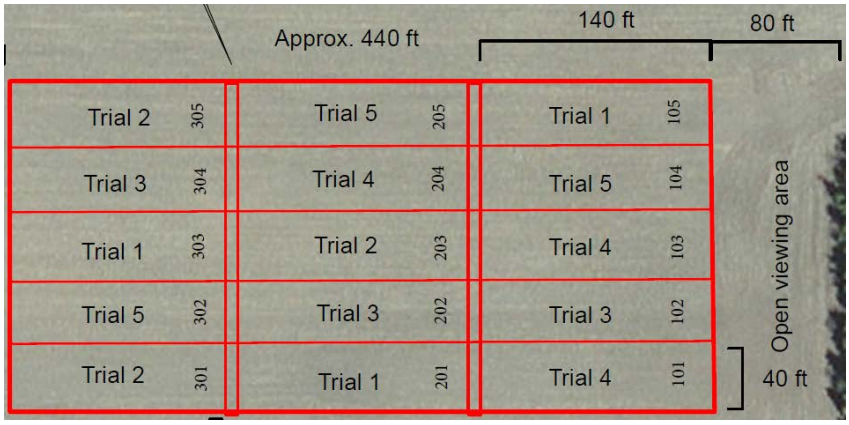
Horse Creek Area Watershed Cover Crop Test Plot

2018 Harvest Results

The 2018 fall harvest wrapped up the fourth year of the Horse Creek Area Watershed Council's cover crop test plot. This was our second year of soybeans bringing an end to the second round of our corn-bean rotation. Our test plot continues to test five different trials looking for potential differences resulting from changes in tillage practices and the use of cover crops. Soil type is Rosholt sandy loam with 2-6% slope. All other agronomic practices are the same. These trials are randomly placed and triplicated in the plot. The five trials are as follows.

Trial 1. No-till without cover crop
Trial 2. No-till with a multispecies cover crop
Trial 3. No-till with cereal rye cover crop
Trial 4. Conventional till with cereal rye cover crop
Trial 5. Conventional till without cover crop



Conventional tillage is simulated with a rotavator type attachment. Rows are planted with a no-till planter with 30 inch row spacing. Pioneer 91M10 non-gmo, food grade variety soybeans were planted on May 16th at 140,000 seeds per acre. The herbicide program consisted of three applications. An initial pre-plant application to burndown weeds and the overwintered cover crop was applied on May 9th. This initial application also included a residual herbicide. A pre-emergence application on May 17th consisted of a second burndown with an additional residual. A final post-emergence herbicide application was applied on June 13th. Data was collected the first week of July to document actual plant population, and residue cover. The cover crop was seeded on September 6th. The plots were harvested on October 18th and yield data was collected. We were unable to collect bulk density, resistance to penetration, soil moisture, or infiltration rate data this year.

Figure 1

Visual field observations were taken throughout the year and several differences in plant development were noted. These observations became very apparent because the no-till plot plants were still holding leaves when the cover crop was planted on September 6th. Figure 1 shows the difference in maturity with the no-till plots, trials 1, 2, and 3, all holding leaves and nearing maturity. Seeds and pods still seemed to be filling. The conventional tillage plots, trials 4 and 5, had plants that already reached full maturity and completely dropped their leaves. We were quite interested to see if these difference in maturity would result in any yield differences.

Plot #	Tillage	Cover Crop	Moisture (%)	Test Weight	Yield (Wet)	Adjusted Yield (13% moisture)
101	Conventional	Cereal Rye	13.2	58	46.43	46.33
102	No-Till	Cereal Rye	12.7	57.5	44.36	44.51
103	Conventional	Cereal Rye	12.3	57	40.73	41.05
104	Conventional	No Cover	11.1	57	40.99	41.88
105	No-Till	No Cover	11.5	57.5	43.58	44.33
201	No-Till	No Cover	11.9	57.5	48.51	49.12
202	No-Till	Cereal Rye	13.0	57	48.25	48.25
203	No-Till	Multi-species	9.7	57.5	44.62	46.31
204	Conventional	Cereal Rye	13.0	57.5	43.06	43.06
205	Conventional	No Cover	11.4	57	41.25	42.00
301	No-Till	Multi-species	12.2	58	42.8	43.20
302	Conventional	No Cover	11.6	58	41.25	41.91
303	No-Till	No Cover	11.9	58	41.76	42.29
304	No-Till	Cereal Rye	11.7	59	43.58	44.23
305	No-Till	Multi-species	9.0	59	45.91	48.03

Table 1: Harvest Yield Data

Each plot was harvested individually. Grain from each plot was weighed in a weigh wagon and grain moisture and test weight was recorded (see Table 1). Yield was calculated to a standard moisture of 13%. Grain moisture ranged from 9 to 13.2% and test weight was very consistent from 57 to 59 lbs./bu.

Figure 2: No-Till with Cereal Rye - at harvest

	Plant Population (Plants/Acre)	Residue Cover (%)	Yield Average (Adjusted 13% Moisture)
Trial 1	122,778	88.89	45.25
Trial 2	119,444	86.44	45.84
Trial 3	121,000	92.89	45.66
Trial 4	123,778	37.56	43.48
Trial 5	133,556	26.22	41.93
Cover Crop	121,407	72.30	45.00
No Cover	128,167	57.56	43.59
No-Till	121,074	89.41	45.59
Conventional	128,667	31.89	42.71
No-Till - Cover	120,222	89.67	45.76
No-Till - No Cover	122,778	88.89	45.25
Conventional – Cover	123,778	37.56	43.48
Conventional – No Cover	133,556	26.22	41.93

Table 2: Trial and Treatment Comparisons

When we start to analyze the data and compare different trials and treatments we begin so see some subtle differences (see Table 2). We see some differences in plant population. Overall we see that the no-till plots and plots with cover crops had less plant population than plots with conventional tillage and plots with cover crops. These differences were found to be statistically significant. This also corresponds with the percent residue cover. In general more residue resulted in a lower plant population. This can be somewhat expected as high residue can out compete emerging seedlings. This was noted in the field as plants were observed growing around or through pieces of corn stalk residue. The observed differences in higher plant population did not result in yield increases. In fact it was the opposite, high plant population plots had the lowest yields.

Looking closer at the data the highest yields were in the no-till plots and plots with cover crops. Cover crop plots showed a 1.4 bushel advantage over no cover crop. This difference was not significantly different. We saw an even bigger advantage when comparing tillage practices. No-till had a 2.88 bushel advantage over conventional tillage. This was significantly different. Plots with no-till and cover crops slightly edged out the no-till and no cover crop plots by 0.5 bushels. And conventional tillage with cover crops had a 1.55 bushel advantage over conventional tillage with no cover crops.

When we rank all the individual plots from highest yield to lowest yield we can see that in general the highest yielding plots were also the plots with the lowest plant population and the highest residue (Figure 3). So why are we seeing the highest yields in the no-till, high residue, and low plant population plots? Considering these facts, it leads us to believe the predominant factor effecting yield for 2018 was soil moisture. Unfortunately we were unable to collect soil moisture data this year. But we do know that less soil disturbance, higher residue, and fewer plants would all lead to higher soil moisture levels throughout the growing season. The producer reported that from April 1st to September 5th we had about 13.5 inches of rain. This would be about 5 inches or 37% less than normal for those months. This lack of moisture would have a negative effect on yield. We believe the no-till and high residue plots were able to overcome this shortfall in precipitation by holding more moisture in the soil for a

longer period of time. This allowed the soybean plants to continue growing with less drought stress, prolonging their maturity and produced higher yields.

Plot #	Treatments		Plant Population	Residue	Yield
201	No-Till	No Cover	124667	90	49.12
202	No-Till	Cereal Rye	119667	95	48.25
305	No-Till	Multi-species Blend	122667	88	48.03
101	Conventional	Cereal Rye	119000	42	46.33
203	No-Till	Multi-species Blend	116000	88	46.31
102	No-Till	Cereal Rye	118333	92	44.51
105	No-Till	No Cover	121333	92	44.33
304	No-Till	Cereal Rye	125000	92	44.23
301	No-Till	Multi-species Blend	119667	84	43.2
204	Conventional	Cereal Rye	129000	34	43.06
303	No-Till	No Cover	122333	85	42.29
205	Conventional	No Cover	134333	29	42
302	Conventional	No Cover	133667	25	41.91
104	Conventional	No Cover	132667	25	41.88
103	Conventional	Cereal Rye	123333	37	41.05

Figure 3: Plots ranked from highest to lowest yield

Green = Top 5 plots for each category
Orange = Middle 5 plots for each category
Yellow = Bottom 5 plots for each category

As our weather patterns become more erratic, with higher precipitation events that are spaced further apart, harvesting precipitation and holding it in the soil will be a major benefit to crop producers. The Horse Creek Area Watershed Council sees soil health principles as a key tool to achieve these goals. The data collected at our cover crop test plot is a great way to showcase these principles to area producers. We hope to collect data on soil moisture and infiltration next year. This may help use explain some of the differences we saw this year. We are excited by the results from 2018 and look forward to seeing long term trends from our study.

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