Supplementary Material for 'Long-term use of cover crops'

Nichols et al. 2020

7/15/2020

General Site Management Summary

Table 1: General Site Description

Site Description	General Location	Treatment Description	Yea
Central Grain	Boyd Farm, Boone, field 44	corn/soybean grain rotation, with and without rye cover crop	
Central Grain	Boyd Farm, Boone, field 42	corn/soybean grain rotation, with and without rye cover crop	
Central Silage	Boyd Farm, Boone, field 44	corn silage/soybean grain rotation, with and without rye cover crop	
Central Silage	Boyd Farm, Boone, field 42	corn silage/soybean grain rotation, with and without rye cover crop	
West	Jefferson, IA	corn/soybean grain rotation, with and without rye cover crop	
East	Washington, IA	corn/soybean grain rotation, with and without rye cover crop	

Table 2: 2018-2019 Herbicide Use

Site Description	Herbicides Used in 2018 Growing Season	Herbicdes Used in Fall 2018	Herbicides Used in Spring 2019
Central Grain	glyphosate 1 week before soybean planting	none	glyphosate 1 week before corn planting, Lumax at planting
Central Grain	glyphosate 1 week before corn planting, Lumax at planting	none	glyphosate 1 week before soybean planting
Central Silage	glyphosate 1 week before soybean planting	none	glyphosate 1 week before corn planting, Lumax at planting
Central Silage	glyphosate 1 week before corn planting, Lumax at planting	none	glyphosate 1 week before soybean planting
West	Roundup and Cadet	none	Roundup and Cadet
East	April 15-Roundup Powermax 32 oz; April 15-Acetochlor ATZ 40 oz; May 14-Aatrex 9-0 1/2; May 14-Harness Max 40 oz; June 15-Warrant Ultra 50 oz; June 15-Roundup Powermax 22 oz;	none	3 oz Fierce XLT with 26-32 oz Roundup Powermax as burndown followed by a post emergence application of 22 oz Xtendimax plus 2 pt of Warrant

Table 3: General Management

Site Description	General Herbicide Regime	General Date of Cover Crop Termination	General Date of Crop Planting	I
Central Grain	burndown, residual herbicide at corn planting	15-Apr	26-Apr	
Central Grain	burndown, residual herbicide at corn planting	25-Apr	5-May	
Central Silage	burndown, residual herbicide at corn planting	15-Apr	26-Apr	
Central Silage	burndown, residual herbicide at corn planting	25-Apr	5-May	
West	burndown, pre-emergent herbicide	1-May	10-May	
East	burndown, residual herbicide at planting, another application on corn at ~V6	1-May	5-May	

Field wet soil amounts

Table 4: Wet Soil Weights Immediately After Sampling

site	cc_trt	rep	soilwt_g	notes
BC	no	1	6718.3	sampled 4/8, 12-6pm
BC	rye	1	6936.2	sampled 4/8, 12-6pm
BC	no	2	6838.6	sampled 4/8, 12-6pm
BC	rye	2	5965.2	sampled 4/8, 12-6pm
BC	no	3	6260.4	sampled 4/8, 12-6pm
BC	rye	3	6136.0	sampled 4/8, 12-6pm
BC	no	4	5554.9	sampled 4/9
BC	rye	4	6312.7	sampled 4/9
BC	no	5	5866.2	sampled 4/9
BC	rye	5	5981.1	sampled 4/9
Bcsil	rye	1	6340.0	sampled 4/16, 2-6pm
Bcsil	no	1	5800.0	sampled 4/16, 2-6pm
Bcsil	rye	2	5990.0	sampled 4/16, 2-6pm
Bcsil	no	2	6100.0	sampled 4/16, 2-6pm
Bcsil	no	3	6245.5	sampled 4/8
Bcsil	rye	3	6160.2	sampled 4/8
Bcsil	no	4	6240.2	sampled 4/8
Bcsil	rye	4	6007.5	sampled 4/8
Bcsil	no	5	6682.9	sampled 4/8
Bcsil	rye	5	6045.7	sampled 4/8
BS	rye	1	6068.7	sampled 4/9
BS	no	2	6240.3	sampled 4/9
BS	rye	2	5950.5	sampled 4/9
BS	no	3	5885.7	sampled 4/9
BS	rye	3	5734.1	sampled 4/9
BS	no	4	6213.3	sampled 4/9
BS	rye	4	5968.2	sampled 4/9
BS	no	5	6175.8	sampled 4/9
BS	rye	5	6050.4	sampled 4/9
East	no	1	5349.6	sampled 4/6, 8-5pm
East	rye	1	5460.6	sampled 4/6, 8-5pm
East	no	2	5235.5	sampled 4/6, 8-5pm
East	rye	2	5055.2	sampled 4/6, 8-5pm
East	no	3	5211.1	sampled 4/6, 8-5pm
East	rye	3	4991.7	sampled 4/6, 8-5pm
East	no	4	5401.6	sampled 4/6, 8-5pm
East	rye	4	5163.9	sampled 4/6, 8-5pm
West	no	1	6314.0	sampled 4/17, 9-2pm
West	rye	1	6401.0	sampled 4/17, 9-2pm
West	no	2	5841.0	sampled 4/17, 9-2pm
West	rye	2	5543.0	sampled 4/17, 9-2pm
West	no	3	5698.0	sampled 4/17, 9-2pm
West	rye	3	5947.0	sampled 4/17, 9-2pm
West	no	4	6057.0	sampled 4/17, 9-2pm
West	rye	4	5989.0	sampled 4/17, 9-2pm

Statistical Results

Note: Boyd refers to the Central site, Stout to the East site, and Funcke to the West site

Linear models on seedbank density

Values are presented for the models run with the full dataset (XX_full) and with the outlier removed (XX_out-rm)

Table 5: Contrasts with full dataset and dataset with outlier removed

model	level1	level2	site_sys	estimate	std.error	z.ratio	p.value
pois_out-rm	no	rye	Boyd_grain	-0.32	0.26	-1.22	0.22
pois_out-rm	no	rye	Boyd_silage	0.95	0.35	2.66	0.01
pois_out-rm	no	rye	Funcke_grain	0.71	0.42	1.68	0.09
pois_out-rm	no	rye	Stout_grain	0.42	0.41	1.03	0.31
pois_full	no	rye	Boyd_grain	-0.32	0.27	-1.19	0.24
pois_full	no	rye	Boyd_silage	0.95	0.37	2.58	0.01
pois_full	no	rye	Funcke_grain	0.36	0.40	0.91	0.37
pois_full	no	rye	Stout_grain	0.43	0.43	1.00	0.32
binom_out-rm	no	rye	Boyd_grain	-0.33	0.26	-1.27	0.20
binom_out-rm	no	rye	Boyd_silage	1.02	0.34	2.99	0.00
binom_out-rm	no	rye	Funcke_grain	0.71	0.41	1.72	0.09
binom_out-rm	no	rye	Stout_grain	0.45	0.40	1.12	0.26
binom_full	no	rye	Boyd_grain	-0.33	0.26	-1.23	0.22
binom_full	no	rye	Boyd_silage	1.03	0.35	2.92	0.00
binom_full	no	rye	Funcke_grain	0.28	0.39	0.71	0.48
binom_full	no	rye	Stout_grain	0.45	0.41	1.09	0.27

Table 6: Estimates with full dataset and dataset with outlier removed

model	cc_trt	site_sys	estimate	std.error	asymp.LCL	asymp.UCL
pois_out-rm	no	Boyd_grain	2.97	0.23	2.52	3.42
pois_out-rm	rye	Boyd_grain	3.29	0.23	2.85	3.73
pois_out-rm	no	Boyd_silage	4.30	0.30	3.72	4.88
pois_out-rm	rye	Boyd_silage	3.35	0.30	2.76	3.95
pois_out-rm	no	Funcke_grain	6.02	0.34	5.35	6.69
pois_out-rm	rye	Funcke_grain	5.31	0.39	4.55	6.07
pois_out-rm	no	Stout_grain	3.32	0.36	2.62	4.03
pois_out-rm	rye	Stout_grain	2.90	0.36	2.19	3.61
pois_full	no	Boyd_grain	2.97	0.24	2.50	3.43
pois_full	rye	Boyd_grain	3.29	0.23	2.83	3.74
pois_full	no	Boyd_silage	4.29	0.31	3.69	4.90
pois_full	rye	Boyd_silage	3.35	0.31	2.74	3.96
pois_full	no	Funcke_grain	6.02	0.35	5.33	6.71
pois_full	rye	Funcke_grain	5.66	0.36	4.97	6.36
pois_full	no	Stout_grain	3.32	0.37	2.60	4.05
pois_full	rye	Stout_grain	2.90	0.38	2.16	3.63
binom_out-rm	no	Boyd_grain	3.11	0.23	2.67	3.55
binom_out-rm	rye	Boyd_grain	3.44	0.23	3.00	3.88
binom_out-rm	no	Boyd_silage	4.45	0.29	3.87	5.02
binom_out-rm	rye	Boyd_silage	3.42	0.30	2.84	4.01
binom_out-rm	no	Funcke_grain	6.03	0.33	5.37	6.68
binom_out-rm	rye	Funcke_grain	5.32	0.38	4.58	6.06
binom_out-rm	no	Stout_grain	3.43	0.36	2.73	4.13
binom_out-rm	rye	Stout_grain	2.98	0.36	2.28	3.69
binom_full	no	Boyd_grain	3.11	0.23	2.65	3.57
binom_full	rye	Boyd_grain	3.43	0.24	2.97	3.90
binom_full	no	Boyd_silage	4.44	0.30	3.85	5.04
binom_full	rye	Boyd_silage	3.42	0.31	2.81	4.02
binom_full	no	Funcke_grain	6.04	0.35	5.35	6.72
binom_full	rye	Funcke_grain	5.76	0.36	5.06	6.46
binom_full	no	Stout_grain	3.42	0.37	2.69	4.15
binom_full	rye	Stout_grain	2.98	0.37	2.24	3.71

Manuscript figures with full datasets

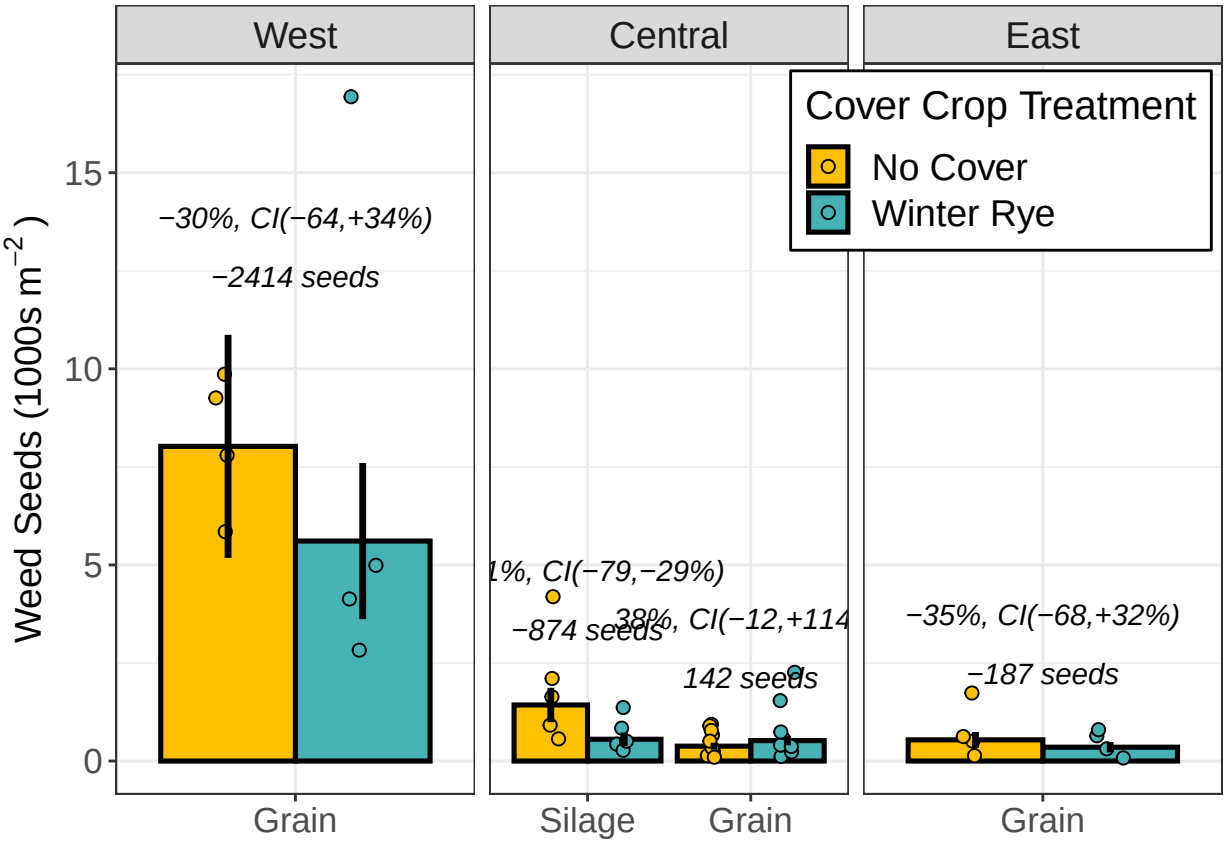

Figure 1: Figure 2 on full dataset

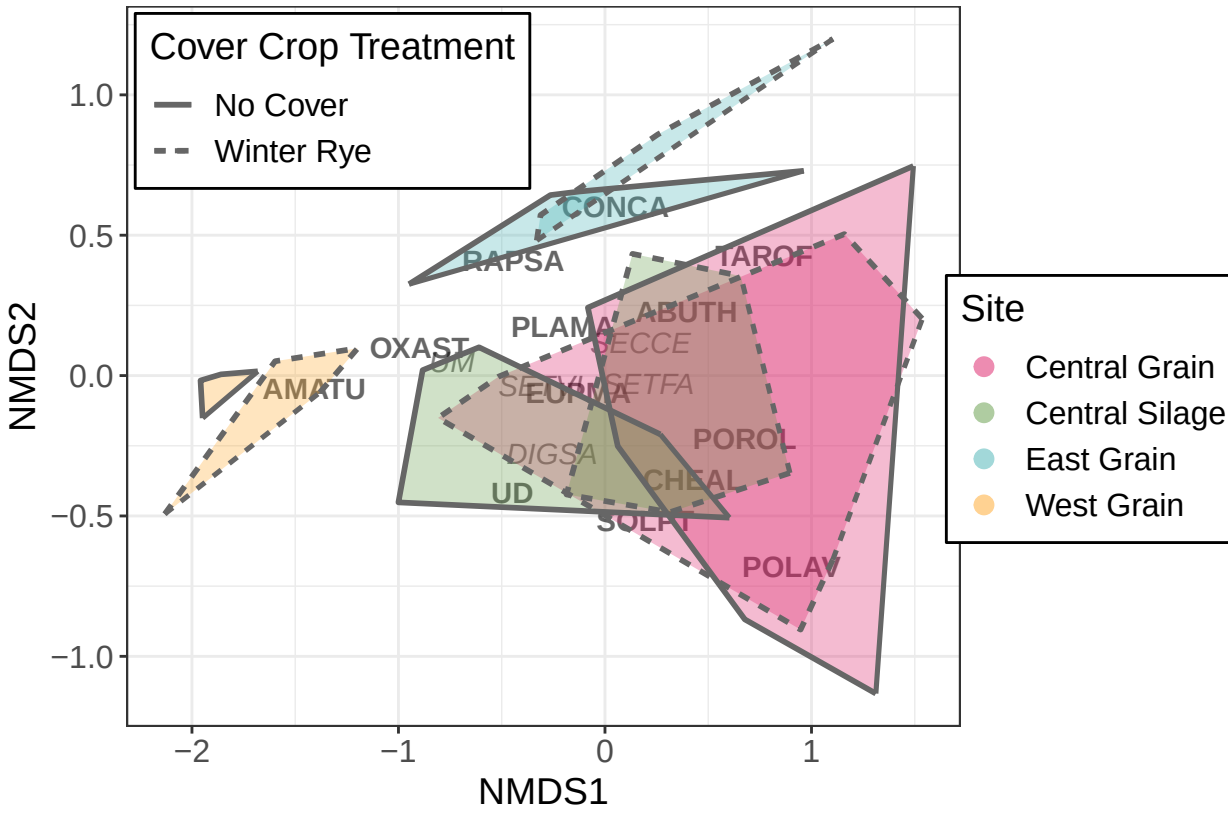

Figure 2: Figure 4 on full dataset

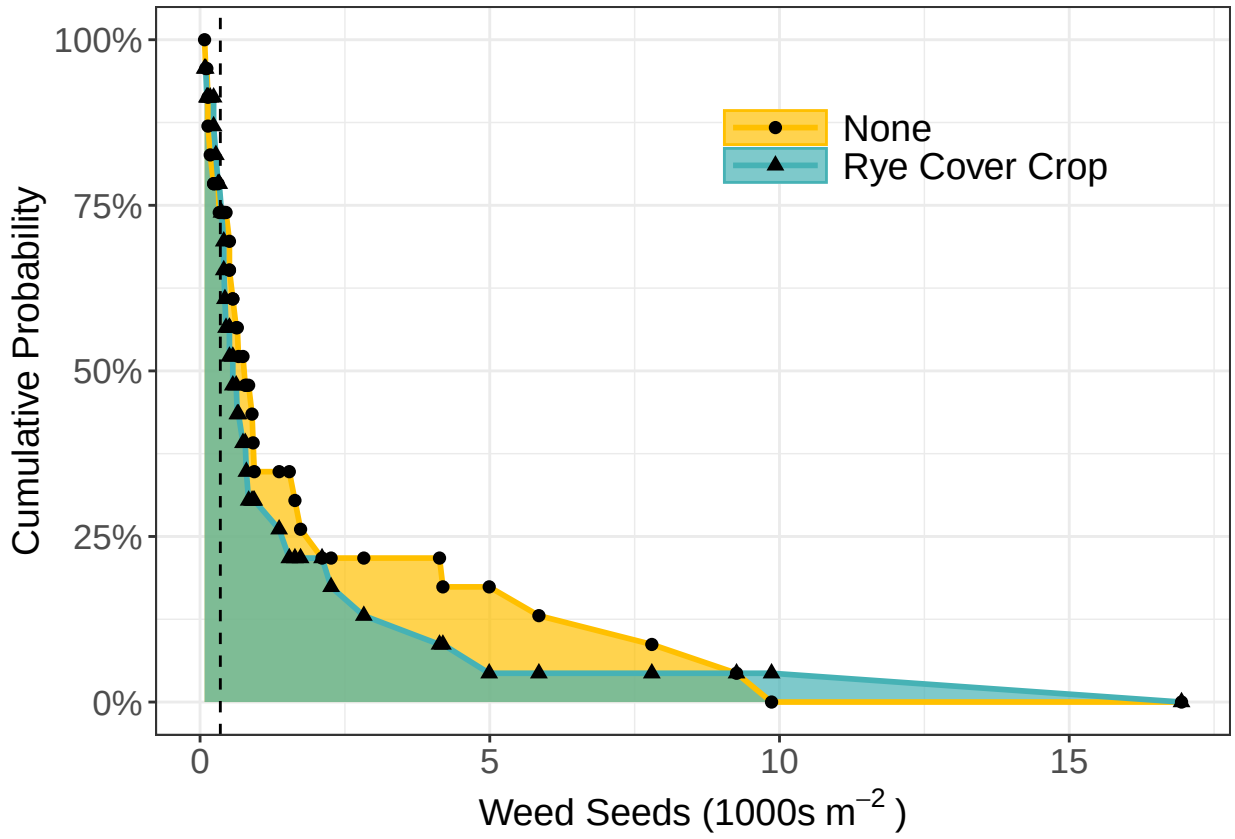

Figure 3: Figure 5 on full dataset