

Lincoln County

Cover Crop Comparison

Site C001

2016-2023 on-going



Imagery 7/11/2022

Ver. 060624

Cover Crop Management

Lincoln County

Site C001

					Termination Management			
Year	Planting Date	Method	Cover Crop Treatment 1	Seeding Rate (lbs/A)	Date	Method	Cover Crop Stage at Termination	Notes
2016	10/16/15	Drilled	Cereal Rye	60	3/28/16	Herbicide	8" vegetative	
	10/16/15	Drilled	Winter Wheat	60	3/28/16	Herbicide	8" vegetative	
2017	10/19/16	Drilled	Cereal Rye	60	4/12/17	Herbicide	8" vegetative	
	10/19/16	Drilled	Winter Wheat	60	4/12/17	Herbicide	8" vegetative	
2018	11/1/17	Drilled	Cereal Rye	60	4/11/18	Herbicide	3" vegetative	
	11/1/17	Drilled	Winter Wheat	60	4/11/18	Herbicide	3" vegetative	
2019	9/28/18	Broadcast	Cereal Rye		5/17/19	Herbicide		
	9/28/18	Broadcast	Winter Wheat		5/17/19	Herbicide		
2020	10/28/19	Broadcast	Cereal Rye		4/5/20	Herbicide	6" vegetative	
	10/28/19	Broadcast	Winter Wheat		4/5/20	Herbicide	6" vegetative	
2021	11/5/20	Drilled	Cereal Rye		5/21/21	Herbicide	48" heading	Extensive vole damage.
	11/5/20	Drilled	Winter Wheat		5/21/21	Herbicide	24" heading	Extensive vole damage.
2022			Cereal Rye		4/10/22	Herbicide	6" vegetative	
			Winter Wheat		4/10/22	Herbicide		
2023		Drilled	Cereal Rye		4/26/23	Herbicide		Planted into the green.
		Drilled	Winter wheat		4/26/23	Herbicide		Planted into the green.

Grain Crop Management

Lincoln County

Site COO1

Year	Cover Crop Year	Grain Crop	Planting Date	Days after CC Termination	Variety	Seeding Rate (Seeds/A)	Harvest Date	Tillage	Notes
2016	1	Corn	4/17/16	20			9/19/16	NoTill	
2017	2	Soybean	5/15/17	33			10/1/17	NoTill	
2018	3	Corn	4/24/18	13	LG5650	34,000	9/22/18	NoTill	
2019	4	Soybean	5/17/19	0			10/18/19	NoTill	
2020	5	Corn	4/20/20	15	LG 5650 VT2RIB	34,000	10/31/20	NoTill	
2021	6	Soybean	5/14/21	-7			10/19/21	NoTill	
2022	7	Corn	5/12/22	32			10/18/22	NoTill	
2023	8	Soybean	4/26/23	0			10/12/23	NoTill	

Lincoln County

Cover Crop Comparison

Site 1

Year 1
Corn

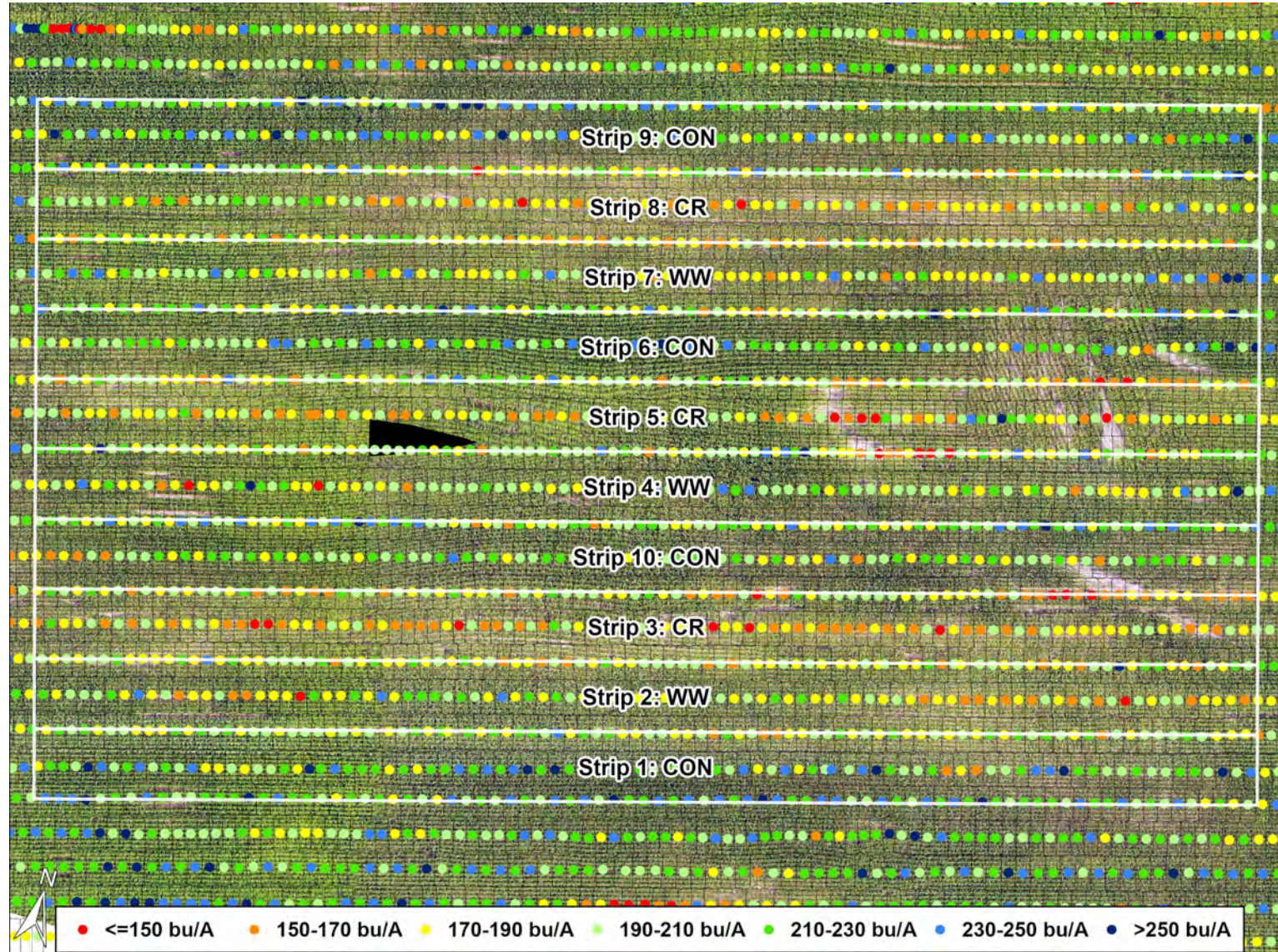
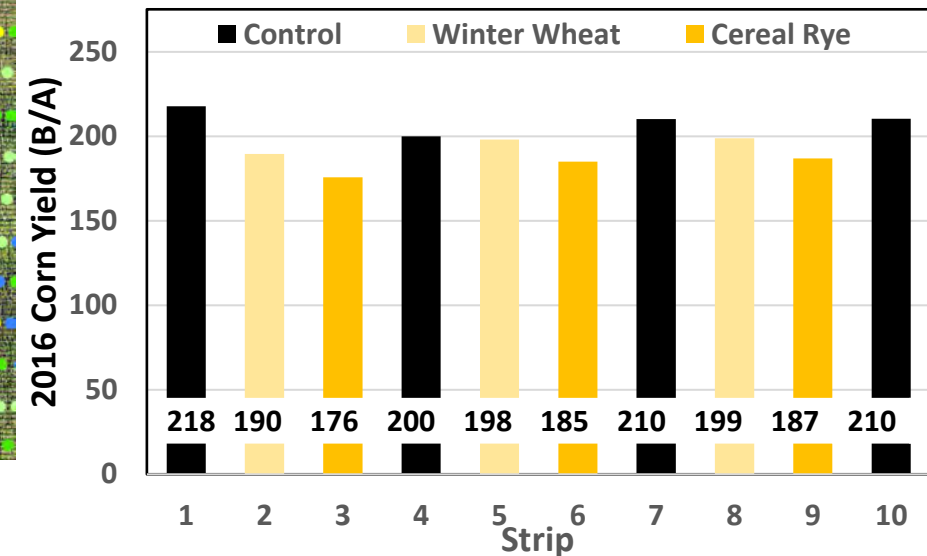


Figure 1. Yield for corn in 2016. Data from passes fully in treatment strips. Imagery from 100 meters on June 28, 2016.

Crop	Site 1	
	Yield (STD)	Delta No Cover
	<i>bushels per acre</i>	
Site mean	197 (13)	--
No Cover Crop	210 (7)	--
Winter Wheat	195 (5)	-15
Cereal Rye	183 (6)	-27



Lincoln County

Cover Crop Comparison

Site 1

Year 2
Beans

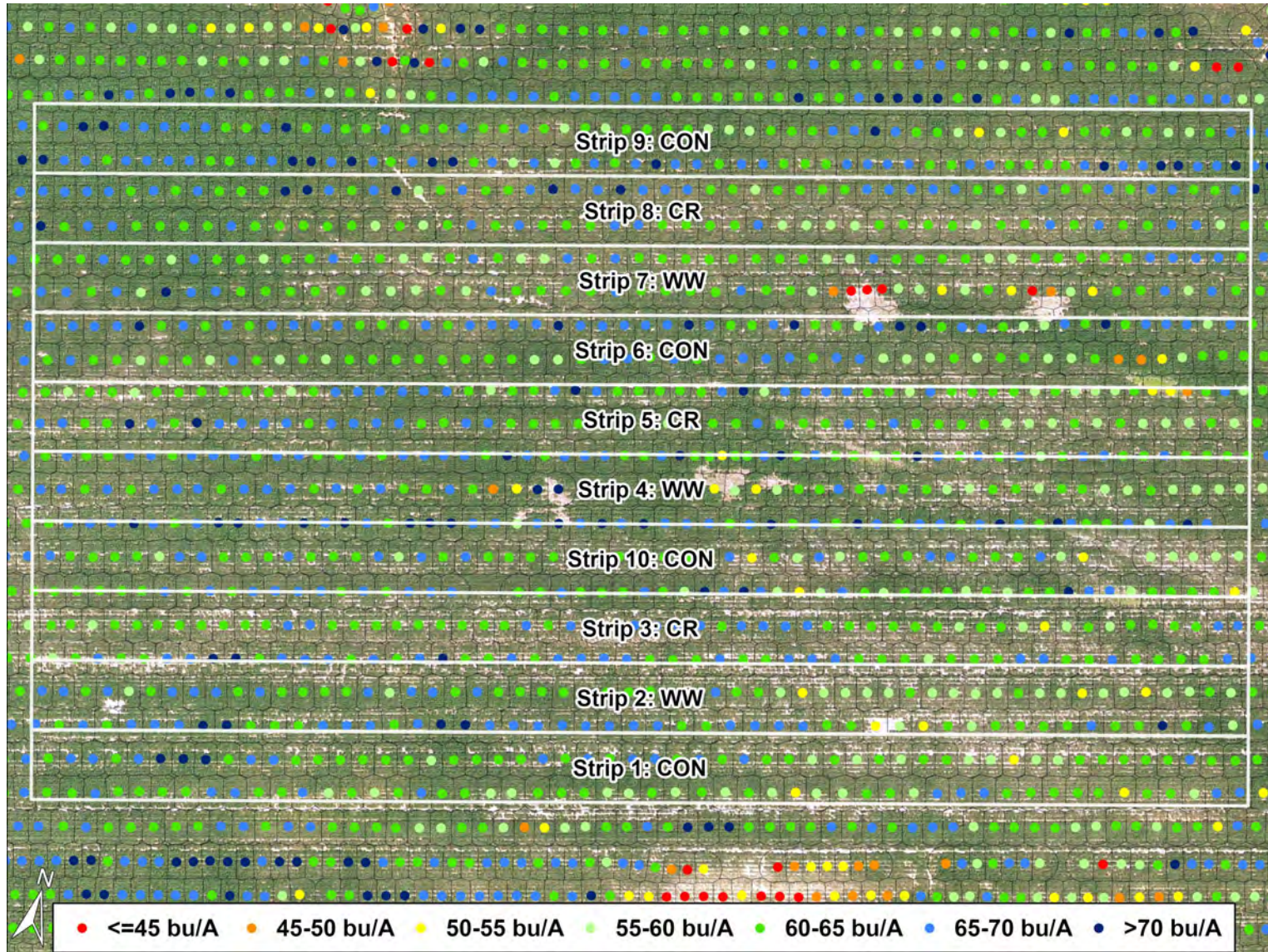
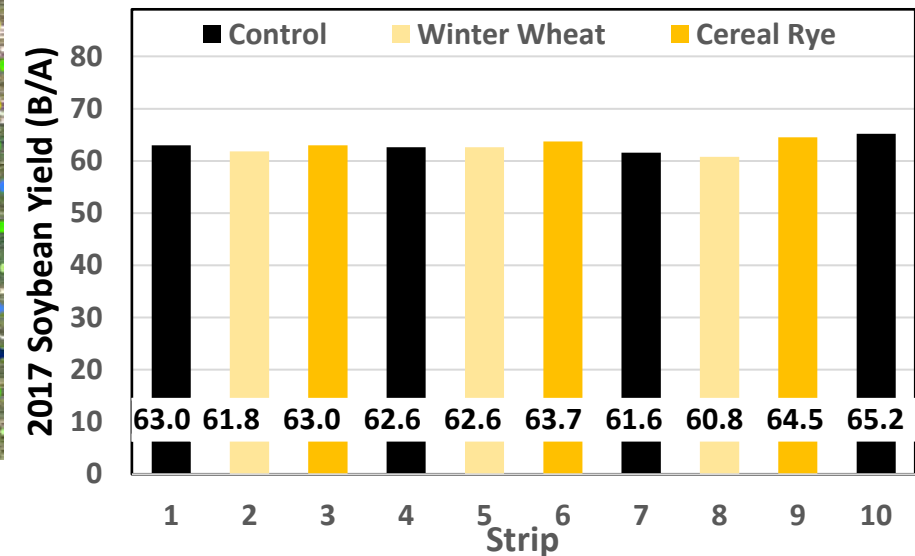


Figure 1. Yield for soybeans in 2017. Data from passes fully in treatment strips. Imagery from 100 meters on July 20, 2017.

Crop	Site 1	
	Yield (STD)	Delta No Cover
	<i>bushels per acre</i>	
Site mean	62.8 (1)	--
No Cover Crop	63.1 (2)	--
Winter Wheat	61.7 (1)	-1.4
Cereal Rye	63.7 (1)	0.6



Lincoln County Cover Crop Comparison

Site 1

Year 3
Corn

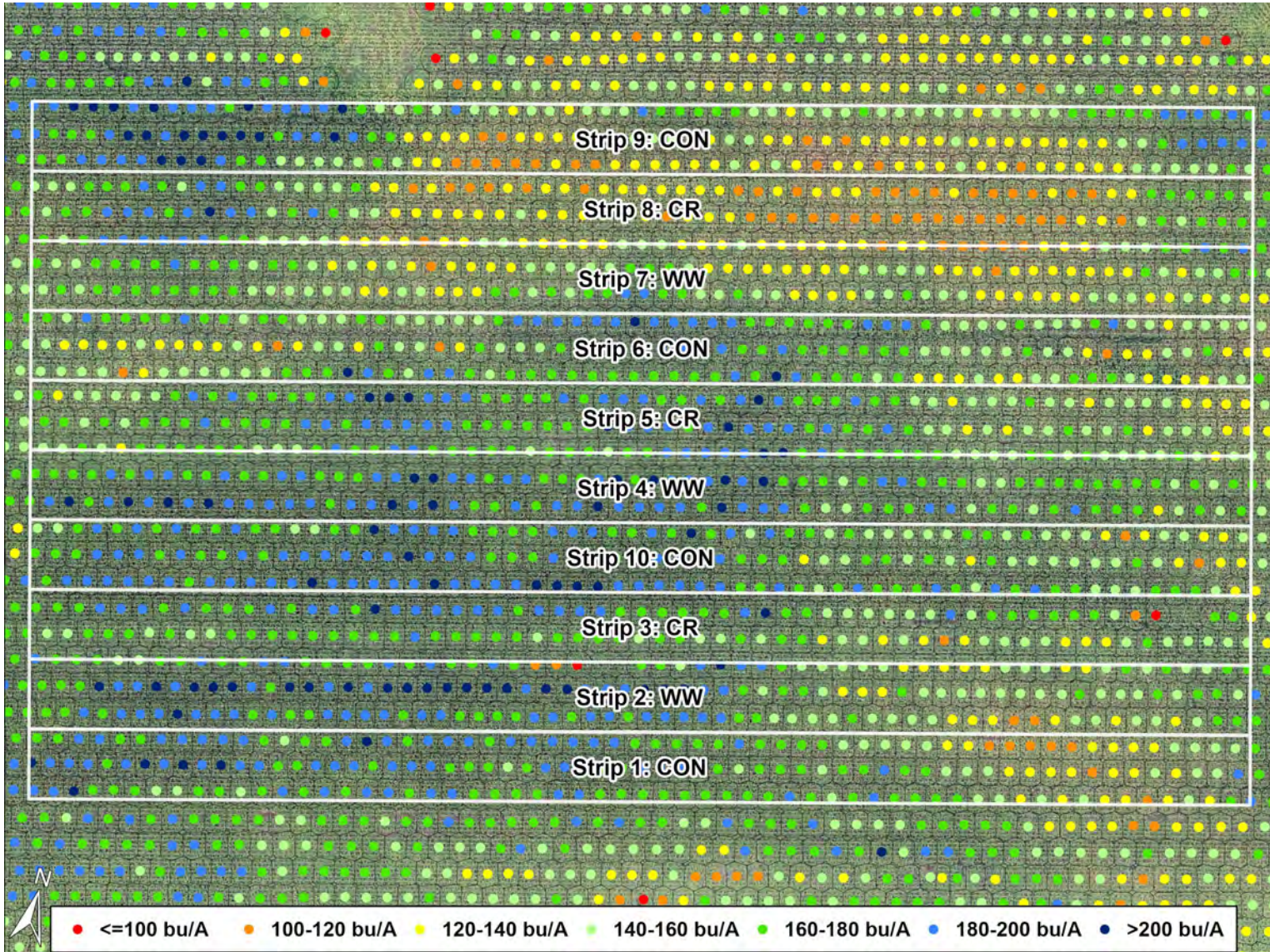
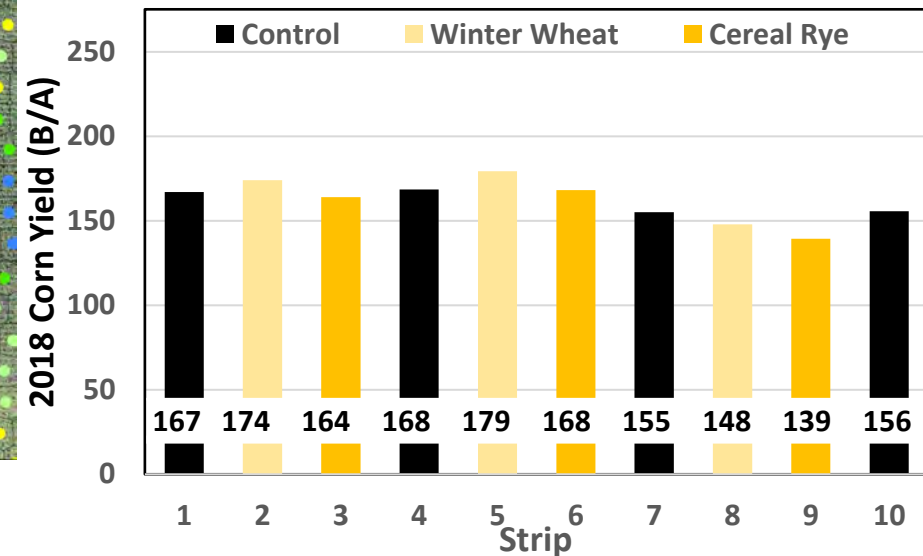


Figure 1. Yield for corn in 2018. Data from passes fully in treatment strips. Imagery from 100 meters on July 31, 2018.

Crop	Site 1	
	Yield (STD)	Delta No Cover
	<i>bushels per acre</i>	
Site mean	162 (12)	--
No Cover Crop	162 (7)	--
Winter Wheat	167 (17)	5
Cereal Rye	157 (16)	-5

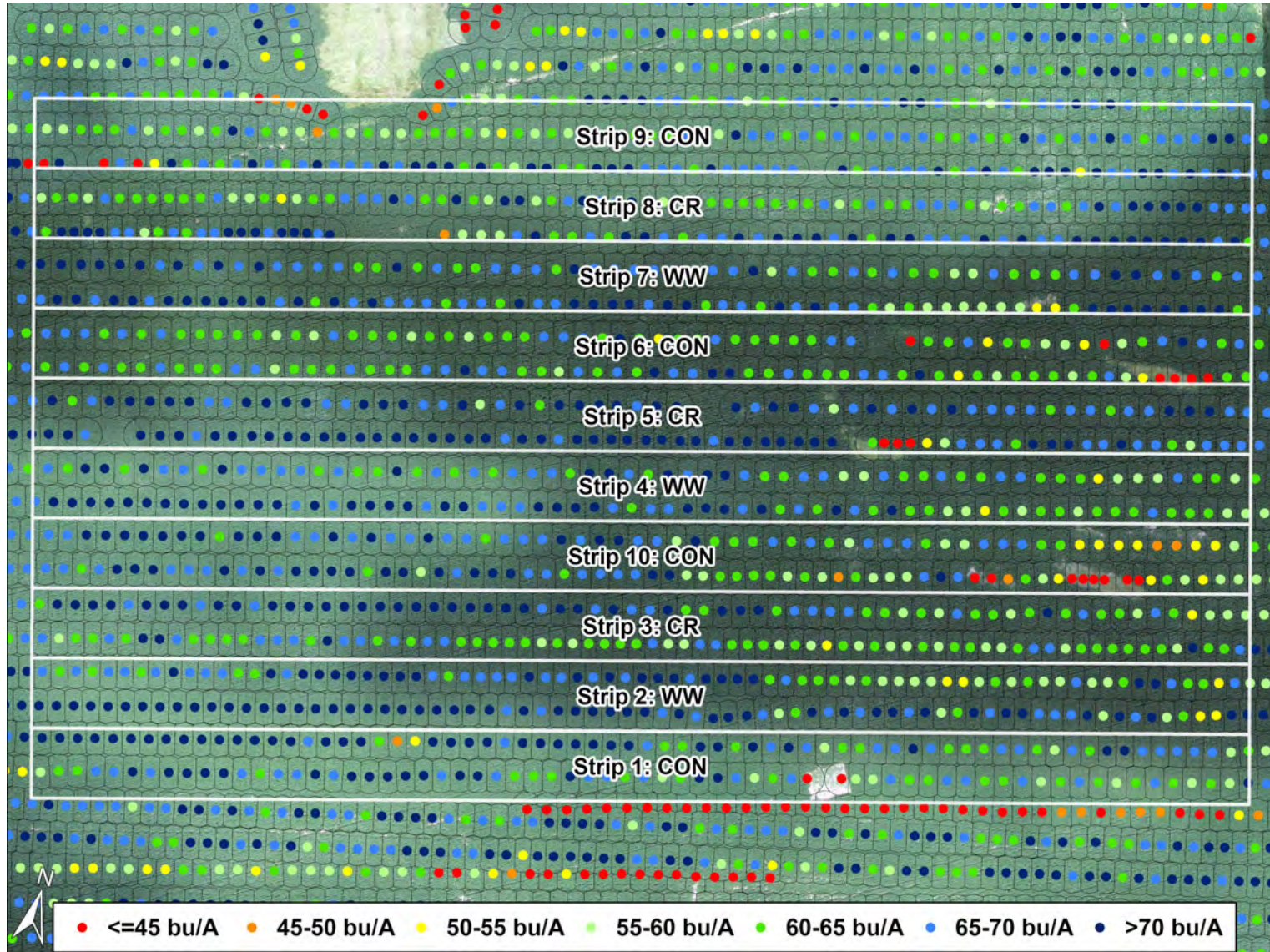


Lincoln County

Cover Crop Comparison

Site 1

Year 4
Soybean



Crop	Site 1	
	Yield (STD)	Delta No Cover
	<i>bushels per acre</i>	
Site mean	65.7 (3)	--
No Cover Crop	63.7 (2)	--
Winter Wheat	67.5 (1)	3.8
Cereal Rye	65.6 (2)	2.8

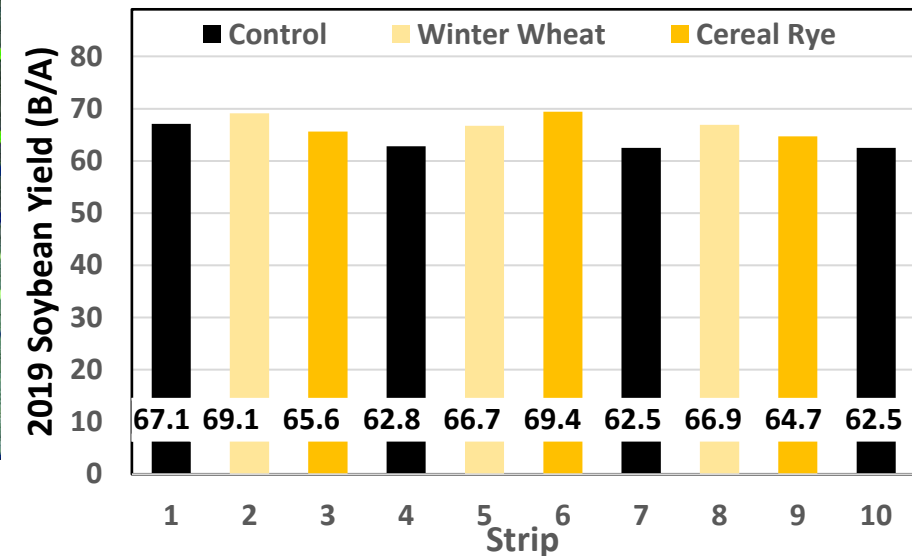


Figure 1b. Yield for soybeans in 2019. Data from passes fully in treatment strips. Imagery from 100 meters on August 13, 2019.

Lincoln County Cover Crop Comparison

Site 1

Year 5
Corn

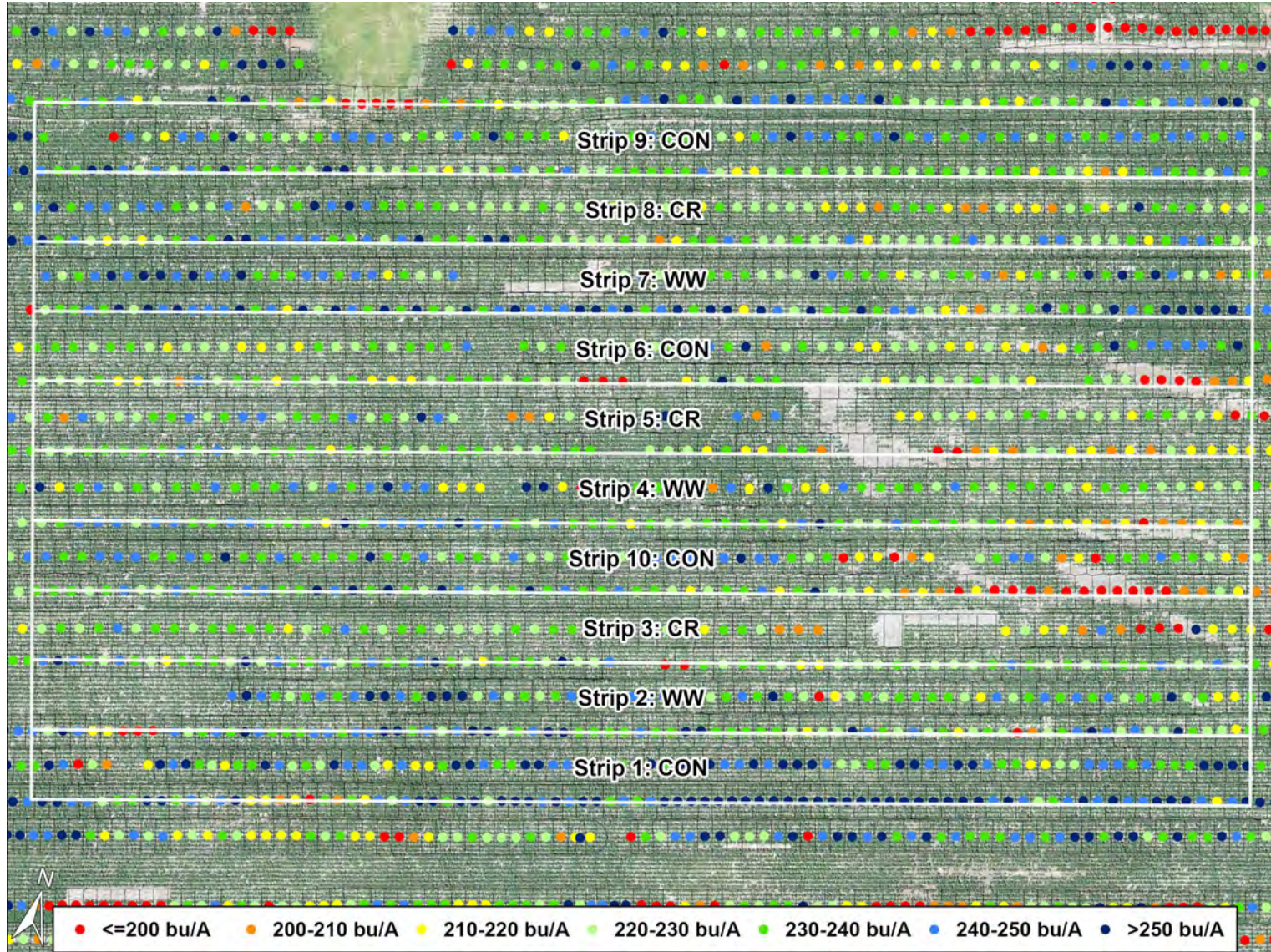
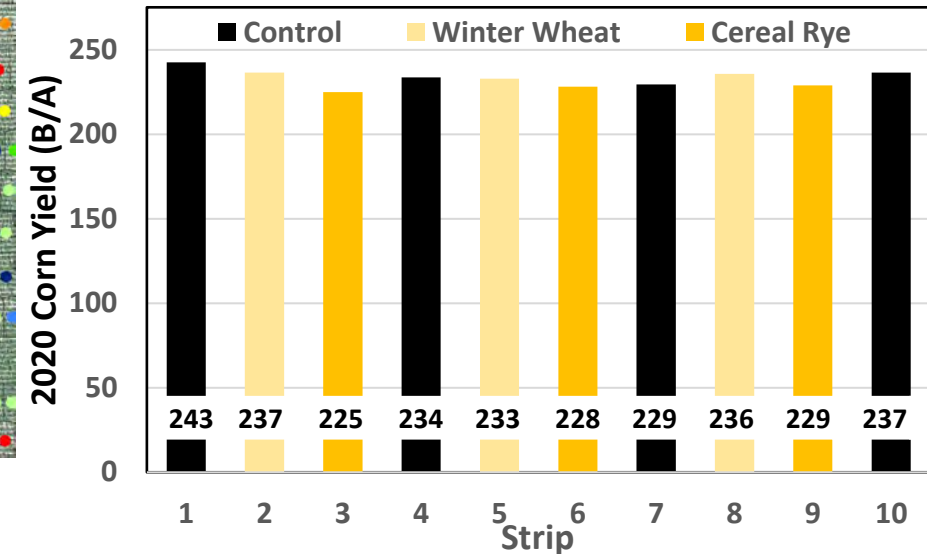


Figure 1. Yield for corn in 2020. Data from passes fully in treatment strips. Imagery from 100 meters on June 24, 2020.

Crop	Site 1	
	Yield (STD)	Delta No Cover
	<i>bushels per acre</i>	
Site mean	233 (5)	-
No Cover Crop	236 (6)	-
Winter Wheat	235 (2)	-1
Cereal Rye	227 (2)	-8



Lincoln County Cover Crop Comparison

Site 1

Year 6
Soybean

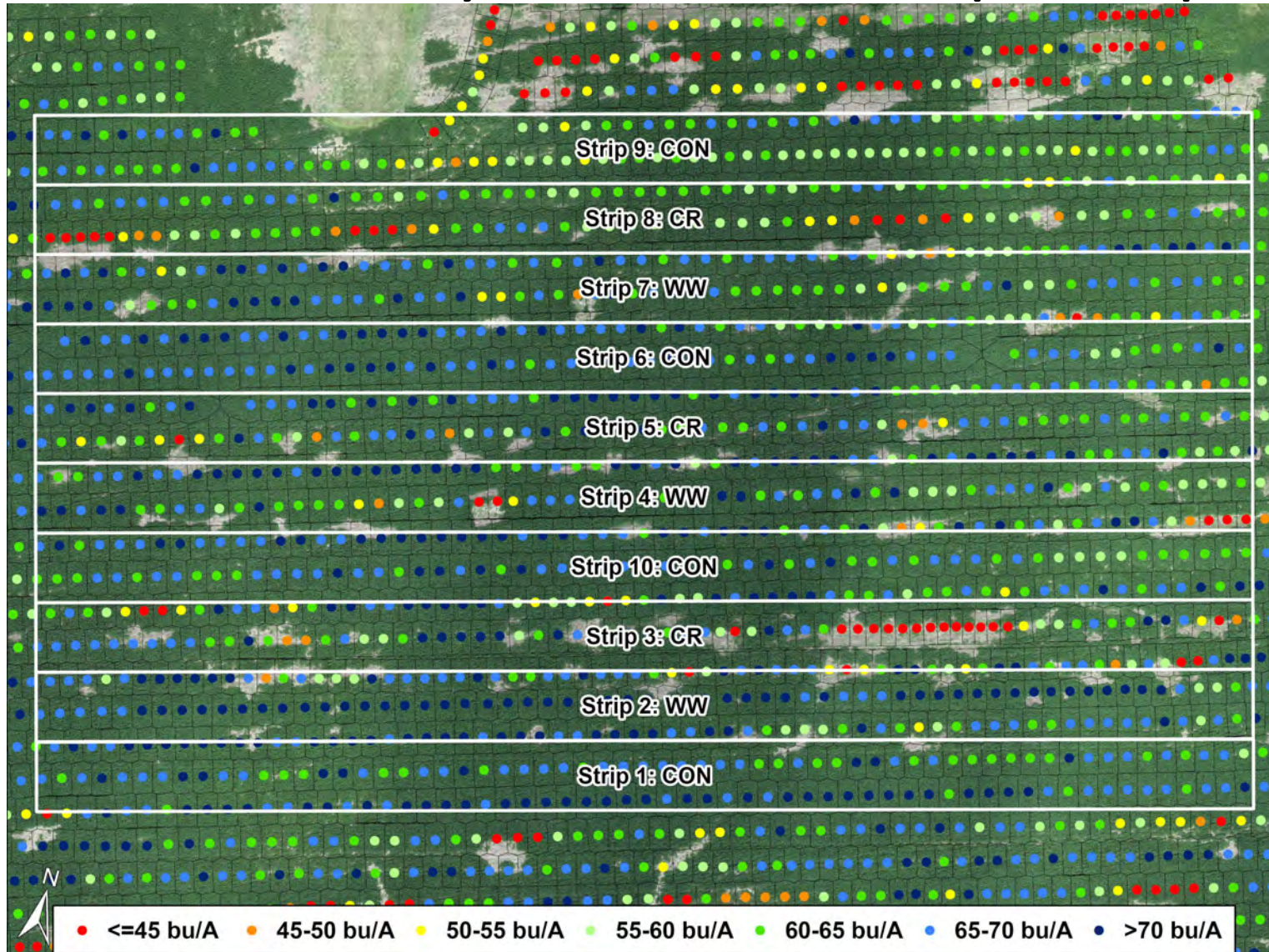
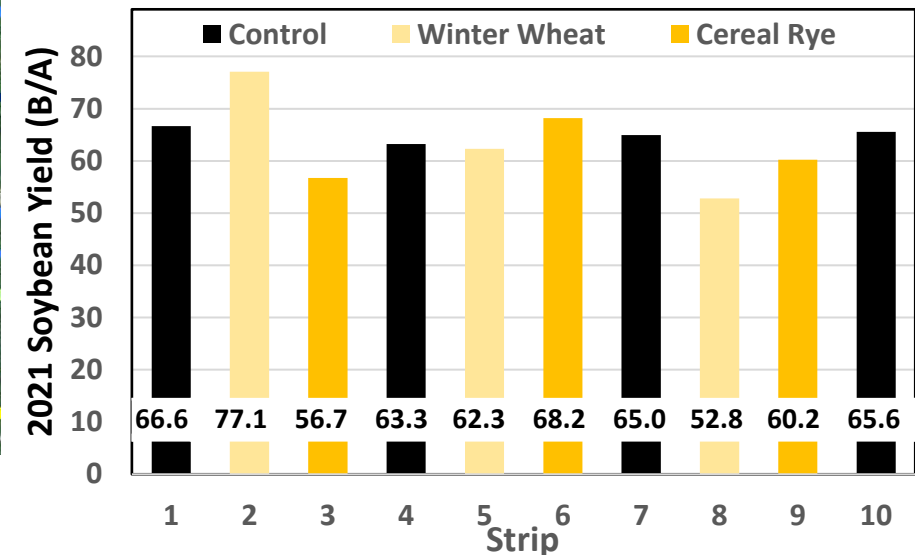


Figure 1b. Yield for soybeans in 2021. Data from passes fully in treatment strips. Imagery from 100 meters on August 5, 2021.

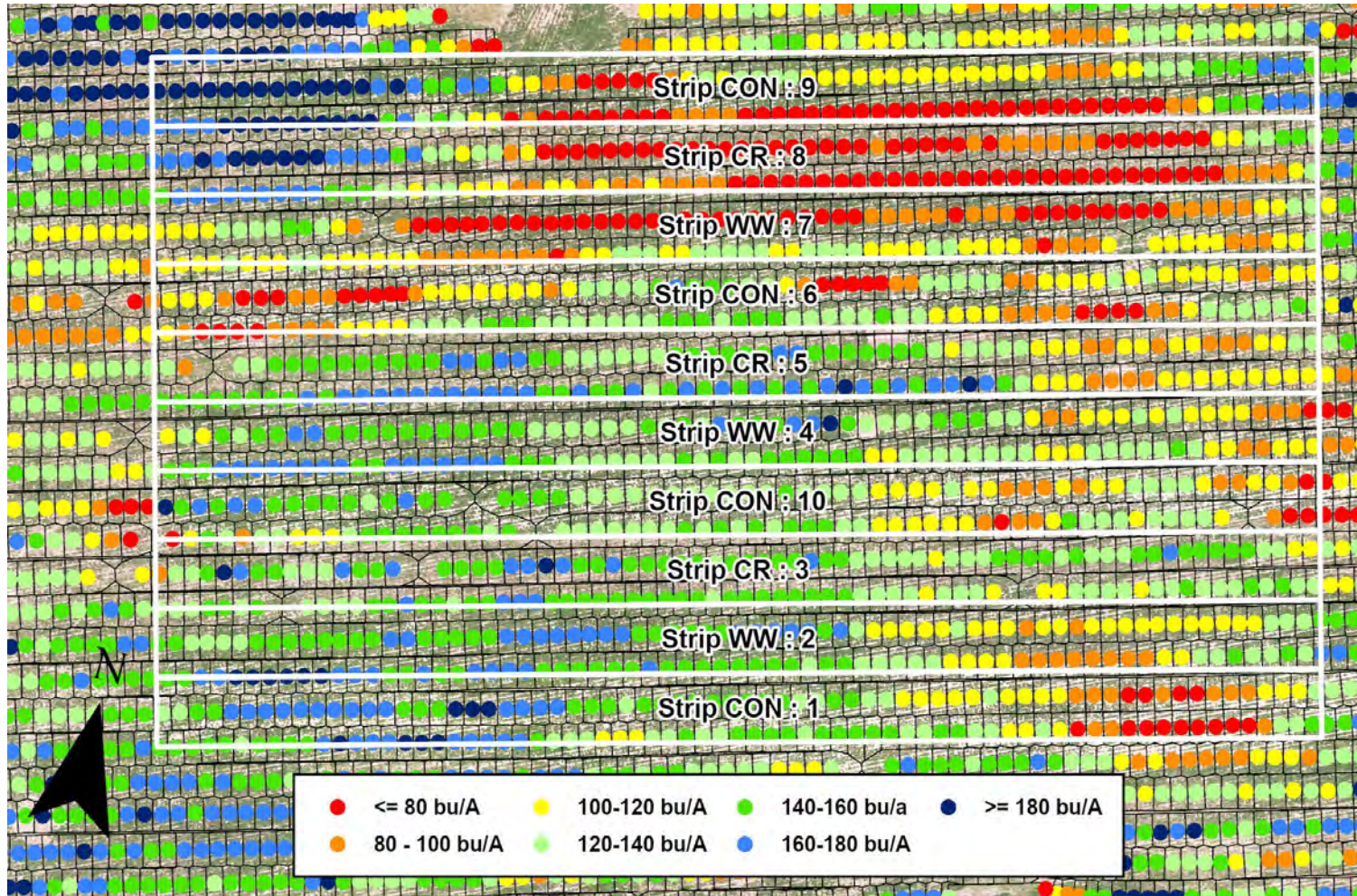
Crop	Site 1	
	Yield (STD)	Delta No Cover
	<i>bushels per acre</i>	
Site mean	64.8 (7)	--
No Cover Crop	65.1 (1)	--
Winter Wheat	64.1 (12)	-1.0
Cereal Rye	61.7 (6)	-3.4



Lincoln County Cover Crop Comparison

Site 1

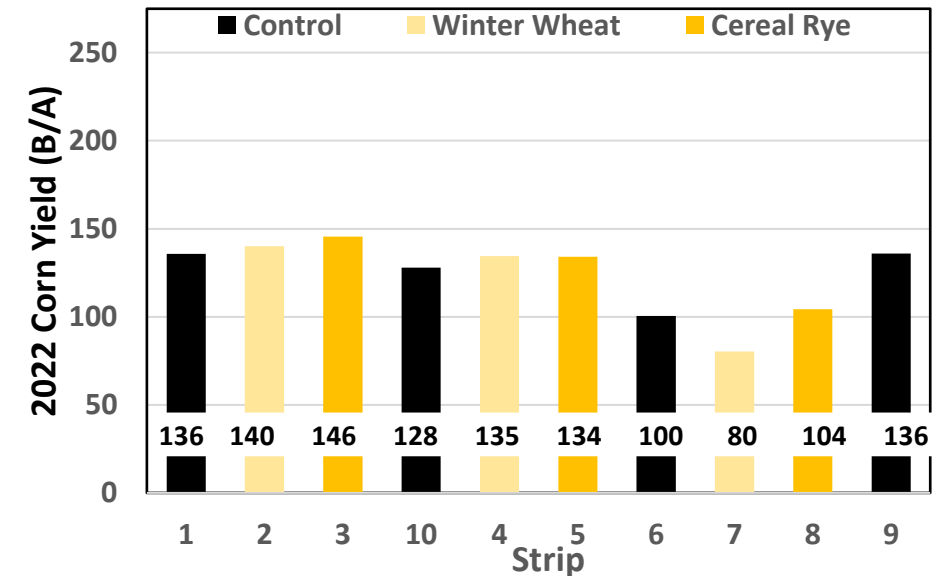
Year 7
Corn



Yield for corn in 2022. Data from passes fully in treatment strips. Imagery from 100 meters on July 11, 2022.

Crop	Site 1	
	Yield (STD)	Delta No Cover
	<i>bushels per acre</i>	
Site mean	124 (21)	--
No Cover Crop	125 (16)	--
Winter Wheat	118 (10)	-7
Cereal Rye	128 (33)	3

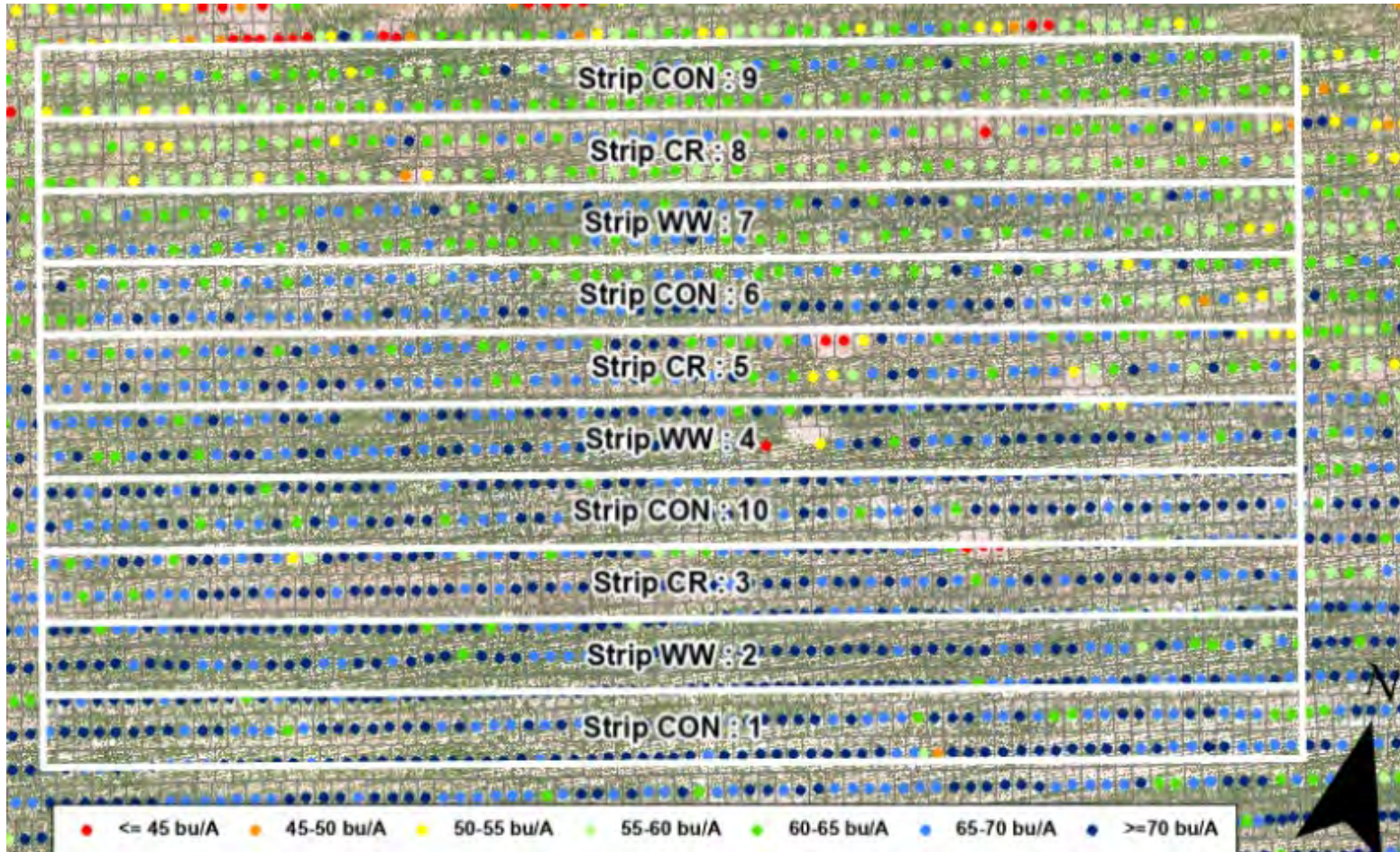
¹ Credible interval is the treatment effect compared to control.



Lincoln County Cover Crop Comparison

Site 1

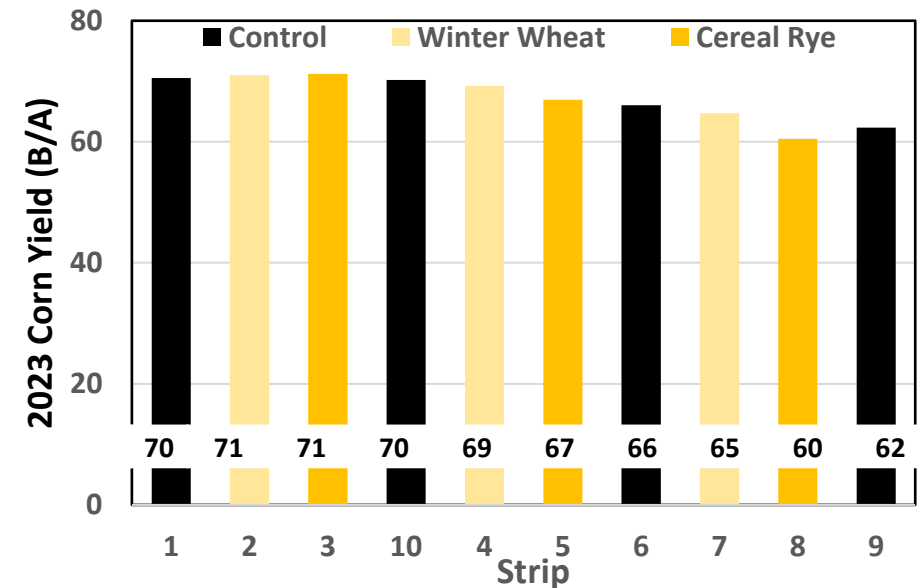
Year 8
Soybean

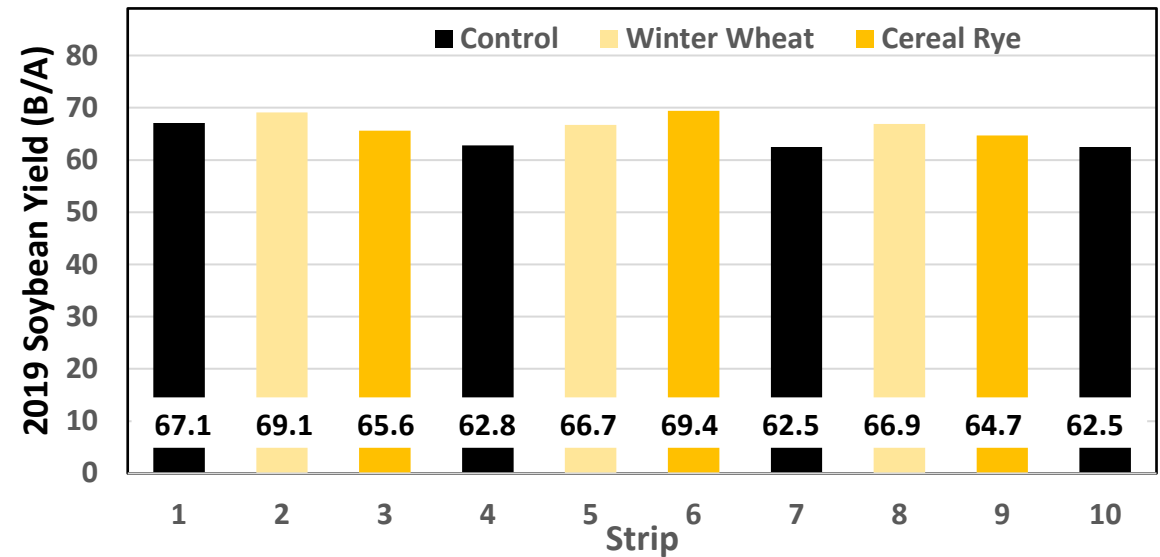
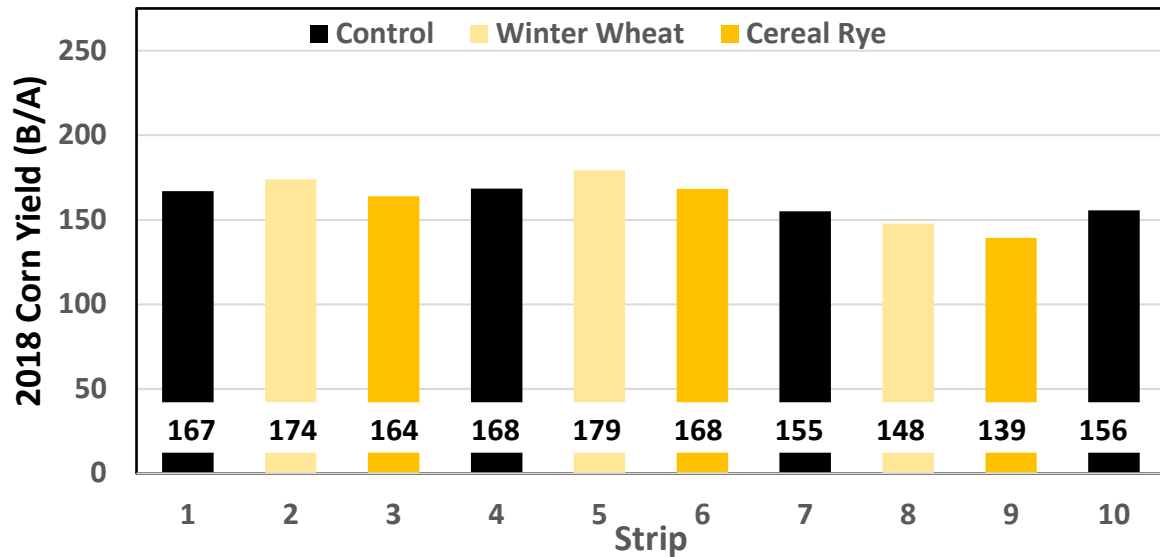
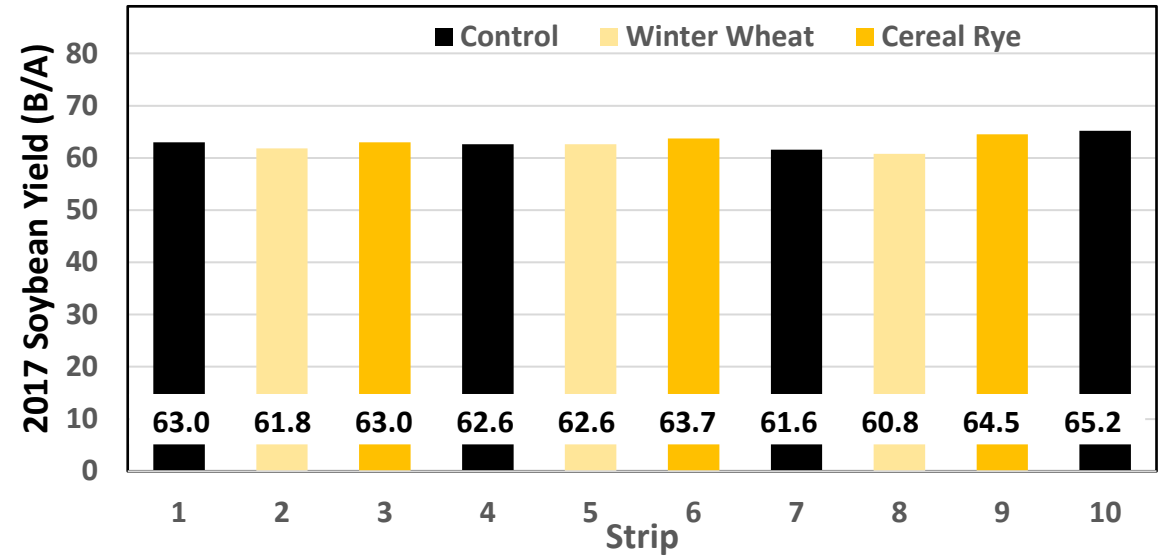
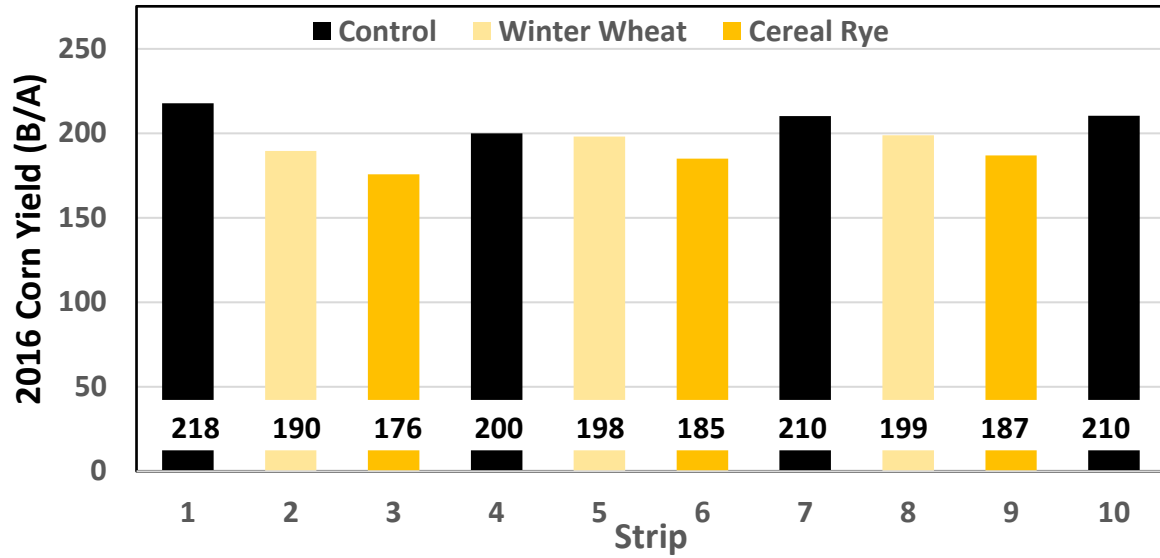


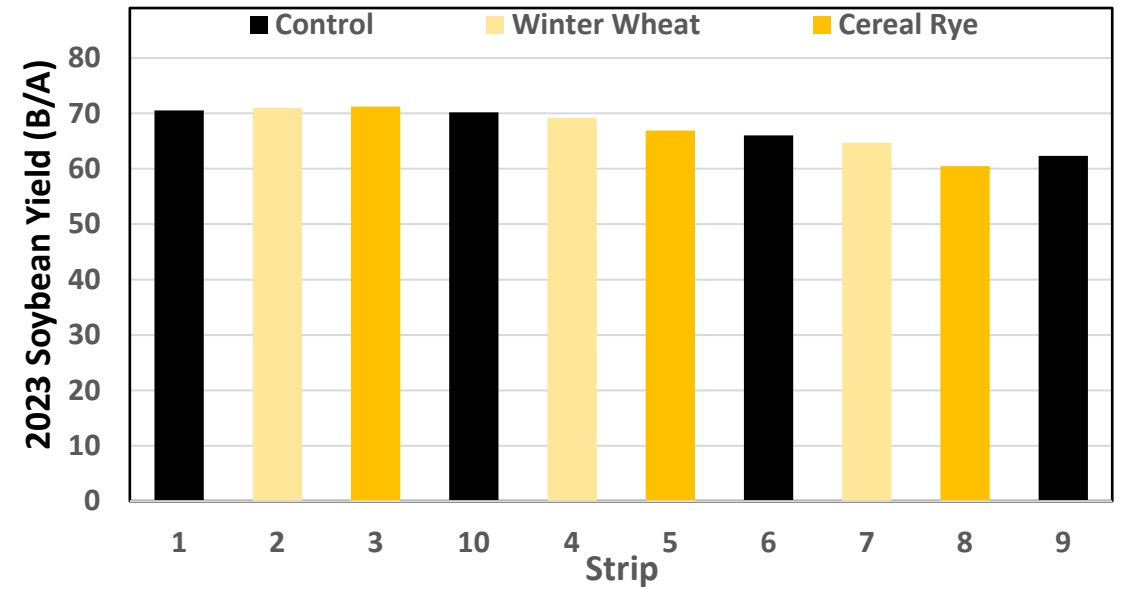
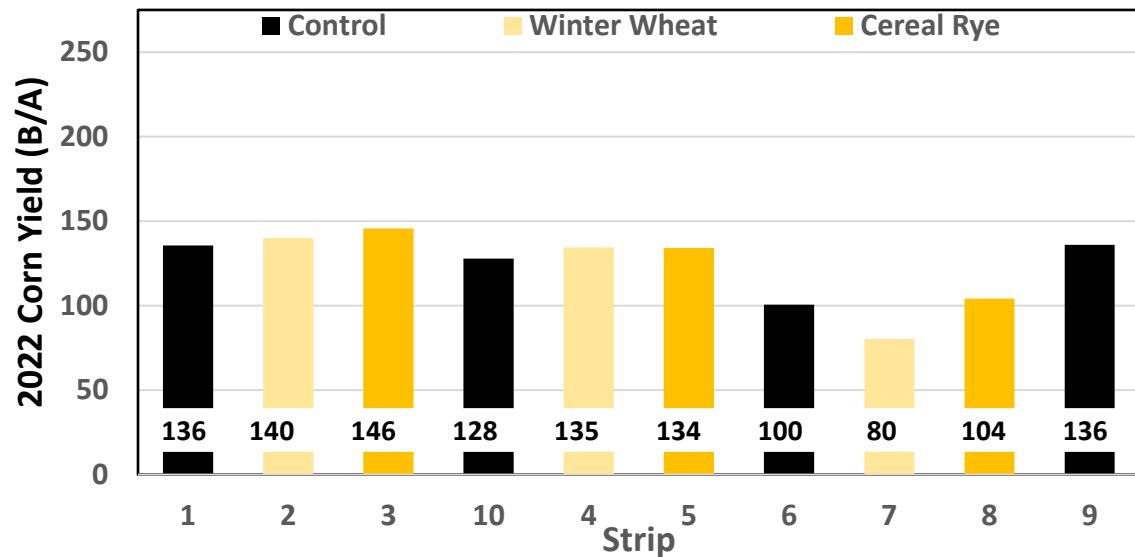
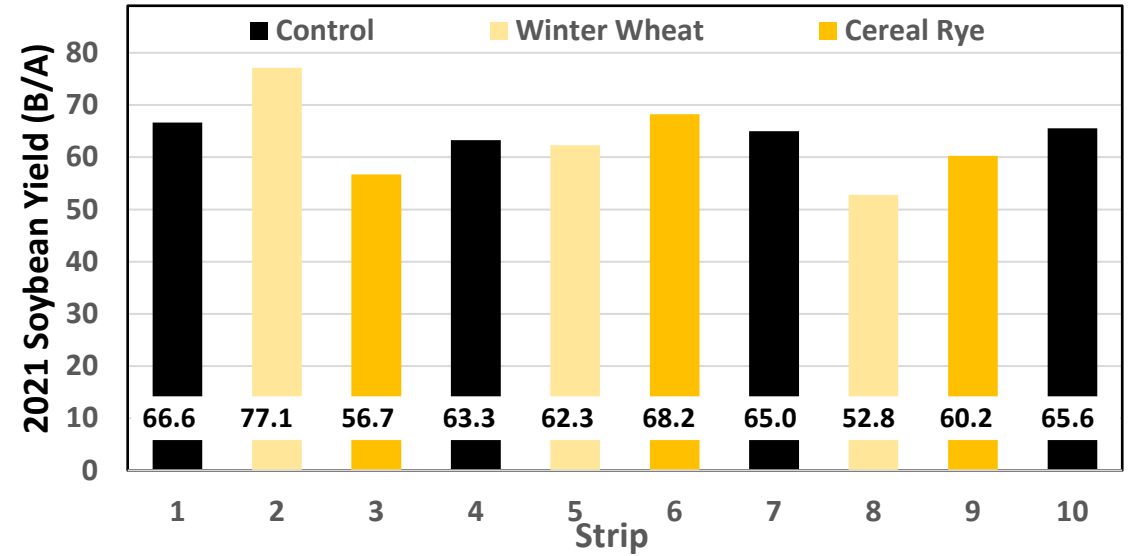
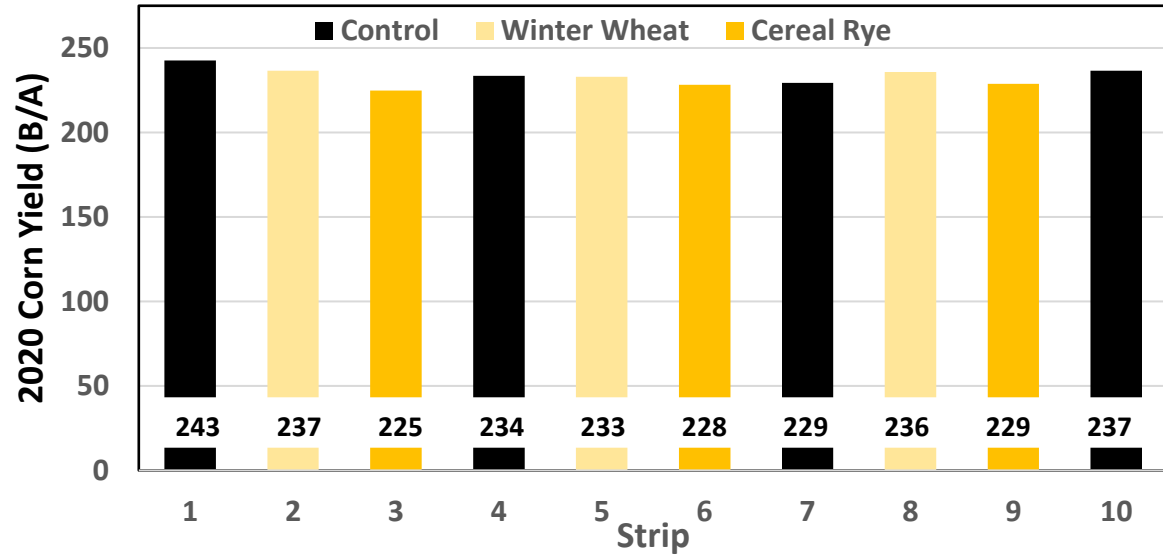
Yield for soybean in 2023. Data from passes fully in treatment strips. Imagery from 100 meters on July 17, 2023.

Crop	Site 1	
	Yield (STD)	Delta No Cover
	<i>bushels per acre</i>	
Site mean	67.3 (4)	-
No Cover Crop	68.7 (3)	-
Winter Wheat	66.1 (5)	-2.5
Cereal Rye	66.5 (4)	-2.1

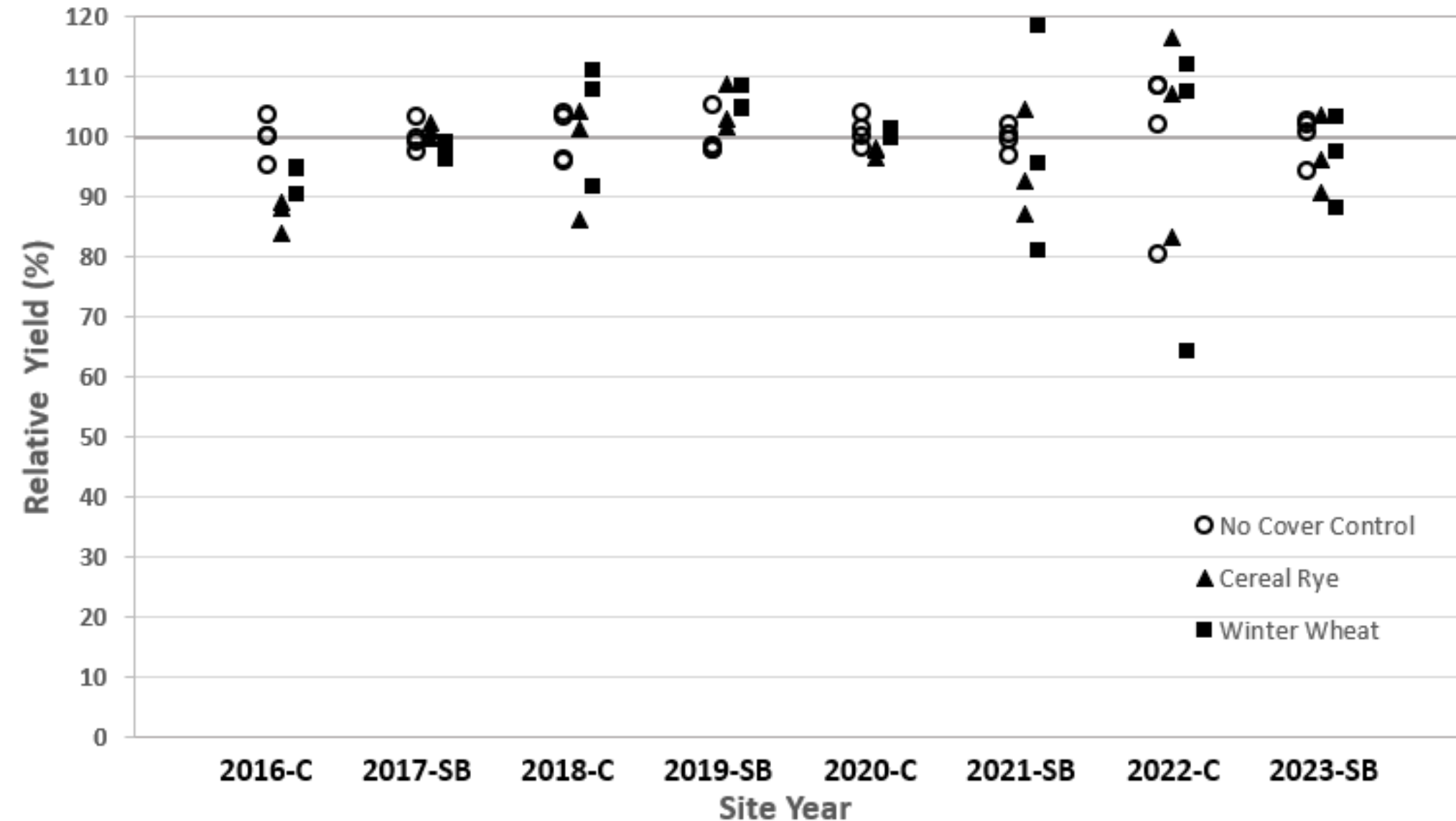
¹ Credible interval is the treatment effect compared to control.







By-year effect of treatment on relative yield.



Question: How does cover crop affect corn and soybean yield?

By Year Summary

		Cereal Rye	Winter Wheat
Crop	Year	Credible Interval	Credible Interval
		<i>bushels per acre</i>	<i>bushels per acre</i>
Corn	1	-22 (-30 to -13)	-8 (-18 to 2)
Soybean	2	1 (-7 to 9)	-1 (-11 to 9)
Corn	3	-5 (-13 to 3)	2 (-8 to 12)
Soybean	4	3 (-6 to 11)	3 (-6 to 13)
Corn	5	-6 (-14 to 2)	2 (-8 to 12)
Soybean	6	-2 (-10 to 6)	-0.3 (-10 to 10)
Corn	7	7 (-1 to 16)	-6 (-16 to 4)
Soybean	8	-1 (-9 to 8)	-2 (-12 to 8)

Multi-Year Summary

Crop	Cereal Rye		Winter Wheat	
	Site-years	Credible Interval	Site-years	Credible Interval
		<i>bushels per acre</i>		<i>bushels per acre</i>
Corn	4	-4 (-8 to 0)	4	-0.8 (-5 to 3)
Soybean	4	0 (-4 to 4)	4	-0.1 (-4 to 4)
		% Effect on Yield		
Corn	4	-1.5 (-5 to 2)	4	-0.8 (-4 to 3)
Soybean	4	0.3 (-3 to 3)	4	0.5 (-4 to 3)
All crops	7	-0.6 (-3 to 2)		-0.8 (-4 to 3)

Conclusions:

- Results suggest cereal rye had a negative effect on corn yield whereas winter wheat did not.
- Cover crops had limited impact on soybean yield.
- In three years (two corn and one soybean) cover crops were associated with much higher yield variability.

CORN	2016		2018		2020		2022		Four-Year Total	
Treatments	Mean (SD)	Delta Control	Mean (SD)	Delta Control	Mean (SD)	Delta Control	Mean (SD)	Delta Control	Mean	Delta Control
	<i>Corn Yield in bushels per acre</i>									
All strips	197 (13)	--	163 (12)	--	233 (4)	--	124 (21)	--	179	--
No Cover Control	210 (7)	--	162 (7)	--	236 (6)	--	125 (17)	--	183	--
Winter Wheat	195 (5)	-15	167 (17)	5	235 (2)	-1	118 (33)	-7	179	-4
Cereal Rye	183 (6)	-27	157 (16)	-5	227 (2)	-9	128 (21)	3	174	-9

Soybean	2017		2019		2021		2023		Four-Year Total	
Treatments	Mean (SD)	Delta Control	Mean (SD)	Delta Control	Mean (SD)	Delta Control	Mean (SD)	Delta Control	Mean	Delta Control
	<i>Soybean Yield in bushels per acre</i>									
All strips	63 (1)	--	66 (3)	--	64 (7)		67 (4)	-	64.9	--
No Cover Control	63 (2)	--	64 (2)	--	65 (1)		69 (3)	-	65.1	--
Winter Wheat	62 (1)	-1	68 (1)	4	64 (12)	-1	66 (5)	-3	64.9	-0.3
Cereal Rye	64 (1)	1	67 (2)	3	62 (6)	-3	67 (4)	-2	64.6	-0.5