

Supplementary Materials for

The pace of plant community change is accelerating in remnant prairies

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Supplementary Materials

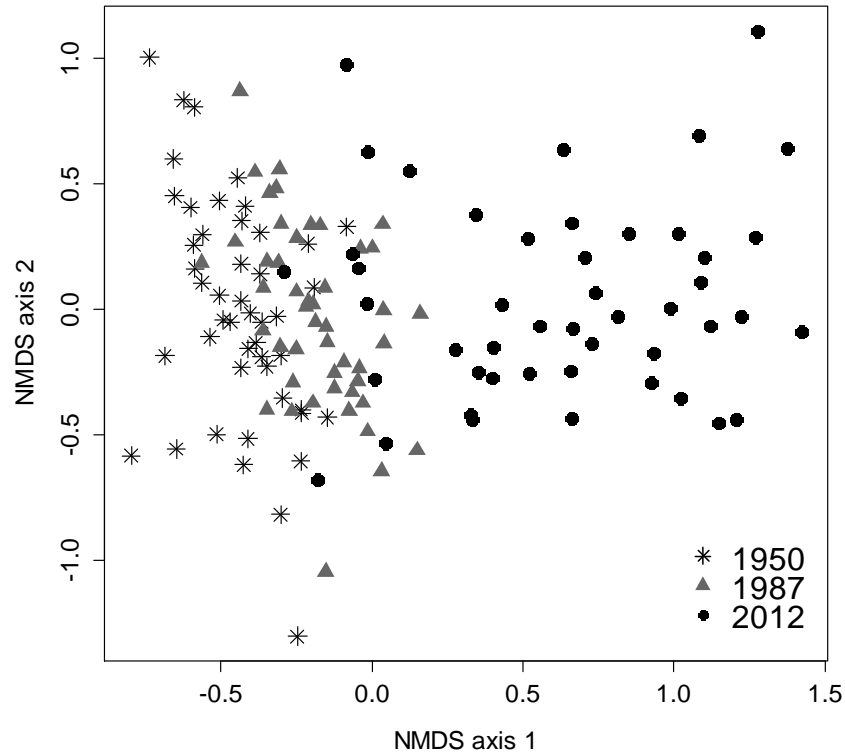


Figure S1. Changes in species composition. Nonmetric multidimensional scaling (NMDS) ordination of 47 Wisconsin prairie remnants sampled in the 1950s, 1987-88, and 2012. This ordination represents a two-dimensional solution with a final stress of 0.15.

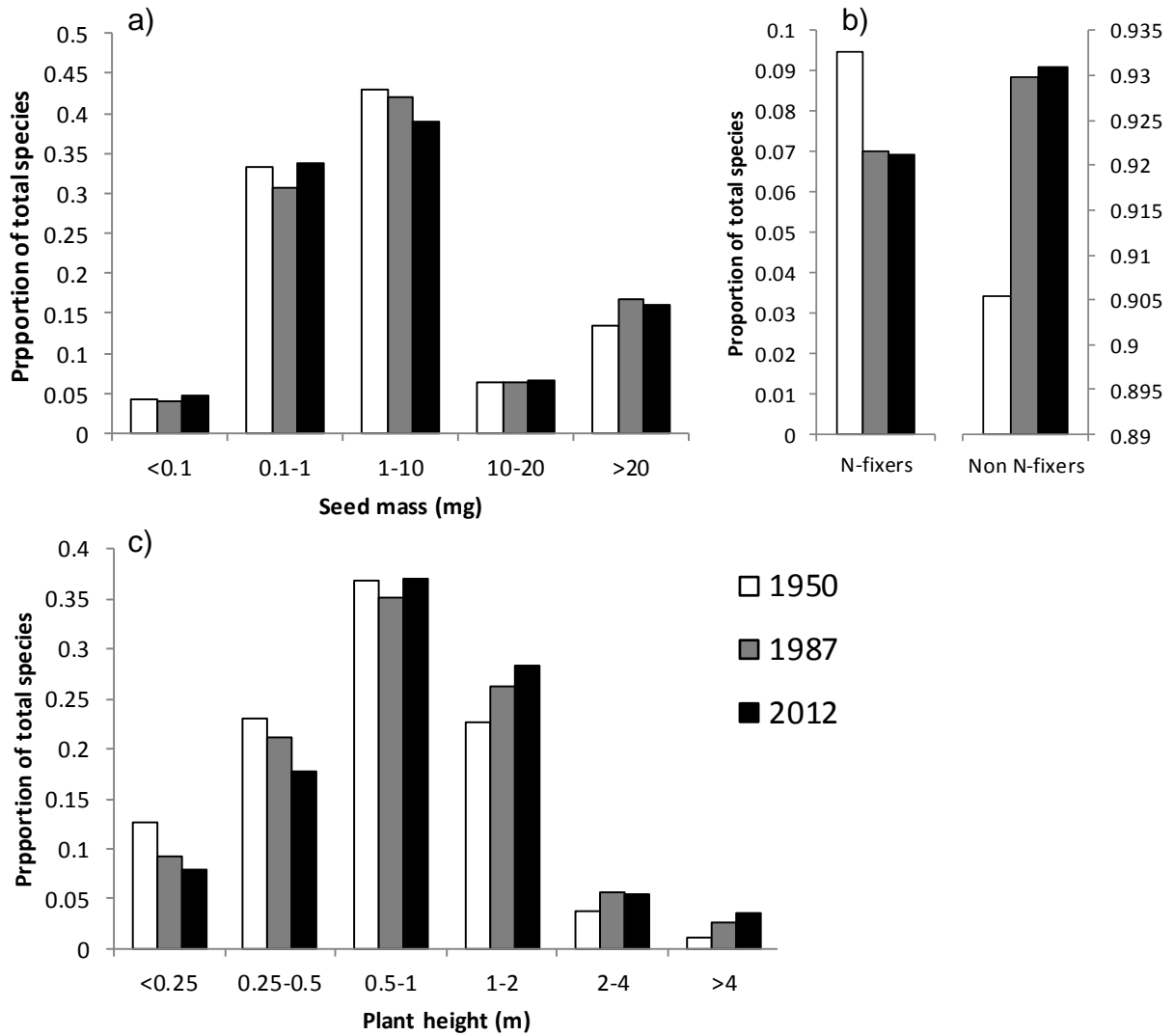


Figure S2. Changes in proportion of total species as a function of (A) seed mass, (B) nitrogen fixing ability, and (C) plant height. Classes for plant height and seed size follow those used in the first survey (4). For the relevant statistics, see Table S2.

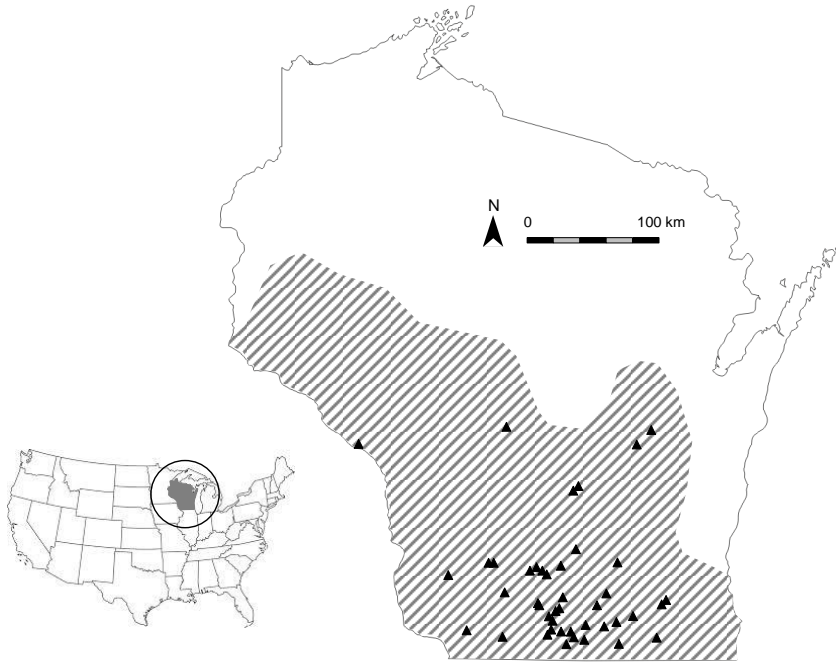


Figure S3. Distribution of 47 prairie remnants in southern Wisconsin. All 47 sites have occurrence data from three vegetation surveys in the 1950s, 1987-88, and 2012. The approximate historic extent of prairie habitat in Wisconsin is represented by the shaded area.

Table S1. Results from four generalized linear models examining the role of site characteristics in annual colonization and extinction rates. Parameter estimates are not included for the soil continuum index but see Fig. 3 for relationships. Factors that are significant at the $p < 0.05$ level in the given model are in bold text.

Response (# spp/yr)	Factor	1950-1987			1987-2012		
		Parameter estimate \pm SE	<i>F</i>	<i>p</i> -value	Parameter estimate \pm SE	<i>F</i>	<i>p</i> -value
Extinction Rate	Soil continuum index	-	2.69	0.044	-	0.91	0.47
	Fire	0.0060 \pm 0.024	0.060	0.80	-0.024 \pm 0.0084	8.064	0.0076
	Patch area	-0.077 \pm 0.096	0.42	0.42	-0.20 \pm 0.062	10.76	0.0022
Colonization Rate	Soil continuum index	-	2.80	0.038	-	3.61	0.013
	Fire	-0.012 \pm 0.016	0.56	0.46	0.012 \pm 0.0055	5.11	0.029
	Patch area	-0.016 \pm 0.063	0.063	0.80	0.072 \pm 0.040	3.16	0.083

Table S2. Changes in site occupation and net change among surveys as a function of plant traits. Our net change parameter, which included recruitment to be conservative, was calculated as follows: $[(\# \text{ original occurrences} - (\# \text{ persisting} + \# \text{ colonizations})) / \# \text{ original occurrences}]$. McNemar's change test was used to determine if changes in occurrence were significant for each functional trait class; bolded rows indicate changes that were significant at the $p < 0.05$ level.

Trait	1950-1987					1987-2012				
	#Original	#Lost	#Recruited	Net Δ (%)	χ^2 , p-value	#Original	#Lost	#Recruited	Net Δ (%)	χ^2 , p-value
N-fixing										
Fixers	263	100	35	-24.71	30.34, <0.001	198	152	119	-16.67	3.78, 0.052
Non-fixers	2519	745	847	4.05	6.41, 0.011	2621	1494	1096	-15.19	60.85, <0.001
Seed size (mg)										
<0.1	104	58	43	-14.42	1.94, 0.16	89	56	62	6.74	0.21, 0.65
0.1-1	861	315	248	-7.78	7.74, 0.0054	794	484	413	-8.94	5.46, 0.019
1-10	1112	275	255	-1.80	0.68, 0.41	1092	619	346	-28.30	76.67, <0.001
10-20	138	53	36	-12.32	2.88, 0.089	121	77	67	-8.26	0.56, 0.45
>20	234	52	90	16.23	9.64, 0.002	272	145	85	-22.06	15.13, <0.001
Plant height (m)										
<0.25	351	175	83	-26.21	32.10, <0.001	259	181	111	-27.03	16.30, <0.001
0.25-0.5	638	233	187	-7.21	4.82, 0.028	592	387	206	-29.05	50.07, <0.001
0.5-1	1018	290	261	-2.85	1.42, 0.23	989	572	461	-11.22	24.31, <0.001
1-2	630	125	232	16.98	31.47, <0.001	737	382	316	-8.96	6.05, 0.014
2-4	102	11	65	52.94	36.96, <0.001	156	88	60	-17.95	4.93, 0.026
>4	30	2	48	153.33	40.50, <0.001	76	35	42	9.21	0.47, 0.59

Table S3. Interannual variation in extinctions and colonizations since 1987 for 10 Wisconsin prairie remnants. Data for 2012 are those presented in the manuscript, and data for 2015 are those gathered to assess the magnitude of inter-annual variation. Each row represents a study site. Across all ten sites that we resurveyed, we documented a total of seven more extinctions and 23 fewer colonizations than we found with the original 2012 data. This represents a 1.75% decrease in the annual rate of extinctions, and a 8.95% increase in the annual rate of colonizations. This increase in colonization translates to annual gains of 1.02 species year with these new data compared to 0.93 species per year with the original data.

Extinctions		Colonizations	
2012	2015	2012	2015
57	57	25	23
36	37	27	24
34	33	24	23
34	35	20	19
54	54	31	26
47	48	31	29
3	6	30	28
32	34	26	25
50	50	16	14
46	46	27	23