# Horse Creek Area Farmer-Led Watershed Council's Cover Crop and Tillage Test Plot

2015 – 2021 crop years

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# Horse Creek Watershed Council Background

- Group of agricultural producers with diverse operations but common goals
- ♦ Formed in early 2010's as part of a wider effort to engage producers in soil and water conservation 3 other partnering councils
- Farmer-led but partnerships are key
- Horse Creek Watershed
  - ♦ Horse Creek & Squaw Lake: ≈ 42,000 acres
  - $\diamond$  Total cropland:  $\approx 16,000$  acres
  - ♦ Impaired waters (Cedar Lake and others)
  - ♦ Flows to Apple River --> St Croix River



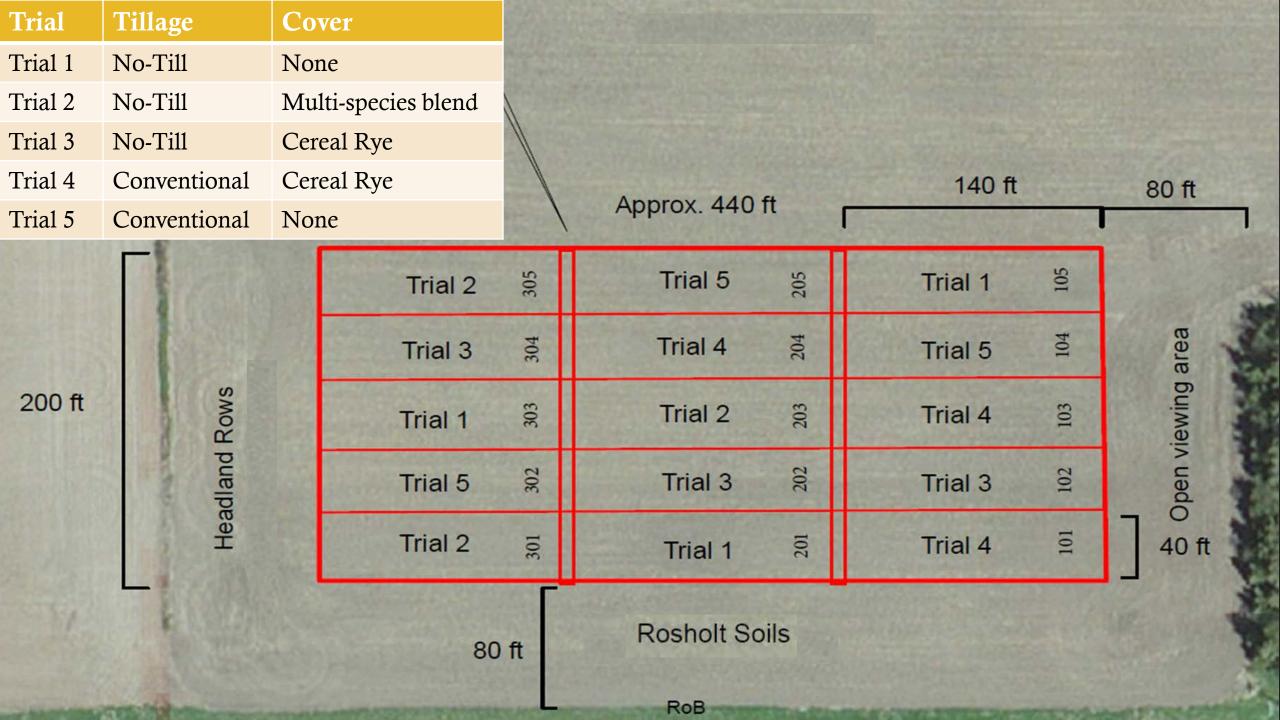
# Council's Mission and Goals

- ♦ Inspire producers to adopt best management practices dedicated to protecting water quality and improving soil health
- ♦ Identify and find solutions to local resource concerns
- Increase farmer engagement in soil health practices
- Share information and results with agricultural community
  - ♦ Peer to peer learning
  - ♦ Field days
  - ♦ Yearly educational seminar
  - ♦ Demonstrations
  - ♦ Conservation practice incentives
  - ♦ Cover crop and tillage test plot



# Project Goals & Overview

- ♦ Analyze effectiveness and feasibility of growing cover crops in NW Wisconsin
- ♦ Determine the effects of tillage practices and cover crops on soil properties, and how it impacts soil health and agronomic productivity
- Monitor long term impact of each management system on soil over time
- ♦ Believe local data and observable results will promote implementation



## Data Collection

- ♦ Standard soil test (pH, %O.M., N, P, K, bulk density)
- Yield data (moisture, test weight, total plot harvest weight)
- Plant population
- ♦ Residue cover
- ♦ Soil moisture
- ♦ Bulk density
- Resistance to penetration (compaction)
- **♦** Infiltration
- ♦ Surface runoff

# Why No-Till and Cover Crops

These conservation practices:

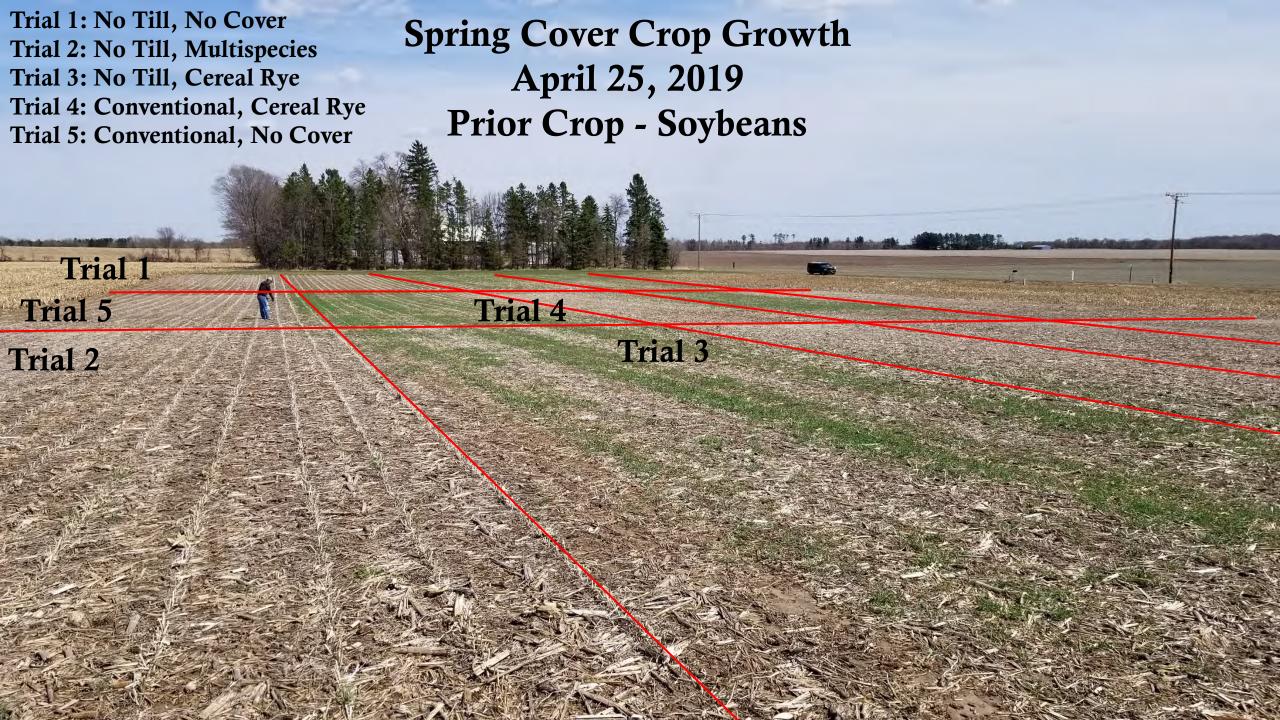
- ♦ Reduce soil erosion
- Reduce/improves soil compaction
- Saves time and fuel by removing the tillage operation
- ♦ Improves soil biology
- ♦ Increases water infiltration

- ♦ Decreases runoff
- ♦ Increases organic matter
- Scavenges and recycles nutrients like nitrogen
- ♦ Conserves soil moisture
- ♦ Weed suppression
- ♦ Builds soil

Ultimately improve water quality!



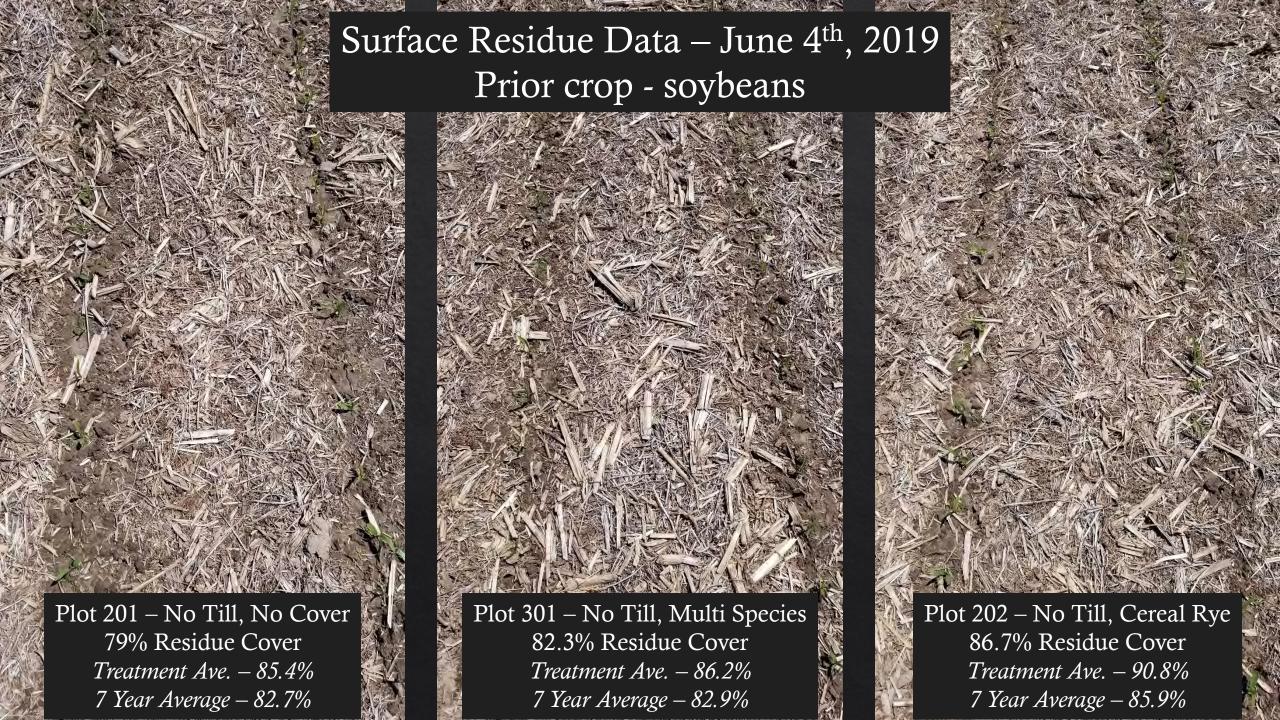






- Cover crop terminated prior to planting
- Spring tillage –
   replicate conventional
   tillage with rotavator
   type tiller
- Crop planted in 30inch rows (16 rows per plot)
- Planting rates
  - Corn 32,500
  - Soybean 140,000
- Typical planting datesearly May
- All field work completed by farmer-led council member





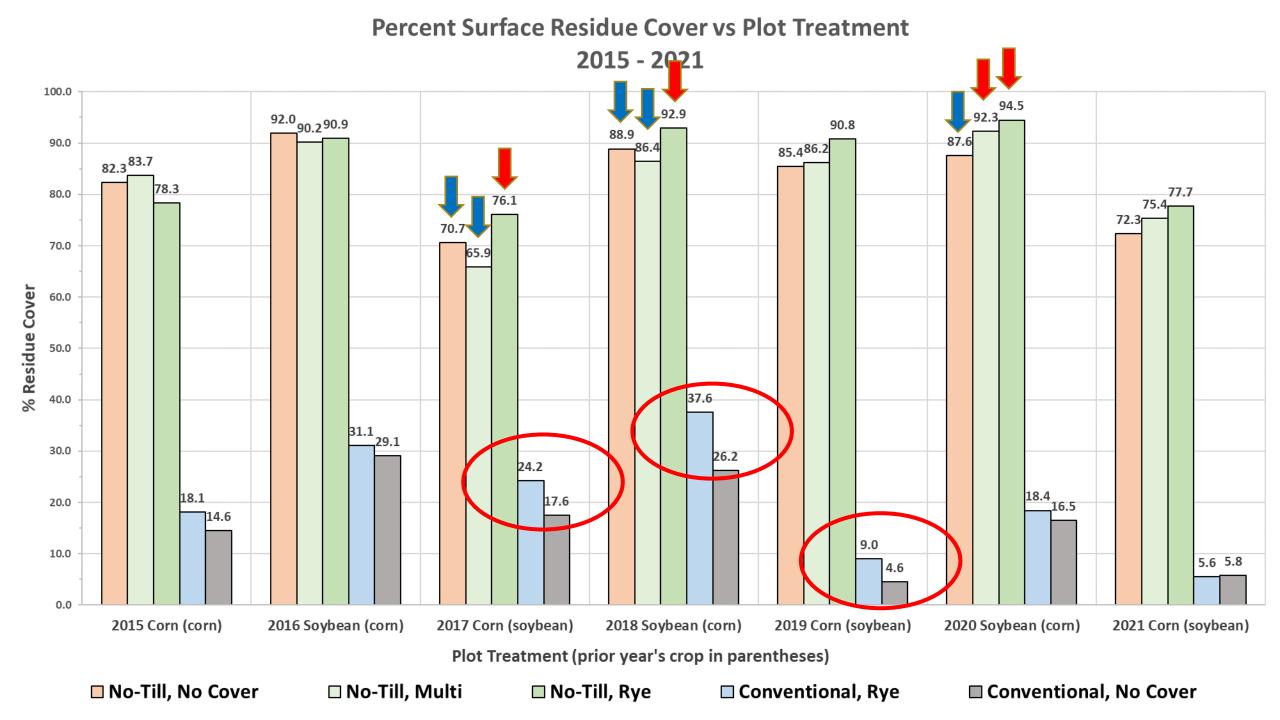


Plot 204 – Conventional, Cereal Rye 6.7% Residue Cover Treatment Ave. – 9.0% 7 Year Ave. – 20.6%

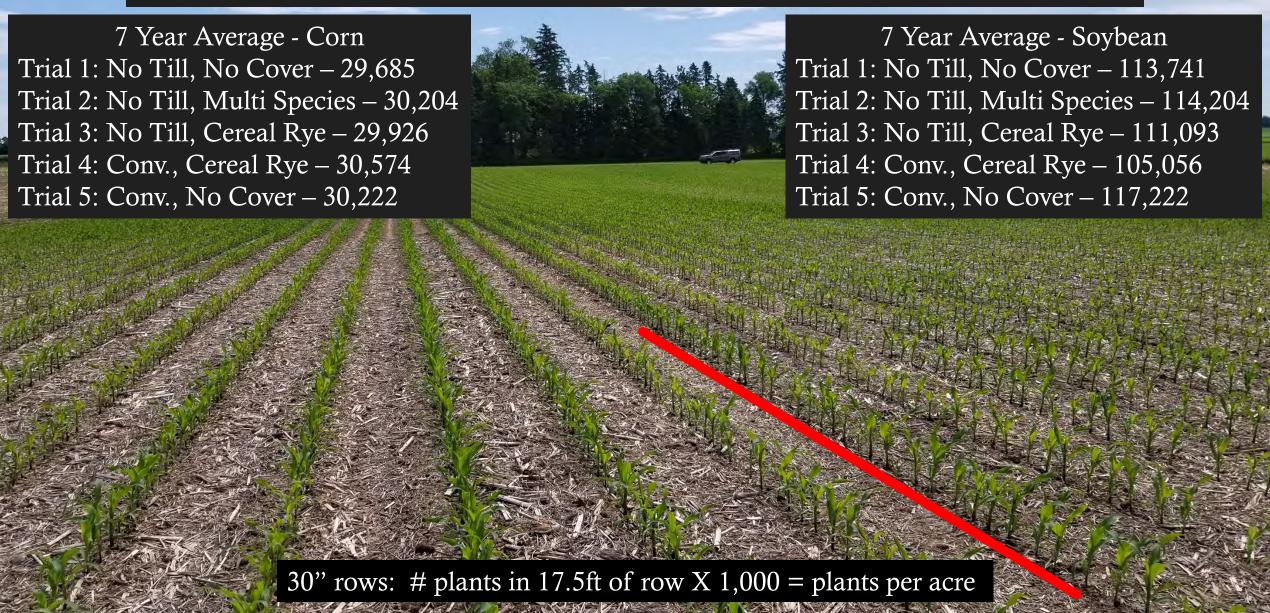




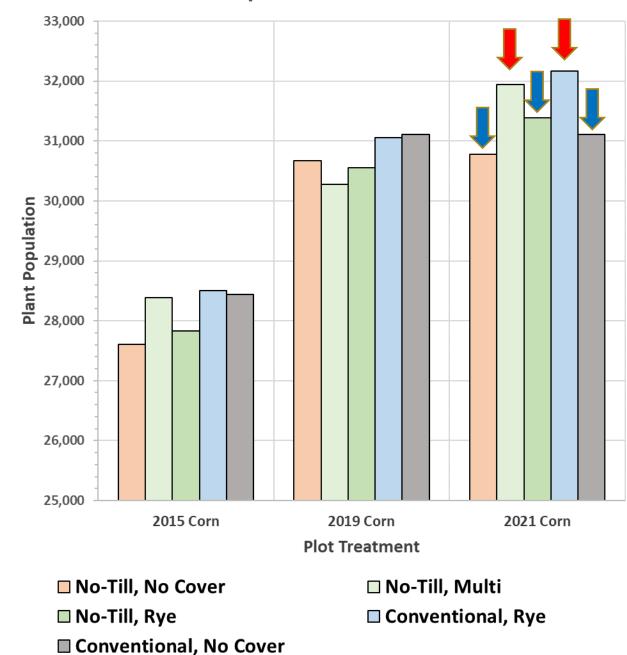
Plot 205 – Conventional, No Cover 4.7% Residue Cover *Treatment Ave. 4.6%* 7 Year Ave. – 16.3%



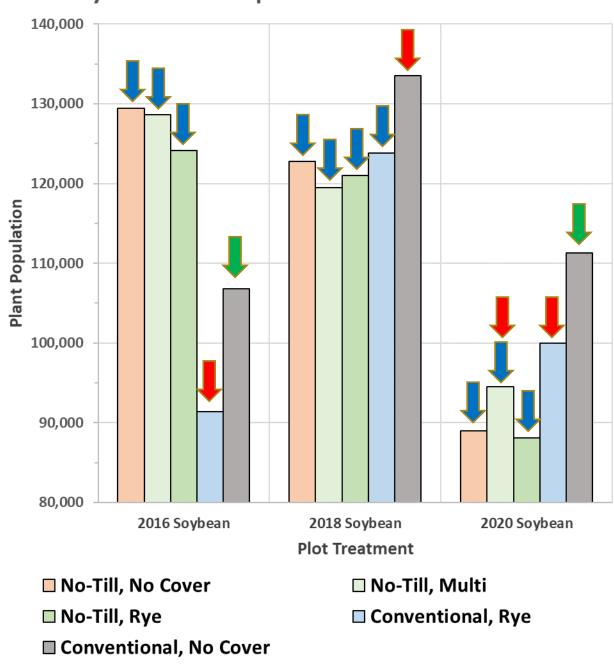
# Plant Population Data Seeding Rates: Corn 32,500 seeds/acre, Soybean 140,000 seeds/acre



### **Corn Plant Population vs Plot Treatment**



### **Soybean Plant Population vs Plot Treatment**





# Cover Crop Info

### Cover crop species

- ♦ Cereal Rye cleaned, bin run rye from local producer
- ♦ Multi-species mix 8 species selected for different soil health and agronomic advantages

### ♦ Broadcast application

- Rye: hand-held bag cyclone seeder@ 9# per plot (70#/acre)
- ♦ Multi-species: mixed with sand and hand broadcast @ 2# seed per plot (15#/acre)

### ♦ Timing

- ♦ Corn: ≈ leaf senescence/yellowing up to ear
- $\diamond$  Soybean:  $\approx 50\%$  leaf drop

### Multi-Species Cover Crop Mix Planned (15lb/ac rate)

### 1. Cereal Rye – 25%

Weed suppression

Soil builder

N scavenger

Soil loosener

### 2. Daikon Radish - 10%

Sub-soil loosener

N scavenger

Grazing value

### 3. Red Clover – 10%

N source

Soil builder

Good drought tolerance

Grazing value

### 4. Crimson Clover – 5%

N source

Soil builder

Grazing value

### 5. Berseem Clover – 5%

N source

Soil builder

Erosion preventer

### 6. Wheat - 15%

Erosion preventer

Lasting residue

N Scavenger

Grazing value

### 7. Rapeseed/Canola – 10%

N scavenger

Soil builder

Topsoil loosener

### 8. Oats - 20%

Weed fighter

Erosion preventer

Soil builder



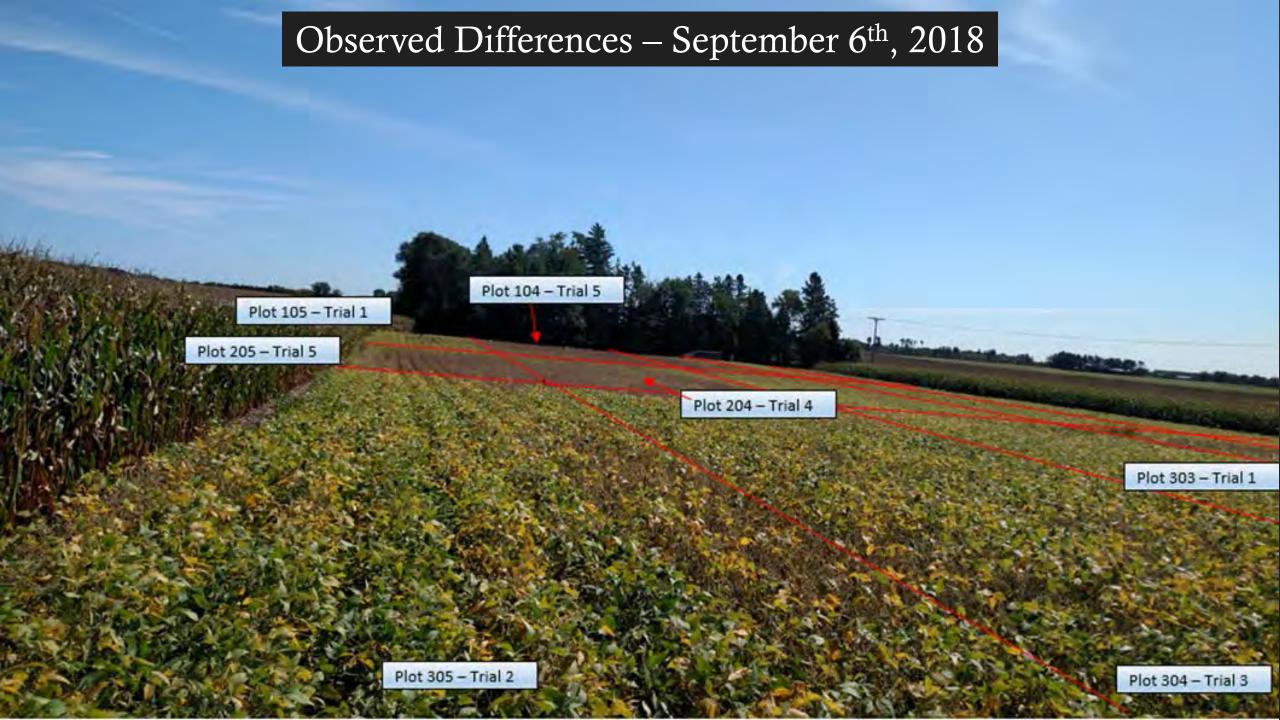






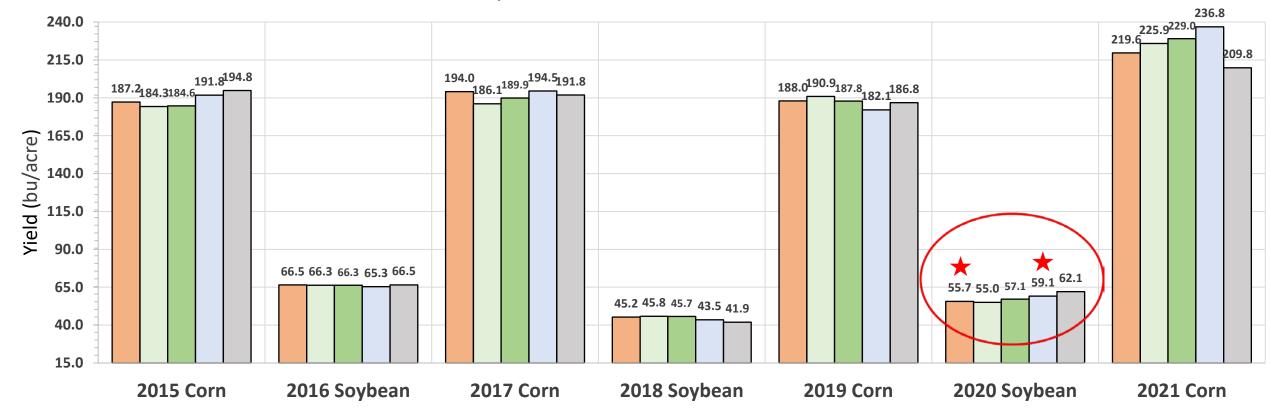






		Harvest Year	2015	2016	2017	2018	2019	2020	2021
		Crop	Corn	Soybean	Corn	Soybean	Corn	Soybean	Corn
Trial #	7	Treatment			Yield Average	e (Bu/Acre)*			
Trial 1	No-Till	No Cover	187.2	66.5	194.0	45.2	188.0	55.7	219.6
Trial 2	No-Till	Multi-species Blend	184.3	66.3	186.1	45.8	190.9	55.0	225.9
Trial 3	No-Till	Cereal Rye	184.6	66.3	189.9	45.7	187.8	57.1	229.0
Trial 4	Conventional	Cereal Rye	191.8	65.3	194.5	43.5	182.1	59.1	236.8
Trial 5	Conventional	No Cover	194.8	66.5	191.8	41.9	186.8	62.1	209.8

### Crop Yield vs Plot Treatments



**Growing Season and Plot Treatment** 

■ No-till, No cover □ No-till, Multispecies □ No-till, Cereal rye □ Conventional, Cereal rye □ Conventional, No cover

	Total B	Total Bushels Produced – All 15 Plots						
	Corn (4 years)	Total (7 years)						
No-Till, No Cover	2,366	502	2,869					
No-Till, Multi Species	2,361	501	2,863					
No-Till, Cereal Rye	2,374	507	2,881					
Conventional, Cereal Rye	2,416	504	2,919					
Conventional, No Cover	2,350	512	2,861					

- Conventional with Cereal Rye has produced the most bushels of corn
  - ♦ 42 more bushels than 2<sup>nd</sup> highest trial
  - ♦ 66 more bushels than the lowest trial
- ♦ Conventional with No Cover Crop has produced the most bushels of soybean
  - ♦ 4 more bushes than 2<sup>nd</sup> highest trial
  - ♦ 11 more bushels than the lowest trial
- ♦ Conventional with Cereal Rye has produced the most total bushels (corn and soybean)
  - ♦ 38 to 58 more total bushels than the other four trials

# Yield vs Profitability

- \* Yield is the number we see on the monitor, but profitability is what pays the bills
- \* Attempt to quantify differences in profitability between the 5 trials
- Assumptions of Variables
  - ♦ Tillage equipment, maintenance, fuel, labor
    - ♦ Custom tillage rate \$14.00 per acre
  - ♦ Cover seed cost
    - ♦ Rye \$10 per bushel (applied at 1.25 bushel per acre)
    - ♦ Multi-species \$1.40 per pound (applied at 12# per acre)
    - ♦ Application cost \$15 per acre
  - ♦ All other factors (lime, fertilizer, seed, planting, herbicide, harvest, land cost)
    - ♦ Assume \$550 per acre
- ♦ Market price 90% of last years crop sold for average of \$6.80 per bushel

		Price per				<b>Cover Crop</b>	Total	
2017	<b>Total Bushels</b>	Bushel	Gross Income	Input Cost	Tillage Cost	Expense	Expense	
No-Till, No Cover	194.0	\$6.80	\$1,319.43	\$550.00	\$0.00	\$0.00	\$550.00	
No-Till, Multi Species	186.1	\$6.80	\$1,265.14	\$550.00	\$0.00	\$31.80	\$581.80	
No-Till, Cereal Rye	189.9	\$6.80	\$1,291.16	\$550.00	\$0.00	\$27.50	\$577.50	1
Conventional, Cereal Rye	194.5	\$6.80	\$1,322.78	\$550.00	\$14.00	\$27.50	\$591.50	
Conventional, No Cover	191.8	\$6.80	\$1,304.33	\$550.00	\$14.00	\$0.00	\$564.00	 

**Gross Income** 

**Gross Income** 

\$1,278.11

\$1,297.80

\$1,277.15

\$1,237.96

\$1,270.29

\$1,493.55

\$1,536.09

\$1,557.19

\$1,610.46

\$1,426.49

					5
2047		Price per			
2017	<b>Total Bushels</b>	Bushel	<b>Gross Income</b>	Input Cost	Tillage C
o-Till, No Cover	194.0	\$6.80	\$1,319.43	\$550.00	\$(

Price per

Bushel

\$6.80

\$6.80

\$6.80

\$6.80

\$6.80

Price per

Bushel

\$6.80

\$6.80

\$6.80

\$6.80

\$6.80

**Total Bushels** 

**Total Bushels** 

188.0

190.9

187.8

182.1

186.8

219.6

225.9

229.0

236.8

209.8

2019

No-Till, No Cover

No-Till, Cereal Rye

No-Till, No Cover

No-Till, Cereal Rye

No-Till, Multi Species

Conventional, Cereal Rye

Conventional, No Cover

No-Till, Multi Species

Conventional, Cereal Rye

Conventional, No Cover

2021

LJ	leiu	<b>V S</b>	Omau	unty			
er					<b>Cover Crop</b>	Total	

**Cover Crop** 

**Expense** 

**Cover Crop** 

**Expense** 

\$0.00

\$31.80

\$27.50

\$27.50

\$0.00

\$0.00

\$31.80

\$27.50

\$27.50

\$0.00

**Tillage Cost** 

\$0.00

\$0.00

\$0.00

\$14.00

\$14.00

\$0.00

\$0.00

\$0.00

\$14.00

\$14.00

**Tillage Cost** 

Total

**Expense** 

\$550.00

\$581.80

\$577.50

\$591.50

\$564.00

**Total** 

Expense

\$550.00

\$581.80

\$577.50

\$591.50

\$564.00

**Net Profit** 

\$769.43 \$683.34 \$713.66 \$731.28

\$740.33

\$728.11

\$716.00

\$699.65

\$646.46

\$706.29

\$943.55

\$954.29

\$979.69

\$862.49

\$1,018.96

**Net Profit** 

**Net Profit** 

Yi	eld	VS	Pı	rofitab	oility		
							_

**Input Cost** 

**Input Cost** 

\$550.00

\$550.00

\$550.00

\$550.00

\$550.00

\$550.00

\$550.00

\$550.00

\$550.00

\$550.00

# Future of the Project and Areas of Interest

- Continue current tillage and cover crop project to study long term effects of these practices
- ♦ Desire to learn about and quantify water harvesting capacity/differences
  - ♦ Testing for soil moisture, infiltration rates
- ♦ Discussions about new plots to study new and emerging topics in soil health
  - ♦ Soil carbon biochar, manure (turkey litter)
- Explore groundwater topics

For more info about the test plot please contact Dane Christenson dane.christenson@polkcountywi.gov



# Special Thanks

♦ Timm & Helen Johnson – setting aside land for the trial

♦ Carlson Farms – performing field work and harvest

♦ Federated Co-op – assisting in data collection at harvest

Questions???