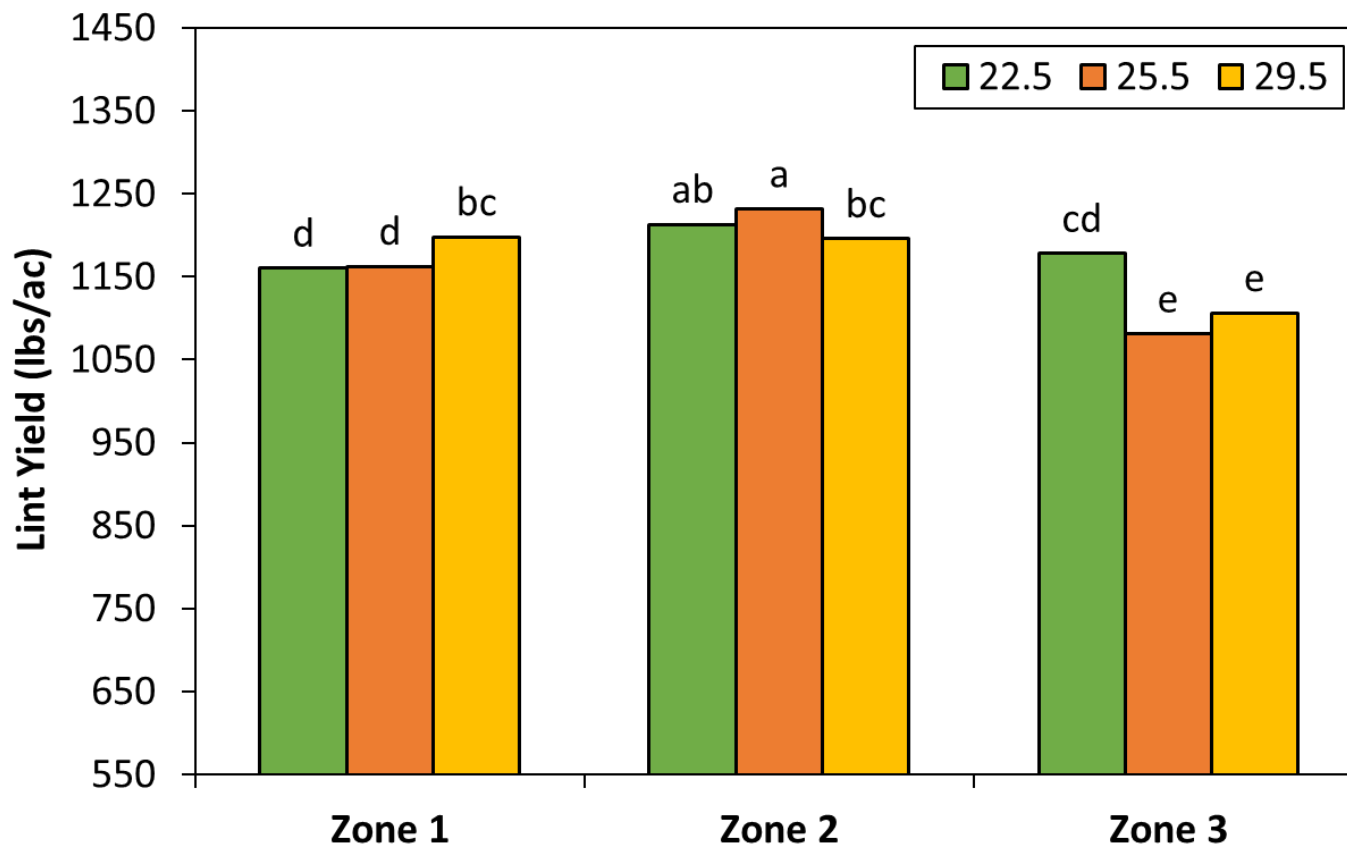
Yield by Management Zone



Yield by Seeding Rate



Yield by Management Zone



Spray Drone Applications in Cotton



Spot-Spray Herbicide Applications

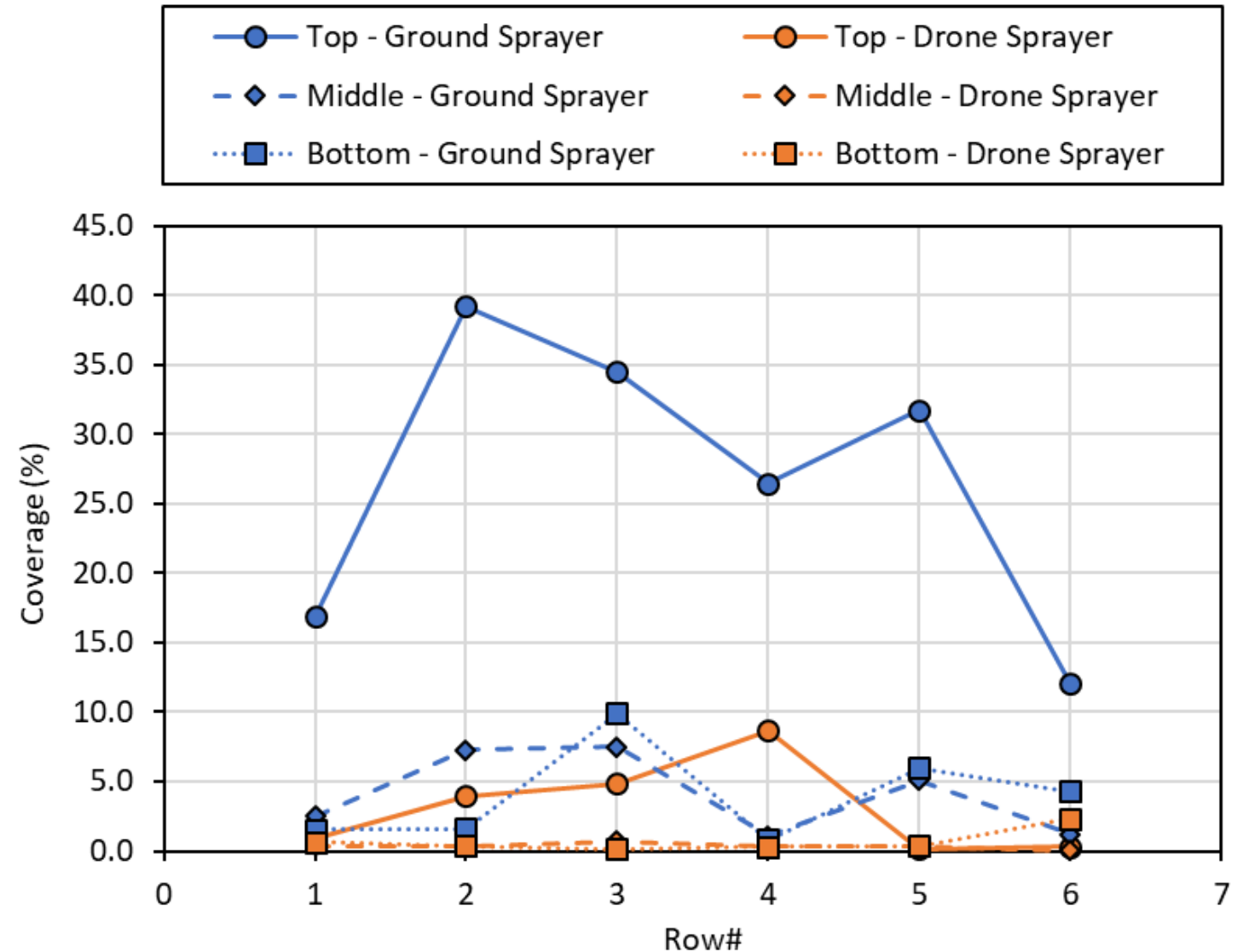
Targeting weed escapes early or late in the season



Cotton Fungicide Application

Study Information:

- Two application methods: *Spray drone (2 GPA) and ground sprayer (15 GPA)*
- Fungicide used was Revytek @ 10 oz/A
- Fungicides applied 3rd week of bloom
- Cotton Variety – DynaGro 3799 B3XF
- Three positions within the cotton canopy: *Top, Middle and Bottom*
- DJI Agras T30 agricultural spray drone (8 gallon tank, 16-nozzle configuration, hexcopter)



Cotton Defoliation with Spray Drone

■ Drone Sprayer:

- DJI Agras T40
- 40 L tank, rotary atomizers
- Application height: 8 ft
- Flight speed: 10 mph



■ Ground Sprayer:

- 6700 JD sprayer
- 60 ft boom
- 20 in. nozzle spacing
- Ground speed: 8 mph



- **Study Treatments:**
 - Drone Sprayer
 - 3 GPA & 5 GPA
 - Ground Sprayer
 - 5 GPA & 10 GPA
- Each treatment (sprayer and volume) was replicated four times
- Each treatment was implemented in large blocks (4 plots)
- Each plot measured 8 rows wide (24 ft) and 350 ft long



Data Collection



Spray Deposition:

- Using water-sensitive paper (WSP) placed at the top, middle, and bottom of the canopy across the swath (8 rows)

Defoliation Efficacy:

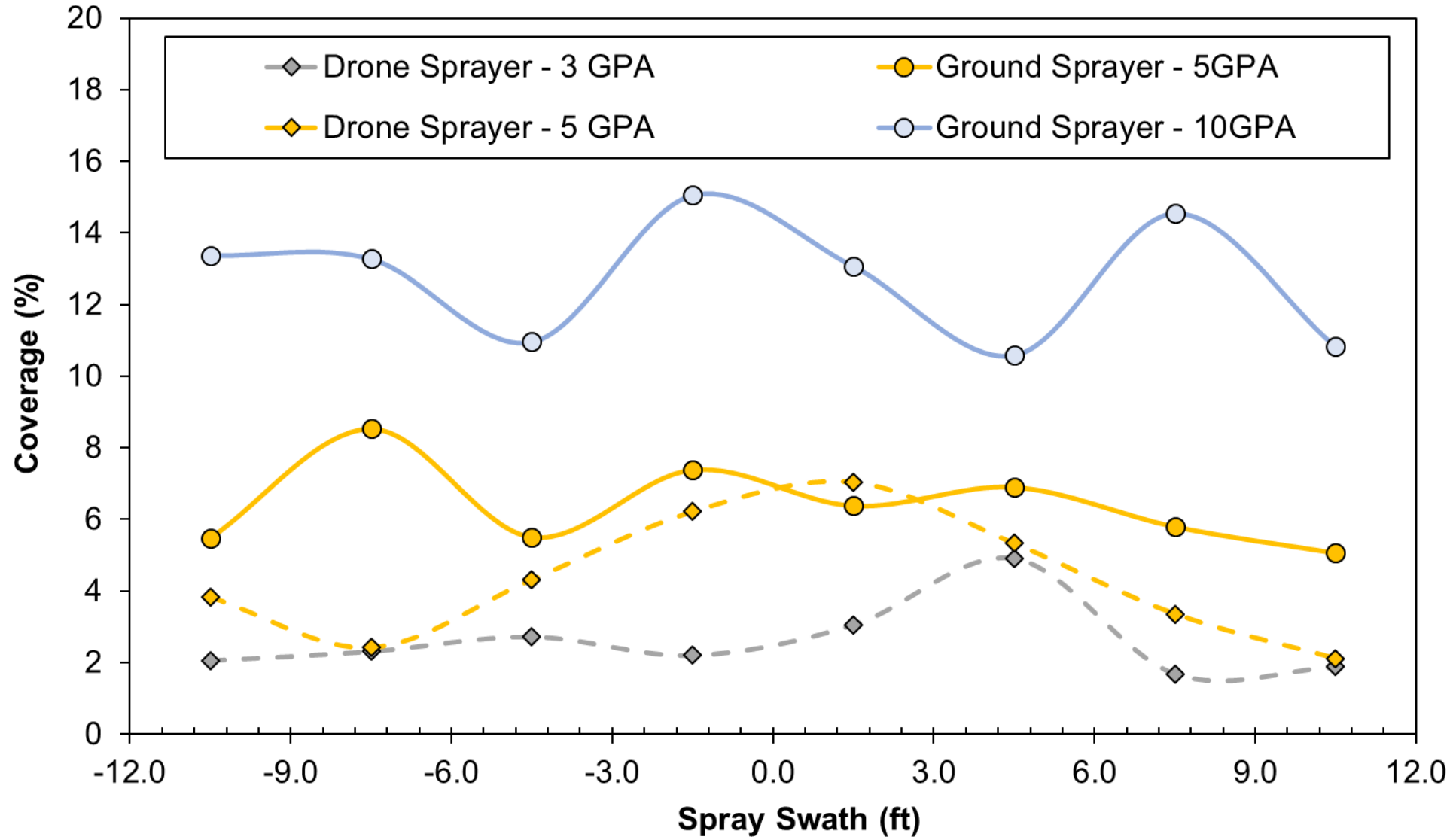
- Defoliation (%), open bolls (%), desiccation (%), and regrowth (%) was recorded at 10 days after application.



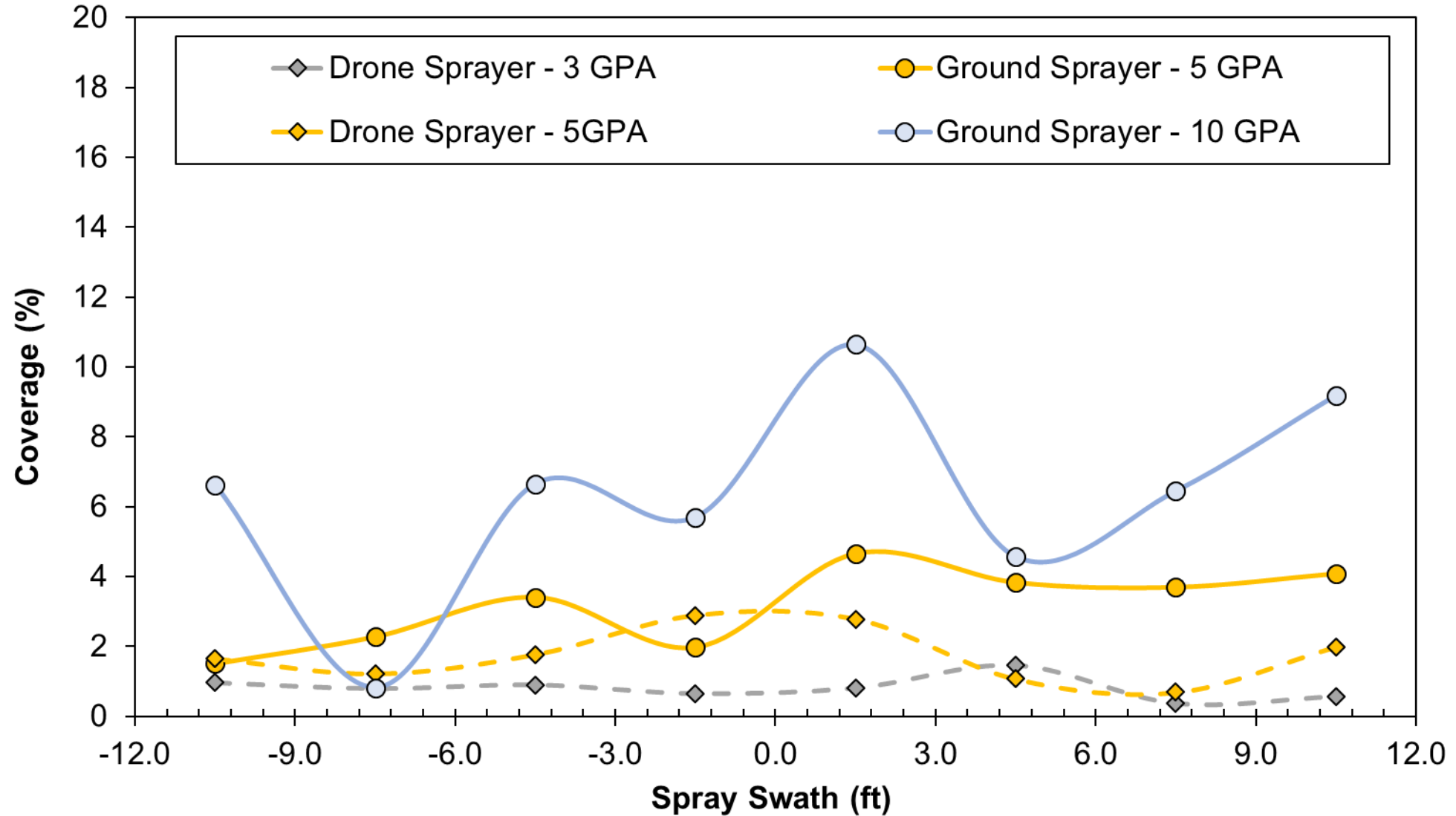
Yield and Fiber Quality:

- Yield was recorded by harvesting middle 4 rows within each plot. Cotton samples were taken from each plot to assess lint and fiber quality.

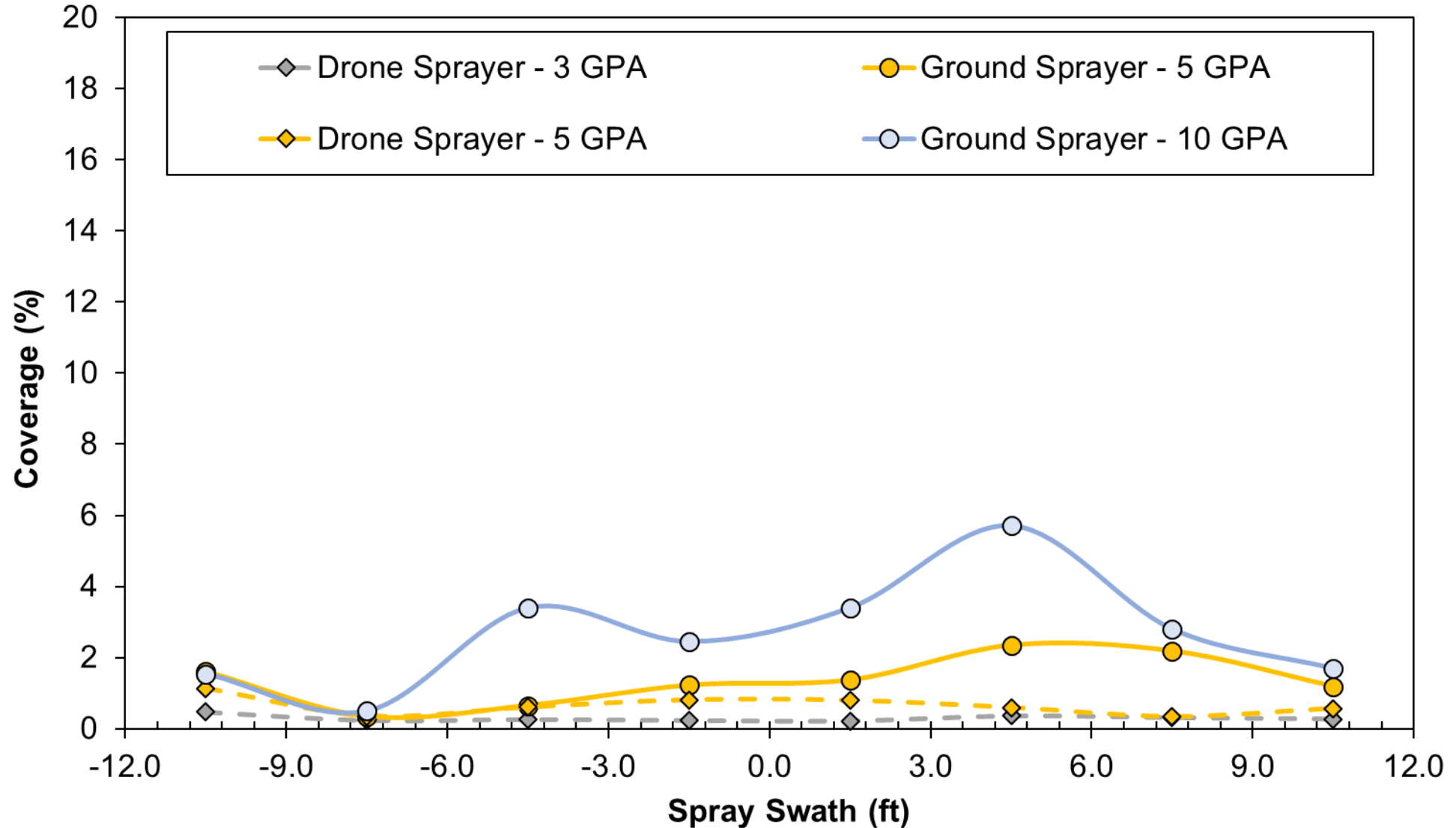
Spray Deposition – Top Canopy



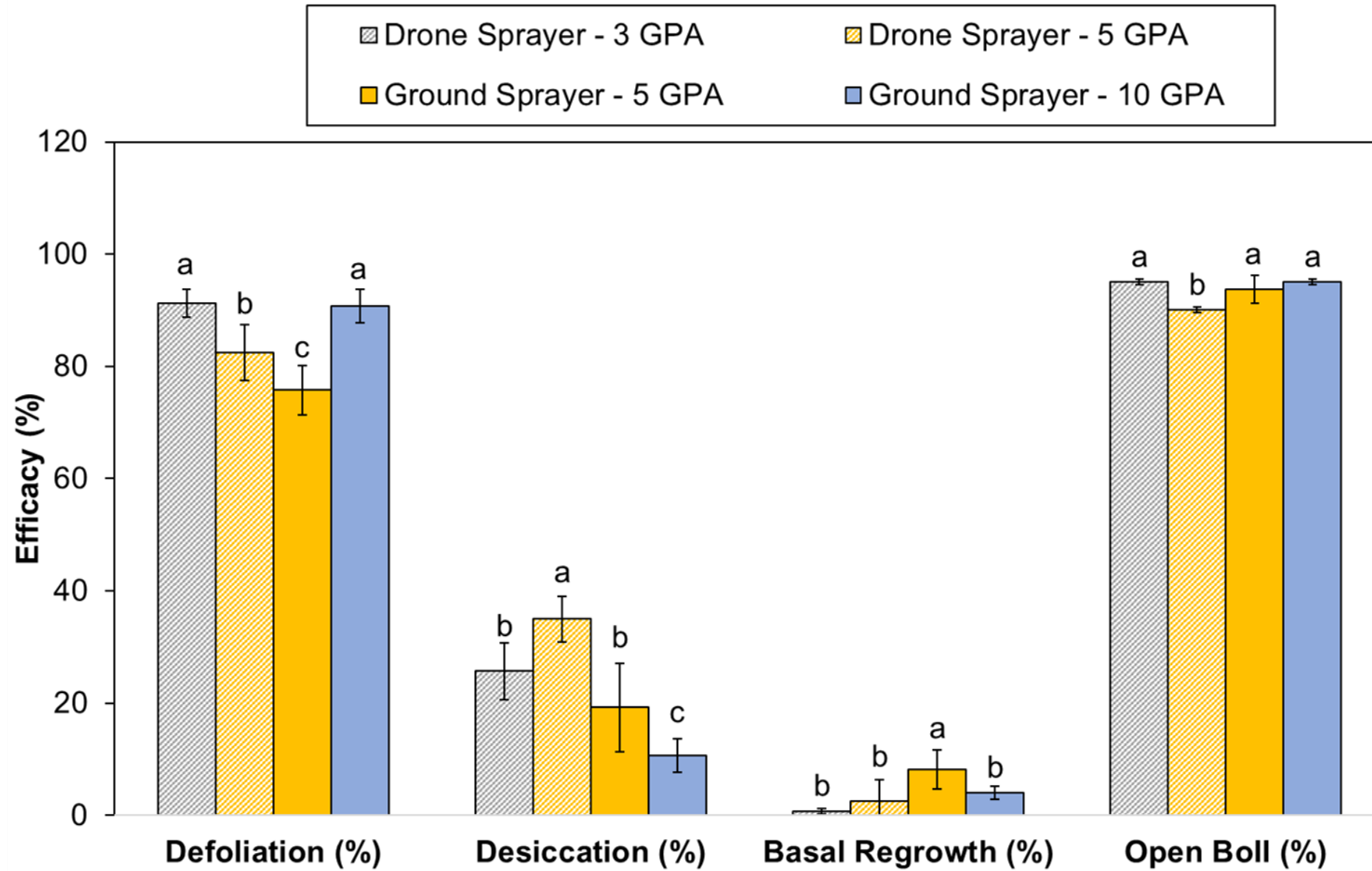
Spray Deposition – Middle Canopy

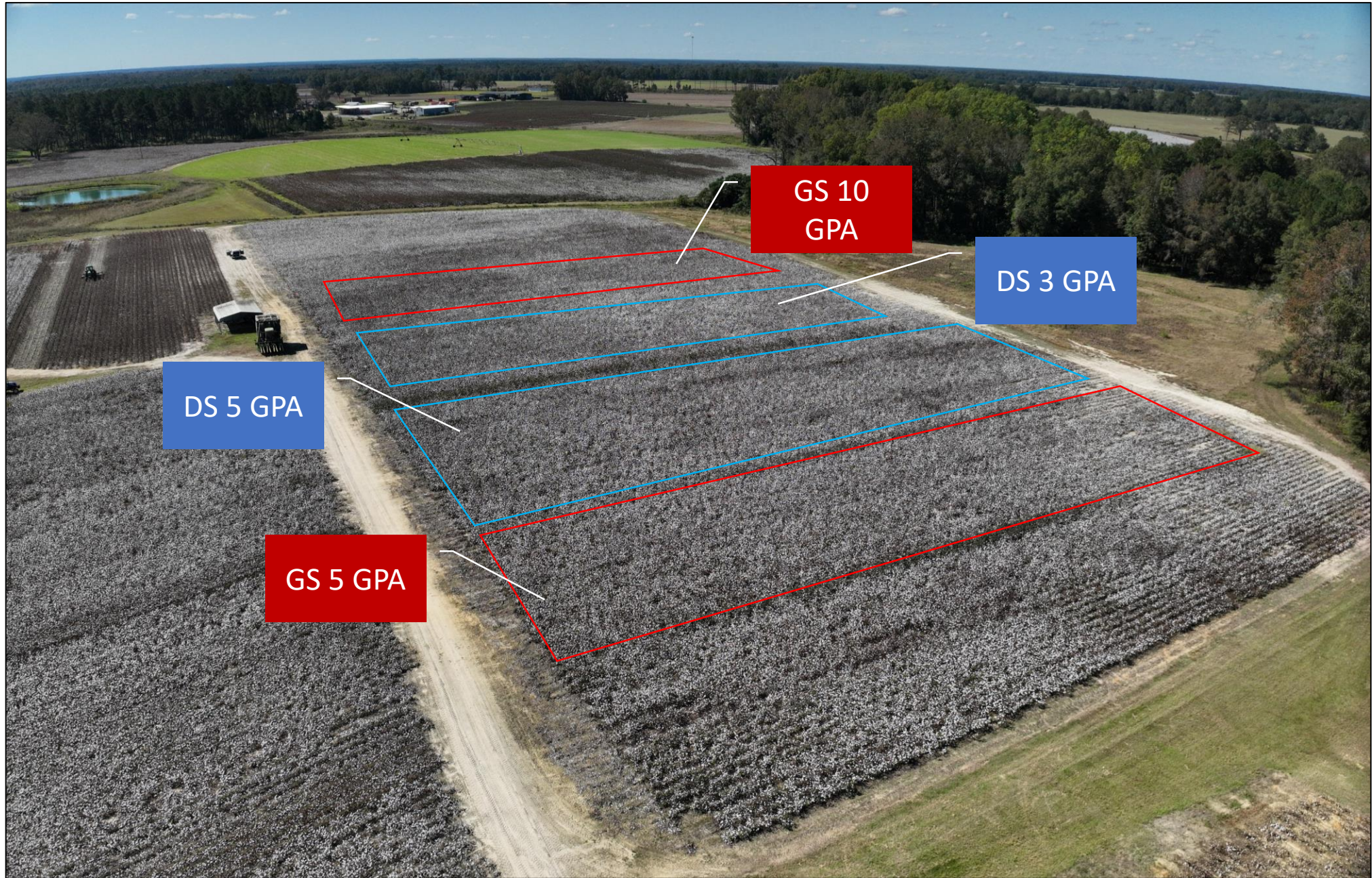


Spray Deposition – Bottom Canopy



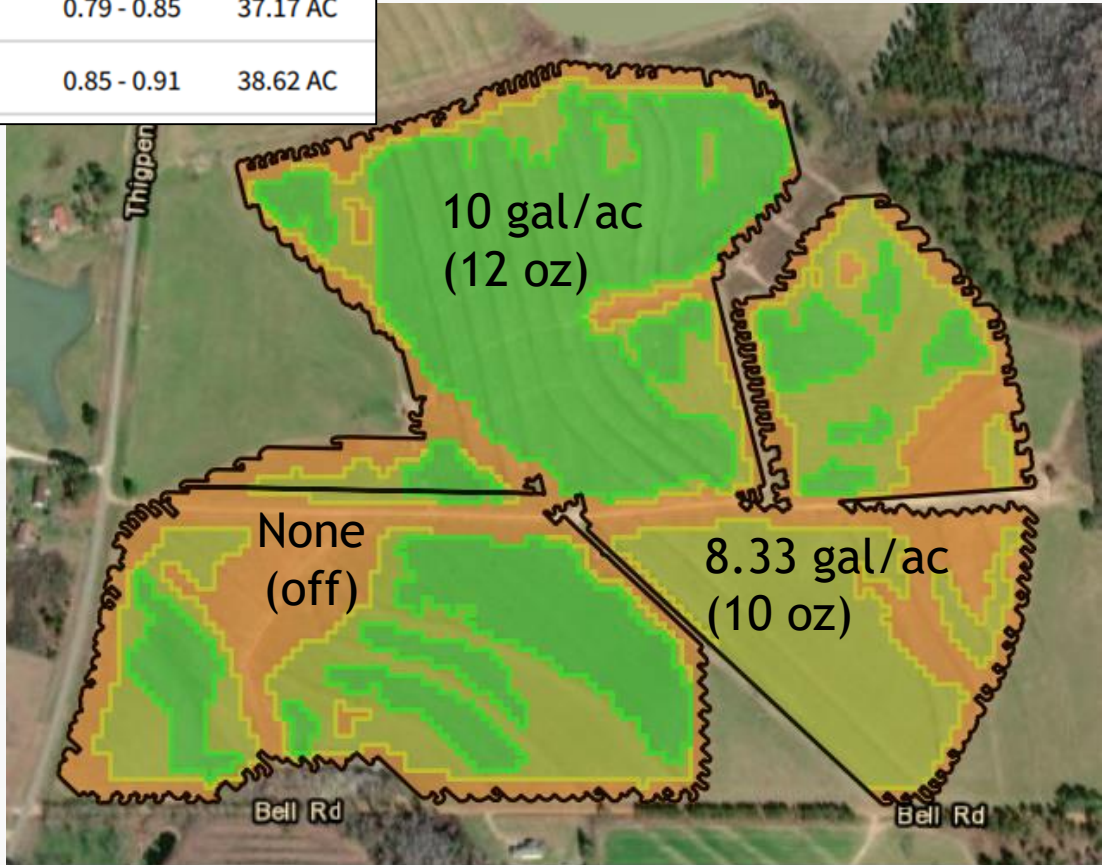
Defoliation Efficacy





Variable-Rate PGR Application with Spray Drone?

ZONE	SPAN	AREA
1	0.3 - 0.79	31.57 AC
2	0.79 - 0.85	37.17 AC
3	0.85 - 0.91	38.62 AC



Zone delineation from in-season aerial imagery



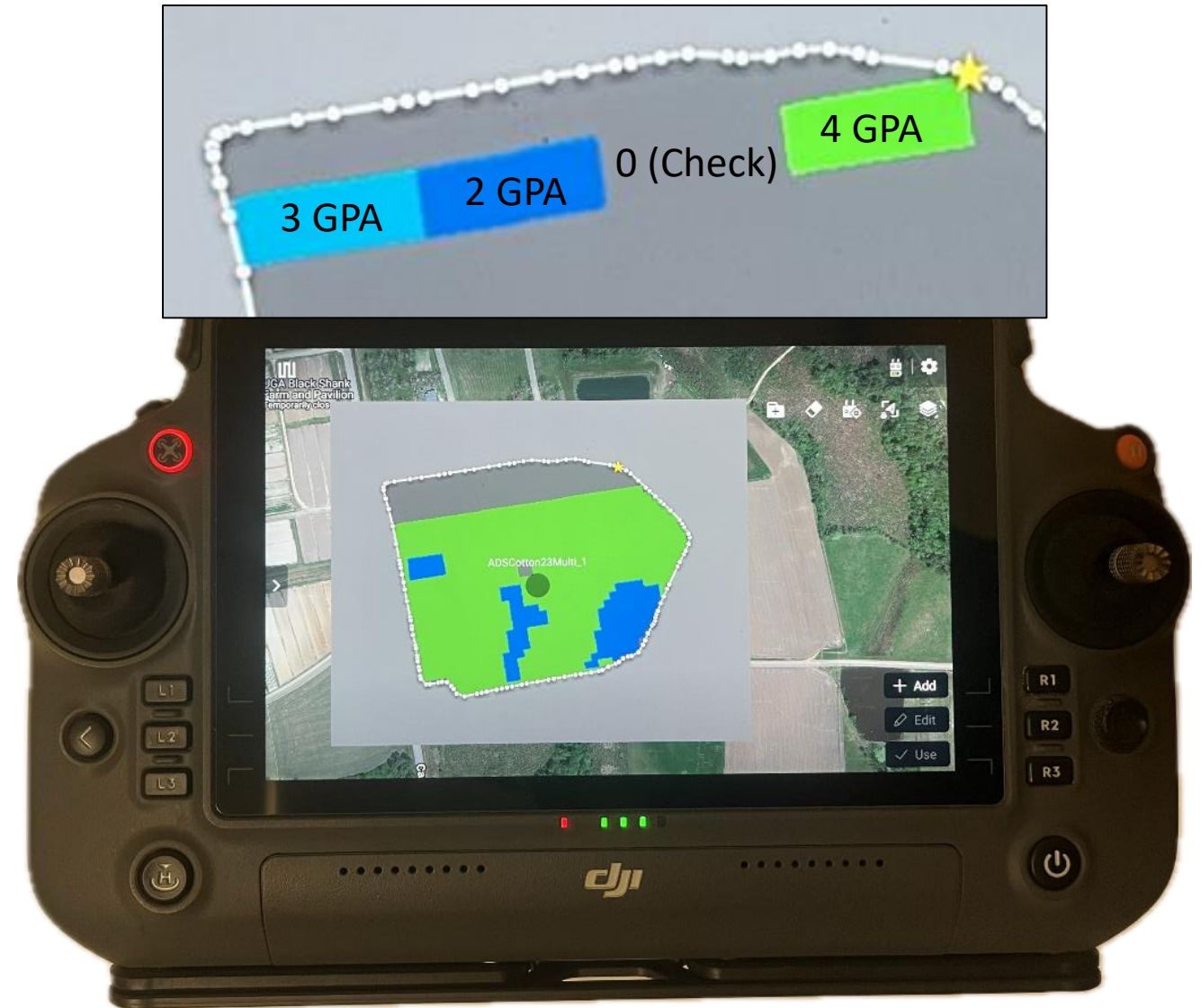
11.9	2 %
10.9	4 %
10.2	9 %
9.7	64 %
9	8 %
8	11 %
0	2 %

As-applied PGR Map

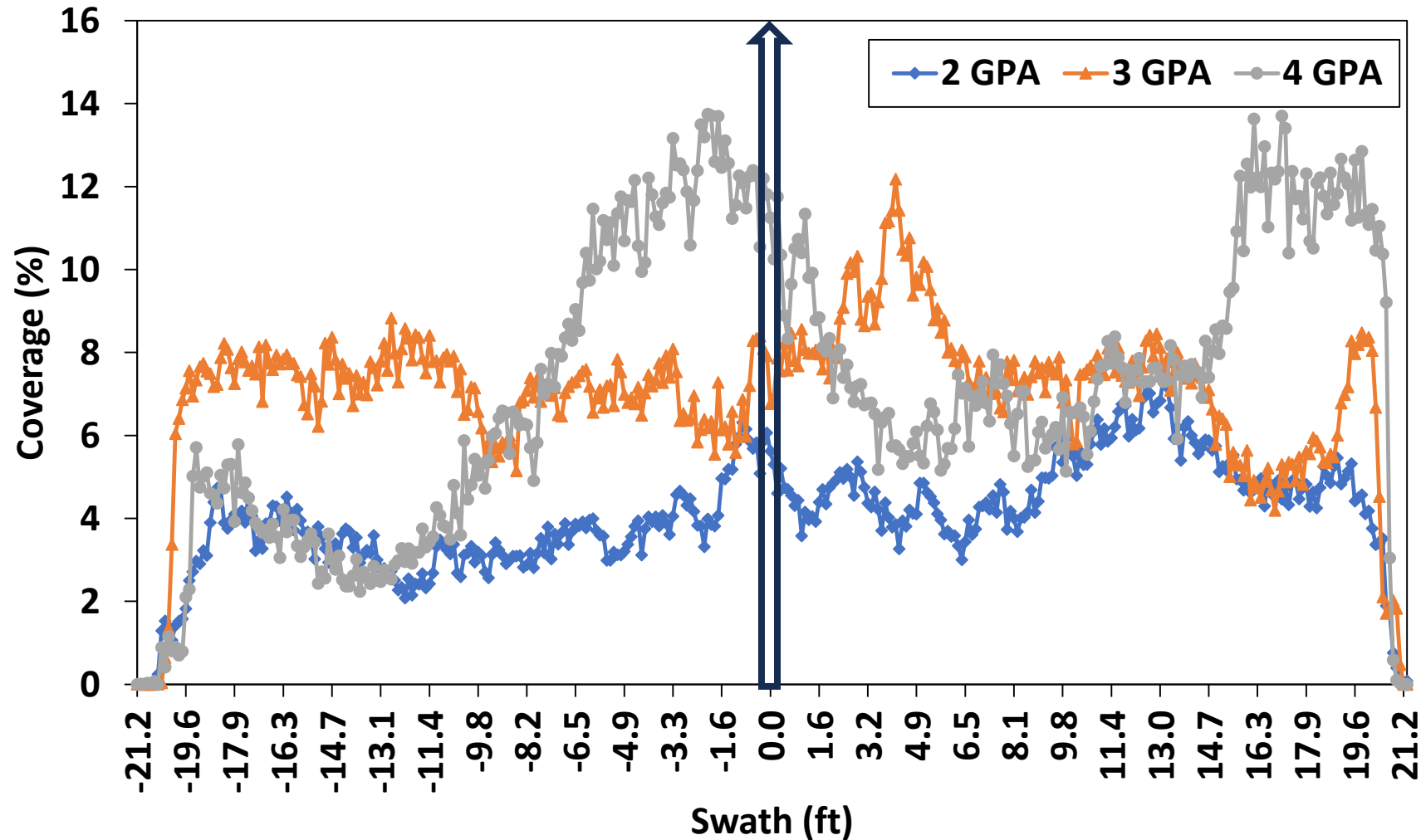
Variable-Rate PGR Application Study

■ Field Testing

- PGR (*Mepiquat Chloride*)
- Application Rates (*PGR rate*)
 - 2 GPA (8 oz/ac)
 - 3 GPA (10 oz/ac)
 - 4 GPA (12 oz/ac)
- 8 Row Plots, 24 ft Swath
- Variable-Rate Application
 - Prescription map with two rates (26 ac field)



Spray Deposition Within the Swath



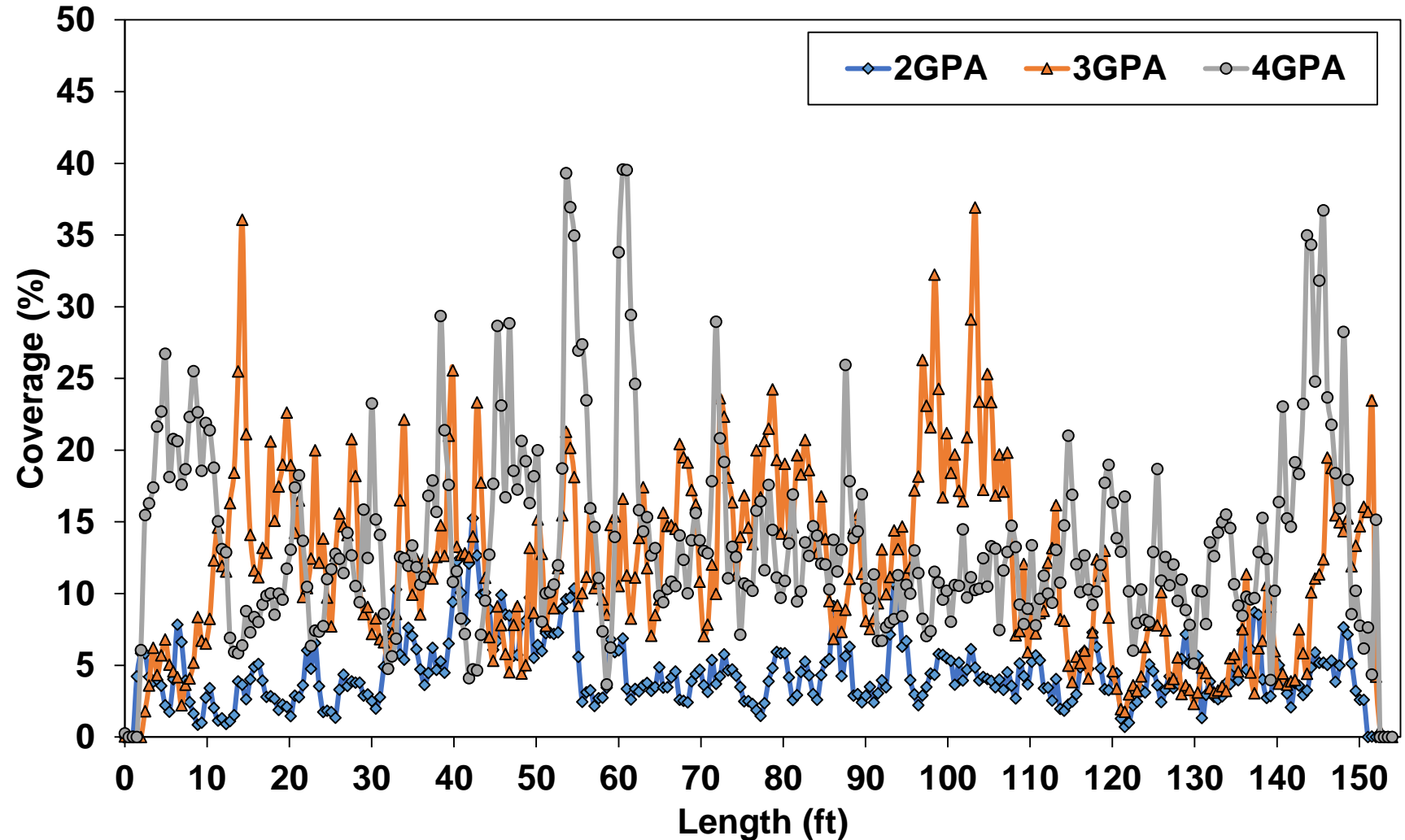
Rate (GPA)	Mean Coverage (%)	CV (%)
2.0	3.9 b	34.8
3.0	6.6 a	37.4
4.0	6.5 a	51.7

CV less than 25% is acceptable as per ASABE standard S386.2

Spray Deposition Along the Swath

Rate (GPA)	Mean Coverage (%)	CV (%)
2.0	3.7 b	60.5
3.0	11.8 a	71.7
4.0	12.7 a	75.9

CV less than 25% is acceptable
as per ASABE standard S386.2





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