2018

Appendix 1. Testing the Influence of Management Regime and Year on Vegetation Structure Variables on Two Grass Types on Federal Lands Managed under an Adaptive-Management Framework by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13

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Appendix 1. Testing the Influence of Management Regime and Year on Vegetation Structure Variables on Two Grass Types on Federal Lands Managed under an Adaptive-Management Framework by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13

A. Mean Bare-Ground Cover (percent)

Table 1.1. Generalized linear mixed model (assuming a beta distribution with a logit link) testing the influence of management regime and year on mean bare-ground cover (percent) on two grass types on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[**, evidence for strong effect ($p \leq 0.05$)]

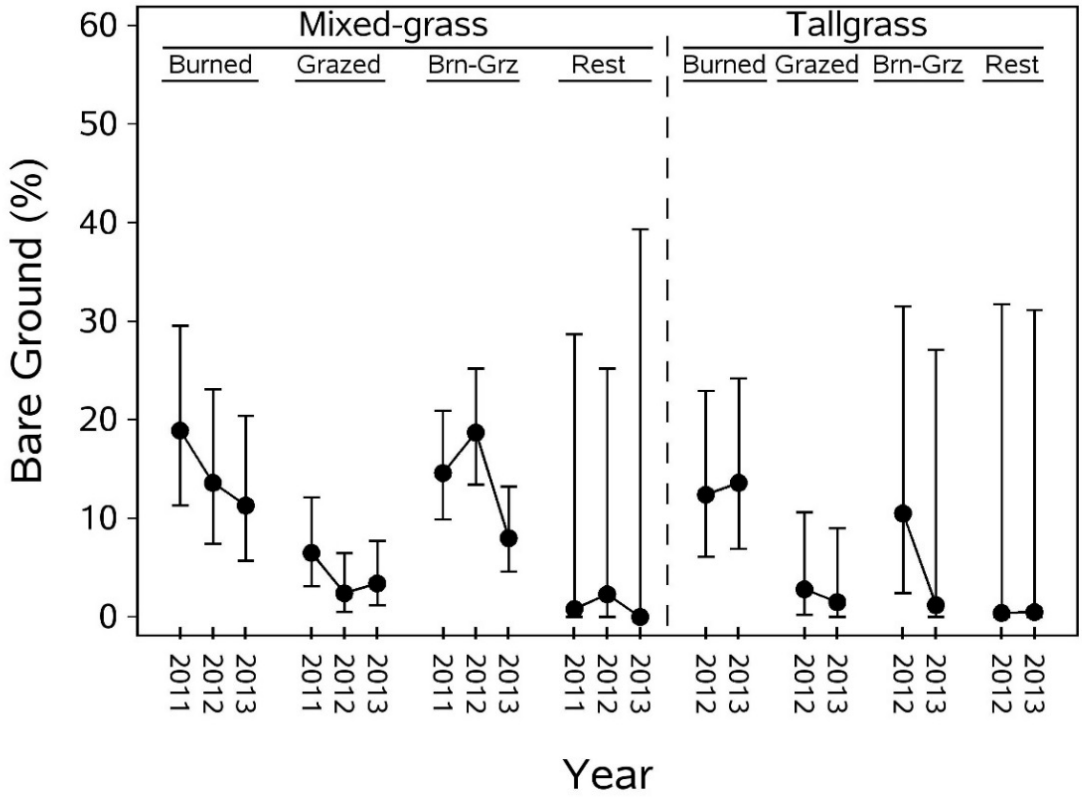
Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × regime × year	19	181.3	2.63	0.0005**
Contrasts:	Mixed: regime effect	3	82.1	7.68	0.0001**
	Mixed: year effect	2	132.2	0.44	0.6448
	Mixed: interaction	6	141.3	1.19	0.3156
	Tall: regime effect	3	112.8	3.36	0.0213**
	Tall: year effect	1	128.0	0.54	0.4644
	Tall: interaction	3	129.7	0.55	0.6509
	Mixed versus tall: burned only	1	95.4	0.10	0.7507
	Mixed versus tall: grazed only	1	104.0	0.65	0.4222
	Mixed versus tall: burned-grazed	1	123.4	1.63	0.2044
	Mixed versus tall: rest	1	97.6	0.01	0.9055

[1]Sources of variation for the model: Y=Unit(Grass type × Regime) + Grass type × Regime × Year + Year × Unit(Grass type × Regime), where Grass type × Regime × Year is a fixed effect, Unit(Grass type × Regime) and Year × Unit(Grass type × Regime) are random effects in a mixed-model framework, and Year is a repeated-measures factor.
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 1.2. Least squares mean (standard error) and back-transformed least squares mean (95-percent confidence intervals) of bare-ground cover (percent), by grassland type (mixed-grass, tallgrass), overall treatment regime (burned-only, grazed-only, burned-grazed, or rest), and year (2011, 2012, 2013), on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

					Back-transformed		
						95-percent confidence intervals	
Grass type	Regime	Year	LSMean	SE	LSMean	LCL	UCL
Mixed	Burned only	2011	−1.395	0.292	18.9	11.3	29.5
		2012	−1.765	0.315	13.6	7.4	23.1
		2013	−1.966	0.339	11.3	5.7	20.4
	Grazed only	2011	−2.518	0.321	6.5	3.1	12.1
		2012	−3.342	0.423	2.4	0.5	6.5
		2013	−3.077	0.367	3.4	1.2	7.7
	Burned-grazed	2011	−1.688	0.212	14.6	9.9	20.9
		2012	−1.408	0.190	18.7	13.4	25.2
		2013	−2.311	0.263	8.0	4.6	13.2
	Rest	2011	−3.985	1.594	0.8	0.0	28.7
		2012	−3.390	1.201	2.3	0.0	25.2
		2013	−4.595	2.144	0.0	0.0	39.3
Tall	Burned only	2012	−1.869	0.362	12.4	6.1	22.9
		2013	−1.770	0.349	13.6	6.9	24.2
	Grazed only	2012	−3.227	0.610	2.8	0.2	10.6
		2013	−3.676	0.753	1.5	0.0	9.0
	Burned-grazed	2012	−2.042	0.669	10.5	2.4	31.5
		2013	−3.809	1.464	1.2	0.0	27.1
	Rest	2012	−4.220	1.785	0.4	0.0	31.7
		2013	−4.179	1.750	0.5	0.0	31.1



[Brn-Grz, burned-grazed; %, percent]

Figure 1.1. Back-transformed least squares mean bare-ground cover (percent) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits.

B. Standard Deviation of Bare-Ground Cover (percent)

Table 1.3. Generalized linear mixed model (assuming a beta distribution with a logit link) testing the influence of management regime and year on the standard deviation of bare-ground cover (percent) on two grass types on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[*, evidence for moderate effect ($0.05<p\leq 0.10$); **, evidence for strong effect ($p\leq 0.05$)]

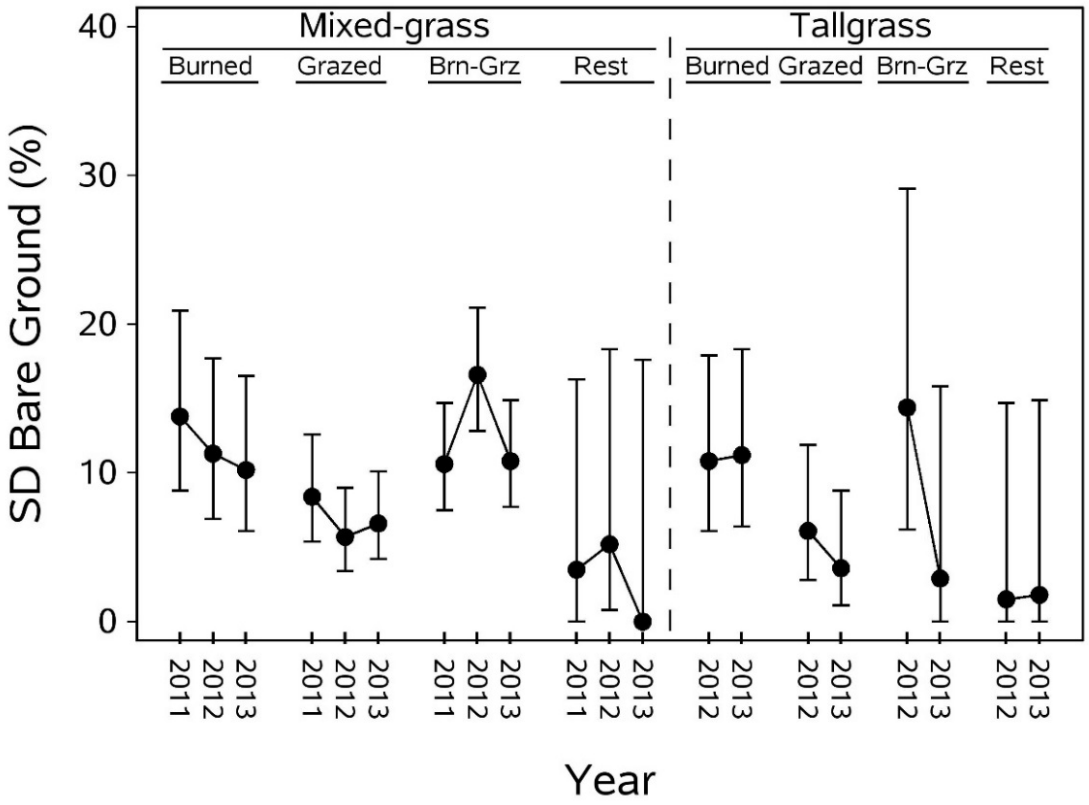
Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × regime × year	19	181.5	2.18	0.0043**
Contrasts:	Mixed: regime effect	3	81.0	4.53	0.0055**
	Mixed: year effect	2	145.0	1.14	0.3233
	Mixed: interaction	6	141.7	1.97	0.0745*
	Tall: regime effect	3	106.2	2.28	0.0838*
	Tall: year effect	1	131.8	1.54	0.2173
	Tall: interaction	3	132.8	1.28	0.2845
	Mixed versus tall: burned only	1	92.2	0.05	0.8215
	Mixed versus tall: grazed only	1	99.9	0.93	0.3371
	Mixed versus tall: burned-grazed	1	109.5	1.16	0.2840
	Mixed versus tall: rest	1	94.8	0.02	0.8894

[1]Sources of variation for the model: Y=Unit(Grass type × Regime) + Grass type × Regime × Year + Year × Unit(Grass type × Regime), where Grass type × Regime × Year is a fixed effect, Unit(Grass type × Regime) and Year × Unit(Grass type × Regime) are random effects in a mixed-model framework, and Year is a repeated-measures factor.
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 1.4. Least squares mean (standard error) and back-transformed least squares mean (95 percent confidence intervals) of the standard deviation of bare-ground cover (percent), by grassland type (mixed-grass, tallgrass), overall treatment regime (burned-only, grazed-only, burned-grazed, or rest), and year (2011, 2012, 2013), on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

					Back-transformed		
						95-percent confidence intervals	
Grass type	Regime	Year	LSMean	SE	LSMean	LCL	UCL
Mixed	Burned only	2011	−1.748	0.242	13.8	8.8	20.9
		2012	−1.965	0.252	11.3	6.9	17.7
		2013	−2.066	0.262	10.2	6.1	16.5
	Grazed only	2011	−2.269	0.212	8.4	5.4	12.6
		2012	−2.638	0.227	5.7	3.4	9.0
		2013	−2.492	0.210	6.6	4.2	10.1
	Burned-grazed	2011	−2.032	0.178	10.6	7.5	14.7
		2012	−1.547	0.147	16.6	12.8	21.1
		2013	−2.009	0.173	10.8	7.7	14.9
	Rest	2011	−3.066	0.767	3.5	0.0	16.3
		2012	−2.718	0.657	5.2	0.8	18.3
		2013	−4.595	1.590	0.0	0.0	17.6
Tall	Burned only	2012	−2.012	0.283	10.8	6.1	17.9
		2013	−1.975	0.279	11.2	6.4	18.3
	Grazed only	2012	−2.570	0.337	6.1	2.8	11.9
		2013	−3.035	0.414	3.6	1.1	8.8
	Burned-grazed	2012	−1.701	0.438	14.4	6.2	29.1
		2013	−3.192	0.812	2.9	0.0	15.8
	Rest	2012	−3.678	1.020	1.5	0.0	14.7
		2013	−3.552	0.961	1.8	0.0	14.9



[Brn-Grz, burned-grazed; %, percent; SD, standard deviation]

Figure 1.2. Back-transformed least squares mean standard deviation of bare-ground cover (percent) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits.

C. Mean Litter Depth (centimeters)

Table 1.5. Generalized linear mixed model (assuming a gamma distribution with a log link) testing the influence of management regime and year on mean litter depth (centimeters) on two grass types on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[**, evidence for strong effect ($p \leq 0.05$)]

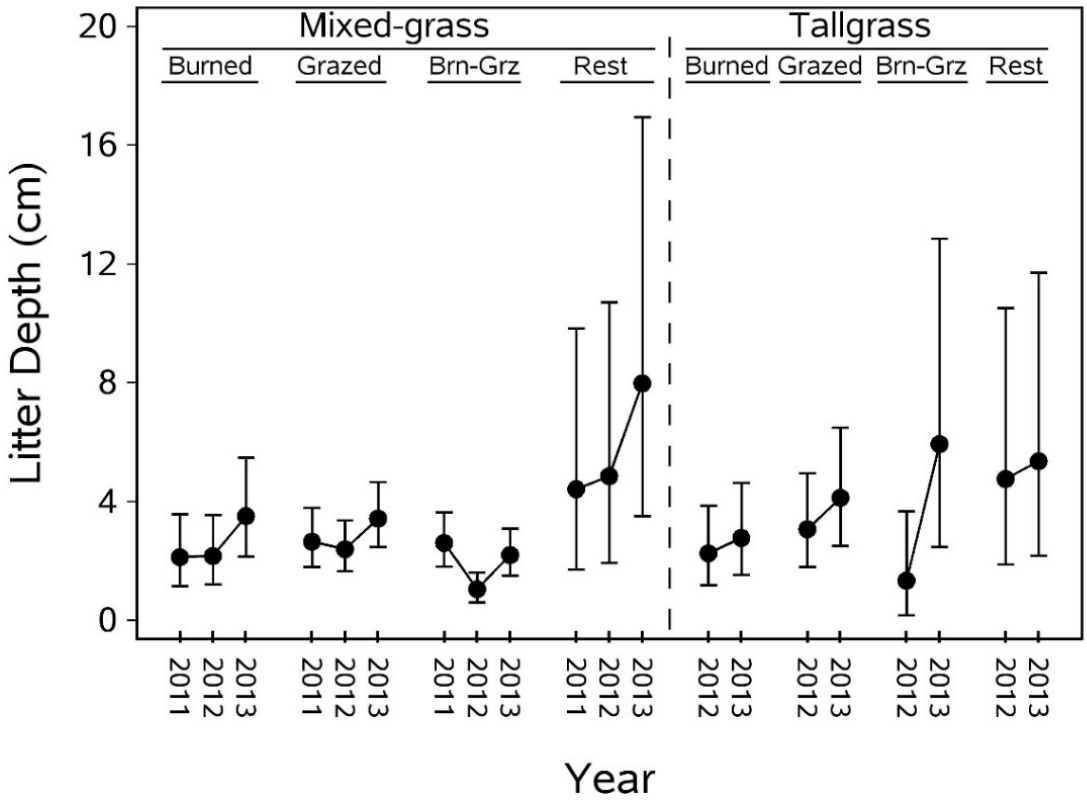
Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × regime × year	19	182.2	2.76	0.0002**
Contrasts:	Mixed: regime effect	3	79.7	3.93	0.0113**
	Mixed: year effect	2	132.7	4.56	0.0122**
	Mixed: interaction	6	137.5	1.44	0.2019
	Tall: regime effect	3	106.4	1.01	0.3936
	Tall: year effect	1	122.4	5.82	0.0173**
	Tall: interaction	3	122.4	1.55	0.2039
	Mixed versus tall: burned only	1	94.5	0.00	0.9538
	Mixed versus tall: grazed only	1	100.8	0.98	0.3235
	Mixed versus tall: burned-grazed	1	103.7	1.24	0.2684
	Mixed versus tall: rest	1	92.1	0.05	0.8285

[1]Sources of variation for the model: Y=Unit(Grass type × Regime) + Grass type × Regime × Year + Year × Unit(Grass type × Regime), where Grass type × Regime × Year is a fixed effect, Unit(Grass type × Regime) and Year × Unit(Grass type × Regime) are random effects in a mixed-model framework, and Year is a repeated-measures factor.
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 1.6. Least squares mean (standard error) and back-transformed least squares mean (95-percent confidence intervals) litter depth (centimeters), by grassland type (mixed-grass, tallgrass), overall treatment regime (burned-only, grazed-only, burned-grazed, or rest), and year (2011, 2012, 2013), on federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

					Back-transformed		
						95-percent confidence intervals	
Grass type	Regime	Year	LSMean	SE	LSMean	LCL	UCL
Mixed	Burned only	2011	1.14	0.19	2.13	1.15	3.57
		2012	1.15	0.18	2.17	1.21	3.55
		2013	1.51	0.18	3.51	2.14	5.48
	Grazed only	2011	1.30	0.14	2.65	1.79	3.79
		2012	1.22	0.13	2.40	1.65	3.36
		2013	1.49	0.12	3.43	2.47	4.66
	Burned-grazed	2011	1.28	0.13	2.61	1.81	3.63
		2012	0.72	0.12	1.05	0.61	1.62
		2013	1.16	0.12	2.20	1.50	3.08
	Rest	2011	1.69	0.35	4.42	1.71	9.83
		2012	1.77	0.35	4.86	1.93	10.71
		2013	2.20	0.35	7.98	3.50	16.95
Tall	Burned only	2012	1.18	0.20	2.26	1.18	3.86
		2013	1.33	0.20	2.78	1.53	4.63
	Grazed only	2012	1.40	0.19	3.07	1.79	4.95
		2013	1.63	0.19	4.13	2.51	6.49
	Burned-grazed	2012	0.85	0.35	1.34	0.17	3.67
		2013	1.94	0.35	5.94	2.47	12.86
	Rest	2012	1.75	0.35	4.76	1.88	10.51
		2013	1.85	0.35	5.36	2.18	11.71



[Brn-Grz, burned-grazed; cm, centimeters]

Figure 1.3. Back-transformed least squares mean litter depth (centimeters) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits.

D. Standard Deviation of Litter Depth (centimeters)

Table 1.7. Generalized linear mixed model (assuming a gamma distribution with a log link) testing the influence of management regime and year on the standard deviation of the mean litter depth (centimeters) on two grass types on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[*, evidence for moderate effect ($0.05<p\leq0.10$); **, evidence for strong effect ($p\leq0.05$)]

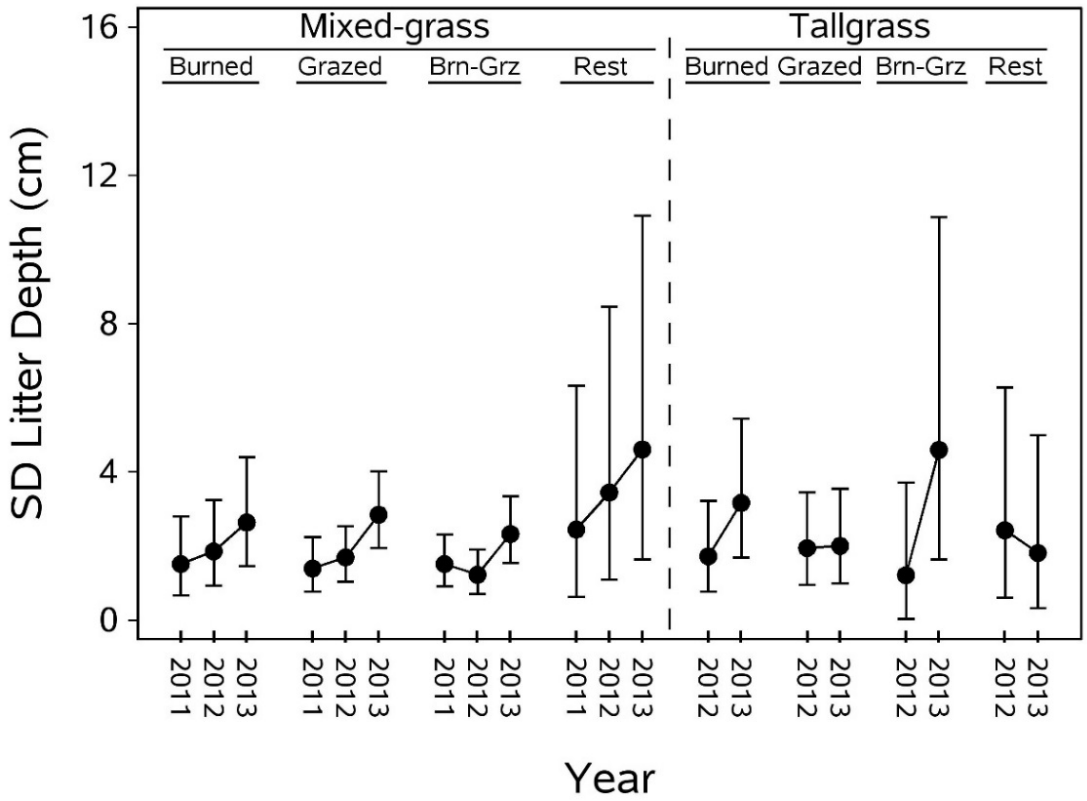
Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × regime × year	19	184.1	1.28	0.1982
Contrasts:	Mixed: regime effect	3	89.5	1.39	0.2499
	Mixed: year effect	2	140.1	3.16	0.0455
	Mixed: interaction	6	147.1	0.23	0.9670
	Tall: regime effect	3	118.0	0.14	0.9359
	Tall: year effect	1	123.3	2.02	0.1579
	Tall: interaction	3	123.3	1.19	0.3175
	Mixed versus tall: burned only	1	106.1	0.37	0.5460
	Mixed versus tall: grazed only	1	112.9	0.01	0.9074
	Mixed versus tall: burned-grazed	1	115.3	0.89	0.3474
	Mixed versus tall: rest	1	103.3	0.88	0.3511

[1]Sources of variation for the model: Y=Unit(Grass type × Regime) + Grass type × Regime × Year + Year × Unit(Grass type × Regime), where Grass type × Regime × Year is a fixed effect, Unit(Grass type × Regime) and Year × Unit(Grass type × Regime) are random effects in a mixed-model framework, and Year is a repeated-measures factor.
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 1.8. Least squares mean (standard error) and back-transformed least squares mean (95-percent confidence intervals) standard deviation of litter depth (centimeters), by grassland type (mixed-grass, tallgrass), overall treatment regime (burned-only, grazed-only, burned-grazed, or rest), and year (2011, 2012, 2013), on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

					Back-transformed		
						95-percent confidence intervals	
Grass type	Regime	Year	LSMean	SE	LSMean	LCL	UCL
Mixed	Burned only	2011	0.92	0.21	1.52	0.67	2.81
		2012	1.05	0.20	1.86	0.93	3.24
		2013	1.29	0.20	2.64	1.46	4.40
	Grazed only	2011	0.88	0.15	1.40	0.78	2.24
		2012	0.99	0.14	1.70	1.05	2.54
		2013	1.35	0.14	2.85	1.95	4.02
	Burned-grazed	2011	0.93	0.14	1.52	0.92	2.31
		2012	0.80	0.14	1.23	0.71	1.91
		2013	1.20	0.14	2.33	1.55	3.34
	Rest	2011	1.24	0.38	2.45	0.63	6.33
		2012	1.49	0.38	3.45	1.10	8.45
		2013	1.72	0.38	4.61	1.64	10.91
Tall	Burned only	2012	1.00	0.22	1.73	0.77	3.22
		2013	1.43	0.22	3.17	1.70	5.44
	Grazed only	2012	1.08	0.21	1.95	0.96	3.46
		2013	1.10	0.21	2.01	1.00	3.55
	Burned-grazed	2012	0.80	0.38	1.22	0.04	3.71
		2013	1.72	0.38	4.60	1.64	10.88
	Rest	2012	1.23	0.38	2.43	0.61	6.28
		2013	1.04	0.38	1.82	0.33	4.99



[Brn-Grz, burned-grazed; cm, centimeters; SD, standard deviation]

Figure 1.4. Back-transformed least squares mean standard deviation of litter depth (centimeters) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits.

E. Mean Maximum Vegetation Height

Table 1. Generalized linear mixed model (assuming a gamma distribution with a log link) testing the influence of management regime and year on mean maximum vegetation height (centimeters) on two grass types on federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[*, evidence for moderate effect ($0.05<p\leq 0.10$); **, evidence for strong effect ($p\leq 0.05$)]

Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × regime × year	19	180.2	2.43	0.0013**
Contrasts:	Mixed: regime effect	3	76.9	2.17	0.0986*
	Mixed: year effect	2	129.2	4.57	0.0121**
	Mixed: interaction	6	135.9	1.95	0.0777*
	Tall: regime effect	3	105.2	0.11	0.9537
	Tall: year effect	1	114.0	4.76	0.0311**
	Tall: interaction	3	114.0	1.44	0.2352
	Mixed versus tall: burned only	1	92.9	2.97	0.0883*
	Mixed versus tall: grazed only	1	99.7	3.94	0.0499**
	Mixed versus tall: burned-grazed	1	102.5	1.27	0.2619
	Mixed versus tall: rest	1	90.3	0.67	0.4156

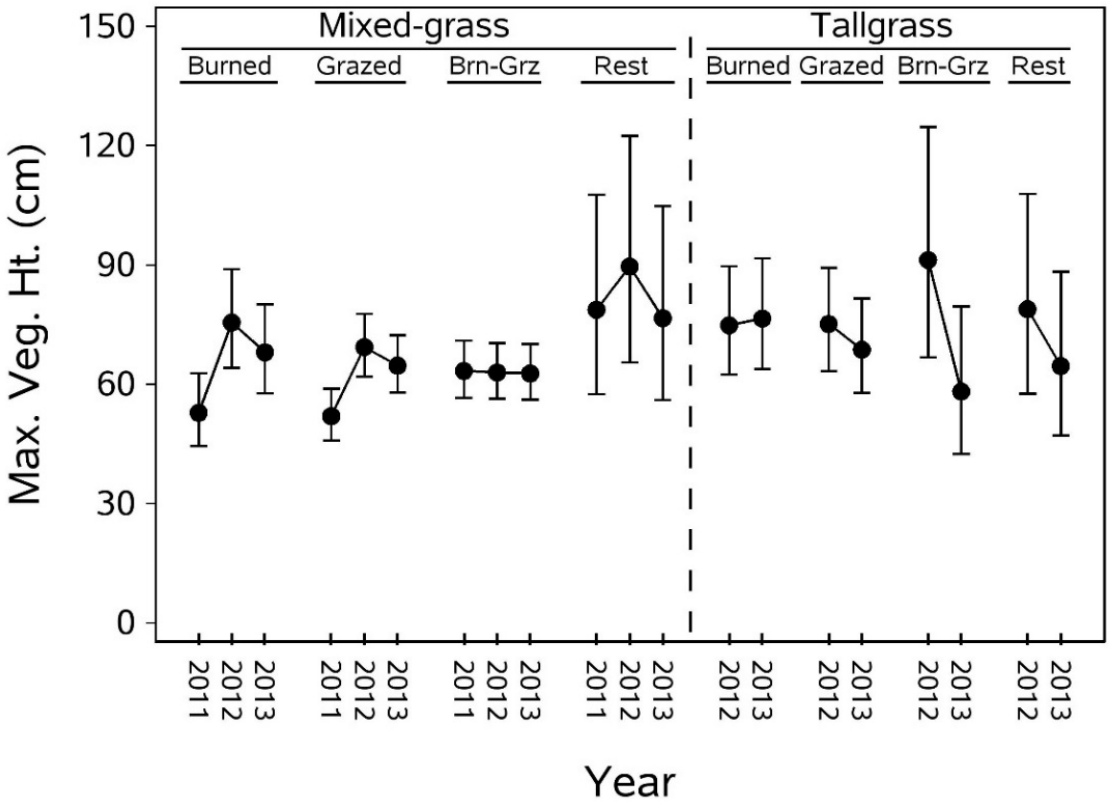
[1]Sources of variation for the model: Y=Unit(Grass type × Regime) + Grass type × Regime × Year + Year × Unit(Grass type × Regime), where Grass type × Regime × Year is a fixed effect, Unit(Grass type × Regime) and Year × Unit(Grass type × Regime) are random effects in a mixed-model framework, and Year is a repeated-measures factor.

[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 2. Least squares mean (standard error) and back-transformed least squares mean (95-percent confidence intervals) maximum vegetation height (centimeters), by grassland type (mixed-grass, tallgrass), overall treatment regime (burned-only, grazed-only, burned-grazed, or rest), and year (2011, 2012, 2013), on federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

					Back-transformed		
						95-percent confidence intervals	
Grass type	Regime	Year	LSMean	SE	LSMean	LCL	UCL
Mixed	Burned only	2011	3.99	0.09	52.84	44.47	62.77
		2012	4.34	0.08	75.52	64.11	88.93
		2013	4.23	0.08	68.04	57.75	80.14
	Grazed only	2011	3.97	0.06	52.00	45.89	58.91
		2012	4.25	0.06	69.36	61.94	77.66
		2013	4.19	0.06	64.70	57.90	72.29
	Burned-grazed	2011	4.16	0.06	63.36	56.56	70.95
		2012	4.16	0.06	62.97	56.35	70.35
		2013	4.15	0.06	62.72	56.12	70.08
	Rest	2011	4.38	0.16	78.75	57.55	107.64
		2012	4.51	0.16	89.63	65.53	122.46
		2013	4.35	0.16	76.64	55.99	104.76
Tall	Burned only	2012	4.33	0.09	74.84	62.44	89.65
		2013	4.35	0.09	76.52	63.85	91.66
	Grazed only	2012	4.33	0.09	75.19	63.32	89.24
		2013	4.24	0.09	68.69	57.84	81.55
	Burned-grazed	2012	4.52	0.16	91.27	66.74	124.70
		2013	4.08	0.16	58.19	42.45	79.63
	Rest	2012	4.38	0.16	78.88	57.64	107.81
		2013	4.18	0.16	64.60	47.15	88.35



[Brn-Grz, burned-grazed; cm, centimeters; Max. Veg. Ht., maximum vegetation height; %, percent]

Figure 1.5. Back-transformed least squares mean maximum vegetation height (centimeters) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits.

F. Standard Deviation of Maximum Vegetation Height (centimeters)

Table 1.9. Generalized linear mixed model (assuming a gamma distribution with a log link) testing the influence of management regime and year on the standard deviation of maximum vegetation height (centimeters) on two grass types on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[<, less than; *, evidence for moderate effect ($0.05<p\leq0.10$); **, evidence for strong effect ($p\leq0.05$)]

Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × regime × year	19	186.8	5.15	<0.0001**
Contrasts:	Mixed: regime effect	3	95.2	0.42	0.7364
	Mixed: year effect	2	146.5	23.09	<0.0001**
	Mixed: interaction	6	152.1	0.19	0.9794
	Tall: regime effect	3	123.9	2.26	0.0845*
	Tall: year effect	1	133.6	4.76	0.0309**
	Tall: interaction	3	133.6	0.63	0.5942
	Mixed versus tall: burned only	1	111.7	1.38	0.2421
	Mixed versus tall: grazed only	1	118.4	0.35	0.5554
	Mixed versus tall: burned-grazed	1	121.2	6.92	0.0096**
	Mixed versus tall: rest	1	109.1	0.37	0.5432

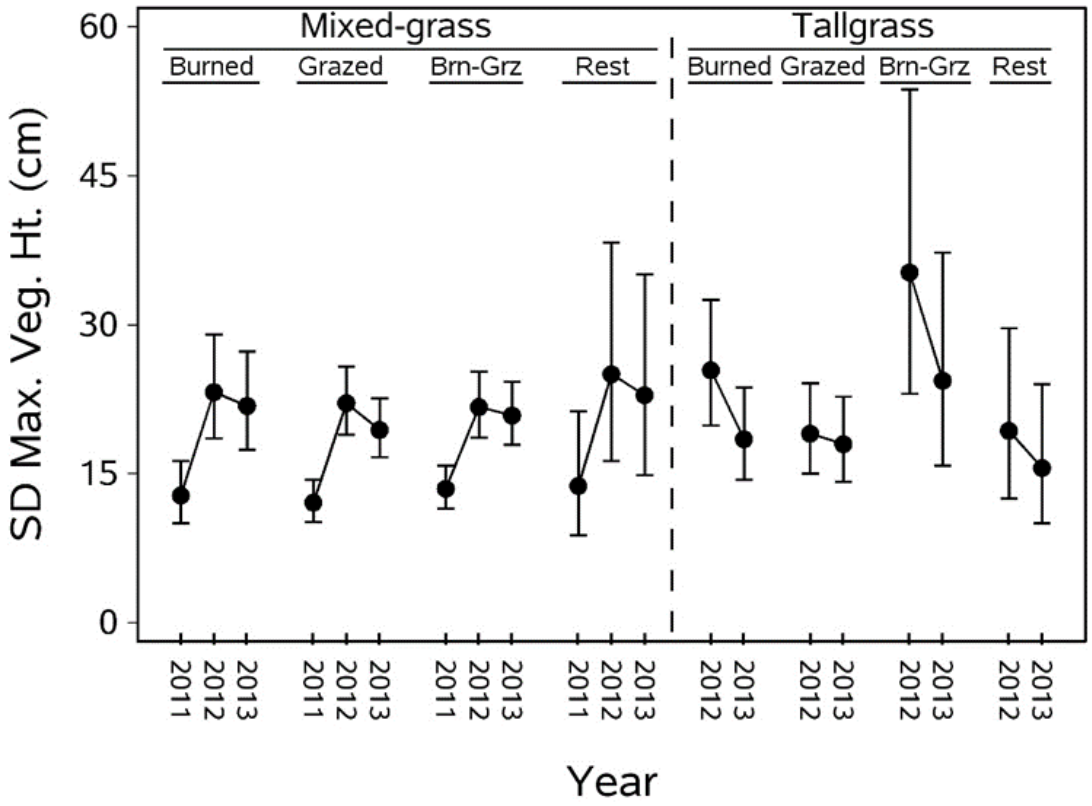
[1]Sources of variation for the model: Y=Unit(Grass type × Regime) + Grass type × Regime × Year + Year × Unit(Grass type × Regime), where Grass type × Regime × Year is a fixed effect, Unit(Grass type × Regime) and Year × Unit(Grass type × Regime) are random effects in a mixed-model framework, and Year is a repeated-measures factor.

[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 1.10. Least squares mean (standard error) and back-transformed least squares mean (95-percent confidence intervals) standard deviation of maximum vegetation height (centimeters), by grassland type (mixed-grass, tallgrass), overall treatment regime (burned-only, grazed-only, burned-grazed, or rest), and year (2011, 2012, 2013), on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

					Back-transformed		
						95-percent confidence intervals	
Grass type	Regime	Year	LSMean	SE	LSMean	LCL	UCL
Mixed	Burned only	2011	2.62	0.11	12.80	10.02	16.28
		2012	3.19	0.11	23.22	18.54	29.02
		2013	3.13	0.11	21.83	17.42	27.29
	Grazed only	2011	2.57	0.08	12.09	10.13	14.40
		2012	3.14	0.08	22.11	18.93	25.80
		2013	3.02	0.07	19.41	16.65	22.60
	Burned-grazed	2011	2.67	0.08	13.49	11.50	15.81
		2012	3.12	0.07	21.72	18.65	25.27
		2013	3.08	0.07	20.86	17.90	24.27
	Rest	2011	2.69	0.21	13.77	8.79	21.27
		2012	3.26	0.21	25.03	16.26	38.25
		2013	3.17	0.21	22.91	14.86	35.06
Tall	Burned only	2012	3.27	0.12	25.42	19.84	32.49
		2013	2.97	0.12	18.48	14.37	23.69
	Grazed only	2012	3.00	0.11	19.04	15.00	24.10
		2013	2.94	0.11	17.98	14.16	22.77
	Burned-grazed	2012	3.59	0.21	35.27	23.05	53.69
		2013	3.23	0.21	24.37	15.83	37.27
	Rest	2012	3.01	0.21	19.33	12.48	29.66
		2013	2.81	0.21	15.58	10.00	24.01



[Brn-Grz, burned-grazed; cm, centimeters; Max. Veg. Ht., maximum vegetation height; %, percent; SD, standard deviation]

Figure 1.6. Back-transformed least squares mean standard deviation of maximum vegetation height (cm) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits.

G. Mean Vertical Obstruction Reading (VOR)

Table 1.11. Generalized linear mixed model (assuming a gamma distribution with a log link) testing the influence of management regime and year on mean vertical obstruction reading (decimeters) on two grass types on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[<, less than; *, evidence for moderate effect ($0.05<p\leq0.10$); **, evidence for strong effect ($p\leq0.05$)]

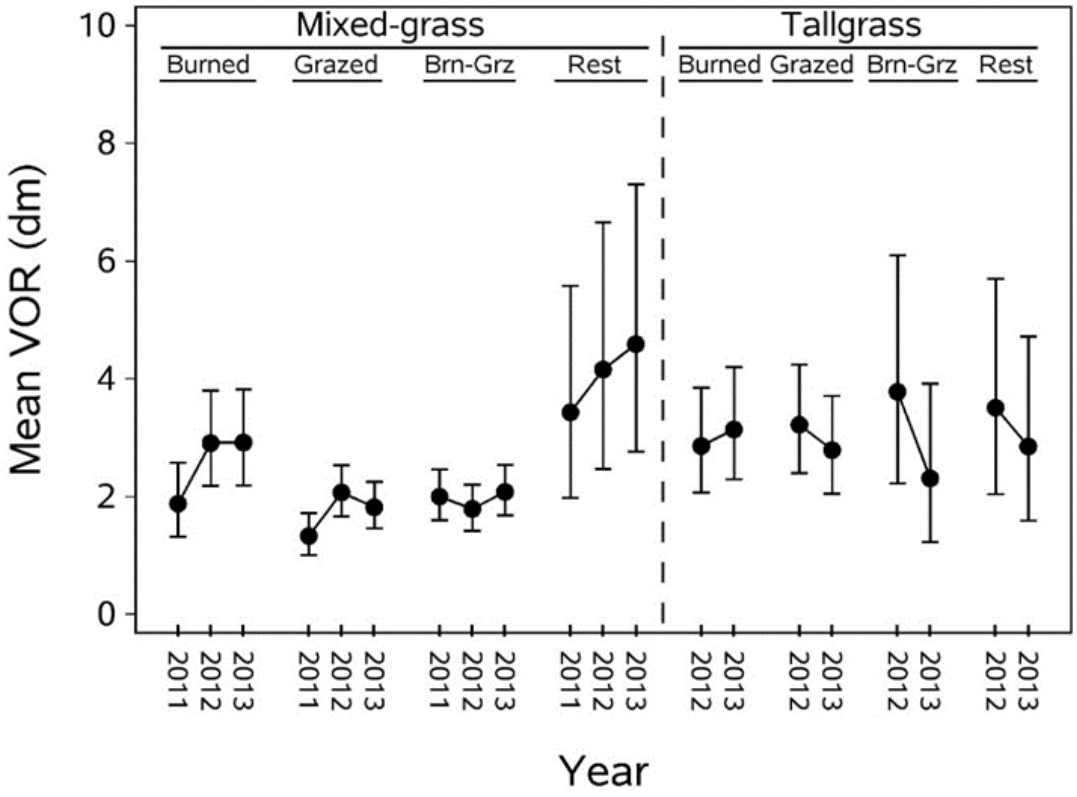
Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × regime × year	19	183.8	3.20	<0.0001**
Contrasts:	Mixed: regime effect	3	84.0	6.80	0.0004**
	Mixed: year effect	2	136.8	3.29	0.0401**
	Mixed: interaction	6	141.5	1.94	0.0781*
	Tall: regime effect	3	110.9	0.02	0.9965
	Tall: year effect	1	126.9	2.33	0.1292
	Tall: interaction	3	126.9	1.02	0.3871
	Mixed versus tall: burned only	1	99.0	1.02	0.3154
	Mixed versus tall: grazed only	1	105.3	13.31	0.0004**
	Mixed versus tall: burned-grazed	1	108.2	2.93	0.0898*
	Mixed versus tall: rest	1	96.6	0.73	0.3959

[1]Sources of variation for the model: Y=Unit(Grass type × Regime) + Grass type × Regime × Year + Year × Unit(Grass type × Regime), where Grass type × Regime × Year is a fixed effect, Unit(Grass type × Regime) and Year × Unit(Grass type × Regime) are random effects in a mixed-model framework, and Year is a repeated-measures factor.
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 1.12. Least squares mean (standard error) and back-transformed least squares mean (95-percent confidence intervals) vertical obstruction reading (decimeters), by grassland type (mixed-grass, tallgrass), overall treatment regime (burned-only, grazed-only, burned-grazed, or rest), and year (2011, 2012, 2013), on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

					Back-transformed		
						95-percent confidence intervals	
Grass type	Regime	Year	LSMean	SE	LSMean	LCL	UCL
Mixed	Burned only	2011	1.06	0.11	1.88	1.32	2.57
		2012	1.36	0.11	2.91	2.18	3.80
		2013	1.37	0.11	2.92	2.19	3.82
	Grazed only	2011	0.85	0.08	1.33	1.00	1.72
		2012	1.12	0.07	2.07	1.66	2.53
		2013	1.04	0.07	1.82	1.46	2.25
	Burned-grazed	2011	1.10	0.07	2.00	1.60	2.46
		2012	1.02	0.07	1.79	1.42	2.20
		2013	1.12	0.07	2.08	1.68	2.54
	Rest	2011	1.49	0.20	3.43	1.98	5.58
		2012	1.64	0.20	4.16	2.47	6.66
		2013	1.72	0.20	4.59	2.76	7.30
Tall	Burned only	2012	1.35	0.12	2.86	2.07	3.85
		2013	1.42	0.12	3.14	2.29	4.20
	Grazed only	2012	1.44	0.11	3.22	2.40	4.24
		2013	1.33	0.11	2.79	2.05	3.71
	Burned-grazed	2012	1.57	0.20	3.78	2.22	6.10
		2013	1.20	0.20	2.31	1.23	3.92
	Rest	2012	1.51	0.20	3.51	2.04	5.70
		2013	1.35	0.20	2.85	1.59	4.72



[Brn-Grz, burned-grazed; VOR, vertical obstruction reading; dm, decimeters]

Figure 1.7. Back-transformed least squares mean vertical obstruction reading (decimeters) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits.

H. Standard Deviation of Vertical Obstruction Reading (VOR; decimeters)

Table 1.13. Generalized linear mixed model (assuming a gamma distribution with a log link) testing the influence of management regime and year on the standard deviation of vertical obstruction reading (decimeters) on two grass types on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[<, less than; *, evidence for moderate effect ($0.05<p\leq0.10$); **, evidence for strong effect ($p\leq0.05$)]

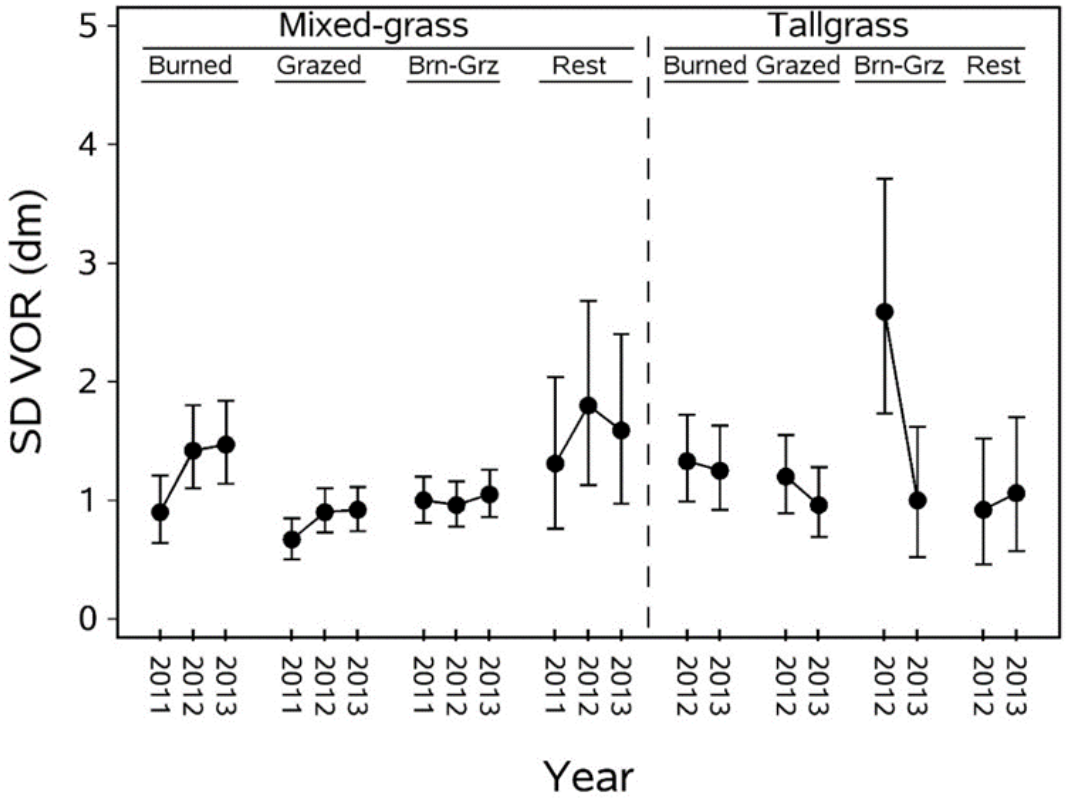
Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × regime × year	19	181.3	3.05	<0.0001**
Contrasts:	Mixed: regime effect	3	77.3	5.79	0.0013**
	Mixed: year effect	2	130.4	4.16	0.0177**
	Mixed: interaction	6	135.4	1.36	0.2355
	Tall: regime effect	3	104.1	1.63	0.1870
	Tall: year effect	1	119.8	6.65	0.0111**
	Tall: interaction	3	119.8	3.66	0.0145**
	Mixed versus tall: burned only	1	92.2	0.03	0.8525
	Mixed versus tall: grazed only	1	98.5	3.14	0.0794*
	Mixed versus tall: burned-grazed	1	101.4	5.83	0.0176**
	Mixed versus tall: rest	1	89.8	2.74	0.1012

[1]Sources of variation for the model: Y=Unit(Grass type × Regime) + Grass type × Regime × Year + Year × Unit(Grass type × Regime), where Grass type × Regime × Year is a fixed effect, Unit(Grass type × Regime) and Year × Unit(Grass type × Regime) are random effects in a mixed-model framework, and Year is a repeated-measures factor.
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 1.14. Least squares mean (standard error) and back-transformed least squares mean (95-percent confidence intervals) standard deviation of vertical obstruction reading (decimeters), by grassland type (mixed-grass, tallgrass), overall treatment regime (burned-only, grazed-only, burned-grazed, or rest), and year (2011, 2012, 2013), on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

					Back-transformed		
						95-percent confidence intervals	
Grass type	Regime	Year	LSMean	SE	LSMean	LCL	UCL
Mixed	Burned only	2011	0.64	0.08	0.90	0.64	1.21
		2012	0.89	0.07	1.42	1.10	1.80
		2013	0.90	0.07	1.47	1.14	1.84
	Grazed only	2011	0.51	0.05	0.67	0.50	0.85
		2012	0.64	0.05	0.90	0.73	1.10
		2013	0.65	0.05	0.92	0.74	1.11
	Burned-grazed	2011	0.69	0.05	1.00	0.81	1.20
		2012	0.67	0.05	0.96	0.78	1.16
		2013	0.72	0.05	1.05	0.86	1.26
	Rest	2011	0.84	0.14	1.31	0.76	2.04
		2012	1.03	0.14	1.80	1.13	2.68
		2013	0.95	0.14	1.59	0.97	2.40
Tall	Burned only	2012	0.84	0.08	1.33	0.99	1.72
		2013	0.81	0.08	1.25	0.92	1.63
	Grazed only	2012	0.79	0.08	1.20	0.89	1.55
		2013	0.67	0.08	0.96	0.69	1.28
	Burned-grazed	2012	1.28	0.14	2.59	1.73	3.71
		2013	0.69	0.14	1.00	0.52	1.62
	Rest	2012	0.65	0.14	0.92	0.46	1.52
		2013	0.72	0.14	1.06	0.57	1.70



[Brn-Grz, burned-grazed; dm, decimeters; SD, standard deviation; VOR, vertical obstruction reading]

Figure 1.8. Back-transformed least squares mean standard deviation of vertical obstruction reading (decimeters) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits.

I. Mean Standing Dead Cover (percent)

Table 1.15. Generalized linear mixed model (assuming a beta distribution with a logit link) testing the influence of management regime and year on mean standing dead cover (percent) on two grass types on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[<, less than; *, evidence for moderate effect ($0.05<p\leq0.10$); **, evidence for strong effect ($p\leq0.05$)]

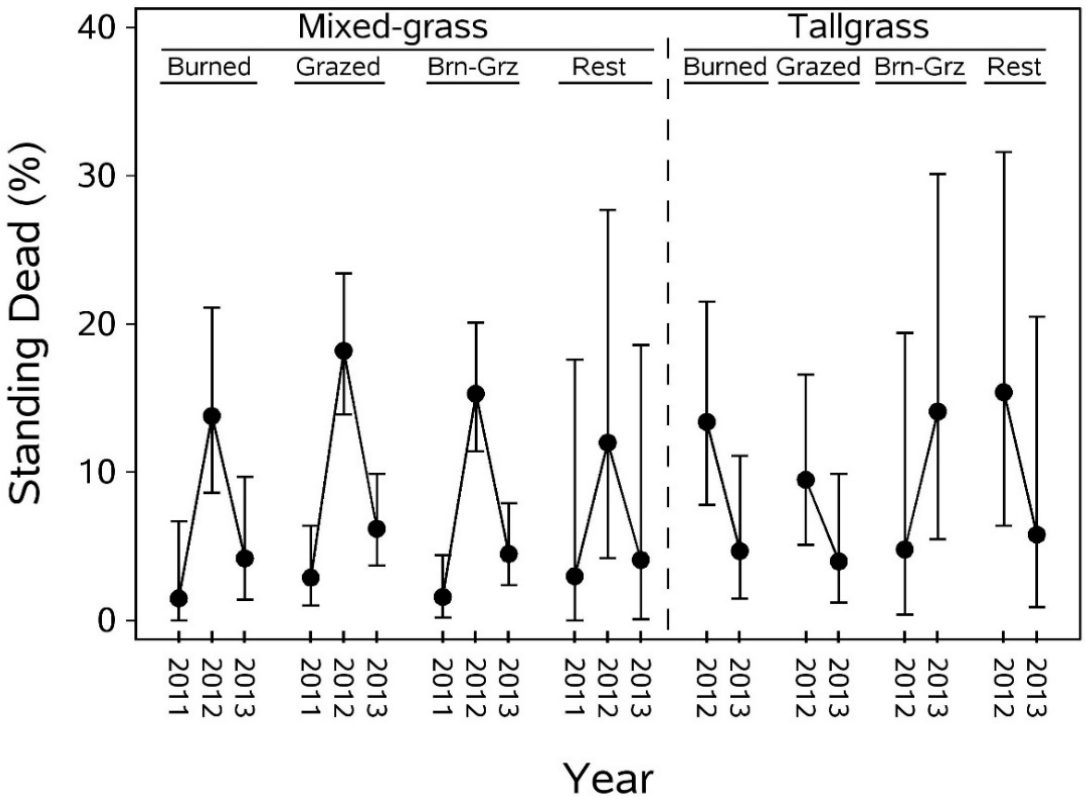
Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × regime × year	19	188.5	5.25	<0.0001**
Contrasts:	Mixed: regime effect	3	130.0	0.78	0.5046
	Mixed: year effect	2	152.7	19.95	<0.0001**
	Mixed: interaction	6	160.2	0.08	0.9977
	Tall: regime effect	3	138.6	0.28	0.8409
	Tall: year effect	1	145.4	1.73	0.1900
	Tall: interaction	3	145.2	1.71	0.1683
	Mixed versus tall: burned only	1	136.5	1.56	0.2138
	Mixed versus tall: grazed only	1	138.0	0.20	0.6548
	Mixed versus tall: burned-grazed	1	138.9	0.81	0.3683
	Mixed versus tall: rest	1	127.6	0.79	0.3766

[1]Sources of variation for the model: Y=Unit(Grass type × Regime) + Grass type × Regime × Year + Year × Unit(Grass type × Regime), where Grass type × Regime × Year is a fixed effect, Unit(Grass type × Regime) and Year × Unit(Grass type × Regime) are random effects in a mixed-model framework, and Year is a repeated-measures factor.
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 1.16. Least squares mean (standard error) and back-transformed least squares mean (95-percent confidence intervals) standing dead cover (percent), by grassland type (mixed-grass, tallgrass), overall treatment regime (burned-only, grazed-only, burned-grazed, or rest), and year (2011, 2012, 2013), on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

					Back-transformed		
						95-percent confidence intervals	
Grass type	Regime	Year	LSMean	SE	LSMean	LCL	UCL
Mixed	Burned only	2011	−3.647	0.593	1.5	0.0	6.7
		2012	−1.752	0.251	13.8	8.6	21.1
		2013	−2.902	0.401	4.2	1.4	9.7
	Grazed only	2011	−3.208	0.350	2.9	1.0	6.4
		2012	−1.435	0.156	18.2	13.9	23.4
		2013	−2.559	0.233	6.2	3.7	9.9
	Burned-grazed	2011	−3.616	0.385	1.6	0.2	4.4
		2012	−1.638	0.163	15.3	11.4	20.1
		2013	−2.839	0.264	4.5	2.4	7.9
	Rest	2011	−3.190	0.874	3.0	0.0	17.6
		2012	−1.905	0.507	12.0	4.2	27.7
		2013	−2.932	0.777	4.1	0.1	18.6
Tall	Burned only	2012	−1.785	0.280	13.4	7.8	21.5
		2013	−2.815	0.426	4.7	1.5	11.1
	Grazed only	2012	−2.140	0.304	9.5	5.1	16.6
		2013	−2.944	0.428	4.0	1.2	9.9
	Burned-grazed	2012	−2.792	0.730	4.8	0.4	19.4
		2013	−1.728	0.476	14.1	5.5	30.1
	Rest	2012	−1.630	0.460	15.4	6.4	31.6
		2013	−2.626	0.679	5.8	0.9	20.5



[Brn-Grz, burned-grazed; %, percent]

Figure 1.9. Back-transformed least squares mean standing dead cover (percent) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits.

J. Standard Deviation of Standing Dead Cover (percent)

Table 1.17. Generalized linear mixed model (assuming a beta distribution with a logit link) testing the influence of management regime and year on the standard deviation of standing dead cover (percent) on two grass types on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[<, less than; *, evidence for moderate effect ($0.05<p\leq0.10$); **, evidence for strong effect ($p\leq0.05$)]

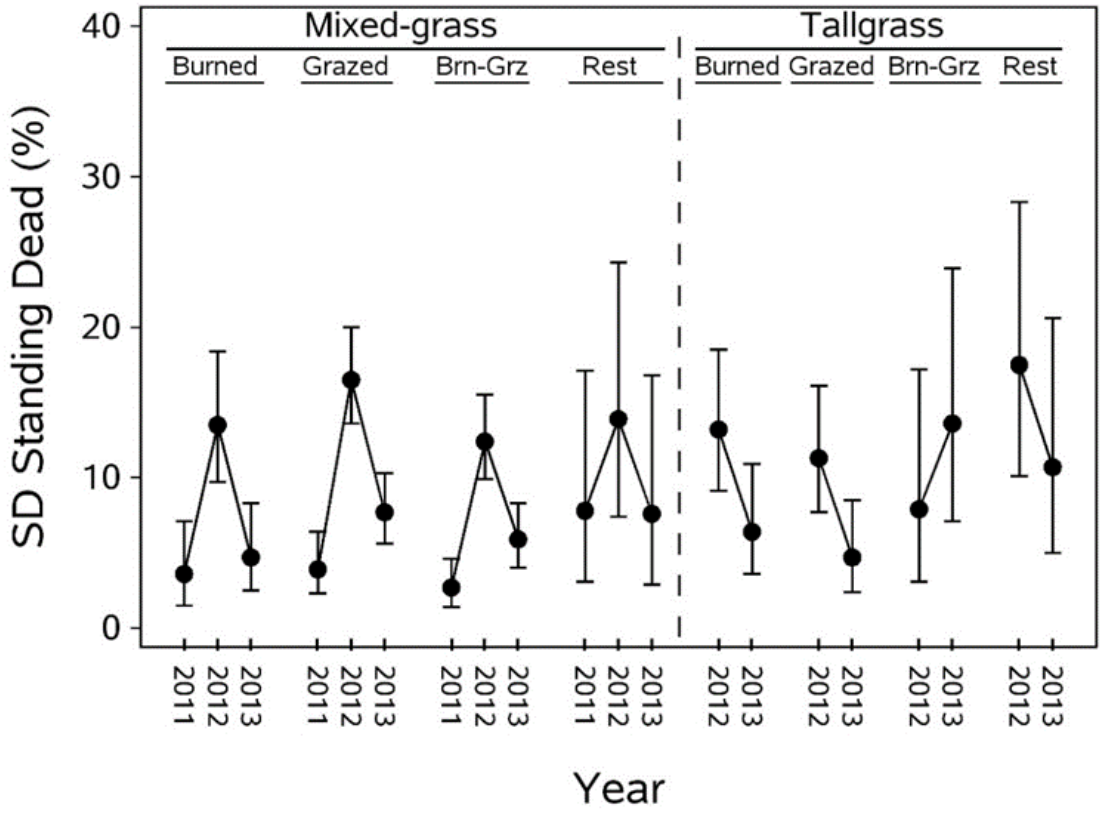
Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × regime × year	19	185.5	7.07	<0.0001**
Contrasts:	Mixed: regime effect	3	106.6	1.86	0.1413
	Mixed: year effect	2	141.6	28.05	<0.0001**
	Mixed: interaction	6	149.0	0.51	0.7967
	Tall: regime effect	3	124.9	1.42	0.2390
	Tall: year effect	1	131.5	3.59	0.0603*
	Tall: interaction	3	132.0	1.97	0.1217
	Mixed versus tall: burned only	1	117.4	2.55	0.1128
	Mixed versus tall: grazed only	1	125.4	0.22	0.6409
	Mixed versus tall: burned-grazed	1	122.3	3.03	0.0845*
	Mixed versus tall: rest	1	109.2	1.26	0.2640

[1]Sources of variation for the model: Y=Unit(Grass type × Regime) + Grass type × Regime × Year + Year × Unit(Grass type × Regime), where Grass type × Regime × Year is a fixed effect, Unit(Grass type × Regime) and Year × Unit(Grass type × Regime) are random effects in a mixed-model framework, and Year is a repeated-measures factor.
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 1.18. Least squares mean (standard error) and back-transformed least squares mean (95 percent confidence intervals) of the standard deviation of standing dead cover (percent), by grassland type (mixed-grass, tallgrass), overall treatment regime (burned-only, grazed-only, burned-grazed, or rest), and year (2011, 2012, 2013), on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

Grass	Regime	Year	LSMean	Standard error	Back-transformed		
					LSMean	95 percent confidence intervals	
						LCL	UCL
Mixed	Burned only	2011	−3.041	0.313	3.6	1.5	7.1
		2012	−1.774	0.177	13.5	9.7	18.4
		2013	−2.798	0.268	4.7	2.5	8.3
	Grazed only	2011	−2.958	0.219	3.9	2.3	6.4
		2012	−1.548	0.113	16.5	13.6	20.0
		2013	−2.357	0.150	7.7	5.6	10.3
	Burned-grazed	2011	−3.264	0.229	2.7	1.4	4.6
		2012	−1.862	0.124	12.4	9.9	15.5
		2013	−2.610	0.167	5.9	4.0	8.3
	Rest	2011	−2.334	0.420	7.8	3.1	17.1
		2012	−1.739	0.335	13.9	7.4	24.3
		2013	−2.368	0.426	7.6	2.9	16.8
Tall	Burned only	2012	−1.803	0.198	13.2	9.1	18.5
		2013	−2.521	0.262	6.4	3.6	10.9
	Grazed only	2012	−1.966	0.199	11.3	7.7	16.1
		2013	−2.804	0.281	4.7	2.4	8.5
	Burned-grazed	2012	−2.326	0.419	7.9	3.1	17.2
		2013	−1.769	0.338	13.6	7.1	23.9
	Rest	2012	−1.481	0.307	17.5	10.1	28.3
		2013	−2.018	0.371	10.7	5.0	20.6



[Brn-Grz, burned-grazed; %, percent; SD, standard deviation]

Figure 1.10. Back-transformed least squares mean standard deviation of standing dead cover (percent) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits.

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Appendix 2. Testing the Influence of Post-Management Treatments on Vegetation Structure Variables on Federal Lands Managed under an Adaptive-Management Framework by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13

A. Mean Bare-Ground Cover (percent)

Table 2.1. Generalized linear mixed model, assuming a beta distribution with a logit link, $y = (y+0.0)$, testing the influence of post-management treatments on mean bare-ground cover (percent) on two grass types on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[<, less than; *, evidence for moderate effect ($0.05<p\leq0.10$); **, evidence for strong effect ($p\leq0.05$)]

Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × treatment	18	150.3	7.03	<0.0001**
Contrasts:	Mixed: burned linear	1	158.6	13.62	0.0003**
	Mixed: burned quadratic	1	107.2	0.15	0.7003
	Mixed: BG0 versus BG1-3	1	131.5	5.52	0.0203**
	Mixed: grazed linear	1	168.8	0.01	0.9384
	Mixed: grazed quadratic	1	159.1	0.01	0.9401
	Tall: burned linear	1	146.5	8.05	0.0052**
	Tall: grazed linear	1	161.1	0.31	0.5788
	Tall: grazed quadratic	1	131.8	0.37	0.5460
	B1: mixed versus tall	1	167.1	0.95	0.3299
	B2: mixed versus tall	1	167.6	0.53	0.4694
	G0: mixed versus tall	1	165.8	0.70	0.4035
	G: mixed versus tall	1	168.3	0.15	0.6957
	G1: mixed versus tall	1	168.6	0.65	0.4226
	G2: mixed versus tall	1	169.0	2.53	0.1133
	Mixed: burned versus rest	1	150.4	1.35	0.2470
	Mixed: grazed versus rest	1	149.9	0.71	0.3995
	Mixed: burned-grazed versus rest	1	150.6	3.34	0.0697*
	Mixed: burned versus grazed	1	163.1	1.47	0.2268
	Tall: burned versus rest	1	164.6	1.88	0.1724
	Tall: grazed versus rest	1	167.4	0.16	0.6867
	Tall: burned versus grazed	1	141.3	6.55	0.0115**

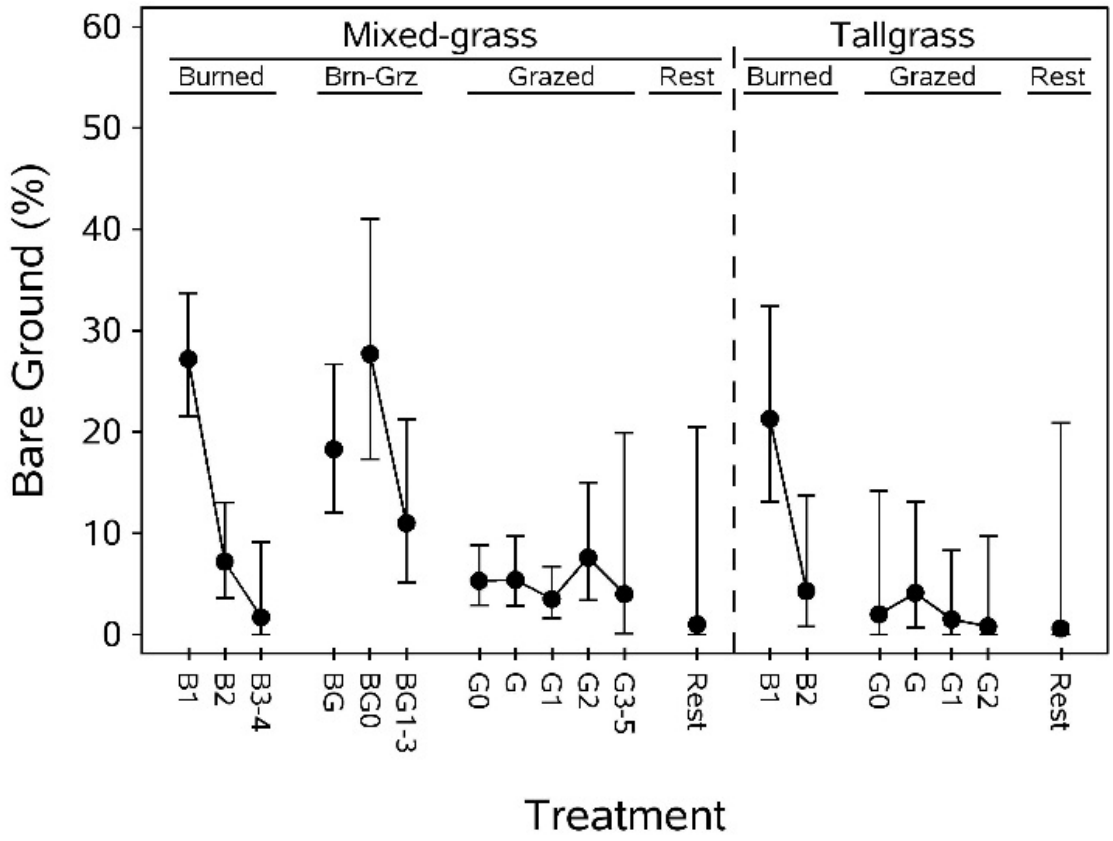
[1]Sources of variation for the model: Y=Unit(Grass type) + Grass type × Treatment + Residual, where Unit(Grass type) and Residual are random effects and Grass type × Treatment is a fixed effect in a mixed-model framework. Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 2.2. Least squares mean (standard error) bare-ground cover (percent) and back-transformed least squares mean (95-percent confidence intervals) bare-ground cover (percent), by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

				Back-transformed		
					95-percent confidence intervals	
Grass	Treatment[1]	LSMean	SE	LSMean	LCL	UCL
Mixed	B1	−0.933	0.155	27.2	21.5	33.7
	B2	−2.417	0.309	7.2	3.6	13.0
	B3-4	−3.578	0.713	1.7	0.0	9.1
	BG	−1.430	0.239	18.3	12.0	26.7
	BG0	−0.910	0.300	27.7	17.3	41.0
	BG1-3	−1.991	0.376	11.0	5.1	21.2
	G0	−2.707	0.250	5.3	2.9	8.8
	G	−2.682	0.285	5.4	2.8	9.7
	G1	−3.049	0.286	3.5	1.6	6.7
	G2	−2.368	0.361	7.6	3.4	15.0
	G3-5	−2.935	0.818	4.0	0.1	19.9
	Rest	−3.877	1.317	1.0	0.0	20.5
Tall	B1	−1.251	0.286	21.3	13.1	32.4
	B2	−2.892	0.577	4.3	0.8	13.7
	G0	−3.492	0.904	2.0	0.0	14.2
	G	−2.933	0.575	4.1	0.7	13.1
	G1	−3.661	0.705	1.5	0.0	8.3
	G2	−3.980	0.946	0.8	0.0	9.7
	Rest	−4.126	1.457	0.6	0.0	20.9

[1]Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).



[Brn-Grz, burned-grazed; %, percent]

Figure 2.1. Back-transformed least squares mean bare-ground cover (percent) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits. Treatments are defined in tables 2.1 and 2.2.

B. Standard Deviation of Bare-Ground Cover (percent)

Table 2.3. Generalized linear mixed model, assuming a beta distribution with a logit link, $y = (y+0.0)$, testing the influence of post-management treatments on the standard deviation of mean bare-ground cover (percent) on two grass types on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[<, less than; *, evidence for moderate effect ($0.05<p\leq0.10$); **, evidence for strong effect ($p\leq0.05$)]

Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × Treatment	18	151.8	4.06	<0.0001**
Contrasts:	Mixed: burned linear	1	158.8	11.55	0.0009**
	Mixed: burned quadratic	1	104.5	0.77	0.3821
	Mixed: BG0 versus BG1-3	1	137.1	2.83	0.0950*
	Mixed: grazed linear	1	167.9	0.12	0.7258
	Mixed: grazed quadratic	1	159.9	0.03	0.8663
	Tall: burned linear	1	135.1	7.65	0.0065**
	Tall: grazed linear	1	161.9	0.39	0.5334
	Tall: grazed quadratic	1	134.0	1.05	0.3076
	B1: mixed versus tall	1	167.9	0.60	0.4387
	B2: mixed versus tall	1	168.3	0.55	0.4590
	G0: mixed versus tall	1	166.7	1.63	0.2034
	G: mixed versus tall	1	168.1	0.15	0.6950
	G1: mixed versus tall	1	168.9	2.04	0.1554
	G2: mixed versus tall	1	168.9	3.19	0.0760*
	Mixed: burned versus rest	1	155.1	1.51	0.2211
	Mixed: grazed versus rest	1	155.1	1.15	0.2853
	Mixed: burned-grazed versus rest	1	155.9	4.14	0.0435*
	Mixed: burned versus grazed	1	156.2	0.29	0.5880
	Tall: burned versus rest	1	165.2	3.57	0.0605*
	Tall: grazed versus rest	1	167.6	0.54	0.4640
	Tall: burned versus grazed	1	141.2	9.40	0.0026**

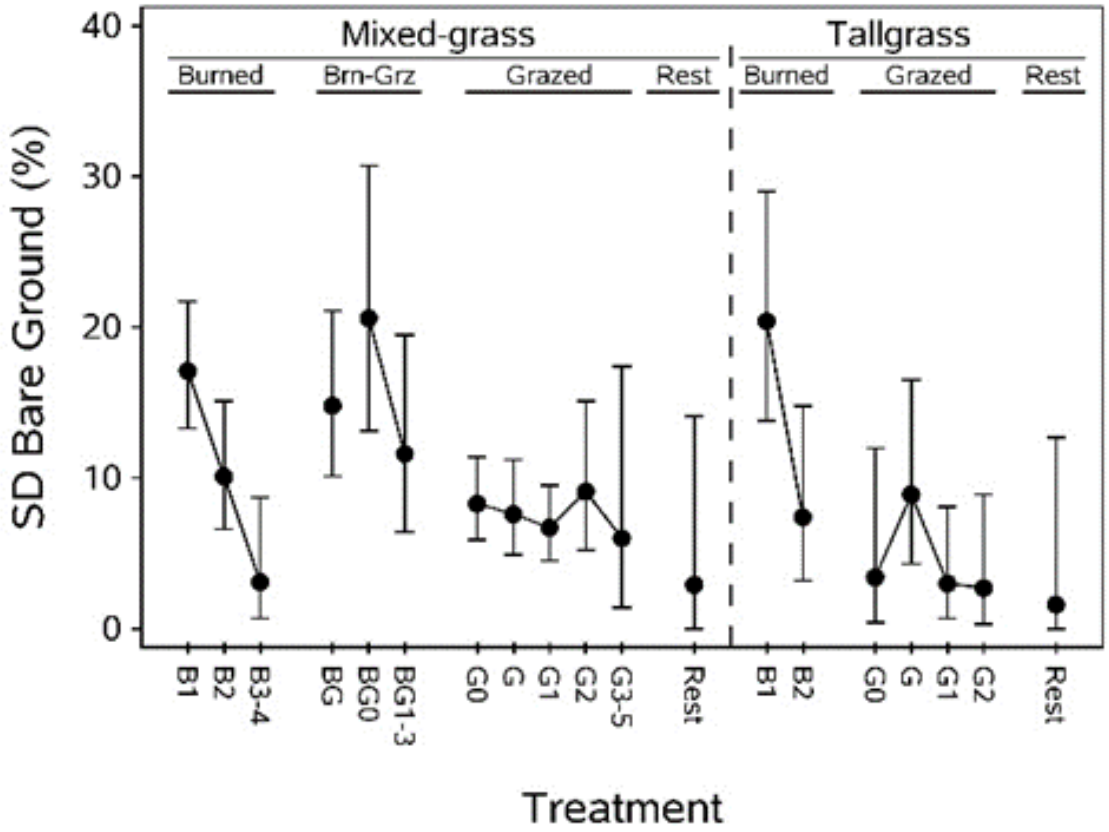
[1]Sources of variation for the model: Y=Unit(Grass type) + Grass type × Treatment + Residual, where Unit(Grass type) and Residual are random effects and Grass type × Treatment is a fixed effect in a mixed-model framework. Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 2.4. Least squares mean (standard error) and back-transformed least squares mean (95-percent confidence intervals) of the standard deviation of bare-ground cover (percent), by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

				Back-transformed		
					95-percent confidence intervals	
Grass	Treatment[1]	LSMean	SE	LSMean	LCL	UCL
Mixed	B1	−1.510	0.144	17.1	13.3	21.7
	B2	−2.077	0.217	10.1	6.6	15.1
	B3-4	−3.160	0.472	3.1	0.7	8.7
	BG	−1.669	0.210	14.8	10.1	21.1
	BG0	−1.289	0.266	20.6	13.1	30.7
	BG1-3	−1.940	0.300	11.6	6.4	19.5
	G0	−2.278	0.167	8.3	5.9	11.4
	G	−2.367	0.201	7.6	4.9	11.2
	G1	−2.489	0.179	6.7	4.5	9.5
	G2	−2.184	0.270	9.1	5.2	15.1
	G3-5	−2.590	0.563	6.0	1.4	17.4
	Rest	−3.209	0.757	2.9	0.0	14.1
Tall	B1	−1.299	0.230	20.4	13.8	29.0
	B2	−2.395	0.370	7.4	3.2	14.8
	G0	−3.072	0.598	3.4	0.4	12.0
	G	−2.213	0.339	8.9	4.3	16.5
	G1	−3.178	0.449	3.0	0.7	8.1
	G2	−3.256	0.536	2.7	0.3	8.9
	Rest	−3.620	0.908	1.6	0.0	12.7

[1]Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).



[Brn-Grz, burned-grazed; %, percent; SD, standard deviation]

Figure 2.2. Back-transformed least squares mean standard deviation of bare-ground cover (percent) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits. Treatments are defined in tables 2.3 and 2.4.

C. Mean Litter Depth (centimeters)

Table 2.5. Generalized linear mixed model, assuming a gamma distribution with a log link, $y = (y+1)$, testing the influence of post-management treatments on mean litter depth (centimeters) on two grass types on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[<, less than; *, evidence for moderate effect ($0.05<p\leq0.10$); **, evidence for strong effect ($p\leq0.05$)]

Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × Treatment	18	152.7	5.04	<0.0001**
Contrasts:	Mixed: burned linear	1	155.3	29.09	<0.0001**
	Mixed: burned quadratic	1	96.9	0.13	0.7215
	Mixed: BG0 versus BG1-3	1	141.0	1.96	0.1642
	Mixed: grazed linear	1	167.1	3.72	0.0553*
	Mixed: grazed quadratic	1	158.4	0.32	0.5718
	Tall: burned linear	1	125.6	10.78	0.0013**
	Tall: grazed linear	1	159.7	0.00	0.9784
	Tall: grazed quadratic	1	141.4	2.91	0.0901*
	B1: mixed versus tall	1	168.1	0.00	0.9832
	B2: mixed versus tall	1	168.7	0.70	0.4034
	G0: mixed versus tall	1	167.2	3.20	0.0753*
	G: mixed versus tall	1	168.2	0.07	0.7973
	G1: mixed versus tall	1	168.9	0.01	0.9053
	G2: mixed versus tall	1	168.3	0.44	0.5072
	Mixed: burned versus rest	1	155.7	4.18	0.0426**
	Mixed: grazed versus rest	1	156.8	1.72	0.1913
	Mixed: burned-grazed versus rest	1	158.2	9.79	0.0021**
	Mixed: burned versus grazed	1	146.8	3.46	0.0648*
	Tall: burned versus rest	1	161.5	3.81	0.0525*
	Tall: grazed versus rest	1	167.8	0.21	0.6448
	Tall: burned versus grazed	1	140.6	7.10	0.0086**

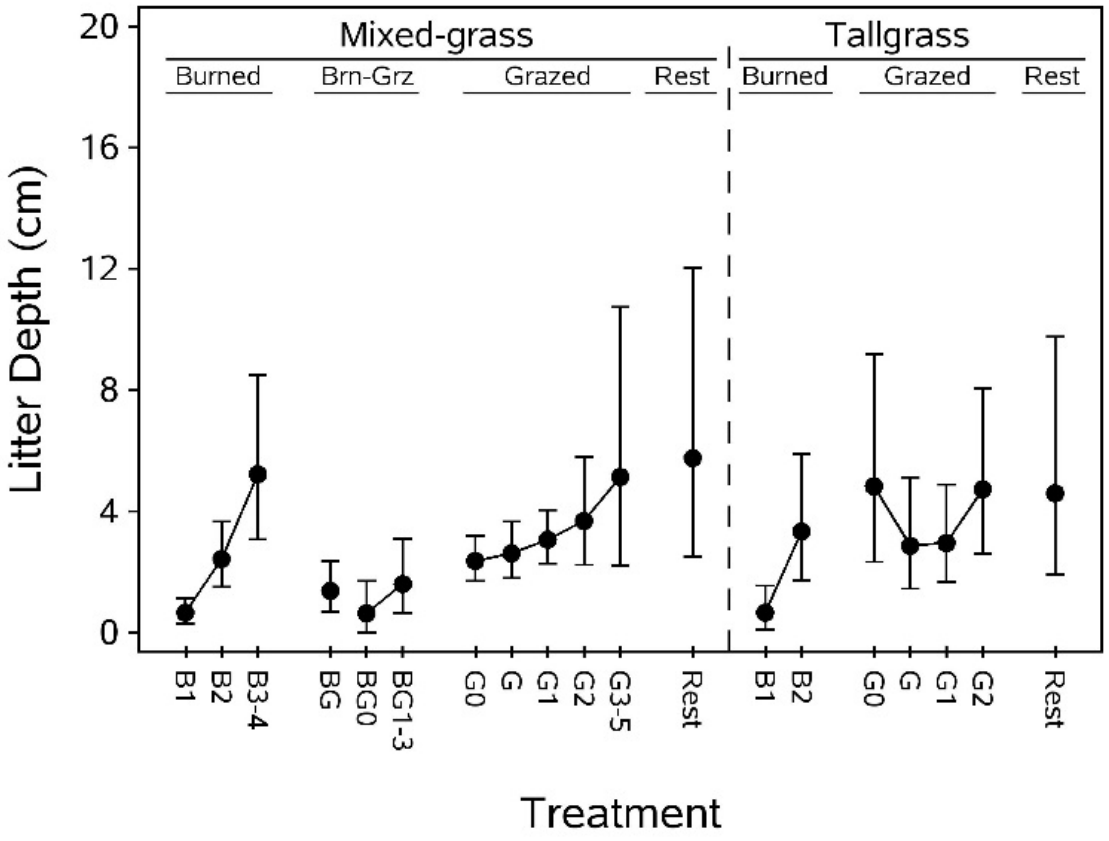
[1]Sources of variation for the model: Y=Unit(Grass type) + Grass type × Treatment + Residual, where Unit(Grass type) and Residual are random effects and Grass type × Treatment is a fixed effect in a mixed-model framework. Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 2.6. Least squares mean (standard error) litter depth (centimeters) and back-transformed least squares mean (95-percent confidence intervals) litter depth (centimeters), by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

				Back-transformed		
					95-percent confidence intervals	
Grass	Treatment[1]	LSMean	SE	LSMean	LCL	UCL
Mixed	B1	0.50	0.13	0.66	0.29	1.13
	B2	1.23	0.16	2.43	1.51	3.67
	B3-4	1.83	0.22	5.23	3.08	8.50
	BG	0.87	0.18	1.38	0.68	2.37
	BG0	0.49	0.25	0.64	0.00	1.70
	BG1-3	0.96	0.23	1.61	0.66	3.10
	G0	1.22	0.11	2.37	1.71	3.20
	G	1.29	0.13	2.62	1.80	3.67
	G1	1.40	0.11	3.07	2.28	4.05
	G2	1.55	0.19	3.69	2.24	5.80
	G3-5	1.81	0.33	5.14	2.21	10.74
	Rest	1.91	0.34	5.76	2.50	12.05
Tall	B1	0.51	0.22	0.66	0.09	1.55
	B2	1.47	0.24	3.34	1.74	5.89
	G0	1.76	0.28	4.83	2.34	9.19
	G	1.35	0.23	2.87	1.45	5.12
	G1	1.38	0.20	2.96	1.66	4.89
	G2	1.75	0.23	4.73	2.62	8.06
	Rest	1.72	0.33	4.60	1.92	9.77

[1]Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).



[Brn-Grz, burned-grazed; cm, centimeters]

Figure 2.3. Back-transformed least squares mean litter depth (centimeters) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits. Treatments are defined in tables 2.5 and 2.6.

D. Standard Deviation of Litter Depth (centimeters)

Table 2.7. Generalized linear mixed model, assuming a normal distribution with a log link, $y = (y+1)$, testing the influence of post-management treatments on the standard deviation of the mean litter depth (centimeters) on two grass types on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × Treatment	18	156.4	1.37	0.1521
Contrasts:	Mixed: burned linear	1	163.6	7.22	0.0079
	Mixed: burned quadratic	1	98.9	0.05	0.8308
	Mixed: BG0 versus BG1-3	1	157.6	0.91	0.3427
	Mixed: grazed linear	1	162.5	0.93	0.3355
	Mixed: grazed quadratic	1	157.4	0.12	0.7307
	Tall: burned linear	1	144.3	4.84	0.0294
	Tall: grazed linear	1	162.2	0.13	0.7152
	Tall: grazed quadratic	1	148.8	0.59	0.4447
	B1: mixed versus tall	1	168.8	0.03	0.8607
	B2: mixed versus tall	1	168.9	5.36	0.0219
	G0: mixed versus tall	1	168.5	0.65	0.4215
	G: mixed versus tall	1	168.6	0.04	0.8468
	G1: mixed versus tall	1	169.0	0.48	0.4877
	G2: mixed versus tall	1	168.7	0.01	0.9284
	Mixed: burned versus rest	1	159.1	1.89	0.1707
	Mixed: grazed versus rest	1	163.3	1.17	0.2803
	Mixed: burned-grazed versus rest	1	161.0	3.25	0.0733
	Mixed: burned versus grazed	1	128.3	0.41	0.5255
	Tall: burned versus rest	1	165.5	0.06	0.8114
	Tall: grazed versus rest	1	168.7	0.02	0.8776
	Tall: burned versus grazed	1	147.1	0.03	0.8643

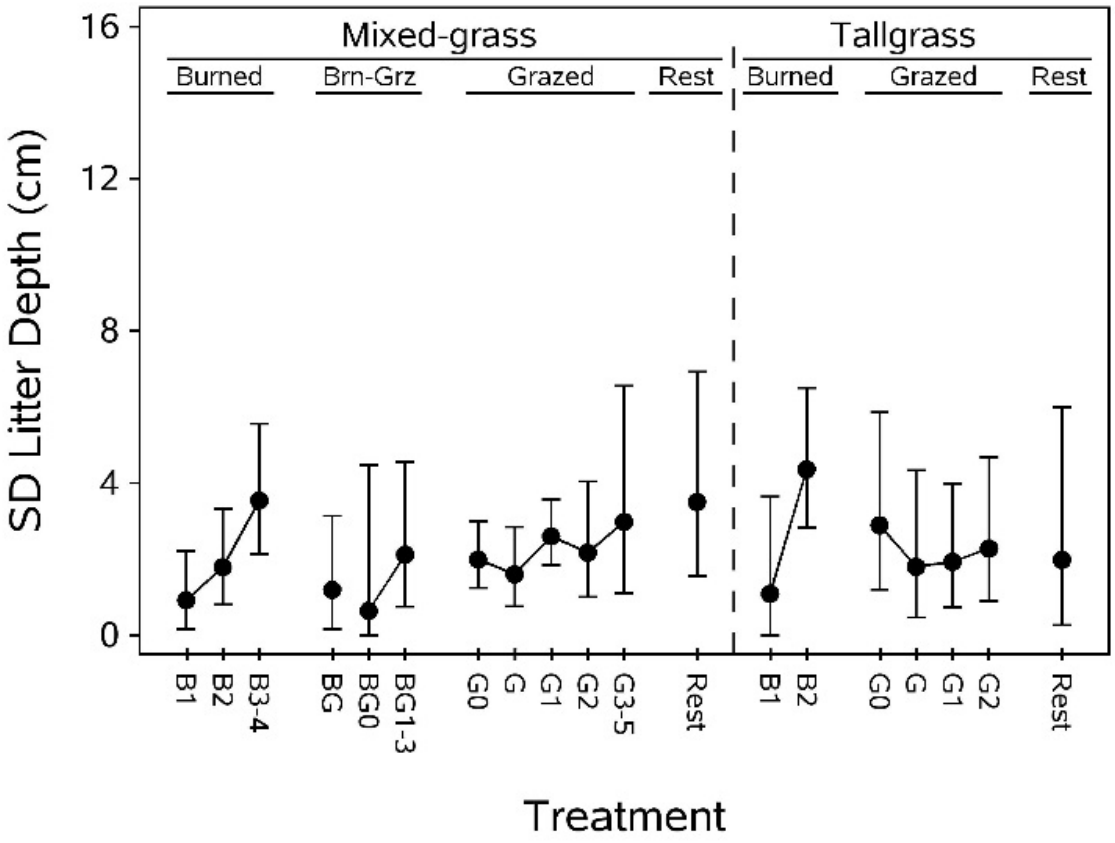
[1]Sources of variation for the model: Y=Unit(Grass type) + Grass type × Treatment + Residual, where Unit(Grass type) and Residual are random effects and Grass type × Treatment is a fixed effect in a mixed-model framework. Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 2.8. Least squares mean (standard error) and back-transformed least squares mean (95-percent confidence intervals) standard deviation of litter depth (centimeters), by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

				Back-transformed		
					95-percent confidence intervals	
Grass	Treatment[1]	LSMean	SE	LSMean	LCL	UCL
Mixed	B1	0.65	0.26	0.92	0.15	2.21
	B2	1.03	0.22	1.79	0.80	3.33
	B3-4	1.51	0.19	3.54	2.14	5.56
	BG	0.79	0.32	1.19	0.16	3.14
	BG0	0.49	0.61	0.64	0.00	4.47
	BG1-3	1.14	0.30	2.12	0.75	4.56
	G0	1.10	0.15	1.99	1.24	2.99
	G	0.96	0.20	1.60	0.76	2.84
	G1	1.28	0.12	2.60	1.85	3.56
	G2	1.15	0.24	2.17	1.00	4.04
	G3-5	1.38	0.33	2.98	1.09	6.55
	Rest	1.50	0.29	3.50	1.56	6.92
Tall	B1	0.74	0.41	1.09	0.00	3.64
	B2	1.68	0.17	4.36	2.83	6.50
	G0	1.36	0.29	2.89	1.20	5.86
	G	1.03	0.33	1.80	0.47	4.33
	G1	1.08	0.27	1.93	0.72	3.99
	G2	1.19	0.28	2.28	0.89	4.68
	Rest	1.09	0.44	1.98	0.27	6.00

[1]Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).



[Brn-Grz, burned-grazed; cm, centimeters; SD, standard deviation]

Figure 2.4. Back-transformed least squares mean standard deviation of litter depth (centimeters) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits. Treatments are defined in tables 2.7 and 2.8.

E. Mean Maximum Vegetation Height (centimeters)

Table 2.9. Generalized linear mixed model, assuming a gamma distribution with a log link, $y = (y+1)$, testing the influence of post-management treatments on maximum vegetation height (centimeters) on two grass types on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[<, less than; *, evidence for moderate effect ($0.05<p\leq0.10$); **, evidence for strong effect ($p\leq0.05$)]

Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × Treatment	18	154.1	3.65	<0.0001**
Contrasts:	Mixed: burned linear	1	159.4	3.41	0.0667*
	Mixed: burned quadratic	1	96.5	2.05	0.1555
	Mixed: BG0 versus BG1-3	1	146.5	4.79	0.0302**
	Mixed: grazed linear	1	165.3	2.39	0.1237
	Mixed: grazed quadratic	1	159.1	0.00	0.9799
	Tall: burned linear	1	122.5	1.25	0.2649
	Tall: grazed linear	1	161.6	17.91	<0.0001**
	Tall: grazed quadratic	1	142.7	0.84	0.3619
	B1: mixed versus tall	1	168.5	1.50	0.2222
	B2: mixed versus tall	1	168.8	0.27	0.6056
	G0: mixed versus tall	1	167.9	4.74	0.0308**
	G: mixed versus tall	1	168.4	0.56	0.4533
	G1: mixed versus tall	1	169.0	6.93	0.0093**
	G2: mixed versus tall	1	168.5	0.08	0.7836
	Mixed: burned versus rest	1	159.8	0.86	0.3546
	Mixed: grazed versus rest	1	161.2	2.78	0.0972*
	Mixed: burned-grazed versus rest	1	161.3	4.41	0.0373**
	Mixed: burned versus grazed	1	137.8	3.24	0.0742*
	Tall: burned versus rest	1	162.6	0.45	0.5021
	Tall: grazed versus rest	1	168.2	0.10	0.7530
	Tall: burned versus grazed	1	137.2	2.98	0.0866*

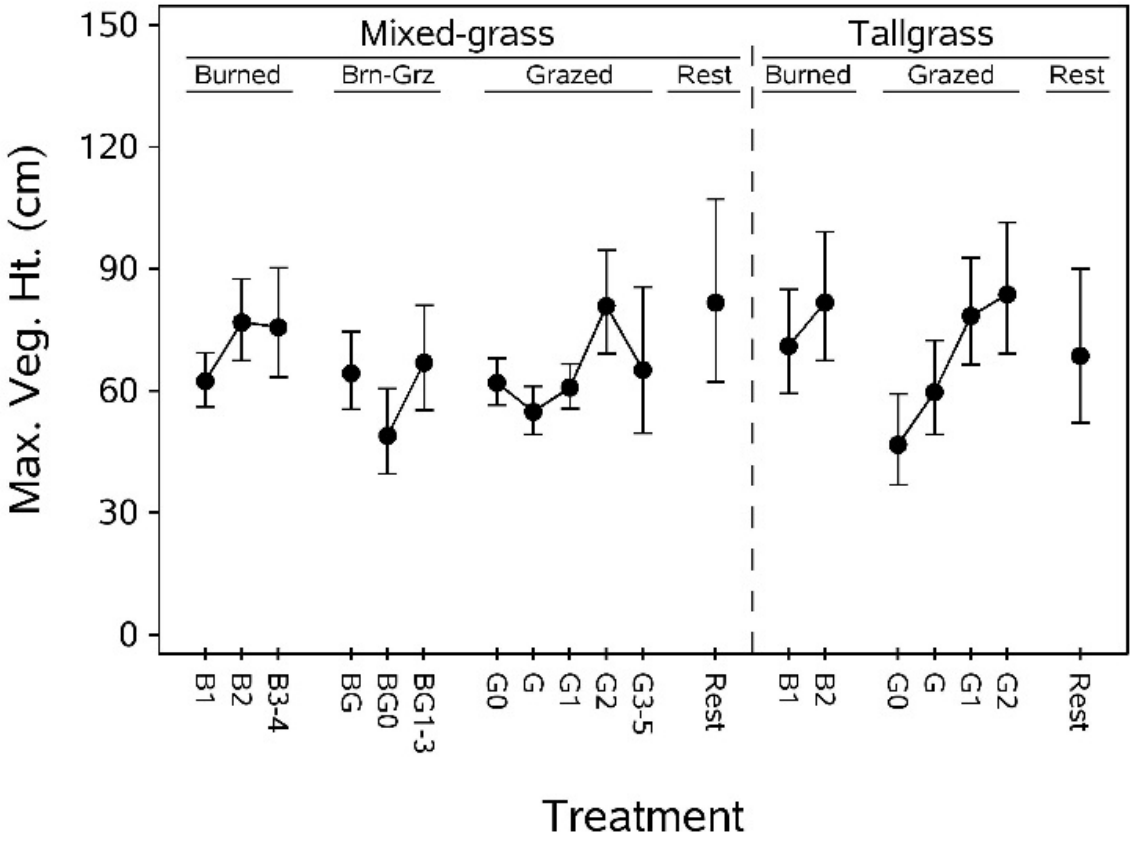
[1]Sources of variation for the model: Y=Unit(Grass type) + Grass type × Treatment + Residual, where Unit(Grass type) and Residual are random effects and Grass type × Treatment is a fixed effect in a mixed-model framework. Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 2.10. Least squares mean (standard error) and back-transformed least squares mean (95-percent confidence intervals) maximum vegetation height (centimeters), by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

				Back-transformed		
					95-percent confidence intervals	
Grass	Treatment[1]	LSMean	SE	LSMean	LCL	UCL
Mixed	B1	4.15	0.05	62.37	56.12	69.31
	B2	4.36	0.07	76.87	67.47	87.55
	B3-4	4.34	0.09	75.62	63.30	90.30
	BG	4.18	0.07	64.30	55.42	74.57
	BG0	3.91	0.11	48.97	39.62	60.48
	BG1-3	4.22	0.10	66.92	55.24	81.04
	G0	4.14	0.05	61.96	56.48	67.95
	G	4.02	0.05	54.85	49.23	61.11
	G1	4.12	0.05	60.82	55.54	66.59
	G2	4.41	0.08	80.87	69.16	94.53
	G3-5	4.19	0.14	65.13	49.57	85.49
	Rest	4.41	0.14	81.68	62.16	107.22
Tall	B1	4.28	0.09	71.01	59.39	84.85
	B2	4.42	0.10	81.73	67.41	99.04
	G0	3.87	0.12	46.74	36.86	59.20
	G	4.11	0.10	59.70	49.23	72.36
	G1	4.38	0.08	78.45	66.42	92.64
	G2	4.44	0.10	83.72	69.09	101.41
	Rest	4.24	0.14	68.59	52.19	90.05

[1]Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).



[Brn-Grz, burned-grazed; cm, centimeters; Max., maximum; Veg., vegetation; Ht., height]

Figure 2.5. Back-transformed least squares mean maximum vegetation height (centimeters) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits. Treatments are defined in tables 2.9 and 2.10.

F. Standard Deviation of Maximum Vegetation Height (centimeters)

Table 2.11. Generalized linear mixed model, assuming a gamma distribution with a log link, $y = (y+1)$, testing the influence of post-management treatments on the standard deviation of maximum vegetation height on two grass types on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × Treatment	18	159.0	1.10	0.3599
Contrasts:	Mixed: burned linear	1	164.9	0.56	0.4548
	Mixed: burned quadratic	1	113.5	0.07	0.7886
	Mixed: BG0 versus BG1-3	1	157.3	1.62	0.2045
	Mixed: grazed linear	1	165.2	0.97	0.3267
	Mixed: grazed quadratic	1	162.9	0.01	0.9119
	Tall: burned linear	1	132.6	1.77	0.1859
	Tall: grazed linear	1	165.2	0.36	0.5468
	Tall: grazed quadratic	1	151.7	0.71	0.4023
	B1: mixed versus tall	1	168.9	5.39	0.0214
	B2: mixed versus tall	1	169.0	0.01	0.9120
	G0: mixed versus tall	1	168.7	0.00	0.9540
	G: mixed versus tall	1	168.8	0.48	0.4886
	G1: mixed versus tall	1	169.0	0.14	0.7059
	G2: mixed versus tall	1	168.8	0.03	0.8554
	Mixed: burned versus rest	1	165.2	0.01	0.9332
	Mixed: grazed versus rest	1	166.1	0.19	0.6608
	Mixed: burned-grazed versus rest	1	165.6	0.00	0.9738
	Mixed: burned versus grazed	1	140.8	0.79	0.3755
	Tall: burned versus rest	1	165.5	1.23	0.2686
	Tall: grazed versus rest	1	168.7	0.00	0.9536
	Tall: burned versus grazed	1	144.2	3.59	0.0602

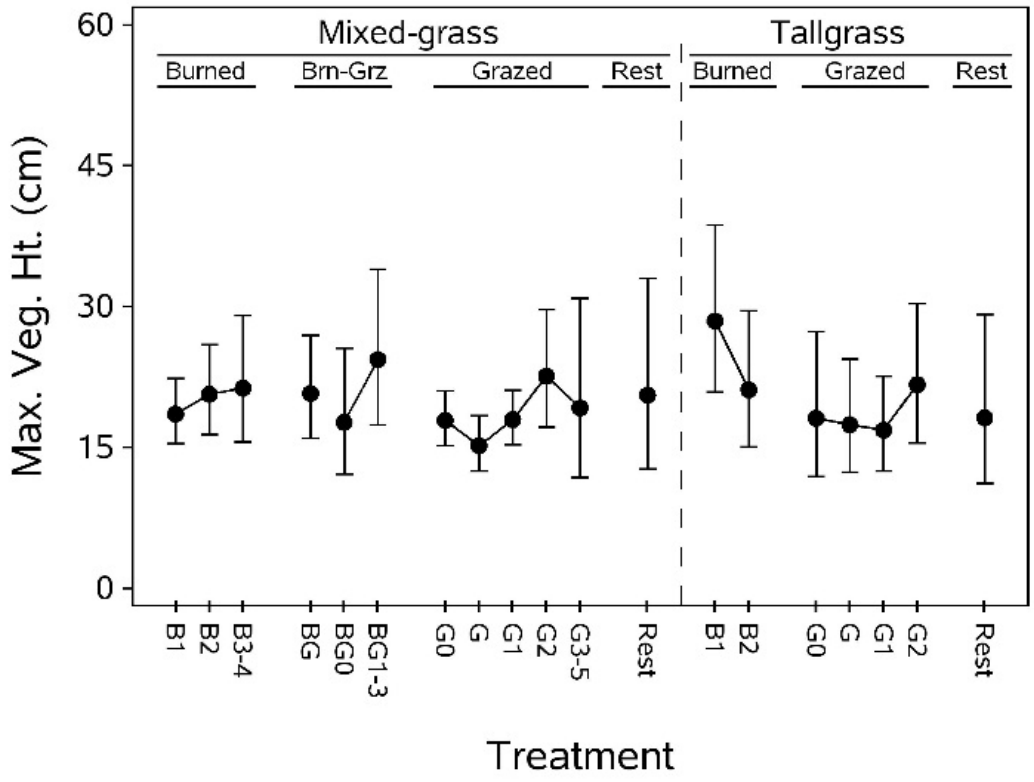
[1]Sources of variation for the model: Y=Unit(Grass type) + Grass type × Treatment + Residual, where Unit(Grass type) and Residual are random effects and Grass type × Treatment is a fixed effect in a mixed-model framework. Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 2.12. Least squares mean (standard error) and back-transformed least squares mean (95-percent confidence intervals) standard deviation of maximum vegetation height (centimeters), by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

				Back-transformed		
					95-percent confidence intervals	
Grass	Treatment[1]	LSMean	SE	LSMean	LCL	UCL
Mixed	B1	2.97	0.09	18.55	15.39	22.32
	B2	3.08	0.11	20.65	16.40	25.94
	B3-4	3.10	0.15	21.30	15.55	29.03
	BG	3.08	0.13	20.75	15.95	26.90
	BG0	2.93	0.18	17.66	12.12	25.54
	BG1-3	3.23	0.16	24.35	17.38	33.97
	G0	2.94	0.08	17.87	15.17	21.02
	G	2.78	0.09	15.16	12.49	18.36
	G1	2.94	0.08	17.95	15.29	21.05
	G2	3.16	0.13	22.59	17.14	29.68
	G3-5	3.01	0.23	19.20	11.82	30.84
	Rest	3.07	0.23	20.57	12.69	32.99
Tall	B1	3.38	0.15	28.46	20.87	38.68
	B2	3.10	0.16	21.13	15.05	29.53
	G0	2.95	0.20	18.10	11.88	27.33
	G	2.91	0.16	17.41	12.35	24.40
	G1	2.88	0.14	16.83	12.49	22.55
	G2	3.12	0.16	21.69	15.45	30.30
	Rest	2.95	0.23	18.14	11.15	29.17

[1]Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).



[Brn-Grz, burned-grazed; cm, centimeter; Max., maximum; Veg., vegetation; Ht., height]

Figure 2.6. Back-transformed least squares mean standard deviation of maximum vegetation height (centimeters) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits. Treatments are defined in tables 2.11 and 2.12.

G. Mean Vertical Obstruction Reading (VOR, decimeters)

Table 2.13. Generalized linear mixed model, assuming a gamma distribution with a log link, $y = (y+1.0)$, testing the influence of post-management treatments on mean vertical obstruction readings (decimeters) on two grass types on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[<, less than; *, evidence for moderate effect ($0.05<p\leq0.10$); **, evidence for strong effect ($p\leq0.05$)]

Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × Treatment	18	146.2	6.00	<0.0001**
Contrasts:	Mixed: burned linear	1	142.9	6.78	0.0102**
	Mixed: burned quadratic	1	89.9	1.19	0.2775
	Mixed: BG0 versus BG1-3	1	126.1	14.54	0.0002**
	Mixed: grazed linear	1	168.9	7.34	0.0074**
	Mixed: grazed quadratic	1	153.9	0.49	0.4867
	Tall: burned linear	1	121.9	1.09	0.2991
	Tall: grazed linear	1	153.4	13.01	0.0004**
	Tall: grazed quadratic	1	133.4	3.76	0.0547*
	B1: mixed versus tall	1	166.5	2.62	0.1076
	B2: mixed versus tall	1	167.9	0.54	0.4617
	G0: mixed versus tall	1	165.3	0.02	0.8896
	G: mixed versus tall	1	168.2	7.73	0.0061**
	G1: mixed versus tall	1	168.5	11.75	0.0008**
	G2: mixed versus tall	1	168.0	0.65	0.4197
	Mixed: burned versus rest	1	143.6	2.91	0.0902*
	Mixed: grazed versus rest	1	143.8	8.92	0.0033**
	Mixed: burned-grazed versus rest	1	148.5	10.56	0.0014**
	Mixed: burned versus grazed	1	159.2	9.50	0.0024**
	Tall: burned versus rest	1	158.1	0.00	0.9907
	Tall: grazed versus rest	1	167.3	0.55	0.4609
	Tall: burned versus grazed	1	141.3	1.36	0.2450

[1]Sources of variation for the model: Y=Unit(Grass type) + Grass type × Treatment + Residual, where Unit(Grass type) and Residual are random effects and Grass type × Treatment is a fixed effect in a mixed-model framework. Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).

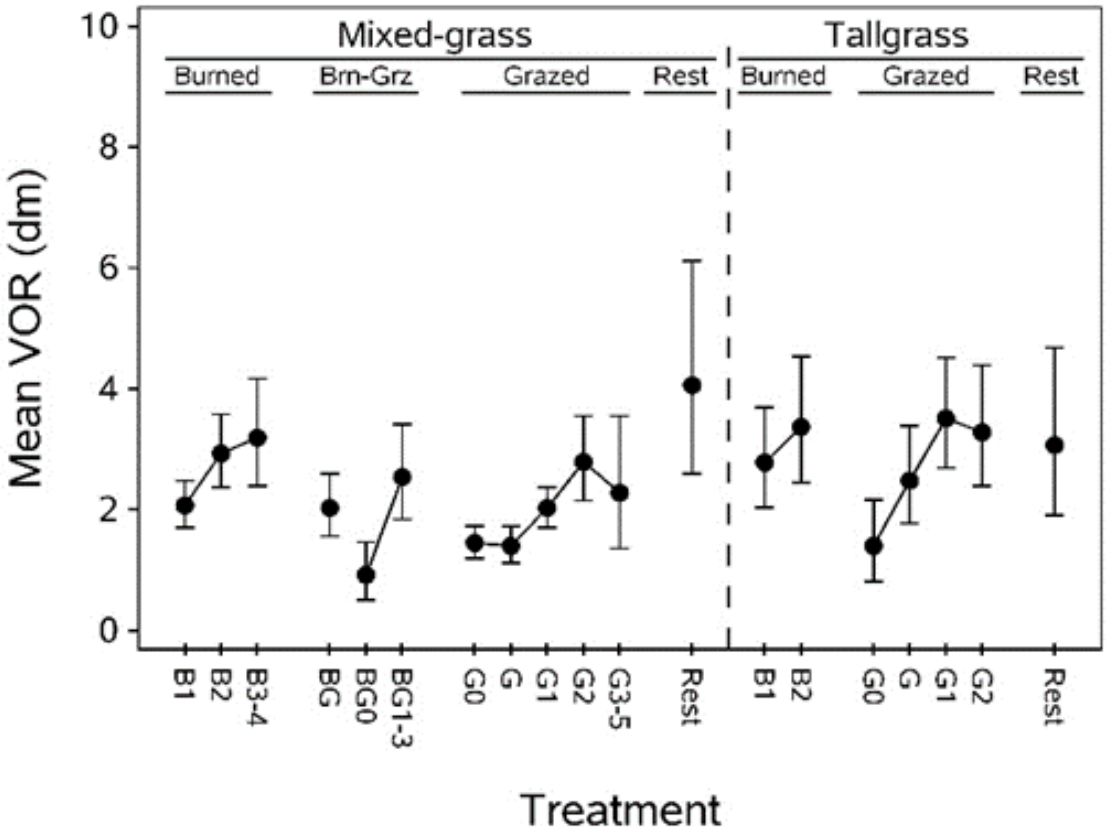
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 2.14. Least squares mean (standard error) and back-transformed least squares mean (95-percent confidence intervals) vertical obstruction readings (decimeters), by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

				Back-transformed		
					95-percent confidence intervals	
Grass	Treatment[1]	LSMean	SE	LSMean	LCL	UCL
Mixed	B1	1.12	0.06	2.07	1.70	2.48
	B2	1.37	0.08	2.93	2.37	3.58
	B3-4	1.43	0.11	3.19	2.39	4.17
	BG	1.11	0.09	2.03	1.56	2.59
	BG0	0.65	0.13	0.92	0.50	1.46
	BG1-3	1.26	0.11	2.54	1.84	3.41
	G0	0.90	0.06	1.45	1.19	1.73
	G	0.88	0.06	1.40	1.11	1.72
	G1	1.11	0.06	2.03	1.71	2.37
	G2	1.33	0.09	2.79	2.15	3.55
	G3-5	1.19	0.17	2.28	1.36	3.55
	Rest	1.62	0.17	4.06	2.59	6.12
Tall	B1	1.33	0.11	2.78	2.04	3.69
	B2	1.47	0.12	3.37	2.45	4.53
	G0	0.87	0.14	1.40	0.81	2.16
	G	1.25	0.12	2.48	1.77	3.38
	G1	1.51	0.10	3.51	2.69	4.52
	G2	1.45	0.12	3.28	2.39	4.39
	Rest	1.40	0.17	3.07	1.91	4.68

[1]Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).



[Brn-Grz, burned-grazed; dm, decimeter; VOR, vertical obstruction reading]

Figure 2.7. Back-transformed least squares mean vertical obstruction readings (decimeters) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits. Treatments are defined in tables 2.13 and 2.14.

H. Standard Deviation of Vertical Obstruction Reading (VOR, decimeters)

Table 2.15. Generalized linear mixed model, assuming a gamma distribution with a log link, $y = (y+1)$, testing the influence of post-management treatments on the standard deviation of vertical obstruction readings (decimeters) on two grass types on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[<, less than; *, evidence for moderate effect ($0.05<p\leq0.10$); **, evidence for strong effect ($p\leq0.05$)]

Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × Treatment	18	148.9	3.85	<0.0001**
Contrasts:	Mixed: burned linear	1	148.3	1.82	0.1791
	Mixed: burned quadratic	1	91.8	0.27	0.6025
	Mixed: BG0 versus BG1-3	1	132.0	11.32	0.0010**
	Mixed: grazed linear	1	168.3	3.89	0.0503*
	Mixed: grazed quadratic	1	155.8	0.01	0.9342
	Tall: burned linear	1	123.1	0.77	0.3829
	Tall: grazed linear	1	156.2	4.63	0.0330**
	Tall: grazed quadratic	1	136.4	1.64	0.2019
	B1: mixed versus tall	1	167.3	5.13	0.0247**
	B2: mixed versus tall	1	168.3	0.07	0.7961
	G0: mixed versus tall	1	166.1	0.85	0.3586
	G: mixed versus tall	1	168.1	2.38	0.1249
	G1: mixed versus tall	1	168.8	0.92	0.3395
	G2: mixed versus tall	1	168.1	0.07	0.7907
	Mixed: burned versus rest	1	148.8	0.45	0.5020
	Mixed: grazed versus rest	1	149.5	4.44	0.0368**
	Mixed: burned-grazed versus rest	1	152.8	2.94	0.0882*
	Mixed: burned versus grazed	1	153.5	12.13	0.0006**
	Tall: burned versus rest	1	159.3	2.80	0.0960*
	Tall: grazed versus rest	1	167.4	0.09	0.7610
	Tall: burned versus grazed	1	140.4	11.60	0.0009**

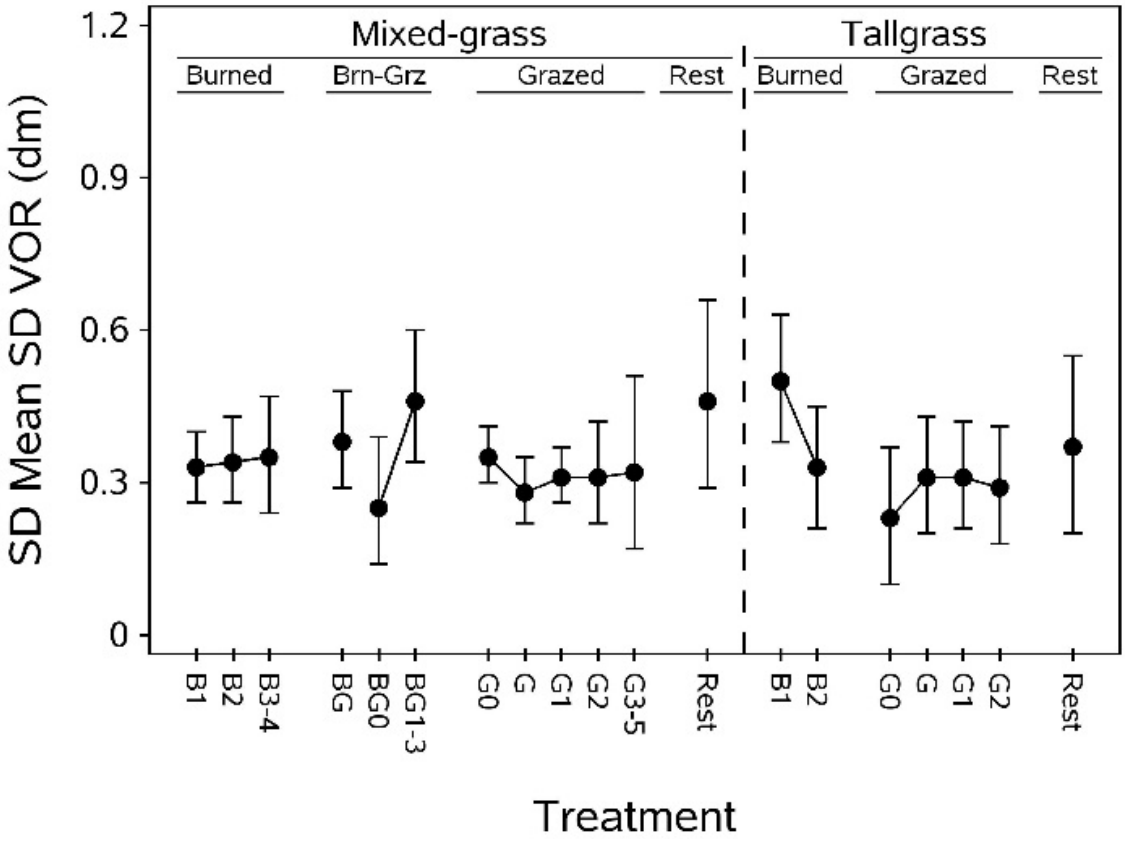
[1]Sources of variation for the model: Y=Unit(Grass type) + Grass type × Treatment + Residual, where Unit(Grass type) and Residual are random effects and Grass type × Treatment is a fixed effect in a mixed-model framework. Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 2.16. Least squares mean (standard error) and back-transformed least squares mean (95-percent confidence intervals) standard deviation of vertical obstruction readings (decimeters), by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

				Back-transformed		
					95-percent confidence intervals	
Grass	Treatment[1]	LSMean	SE	LSMean	LCL	UCL
Mixed	B1	0.77	0.05	1.17	0.97	1.39
	B2	0.87	0.06	1.39	1.13	1.69
	B3-4	0.90	0.08	1.46	1.09	1.89
	BG	0.72	0.07	1.06	0.80	1.35
	BG0	0.48	0.10	0.61	0.33	0.95
	BG1-3	0.90	0.09	1.45	1.07	1.91
	G0	0.57	0.04	0.76	0.62	0.92
	G	0.54	0.05	0.71	0.55	0.89
	G1	0.65	0.04	0.92	0.77	1.08
	G2	0.78	0.07	1.19	0.90	1.52
	G3-5	0.73	0.13	1.08	0.62	1.67
	Rest	0.94	0.13	1.57	0.98	2.32
Tall	B1	1.00	0.08	1.71	1.30	2.20
	B2	0.90	0.09	1.46	1.06	1.94
	G0	0.46	0.11	0.58	0.28	0.96
	G	0.70	0.09	1.01	0.68	1.39
	G1	0.74	0.08	1.09	0.79	1.43
	G2	0.75	0.09	1.12	0.78	1.53
	Rest	0.70	0.13	1.02	0.57	1.60

[1]Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).



[Brn-Grz, burned-grazed; dm, decimeter; Min., minimum; SD, standard deviation; VOR, vertical obstruction reading]

Figure 2.8. Back-transformed least squares mean standard deviation vertical obstruction readings (decimeters) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits. Treatments are defined in tables 2.15 and 2.16.

I. Mean Minimum Vertical Obstruction Reading (VOR, decimeters)

Table 2.17. Generalized linear mixed model, assuming a gamma distribution with a log link, $y = (y+1)$, testing the influence of post-management treatments on the mean minimum vertical obstruction readings (decimeters) on two grass types on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[<, less than; *, evidence for moderate effect ($0.05<p\leq0.10$); **, evidence for strong effect ($p\leq0.05$)]

Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	F-statistic	*p*-value
Overall	Grass type × Treatment	18	144.5	6.46	<0.0001**
Contrasts:	Mixed: burned linear	1	140.0	7.35	0.0076**
	Mixed: burned quadratic	1	88.3	1.13	0.2901
	Mixed: BG0 versus BG1-3	1	123.0	15.04	0.0002**
	Mixed: grazed linear	1	169.0	7.77	0.0059**
	Mixed: grazed quadratic	1	152.7	0.82	0.3665
	Tall: burned linear	1	120.6	1.46	0.2290**
	Tall: grazed linear	1	151.9	14.08	0.0002**
	Tall: grazed quadratic	1	131.4	3.61	0.0597*
	B1: mixed versus tall	1	166.1	2.44	0.1205
	B2: mixed versus tall	1	167.6	0.69	0.4086
	G0: mixed versus tall	1	164.9	0.00	0.9692
	G: mixed versus tall	1	168.3	8.34	0.0044**
	G1: mixed versus tall	1	168.3	12.47	0.0005**
	G2: mixed versus tall	1	168.0	0.85	0.3581
	Mixed: burned versus rest	1	140.8	3.10	0.0805*
	Mixed: grazed versus rest	1	140.7	9.60	0.0023**
	Mixed: burned-grazed versus rest	1	146.0	11.30	0.0010**
	Mixed: burned versus grazed	1	161.4	10.45	0.0015**
	Tall: burned versus rest	1	157.5	0.01	0.9351
	Tall: grazed versus rest	1	167.3	0.36	0.5518
	Tall: burned versus grazed	1	141.3	1.19	0.2764

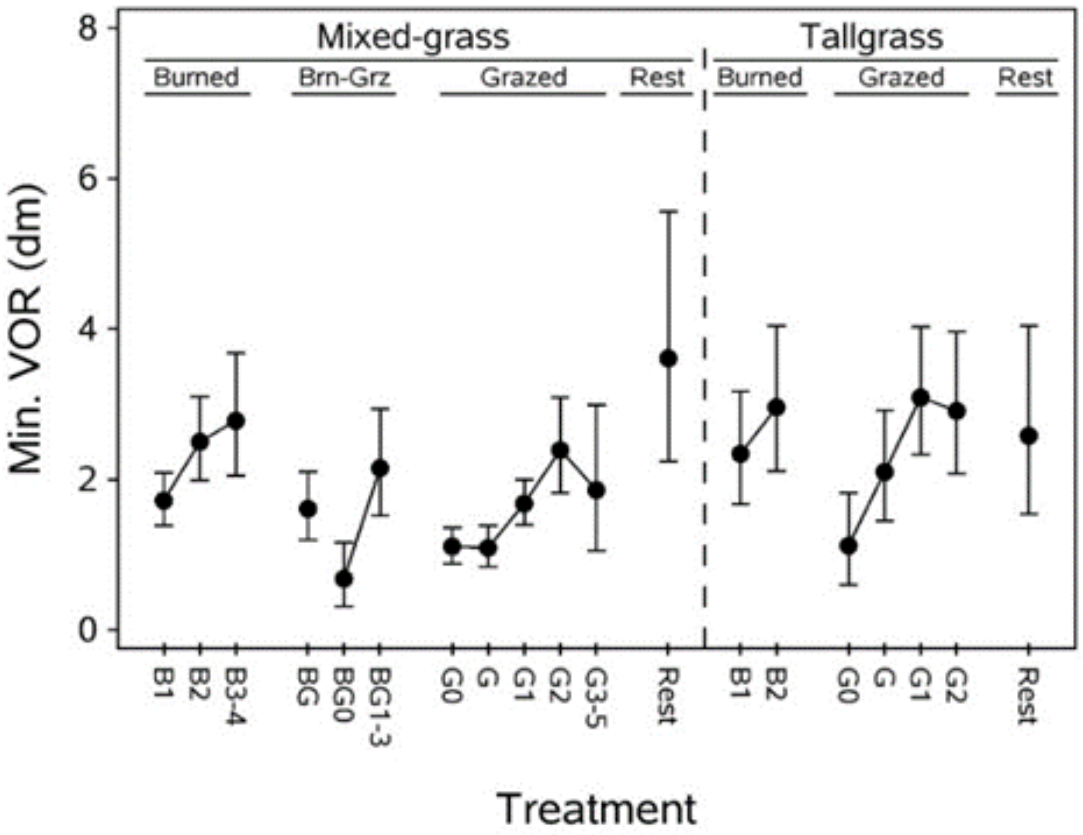
[1]Sources of variation for the model: Y=Unit(Grass type) + Grass type × Treatment + Residual, where Unit(Grass type) and Residual are random effects and Grass type × Treatment is a fixed effect in a mixed-model framework. Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 2.18. Least squares mean (standard error) and back-transformed least squares mean (95-percent confidence intervals) minimum vertical obstruction readings (decimeters), by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

				Back-transformed		
					95-percent confidence intervals	
Grass	Treatment[1]	LSMean	SE	LSMean	LCL	UCL
Mixed	B1	1.00	0.07	1.72	1.38	2.09
	B2	1.25	0.08	2.50	1.99	3.10
	B3-4	1.33	0.11	2.78	2.05	3.68
	BG	0.96	0.09	1.61	1.19	2.10
	BG0	0.52	0.13	0.68	0.31	1.16
	BG1-3	1.15	0.11	2.15	1.52	2.94
	G0	0.75	0.06	1.11	0.88	1.36
	G	0.74	0.07	1.09	0.84	1.38
	G1	0.99	0.06	1.68	1.40	2.00
	G2	1.22	0.10	2.39	1.82	3.09
	G3-5	1.05	0.17	1.86	1.05	2.99
	Rest	1.53	0.18	3.61	2.24	5.56
Tall	B1	1.20	0.11	2.34	1.67	3.17
	B2	1.38	0.12	2.96	2.11	4.04
	G0	0.75	0.14	1.12	0.60	1.82
	G	1.13	0.12	2.10	1.45	2.92
	G1	1.41	0.11	3.09	2.33	4.03
	G2	1.36	0.12	2.91	2.08	3.96
	Rest	1.27	0.17	2.58	1.54	4.04

[1]Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).



[Brn-Grz, burned-grazed; dm, decimeter; Min., minimum; SD, VOR, vertical obstruction reading]

Figure 2.9. Back-transformed least squares mean minimum vertical obstruction readings (decimeters) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits. Treatments are defined in tables 2.17 and 2.18.

J. Standard Deviation of Minimum Vertical Obstruction Reading (VOR, decimeters)

Table 2.19. Generalized linear mixed model, assuming a gamma distribution with a log link, $y = (y+1)$, testing the influence of post-management treatments on the standard deviation of mean minimum vertical obstruction readings (decimeters) on two grass types on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[<, less than; *, evidence for moderate effect ($0.05<p\leq0.10$); **, evidence for strong effect ($p\leq0.05$)]

Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × Treatment	18	148.1	4.11	<0.0001**
Contrasts:	Mixed: burned linear	1	146.4	3.20	0.0755*
	Mixed: burned quadratic	1	91.6	0.13	0.7165
	Mixed: BG0 versus BG1-3	1	130.0	10.79	0.0013**
	Mixed: grazed linear	1	168.6	4.50	0.0353**
	Mixed: grazed quadratic	1	155.2	0.06	0.8004
	Tall: burned linear	1	123.2	0.10	0.7501
	Tall: grazed linear	1	155.3	5.47	0.0206**
	Tall: grazed quadratic	1	135.5	1.93	0.1674
	B1: mixed versus tall	1	167.0	4.04	0.0461**
	B2: mixed versus tall	1	168.2	0.26	0.6124
	G0: mixed versus tall	1	165.8	0.40	0.5271
	G: mixed versus tall	1	168.1	2.52	0.1143
	G1: mixed versus tall	1	168.7	1.89	0.1715
	G2: mixed versus tall	1	168.1	0.00	0.9964
	Mixed: burned versus rest	1	147.0	0.42	0.5176
	Mixed: grazed versus rest	1	147.5	4.86	0.0290**
	Mixed: burned-grazed versus rest	1	151.3	3.73	0.0554*
	Mixed: burned versus grazed	1	156.0	14.34	0.0002**
	Tall: burned versus rest	1	159.0	2.33	0.1293
	Tall: grazed versus rest	1	167.4	0.11	0.7397
	Tall: burned versus grazed	1	141.1	10.12	0.0018**

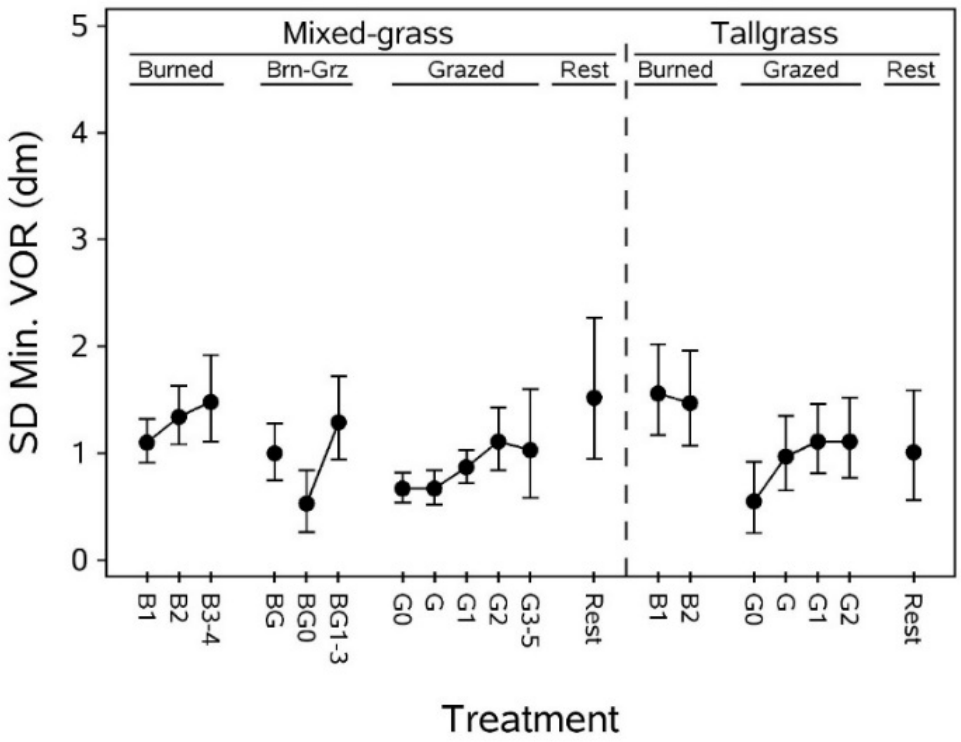
[1]Sources of variation for the model: Y=Unit(Grass type) + Grass type × Treatment + Residual, where Unit(Grass type) and Residual are random effects and Grass type × Treatment is a fixed effect in a mixed-model framework. Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 2.20. Least squares mean (standard error) and back-transformed least squares mean (95-percent confidence intervals) standard deviation of mean minimum vertical obstruction reading (decimeters), by grassland type (mixed grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

				Back-transformed		
					95-percent confidence intervals	
Grass	Treatment[1]	LSMean	SE	LSMean	LCL	UCL
Mixed	B1	0.74	0.05	1.10	0.91	1.32
	B2	0.85	0.06	1.34	1.08	1.63
	B3-4	0.91	0.08	1.48	1.11	1.92
	BG	0.69	0.07	1.00	0.75	1.28
	BG0	0.42	0.10	0.53	0.26	0.84
	BG1-3	0.83	0.09	1.29	0.94	1.72
	G0	0.51	0.04	0.67	0.54	0.82
	G	0.51	0.05	0.67	0.52	0.84
	G1	0.63	0.04	0.87	0.72	1.03
	G2	0.75	0.07	1.11	0.84	1.43
	G3-5	0.71	0.13	1.03	0.58	1.60
	Rest	0.92	0.13	1.52	0.95	2.27
Tall	B1	0.94	0.08	1.56	1.17	2.02
	B2	0.91	0.09	1.47	1.07	1.96
	G0	0.44	0.11	0.55	0.25	0.92
	G	0.68	0.09	0.97	0.65	1.35
	G1	0.75	0.08	1.11	0.81	1.46
	G2	0.75	0.09	1.11	0.77	1.52
	Rest	0.70	0.13	1.01	0.56	1.59

[1]Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).



[Brn-Grz, burned-grazed; dm, decimeter; Min., minimum; SD, standard deviation; VOR, vertical obstruction reading]

Figure 2.10. Back-transformed least squares mean standard deviation of the mean minimum vertical obstruction readings (decimeters) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits. Treatments are defined in tables 2.19 and 2.20.

K. Mean Maximum Vertical Obstruction Reading (VOR, decimeters)

Table 2.21. Generalized linear mixed model, assuming a gamma distribution with a log link, $y = (y+1)$, testing the influence of post-management treatments on the mean maximum vertical obstruction readings (decimeters) on two grass types on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[<, less than; *, evidence for moderate effect ($0.05<p\leq0.10$); **, evidence for strong effect ($p\leq0.05$)]

Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × Treatment	18	149.1	5.19	<0.0001**
Contrasts:	Mixed: burned linear	1	148.3	6.04	0.0151**
	Mixed: burned quadratic	1	92.5	1.14	0.2877
	Mixed: BG0 versus BG1-3	1	132.1	13.47	0.0003**
	Mixed: grazed linear	1	168.4	6.22	0.0136**
	Mixed: grazed quadratic	1	155.9	0.18	0.6715
	Tall: burned linear	1	123.8	0.69	0.4093
	Tall: grazed linear	1	156.2	10.33	0.0016**
	Tall: grazed quadratic	1	136.7	3.64	0.0584*
	B1: mixed versus tall	1	167.3	3.14	0.0783*
	B2: mixed versus tall	1	168.3	0.51	0.4745
	G0: mixed versus tall	1	166.1	0.08	0.7773
	G: mixed versus tall	1	168.1	7.22	0.0079**
	G1: mixed versus tall	1	168.7	10.05	0.0018**
	G2: mixed versus tall	1	168.1	0.45	0.5026
	Mixed: burned versus rest	1	148.8	2.70	0.1022
	Mixed: grazed versus rest	1	149.4	7.95	0.0055**
	Mixed: burned-grazed versus rest	1	152.8	9.69	0.0022**
	Mixed: burned versus grazed	1	154.3	7.94	0.0055**
	Tall: burned versus rest	1	159.4	0.00	0.9803
	Tall: grazed versus rest	1	167.4	0.67	0.4147
	Tall: burned versus grazed	1	141.0	1.66	0.2000

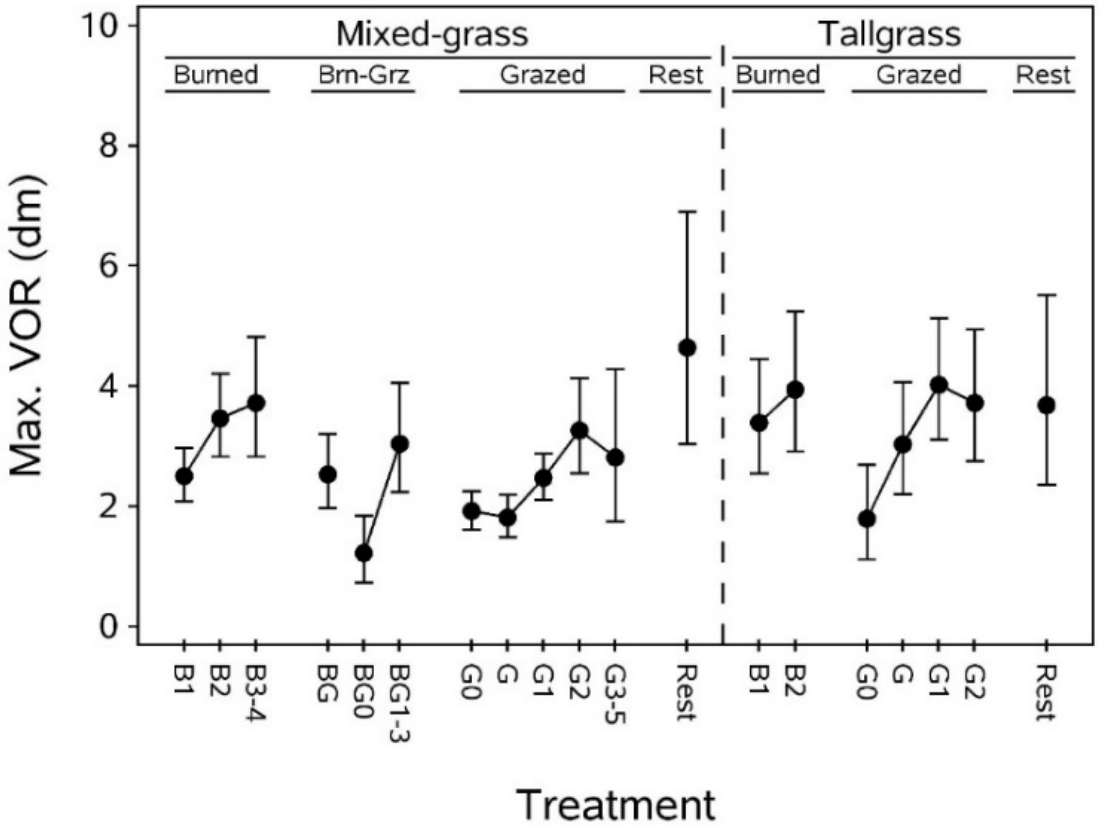
[1]Sources of variation for the model: Y=Unit(Grass type) + Grass type × Treatment + Residual, where Unit(Grass type) and Residual are random effects and Grass type × Treatment is a fixed effect in a mixed-model framework. Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 2.22. Least squares mean (standard error) and back-transformed least squares mean (95-percent confidence intervals) maximum vertical obstruction readings (decimeters), by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

				Back-transformed		
					95-percent confidence intervals	
Grass	Treatment[1]	LSMean	SE	LSMean	LCL	UCL
Mixed	B1	1.25	0.06	2.50	2.08	2.97
	B2	1.49	0.08	3.46	2.82	4.20
	B3-4	1.55	0.11	3.72	2.82	4.82
	BG	1.26	0.09	2.53	1.97	3.20
	BG0	0.80	0.13	1.22	0.73	1.84
	BG1-3	1.40	0.11	3.04	2.23	4.05
	G0	1.07	0.06	1.92	1.61	2.25
	G	1.03	0.06	1.81	1.48	2.19
	G1	1.24	0.06	2.47	2.11	2.87
	G2	1.45	0.09	3.26	2.55	4.13
	G3-5	1.34	0.17	2.81	1.75	4.28
	Rest	1.73	0.17	4.64	3.03	6.90
Tall	B1	1.48	0.11	3.39	2.54	4.45
	B2	1.60	0.12	3.94	2.91	5.24
	G0	1.03	0.14	1.79	1.11	2.69
	G	1.39	0.12	3.03	2.20	4.06
	G1	1.61	0.10	4.02	3.11	5.13
	G2	1.55	0.12	3.72	2.75	4.94
	Rest	1.54	0.17	3.68	2.36	5.51

[1]Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).



[Brn-Grz, burned-grazed; dm, decimeter; Max., maximum; VOR, vertical obstruction reading]

Figure 2.11. Back-transformed least squares mean maximum vertical obstruction reading (decimeters) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits. Treatments are defined in tables 2.21 and 2.22.

L. **Standard Deviation of Maximum Vertical Obstruction Reading (VOR, decimeters)**

Table 2.23. Generalized linear mixed model, assuming a gamma distribution with a log link, $y = (y+1)$, testing the influence of post-management treatments on the standard deviation of mean maximum vertical obstruction readings (decimeters) on two grass types on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[<, less than; *, evidence for moderate effect ($0.05<p\leq0.10$); **, evidence for strong effect ($p\leq0.05$)]

Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × Treatment	18	154.5	3.05	<0.0001**
Contrasts:	Mixed: burned linear	1	159.4	0.56	0.4545
	Mixed: burned quadratic	1	98.9	0.18	0.6752
	Mixed: BG0 versus BG1-3	1	146.8	11.79	0.0008**
	Mixed: grazed linear	1	165.8	2.13	0.1468
	Mixed: grazed quadratic	1	159.5	0.01	0.9182
	Tall: burned linear	1	124.9	2.05	0.1544
	Tall: grazed linear	1	161.7	2.61	0.1079
	Tall: grazed quadratic	1	143.7	1.26	0.2634
	B1: mixed versus tall	1	168.5	5.83	0.0168**
	B2: mixed versus tall	1	168.8	0.00	0.9730
	G0: mixed versus tall	1	167.9	1.80	0.1812
	G: mixed versus tall	1	168.4	1.97	0.1626
	G1: mixed versus tall	1	169.0	0.01	0.9424
	G2: mixed versus tall	1	168.5	0.21	0.6448
	Mixed: burned versus rest	1	159.7	0.60	0.4380
	Mixed: grazed versus rest	1	161.0	3.58	0.0601*
	Mixed: burned-grazed versus rest	1	161.3	2.09	0.1504
	Mixed: burned versus grazed	1	140.5	7.45	0.0071**
	Tall: burned versus rest	1	162.8	2.84	0.0937*
	Tall: grazed versus rest	1	168.2	0.11	0.7420
	Tall: burned versus grazed	1	139.2	12.56	0.0005**

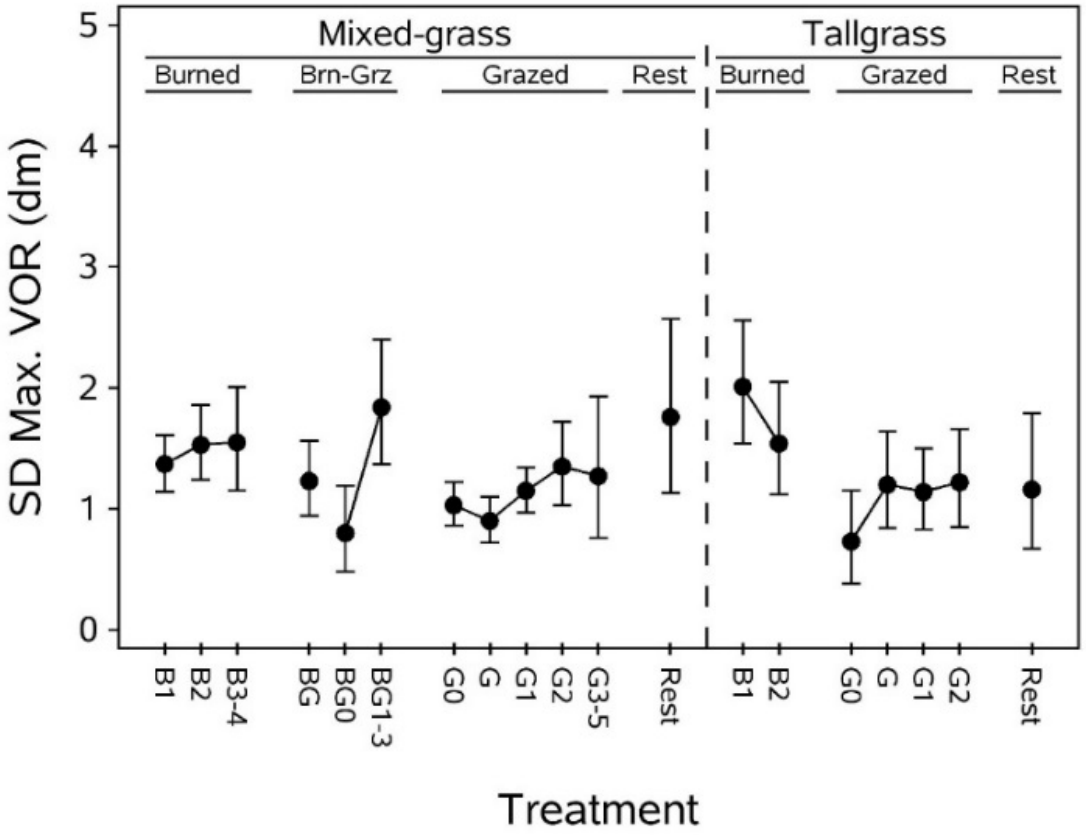
[1]Sources of variation for the model: Y=Unit(Grass type) + Grass type × Treatment + Residual, where Unit(Grass type) and Residual are random effects and Grass type × Treatment is a fixed effect in a mixed-model framework. Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 2.24. Least squares mean (standard error) and back-transformed least squares mean (95-percent confidence intervals) standard deviation of mean maximum vertical obstruction readings (decimeters), by grassland type (mixed grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

				Back-transformed		
					95-percent confidence intervals	
Grass	Treatment[1]	LSMean	SE	LSMean	LCL	UCL
Mixed	B1	0.86	0.05	1.37	1.14	1.61
	B2	0.93	0.06	1.53	1.24	1.86
	B3-4	0.93	0.09	1.55	1.15	2.01
	BG	0.80	0.07	1.23	0.94	1.56
	BG0	0.59	0.10	0.80	0.48	1.19
	BG1-3	1.04	0.09	1.84	1.37	2.40
	G0	0.71	0.04	1.03	0.86	1.22
	G	0.64	0.05	0.90	0.72	1.10
	G1	0.77	0.04	1.15	0.97	1.34
	G2	0.85	0.07	1.35	1.03	1.72
	G3-5	0.82	0.13	1.27	0.76	1.93
	Rest	1.02	0.13	1.76	1.13	2.57
Tall	B1	1.10	0.09	2.01	1.54	2.56
	B2	0.93	0.09	1.54	1.12	2.05
	G0	0.55	0.11	0.73	0.38	1.15
	G	0.79	0.09	1.20	0.84	1.64
	G1	0.76	0.08	1.14	0.83	1.50
	G2	0.80	0.09	1.22	0.85	1.66
	Rest	0.77	0.13	1.16	0.67	1.79

[1]Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).



[Brn-Grz, burned-grazed; dm, decimeters; Max., maximum; SD, standard deviation; VOR, vertical obstruction reading]

Figure 2.12. Back-transformed least squares mean standard deviation of the mean maximum vertical obstruction readings (decimeters) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits. Treatments are defined in tables 2.23 and 2.24.

M. Mean Standing Dead Cover (percent)

Table 2.25. Generalized linear mixed model, assuming a beta distribution with a logit link, $y = (y+0.0)$, testing the influence of post-management treatments on mean standing dead cover (percent) on two grass types on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × Treatment	18	162.3	1.25	0.2295
Contrasts:	Mixed: burned linear	1	168.9	5.05	0.0260
	Mixed: burned quadratic	1	128.5	2.05	0.1546
	Mixed: BG0 versus BG1-3	1	168.6	3.30	0.0711
	Mixed: grazed linear	1	163.7	0.39	0.5341
	Mixed: grazed quadratic	1	166.6	0.01	0.9118
	Tall: burned linear	1	138.3	1.34	0.2490
	Tall: grazed linear	1	168.5	1.50	0.2228
	Tall: grazed quadratic	1	158.0	0.50	0.4826
	B1: mixed versus tall	1	169.0	0.16	0.6921
	B2: mixed versus tall	1	169.0	0.02	0.9027
	G0: mixed versus tall	1	168.9	0.15	0.7010
	G: mixed versus tall	1	168.9	1.05	0.3072
	G1: mixed versus tall	1	169.0	2.04	0.1554
	G2: mixed versus tall	1	168.9	0.01	0.9246
	Mixed: burned versus rest	1	169.0	0.01	0.9318
	Mixed: grazed versus rest	1	168.8	0.06	0.8021
	Mixed: burned-grazed versus rest	1	168.9	0.00	0.9794
	Mixed: burned versus grazed	1	139.0	0.20	0.6556
	Tall: burned versus rest	1	166.9	0.76	0.3858
	Tall: grazed versus rest	1	169.0	0.22	0.6434
	Tall: burned versus grazed	1	144.8	0.50	0.4818

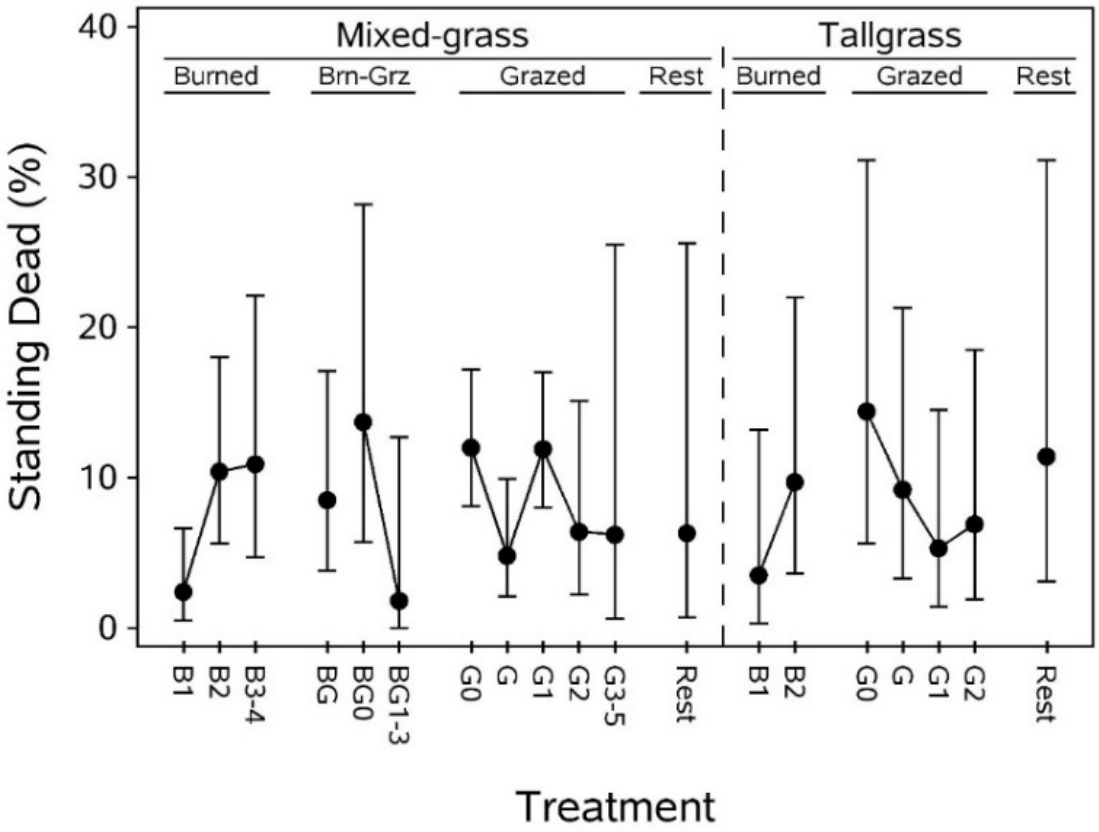
[1]Sources of variation for the model: Y=Unit(Grass type) + Grass type × Treatment + Residual, where Unit(Grass type) and Residual are random effects and Grass type × Treatment is a fixed effect in a mixed-model framework. Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 2.26. Least squares mean (standard error) standing dead cover (percent) and back-transformed least squares mean (95-percent confidence intervals) standing dead cover (percent) by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

				Back-transformed		
					95-percent confidence intervals	
Grass	Treatment[1]	LSMean	SE	LSMean	LCL	UCL
Mixed	B1	−3.353	0.435	2.4	0.5	6.6
	B2	−2.049	0.307	10.4	5.6	18.0
	B3-4	−2.005	0.411	10.9	4.7	22.1
	BG	−2.252	0.380	8.5	3.8	17.1
	BG0	−1.758	0.444	13.7	5.7	28.2
	BG1-3	−3.539	0.868	1.8	0.0	12.7
	G0	−1.904	0.205	12.0	8.1	17.2
	G	−2.780	0.344	4.8	2.1	9.9
	G1	−1.913	0.202	11.9	8.0	17.0
	G2	−2.525	0.448	6.4	2.2	15.1
	G3-5	−2.563	0.787	6.2	0.6	25.5
	Rest	−2.538	0.776	6.3	0.7	25.6
Tall	B1	−3.047	0.637	3.5	0.3	13.2
	B2	−2.117	0.462	9.7	3.6	22.0
	G0	−1.701	0.486	14.4	5.6	31.1
	G	−2.180	0.475	9.2	3.3	21.3
	G1	−2.696	0.510	5.3	1.4	14.5
	G2	−2.459	0.532	6.9	1.9	18.5
	Rest	−1.952	0.614	11.4	3.1	31.1

[1]Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).



[Brn-Grz, burned-grazed; %, percent]

Figure 2.13. Back-transformed least squares mean standing dead cover (percent) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits. Treatments are defined in tables 2.25 and 2.26.

N. Standard Deviation of Standing Dead Cover (percent)

Table 2.27. Generalized linear mixed model, assuming a beta distribution with a logit link, $y = (y+0.0)$, testing the influence of post-management treatments on the standard deviation of mean standing dead cover (percent) on two grass types on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[*, evidence for moderate effect ($0.05<p\leq0.10$); **, evidence for strong effect ($p\leq0.05$)]

Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × Treatment	18	160.5	1.59	0.0683*
Contrasts:	Mixed: burned linear	1	168.7	3.95	0.0484**
	Mixed: burned quadratic	1	128.3	0.94	0.3337
	Mixed: BG0 versus BG1-3	1	169.0	2.28	0.1333
	Mixed: grazed linear	1	160.2	0.04	0.8486
	Mixed: grazed quadratic	1	166.5	0.01	0.9281
	Tall: burned linear	1	127.8	2.22	0.1383
	Tall: grazed linear	1	168.9	1.75	0.1879
	Tall: grazed quadratic	1	157.3	0.04	0.8329
	B1: mixed versus tall	1	168.8	0.18	0.6751
	B2: mixed versus tall	1	169.0	0.44	0.5099
	G0: mixed versus tall	1	168.4	0.43	0.5114
	G: mixed versus tall	1	168.2	2.06	0.1532
	G1: mixed versus tall	1	169.0	2.31	0.1301
	G2: mixed versus tall	1	168.6	0.01	0.9034
	Mixed: burned versus rest	1	168.3	0.14	0.7063
	Mixed: grazed versus rest	1	167.6	0.06	0.8056
	Mixed: burned-grazed versus rest	1	169.0	1.05	0.3072
	Mixed: burned versus grazed	1	125.5	0.12	0.7322
	Tall: burned versus rest	1	167.4	1.95	0.1639
	Tall: grazed versus rest	1	169.0	1.80	0.1820
	Tall: burned versus grazed	1	137.9	0.05	0.8273

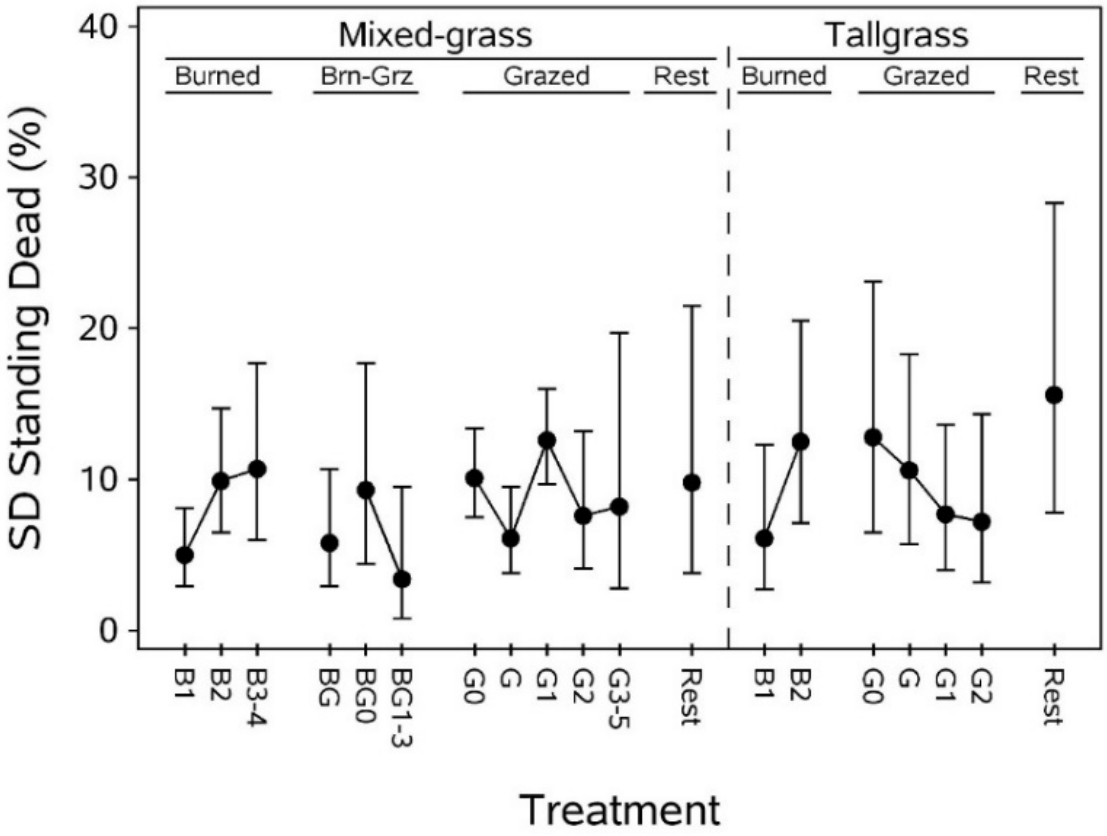
[1]Sources of variation for the model: Y=Unit(Grass type) + Grass type × Treatment + Residual, where Unit(Grass type) and Residual are random effects and Grass type × Treatment is a fixed effect in a mixed-model framework. Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 2.28. Least squares mean (standard error) and back-transformed least squares mean (95-percent confidence intervals) of the standard deviation of standing dead cover (percent) by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

				Back-transformed		
					95-percent confidence intervals	
Grass	Treatment[1]	LSMean	SE	LSMean	LCL	UCL
Mixed	B1	−2.748	0.226	5.0	2.9	8.1
	B2	−2.099	0.214	9.9	6.5	14.7
	B3-4	−2.023	0.283	10.7	6.0	17.7
	BG	−2.619	0.303	5.8	2.9	10.7
	BG0	−2.169	0.355	9.3	4.4	17.7
	BG1-3	−3.080	0.480	3.4	0.8	9.5
	G0	−2.079	0.150	10.1	7.5	13.4
	G	−2.567	0.215	6.1	3.8	9.5
	G1	−1.851	0.135	12.6	9.7	16.0
	G2	−2.357	0.286	7.6	4.1	13.2
	G3-5	−2.285	0.480	8.2	2.8	19.7
	Rest	−2.113	0.448	9.8	3.8	21.5
Tall	B1	−2.571	0.354	6.1	2.7	12.3
	B2	−1.862	0.288	12.5	7.1	20.5
	G0	−1.829	0.349	12.8	6.5	23.1
	G	−2.029	0.307	10.6	5.7	18.3
	G1	−2.356	0.303	7.7	4.0	13.6
	G2	−2.413	0.358	7.2	3.2	14.3
	Rest	−1.612	0.373	15.6	7.8	28.3

[1]Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).



[Brn-Grz, burned-grazed; %, percent; SD, standard deviation]

Figure 2.14. Back-transformed least squares mean standard deviation of standing dead cover (percent) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits. Treatments are defined in tables 2.27 and 2.28.

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Appendix 3. Testing the Influence of Management Regime and Year on Floristic Composition Variables Collected on Two Grass Types on Federal Lands Managed under an Adaptive-Management Framework by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13

A. Mean Brome Cover (percent)

Table 3.1. Generalized linear mixed model, assuming a beta distribution with a logit link, $y = (y+1)$, testing the influence of management regime and year on mean cover (percent) of smooth brome (*Bromus inermis*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

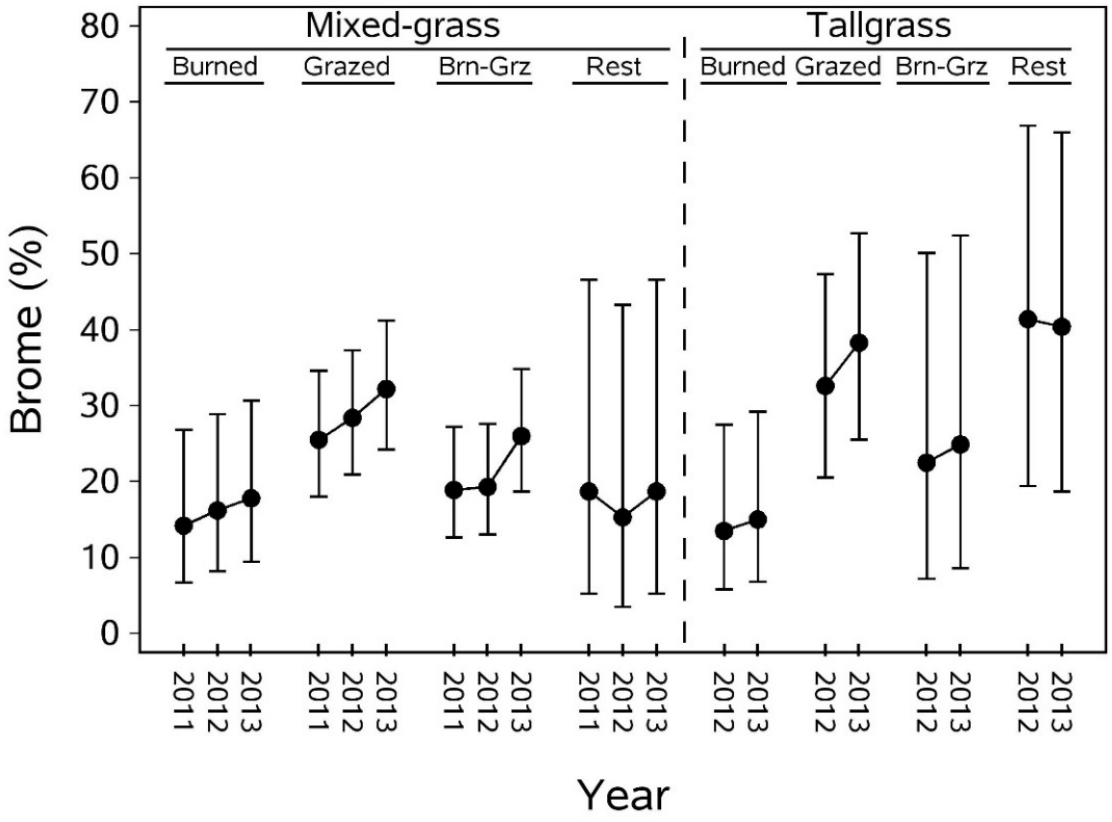
Effect	Source of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × regime × year	19	181.3	1.44	0.1129
Contrasts:	Mixed: regime effect	3	79.7	1.45	0.2347
	Mixed: year effect	2	131.8	1.82	0.1659
	Mixed: interaction	6	131.6	0.47	0.8294
	Tall: regime effect	3	88.3	2.22	0.0915
	Tall: year effect	1	127.6	0.66	0.4183
	Tall: interaction	3	127.7	0.24	0.8708
	Mixed versus tall: burned only	1	84.3	0.06	0.8124
	Mixed versus tall: grazed only	1	86.9	0.77	0.3822
	Mixed versus tall: burned-grazed	1	87.1	0.04	0.8335
	Mixed versus tall: rest	1	82.4	1.98	0.1628

[1]Sources of variation for the model: Y=Unit(Grass type × Regime) + Grass type × Regime × Year + Year × Unit(Grass type × Regime), where Grass type × Regime × Year is a fixed effect, Unit(Grass type × Regime) and Year × Unit(Grass type × Regime) are random effects in a mixed-model framework, and Year is a repeated-measures factor.
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 3.2. Least squares mean (standard error) and back-transformed least squares mean (95-percent confidence intervals) of brome cover (percent), by grassland type (mixed-grass, tallgrass), overall treatment regime (burned only, grazed only, burned-grazed, or rest), and year (2011, 2012, 2013), on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

					Back-transformed		
						95-percent confidence intervals	
Grass	Regime	Year	LSMean	SE	LSMean	LCL	UCL
Mixed	Burned only	2011	−1.722	0.392	14.2	6.7	26.8
		2012	−1.573	0.368	16.2	8.2	28.9
		2013	−1.462	0.355	17.8	9.4	30.7
	Grazed only	2011	−1.020	0.218	25.5	18.0	34.6
		2012	−0.874	0.203	28.4	20.9	37.3
		2013	−0.701	0.197	32.2	24.2	41.2
	Burned-grazed	2011	−1.390	0.233	18.9	12.6	27.2
		2012	−1.366	0.230	19.3	13.0	27.6
		2013	−0.994	0.209	26.0	18.7	34.8
	Rest	2011	−1.404	0.667	18.7	5.2	46.6
		2012	−1.638	0.719	15.3	3.5	43.3
		2013	−1.406	0.668	18.7	5.2	46.6
Tall	Burned only	2012	−1.771	0.435	13.5	5.8	27.5
		2013	−1.655	0.418	15.0	6.8	29.2
	Grazed only	2012	−0.682	0.313	32.6	20.5	47.3
		2013	−0.437	0.298	38.3	25.5	52.7
	Burned-grazed	2012	−1.183	0.627	22.5	7.2	50.1
		2013	−1.053	0.606	24.9	8.6	52.4
	Rest	2012	−0.306	0.537	41.4	19.4	66.9
		2013	−0.349	0.539	40.4	18.7	66.0



[Brn-Grz, burned-grazed; %, percent]

Figure 3.1. Back-transformed least squares mean cover (percent) of smooth brome (*Bromus inermis*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits.

B. Standard Deviation of Brome Cover (percent)

Table 3.3. Generalized linear mixed model, assuming a beta distribution with a logit link, $y = (y+1)$, testing the influence of management regime and year on standard deviation of the mean cover (percent) of smooth brome (*Bromus inermis*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

Effect	Source of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × regime × year	19	181.3	0.65	0.8610
Contrasts:	Mixed: regime effect	3	78.2	0.28	0.8432
	Mixed: year effect	2	130.6	1.08	0.3414
	Mixed: interaction	6	131.0	0.62	0.7106
	Tall: regime effect	3	92.1	1.82	0.1491
	Tall: year effect	1	126.9	0.03	0.8534
	Tall: interaction	3	126.8	0.50	0.6854
	Mixed versus tall: burned only	1	86.2	2.10	0.1506
	Mixed versus tall: grazed only	1	90.0	0.09	0.7706
	Mixed versus tall: burned-grazed	1	90.3	0.03	0.8584
	Mixed versus tall: rest	1	83.7	0.75	0.3879

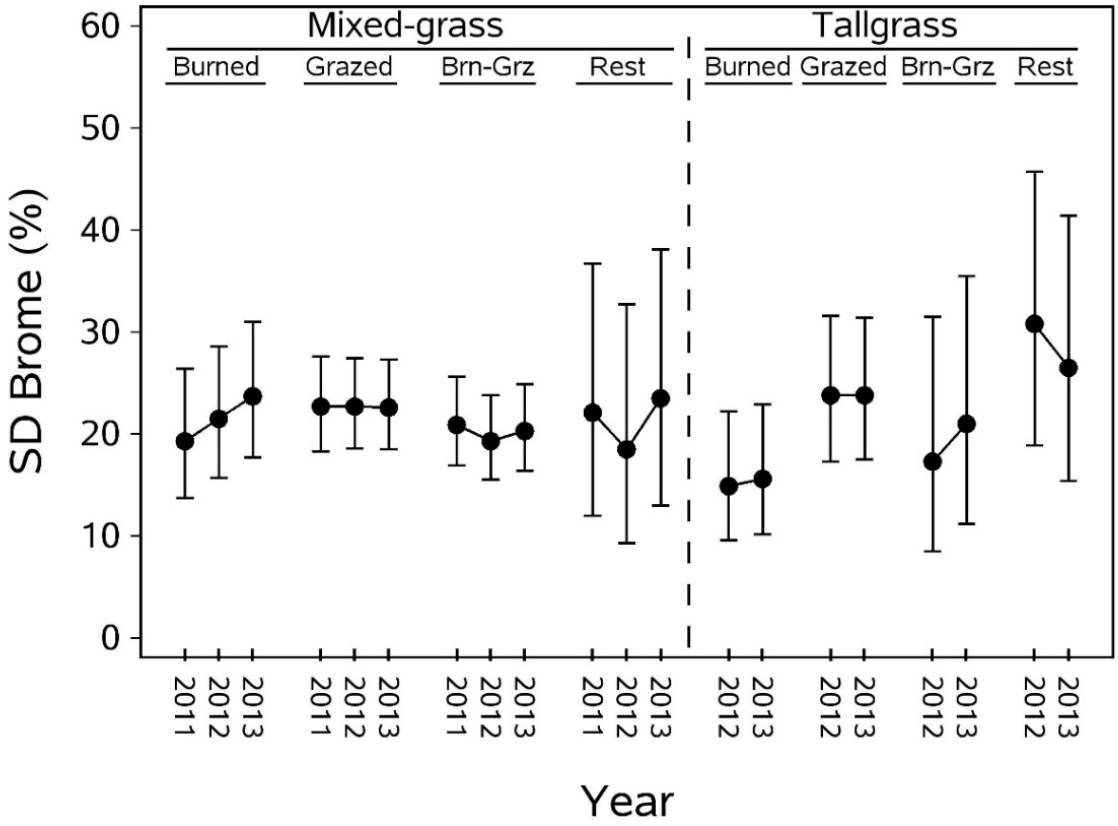
[1]Sources of variation for the model: Y=Unit(Grass type × Regime) + Grass type × Regime × Year + Year × Unit(Grass type × Regime), where Grass type × Regime × Year is a fixed effect, Unit(Grass type × Regime) and Year × Unit(Grass type × Regime) are random effects in a mixed-model framework, and Year is a repeated-measures factor.

[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 3.4. Least squares mean (standard error) and back-transformed least squares mean (95-percent confidence intervals) of standard deviation of the mean cover (percent) of smooth brome (*Bromus inermis*), by grassland type (mixed-grass, tallgrass), overall treatment regime (burned only, grazed only, burned-grazed, or rest), and year (2011, 2012, 2013), on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

					Back-transformed		
						95-percent confidence intervals	
Grass	Regime	Year	LSMean	SE	LSMean	LCL	UCL
Mixed	Burned only	2011	−1.368	0.200	19.3	13.7	26.4
		2012	−1.236	0.188	21.5	15.7	28.6
		2013	−1.112	0.182	23.7	17.7	31.0
	Grazed only	2011	−1.170	0.131	22.7	18.3	27.6
		2012	−1.168	0.124	22.7	18.6	27.4
		2013	−1.175	0.124	22.6	18.5	27.3
	Burned-grazed	2011	−1.269	0.128	20.9	16.9	25.6
		2012	−1.368	0.131	19.3	15.5	23.8
		2013	−1.306	0.129	20.3	16.4	24.9
	Rest	2011	−1.202	0.357	22.1	12.0	36.7
		2012	−1.421	0.380	18.5	9.3	32.7
		2013	−1.128	0.350	23.5	13.0	38.1
Tall	Burned only	2012	−1.663	0.237	14.9	9.6	22.2
		2013	−1.613	0.233	15.6	10.2	22.9
	Grazed only	2012	−1.112	0.196	23.8	17.3	31.6
		2013	−1.107	0.191	23.8	17.5	31.4
	Burned-grazed	2012	−1.495	0.389	17.3	8.5	31.5
		2013	−1.265	0.363	21.0	11.2	35.5
	Rest	2012	−0.763	0.323	30.8	18.9	45.7
		2013	−0.968	0.337	26.5	15.4	41.4



[Brn-Grz, burned-grazed; %, percent; SD, standard deviation]

Figure 3.2. Back-transformed least squares mean standard deviation of the mean cover (percent) of smooth brome (*Bromus inermis*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits.

C. Mean Kentucky Bluegrass Cover (percent)

Table 3.5. Generalized linear mixed model, assuming a beta distribution with a logit link, $y = (y+1)$, testing the influence of management regime and year on the mean cover (percent) of Kentucky bluegrass (*Poa pratensis*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

Effect	Source of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × regime × year	19	180.1	1.44	0.1121
Contrasts:	Mixed: regime effect	3	74.5	0.50	0.6860
	Mixed: year effect	2	127.5	3.71	0.0272
	Mixed: interaction	6	128.1	1.40	0.2200
	Tall: regime effect	3	89.7	0.59	0.6203
	Tall: year effect	1	123.5	0.93	0.3356
	Tall: interaction	3	123.5	0.49	0.6931
	Mixed versus tall: burned only	1	83.1	1.03	0.3141
	Mixed versus tall: grazed only	1	87.7	0.54	0.4660
	Mixed versus tall: burned-grazed	1	87.6	0.73	0.3954
	Mixed versus tall: rest	1	81.3	0.03	0.8673

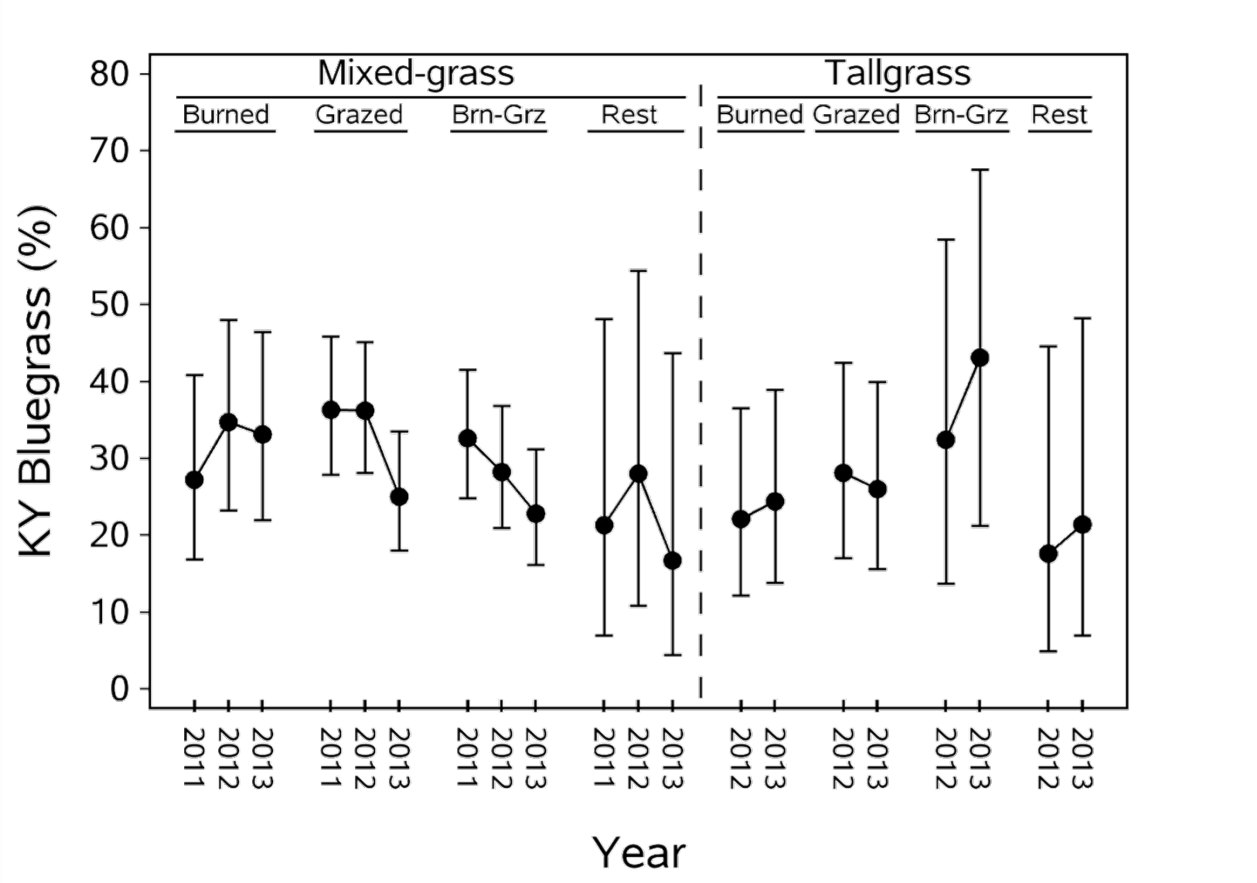
[1]Sources of variation for the model: Y=Unit(Grass type × Regime) + Grass type × Regime × Year + Year × Unit(Grass type × Regime), where Grass type × Regime × Year is a fixed effect, Unit(Grass type × Regime) and Year × Unit(Grass type × Regime) are random effects in a mixed-model framework, and Year is a repeated-measures factor.

[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 3.6. Least squares mean (standard error) and back-transformed least squares mean cover (percent) of Kentucky bluegrass (*Poa pratensis*) (95-percent confidence intervals), by grassland type (mixed-grass, tallgrass), overall treatment regime (burned only, grazed only, burned-grazed, or rest), and year (2011, 2012, 2013), on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

					Back-transformed		
						95-percent confidence intervals	
Grass	Regime	Year	LSMean	SE	LSMean	LCL	UCL
Mixed	Burned only	2011	−0.932	0.306	27.2	16.8	40.8
		2012	−0.589	0.281	34.7	23.2	48.0
		2013	−0.661	0.284	33.1	21.9	46.4
	Grazed only	2011	−0.517	0.199	36.3	27.8	45.8
		2012	−0.523	0.186	36.2	28.1	45.1
		2013	−1.046	0.206	25.0	18.0	33.5
	Burned-grazed	2011	−0.680	0.193	32.6	24.8	41.5
		2012	−0.886	0.198	28.2	20.9	36.8
		2013	−1.162	0.213	22.8	16.1	31.2
	Rest	2011	−1.250	0.619	21.3	6.9	48.1
		2012	−0.896	0.567	28.0	10.8	54.4
		2013	−1.535	0.674	16.7	4.4	43.7
Tall	Burned only	2012	−1.202	0.353	22.1	12.1	36.5
		2013	−1.079	0.342	24.4	13.8	38.9
	Grazed only	2012	−0.893	0.319	28.1	17.0	42.4
		2013	−0.992	0.317	26.0	15.6	39.9
	Burned-grazed	2012	−0.689	0.546	32.4	13.7	58.4
		2013	−0.239	0.519	43.1	21.2	67.5
	Rest	2012	−1.479	0.662	17.6	4.9	44.5
		2013	−1.243	0.618	21.4	6.9	48.2



[Brn-Grz, burned-grazed; %, percent; KY, Kentucky]

Figure 3.3. Back-transformed least squares mean cover (percent) of Kentucky bluegrass (*Poa pratensis*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits.

D. Standard Deviation of Kentucky Bluegrass Cover (percent)

Table 3.7. Generalized linear mixed model, assuming a beta distribution with a logit link, $y = (y+1)$, testing the influence of management regime and year on standard deviation of the mean cover (percent) of Kentucky bluegrass (*Poa pratensis*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

Effect	Source of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × regime × year	19	181.1	1.43	0.1183
Contrasts:	Mixed: regime effect	3	76.3	2.51	0.0650
	Mixed: year effect	2	127.6	3.97	0.0213
	Mixed: interaction	6	130.0	0.45	0.8426
	Tall: regime effect	3	95.6	0.24	0.8714
	Tall: year effect	1	124.6	0.92	0.3394
	Tall: interaction	3	125.3	1.72	0.1659
	Mixed versus tall: burned only	1	87.8	5.53	0.0209
	Mixed versus tall: grazed only	1	92.7	0.02	0.8803
	Mixed versus tall: burned-grazed	1	93.1	0.05	0.8190
	Mixed versus tall: rest	1	85.5	0.62	0.4349

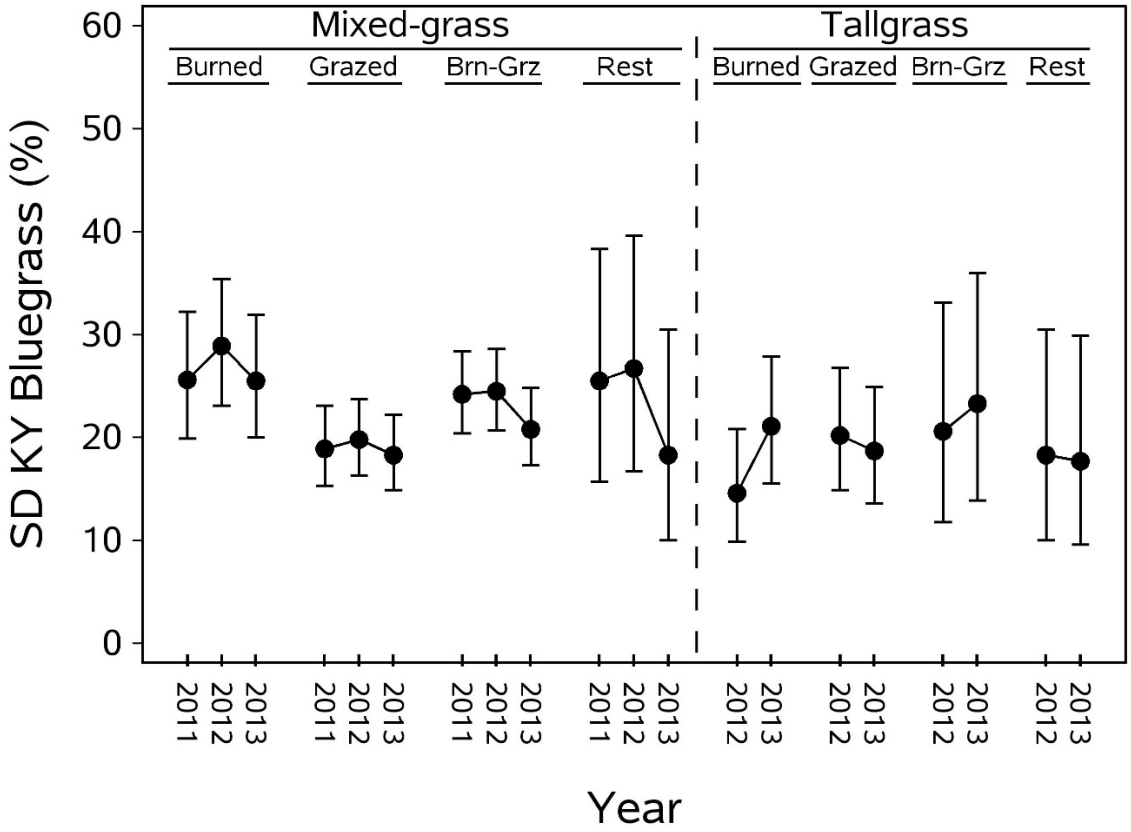
[1]Sources of variation for the model: Y=Unit(Grass type × Regime) + Grass type × Regime × Year + Year × Unit(Grass type × Regime), where Grass type × Regime × Year is a fixed effect, Unit(Grass type × Regime) and Year × Unit(Grass type × Regime) are random effects in a mixed-model framework, and Year is a repeated-measures factor.

[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 3.8. Least squares mean (standard error) and back-transformed least squares mean cover (percent) of Kentucky bluegrass (*Poa pratensis*) (95-percent confidence intervals), by grassland type (mixed-grass, tallgrass), overall treatment regime (burned only, grazed only, burned-grazed, or rest), and year (2011, 2012, 2013), on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

					Back-transformed		
						95-percent confidence intervals	
Grass	Regime	Year	LSMean	SE	LSMean	LCL	UCL
Mixed	Burned only	2011	−1.013	0.161	25.6	19.9	32.2
		2012	−0.852	0.151	28.9	23.1	35.4
		2013	−1.021	0.156	25.5	20.0	31.9
	Grazed only	2011	−1.392	0.125	18.9	15.3	23.1
		2012	−1.338	0.114	19.8	16.3	23.7
		2013	−1.431	0.118	18.3	14.9	22.2
	Burned-grazed	2011	−1.089	0.108	24.2	20.4	28.4
		2012	−1.073	0.106	24.5	20.7	28.6
		2013	−1.275	0.113	20.8	17.3	24.8
	Rest	2011	−1.022	0.299	25.5	15.7	38.3
		2012	−0.957	0.295	26.7	16.7	39.6
		2013	−1.433	0.335	18.3	10.0	30.5
Tall	Burned only	2012	−1.692	0.210	14.6	9.9	20.8
		2013	−1.263	0.184	21.1	15.5	27.9
	Grazed only	2012	−1.311	0.183	20.2	14.9	26.8
		2013	−1.406	0.182	18.7	13.6	24.9
	Burned-grazed	2012	−1.290	0.321	20.6	11.8	33.1
		2013	−1.138	0.308	23.3	13.9	36.0
	Rest	2012	−1.431	0.335	18.3	10.0	30.5
		2013	−1.467	0.338	17.7	9.6	29.9



[Brn-Grz, burned-grazed; %, percent; KY, Kentucky; SD, standard deviation]

Figure 3.4. Back-transformed least squares mean standard deviation of the mean cover (percent) of Kentucky bluegrass (*Poa pratensis*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits.

E. Mean Native Forb Cover (percent)

Table 3.9. Generalized linear mixed model, assuming a beta distribution with a logit link, $y = (y+1)$, testing the influence of management regime and year on mean native forb cover (percent) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[<, less than; *, evidence for moderate effect ($0.05<p\leq0.10$); **, evidence for strong effect ($p\leq0.05$)]

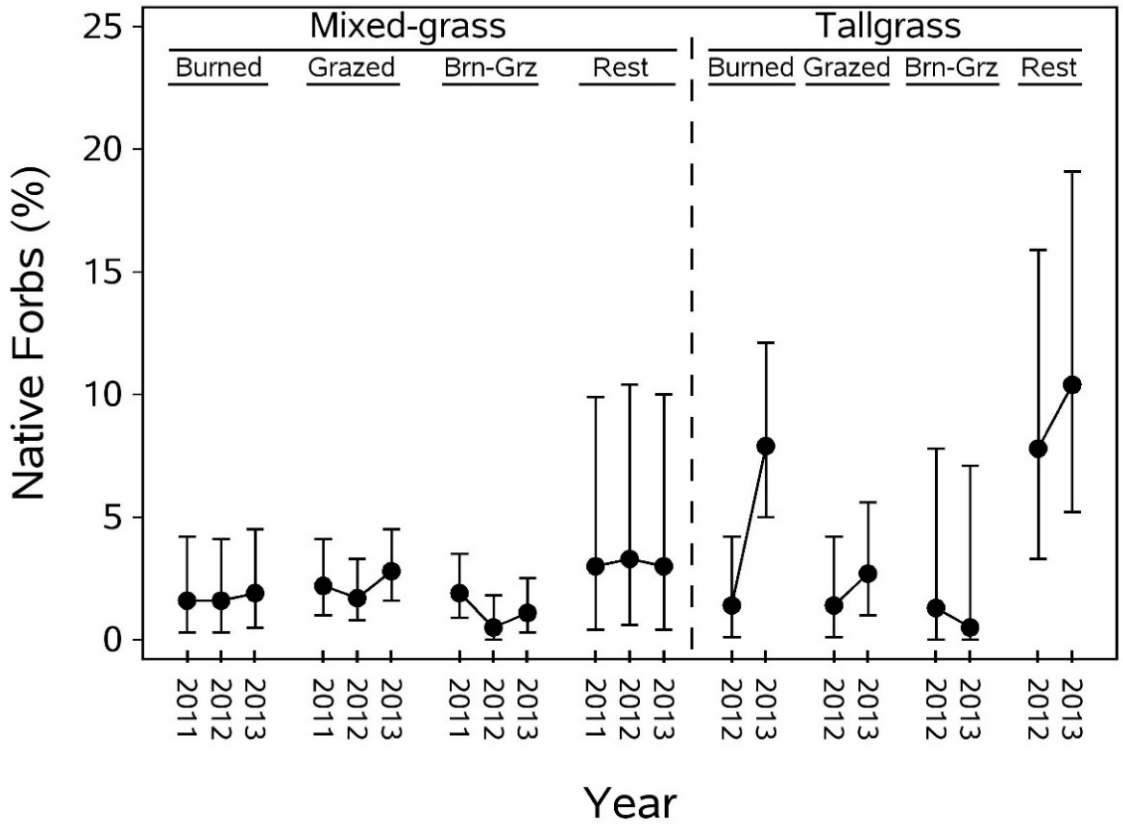
Effect	Source of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × regime × year	19	181.8	2.96	<0.0001**
Contrasts:	Mixed: regime effect	3	77.3	1.27	0.2914
	Mixed: year effect	2	133.0	0.58	0.5628
	Mixed: interaction	6	138.6	0.54	0.7732
	Tall: regime effect	3	106.1	3.88	0.0112**
	Tall: year effect	1	130.5	2.23	0.1381
	Tall: interaction	3	134.3	2.03	0.1124
	Mixed versus tall: burned only	1	92.0	2.39	0.1253
	Mixed versus tall: grazed only	1	102.2	0.07	0.7989
	Mixed versus tall: burned-grazed	1	101.4	0.04	0.8422
	Mixed versus tall: rest	1	83.5	3.59	0.0616*

[1]Sources of variation for the model: Y=Unit(Grass type × Regime) + Grass type × Regime × Year + Year × Unit(Grass type × Regime), where Grass type × Regime × Year is a fixed effect, Unit(Grass type × Regime) and Year × Unit(Grass type × Regime) are random effects in a mixed-model framework, and Year is a repeated-measures factor.
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 3.10. Least squares mean (standard error) and back-transformed least squares mean (95-percent confidence intervals) of native forb cover (percent), by grassland type (mixed-grass, tallgrass), overall treatment regime (burned only, grazed only, burned-grazed, or rest), and year (2011, 2012, 2013), on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

					Back-transformed		
						95-percent confidence intervals	
Grass	Regime	Year	LSMean	SE	LSMean	LCL	UCL
Mixed	Burned only	2011	−3.636	0.373	1.6	0.3	4.2
		2012	−3.617	0.355	1.6	0.3	4.1
		2013	−3.503	0.336	1.9	0.5	4.5
	Grazed only	2011	−3.401	0.240	2.2	1.0	4.1
		2012	−3.567	0.234	1.7	0.8	3.3
		2013	−3.231	0.200	2.8	1.6	4.5
	Burned-grazed	2011	−3.498	0.231	1.9	0.9	3.5
		2012	−4.167	0.312	0.5	0.0	1.8
		2013	−3.826	0.265	1.1	0.3	2.5
	Rest	2011	−3.191	0.557	3.0	0.4	9.9
		2012	−3.095	0.533	3.3	0.6	10.4
		2013	−3.174	0.552	3.0	0.4	10.0
Tall	Burned only	2012	−3.693	0.407	1.4	0.1	4.2
		2013	−2.324	0.220	7.9	5.0	12.1
	Grazed only	2012	−3.705	0.406	1.4	0.1	4.2
		2013	−3.270	0.316	2.7	1.0	5.6
	Burned-grazed	2012	−3.767	0.730	1.3	0.0	7.8
		2013	−4.176	0.888	0.5	0.0	7.1
	Rest	2012	−2.342	0.384	7.8	3.3	15.9
		2013	−2.053	0.342	10.4	5.2	19.1



[Brn-Grz, burned-grazed; %, percent]

Figure 3.5. Back-transformed least squares mean native forb cover (percent) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits.

F. Standard Deviation of Native Forb Cover (percent)

Table 3.11. Generalized linear mixed model, assuming a beta distribution with a logit link, $y = (y+1)$, testing the influence of management regime and year on standard deviation of native forb cover (percent) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[**, evidence for strong effect ($p \leq 0.05$)]

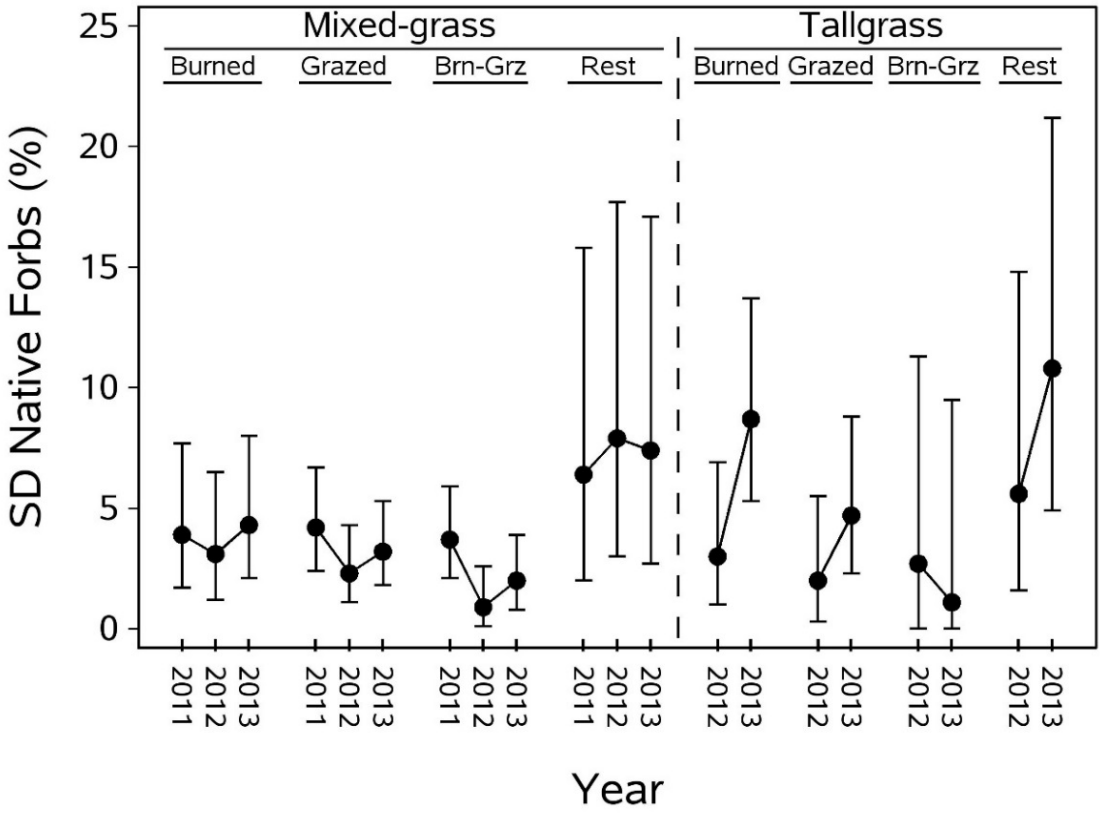
Effect	Source of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × regime × year	19	182.4	2.06	0.0076**
Contrasts:	Mixed: regime effect	3	79.0	2.81	0.0446**
	Mixed: year effect	2	137.7	1.71	0.1851
	Mixed: interaction	6	143.2	0.73	0.6292
	Tall: regime effect	3	109.5	1.52	0.2125
	Tall: year effect	1	132.5	2.03	0.1564
	Tall: interaction	3	134.0	0.86	0.4624
	Mixed versus tall: burned only	1	94.4	0.78	0.3806
	Mixed versus tall: grazed only	1	106.1	0.00	0.9854
	Mixed versus tall: burned-grazed	1	105.1	0.02	0.8914
	Mixed versus tall: rest	1	92.1	0.03	0.8703

[1]Sources of variation for the model: Y=Unit(Grass type × Regime) + Grass type × Regime × Year + Year × Unit(Grass type × Regime), where Grass type × Regime × Year is a fixed effect, Unit(Grass type × Regime) and Year × Unit(Grass type × Regime) are random effects in a mixed-model framework, and Year is a repeated-measures factor.
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 3.12. Least squares mean (standard error) and back-transformed least squares mean (95-percent confidence intervals) of standard deviation of native forb cover (percent), by grassland type (mixed-grass, tallgrass), overall treatment regime (burned only, grazed only, burned-grazed, or rest), and year (2011, 2012, 2013), on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

					Back-transformed		
						95-percent confidence intervals	
Grass	Regime	Year	LSMean	SE	LSMean	LCL	UCL
Mixed	Burned only	2011	−2.967	0.314	3.9	1.7	7.7
		2012	−3.153	0.327	3.1	1.2	6.5
		2013	−2.874	0.288	4.3	2.1	8.0
	Grazed only	2011	−2.908	0.220	4.2	2.4	6.7
		2012	−3.371	0.245	2.3	1.1	4.3
		2013	−3.135	0.220	3.2	1.8	5.3
	Burned-grazed	2011	−3.019	0.212	3.7	2.1	5.9
		2012	−3.919	0.317	0.9	0.1	2.6
		2013	−3.472	0.257	2.0	0.8	3.9
	Rest	2011	−2.531	0.475	6.4	2.0	15.8
		2012	−2.323	0.436	7.9	3.0	17.7
		2013	−2.390	0.448	7.4	2.7	17.1
Tall	Burned only	2012	−3.172	0.365	3.0	1.0	6.9
		2013	−2.233	0.243	8.7	5.3	13.7
	Grazed only	2012	−3.490	0.421	2.0	0.3	5.5
		2013	−2.798	0.292	4.7	2.3	8.8
	Burned-grazed	2012	−3.257	0.658	2.7	0.0	11.3
		2013	−3.863	0.875	1.1	0.0	9.5
	Rest	2012	−2.657	0.502	5.6	1.6	14.8
		2013	−2.012	0.385	10.8	4.9	21.2



[Brn-Grz, burned-grazed; %, percent; SD, standard deviation]

Figure 3.6. Back-transformed least squares mean standard deviation of native forb cover (percent) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits.

G. Mean Native Grass Cover (percent)

Table 3.13. Generalized linear mixed model, assuming a beta distribution with a logit link, $y = (y+1)$, testing the influence of management regime and year on mean native grass cover (percent) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[*, evidence for moderate effect ($0.05 < p \leq 0.10$); **, evidence for strong effect ($p \leq 0.05$)]

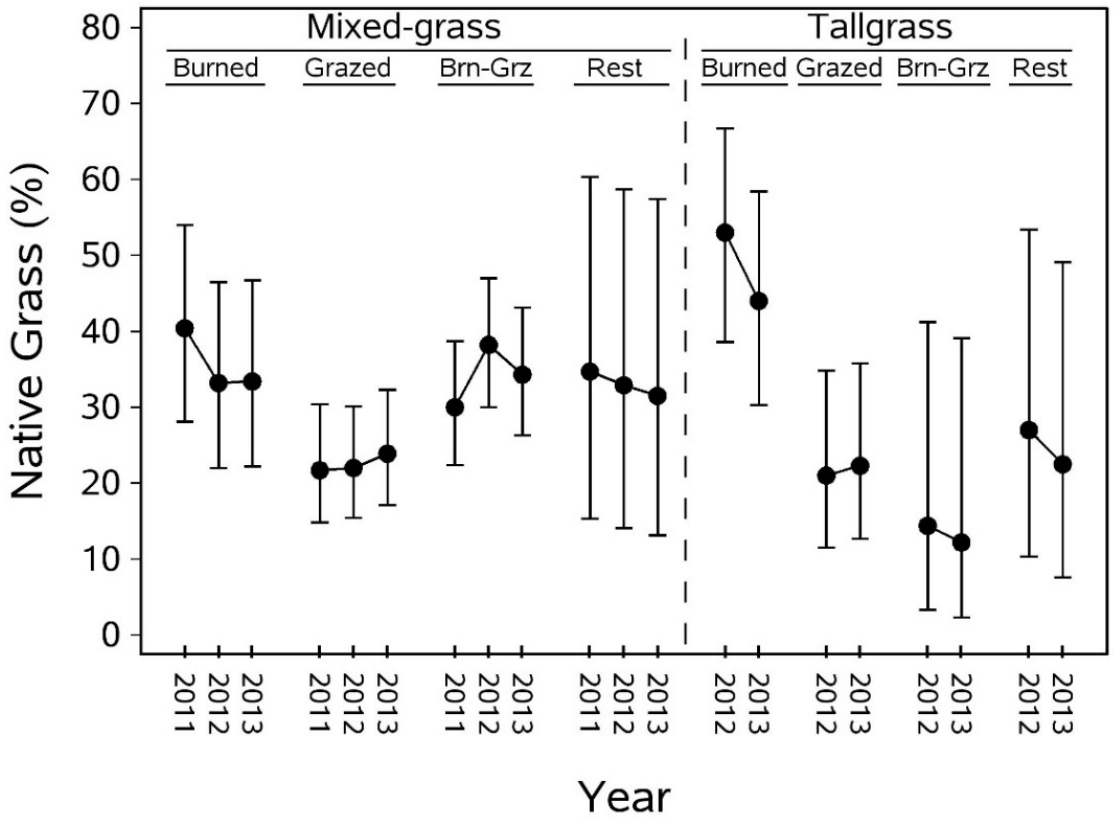
Effect	Source of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × regime × year	19	182.0	1.63	0.0533*
Contrasts:	Mixed: regime effect	3	79.8	2.17	0.0982*
	Mixed: year effect	2	130.0	0.03	0.9704
	Mixed: interaction	6	131.6	1.43	0.2070
	Tall: regime effect	3	94.2	3.96	0.0105**
	Tall: year effect	1	128.7	0.82	0.3680
	Tall: interaction	3	128.7	0.56	0.6404
	Mixed versus tall: burned only	1	87.0	2.03	0.1578
	Mixed versus tall: grazed only	1	92.3	0.02	0.8968
	Mixed versus tall: burned-grazed	1	92.9	2.82	0.0964*
	Mixed versus tall: rest	1	86.7	0.30	0.5832

[1]Sources of variation for the model: Y=Unit(Grass type × Regime) + Grass type × Regime × Year + Year × Unit(Grass type × Regime), where Grass type × Regime × Year is a fixed effect, Unit(Grass type × Regime) and Year × Unit(Grass type × Regime) are random effects in a mixed-model framework, and Year is a repeated-measures factor.
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 3.14. Least squares mean (standard error) and back-transformed least squares mean (95-percent confidence intervals) of native grass cover (percent), by grassland type (mixed-grass, tallgrass), overall treatment regime (burned only, grazed only, burned-grazed, or rest), and year (2011, 2012, 2013), on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

					Back-transformed		
						95-percent confidence intervals	
Grass	Regime	Year	LSMean	SE	LSMean	LCL	UCL
Mixed	Burned only	2011	−0.346	0.278	40.4	28.1	54.0
		2012	−0.653	0.282	33.2	22.0	46.5
		2013	−0.645	0.282	33.4	22.2	46.7
	Grazed only	2011	−1.225	0.227	21.7	14.8	30.4
		2012	−1.211	0.213	22.0	15.4	30.1
		2013	−1.104	0.208	23.9	17.1	32.3
	Burned-grazed	2011	−0.800	0.196	30.0	22.4	38.7
		2012	−0.440	0.184	38.2	30.0	47.0
		2013	−0.608	0.189	34.3	26.3	43.1
	Rest	2011	−0.586	0.534	34.7	15.3	60.3
		2012	−0.667	0.541	32.9	14.1	58.7
		2013	−0.732	0.547	31.5	13.1	57.4
Tall	Burned only	2012	0.160	0.297	53.0	38.6	66.7
		2013	−0.203	0.297	44.0	30.3	58.4
	Grazed only	2012	−1.266	0.348	21.0	11.5	34.8
		2013	−1.189	0.332	22.3	12.7	35.8
	Burned-grazed	2012	−1.704	0.710	14.4	3.3	41.2
		2013	−1.881	0.756	12.2	2.3	39.1
	Rest	2012	−0.942	0.570	27.0	10.3	53.4
		2013	−1.179	0.604	22.5	7.6	49.1



[Brn-Grz, burned-grazed; %, percent]

Figure 3.7. Back-transformed least squares mean native grass cover (percent) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits.

H. Standard Deviation of Native Grass Cover (percent)

Table 3.15. Generalized linear mixed model, assuming a beta distribution with a logit link, $y = (y+1)$, testing the influence of management regime and year on standard deviation of native grass cover (percent) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[*, evidence for moderate effect ($0.05<p\leq0.10$)]

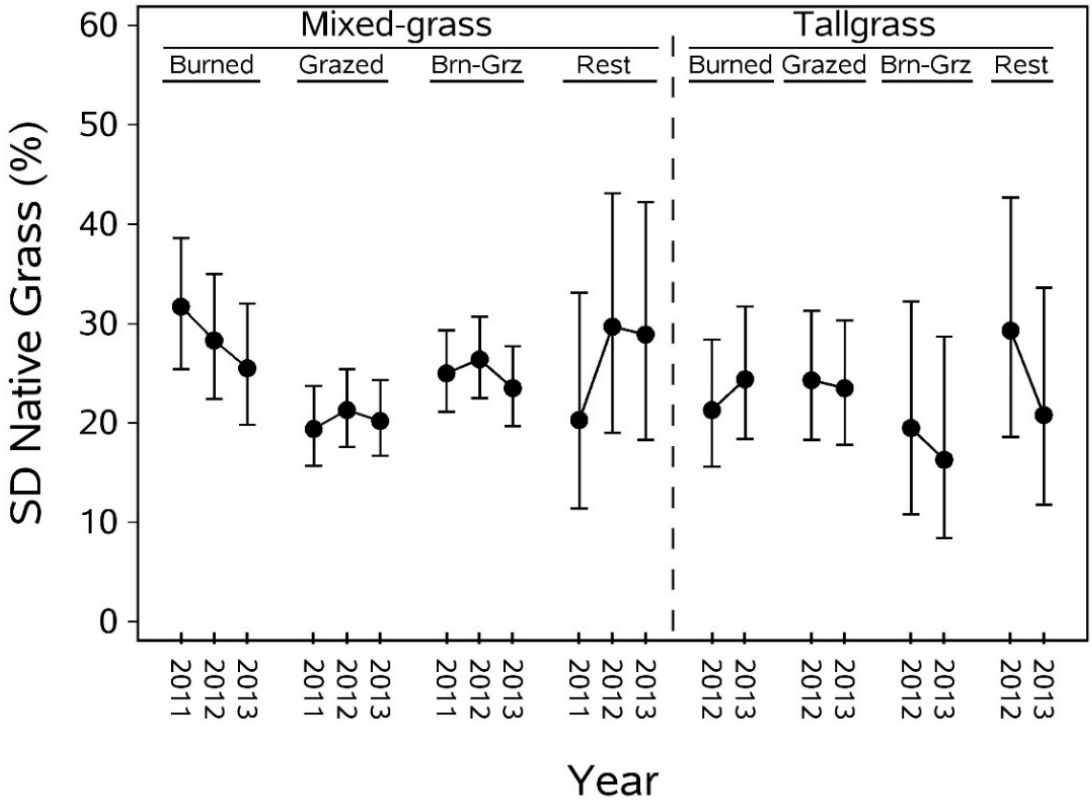
Effect	Source of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × regime × year	19	180.6	1.56	0.0713*
Contrasts:	Mixed: regime effect	3	76.4	2.37	0.0769*
	Mixed: year effect	2	127.1	2.52	0.0843*
	Mixed: interaction	6	128.3	1.44	0.2030
	Tall: regime effect	3	90.1	0.37	0.7753
	Tall: year effect	1	126.6	1.84	0.1773
	Tall: interaction	3	126.5	2.07	0.1079
	Mixed versus tall: burned only	1	83.9	1.68	0.1991
	Mixed versus tall: grazed only	1	87.8	1.11	0.2939
	Mixed versus tall: burned-grazed	1	88.6	1.49	0.2262
	Mixed versus tall: rest	1	82.4	0.03	0.8710

[1]Sources of variation for the model: Y=Unit(Grass type × Regime) + Grass type × Regime × Year + Year × Unit(Grass type × Regime), where Grass type × Regime × Year is a fixed effect, Unit(Grass type × Regime) and Year × Unit(Grass type × Regime) are random effects in a mixed-model framework, and Year is a repeated-measures factor.
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 3.16. Least squares mean (standard error) and back-transformed least squares mean (95-percent confidence intervals) of standard deviation of native grass cover (percent), by grassland type (mixed-grass, tallgrass), overall treatment regime (burned only, grazed only, burned-grazed, or rest), and year (2011, 2012, 2013), on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

					Back-transformed		
						95-percent confidence intervals	
Grass	Regime	Year	LSMean	SE	LSMean	LCL	UCL
Mixed	Burned only	2011	−0.724	0.154	31.7	25.4	38.6
		2012	−0.882	0.155	28.3	22.4	35.0
		2013	−1.022	0.160	25.5	19.8	32.0
	Grazed only	2011	−1.360	0.125	19.4	15.7	23.7
		2012	−1.251	0.114	21.3	17.6	25.4
		2013	−1.310	0.116	20.2	16.7	24.3
	Burned-grazed	2011	−1.048	0.109	25.0	21.1	29.3
		2012	−0.974	0.106	26.4	22.5	30.7
		2013	−1.126	0.111	23.5	19.7	27.7
	Rest	2011	−1.305	0.331	20.3	11.4	33.1
		2012	−0.813	0.294	29.7	19.0	43.1
		2013	−0.852	0.296	28.9	18.3	42.2
Tall	Burned only	2012	−1.246	0.188	21.3	15.6	28.4
		2013	−1.075	0.180	24.4	18.4	31.7
	Grazed only	2012	−1.085	0.175	24.3	18.3	31.3
		2013	−1.125	0.172	23.5	17.8	30.3
	Burned-grazed	2012	−1.356	0.336	19.5	10.8	32.2
		2013	−1.565	0.358	16.3	8.4	28.7
	Rest	2012	−0.832	0.295	29.3	18.6	42.7
		2013	−1.278	0.328	20.8	11.8	33.6



[Brn-Grz, burned-grazed; %, percent; SD, standard deviation]

Figure 3.8. Back-transformed least squares mean standard deviation of native grass cover (percent) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits.

I. Mean Nonnative Forb Cover (percent)

Table 3.17. Generalized linear mixed model, assuming a beta distribution with a logit link, $y = (y+1)$, testing the influence of management regime and year on mean nonnative forb cover (percent) on two grass types on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

Effect	Source of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × regime × year	19	177.5	0.77	0.7417
Contrasts:	Mixed: regime effect	3	70.5	0.19	0.9020
	Mixed: year effect	2	132.7	4.02	0.0201
	Mixed: interaction	6	137.5	0.66	0.6859
	Tall: regime effect	3	98.6	0.33	0.8045
	Tall: year effect	1	108.2	0.03	0.8545
	Tall: interaction	3	108.9	0.21	0.8867
	Mixed versus tall: burned only	1	84.1	1.13	0.2913
	Mixed versus tall: grazed only	1	93.8	0.60	0.4401
	Mixed versus tall: burned-grazed	1	95.4	0.08	0.7776
	Mixed versus tall: rest	1	85.0	0.19	0.6660

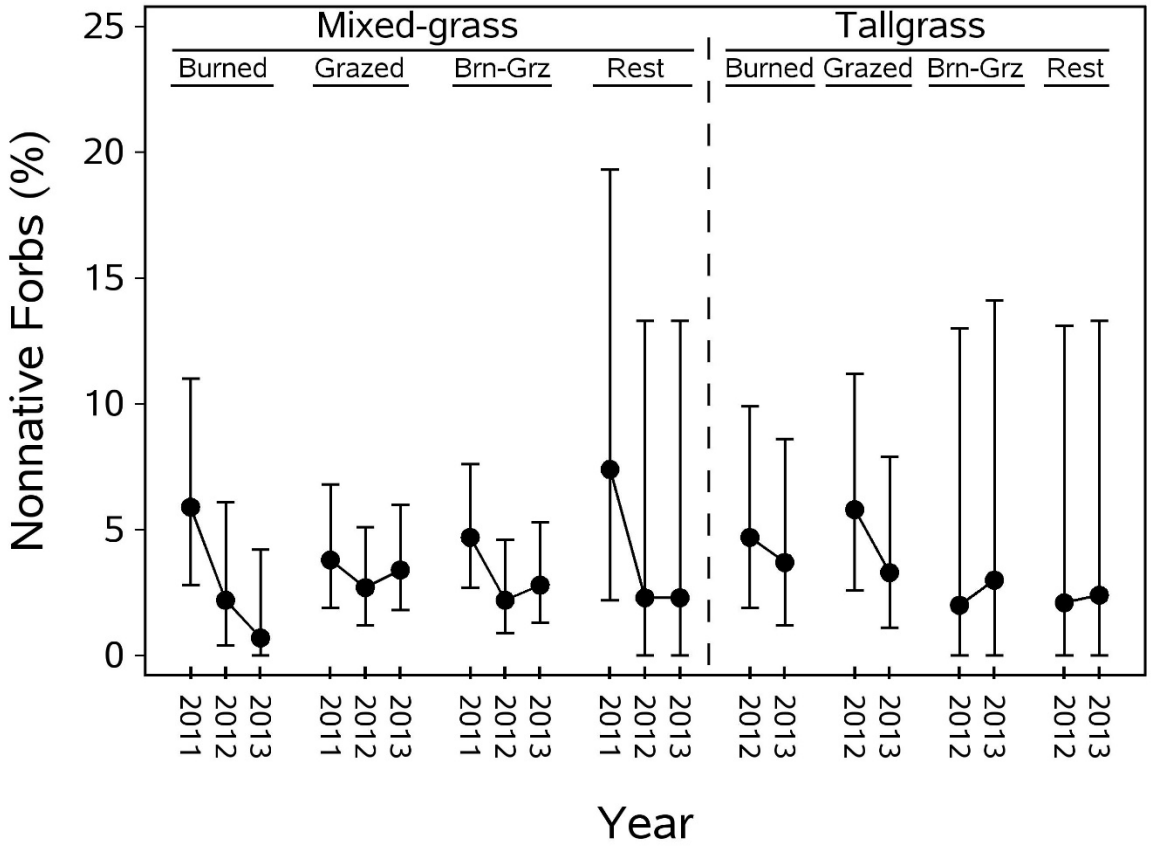
[1]Sources of variation for the model: Y=Unit(Grass type × Regime) + Grass type × Regime × Year + Year × Unit(Grass type × Regime), where Grass type × Regime × Year is a fixed effect, Unit(Grass type × Regime) and Year × Unit(Grass type × Regime) are random effects in a mixed-model framework, and Year is a repeated-measures factor.

[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 3.18. Least squares mean (standard error) and back-transformed least squares mean (95-percent confidence intervals) of nonnative forb cover (percent), by grassland type (mixed-grass, tallgrass), overall treatment regime (burned only, grazed only, burned-grazed, or rest), and year (2011, 2012, 2013), on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

					Back-transformed		
						95-percent confidence intervals	
Grass	Regime	Year	LSMean	SE	LSMean	LCL	UCL
Mixed	Burned only	2011	−2.606	0.313	5.9	2.8	11.0
		2012	−3.405	0.428	2.2	0.4	6.1
		2013	−4.060	0.585	0.7	0.0	4.2
	Grazed only	2011	−2.997	0.269	3.8	1.9	6.8
		2012	−3.264	0.271	2.7	1.2	5.1
		2013	−3.076	0.249	3.4	1.8	6.0
	Burned-grazed	2011	−2.806	0.225	4.7	2.7	7.6
		2012	−3.394	0.288	2.2	0.9	4.6
		2013	−3.231	0.267	2.8	1.3	5.3
	Rest	2011	−2.394	0.522	7.4	2.2	19.3
		2012	−3.381	0.811	2.3	0.0	13.3
		2013	−3.390	0.814	2.3	0.0	13.3
Tall	Burned only	2012	−2.811	0.361	4.7	1.9	9.9
		2013	−3.016	0.396	3.7	1.2	8.6
	Grazed only	2012	−2.624	0.332	5.8	2.6	11.2
		2013	−3.092	0.389	3.3	1.1	7.9
	Burned-grazed	2012	−3.478	0.849	2.0	0.0	13.0
		2013	−3.171	0.736	3.0	0.0	14.1
	Rest	2012	−3.437	0.832	2.1	0.0	13.1
		2013	−3.362	0.804	2.4	0.0	13.3



[Brn-Grz, burned-grazed; %, percent]

Figure 3.9. Back-transformed least squares mean nonnative forb cover (percent) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits.

J. Standard Deviation of Nonnative Forb Cover (percent)

Table 3.19. Generalized linear mixed model, assuming a beta distribution with a logit link, $y = (y+1)$, testing the influence of management regime and year on standard deviation of nonnative forb cover (percent) on two grass types on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

Effect	Source of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × regime × year	19	180.4	1.19	0.2705
Contrasts:	Mixed: regime effect	3	75.5	0.10	0.9586
	Mixed: year effect	2	140.9	5.88	0.0035
	Mixed: interaction	6	141.7	1.08	0.3768
	Tall: regime effect	3	103.0	0.18	0.9120
	Tall: year effect	1	118.6	0.00	0.9984
	Tall: interaction	3	119.2	0.73	0.5363
	Mixed versus tall: burned only	1	89.4	0.26	0.6087
	Mixed versus tall: grazed only	1	98.8	0.22	0.6419
	Mixed versus tall: burned-grazed	1	98.7	0.28	0.5958
	Mixed versus tall: rest	1	90.5	0.45	0.5055

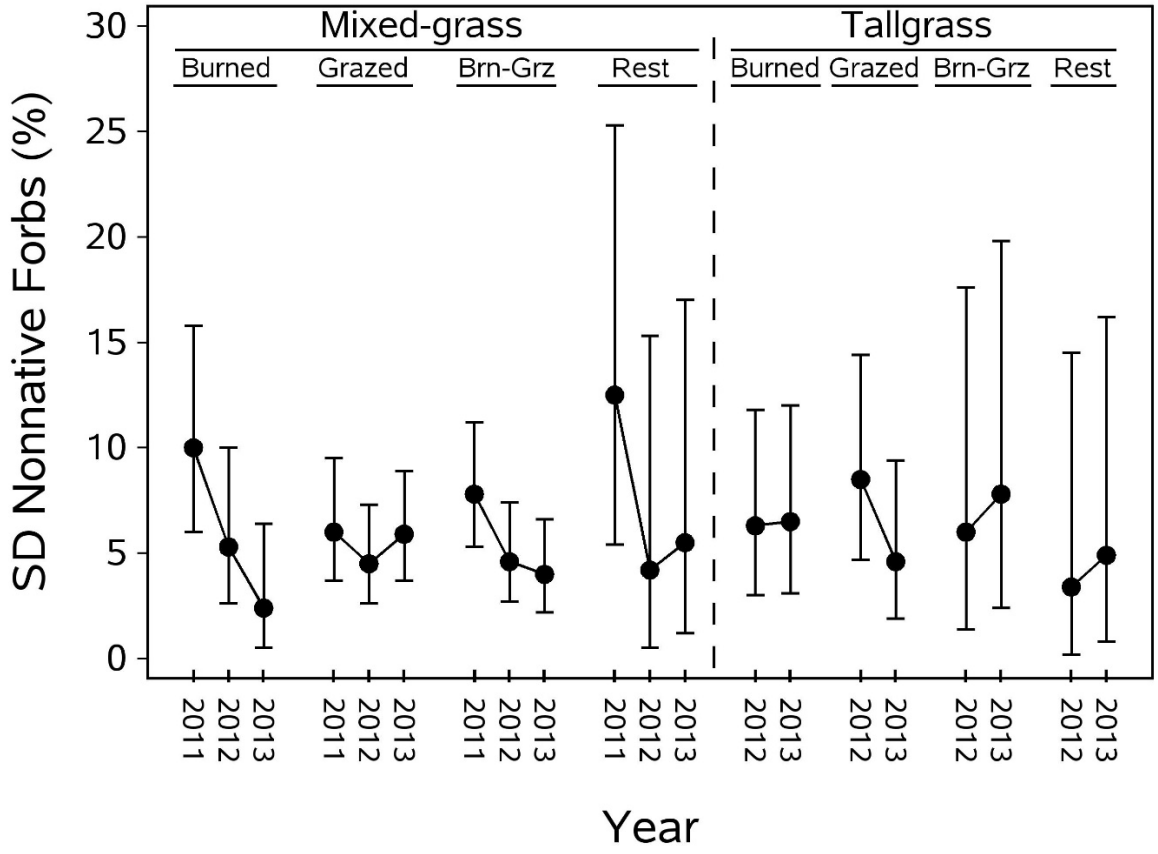
[1]Sources of variation for the model: Y=Unit(Grass type × Regime) + Grass type × Regime × Year + Year × Unit(Grass type × Regime), where Grass type × Regime × Year is a fixed effect, Unit(Grass type × Regime) and Year × Unit(Grass type × Regime) are random effects in a mixed-model framework, and Year is a repeated-measures factor.

[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 3.20. Least squares mean (standard error) and back-transformed least squares mean (95-percent confidence intervals) of standard deviation of nonnative forb cover (percent), by grassland type (mixed-grass, tallgrass), overall treatment regime (burned only, grazed only, burned-grazed, or rest), and year (2011, 2012, 2013), on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

					Back-transformed		
						95-percent confidence intervals	
Grass	Regime	Year	LSMean	SE	LSMean	LCL	UCL
Mixed	Burned only	2011	−2.093	0.252	10.0	6.0	15.8
		2012	−2.692	0.309	5.3	2.6	10.0
		2013	−3.343	0.415	2.4	0.5	6.4
	Grazed only	2011	−2.580	0.222	6.0	3.7	9.5
		2012	−2.845	0.224	4.5	2.6	7.3
		2013	−2.606	0.202	5.9	3.7	8.9
	Burned-grazed	2011	−2.335	0.183	7.8	5.3	11.2
		2012	−2.824	0.221	4.6	2.7	7.4
		2013	−2.954	0.235	4.0	2.2	6.6
	Rest	2011	−1.860	0.423	12.5	5.4	25.3
		2012	−2.911	0.652	4.2	0.5	15.3
		2013	−2.661	0.584	5.5	1.2	17.0
Tall	Burned only	2012	−2.544	0.321	6.3	3.0	11.8
		2013	−2.519	0.317	6.5	3.1	12.0
	Grazed only	2012	−2.257	0.283	8.5	4.7	14.4
		2013	−2.823	0.343	4.6	1.9	9.4
	Burned-grazed	2012	−2.583	0.565	6.0	1.4	17.6
		2013	−2.336	0.509	7.8	2.4	19.8
	Rest	2012	−3.069	0.700	3.4	0.2	14.5
		2013	−2.772	0.613	4.9	0.8	16.2



[Brn-Grz, burned-grazed; %, percent; SD, standard deviation]

Figure 3.10. Back-transformed least squares mean standard deviation of nonnative forb cover (percent) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits.

K. **Mean Nonnative Grass Cover (percent)**

Table 3.21. Generalized linear mixed model, assuming a beta distribution with a logit link, $y = (y+1)$, testing the influence of management regime and year on mean nonnative grass cover (percent) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[**, evidence for strong effect ($p \leq 0.05$)]

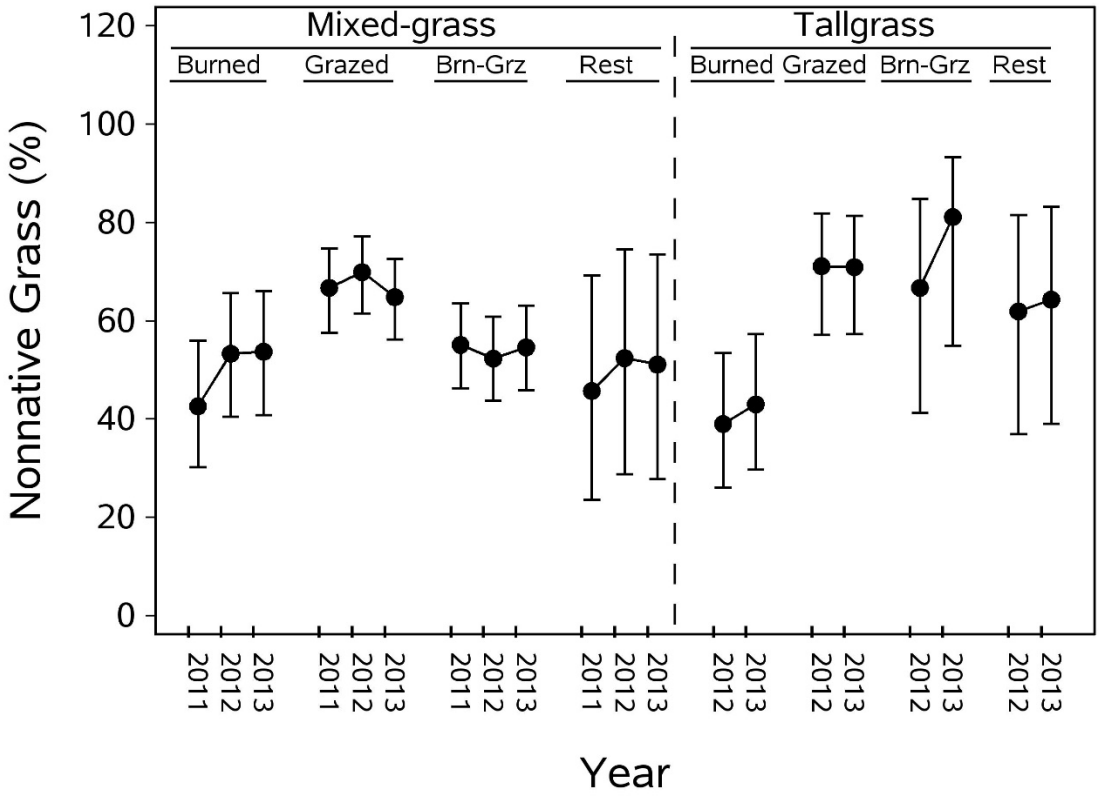
Effect	Source of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × regime × year	19	180.8	1.64	0.0500**
Contrasts:	Mixed: regime effect	3	78.3	3.29	0.0248**
	Mixed: year effect	2	128.6	0.97	0.3834
	Mixed: interaction	6	130.9	1.07	0.3861
	Tall: regime effect	3	95.8	4.30	0.0069**
	Tall: year effect	1	130.1	1.89	0.1714
	Tall: interaction	3	128.8	0.65	0.5833
	Mixed versus tall: burned only	1	87.3	1.04	0.3097
	Mixed versus tall: grazed only	1	93.4	0.31	0.5800
	Mixed versus tall: burned-grazed	1	94.2	2.71	0.1033
	Mixed versus tall: rest	1	86.2	0.73	0.3945

[1]Sources of variation for the model: Y=Unit(Grass type × Regime) + Grass type × Regime × Year + Year × Unit(Grass type × Regime), where Grass type × Regime × Year is a fixed effect, Unit(Grass type × Regime) and Year × Unit(Grass type × Regime) are random effects in a mixed-model framework, and Year is a repeated-measures factor.
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 3.22. Least squares mean (standard error) and back-transformed least squares mean (95-percent confidence intervals) of nonnative grass cover (percent), by grassland type (mixed-grass, tallgrass), overall treatment regime (burned only, grazed only, burned-grazed, or rest), and year (2011, 2012, 2013), on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

					Back-transformed		
						95-percent confidence intervals	
Grass	Regime	Year	LSMean	SE	LSMean	LCL	UCL
Mixed	Burned only	2011	−0.257	0.273	42.6	30.2	55.9
		2012	0.173	0.264	53.3	40.5	65.6
		2013	0.189	0.265	53.7	40.8	66.0
	Grazed only	2011	0.740	0.203	66.7	57.5	74.7
		2012	0.891	0.195	69.9	61.5	77.1
		2013	0.656	0.187	64.8	56.2	72.6
	Burned-grazed	2011	0.245	0.180	55.1	46.3	63.5
		2012	0.133	0.177	52.3	43.7	60.8
		2013	0.226	0.181	54.6	45.8	63.1
	Rest	2011	−0.132	0.505	45.7	23.6	69.2
		2012	0.135	0.505	52.4	28.8	74.5
		2013	0.084	0.505	51.1	27.8	73.5
Tall	Burned only	2012	−0.407	0.297	39.0	26.1	53.4
		2013	−0.241	0.293	43.0	29.7	57.3
	Grazed only	2012	0.950	0.318	71.1	57.1	81.8
		2013	0.938	0.307	70.9	57.3	81.3
	Burned-grazed	2012	0.741	0.539	66.7	41.2	84.8
		2013	1.525	0.658	81.1	54.9	93.3
	Rest	2012	0.528	0.522	61.9	36.9	81.5
		2013	0.632	0.530	64.3	39.0	83.2



[Brn-Grz, burned-grazed; %, percent]

Figure 3.11. Back-transformed least squares mean nonnative grass cover (percent) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits.

L. Standard Deviation of Nonnative Grass Cover (percent)

Table 3.23. Generalized linear mixed model, assuming a beta distribution with a logit link, $y = (y+1)$, testing the influence of management regime and year on standard deviation of nonnative grass cover (percent) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

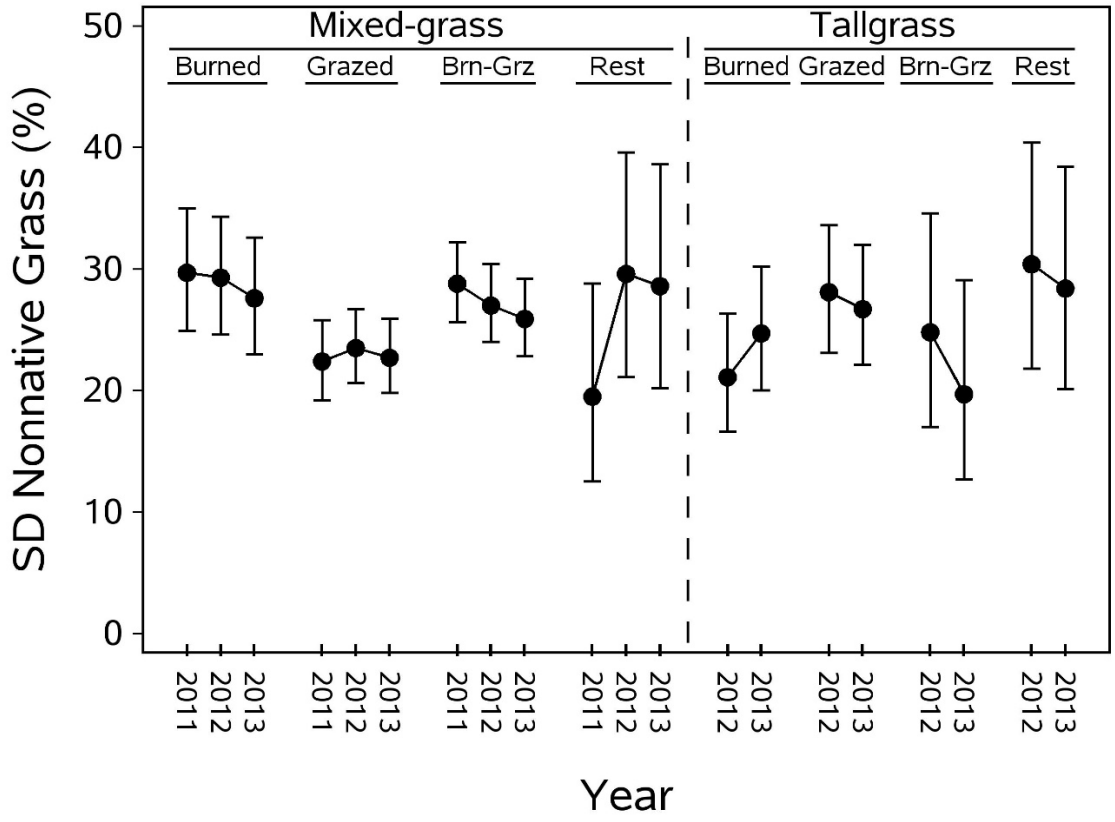
Effect	Source of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × regime × year	19	182.0	1.30	0.1879
Contrasts:	Mixed: regime effect	3	78.2	3.04	0.0340
	Mixed: year effect	2	130.2	1.51	0.2255
	Mixed: interaction	6	134.0	1.16	0.3335
	Tall: regime effect	3	101.8	1.25	0.2951
	Tall: year effect	1	125.3	0.40	0.5276
	Tall: interaction	3	125.6	1.28	0.2827
	Mixed versus tall: burned only	1	91.5	3.97	0.0494
	Mixed versus tall: grazed only	1	98.1	3.32	0.0716
	Mixed versus tall: burned-grazed	1	99.1	1.42	0.2367
	Mixed versus tall: rest	1	88.1	0.49	0.4876

[1]Sources of variation for the model: Y=Unit(Grass type × Regime) + Grass type × Regime × Year + Year × Unit(Grass type × Regime), where Grass type × Regime × Year is a fixed effect, Unit(Grass type × Regime) and Year × Unit(Grass type × Regime) are random effects in a mixed-model framework, and Year is a repeated-measures factor.
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 3.24. Least squares mean (standard error) and back-transformed least squares mean (95-percent confidence intervals) of standard deviation of nonnative grass cover (percent), by grassland type (mixed-grass, tallgrass), overall treatment regime (burned only, grazed only, burned-grazed, or rest), and year (2011, 2012, 2013), on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

					Back-transformed		
						95-percent confidence intervals	
Grass	Regime	Year	LSMean	SE	LSMean	LCL	UCL
Mixed	Burned only	2011	−0.815	0.121	29.7	24.9	35.0
		2012	−0.835	0.118	29.3	24.6	34.3
		2013	−0.917	0.120	27.6	23.0	32.6
	Grazed only	2011	−1.188	0.094	22.4	19.2	25.8
		2012	−1.125	0.085	23.5	20.6	26.7
		2013	−1.168	0.086	22.7	19.8	25.9
	Burned-grazed	2011	−0.858	0.081	28.8	25.6	32.2
		2012	−0.942	0.081	27.0	24.0	30.4
		2013	−1.000	0.082	25.9	22.8	29.2
	Rest	2011	−1.358	0.256	19.5	12.5	28.8
		2012	−0.821	0.224	29.6	21.1	39.6
		2013	−0.867	0.226	28.6	20.2	38.6
Tall	Burned only	2012	−1.261	0.144	21.1	16.6	26.3
		2013	−1.060	0.137	24.7	20.0	30.2
	Grazed only	2012	−0.891	0.130	28.1	23.1	33.6
		2013	−0.957	0.126	26.7	22.1	32.0
	Burned-grazed	2012	−1.055	0.236	24.8	17.0	34.6
		2013	−1.341	0.255	19.7	12.7	29.1
	Rest	2012	−0.783	0.223	30.4	21.8	40.4
		2013	−0.874	0.227	28.4	20.1	38.4



[Brn-Grz, burned-grazed; %, percent; SD, standard deviation]

Figure 3.12. Back-transformed least squares mean standard deviation of nonnative grass cover (percent) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits.

M. Defoliation Index

Table 3.25. Generalized linear mixed model, assuming a gamma distribution with a log link, $y = (y+1)$, testing the influence of management regime and year on mean the Defoliation Index on two grass types on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[<, less than; *, evidence for moderate effect ($0.05<p\leq0.10$); **, evidence for strong effect ($p\leq0.05$)]

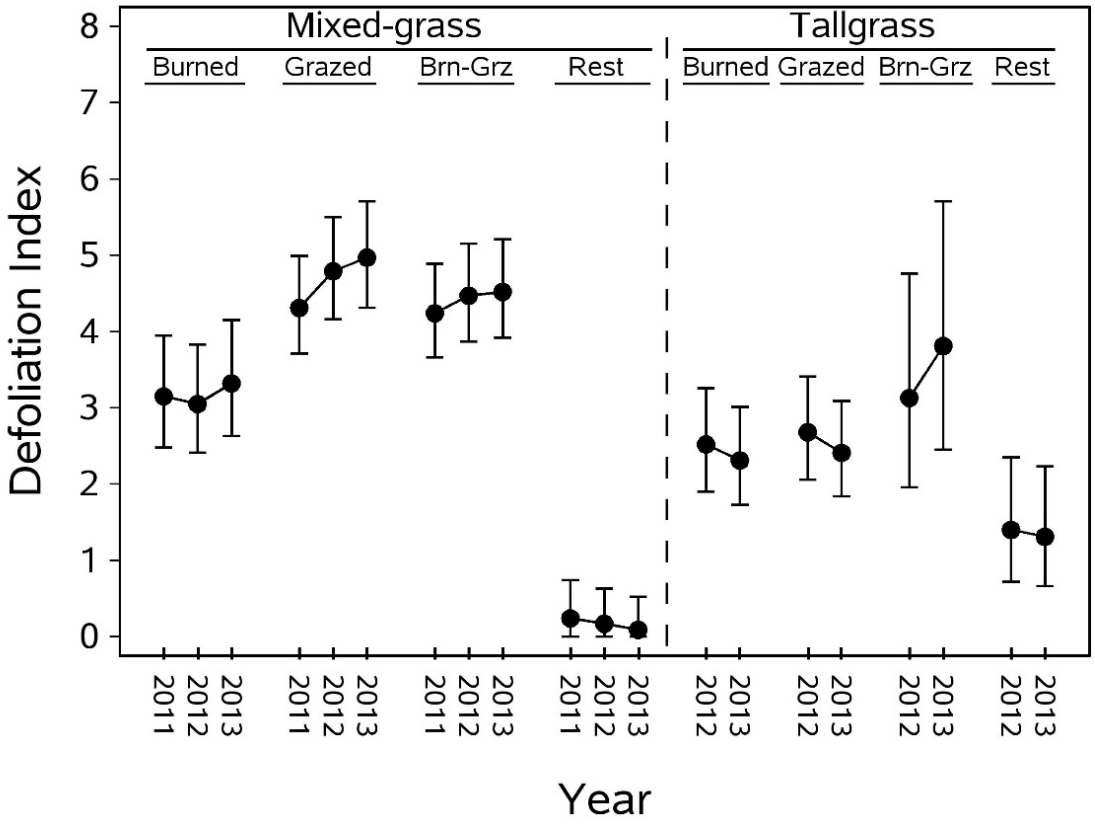
Effect	Source of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × regime × year	19	182.1	7.93	<0.0001**
Contrasts:	Mixed: regime effect	3	79.4	32.51	<0.0001**
	Mixed: year effect	2	128.7	0.12	0.8910
	Mixed: interaction	6	129.6	0.95	0.4646
	Tall: regime effect	3	88.2	2.68	0.0519*
	Tall: year effect	1	127.5	0.01	0.9129
	Tall: interaction	3	127.5	1.47	0.2252
	Mixed versus tall: burned only	1	84.1	2.60	0.1108
	Mixed versus tall: grazed only	1	86.2	20.43	<0.0001**
	Mixed versus tall: burned-grazed	1	87.3	1.28	0.2618
	Mixed versus tall: rest	1	83.4	9.66	0.0026**

[1]Sources of variation for the model: Y=Unit(Grass type × Regime) + Grass type × Regime × Year + Year × Unit(Grass type × Regime), where Grass type × Regime × Year is a fixed effect, Unit(Grass type × Regime) and Year × Unit(Grass type × Regime) are random effects in a mixed-model framework, and Year is a repeated-measures factor.
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 3.26. Least squares mean (standard error) and back-transformed least squares mean (95-percent confidence intervals) of the Defoliation Index, by grassland type (mixed-grass, tallgrass), overall treatment regime (burned only, grazed only, burned-grazed, or rest), and year (2011, 2012, 2013), on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

					Back-transformed		
						95-percent confidence intervals	
Grass	Regime	Year	LSMean	SE	LSMean	LCL	UCL
Mixed	Burned only	2011	1.42	0.09	3.15	2.48	3.95
		2012	1.40	0.09	3.05	2.41	3.83
		2013	1.46	0.09	3.32	2.63	4.15
	Grazed only	2011	1.67	0.06	4.31	3.71	4.99
		2012	1.76	0.06	4.79	4.16	5.50
		2013	1.79	0.06	4.97	4.31	5.71
	Burned-grazed	2011	1.66	0.06	4.24	3.66	4.89
		2012	1.70	0.06	4.47	3.87	5.15
		2013	1.71	0.06	4.52	3.92	5.21
	Rest	2011	0.22	0.17	0.24	0.00	0.74
		2012	0.15	0.17	0.17	0.00	0.63
		2013	0.09	0.17	0.09	0.00	0.52
Tall	Burned only	2012	1.26	0.10	2.52	1.90	3.26
		2013	1.20	0.10	2.31	1.73	3.01
	Grazed only	2012	1.30	0.09	2.68	2.06	3.41
		2013	1.23	0.09	2.41	1.84	3.09
	Burned-grazed	2012	1.42	0.17	3.13	1.96	4.76
		2013	1.57	0.17	3.81	2.45	5.71
	Rest	2012	0.87	0.17	1.40	0.72	2.35
		2013	0.84	0.17	1.31	0.66	2.23



[Brn-Grz, burned-grazed]

Figure 3.13. Back-transformed least squares mean Defoliation Index in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits.

References

Gannon, J.J., Shaffer, T.L., and Moore, C.T., 2013, Native Prairie Adaptive Management—A multi-region adaptive approach to invasive plant management on Fish and Wildlife Service owned native prairies: U.S. Geological Survey Open-File Report 2013–1279, 184 p. [Also available at *https://dx.doi.org/10.3133/ofr20131279*.]

Littell, R.C., Milliken, G.A., Stroup, W.W., Wolfinger, R.D., and Schabenberger, O., 2006, SAS® for mixed models (2d ed.): Cary, N.C., SAS Institute, Inc., 814 p.

Appendix 4. Testing the Influence of Post-Management Treatments on Vegetation Composition Variables on Federal Lands Managed under an Adaptive-Management Framework by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13

A. Mean Brome Cover (percent)

Table 4.1. Generalized linear mixed model, assuming a beta distribution with a logit link, y = (y+1percent), testing the influence of post-management treatments on mean cover (percent) of smooth brome (*Bromus inermis*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[*, evidence for moderate effect ($0.05<p\leq0.10$); **, evidence for strong effect ($p \leq 0.05$)]

Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × Treatment	18	118.7	1.61	0.0669*
Contrasts:	Mixed: burned linear	1	99.1	0.31	0.5772
	Mixed: burned quadratic	1	81.9	0.06	0.8044
	Mixed: BG0 vs BG1-3	1	93.5	1.92	0.1690
	Mixed: grazed linear	1	133.6	6.28	0.0134**
	Mixed: grazed quadratic	1	117.1	2.32	0.1301
	Tall: burned linear	1	98.7	0.31	0.5808
	Tall: grazed linear	1	123.5	7.37	0.0076**
	Tall: grazed quadratic	1	114.6	1.19	0.2781
	B1: mixed versus tall	1	152.3	0.04	0.8403
	B2: mixed versus tall	1	157.9	0.00	0.9500
	G0: mixed versus tall	1	167.9	0.03	0.8683
	G: mixed versus tall	1	165.1	0.20	0.6572
	G1: mixed versus tall	1	151.4	1.27	0.2609
	G2: mixed versus tall	1	167.3	2.95	0.0875*
	Mixed: burned versus rest	1	100.8	0.18	0.6765
	Mixed: grazed versus rest	1	98.5	0.63	0.4290
	Mixed: burned-grazed versus rest	1	103.5	0.13	0.7153
	Mixed: burned versus grazed	1	136.5	1.88	0.1722
	Tall: burned versus rest	1	164.6	2.11	0.1487
	Tall: grazed versus rest	1	161.3	0.44	0.5069
	Tall: burned versus grazed	1	163.3	1.98	0.1613

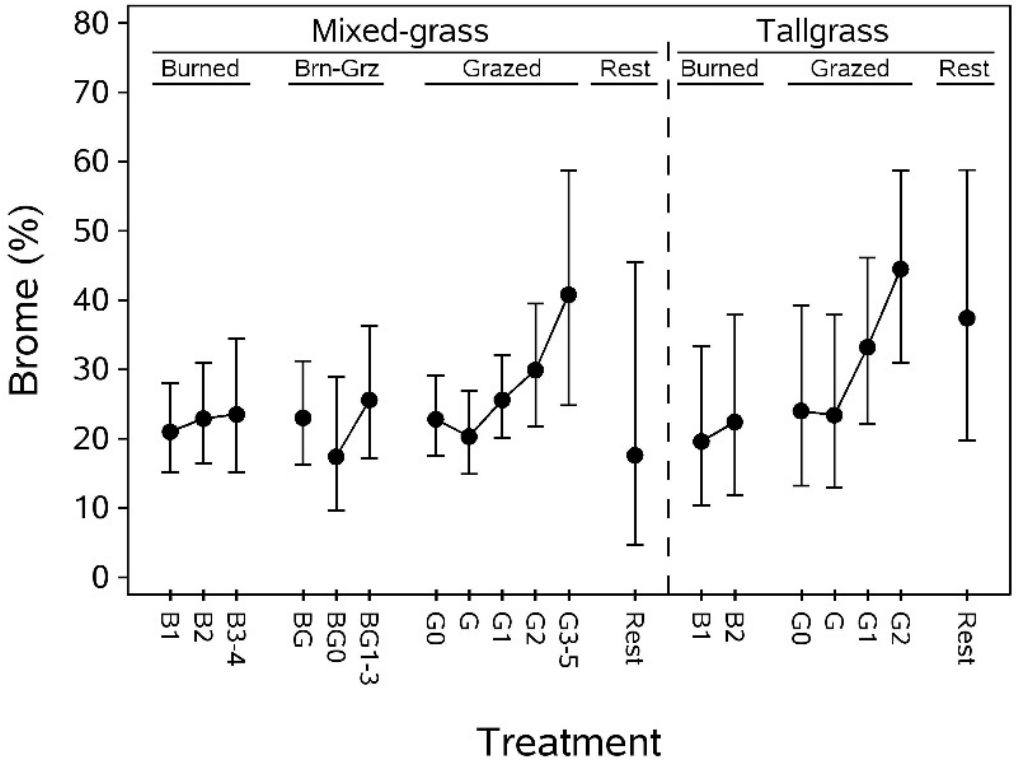
[1]Sources of variation for the model: Y=Unit(Grass type) + Grass type × Treatment + Residual, where Unit(Grass type) and Residual are random effects and Grass type × Treatment is a fixed effect in a mixed-model framework. Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 4.2. Least squares mean (standard error) cover (percent) of smooth brome (*Bromus inermis*) and back-transformed least squares mean (95-percent confidence intervals) cover (percent) of smooth brome (percent), by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

				Back-transformed		
					95-percent confidence intervals	
Grass	Treatment[1]	LSMean	SE	LSMean	LCL	UCL
Mixed	B1	−1.269	0.190	21.0	15.2	28.0
	B2	−1.157	0.205	22.9	16.4	31.0
	B3-4	−1.124	0.267	23.5	15.2	34.4
	BG	−1.153	0.209	23.0	16.3	31.2
	BG0	−1.491	0.327	17.4	9.6	28.9
	BG1-3	−1.013	0.251	25.6	17.2	36.3
	G0	−1.164	0.164	22.8	17.5	29.1
	G	−1.308	0.182	20.3	14.9	26.9
	G1	−1.013	0.157	25.6	20.1	32.1
	G2	−0.803	0.213	29.9	21.8	39.5
	G3-5	−0.332	0.371	40.8	24.8	58.7
	Rest	−1.479	0.682	17.6	4.7	45.5
Tall	B1	−1.351	0.359	19.6	10.4	33.4
	B2	−1.184	0.374	22.4	11.8	37.9
	G0	−1.099	0.358	24.0	13.2	39.2
	G	−1.133	0.348	23.4	13.0	37.9
	G1	−0.655	0.276	33.2	22.2	46.1
	G2	−0.180	0.293	44.5	31.0	58.7
	Rest	−0.472	0.444	37.4	19.7	58.8

[1]Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).



[Brn-Grz, burned-grazed; %, percent]

Figure 4.1. Back-transformed least squares mean cover (percent) of smooth brome (*Bromus inermis*) on Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits. Treatments are defined in tables 4.1 and 4.2.

B. Standard Deviation of Brome Cover (percent)

Table 4.3. Generalized linear mixed model, assuming a beta distribution with a logit link, y = (y+1 percent), testing the influence of post-management treatments on standard deviation of mean cover (percent) of smooth brome (*Bromus inermis*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × Treatment	18	125.6	1.20	0.2676
Contrasts:	Mixed: burned linear	1	108.2	1.76	0.1874
	Mixed: burned quadratic	1	79.3	0.16	0.6945
	Mixed: BG0 vs BG1-3	1	98.2	2.29	0.1335
	Mixed: grazed linear	1	153.5	0.01	0.9271
	Mixed: grazed quadratic	1	131.1	0.55	0.4600
	Tall: burned linear	1	104.9	0.02	0.8888
	Tall: grazed linear	1	131.8	0.21	0.6450
	Tall: grazed quadratic	1	114.5	0.25	0.6193
	B1: mixed versus tall	1	157.2	1.02	0.3153
	B2: mixed versus tall	1	160.4	1.65	0.2006
	G0: mixed versus tall	1	164.3	0.00	0.9496
	G: mixed versus tall	1	168.0	0.15	0.6949
	G1: mixed versus tall	1	160.0	0.00	0.9808
	G2: mixed versus tall	1	167.8	1.57	0.2121
	Mixed: burned versus rest	1	110.7	0.17	0.6791
	Mixed: grazed versus rest	1	108.8	0.00	0.9555
	Mixed: burned-grazed versus rest	1	117.2	0.25	0.6149
	Mixed: burned versus grazed	1	160.2	1.83	0.1777
	Tall: burned versus rest	1	154.6	5.94	0.0159
	Tall: grazed versus rest	1	167.9	3.70	0.0561
	Tall: burned versus grazed	1	150.4	1.47	0.2277

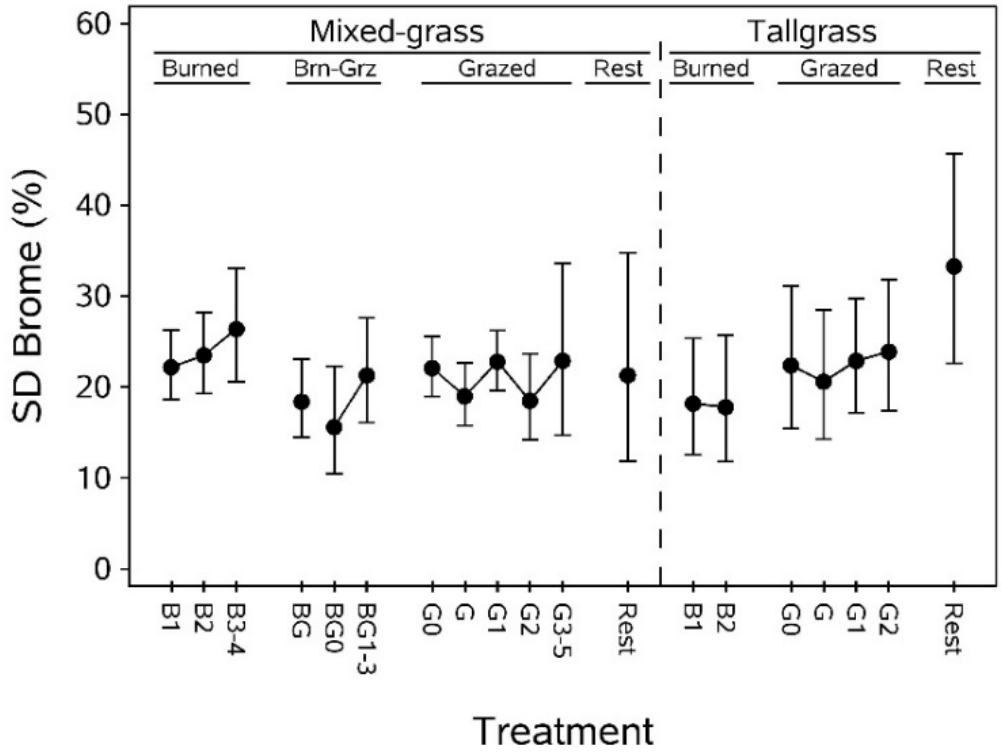
[1]Sources of variation for the model: Y=Unit(Grass type) + Grass type × Treatment + Residual, where Unit(Grass type) and Residual are random effects and Grass type × Treatment is a fixed effect in a mixed-model framework. Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 4.4. Least squares mean (standard error) standard deviation of smooth brome (*Bromus inermis*) cover (percent) and back-transformed least squares mean (95-percent confidence intervals) standard deviation of brome cover (percent), by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

				Back-transformed		
					95-percent confidence intervals	
Grass	Treatment[1]	LSMean	SE	LSMean	LCL	UCL
Mixed	B1	−1.196	0.109	22.2	18.6	26.3
	B2	−1.128	0.123	23.5	19.3	28.2
	B3-4	−0.974	0.161	26.4	20.6	33.1
	BG	−1.422	0.140	18.4	14.5	23.1
	BG0	−1.616	0.217	15.6	10.5	22.3
	BG1-3	−1.247	0.170	21.3	16.1	27.6
	G0	−1.202	0.095	22.1	19.0	25.6
	G	−1.386	0.110	19.0	15.8	22.7
	G1	−1.166	0.093	22.8	19.6	26.2
	G2	−1.416	0.154	18.5	14.2	23.7
	G3-5	−1.159	0.267	22.9	14.7	33.6
	Rest	−1.246	0.338	21.3	11.9	34.8
Tall	B1	−1.434	0.210	18.2	12.6	25.4
	B2	−1.464	0.231	17.8	11.8	25.7
	G0	−1.187	0.224	22.4	15.4	31.1
	G	−1.291	0.215	20.6	14.3	28.5
	G1	−1.161	0.176	22.9	17.2	29.7
	G2	−1.103	0.197	23.9	17.4	31.8
	Rest	−0.652	0.266	33.3	22.6	45.7

[1]Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).



[Brn-Grz, burned-grazed; %, percent; SD, standard deviation]

Figure 4.2. Back-transformed least squares mean standard deviation of smooth brome (Bromus inermis) cover (percent) on Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits. Treatments are defined in tables 4.3 and 4.4.

C. Mean Kentucky Bluegrass Cover (percent)

Table 4.5. Generalized linear mixed model, assuming a beta distribution with a logit link, *y* = (*y*+1 percent), testing the influence of post-management treatments on mean Kentucky bluegrass (*Poa pratensis*) cover (percent) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × Treatment	18	130.5	0.56	0.9235
Contrasts:	Mixed: burned linear	1	115.9	0.66	0.4184
	Mixed: burned quadratic	1	79.0	0.22	0.6380
	Mixed: BG0 vs BG1-3	1	100.8	2.10	0.1507
	Mixed: grazed linear	1	162.0	0.13	0.7240
	Mixed: grazed quadratic	1	139.1	0.07	0.7972
	Tall: burned linear	1	108.9	0.07	0.7984
	Tall: grazed linear	1	140.9	1.20	0.2750
	Tall: grazed quadratic	1	112.6	1.37	0.2446
	B1: mixed versus tall	1	160.0	0.72	0.3958
	B2: mixed versus tall	1	162.3	1.08	0.3008
	G0: mixed versus tall	1	162.6	0.01	0.9281
	G: mixed versus tall	1	167.4	0.05	0.8240
	G1: mixed versus tall	1	163.3	0.01	0.9321
	G2: mixed versus tall	1	167.9	1.14	0.2865
	Mixed: burned versus rest	1	118.1	0.49	0.4874
	Mixed: grazed versus rest	1	116.7	0.42	0.5159
	Mixed: burned-grazed versus rest	1	123.6	0.27	0.6014
	Mixed: burned versus grazed	1	167.3	0.02	0.8825
	Tall: burned versus rest	1	154.2	0.00	0.9851
	Tall: grazed versus rest	1	167.6	0.27	0.6062
	Tall: burned versus grazed	1	143.8	0.68	0.4122

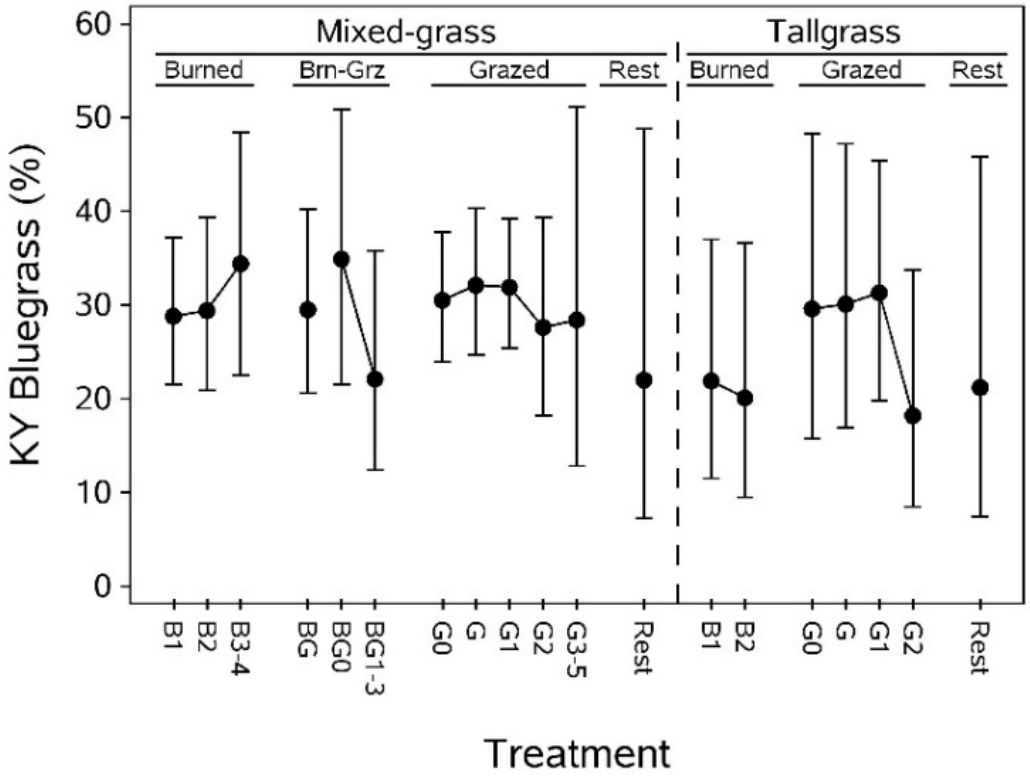
[1]Sources of variation for the model: Y=Unit(Grass type) + Grass type × Treatment + Residual, where Unit(Grass type) and Residual are random effects and Grass type × Treatment is a fixed effect in a mixed-model framework. Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 4.6. Least squares mean (standard error) Kentucky bluegrass (*Poa pratensis*) cover (percent) and back-transformed least squares mean (95-percent confidence intervals) Kentucky bluegrass (*Poa pratensis*) cover (percent), by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

				Back-transformed		
					95-percent confidence intervals	
Grass	Treatment[1]	LSMean	SE	LSMean	LCL	UCL
Mixed	B1	−0.859	0.194	28.8	21.5	37.2
	B2	−0.830	0.225	29.4	20.9	39.4
	B3-4	−0.603	0.295	34.4	22.5	48.4
	BG	−0.823	0.239	29.5	20.6	40.2
	BG0	−0.580	0.336	34.9	21.5	50.9
	BG1-3	−1.203	0.337	22.1	12.4	35.8
	G0	−0.779	0.165	30.5	23.9	37.8
	G	−0.705	0.181	32.1	24.7	40.3
	G1	−0.712	0.161	31.9	25.4	39.2
	G2	−0.914	0.267	27.6	18.2	39.4
	G3-5	−0.874	0.489	28.4	12.8	51.1
	Rest	−1.209	0.613	22.0	7.2	48.8
Tall	B1	−1.216	0.371	21.9	11.5	37.0
	B2	−1.321	0.417	20.1	9.5	36.6
	G0	−0.818	0.404	29.6	15.7	48.3
	G	−0.796	0.369	30.1	16.9	47.2
	G1	−0.741	0.305	31.3	19.8	45.4
	G2	−1.439	0.413	18.2	8.5	33.7
	Rest	−1.256	0.576	21.2	7.4	45.8

[1]Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).



[Brn-Grz, burned-grazed; %, percent; KY, Kentucky]

Figure 4.3. Back-transformed least squares mean Kentucky bluegrass (*Poa pratensis*) cover (percent) on Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits. Treatments are defined in tables 4.5 and 4.6.

D. Standard Deviation of Kentucky Bluegrass Cover (percent)

Table 4.7. Generalized linear mixed model, assuming a beta distribution with a logit link, $y = (y+1$ percent), testing the influence of post-management treatments on standard deviation of Kentucky bluegrass (*Poa pratensis*) cover (percent) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × Treatment	18	133.9	0.83	0.6610
Contrasts:	Mixed: burned linear	1	121.7	0.23	0.6347
	Mixed: burned quadratic	1	80.4	0.85	0.3592
	Mixed: BG0 vs BG1-3	1	105.4	1.20	0.2750
	Mixed: grazed linear	1	165.1	0.06	0.8129
	Mixed: grazed quadratic	1	142.0	0.01	0.9367
	Tall: burned linear	1	111.9	0.19	0.6603
	Tall: grazed linear	1	141.9	0.34	0.5626
	Tall: grazed quadratic	1	117.2	0.57	0.4516
	B1: mixed versus tall	1	161.3	3.70	0.0560
	B2: mixed versus tall	1	163.2	3.33	0.0699
	G0: mixed versus tall	1	162.4	0.19	0.6606
	G: mixed versus tall	1	166.8	0.12	0.7342
	G1: mixed versus tall	1	164.6	0.91	0.3423
	G2: mixed versus tall	1	167.5	0.20	0.6583
	Mixed: burned versus rest	1	124.0	0.00	0.9810
	Mixed: grazed versus rest	1	122.7	0.23	0.6288
	Mixed: burned-grazed versus rest	1	130.6	0.04	0.8493
	Mixed: burned versus grazed	1	167.9	1.64	0.2015
	Tall: burned versus rest	1	152.3	0.87	0.3538
	Tall: grazed versus rest	1	167.2	0.11	0.7357
	Tall: burned versus grazed	1	142.6	1.01	0.3157

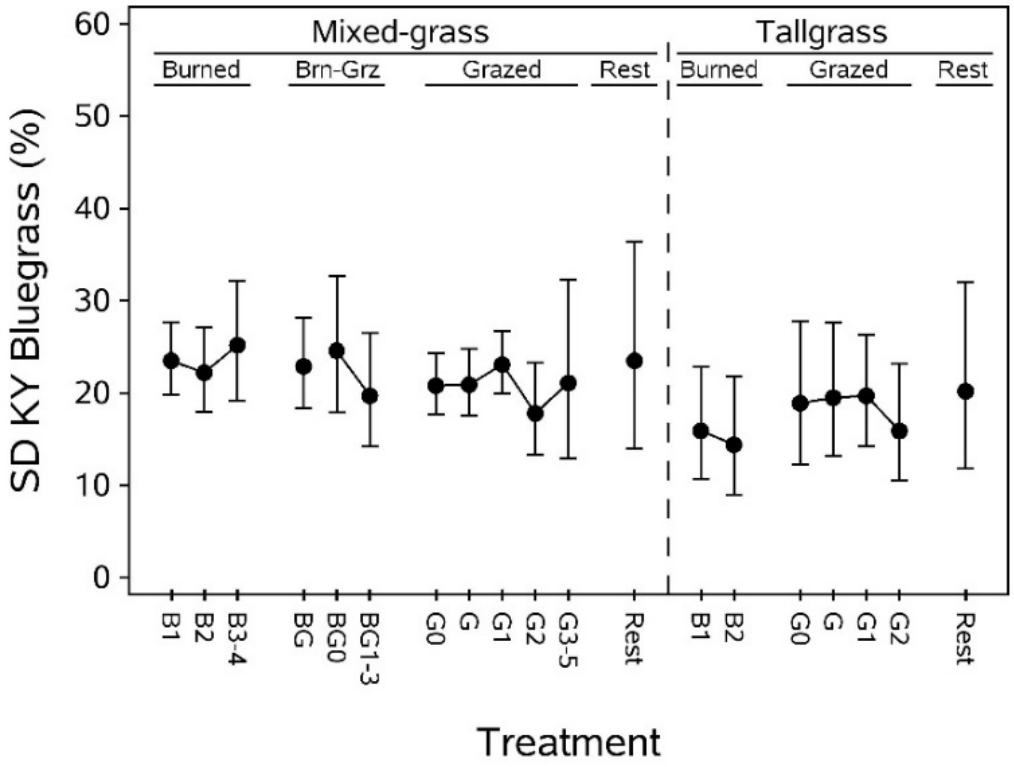
[1]Sources of variation for the model: Y=Unit(Grass type) + Grass type × Treatment + Residual, where Unit(Grass type) and Residual are random effects and Grass type × Treatment is a fixed effect in a mixed-model framework. Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 4.8. Least squares mean (standard error) standard deviation of Kentucky bluegrass (*Poa pratensis*) cover (percent) and back-transformed least squares mean (95-percent confidence intervals) standard deviation of Kentucky bluegrass (*Poa pratensis*) cover (percent), by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

				Back-transformed		
					95-percent confidence intervals	
Grass	Treatment[1]	LSMean	SE	LSMean	LCL	UCL
Mixed	B1	−1.124	0.109	23.5	19.8	27.7
	B2	−1.196	0.131	22.2	18.0	27.1
	B3-4	−1.035	0.172	25.2	19.2	32.2
	BG	−1.158	0.140	22.9	18.3	28.2
	BG0	−1.067	0.199	24.6	17.9	32.7
	BG1-3	−1.344	0.190	19.7	14.2	26.5
	G0	−1.277	0.098	20.8	17.7	24.3
	G	−1.270	0.110	20.9	17.5	24.8
	G1	−1.145	0.094	23.1	19.9	26.7
	G2	−1.464	0.166	17.8	13.3	23.3
	G3-5	−1.259	0.287	21.1	12.9	32.3
	Rest	−1.126	0.311	23.5	14.0	36.4
Tall	B1	−1.595	0.219	15.9	10.7	22.8
	B2	−1.707	0.248	14.4	9.0	21.8
	G0	−1.396	0.250	18.9	12.2	27.8
	G	−1.355	0.226	19.5	13.2	27.6
	G1	−1.344	0.186	19.7	14.3	26.3
	G2	−1.590	0.229	15.9	10.5	23.2
	Rest	−1.311	0.308	20.2	11.8	32.0

[1]Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).



[Brn-Grz, burned-grazed; %, percent, KY, Kentucky; SD, standard deviation]

Figure 4.4. Back-transformed least squares mean standard deviation of Kentucky bluegrass (Poa pratensis) cover (percent) on Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits. Treatments are defined in tables 4.7 and 4.8.

E. Mean Native Forb Cover (percent)

Table 4.9. Generalized linear mixed model, assuming a beta distribution with a logit link, y = (y+1 percent), testing the influence of post-management treatments on mean native forb cover (percent) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[*, evidence for moderate effect ($0.05<p\leq0.10$); **, evidence for strong effect ($p\leq0.05$)]

Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × Treatment	18	153.6	1.98	0.0140**
Contrasts:	Mixed: burned linear	1	160.4	1.25	0.2645
	Mixed: burned quadratic	1	99.5	0.99	0.3211
	Mixed: BG0 vs BG1-3	1	148.1	0.42	0.5163
	Mixed: grazed linear	1	163.2	1.41	0.2368
	Mixed: grazed quadratic	1	155.0	1.38	0.2420
	Tall: burned linear	1	121.3	0.02	0.8801
	Tall: grazed linear	1	160.0	0.18	0.6685
	Tall: grazed quadratic	1	138.8	0.14	0.7058
	B1: mixed versus tall	1	167.7	1.63	0.2031
	B2: mixed versus tall	1	168.0	1.39	0.2407
	G0: mixed versus tall	1	167.0	0.00	0.9496
	G: mixed versus tall	1	167.0	0.08	0.7798
	G1: mixed versus tall	1	168.0	0.01	0.9208
	G2: mixed versus tall	1	167.4	0.36	0.5476
	Mixed: burned versus rest	1	158.4	0.74	0.3896
	Mixed: grazed versus rest	1	160.0	0.42	0.5178
	Mixed: burned-grazed versus rest	1	159.8	1.59	0.2086
	Mixed: burned versus grazed	1	138.7	0.26	0.6115
	Tall: burned versus rest	1	157.1	3.35	0.0690*
	Tall: grazed versus rest	1	163.7	10.98	0.0011**
	Tall: burned versus grazed	1	139.5	3.41	0.0668*

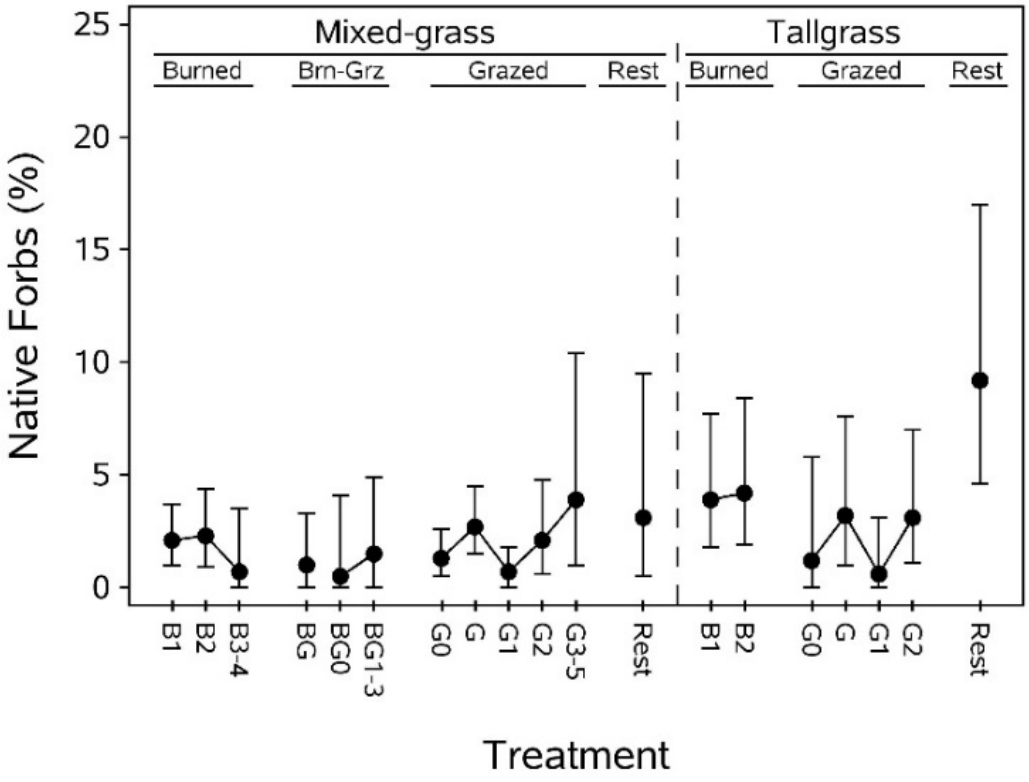
[1]Sources of variation for the model: Y=Unit(Grass type) + Grass type × Treatment + Residual, where Unit(Grass type) and Residual are random effects and Grass type × Treatment is a fixed effect in a mixed-model framework. Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 4.10. Least squares mean (standard error) native forb cover (percent) and back-transformed least squares mean (95-percent confidence intervals) native forb cover (percent) by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

				Back-transformed		
					95-percent confidence intervals	
Grass	Treatment[1]	LSMean	SE	LSMean	LCL	UCL
Mixed	B1	−3.443	0.227	2.1	1.0	3.7
	B2	−3.390	0.274	2.3	0.9	4.4
	B3-4	−4.068	0.515	0.7	0.0	3.5
	BG	−3.870	0.390	1.0	0.0	3.3
	BG0	−4.178	0.642	0.5	0.0	4.1
	BG1-3	−3.673	0.459	1.5	0.0	4.9
	G0	−3.742	0.228	1.3	0.5	2.6
	G	−3.262	0.213	2.7	1.5	4.5
	G1	−4.075	0.263	0.7	0.0	1.8
	G2	−3.440	0.336	2.1	0.6	4.8
	G3-5	−2.973	0.471	3.9	1.0	10.4
	Rest	−3.152	0.512	3.1	0.5	9.5
Tall	B1	−2.956	0.306	3.9	1.8	7.7
	B2	−2.893	0.322	4.2	1.9	8.4
	G0	−3.782	0.594	1.2	0.0	5.8
	G	−3.137	0.392	3.2	1.0	7.6
	G1	−4.131	0.497	0.6	0.0	3.1
	G2	−3.144	0.360	3.1	1.1	7.0
	Rest	−2.176	0.335	9.2	4.6	17.0

[1]Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).



[Brn-Grz, burned-grazed; %, percent]

Figure 4.5. Back-transformed least squares mean native forb cover (percent) on Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits. Treatments are defined in tables 4.9 and 4.10.

F. Standard Deviation of Native Forb Cover (percent)

Table 4.11. Generalized linear mixed model, assuming a beta distribution with a logit link, y = (y+1 percent), testing the influence of post-management treatments on standard deviation of native forb cover (percent) on two grass types on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[*, evidence for moderate effect ($0.05<p\leq0.10$); **, evidence for strong effect ($p\leq0.05$)]

Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × Treatment	18	150.8	2.07	0.0094**
Contrasts:	Mixed: burned linear	1	155.9	2.10	0.1497
	Mixed: burned quadratic	1	96.0	3.20	0.0767*
	Mixed: BG0 vs BG1-3	1	141.2	0.87	0.3519
	Mixed: grazed linear	1	164.9	0.87	0.3518
	Mixed: grazed quadratic	1	151.8	0.96	0.3293
	Tall: burned linear	1	119.5	0.02	0.8890
	Tall: grazed linear	1	156.5	0.80	0.3717
	Tall: grazed quadratic	1	137.2	0.20	0.6514
	B1: mixed versus tall	1	167.2	0.09	0.7596
	B2: mixed versus tall	1	167.7	0.00	0.9692
	G0: mixed versus tall	1	166.1	0.01	0.9142
	G: mixed versus tall	1	166.4	0.12	0.7292
	G1: mixed versus tall	1	167.9	0.00	0.9480
	G2: mixed versus tall	1	166.6	2.02	0.1576
	Mixed: burned versus rest	1	153.3	2.18	0.1416
	Mixed: grazed versus rest	1	153.5	4.24	0.0411**
	Mixed: burned-grazed versus rest	1	156.7	5.38	0.0216**
	Mixed: burned versus grazed	1	144.7	0.92	0.3381
	Tall: burned versus rest	1	156.5	1.31	0.2536
	Tall: grazed versus rest	1	165.0	5.02	0.0264**
	Tall: burned versus grazed	1	142.0	2.04	0.1555

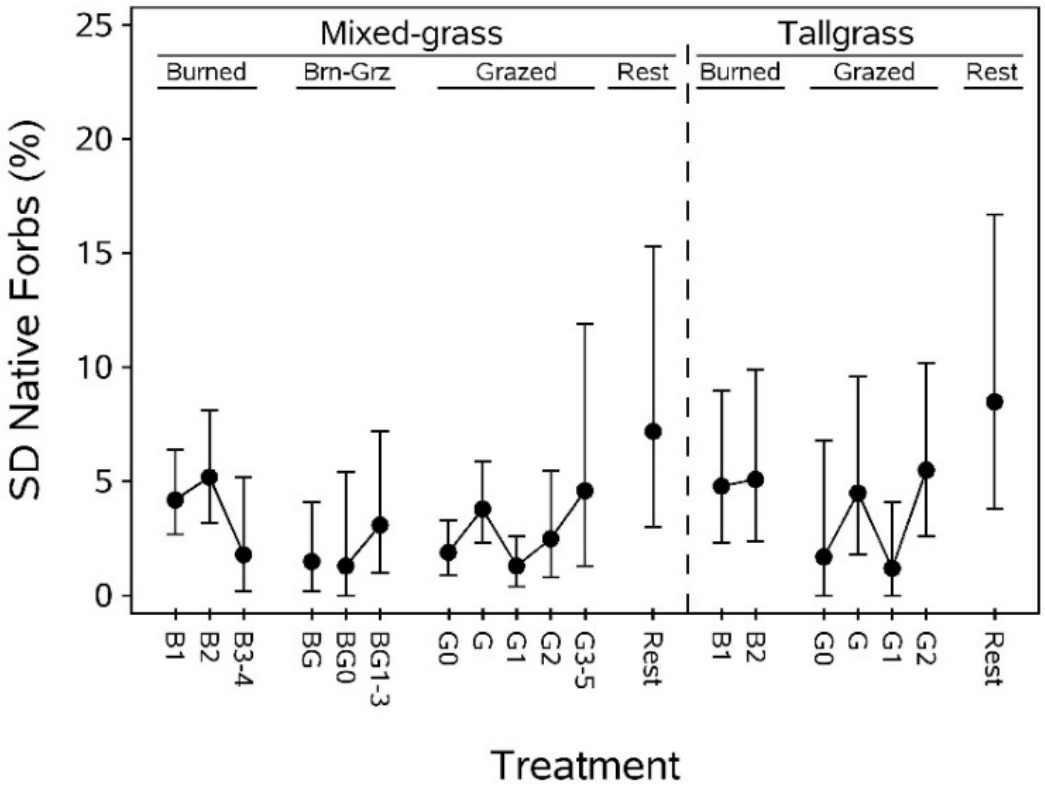
[1]Sources of variation for the model: Y=Unit(Grass type) + Grass type × Treatment + Residual, where Unit(Grass type) and Residual are random effects and Grass type × Treatment is a fixed effect in a mixed-model framework. Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 4.12. Least squares mean (standard error) standard deviation of native forb cover (percent) and back-transformed least squares mean (95-percent confidence intervals) standard deviation of native forb cover (percent), by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

				Back-transformed		
					95-percent confidence intervals	
Grass	Treatment[1]	LSMean	SE	LSMean	LCL	UCL
Mixed	B1	−2.894	0.187	4.2	2.7	6.4
	B2	−2.714	0.212	5.2	3.2	8.1
	B3-4	−3.557	0.426	1.8	0.2	5.2
	BG	−3.652	0.369	1.5	0.2	4.1
	BG0	−3.769	0.555	1.3	0.0	5.4
	BG1-3	−3.156	0.379	3.1	1.0	7.2
	G0	−3.520	0.217	1.9	0.9	3.3
	G	−2.983	0.197	3.8	2.3	5.9
	G1	−3.760	0.239	1.3	0.4	2.6
	G2	−3.320	0.335	2.5	0.8	5.5
	G3-5	−2.823	0.466	4.6	1.3	11.9
	Rest	−2.411	0.395	7.2	3.0	15.3
Tall	B1	−2.785	0.302	4.8	2.3	9.0
	B2	−2.729	0.318	5.1	2.4	9.9
	G0	−3.586	0.571	1.7	0.0	6.8
	G	−2.840	0.362	4.5	1.8	9.6
	G1	−3.794	0.448	1.2	0.0	4.1
	G2	−2.673	0.309	5.5	2.6	10.2
	Rest	−2.256	0.368	8.5	3.8	16.7

[1]Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).



[Brn-Grz, burned-grazed; %, percent; SD, standard deviation]

Figure 4.6. Back-transformed least squares mean standard deviation of native forb cover (percent) on Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits. Treatments are defined in tables 4.11 and 4.12.

G. Mean Native Grass Cover (percent)

Table 4.13. Generalized linear mixed model, assuming a beta distribution with a logit link, y = (y+1 percent), testing the influence of post-management treatments on mean native grass cover (percent) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × Treatment	18	131.3	1.39	0.1471
Contrasts:	Mixed: burned linear	1	117.6	5.02	0.0269
	Mixed: burned quadratic	1	87.7	0.53	0.4671
	Mixed: BG0 vs BG1-3	1	104.0	0.35	0.5540
	Mixed: grazed linear	1	157.2	0.57	0.4501
	Mixed: grazed quadratic	1	139.1	0.23	0.6355
	Tall: burned linear	1	111.1	1.78	0.1847
	Tall: grazed linear	1	139.5	0.56	0.4560
	Tall: grazed quadratic	1	119.4	0.25	0.6194
	B1: mixed versus tall	1	159.5	0.00	0.9993
	B2: mixed versus tall	1	163.3	2.62	0.1077
	G0: mixed versus tall	1	164.7	0.14	0.7082
	G: mixed versus tall	1	168.0	0.02	0.9004
	G1: mixed versus tall	1	161.7	0.41	0.5242
	G2: mixed versus tall	1	167.9	0.02	0.8919
	Mixed: burned versus rest	1	118.9	0.03	0.8534
	Mixed: grazed versus rest	1	116.8	0.46	0.5003
	Mixed: burned-grazed versus rest	1	122.9	0.05	0.8269
	Mixed: burned versus grazed	1	162.7	1.60	0.2078
	Tall: burned versus rest	1	159.9	2.55	0.1123
	Tall: grazed versus rest	1	168.0	0.22	0.6398
	Tall: burned versus grazed	1	152.3	4.55	0.0345

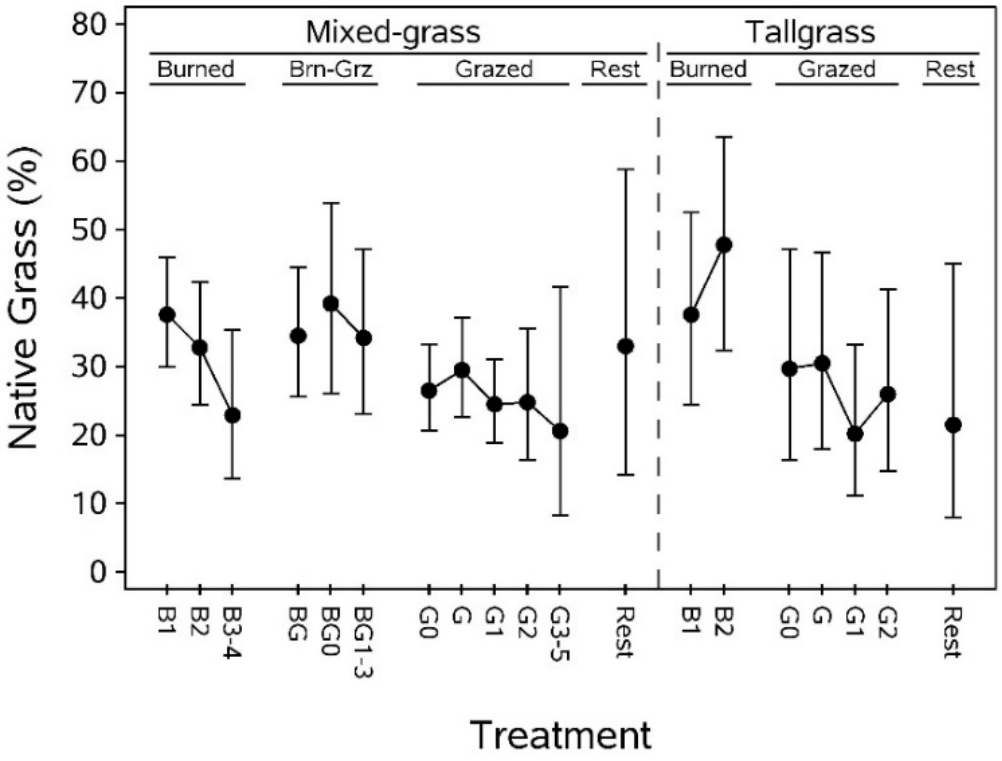
[1]Sources of variation for the model: Y=Unit(Grass type) + Grass type × Treatment + Residual, where Unit(Grass type) and Residual are random effects and Grass type × Treatment is a fixed effect in a mixed-model framework. Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 4.14. Least squares mean (standard error) native grass cover (percent) and back-transformed least squares mean (95-percent confidence intervals) native grass cover (percent), by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

				Back-transformed		
					95-percent confidence intervals	
Grass	Treatment[1]	LSMean	SE	LSMean	LCL	UCL
Mixed	B1	−0.465	0.173	37.6	29.9	45.9
	B2	−0.674	0.206	32.8	24.4	42.3
	B3-4	−1.160	0.308	22.9	13.6	35.4
	BG	−0.599	0.213	34.5	25.6	44.5
	BG0	−0.397	0.303	39.2	26.1	53.9
	BG1-3	−0.612	0.273	34.2	23.1	47.1
	G0	−0.969	0.164	26.5	20.6	33.3
	G	−0.824	0.175	29.5	22.7	37.2
	G1	−1.075	0.167	24.5	18.8	31.1
	G2	−1.054	0.256	24.8	16.4	35.5
	G3-5	−1.291	0.508	20.6	8.2	41.7
	Rest	−0.661	0.540	33.0	14.2	58.8
Tall	B1	−0.465	0.309	37.6	24.5	52.5
	B2	−0.047	0.329	47.8	32.4	63.5
	G0	−0.815	0.378	29.7	16.4	47.1
	G	−0.775	0.348	30.5	17.9	46.7
	G1	−1.314	0.335	20.2	11.2	33.2
	G2	−0.995	0.350	26.0	14.7	41.3
	Rest	−1.239	0.551	21.5	8.0	45.0

[1]Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).



[Brn-Grz, burned-grazed; %, percent]

Figure 4.7. Back-transformed least squares mean native grass cover (percent) on Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits. Treatments are defined in tables 4.13 and 4.14.

H. Standard Deviation of Native Grass Cover (percent)

Table 4.15. Generalized linear mixed model, assuming a beta distribution with a logit link, $y = (y+1$ percent), testing the influence of post-management treatments on standard deviation of native grass cover (percent) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × Treatment	18	126.0	1.11	0.3477
Contrasts:	Mixed: burned linear	1	108.8	0.95	0.3317
	Mixed: burned quadratic	1	84.5	1.09	0.3002
	Mixed: BG0 vs BG1-3	1	99.0	0.78	0.3791
	Mixed: grazed linear	1	148.6	0.04	0.8443
	Mixed: grazed quadratic	1	130.6	0.30	0.5824
	Tall: burned linear	1	110.1	4.37	0.0389
	Tall: grazed linear	1	133.5	0.15	0.6997
	Tall: grazed quadratic	1	115.3	0.06	0.8142
	B1: mixed versus tall	1	156.6	0.54	0.4642
	B2: mixed versus tall	1	159.9	2.19	0.1409
	G0: mixed versus tall	1	166.1	0.28	0.5958
	G: mixed versus tall	1	167.7	0.31	0.5773
	G1: mixed versus tall	1	158.3	0.01	0.9320
	G2: mixed versus tall	1	168.0	0.01	0.9162
	Mixed: burned versus rest	1	111.1	0.02	0.8792
	Mixed: grazed versus rest	1	108.9	0.50	0.4825
	Mixed: burned-grazed versus rest	1	115.0	0.00	0.9459
	Mixed: burned versus grazed	1	153.9	2.47	0.1183
	Tall: burned versus rest	1	160.4	0.50	0.4815
	Tall: grazed versus rest	1	167.0	0.09	0.7664
	Tall: burned versus grazed	1	156.3	0.53	0.4680

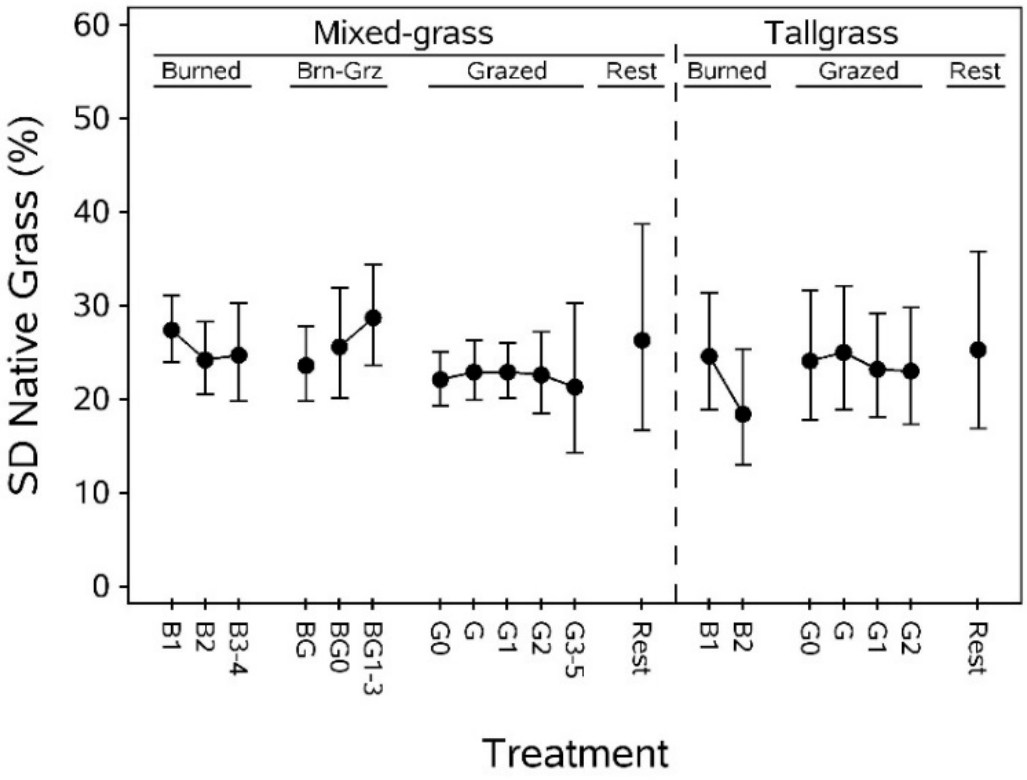
[1]Sources of variation for the model: Y=Unit(Grass type) + Grass type × Treatment + Residual, where Unit(Grass type) and Residual are random effects and Grass type × Treatment is a fixed effect in a mixed-model framework. Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 4.16. Least squares mean (standard error) standard deviation of native grass cover (percent) and back-transformed least squares mean (95-percent confidence intervals) standard deviation of native grass cover (percent), by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

				Back-transformed		
					95-percent confidence intervals	
Grass	Treatment[1]	LSMean	SE	LSMean	LCL	UCL
Mixed	B1	−0.925	0.090	27.4	24.0	31.1
	B2	−1.086	0.105	24.2	20.5	28.3
	B3-4	−1.062	0.140	24.7	19.8	30.3
	BG	−1.119	0.110	23.6	19.8	27.8
	BG0	−1.017	0.155	25.6	20.1	31.9
	BG1-3	−0.861	0.131	28.7	23.6	34.4
	G0	−1.205	0.084	22.1	19.3	25.1
	G	−1.156	0.090	22.9	19.9	26.3
	G1	−1.156	0.082	22.9	20.1	26.0
	G2	−1.176	0.123	22.6	18.5	27.2
	G3-5	−1.248	0.235	21.3	14.3	30.3
	Rest	−0.979	0.286	26.3	16.7	38.7
Tall	B1	−1.064	0.167	24.6	18.9	31.4
	B2	−1.422	0.202	18.4	13.0	25.4
	G0	−1.095	0.189	24.1	17.8	31.6
	G	−1.046	0.176	25.0	18.9	32.1
	G1	−1.141	0.154	23.2	18.1	29.2
	G2	−1.154	0.175	23.0	17.3	29.8
	Rest	−1.033	0.251	25.3	16.9	35.8

[1]Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).



[Brn-Grz, burned-grazed; %, percent, SD, standard deviation]

Figure 4.8. Back-transformed least squares mean standard deviation of native grass cover (percent) on Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits. Treatments are defined in tables 4.15 and 4.16.

I. Mean Nonnative Forb Cover (percent)

Table 4.17. Generalized linear mixed model, assuming a beta distribution with a logit link, y = (y+1 percent), testing the influence of post-management treatments on mean nonnative forb cover (percent) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × Treatment	18	156.8	0.77	0.7342
Contrasts:	Mixed: burned linear	1	165.5	0.25	0.6197
	Mixed: burned quadratic	1	105.8	0.04	0.8516
	Mixed: BG0 vs BG1-3	1	160.3	1.01	0.3175
	Mixed: grazed linear	1	161.6	0.65	0.4219
	Mixed: grazed quadratic	1	161.1	0.06	0.8034
	Tall: burned linear	1	133.2	2.85	0.0935
	Tall: grazed linear	1	165.7	0.55	0.4580
	Tall: grazed quadratic	1	137.4	0.32	0.5703
	B1: mixed versus tall	1	168.0	2.85	0.0930
	B2: mixed versus tall	1	168.0	0.27	0.6073
	G0: mixed versus tall	1	167.9	0.02	0.9022
	G: mixed versus tall	1	167.8	1.83	0.1779
	G1: mixed versus tall	1	168.0	0.31	0.5805
	G2: mixed versus tall	1	167.9	0.19	0.6601
	Mixed: burned versus rest	1	165.0	0.17	0.6811
	Mixed: grazed versus rest	1	166.2	0.10	0.7518
	Mixed: burned-grazed versus rest	1	163.8	0.92	0.3393
	Mixed: burned versus grazed	1	130.8	0.05	0.8300
	Tall: burned versus rest	1	166.0	0.26	0.6110
	Tall: grazed versus rest	1	167.9	0.36	0.5513
	Tall: burned versus grazed	1	137.4	0.02	0.8992

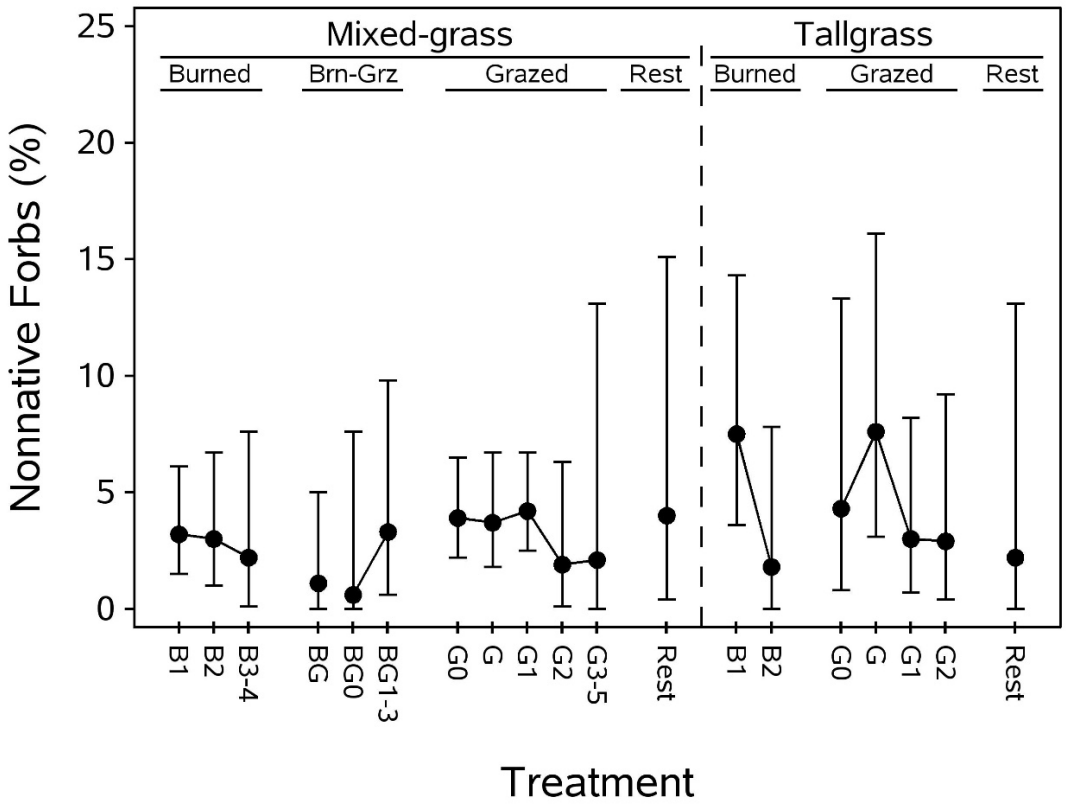
[1]Sources of variation for the model: Y=Unit(Grass type) + Grass type × Treatment + Residual, where Unit(Grass type) and Residual are random effects and Grass type × Treatment is a fixed effect in a mixed-model framework. Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 4.18. Least squares mean (standard error) nonnative forb cover (percent) and back-transformed least squares mean (95-percent confidence intervals) nonnative forb cover (percent), by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

				Back-transformed		
					95-percent confidence intervals	
Grass	Treatment[1]	LSMean	SE	LSMean	LCL	UCL
Mixed	B1	−3.118	0.278	3.2	1.5	6.1
	B2	−3.183	0.356	3.0	1.0	6.7
	B3-4	−3.420	0.542	2.2	0.1	7.6
	BG	−3.842	0.556	1.1	0.0	5.0
	BG0	−4.129	0.900	0.6	0.0	7.6
	BG1-3	−3.098	0.506	3.3	0.6	9.8
	G0	−2.962	0.227	3.9	2.2	6.5
	G	−3.017	0.273	3.7	1.8	6.7
	G1	−2.904	0.217	4.2	2.5	6.7
	G2	−3.527	0.503	1.9	0.1	6.3
	G3-5	−3.446	0.836	2.1	0.0	13.1
	Rest	−2.951	0.662	4.0	0.4	15.1
Tall	B1	−2.377	0.339	7.5	3.6	14.3
	B2	−3.551	0.620	1.8	0.0	7.8
	G0	−2.887	0.561	4.3	0.8	13.3
	G	−2.361	0.400	7.6	3.1	16.1
	G1	−3.182	0.452	3.0	0.7	8.2
	G2	−3.205	0.528	2.9	0.4	9.2
	Rest	−3.423	0.825	2.2	0.0	13.1

[1]Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).



[Brn-Grz, burned-grazed; %, percent]

Figure 4.9. Back-transformed least squares mean nonnative forb cover (percent) on Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits. Treatments are defined in tables 4.17 and 4.18.

J. Standard Deviation of Nonnative Forb Cover (percent)

Table 4.19. Generalized linear mixed model, assuming a beta distribution with a logit link, y = (y+1 percent), testing the influence of post-management treatments on standard deviation of nonnative forb cover (percent) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	p-value
Overall	Grass type × Treatment	18	155.2	0.89	0.5921
Contrasts:	Mixed: burned linear	1	162.0	0.58	0.4485
	Mixed: burned quadratic	1	101.3	0.41	0.5239
	Mixed: BG0 vs BG1-3	1	152.7	0.73	0.3943
	Mixed: grazed linear	1	162.9	0.32	0.5736
	Mixed: grazed quadratic	1	158.9	0.07	0.7897
	Tall: burned linear	1	131.3	3.24	0.0741
	Tall: grazed linear	1	164.8	2.81	0.0954
	Tall: grazed quadratic	1	133.2	0.39	0.5355
	B1: mixed versus tall	1	167.8	2.38	0.1249
	B2: mixed versus tall	1	167.8	0.63	0.4301
	G0: mixed versus tall	1	167.4	0.51	0.4743
	G: mixed versus tall	1	167.3	2.25	0.1358
	G1: mixed versus tall	1	168.0	0.14	0.7114
	G2: mixed versus tall	1	167.7	0.01	0.9317
	Mixed: burned versus rest	1	161.4	0.23	0.6322
	Mixed: grazed versus rest	1	162.6	0.35	0.5542
	Mixed: burned-grazed versus rest	1	161.5	1.56	0.2137
	Mixed: burned versus grazed	1	136.9	0.05	0.8183
	Tall: burned versus rest	1	164.3	0.36	0.5471
	Tall: grazed versus rest	1	167.5	0.30	0.5870
	Tall: burned versus grazed	1	135.6	0.03	0.8734

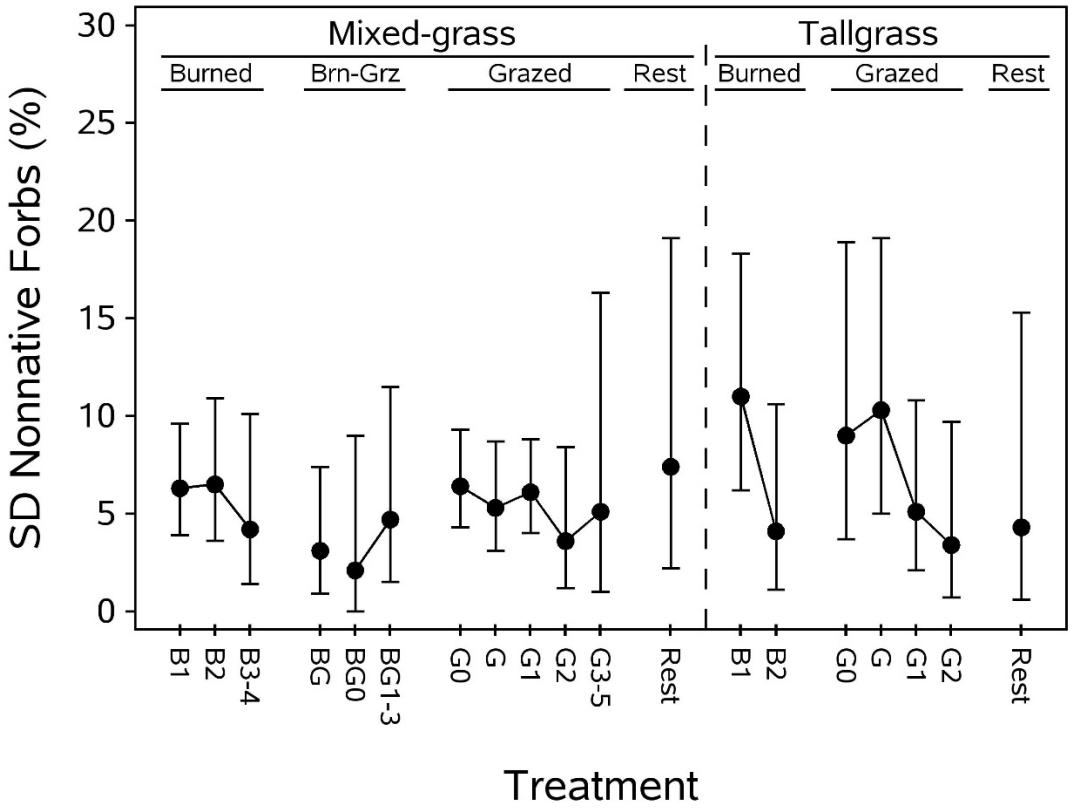
[1]Sources of variation for the model: Y=Unit(Grass type) + Grass type × Treatment + Residual, where Unit(Grass type) and Residual are random effects and Grass type × Treatment is a fixed effect in a mixed-model framework. Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 4.20. Least squares mean (standard error) standard deviation of nonnative forb cover (percent) and back-transformed least squares mean (95-percent confidence intervals) standard deviation of nonnative forb cover (percent), by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

				Back-transformed		
					95-percent confidence intervals	
Grass	Treatment[1]	LSMean	SE	LSMean	LCL	UCL
Mixed	B1	−2.547	0.213	6.3	3.9	9.6
	B2	−2.512	0.260	6.5	3.6	10.9
	B3-4	−2.902	0.420	4.2	1.4	10.1
	BG	−3.156	0.394	3.1	0.9	7.4
	BG0	−3.450	0.640	2.1	0.0	9.0
	BG1-3	−2.798	0.433	4.7	1.5	11.5
	G0	−2.523	0.185	6.4	4.3	9.3
	G	−2.692	0.232	5.3	3.1	8.7
	G1	−2.578	0.186	6.1	4.0	8.8
	G2	−3.030	0.393	3.6	1.2	8.4
	G3-5	−2.735	0.596	5.1	1.0	16.3
	Rest	−2.391	0.515	7.4	2.2	19.1
Tall	B1	−1.995	0.288	11.0	6.2	18.3
	B2	−2.930	0.460	4.1	1.1	10.6
	G0	−2.199	0.412	9.0	3.7	18.9
	G	−2.063	0.349	10.3	5.0	19.1
	G1	−2.730	0.364	5.1	2.1	10.8
	G2	−3.084	0.493	3.4	0.7	9.7
	Rest	−2.883	0.637	4.3	0.6	15.3

[1]Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).



[Brn-Grz, burned-grazed; %, percent; SD, standard deviation]

Figure 4.10. Back-transformed least squares mean standard deviation of nonnative forb cover (percent) on Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits. Treatments are defined in tables 4.19 and 4.20.

K. Mean Nonnative Grass Cover (percent)

Table 4.21. Generalized linear mixed model, assuming a beta distribution with a logit link, y = (y+1 percent), testing the influence of post-management treatments on mean nonnative grass cover (percent) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × Treatment	18	130.0	1.35	0.1682
Contrasts:	Mixed: burned linear	1	115.5	1.28	0.2606
	Mixed: burned quadratic	1	83.1	0.40	0.5297
	Mixed: BG0 vs BG1-3	1	102.6	0.02	0.8768
	Mixed: grazed linear	1	159.6	0.71	0.3999
	Mixed: grazed quadratic	1	139.0	0.11	0.7371
	Tall: burned linear	1	109.5	0.02	0.8751
	Tall: grazed linear	1	138.6	1.23	0.2686
	Tall: grazed quadratic	1	116.4	0.04	0.8365
	B1: mixed versus tall	1	159.3	0.66	0.4183
	B2: mixed versus tall	1	162.4	0.97	0.3271
	G0: mixed versus tall	1	162.5	0.06	0.8133
	G: mixed versus tall	1	166.7	0.00	0.9835
	G1: mixed versus tall	1	161.7	1.63	0.2030
	G2: mixed versus tall	1	166.6	0.47	0.4940
	Mixed: burned versus rest	1	118.6	0.21	0.6495
	Mixed: grazed versus rest	1	116.9	1.08	0.3017
	Mixed: burned-grazed versus rest	1	123.9	0.09	0.7641
	Mixed: burned versus grazed	1	164.2	2.25	0.1356
	Tall: burned versus rest	1	156.6	2.35	0.1274
	Tall: grazed versus rest	1	167.0	0.00	0.9596
	Tall: burned versus grazed	1	148.6	7.23	0.0080

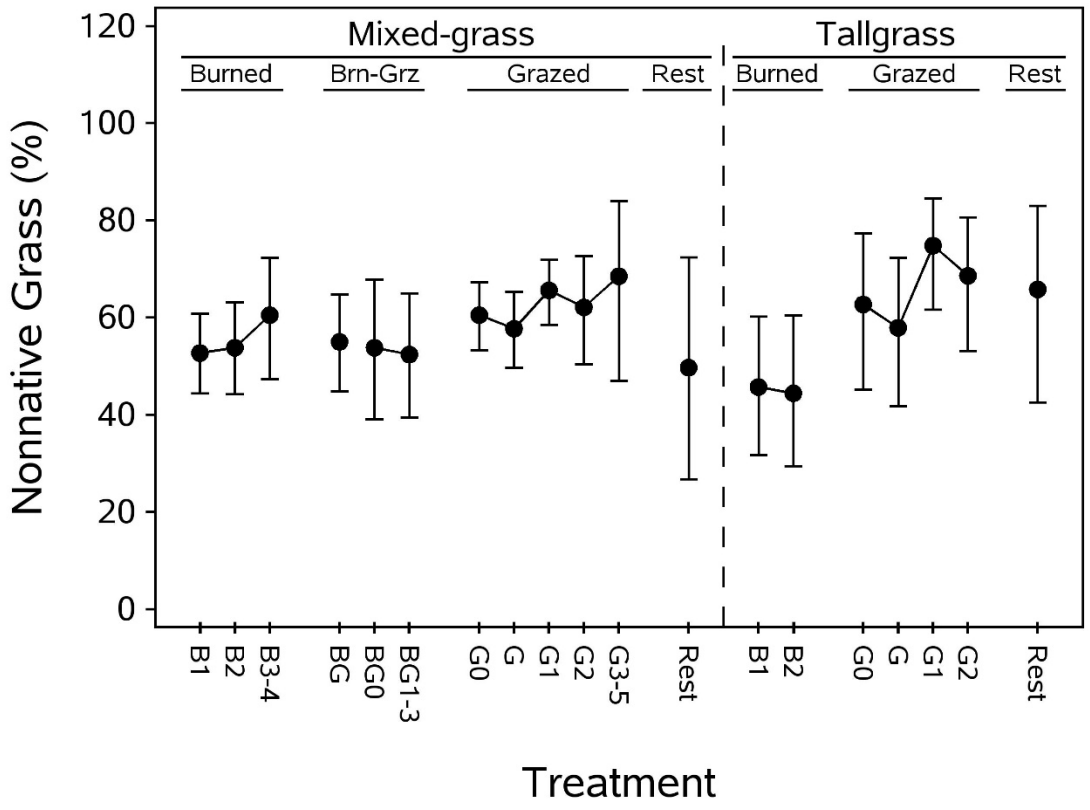
[1]Sources of variation for the model: Y=Unit(Grass type) + Grass type × Treatment + Residual, where Unit(Grass type) and Residual are random effects and Grass type × Treatment is a fixed effect in a mixed-model framework. Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 4.22. Least squares mean (standard error) nonnative grass cover (percent) and back-transformed least squares mean (95-percent confidence intervals) nonnative grass cover (percent), by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

				Back-transformed		
					95-percent confidence intervals	
Grass	Treatment[1]	LSMean	SE	LSMean	LCL	UCL
Mixed	B1	0.148	0.170	52.7	44.4	60.8
	B2	0.194	0.198	53.8	44.2	63.1
	B3-4	0.470	0.274	60.5	47.3	72.3
	BG	0.240	0.209	55.0	44.8	64.7
	BG0	0.194	0.305	53.8	39.1	67.8
	BG1-3	0.138	0.268	52.4	39.4	65.0
	G0	0.469	0.151	60.5	53.3	67.2
	G	0.352	0.165	57.7	49.7	65.3
	G1	0.688	0.154	65.6	58.5	71.9
	G2	0.539	0.249	62.1	50.3	72.6
	G3-5	0.825	0.462	68.5	47.0	84.0
	Rest	0.029	0.504	49.7	26.7	72.4
Tall	B1	−0.133	0.301	45.7	31.7	60.2
	B2	−0.183	0.329	44.4	29.4	60.4
	G0	0.563	0.367	62.7	45.1	77.3
	G	0.360	0.331	57.9	41.8	72.3
	G1	1.143	0.320	74.8	61.6	84.5
	G2	0.827	0.339	68.6	53.1	80.6
	Rest	0.697	0.488	65.8	42.5	83.0

[1]Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).



[Brn-Grz, burned-grazed; %, percent]

Figure 4.11. Back-transformed least squares mean nonnative grass cover (percent) on Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits. Treatments are defined in tables 4.21 and 4.22.

L. Standard Deviation of Nonnative Grass Cover (percent)

Table 4.23. Generalized linear mixed model, assuming a beta distribution with a logit link, y = (y+1 percent), testing the influence of post-management treatments on standard deviation of nonnative grass cover (percent) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × Treatment	18	137.3	1.42	0.1329
Contrasts:	Mixed: burned linear	1	126.3	0.00	0.9485
	Mixed: burned quadratic	1	86.5	0.85	0.3603
	Mixed: BG0 vs BG1-3	1	111.4	0.05	0.8202
	Mixed: grazed linear	1	165.3	0.07	0.7911
	Mixed: grazed quadratic	1	146.3	2.07	0.1523
	Tall: burned linear	1	120.8	11.67	0.0009
	Tall: grazed linear	1	144.2	0.18	0.6711
	Tall: grazed quadratic	1	122.8	0.62	0.4321
	B1: mixed versus tall	1	162.5	0.46	0.5006
	B2: mixed versus tall	1	163.8	9.73	0.0021
	G0: mixed versus tall	1	163.3	0.61	0.4377
	G: mixed versus tall	1	167.0	2.26	0.1345
	G1: mixed versus tall	1	165.1	0.00	0.9626
	G2: mixed versus tall	1	167.5	0.00	0.9794
	Mixed: burned versus rest	1	128.2	0.18	0.6693
	Mixed: grazed versus rest	1	127.1	0.08	0.7759
	Mixed: burned-grazed versus rest	1	134.0	0.02	0.8925
	Mixed: burned versus grazed	1	168.0	3.40	0.0670
	Tall: burned versus rest	1	154.0	3.86	0.0513
	Tall: grazed versus rest	1	167.3	0.42	0.5196
	Tall: burned versus grazed	1	145.9	4.92	0.0281

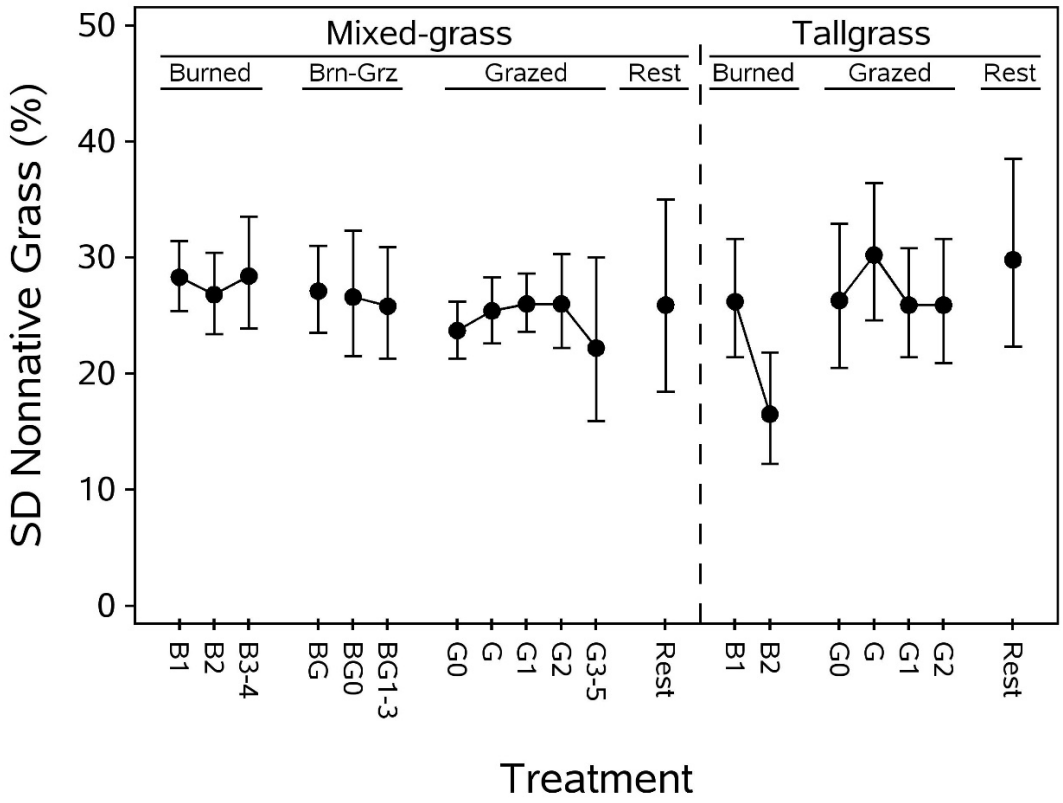
[1]Sources of variation for the model: Y=Unit(Grass type) + Grass type × Treatment + Residual, where Unit(Grass type) and Residual are random effects and Grass type × Treatment is a fixed effect in a mixed-model framework. Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 4.24. Least squares mean (standard error) standard deviation of nonnative grass cover (percent) and back-transformed least squares mean (95-percent confidence intervals) standard deviation of nonnative grass cover (percent), by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

				Back-transformed		
					95-percent confidence intervals	
Grass	Treatment[1]	LSMean	SE	LSMean	LCL	UCL
Mixed	B1	−0.882	0.074	28.3	25.4	31.4
	B2	−0.956	0.089	26.8	23.4	30.4
	B3-4	−0.874	0.119	28.4	23.9	33.5
	BG	−0.940	0.095	27.1	23.5	31.0
	BG0	−0.965	0.139	26.6	21.5	32.3
	BG1-3	−1.004	0.124	25.8	21.3	30.9
	G0	−1.117	0.067	23.7	21.3	26.2
	G	−1.028	0.074	25.4	22.6	28.3
	G1	−0.995	0.065	26.0	23.6	28.6
	G2	−0.993	0.105	26.0	22.2	30.3
	G3-5	−1.195	0.202	22.2	15.9	30.0
	Rest	−1.001	0.217	25.9	18.4	35.0
Tall	B1	−0.984	0.132	26.2	21.4	31.6
	B2	−1.550	0.168	16.5	12.2	21.8
	G0	−0.981	0.160	26.3	20.5	32.9
	G	−0.789	0.141	30.2	24.6	36.4
	G1	−1.001	0.122	25.9	21.4	30.8
	G2	−0.998	0.139	25.9	20.9	31.6
	Rest	−0.810	0.196	29.8	22.3	38.5

[1]Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).



[Brn-Grz, burned-grazed; %, percent; SD, standard deviation]

Figure 4.12. Back-transformed least squares mean standard deviation of nonnative grass cover (percent) on Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits. Treatments are defined in tables 4.23 and 4.24.

M. Defoliation Index

Table 4.25. Generalized linear mixed model, assuming a gamma distribution with a log link, $y = (y+1)$, testing the influence of post-management treatments on the Defoliation Index on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[<, less than; *, evidence for moderate effect ($0.05<p\leq0.10$); **, evidence for strong effect ($p\leq0.05$)]

Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × Treatment	18	118.6	10.28	<0.0001**
Contrasts:	Mixed: burned linear	1	99.7	11.88	0.0008**
	Mixed: burned quadratic	1	80.9	0.03	0.8708
	Mixed: BG0 vs BG1-3	1	91.9	0.09	0.7692
	Mixed: grazed linear	1	136.1	17.02	<0.0001**
	Mixed: grazed quadratic	1	120.2	8.22	0.0049**
	Tall: burned linear	1	99.6	14.80	0.0002**
	Tall: grazed linear	1	126.8	17.49	<0.0001**
	Tall: grazed quadratic	1	110.6	0.68	0.4122
	B1: mixed versus tall	1	150.5	4.84	0.0294**
	B2: mixed versus tall	1	156.1	13.76	0.0003**
	G0: mixed versus tall	1	166.8	6.17	0.0140**
	G: mixed versus tall	1	160.3	18.29	<0.0001**
	G1: mixed versus tall	1	150.0	18.07	<0.0001**
	G2: mixed versus tall	1	166.0	29.70	<0.0001**
	Mixed: burned versus rest#	1	96.2	31.25	<0.0001**
	Mixed: grazed versus rest#	1	95.5	36.26	<0.0001**
	Mixed: burned-grazed versus rest#	1	97.3	40.72	<0.0001**
	Mixed: burned versus grazed	1	139.9	5.05	0.0262**
	Tall: burned versus rest	1	163.8	11.22	0.0010**
	Tall: grazed versus rest	1	161.8	18.07	<0.0001**
	Tall: burned versus grazed	1	159.8	0.21	0.6459

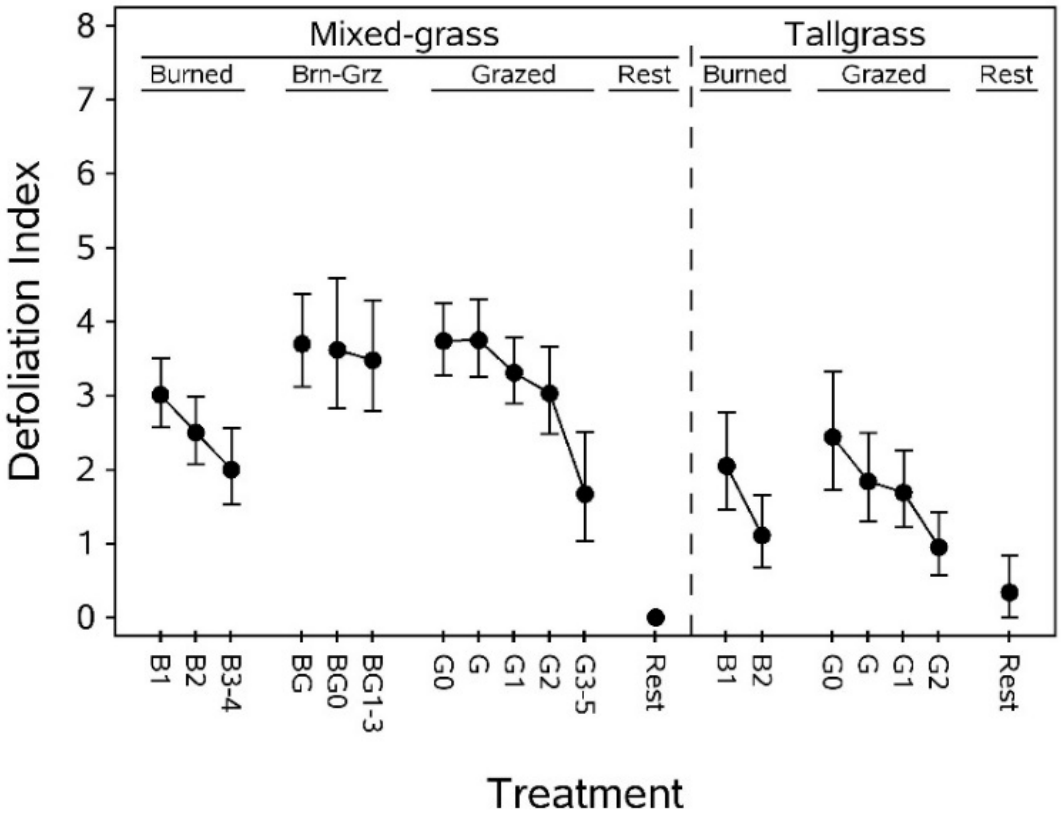
[1]Sources of variation for the model: Y=Unit(Grass type) + Grass type × Treatment + Residual, where Unit(Grass type) and Residual are random effects and Grass type × Treatment is a fixed effect in a mixed-model framework. Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 4.26. Least squares mean (standard error) Defoliation Index and back-transformed least squares mean (95-percent confidence intervals) Defoliation Index, by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

				Back-transformed		
					95-percent confidence intervals	
Grass	Treatment[1]	LSMean	SE	LSMean	LCL	UCL
Mixed	B1	1.39	0.06	3.01	2.57	3.51
	B2	1.25	0.07	2.50	2.07	2.99
	B3-4	1.10	0.09	2.00	1.53	2.56
	BG	1.55	0.07	3.70	3.12	4.37
	BG0	1.53	0.10	3.62	2.83	4.59
	BG1-3	1.50	0.08	3.48	2.79	4.29
	G0	1.56	0.05	3.74	3.28	4.25
	G	1.56	0.06	3.75	3.25	4.30
	G1	1.46	0.05	3.31	2.89	3.78
	G2	1.39	0.07	3.03	2.48	3.66
	G3-5	0.98	0.14	1.67	1.03	2.51
	Rest	−0.69	0.34	-0.50	0.00	-0.02
Tall	B1	1.12	0.11	2.05	1.46	2.78
	B2	0.75	0.12	1.11	0.67	1.66
	G0	1.24	0.12	2.44	1.73	3.33
	G	1.04	0.11	1.84	1.30	2.50
	G1	0.99	0.10	1.69	1.22	2.26
	G2	0.67	0.11	0.95	0.57	1.42
	Rest	0.29	0.16	0.34	0.00	0.84

[1]Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).



[Brn-Grz, burned-grazed]

Figure 4.13. Back-transformed least squares mean Defoliation Index on Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits. Treatments are defined in tables 4.25 and 4.26.

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Gannon, J.J., Shaffer, T.L., and Moore, C.T., 2013, Native Prairie Adaptive Management—A multi-region adaptive approach to invasive plant management on Fish and Wildlife Service owned native prairies: U.S. Geological Survey Open-File Report 2013–1279, 184 p. [Also available at *https://dx.doi.org/10.3133/ofr20131279*.]

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Appendix 5. Testing the Influence of Management Regime and Year on Breeding Densities (Pairs per 100 Hectares) of 35 Common Bird Species and Grassland Bird Species of Conservation Concern on Two Grass Types on Federal Lands Managed under an Adaptive-Management Framework by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13

A. Red-winged Blackbird (*Agelaius phoeniceus*)

Table 5.1. Generalized linear mixed model (assuming a gamma distribution with a log link) testing the influence of management regime and year on breeding densities (pairs per 100 hectares) of red-winged blackbirds (*Agelaius phoeniceus*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[<, less than; **, evidence for strong effect ($p \leq 0.05$)]

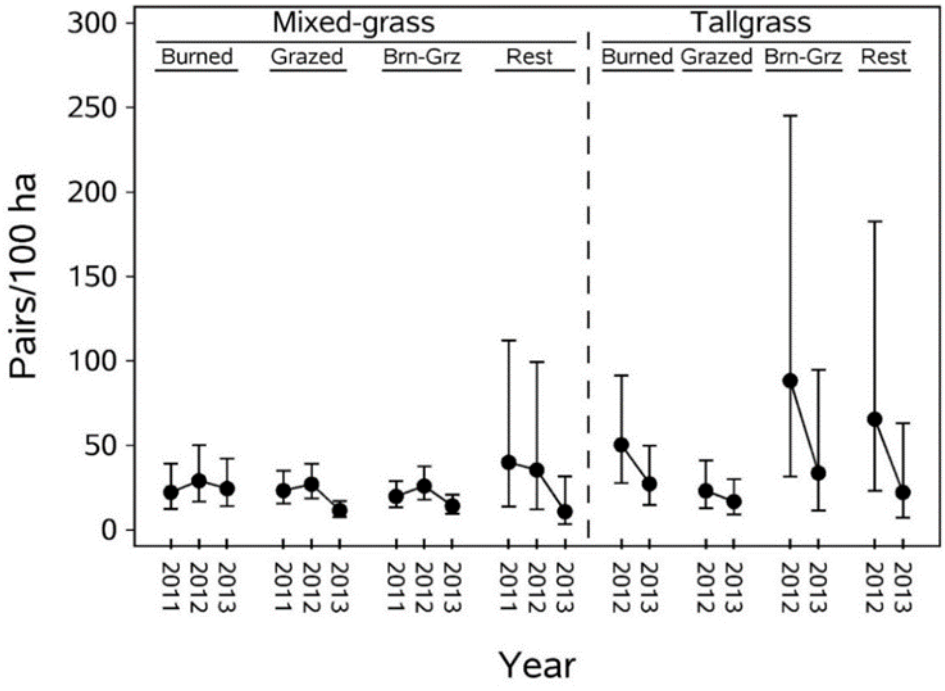
Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × regime × year	19	185.6	3.26	<0.0001**
Contrasts:	Mixed: regime effect	3	86.3	0.43	0.7350
	Mixed: year effect	2	139.1	8.93	0.0002**
	Mixed: interaction	6	142.4	1.09	0.3713
	Tall: regime effect	3	109.3	1.75	0.1604
	Tall: year effect	1	132.9	12.26	0.0006**
	Tall: interaction	3	132.9	0.78	0.5078
	Mixed versus tall: burned only	1	98.9	1.27	0.2633
	Mixed versus tall: grazed only	1	104.1	0.00	0.9644
	Mixed versus tall: burned-grazed	1	107.0	4.48	0.0366**
	Mixed versus tall: rest	1	97.0	0.46	0.5012

[1]Sources of variation for the model: Y=Unit(Grass type × Regime) + Grass type × Regime × Year + Year × Unit(Grass type × Regime), where Grass type × Regime × Year is a fixed effect, Unit(Grass type × Regime) and Year × Unit(Grass type × Regime) are random effects in a mixed-model framework, and Year is a repeated-measures factor.
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 5.2. Least squares mean (standard error) densities (pairs per 100 hectares) and back-transformed least squares mean (95-percent confidence intervals) densities (pairs per 100 hectares) of red-winged blackbirds (*Agelaius phoeniceus*), by grassland type (mixed-grass, tallgrass), overall treatment regime (burned only, grazed only, burned-grazed, or rest), and year (2011, 2012, 2013), on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

					Back-transformed		
						95-percent confidence intervals	
Grass	Regime	Year	LSMean	SE	LSMean	LCL	UCL
Mixed	Burned only	2011	3.15	0.28	22.34	12.49	39.38
		2012	3.41	0.27	29.18	16.78	50.22
		2013	3.24	0.27	24.53	14.04	42.32
	Grazed only	2011	3.20	0.20	23.41	15.53	35.06
		2012	3.34	0.18	27.15	18.71	39.20
		2013	2.53	0.18	11.61	7.82	17.03
	Burned-grazed	2011	3.04	0.18	19.93	13.57	29.06
		2012	3.30	0.18	26.06	17.95	37.64
		2013	2.73	0.18	14.33	9.72	20.92
	Rest	2011	3.72	0.52	40.08	13.92	112.12
		2012	3.60	0.52	35.52	12.26	99.54
		2013	2.48	0.52	10.94	3.34	31.87
Tall	Burned only	2012	3.94	0.30	50.52	27.71	91.45
		2013	3.35	0.30	27.39	14.82	49.94
	Grazed only	2012	3.19	0.28	23.23	12.92	41.20
		2013	2.88	0.28	16.86	9.25	30.10
	Burned-grazed	2012	4.49	0.52	88.40	31.47	245.15
		2013	3.55	0.52	33.77	11.63	94.74
	Rest	2012	4.20	0.52	65.65	23.21	182.50
		2013	3.15	0.52	22.28	7.46	63.10



[Brn-Grz, burned-grazed]

Figure 5.1. Back-transformed least squares mean densities (pairs per 100 hectares) of red-winged blackbirds (*Agelaius phoeniceus*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits.

B. Clay-colored Sparrow (*Spizella pallida*)

Table 5.3. Generalized linear mixed model (assuming a gamma distribution with a log link) testing the influence of management regime and year on breeding densities (pairs per 100 hectares) of clay-colored sparrows (*Spizella pallida*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

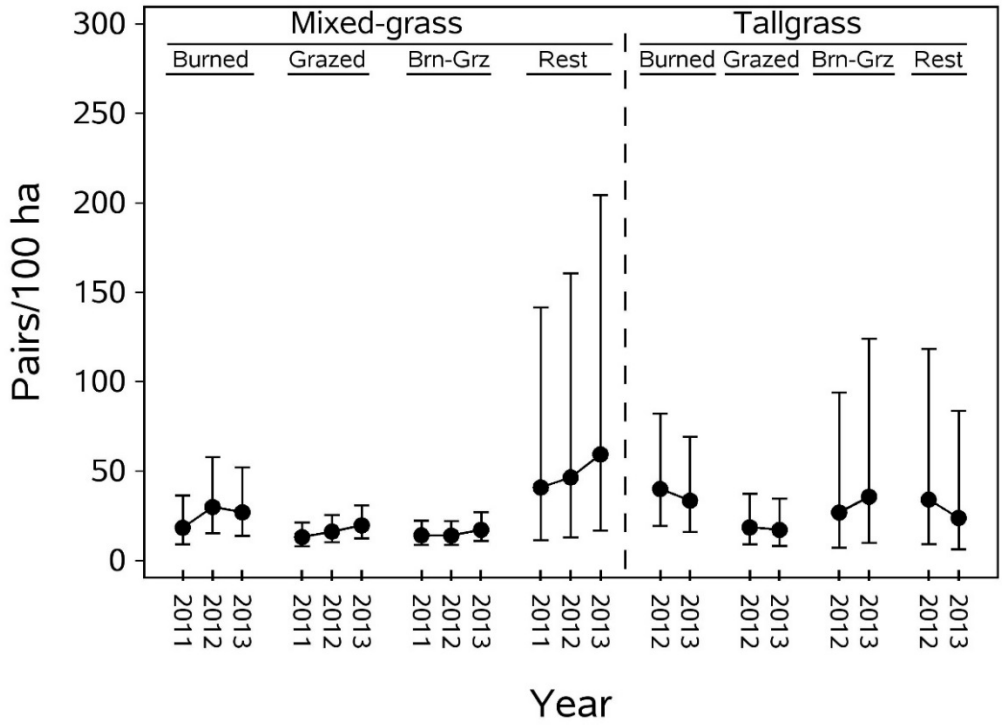
Effect	Sources of Variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × regime × year	19	182.6	1.07	0.3882
Contrasts:	Mixed: regime effect	3	80.0	1.63	0.1887
	Mixed: year effect	2	130.1	1.76	0.1753
	Mixed: interaction	6	131.5	0.70	0.6504
	Tall: regime effect	3	91.3	0.76	0.5167
	Tall: year effect	1	128.2	0.22	0.6431
	Tall: interaction	3	128.2	0.41	0.7445
	Mixed versus tall: burned only	1	86.3	0.73	0.3941
	Mixed versus tall: grazed only	1	89.1	0.06	0.8035
	Mixed versus tall: burned-grazed	1	90.6	1.24	0.2693
	Mixed versus tall: rest	1	85.3	0.40	0.5306

[1]Sources of variation for the model: Y=Unit(Grass type × Regime) + Grass type × Regime × Year + Year × Unit(Grass type × Regime), where Grass type × Regime × Year is a fixed effect, Unit(Grass type × Regime) and Year × Unit(Grass type × Regime) are random effects in a mixed-model framework, and Year is a repeated-measures factor.
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 5.4. Least squares mean (standard error) densities (pairs per 100 hectares) and back-transformed least squares mean (95-percent confidence intervals) densities (pairs per 100 hectares) of clay-colored sparrows (*Spizella pallida*), by grassland type (mixed-grass, tallgrass), overall treatment regime (burned only, grazed only, burned-grazed, or rest), and year (2011, 2012, 2013), on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

					Back-transformed		
						95-percent confidence intervals	
Grass	Regime	Year	LSMean	SE	LSMean	LCL	UCL
Mixed	Burned only	2011	2.97	0.33	18.44	9.14	36.30
		2012	3.43	0.33	30.02	15.38	57.76
		2013	3.33	0.33	27.06	13.81	52.15
	Grazed only	2011	2.66	0.23	13.23	8.08	21.33
		2012	2.85	0.22	16.30	10.28	25.52
		2013	3.03	0.22	19.78	12.52	30.92
	Burned-grazed	2011	2.72	0.22	14.19	8.87	22.37
		2012	2.71	0.22	14.06	8.82	22.08
		2013	2.91	0.22	17.29	10.91	27.11
	Rest	2011	3.74	0.62	40.92	11.34	141.43
		2012	3.86	0.62	46.59	13.01	160.70
		2013	4.10	0.62	59.43	16.78	204.32
Tall	Burned only	2012	3.72	0.36	40.12	19.29	82.32
		2013	3.54	0.36	33.60	16.08	69.10
	Grazed only	2012	2.98	0.34	18.65	9.06	37.40
		2013	2.90	0.34	17.24	8.33	34.64
	Burned-grazed	2012	3.33	0.62	26.96	7.23	94.02
		2013	3.61	0.62	35.80	9.83	124.04
	Rest	2012	3.56	0.62	34.15	9.35	118.44
		2013	3.22	0.62	23.94	6.34	83.73



[Brn-Grz, burned-grazed]

Figure 5.2. Back-transformed least squares mean densities (pairs per 100 hectares) of clay-colored sparrows (*Spizella pallida*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits.

C. Bobolink (*Dolichonyx oryzivorus*)

Table 5.5. Generalized linear mixed model (assuming a gamma distribution with a log link) testing the influence of management regime and year on breeding densities (pairs per 100 hectares) of bobolinks (*Dolichonyx oryzivorus*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[*, evidence for moderate effect ($0.05<p\leq0.10$); **, evidence for strong effect ($p\leq0.05$)]

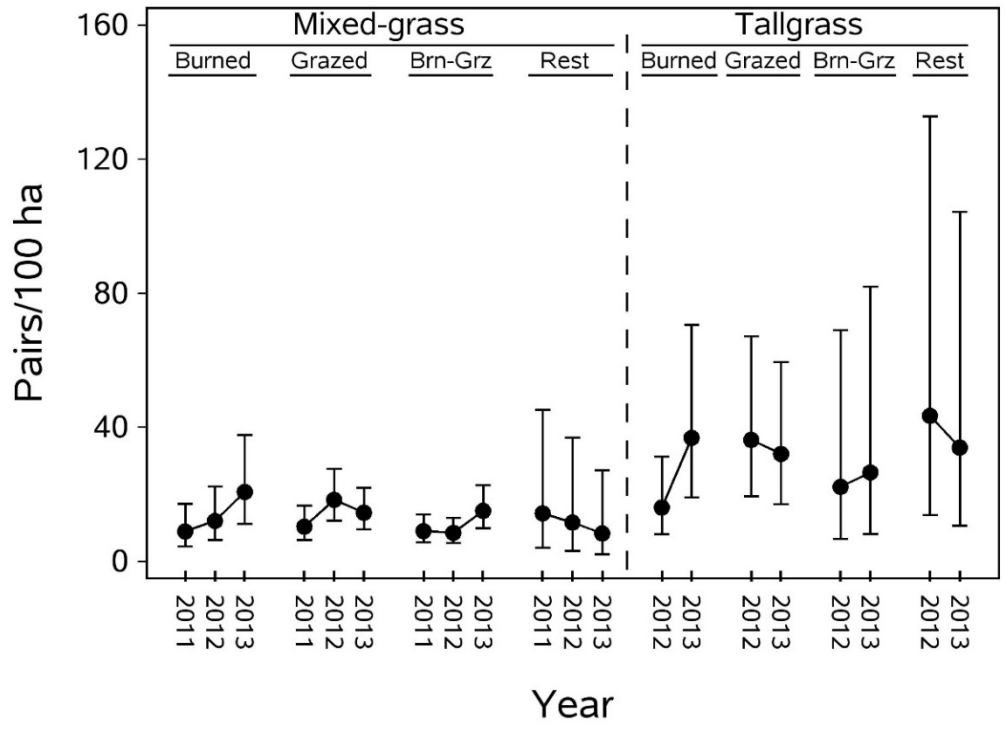
Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × regime × year	19	184.7	2.28	0.0027**
Contrasts:	Mixed: regime effect	3	87.8	0.77	0.5133
	Mixed: year effect	2	139.8	0.59	0.5584
	Mixed: interaction	6	146.3	1.18	0.3215
	Tall: regime effect	3	116.9	0.49	0.6932
	Tall: year effect	1	124.1	0.26	0.6094
	Tall: interaction	3	124.1	1.00	0.3970
	Mixed versus tall: burned only	1	104.8	3.56	0.0621*
	Mixed versus tall: grazed only	1	111.2	9.93	0.0021**
	Mixed versus tall: burned-grazed	1	114.2	3.09	0.0813*
	Mixed versus tall: rest	1	102.0	4.43	0.0377**

[1]Sources of variation for the model: Y=Unit(Grass type × Regime) + Grass type × Regime × Year + Year × Unit(Grass type × Regime), where Grass type × Regime × Year is a fixed effect, Unit(Grass type × Regime) and Year × Unit(Grass type × Regime) are random effects in a mixed-model framework, and Year is a repeated-measures factor.
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 5.6. Least squares mean (standard error) densities (pairs per 100 hectares) and back-transformed least squares mean (95-percent confidence intervals) densities (pairs per 100 hectares) of bobolinks (*Dolichonyx oryzivorus*), by grassland type (mixed-grass, tallgrass), overall treatment regime (burned only, grazed only, burned-grazed, or rest), and year (2011, 2012, 2013), on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

					Back-transformed		
						95-percent confidence intervals	
Grass	Regime	Year	LSMean	SE	LSMean	LCL	UCL
Mixed	Burned only	2011	2.30	0.31	8.95	4.45	17.19
		2012	2.57	0.29	12.10	6.37	22.29
		2013	3.08	0.29	20.74	11.23	37.65
	Grazed only	2011	2.43	0.22	10.40	6.36	16.65
		2012	2.96	0.20	18.39	12.14	27.62
		2013	2.74	0.20	14.55	9.53	21.95
	Burned-grazed	2011	2.31	0.20	9.07	5.77	13.99
		2012	2.26	0.20	8.54	5.46	13.08
		2013	2.78	0.20	15.09	9.90	22.76
	Rest	2011	2.73	0.56	14.37	4.11	45.25
		2012	2.53	0.56	11.61	3.19	36.93
		2013	2.24	0.56	8.36	2.11	27.15
Tall	Burned only	2012	2.84	0.32	16.08	8.04	31.26
		2013	3.63	0.32	36.89	19.06	70.57
	Grazed only	2012	3.62	0.31	36.28	19.39	67.15
		2013	3.50	0.31	32.07	17.09	59.46
	Burned-grazed	2012	3.15	0.56	22.25	6.73	68.96
		2013	3.32	0.56	26.56	8.16	81.94
	Rest	2012	3.79	0.56	43.45	13.77	132.75
		2013	3.55	0.56	33.97	10.62	104.23



[Brn-Grz, burned-grazed]

Figure 5.3. Back-transformed least squares mean densities (pairs per 100 hectares) of bobolinks (*Dolichonyx oryzivorus*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits.

D. Grasshopper Sparrow (*Ammodramus savannarum*)

Table 5.7. Generalized linear mixed model (assuming a gamma distribution with a log link) testing the influence of management regime and year on breeding densities (pairs per 100 hectares) of grasshopper sparrows (*Ammodramus savannarum*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[<, less than; **, evidence for strong effect ($p \leq 0.05$)]

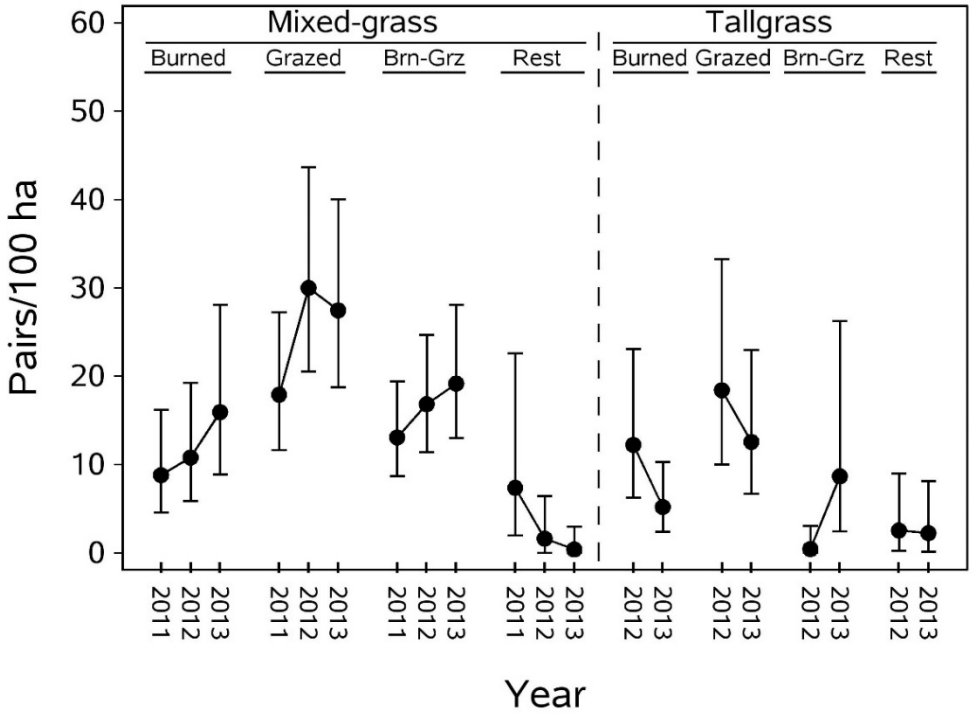
Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × regime × year	19	183.7	4.73	<0.0001**
Contrasts:	Mixed: regime effect	3	80.8	9.17	<0.0001**
	Mixed: year effect	2	134.4	0.16	0.8546
	Mixed: interaction	6	138.2	2.21	0.0459**
	Tall: regime effect	3	105.3	4.71	0.0040**
	Tall: year effect	1	126.8	0.60	0.4391
	Tall: interaction	3	126.8	5.98	0.0008**
	Mixed versus tall: burned only	1	94.3	0.92	0.3386
	Mixed versus tall: grazed only	1	99.8	2.51	0.1163
	Mixed versus tall: burned-grazed	1	102.9	10.37	0.0017**
	Mixed versus tall: rest	1	92.2	0.02	0.8999

[1]Sources of variation for the model: Y=Unit(Grass type × Regime) + Grass type × Regime × Year + Year × Unit(Grass type × Regime), where Grass type × Regime × Year is a fixed effect, Unit(Grass type × Regime) and Year × Unit(Grass type × Regime) are random effects in a mixed-model framework, and Year is a repeated-measures factor.
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 5.8. Least squares mean (standard error) densities (pairs per 100 hectares) and back-transformed least squares mean (95-percent confidence intervals) densities (pairs per 100 hectares) of grasshopper sparrows (*Ammodramus savannarum*), by grassland type (mixed-grass, tallgrass), overall treatment regime (burned only, grazed only, burned-grazed, or rest), and year (2011, 2012, 2013), on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

					Back-transformed		
						95-percent confidence intervals	
Grass	Regime	Year	LSMean	SE	LSMean	LCL	UCL
Mixed	Burned only	2011	2.28	0.29	8.82	4.60	16.21
		2012	2.47	0.28	10.81	5.88	19.28
		2013	2.83	0.28	15.95	8.87	28.11
	Grazed only	2011	2.94	0.20	17.92	11.66	27.26
		2012	3.43	0.19	30.00	20.53	43.63
		2013	3.35	0.19	27.47	18.75	40.04
	Burned-grazed	2011	2.65	0.19	13.09	8.73	19.42
		2012	2.88	0.19	16.84	11.39	24.68
		2013	3.00	0.19	19.17	12.99	28.08
	Rest	2011	2.13	0.53	7.38	1.98	22.60
		2012	0.97	0.53	1.63	0.00	6.42
		2013	0.35	0.53	0.41	0.00	2.98
Tall	Burned only	2012	2.58	0.30	12.24	6.28	23.07
		2013	1.83	0.30	5.21	2.42	10.29
	Grazed only	2012	2.97	0.29	18.43	10.02	33.26
		2013	2.61	0.29	12.58	6.71	22.95
	Burned-grazed	2012	0.37	0.53	0.45	0.00	3.09
		2013	2.27	0.53	8.68	2.44	26.26
	Rest	2012	1.27	0.53	2.56	0.26	9.01
		2013	1.18	0.53	2.25	0.15	8.14



[Brn-Grz, burned-grazed]

Figure 5.4. Back-transformed least squares mean densities (pairs per 100 hectares) of grasshopper sparrows (*Ammodramus savannarum*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits.

E. Savannah Sparrow (*Passerculus sandwichensis*)

Table 5.9. Generalized linear mixed model (assuming a gamma distribution with a log link) testing the influence of management regime and year on breeding densities (pairs per 100 hectares) of Savannah sparrows (*Passerculus sandwichensis*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[<, less than; *, evidence for moderate effect ($0.05<p\leq0.10$); **, evidence for strong effect ($p\leq0.05$]

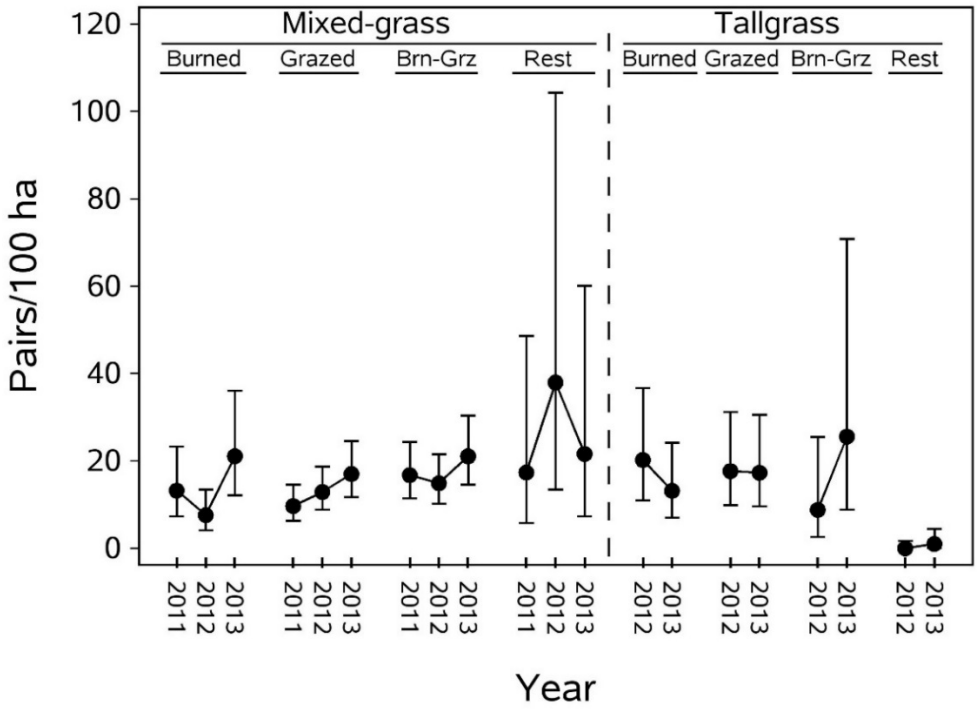
Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × regime × year	19	182.9	3.73	<0.0001**
Contrasts:	Mixed: regime effect	3	78.9	1.16	0.3301
	Mixed: year effect	2	131.3	2.06	0.1315
	Mixed: interaction	6	134.1	2.74	0.0151**
	Tall: regime effect	3	98.9	9.20	<0.0001**
	Tall: year effect	1	126.4	2.87	0.0929*
	Tall: interaction	3	126.4	3.05	0.0309**
	Mixed versus tall: burned only	1	89.7	0.42	0.5209
	Mixed versus tall: grazed only	1	94.3	1.00	0.3211
	Mixed versus tall: burned-grazed	1	96.8	0.08	0.7830
	Mixed versus tall: rest	1	88.0	22.11	<0.0001**

[1]Sources of variation for the model: Y=Unit(Grass type × Regime) + Grass type × Regime × Year + Year × Unit(Grass type × Regime), where Grass type × Regime × Year is a fixed effect, Unit(Grass type × Regime) and Year × Unit(Grass type × Regime) are random effects in a mixed-model framework, and Year is a repeated-measures factor.
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 5.10. Least squares mean (standard error) densities (pairs per 100 hectares) and back-transformed least squares mean (95-percent confidence intervals) densities (pairs per 100 hectares) of Savannah sparrows (*Passerculus sandwichensis*), by grassland type (mixed-grass, tallgrass), overall treatment regime (burned only, grazed only, burned-grazed, or rest), and year (2011, 2012, 2013), on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

					Back-transformed		
						95-percent confidence intervals	
Grass	Regime	Year	LSMean	SE	LSMean	LCL	UCL
Mixed	Burned only	2011	2.66	0.27	13.23	7.33	23.33
		2012	2.15	0.26	7.61	4.12	13.46
		2013	3.10	0.26	21.10	12.15	36.12
	Grazed only	2011	2.37	0.19	9.68	6.32	14.60
		2012	2.63	0.18	12.90	8.81	18.71
		2013	2.89	0.18	17.03	11.70	24.60
	Burned-grazed	2011	2.88	0.18	16.77	11.47	24.32
		2012	2.77	0.18	14.92	10.23	21.56
		2013	3.09	0.18	21.08	14.55	30.34
	Rest	2011	2.91	0.51	17.36	5.80	48.58
		2012	3.66	0.51	37.97	13.43	104.25
		2013	3.12	0.51	21.61	7.37	60.07
Tall	Burned only	2012	3.06	0.29	20.24	10.97	36.70
		2013	2.65	0.29	13.17	6.98	24.14
	Grazed only	2012	2.93	0.28	17.69	9.85	31.21
		2013	2.91	0.28	17.31	9.63	30.56
	Burned-grazed	2012	2.28	0.51	8.82	2.64	25.52
		2013	3.28	0.51	25.58	8.84	70.78
	Rest	2012	0.00	0.51	0.00	0.00	1.70
		2013	0.70	0.51	1.01	0.00	4.43



[Brn-Grz, burned-grazed]

Figure 5.5. Back-transformed least squares mean densities (pairs per 100 hectares) of Savannah sparrows (*Passerculus sandwichensis*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits.

F. Western Meadowlark (*Sturnella neglecta*)

Table 5.11. Generalized linear mixed model (assuming a gamma distribution with a log link) testing the influence of management regime and year on breeding densities (pairs per 100 hectares) of western meadowlarks (*Sturnella neglecta*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[<, less than; *, evidence for moderate effect ($0.05<p\leq0.10$); **, evidence for strong effect ($p\leq0.05$)]

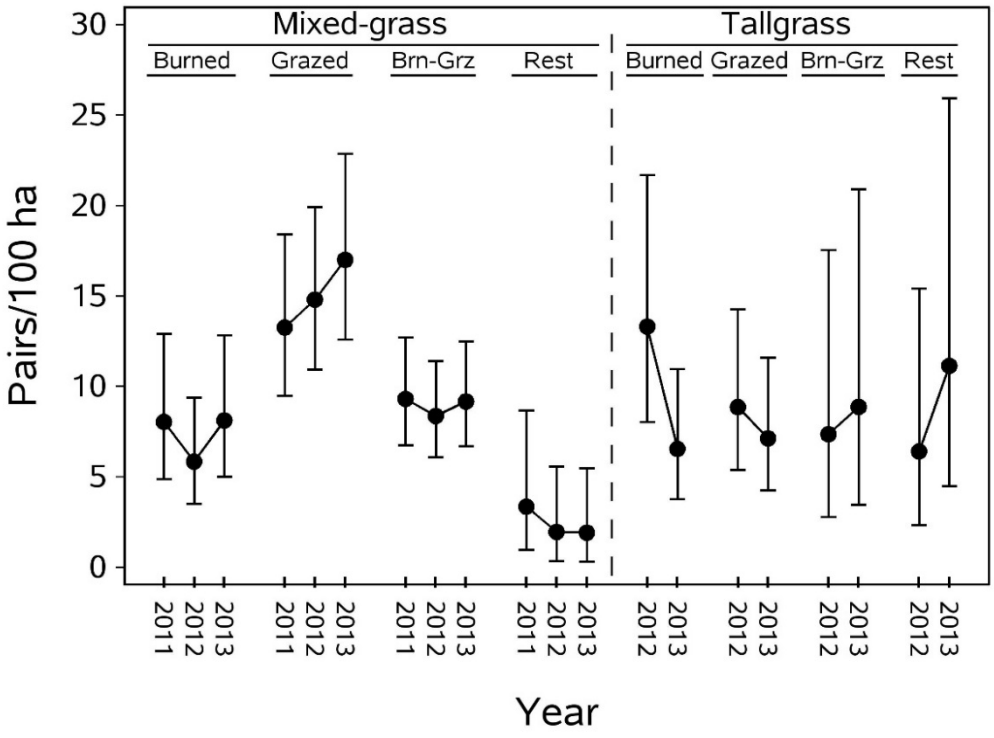
Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × regime × year	19	181.5	2.37	0.0017**
Contrasts:	Mixed: regime effect	3	74.9	9.48	<0.0001**
	Mixed: year effect	2	128.1	1.06	0.3479
	Mixed: interaction	6	131.6	0.59	0.7394
	Tall: regime effect	3	97.6	0.10	0.9590
	Tall: year effect	1	121.4	0.07	0.7935
	Tall: interaction	3	121.4	2.42	0.0695*
	Mixed versus tall: burned only	1	87.5	0.76	0.3861
	Mixed versus tall: grazed only	1	92.4	6.65	0.0115**
	Mixed versus tall: burned-grazed	1	95.3	0.06	0.8082
	Mixed versus tall: rest	1	85.3	4.80	0.0313**

[1]Sources of variation for the model: Y=Unit(Grass type × Regime) + Grass type × Regime × Year + Year × Unit(Grass type × Regime), where Grass type × Regime × Year is a fixed effect, Unit(Grass type × Regime) and Year × Unit(Grass type × Regime) are random effects in a mixed-model framework, and Year is a repeated-measures factor.
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 5.12. Least squares mean (standard error) densities (pairs per 100 hectares) and back-transformed least squares mean (95-percent confidence intervals) densities (pairs per 100 hectares) of western meadowlarks (*Sturnella neglecta*), by grassland type (mixed-grass, tallgrass), overall treatment regime (burned only, grazed only, burned-grazed, or rest), and year (2011, 2012, 2013), on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

					Back-transformed		
						95-percent confidence intervals	
Grass	Regime	Year	LSMean	SE	LSMean	LCL	UCL
Mixed	Burned only	2011	2.20	0.22	8.04	4.88	12.92
		2012	1.92	0.21	5.85	3.52	9.38
		2013	2.21	0.21	8.12	5.01	12.82
	Grazed only	2011	2.66	0.16	13.26	9.49	18.39
		2012	2.76	0.14	14.80	10.94	19.92
		2013	2.89	0.14	17.00	12.59	22.85
	Burned-grazed	2011	2.33	0.15	9.31	6.75	12.70
		2012	2.24	0.14	8.37	6.08	11.39
		2013	2.32	0.14	9.17	6.68	12.48
	Rest	2011	1.47	0.41	3.36	0.97	8.67
		2012	1.09	0.41	1.96	0.34	5.57
		2013	1.07	0.41	1.92	0.32	5.47
Tall	Burned only	2012	2.66	0.23	13.31	8.04	21.67
		2013	2.02	0.23	6.55	3.77	10.96
	Grazed only	2012	2.29	0.22	8.86	5.38	14.26
		2013	2.10	0.22	7.13	4.26	11.58
	Burned-grazed	2012	2.12	0.41	7.36	2.77	17.54
		2013	2.29	0.41	8.87	3.45	20.89
	Rest	2012	2.00	0.41	6.41	2.34	15.42
		2013	2.50	0.41	11.14	4.48	25.92



[Brn-Grz, burned-grazed]

Figure 5.6. Back-transformed least squares mean densities (pairs per 100 hectares) of western meadowlarks (*Sturnella neglecta*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits.

G. Brown-headed Cowbird (*Molothrus ater*)

Table 5.13. Generalized linear mixed model (assuming a gamma distribution with a log link) testing the influence of management regime and year on breeding densities (pairs per 100 hectares) of Brown-headed Cowbirds (*Molothrus ater*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[<, less than; *, evidence for moderate effect ($0.05<p\leq0.10$); **, evidence for strong effect ($p\leq0.05$)]

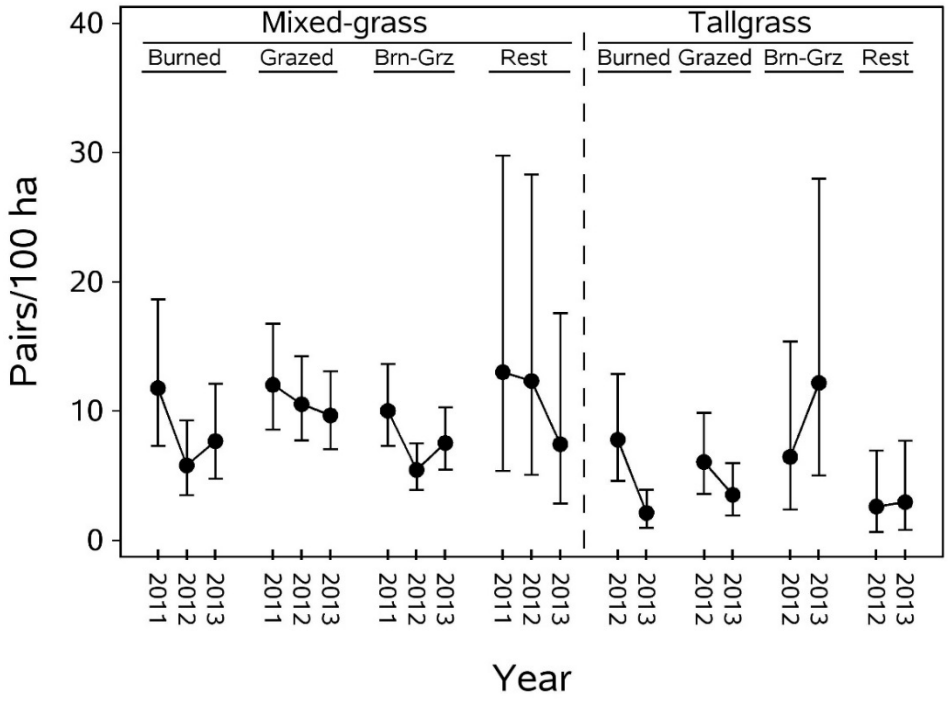
Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × regime × year	19	182.3	3.47	<0.0001**
Contrasts:	Mixed: regime effect	3	77.7	1.94	0.1305
	Mixed: year effect	2	131.7	2.89	0.0588*
	Mixed: interaction	6	137.0	1.07	0.3808
	Tall: regime effect	3	105.5	1.55	0.2048
	Tall: year effect	1	120.1	1.13	0.2889
	Tall: interaction	3	120.1	3.51	0.0175**
	Mixed versus tall: burned only	1	93.4	5.30	0.0236**
	Mixed versus tall: grazed only	1	99.5	12.58	0.0006**
	Mixed versus tall: burned-grazed	1	102.8	0.21	0.6441
	Mixed versus tall: rest	1	90.9	6.82	0.0105**

[1]Sources of variation for the model: Y=Unit(Grass type × Regime) + Grass type × Regime × Year + Year × Unit(Grass type × Regime), where Grass type × Regime × Year is a fixed effect, Unit(Grass type × Regime) and Year × Unit(Grass type × Regime) are random effects in a mixed-model framework, and Year is a repeated-measures factor.
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 5.14. Least squares mean (standard error) densities (pairs per 100 hectares) and back-transformed least squares mean (95-percent confidence intervals) densities (pairs per 100 hectares) of brown-headed cowbirds (*Molothrus ater*), by grassland type (mixed-grass, tallgrass), overall treatment regime (burned only, grazed only, burned-grazed, or rest), and year (2011, 2012, 2013), on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

					Back-transformed		
						95-percent confidence intervals	
Grass	Regime	Year	LSMean	SE	LSMean	LCL	UCL
Mixed	Burned only	2011	2.55	0.22	11.79	7.32	18.65
		2012	1.92	0.21	5.81	3.51	9.27
		2013	2.16	0.21	7.69	4.76	12.10
	Grazed only	2011	2.57	0.16	12.04	8.57	16.77
		2012	2.45	0.14	10.54	7.74	14.24
		2013	2.37	0.14	9.68	7.08	13.10
	Burned-grazed	2011	2.40	0.14	10.03	7.31	13.65
		2012	1.87	0.14	5.46	3.90	7.53
		2013	2.15	0.14	7.55	5.47	10.29
	Rest	2011	2.64	0.40	13.02	5.38	29.78
		2012	2.59	0.40	12.34	5.07	28.30
		2013	2.13	0.40	7.45	2.85	17.57
Tall	Burned only	2012	2.17	0.23	7.80	4.59	12.86
		2013	1.14	0.23	2.14	0.99	3.94
	Grazed only	2012	1.96	0.22	6.07	3.60	9.88
		2013	1.51	0.22	3.54	1.95	5.98
	Burned-grazed	2012	2.01	0.40	6.47	2.40	15.40
		2013	2.58	0.40	12.19	5.01	27.98
	Rest	2012	1.29	0.40	2.62	0.65	6.96
		2013	1.38	0.40	2.97	0.81	7.71



[Brn-Grz, burned-grazed]

Figure 5.7. Back-transformed least squares mean densities (pairs per 100 hectares) of brown-headed cowbirds (*Molothrus ater*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits.

H. Sedge Wren (*Cistothorus platensis*)

Table 5.15. Generalized linear mixed model (assuming a gamma distribution with a log link) testing the influence of management regime and year on breeding densities (pairs per 100 hectares) of sedge wrens (*Cistothorus platensis*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[<, less than; **, evidence for strong effect ($p \leq 0.05$)]

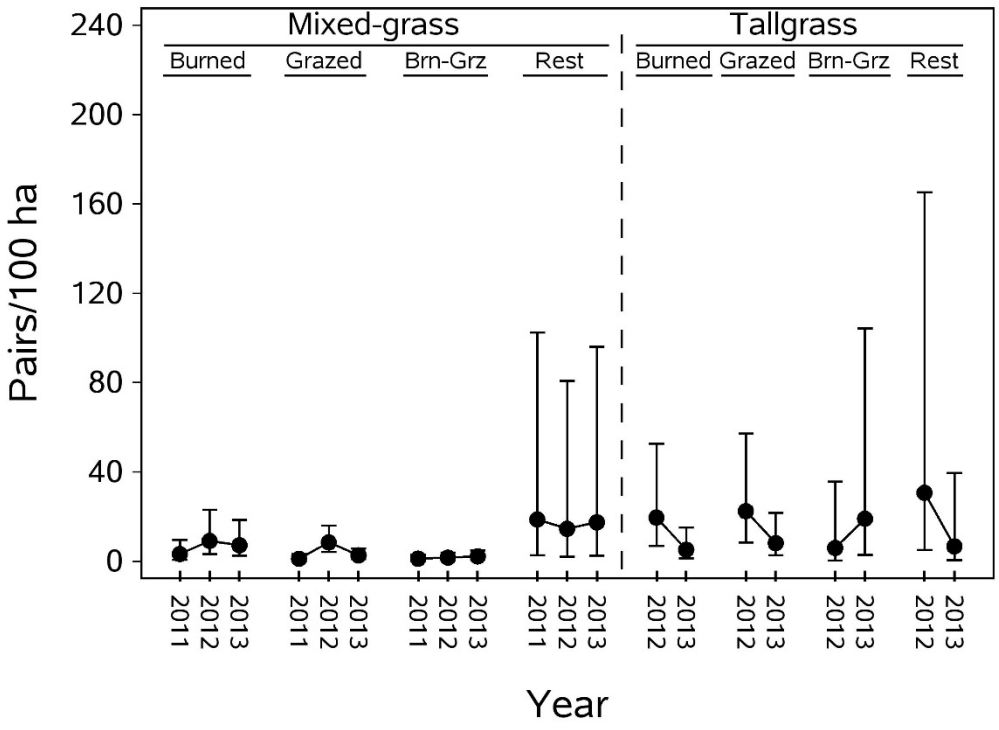
Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × regime × year	19	186.0	3.31	<0.0001**
Contrasts:	Mixed: regime effect	3	88.0	4.25	0.0075**
	Mixed: year effect	2	141.5	1.74	0.1792
	Mixed: interaction	6	146.2	1.68	0.1287
	Tall: regime effect	3	115.7	0.10	0.9579
	Tall: year effect	1	131.2	2.49	0.1168
	Tall: interaction	3	131.2	1.52	0.2112
	Mixed versus tall: burned only	1	103.7	0.83	0.3637
	Mixed versus tall: grazed only	1	109.8	8.05	0.0054**
	Mixed versus tall: burned-grazed	1	113.1	4.15	0.0440**
	Mixed versus tall: rest	1	101.2	0.02	0.8852

[1]Sources of variation for the model: Y=Unit(Grass type × Regime) + Grass type × Regime × Year + Year × Unit(Grass type × Regime), where Grass type × Regime × Year is a fixed effect, Unit(Grass type × Regime) and Year × Unit(Grass type × Regime) are random effects in a mixed-model framework, and Year is a repeated-measures factor.
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 5.16. Least squares mean (standard error) densities (pairs per 100 hectares) and back-transformed least squares mean (95-percent confidence intervals) densities (pairs per 100 hectares) of sedge wrens (*Cistothorus platensis*), by grassland type (mixed-grass, tallgrass), overall treatment regime (burned only, grazed only, burned-grazed, or rest), and year (2011, 2012, 2013), on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

					Back-transformed		
						95-percent confidence intervals	
Grass	Regime	Year	LSMean	SE	LSMean	LCL	UCL
Mixed	Burned only	2011	1.46	0.46	3.31	0.75	9.64
		2012	2.32	0.44	9.16	3.28	23.14
		2013	2.11	0.44	7.23	2.47	18.55
	Grazed only	2011	0.78	0.33	1.18	0.14	3.18
		2012	2.25	0.30	8.49	4.29	16.03
		2013	1.32	0.30	2.73	1.08	5.70
	Burned-grazed	2011	0.81	0.30	1.25	0.24	3.09
		2012	1.00	0.30	1.71	0.51	3.85
		2013	1.19	0.30	2.29	0.83	4.91
	Rest	2011	2.98	0.85	18.76	2.77	102.52
		2012	2.75	0.85	14.60	1.98	80.74
		2013	2.92	0.85	17.51	2.53	95.99
Tall	Burned only	2012	3.03	0.49	19.61	6.92	52.62
		2013	1.83	0.49	5.24	1.40	15.24
	Grazed only	2012	3.16	0.46	22.49	8.48	57.20
		2013	2.22	0.46	8.20	2.71	21.79
	Burned-grazed	2012	1.95	0.85	6.00	0.34	35.69
		2013	3.00	0.85	19.08	2.83	104.24
	Rest	2012	3.46	0.85	30.70	5.05	165.12
		2013	2.04	0.85	6.72	0.47	39.47



[Brn-Grz, burned-grazed]

Figure 5.8. Back-transformed least squares mean densities (pairs per 100 hectares) of sedge wrens (*Cistothorus platensis*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits.

I. Common Yellowthroat (*Geothlypis trichas*)

Table 5.17. Generalized linear mixed model (assuming a gamma distribution with a log link) testing the influence of management regime and year on breeding densities (pairs per 100 hectares) of common yellowthroats (*Geothlypis trichas*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[<, less than; **, evidence for strong effect ($p \leq 0.05$)]

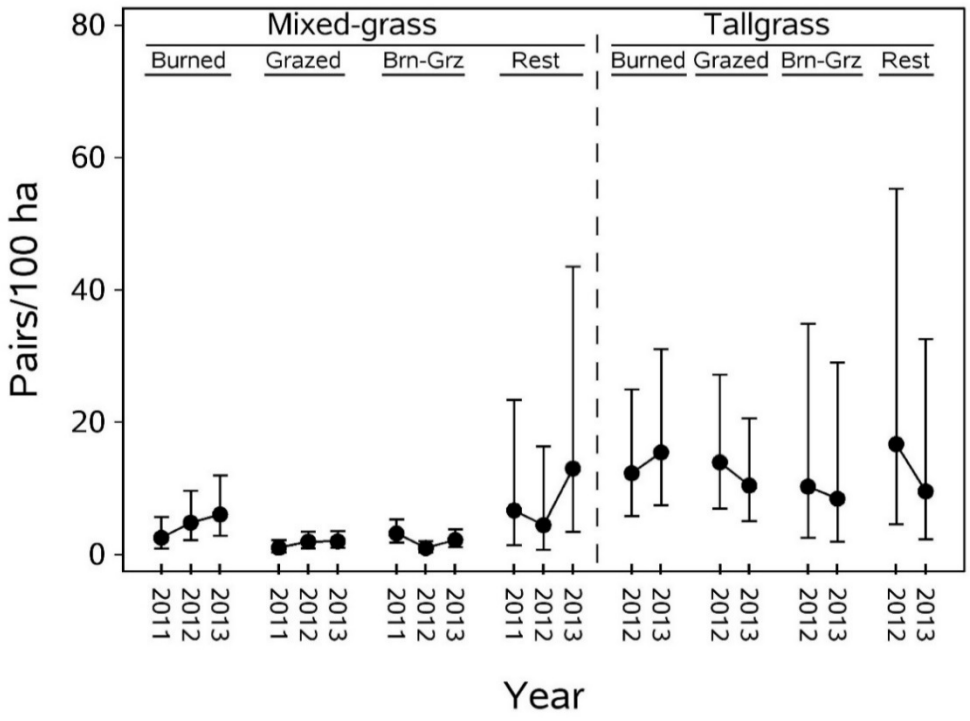
Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × regime × year	19	182.1	4.29	<0.0001**
Contrasts:	Mixed: regime effect	3	77.0	3.02	0.0348**
	Mixed: year effect	2	129.3	3.07	0.0500**
	Mixed: interaction	6	132.0	3.87	0.0014**
	Tall: regime effect	3	96.3	0.12	0.9486
	Tall: year effect	1	124.6	0.76	0.3845
	Tall: interaction	3	124.6	0.67	0.5705
	Mixed versus tall: burned only	1	87.4	6.73	0.0111**
	Mixed versus tall: grazed only	1	91.9	22.70	<0.0001**
	Mixed versus tall: burned-grazed	1	94.3	4.94	0.0286**
	Mixed versus tall: rest	1	85.8	0.47	0.4964

[1]Sources of variation for the model: Y=Unit(Grass type × Regime) + Grass type × Regime × Year + Year × Unit(Grass type × Regime), where Grass type × Regime × Year is a fixed effect, Unit(Grass type × Regime) and Year × Unit(Grass type × Regime) are random effects in a mixed-model framework, and Year is a repeated-measures factor.
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 5.18. Least squares mean (standard error) densities (pairs per 100 hectares) and back-transformed least squares mean (95-percent confidence intervals) densities (pairs per 100 hectares) of common yellowthroats (*Geothlypis trichas*), by grassland type (mixed-grass, tallgrass), overall treatment regime (burned only, grazed only, burned-grazed, or rest), and year (2011, 2012, 2013), on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

					Back-transformed		
						95-percent confidence intervals	
Grass	Regime	Year	LSMean	SE	LSMean	LCL	UCL
Mixed	Burned only	2011	1.27	0.32	2.57	0.92	5.66
		2012	1.76	0.31	4.84	2.19	9.67
		2013	1.96	0.31	6.08	2.87	11.95
	Grazed only	2011	0.72	0.22	1.05	0.32	2.18
		2012	1.09	0.21	1.98	0.99	3.48
		2013	1.10	0.21	2.01	1.00	3.52
	Burned-grazed	2011	1.44	0.21	3.22	1.79	5.36
		2012	0.70	0.21	1.02	0.35	2.03
		2013	1.17	0.21	2.22	1.14	3.84
	Rest	2011	2.04	0.59	6.69	1.42	23.41
		2012	1.70	0.59	4.47	0.72	16.38
		2013	2.64	0.59	13.02	3.41	43.53
Tall	Burned only	2012	2.59	0.34	12.31	5.83	24.94
		2013	2.80	0.34	15.46	7.44	31.07
	Grazed only	2012	2.71	0.32	13.96	6.95	27.18
		2013	2.44	0.32	10.46	5.08	20.57
	Burned-grazed	2012	2.42	0.59	10.29	2.55	34.85
		2013	2.25	0.59	8.46	1.98	29.05
	Rest	2012	2.87	0.59	16.71	4.58	55.26
		2013	2.36	0.59	9.57	2.33	32.57



[Brn-Grz, burned-grazed]

Figure 5.9. Back-transformed least squares mean densities (pairs per 100 hectares) of common yellowthroats (*Geothlypis trichas*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits.

J. Dickcissel (*Spiza americana*)

Table 5.19. Generalized linear mixed model (assuming a gamma distribution with a log link) testing the influence of management regime and year on breeding densities (pairs per 100 hectares) of dickcissels (*Spiza americana*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[<, less than; *, evidence for moderate effect ($0.05<p\leq0.10$); **, evidence for strong effect ($p\leq0.05$)]

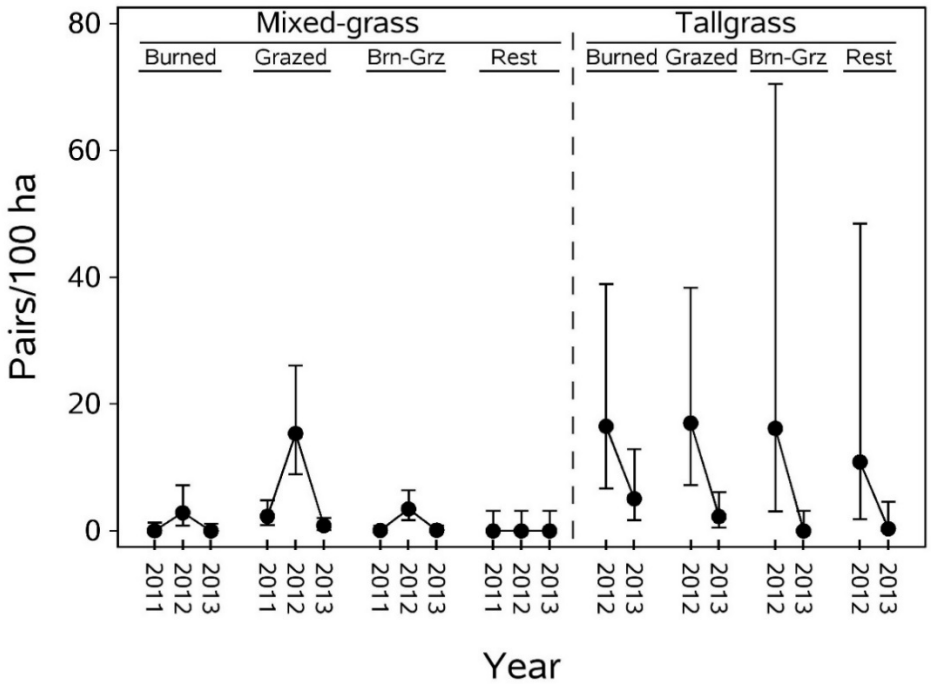
Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × regime × year	19	187.5	9.47	<0.0001**
Contrasts:	Mixed: regime effect	3	93.9	7.36	0.0002**
	Mixed: year effect	2	146.4	13.21	<0.0001**
	Mixed: interaction	6	151.6	1.45	0.1993
	Tall: regime effect	3	122.7	1.05	0.3751
	Tall: year effect	1	134.5	29.51	<0.0001**
	Tall: interaction	3	134.5	1.18	0.3184
	Mixed versus tall: burned only	1	110.5	19.37	<0.0001**
	Mixed versus tall: grazed only	1	116.8	1.91	0.1694
	Mixed versus tall: burned-grazed	1	120.0	2.01	0.1589
	Mixed versus tall: rest	1	107.9	3.32	0.0714*

[1]Sources of variation for the model: Y=Unit(Grass type × Regime) + Grass type × Regime × Year + Year × Unit(Grass type × Regime), where Grass type × Regime × Year is a fixed effect, Unit(Grass type × Regime) and Year × Unit(Grass type × Regime) are random effects in a mixed-model framework, and Year is a repeated-measures factor.
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 5.20. Least squares mean (standard error) densities (pairs per 100 hectares) and back-transformed least squares mean (95-percent confidence intervals) densities (pairs per 100 hectares) of dickcissels (*Spiza americana*), by grassland type (mixed-grass, tallgrass), overall treatment regime (burned only, grazed only, burned-grazed, or rest), and year (2011, 2012, 2013), on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

					Back-transformed		
						95-percent confidence intervals	
Grass	Regime	Year	LSMean	SE	LSMean	LCL	UCL
Mixed	Burned only	2011	0.04	0.40	0.04	0.00	1.28
		2012	1.36	0.38	2.88	0.84	7.17
		2013	0.00	0.38	0.00	0.00	1.11
	Grazed only	2011	1.20	0.29	2.31	0.89	4.81
		2012	2.80	0.26	15.37	8.90	26.09
		2013	0.61	0.26	0.84	0.11	2.04
	Burned-grazed	2011	0.08	0.26	0.08	0.00	0.81
		2012	1.50	0.26	3.47	1.70	6.39
		2013	0.12	0.26	0.12	0.00	0.86
	Rest	2011	0.00	0.73	0.00	0.00	3.16
		2012	0.00	0.73	0.00	0.00	3.16
		2013	0.00	0.73	0.00	0.00	3.16
Tall	Burned only	2012	2.86	0.42	16.51	6.69	38.89
		2013	1.81	0.42	5.09	1.67	12.88
	Grazed only	2012	2.89	0.40	17.01	7.25	38.34
		2013	1.18	0.40	2.27	0.50	6.13
	Burned-grazed	2012	2.84	0.73	16.17	3.12	70.47
		2013	0.00	0.73	0.00	0.00	3.16
	Rest	2012	2.47	0.73	10.88	1.85	48.46
		2013	0.30	0.73	0.35	0.00	4.62



[Brn-Grz, burned-grazed]

Figure 5.10. Back-transformed least squares mean densities (pairs per 100 hectares) of dickcissels (*Spiza americana*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits.

K. Chestnut-collared Longspur (*Calcarius ornatus*)

Table 5.21. Generalized linear mixed model (assuming a gamma distribution with a log link) testing the influence of management regime and year on breeding densities (pairs per 100 hectares) of chestnut-collared longspurs (*Calcarius ornatus*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[**, evidence for strong effect ($p \leq 0.05$)]

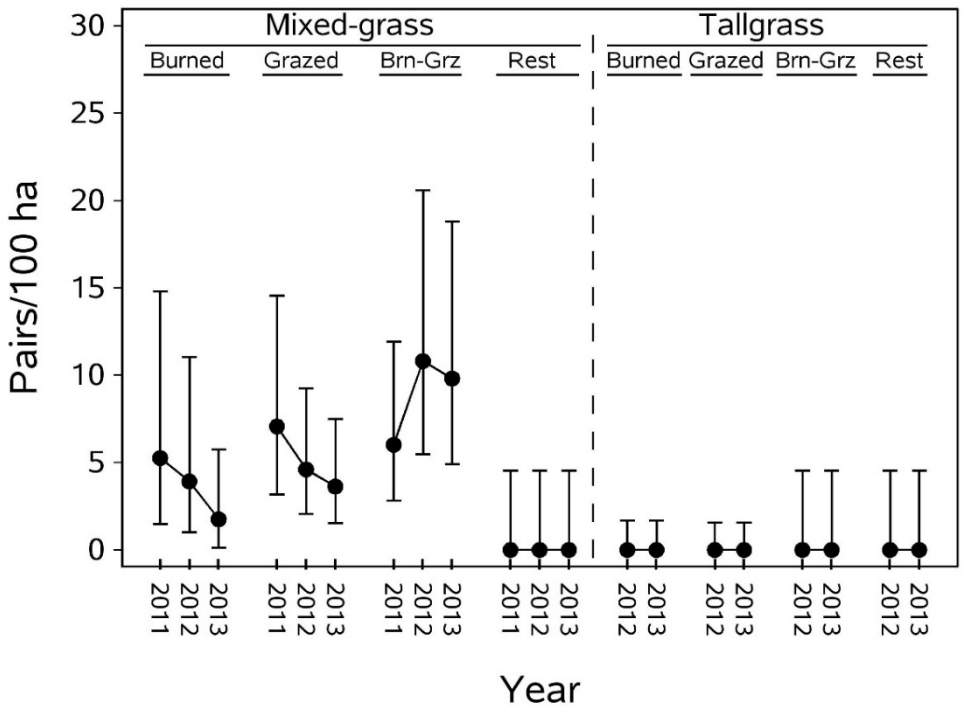
Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × regime × year	19	180.1	2.70	0.0003**
Contrasts:	Mixed: regime effect	3	71.64	3.60	0.0173**
	Mixed: year effect	2	124.2	0.40	0.6769
	Mixed: interaction	6	127.4	1.03	0.4079
	Tall: regime effect	3	92.3	0.00	1.0000
	Tall: year effect	1	118.5	0.00	1.0000
	Tall: interaction	3	118.5	0.00	1.0000
	Mixed versus tall: burned only	1	82.8	6.56	0.0122**
	Mixed versus tall: grazed only	1	87.53	13.20	0.0005**
	Mixed versus tall: burned-grazed	1	90.18	7.84	0.0062**
	Mixed versus tall: rest	1	81.02	0.00	1.0000

[1]Sources of variation for the model: Y=Unit(Grass type × Regime) + Grass type × Regime × Year + Year × Unit(Grass type × Regime), where Grass type × Regime × Year is a fixed effect, Unit(Grass type × Regime) and Year × Unit(Grass type × Regime) are random effects in a mixed-model framework, and Year is a repeated-measures factor.
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 5.22. Least squares mean (standard error) densities (pairs per 100 hectares) and back-transformed least squares mean (95-percent confidence intervals) densities (pairs per 100 hectares) of chestnut-collared longspurs (*Calcarius ornatus*), by grassland type (mixed-grass, tallgrass), overall treatment regime (burned only, grazed only, burned-grazed, or rest), and year (2011, 2012, 2013), on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

					Back-transformed		
						95-percent confidence intervals	
Grass	Regime	Year	LSMean	SE	LSMean	LCL	UCL
Mixed	Burned only	2011	1.83	0.47	5.26	1.48	14.81
		2012	1.59	0.46	3.92	1.01	11.05
		2013	1.01	0.46	1.76	0.13	5.75
	Grazed only	2011	2.09	0.34	7.07	3.18	14.56
		2012	1.73	0.31	4.61	2.07	9.26
		2013	1.53	0.31	3.63	1.53	7.48
	Burned-grazed	2011	1.95	0.31	6.02	2.81	11.93
		2012	2.47	0.31	10.81	5.47	20.58
		2013	2.38	0.31	9.81	4.90	18.79
	Rest	2011	0.00	0.87	0.00	0.00	4.55
		2012	0.00	0.87	0.00	0.00	4.55
		2013	0.00	0.87	0.00	0.00	4.55
Tall	Burned only	2012	0.00	0.50	0.00	0.00	1.69
		2013	0.00	0.50	0.00	0.00	1.69
	Grazed only	2012	0.00	0.48	0.00	0.00	1.56
		2013	0.00	0.48	0.00	0.00	1.56
	Burned-grazed	2012	0.00	0.87	0.00	0.00	4.55
		2013	0.00	0.87	0.00	0.00	4.55
	Rest	2012	0.00	0.87	0.00	0.00	4.55
		2013	0.00	0.87	0.00	0.00	4.55



[Brn-Grz, burned-grazed]

Figure 5.11. Back-transformed least squares mean densities (pairs per 100 hectares) of chestnut-collared longspurs (*Calcarius ornatus*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits.

L. Eastern Kingbird (*Tyrannus tyrannus*)

Table 5.23. Generalized linear mixed model (assuming a gamma distribution with a log link) testing the influence of management regime and year on breeding densities (pairs per 100 hectares) of eastern kingbirds (*Tyrannus tyrannus*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

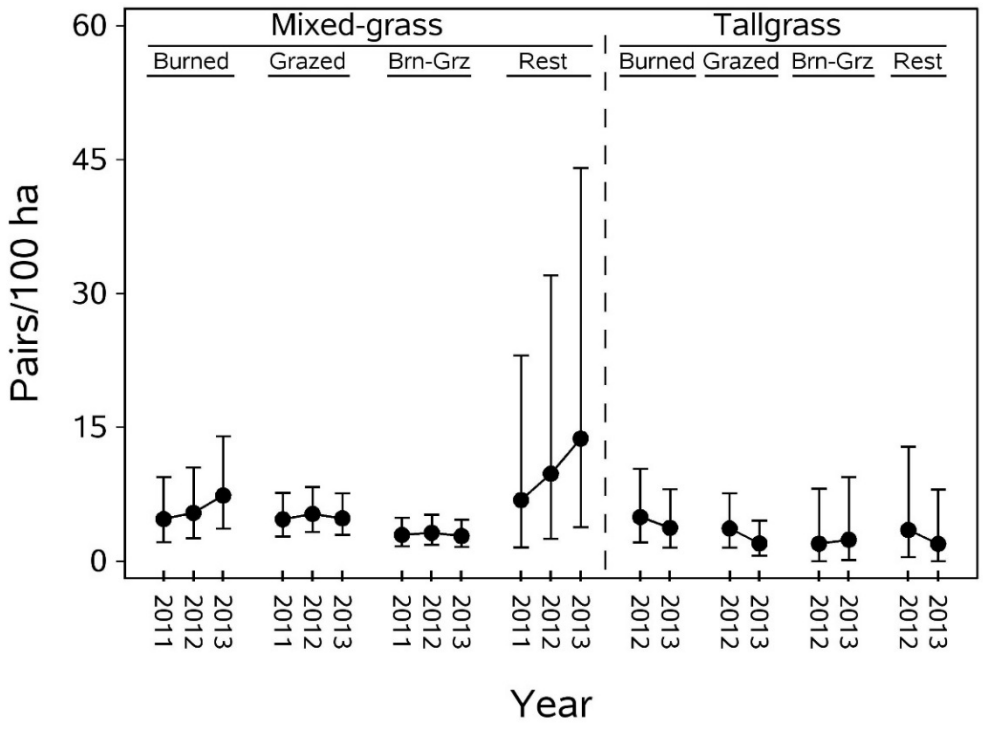
Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × regime × year	19	181.8	0.95	0.5271
Contrasts:	Mixed: regime effect	3	77.0	1.99	0.1230
	Mixed: year effect	2	128.0	0.99	0.3733
	Mixed: interaction	6	129.8	0.51	0.8019
	Tall: regime effect	3	91.7	0.37	0.7777
	Tall: year effect	1	125.2	1.83	0.1784
	Tall: interaction	3	125.2	0.51	0.6783
	Mixed versus tall: burned only	1	84.9	0.36	0.5521
	Mixed versus tall: grazed only	1	88.3	1.86	0.1766
	Mixed versus tall: burned-grazed	1	90.2	0.17	0.6834
	Mixed versus tall: rest	1	83.6	2.24	0.1386

[1]Sources of variation for the model: Y=Unit(Grass type × Regime) + Grass type × Regime × Year + Year × Unit(Grass type × Regime), where Grass type × Regime × Year is a fixed effect, Unit(Grass type × Regime) and Year × Unit(Grass type × Regime) are random effects in a mixed-model framework, and Year is a repeated-measures factor.
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 5.24. Least squares mean (standard error) densities (pairs per 100 hectares) and back-transformed least squares mean (95-percent confidence intervals) densities (pairs per 100 hectares) of eastern kingbirds (*Tyrannus tyrannus*), by grassland type (mixed-grass, tallgrass), overall treatment regime (burned only, grazed only, burned-grazed, or rest), and year (2011, 2012, 2013), on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

					Back-transformed		
						95-percent confidence intervals	
Grass	Regime	Year	LSMean	SE	LSMean	LCL	UCL
Mixed	Burned only	2011	1.75	0.30	4.74	2.16	9.44
		2012	1.86	0.30	5.43	2.59	10.51
		2013	2.13	0.30	7.38	3.68	14.01
	Grazed only	2011	1.74	0.21	4.71	2.77	7.67
		2012	1.84	0.20	5.32	3.28	8.35
		2013	1.76	0.20	4.82	2.93	7.63
	Burned-grazed	2011	1.38	0.20	2.97	1.67	4.89
		2012	1.44	0.20	3.21	1.85	5.22
		2013	1.35	0.20	2.84	1.60	4.69
	Rest	2011	2.06	0.57	6.87	1.58	23.05
		2012	2.38	0.57	9.82	2.54	32.05
		2013	2.69	0.57	13.76	3.83	44.07
Tall	Burned only	2012	1.79	0.33	4.96	2.13	10.36
		2013	1.56	0.33	3.76	1.50	8.07
	Grazed only	2012	1.54	0.31	3.68	1.54	7.63
		2013	1.10	0.31	2.01	0.63	4.56
	Burned-grazed	2012	1.09	0.57	1.98	0.00	8.11
		2013	1.23	0.57	2.42	0.12	9.44
	Rest	2012	1.51	0.57	3.52	0.48	12.81
		2013	1.08	0.57	1.96	0.00	8.03



[Brn-Grz, burned-grazed]

Figure 5.12. Back-transformed least squares mean densities (pairs per 100 hectares) of eastern kingbirds (*Tyrannus tyrannus*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits.

M. Yellow Warbler (*Setophaga petechia*)

Table 5.25. Generalized linear mixed model (assuming a gamma distribution with a log link) testing the influence of management regime and year on breeding densities (pairs per 100 hectares) of yellow warblers (*Setophaga petechia*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[<, less than; **, evidence for strong effect ($p \leq 0.05$)]

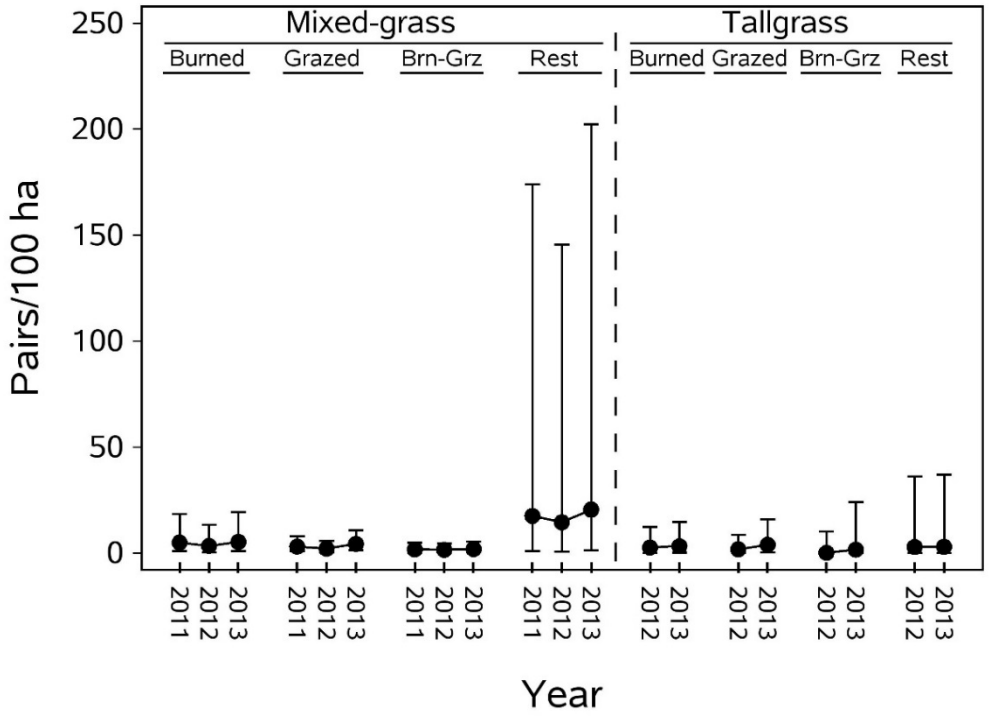
Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × regime × year	19	181.8	2.95	<0.0001**
Contrasts:	Mixed: regime effect	3	80.9	1.02	0.3870
	Mixed: year effect	2	128.4	7.62	0.0007**
	Mixed: interaction	6	128.6	1.22	0.3010
	Tall: regime effect	3	83.1	0.14	0.9354
	Tall: year effect	1	128.2	8.60	0.0040**
	Tall: interaction	3	128.2	1.71	0.1692
	Mixed versus tall: burned only	1	82.1	0.14	0.7085
	Mixed versus tall: grazed only	1	82.6	0.01	0.9035
	Mixed versus tall: burned-grazed	1	82.9	0.13	0.7146
	Mixed versus tall: rest	1	81.9	0.92	0.3402

[1]Sources of variation for the model: Y=Unit(Grass type × Regime) + Grass type × Regime × Year + Year × Unit(Grass type × Regime), where Grass type × Regime × Year is a fixed effect, Unit(Grass type × Regime) and Year × Unit(Grass type × Regime) are random effects in a mixed-model framework, and Year is a repeated-measures factor.
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 5.26. Least squares mean (standard error) densities (pairs per 100 hectares) and back-transformed least squares mean (95-percent confidence intervals) densities (pairs per 100 hectares) of yellow warblers (*Setophaga petechia*), by grassland type (mixed-grass, tallgrass), overall treatment regime (burned only, grazed only, burned-grazed, or rest), and year (2011, 2012, 2013), on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

					Back-transformed		
						95-percent confidence intervals	
Grass	Regime	Year	LSMean	SE	LSMean	LCL	UCL
Mixed	Burned only	2011	1.79	0.60	5.01	0.85	18.48
		2012	1.49	0.60	3.43	0.37	13.30
		2013	1.84	0.60	5.29	0.95	19.29
	Grazed only	2011	1.41	0.40	3.09	0.86	7.98
		2012	1.14	0.40	2.12	0.43	5.80
		2013	1.68	0.40	4.37	1.46	10.72
	Burned-grazed	2011	1.01	0.40	1.75	0.26	4.99
		2012	0.94	0.40	1.55	0.17	4.55
		2013	1.09	0.40	1.96	0.36	5.47
	Rest	2011	2.92	1.14	17.56	0.97	174.00
		2012	2.74	1.14	14.55	0.65	145.61
		2013	3.07	1.14	20.57	1.29	202.38
Tall	Burned only	2012	1.29	0.66	2.64	0.00	12.30
		2013	1.46	0.66	3.31	0.18	14.75
	Grazed only	2012	1.04	0.63	1.83	0.00	8.67
		2013	1.60	0.63	3.95	0.45	15.91
	Burned-grazed	2012	0.17	1.14	0.18	0.00	10.16
		2013	0.97	1.14	1.65	0.00	23.97
	Rest	2012	1.37	1.14	2.93	0.00	36.07
		2013	1.39	1.14	3.03	0.00	36.97



[Brn-Grz, burned-grazed]

Figure 5.13. Back-transformed least squares mean densities (pairs per 100 hectares) of yellow warblers (*Setophaga petechia*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits.

N. Brewer's Blackbird (*Euphagus cyanocephalus*)

Table 5.27. Generalized linear mixed model (assuming a gamma distribution with a log link) testing the influence of management regime and year on breeding densities (pairs per 100 hectares) of Brewer's blackbirds (*Euphagus cyanocephalus*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[*, evidence for moderate effect ($0.05<p\leq0.10$); **, evidence for strong effect ($p\leq0.05$)]

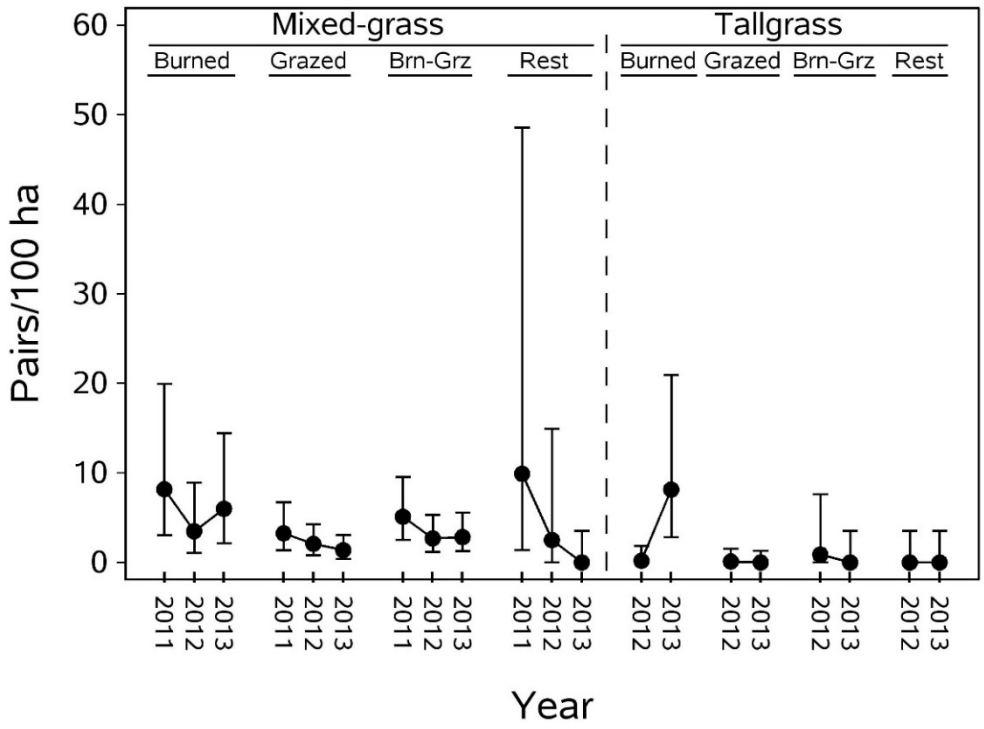
Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × regime × year	19	180.4	2.84	0.0002**
Contrasts:	Mixed: regime effect	3	72.8	1.60	0.1966
	Mixed: year effect	2	126.7	4.48	0.0132**
	Mixed: interaction	6	132.0	0.84	0.5435
	Tall: regime effect	3	99.9	2.02	0.1157
	Tall: year effect	1	115.5	0.80	0.3729
	Tall: interaction	3	115.5	4.05	0.0089**
	Mixed versus tall: burned only	1	87.9	2.24	0.1382
	Mixed versus tall: grazed only	1	94.0	7.64	0.0069**
	Mixed versus tall: burned-grazed	1	97.2	3.15	0.0790*
	Mixed versus tall: rest	1	85.5	2.12	0.1486

[1]Sources of variation for the model: Y=Unit(Grass type × Regime) + Grass type × Regime × Year + Year × Unit(Grass type × Regime), where Grass type × Regime × Year is a fixed effect, Unit(Grass type × Regime) and Year × Unit(Grass type × Regime) are random effects in a mixed-model framework, and Year is a repeated-measures factor.
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 5.28. Least squares mean (standard error) densities (pairs per 100 hectares) and back-transformed least squares mean (95-percent confidence intervals) densities (pairs per 100 hectares) of Brewer's blackbirds (*Euphagus cyanocephalus*), by grassland type (mixed-grass, tallgrass), overall treatment regime (burned only, grazed only, burned-grazed, or rest), and year (2011, 2012, 2013), on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

					Back-transformed		
						95-percent confidence intervals	
Grass	Regime	Year	LSMean	SE	LSMean	LCL	UCL
Mixed	Burned only	2011	2.22	0.42	8.18	3.02	19.95
		2012	1.50	0.40	3.49	1.04	8.90
		2013	1.95	0.40	6.00	2.17	14.43
	Grazed only	2011	1.45	0.30	3.26	1.35	6.73
		2012	1.13	0.27	2.08	0.81	4.26
		2013	0.87	0.27	1.38	0.40	3.07
	Burned-grazed	2011	1.81	0.28	5.12	2.55	9.56
		2012	1.31	0.27	2.69	1.17	5.30
		2013	1.34	0.27	2.84	1.25	5.55
	Rest	2011	2.39	0.77	9.91	1.40	48.55
		2012	1.26	0.77	2.51	0.00	14.94
		2013	0.00	0.77	0.00	0.00	3.54
Tall	Burned only	2012	0.17	0.45	0.19	0.00	1.85
		2013	2.21	0.45	8.15	2.82	20.94
	Grazed only	2012	0.10	0.42	0.11	0.00	1.53
		2013	0.00	0.42	0.00	0.00	1.29
	Burned-grazed	2012	0.64	0.77	0.89	0.00	7.61
		2013	0.00	0.77	0.00	0.00	3.54
	Rest	2012	0.00	0.77	0.00	0.00	3.54
		2013	0.00	0.77	0.00	0.00	3.54



[Brn-Grz, burned-grazed]

Figure 5.14. Back-transformed least squares mean densities (pairs per 100 hectares) of Brewer's blackbirds (*Euphagus cyanocephalus*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits.

O. Common Grackle (*Quiscalus quiscula*)

Table 5.29. Generalized linear mixed model (assuming a gamma distribution with a log link) testing the influence of management regime and year on breeding densities (pairs per 100 hectares) of common grackles (*Quiscalus quiscula*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

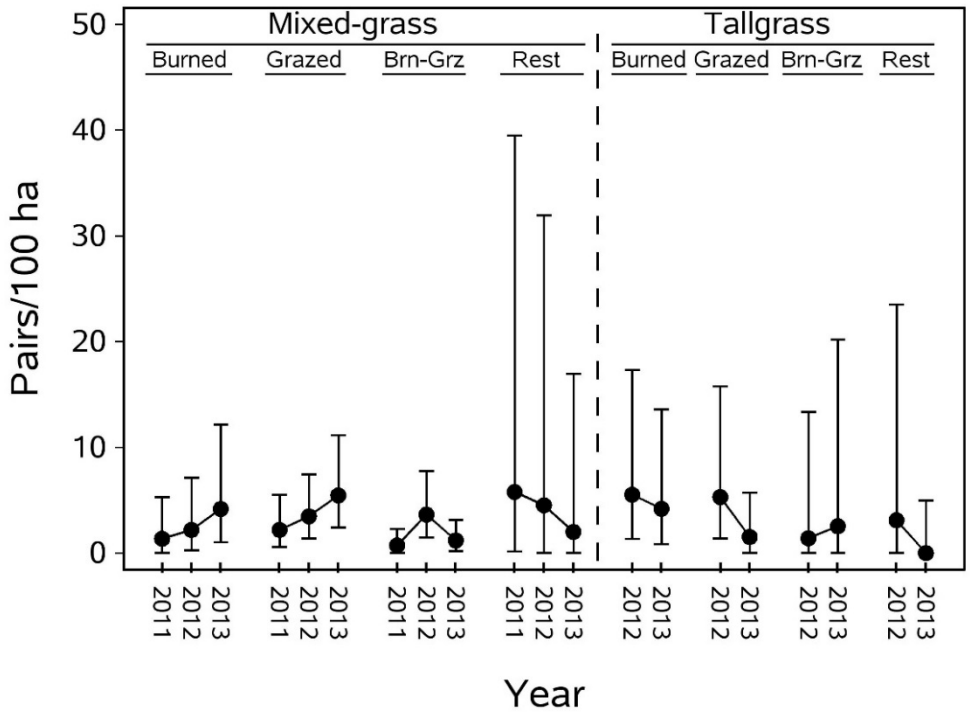
Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × regime × year	19	185.4	1.05	0.4012
Contrasts:	Mixed: regime effect	3	91.8	1.36	0.2615
	Mixed: year effect	2	142.2	0.43	0.6487
	Mixed: interaction	6	149.2	0.89	0.5005
	Tall: regime effect	3	120.4	0.72	0.5440
	Tall: year effect	1	125.1	1.19	0.2773
	Tall: interaction	3	125.1	0.53	0.6628
	Mixed versus tall: burned only	1	108.7	1.21	0.2733
	Mixed versus tall: grazed only	1	114.9	0.09	0.7672
	Mixed versus tall: burned-grazed	1	117.8	0.03	0.8731
	Mixed versus tall: rest	1	105.9	0.97	0.3261

[1]Sources of variation for the model: Y=Unit(Grass type × Regime) + Grass type × Regime × Year + Year × Unit(Grass type × Regime), where Grass type × Regime × Year is a fixed effect, Unit(Grass type × Regime) and Year × Unit(Grass type × Regime) are random effects in a mixed-model framework, and Year is a repeated-measures factor.
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 5.30. Least squares mean (standard error) densities (pairs per 100 hectares) and back-transformed least squares mean (95-percent confidence intervals) densities (pairs per 100 hectares) of common grackles (*Quiscalus quiscula*), by grassland type (mixed-grass, tallgrass), overall treatment regime (burned only, grazed only, burned-grazed, or rest), and year (2011, 2012, 2013), on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

					Back-transformed		
						95-percent confidence intervals	
Grass	Regime	Year	LSMean	SE	LSMean	LCL	UCL
Mixed	Burned only	2011	0.86	0.50	1.36	0.00	5.29
		2012	1.16	0.48	2.19	0.25	7.12
		2013	1.64	0.48	4.18	1.03	12.17
	Grazed only	2011	1.16	0.36	2.20	0.57	5.52
		2012	1.50	0.32	3.48	1.38	7.43
		2013	1.87	0.32	5.46	2.43	11.16
	Burned-grazed	2011	0.55	0.33	0.73	0.00	2.30
		2012	1.54	0.32	3.65	1.47	7.75
		2013	0.79	0.32	1.20	0.17	3.13
	Rest	2011	1.91	0.91	5.78	0.13	39.50
		2012	1.71	0.91	4.52	0.00	31.97
		2013	1.10	0.91	2.01	0.00	16.97
Tall	Burned only	2012	1.88	0.53	5.53	1.33	17.33
		2013	1.65	0.53	4.20	0.85	13.61
	Grazed only	2012	1.84	0.50	5.30	1.37	15.78
		2013	0.93	0.50	1.53	0.00	5.73
	Burned-grazed	2012	0.88	0.91	1.40	0.00	13.37
		2013	1.27	0.91	2.54	0.00	20.18
	Rest	2012	1.41	0.91	3.10	0.00	23.52
		2013	0.00	0.91	0.00	0.00	4.98



[Brn-Grz, burned-grazed]

Figure 5.15. Back-transformed least squares mean densities (pairs per 100 hectares) of common grackles (*Quiscalus quiscula*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits.

P. Yellow-headed Blackbird (*Xanthocephalus xanthocephalus*)

Table 5.31. Generalized linear mixed model (assuming a gamma distribution with a log link) testing the influence of management regime and year on breeding densities (pairs per 100 hectares) of yellow-headed blackbirds (*Xanthocephalus xanthocephalus*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[<, less than; *, evidence for moderate effect ($0.05<p\leq0.10$); **, evidence for strong effect ($p\leq0.05$)]

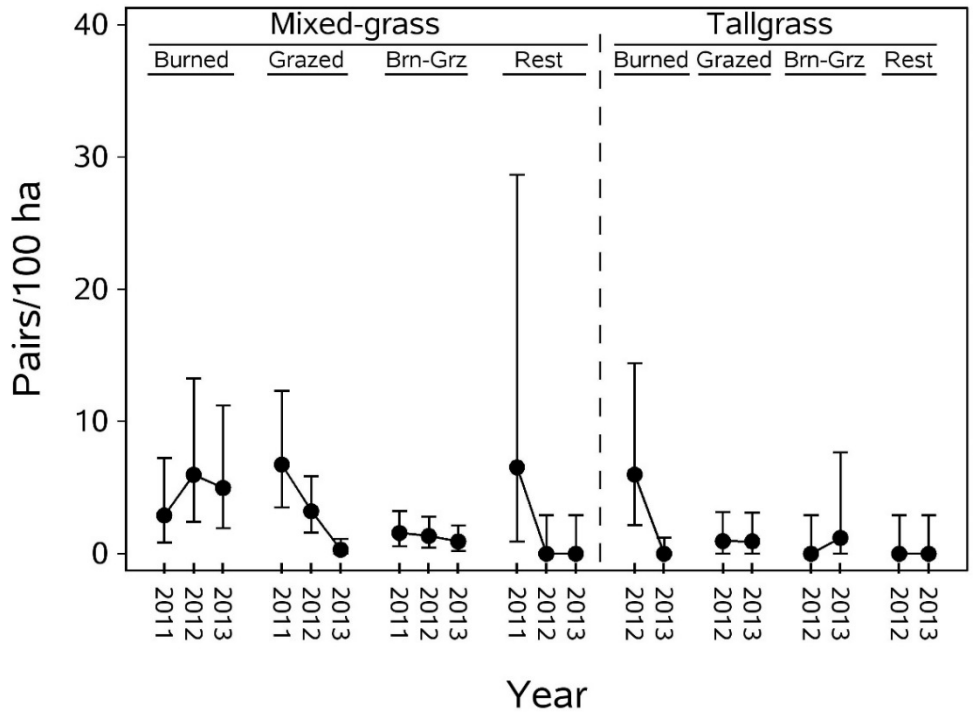
Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × regime × year	19	184.8	3.52	<0.0001**
Contrasts:	Mixed: regime effect	3	85.8	3.38	0.0219**
	Mixed: year effect	2	139.1	4.68	0.0108**
	Mixed: interaction	6	144.8	3.39	0.0037**
	Tall: regime effect	3	114.8	0.88	0.4552
	Tall: year effect	1	126.0	0.70	0.4048
	Tall: interaction	3	126.0	3.99	0.0094**
	Mixed versus tall: burned only	1	102.4	3.23	0.0752*
	Mixed versus tall: grazed only	1	108.8	2.85	0.0940*
	Mixed versus tall: burned-grazed	1	112.0	0.55	0.4605
	Mixed versus tall: rest	1	99.7	0.86	0.3548

[1]Sources of variation for the model: Y=Unit(Grass type × Regime) + Grass type × Regime × Year + Year × Unit(Grass type × Regime), where Grass type × Regime × Year is a fixed effect, Unit(Grass type × Regime) and Year × Unit(Grass type × Regime) are random effects in a mixed-model framework, and Year is a repeated-measures factor.
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 5.32. Least squares mean (standard error) densities (pairs per 100 hectares) and back-transformed least squares mean (95-percent confidence intervals) densities (pairs per 100 hectares) of yellow-headed blackbirds (*Xanthocephalus xanthocephalus*), by grassland type (mixed-grass, tallgrass), overall treatment regime (burned only, grazed only, burned-grazed, or rest), and year (2011, 2012, 2013), on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

					Back-transformed		
						95-percent confidence intervals	
Grass	Regime	Year	LSMean	SE	LSMean	LCL	UCL
Mixed	Burned only	2011	1.36	0.38	2.90	0.85	7.25
		2012	1.94	0.36	5.98	2.41	13.26
		2013	1.79	0.36	4.98	1.93	11.23
	Grazed only	2011	2.05	0.28	6.75	3.51	12.32
		2012	1.44	0.25	3.22	1.60	5.85
		2013	0.27	0.25	0.31	0.00	1.13
	Burned-grazed	2011	0.95	0.25	1.58	0.57	3.22
		2012	0.86	0.25	1.35	0.45	2.82
		2013	0.66	0.25	0.93	0.19	2.14
	Rest	2011	2.02	0.70	6.54	0.92	28.65
		2012	0.00	0.70	0.00	0.00	2.93
		2013	0.00	0.70	0.00	0.00	2.93
Tall	Burned only	2012	1.94	0.40	5.99	2.17	14.41
		2013	0.00	0.40	0.00	0.00	1.21
	Grazed only	2012	0.67	0.38	0.96	0.00	3.15
		2013	0.66	0.38	0.94	0.00	3.11
	Burned-grazed	2012	0.00	0.70	0.00	0.00	2.93
		2013	0.79	0.70	1.20	0.00	7.66
	Rest	2012	0.00	0.70	0.00	0.00	2.93
		2013	0.00	0.70	0.00	0.00	2.93



[Brn-Grz, burned-grazed]

Figure 5.16. Back-transformed least squares mean densities (pairs per 100 hectares) of yellow-headed blackbirds (*Xanthocephalus xanthocephalus*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits.

Q. Cliff Swallow (*Petrochelidon pyrrhonota*)

Table 5.33. Generalized linear mixed model (assuming a gamma distribution with a log link) testing the influence of management regime and year on breeding densities (pairs per 100 hectares) of cliff swallows (*Petrochelidon pyrrhonota*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[**, evidence for strong effect ($p \leq 0.05$)]

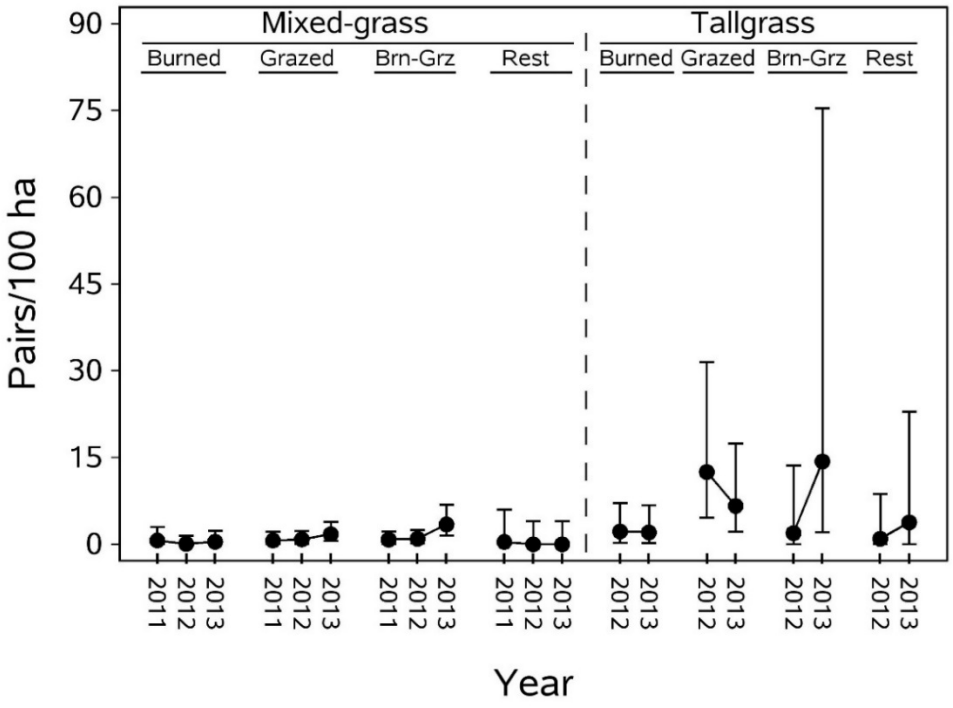
Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × regime × year	19	177.7	2.01	0.0099**
Contrasts:	Mixed: regime effect	3	66.5	1.18	0.3254
	Mixed: year effect	2	119.8	0.89	0.4121
	Mixed: interaction	6	124.6	0.56	0.7624
	Tall: regime effect	3	91.9	1.86	0.1416
	Tall: year effect	1	109.7	1.70	0.1954
	Tall: interaction	3	109.7	1.82	0.1468
	Mixed versus tall: burned only	1	80.4	2.73	0.1024
	Mixed versus tall: grazed only	1	86.1	13.99	0.0003**
	Mixed versus tall: burned-grazed	1	89.3	1.93	0.1684
	Mixed versus tall: rest	1	78.2	1.23	0.2705

[1]Sources of variation for the model: Y=Unit(Grass type × Regime) + Grass type × Regime × Year + Year × Unit(Grass type × Regime), where Grass type × Regime × Year is a fixed effect, Unit(Grass type × Regime) and Year × Unit(Grass type × Regime) are random effects in a mixed-model framework, and Year is a repeated-measures factor.
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 5.34. Least squares mean (standard error) densities (pairs per 100 hectares) and back-transformed least squares mean (95-percent confidence intervals) densities (pairs per 100 hectares) of cliff swallows (*Petrochelidon pyrrhonota*), by grassland type (mixed-grass, tallgrass), overall treatment regime (burned only, grazed only, burned-grazed, or rest), and year (2011, 2012, 2013), on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

					Back-transformed		
						95-percent confidence intervals	
Grass	Regime	Year	LSMean	SE	LSMean	LCL	UCL
Mixed	Burned only	2011	0.51	0.45	0.66	0.00	2.97
		2012	0.07	0.43	0.08	0.00	1.49
		2013	0.36	0.43	0.44	0.00	2.33
	Grazed only	2011	0.51	0.32	0.67	0.00	2.13
		2012	0.61	0.29	0.85	0.05	2.25
		2013	1.01	0.29	1.75	0.56	3.84
	Burned-grazed	2011	0.59	0.29	0.80	0.01	2.20
		2012	0.67	0.29	0.96	0.11	2.45
		2013	1.49	0.29	3.44	1.52	6.84
	Rest	2011	0.34	0.82	0.41	0.00	6.02
		2012	0.00	0.82	0.00	0.00	3.98
		2013	0.00	0.82	0.00	0.00	3.98
Tall	Burned only	2012	1.17	0.47	2.22	0.27	7.14
		2013	1.12	0.47	2.07	0.21	6.75
	Grazed only	2012	2.60	0.45	12.49	4.60	31.51
		2013	2.03	0.45	6.64	2.17	17.42
	Burned-grazed	2012	1.08	0.82	1.94	0.00	13.64
		2013	2.73	0.82	14.34	2.08	75.39
	Rest	2012	0.67	0.82	0.95	0.00	8.71
		2013	1.57	0.82	3.79	0.00	22.88



[Brn-Grz, burned-grazed]

Figure 5.17. Back-transformed least squares mean densities (pairs per 100 hectares) of cliff swallows (*Petrochelidon pyrrhonota*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits.

R. Song Sparrow (*Melospiza melodia*)

Table 5.35. Generalized linear mixed model (assuming a gamma distribution with a log link) testing the influence of management regime and year on breeding densities (pairs per 100 hectares) of song sparrows (*Melospiza melodia*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[**, evidence for strong effect ($p \leq 0.05$)]

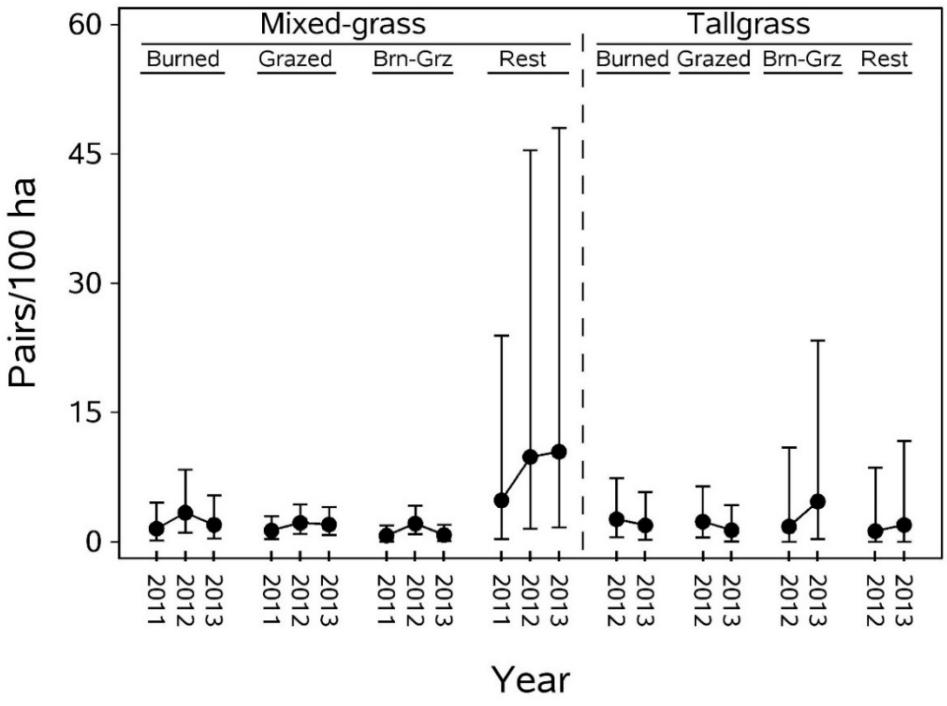
Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × regime × year	19	183.5	1.69	0.0403**
Contrasts:	Mixed: regime effect	3	81.7	1.59	0.1992
	Mixed: year effect	2	132.4	4.94	0.0085**
	Mixed: interaction	6	134.1	0.72	0.6312
	Tall: regime effect	3	95.9	0.09	0.9637
	Tall: year effect	1	129.9	0.22	0.6396
	Tall: interaction	3	129.9	1.15	0.3316
	Mixed versus tall: burned only	1	89.3	0.00	0.9821
	Mixed versus tall: grazed only	1	92.6	0.00	0.9928
	Mixed versus tall: burned-grazed	1	94.5	0.74	0.3931
	Mixed versus tall: rest	1	88.1	1.73	0.1923

[1]Sources of variation for the model: Y=Unit(Grass type × Regime) + Grass type × Regime × Year + Year × Unit(Grass type × Regime), where Grass type × Regime × Year is a fixed effect, Unit(Grass type × Regime) and Year × Unit(Grass type × Regime) are random effects in a mixed-model framework, and Year is a repeated-measures factor.
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 5.36. Least squares mean (standard error) densities (pairs per 100 hectares) and back-transformed least squares mean (95-percent confidence intervals) densities (pairs per 100 hectares) of song sparrows (*Melospiza melodia*), by grassland type (mixed-grass, tallgrass), overall treatment regime (burned only, grazed only, burned-grazed, or rest), and year (2011, 2012, 2013), on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

					Back-transformed		
						95-percent confidence intervals	
Grass	Regime	Year	LSMean	SE	LSMean	LCL	UCL
Mixed	Burned only	2011	0.94	0.40	1.55	0.17	4.54
		2012	1.48	0.39	3.39	1.06	8.38
		2013	1.10	0.39	1.99	0.40	5.39
	Grazed only	2011	0.85	0.28	1.34	0.36	3.01
		2012	1.17	0.26	2.22	0.93	4.35
		2013	1.11	0.26	2.02	0.81	4.04
	Burned-grazed	2011	0.55	0.26	0.74	0.04	1.91
		2012	1.14	0.26	2.14	0.89	4.22
		2013	0.59	0.26	0.80	0.08	2.00
	Rest	2011	1.76	0.74	4.83	0.36	23.92
		2012	2.38	0.74	9.86	1.54	45.40
		2013	2.44	0.74	10.47	1.68	48.00
Tall	Burned only	2012	1.29	0.43	2.64	0.57	7.42
		2013	1.07	0.43	1.93	0.26	5.77
	Grazed only	2012	1.21	0.41	2.36	0.52	6.44
		2013	0.86	0.41	1.37	0.07	4.25
	Burned-grazed	2012	1.03	0.74	1.79	0.00	10.94
		2013	1.74	0.74	4.69	0.33	23.33
	Rest	2012	0.81	0.74	1.26	0.00	8.64
		2013	1.09	0.74	1.97	0.00	11.71



[Brn-Grz, burned-grazed]

Figure 5.18. Back-transformed least squares mean densities (pairs per 100 hectares) of song sparrows (*Melospiza melodia*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits.

S. American Goldfinch (*Spinus tristis*)

Table 5.37. Generalized linear mixed model (assuming a gamma distribution with a log link) testing the influence of management regime and year on breeding densities (pairs per 100 hectares) of American goldfinches (*Spinus tristis*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[**, evidence for strong effect ($p \leq 0.05$)]

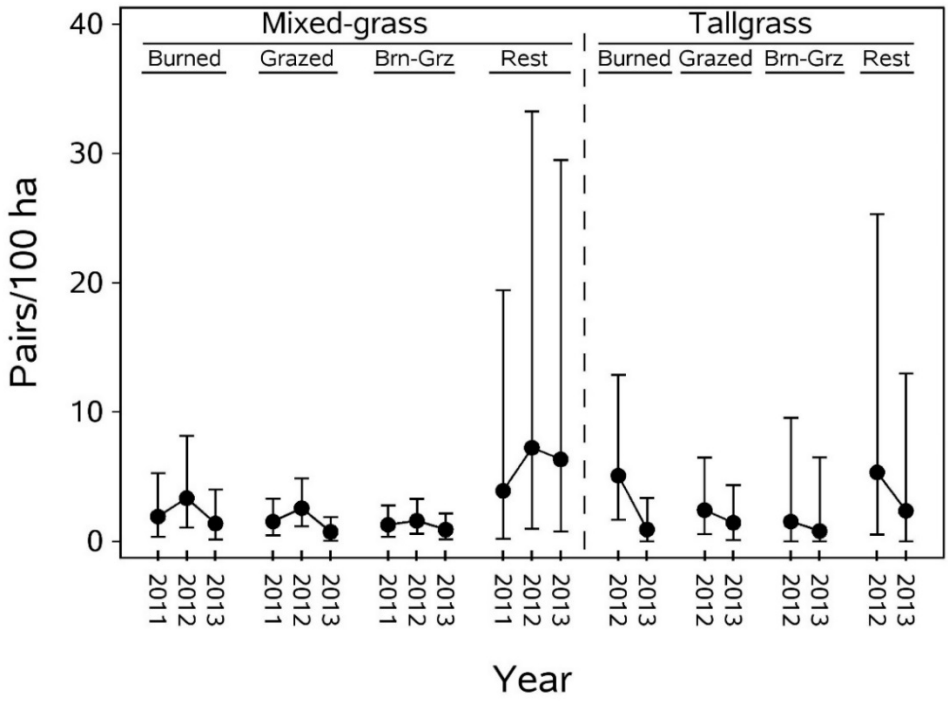
Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × regime × year	19	182.7	2.27	0.0029**
Contrasts:	Mixed: regime effect	3	79.3	0.99	0.4012
	Mixed: year effect	2	130.3	4.53	0.0125**
	Mixed: interaction	6	132.1	0.60	0.7286
	Tall: regime effect	3	94.2	0.25	0.8601
	Tall: year effect	1	127.5	7.42	0.0074**
	Tall: interaction	3	127.5	1.27	0.2877
	Mixed versus tall: burned only	1	87.3	0.03	0.8561
	Mixed versus tall: grazed only	1	90.7	0.11	0.7413
	Mixed versus tall: burned-grazed	1	92.7	0.01	0.9438
	Mixed versus tall: rest	1	86.0	0.16	0.6903

[1]Sources of variation for the model: Y=Unit(Grass type × Regime) + Grass type × Regime × Year + Year × Unit(Grass type × Regime), where Grass type × Regime × Year is a fixed effect, Unit(Grass type × Regime) and Year × Unit(Grass type × Regime) are random effects in a mixed-model framework, and Year is a repeated-measures factor.
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 5.38. Least squares mean (standard error) densities (pairs per 100 hectares) and back-transformed least squares mean (95-percent confidence intervals) densities (pairs per 100 hectares) of American goldfinches (*Spinus tristis*), by grassland type (mixed-grass, tallgrass), overall treatment regime (burned only, grazed only, burned-grazed, or rest), and year (2011, 2012, 2013), on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

					Back-transformed		
						95-percent confidence intervals	
Grass	Regime	Year	LSMean	SE	LSMean	LCL	UCL
Mixed	Burned only	2011	1.08	0.39	1.93	0.37	5.28
		2012	1.47	0.38	3.35	1.07	8.15
		2013	0.87	0.38	1.39	0.14	4.02
	Grazed only	2011	0.93	0.27	1.54	0.49	3.32
		2012	1.28	0.25	2.58	1.17	4.89
		2013	0.56	0.26	0.75	0.06	1.88
	Burned-grazed	2011	0.83	0.26	1.29	0.38	2.79
		2012	0.96	0.25	1.60	0.58	3.28
		2013	0.65	0.26	0.92	0.16	2.17
	Rest	2011	1.59	0.73	3.92	0.19	19.43
		2012	2.11	0.73	7.25	0.99	33.24
		2013	1.99	0.73	6.35	0.77	29.50
Tall	Burned only	2012	1.81	0.42	5.09	1.68	12.86
		2013	0.66	0.42	0.93	0.00	3.38
	Grazed only	2012	1.23	0.40	2.43	0.57	6.47
		2013	0.90	0.40	1.45	0.12	4.34
	Burned-grazed	2012	0.93	0.73	1.54	0.00	9.55
		2013	0.59	0.73	0.81	0.00	6.50
	Rest	2012	1.85	0.73	5.34	0.53	25.31
		2013	1.21	0.73	2.37	0.00	12.99



[Brn-Grz, burned-grazed]

Figure 5.19. Back-transformed least squares mean densities (pairs per 100 hectares) of American goldfinches (*Spinus tristis*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits.

T. Upland Sandpiper (*Bartramia longicauda*)

Table 5.39. Generalized linear mixed model (assuming a gamma distribution with a log link) testing the influence of management regime and year on breeding densities (pairs per 100 hectares) of upland sandpipers (*Bartramia longicauda*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[**, evidence for strong effect ($p \leq 0.05$)]

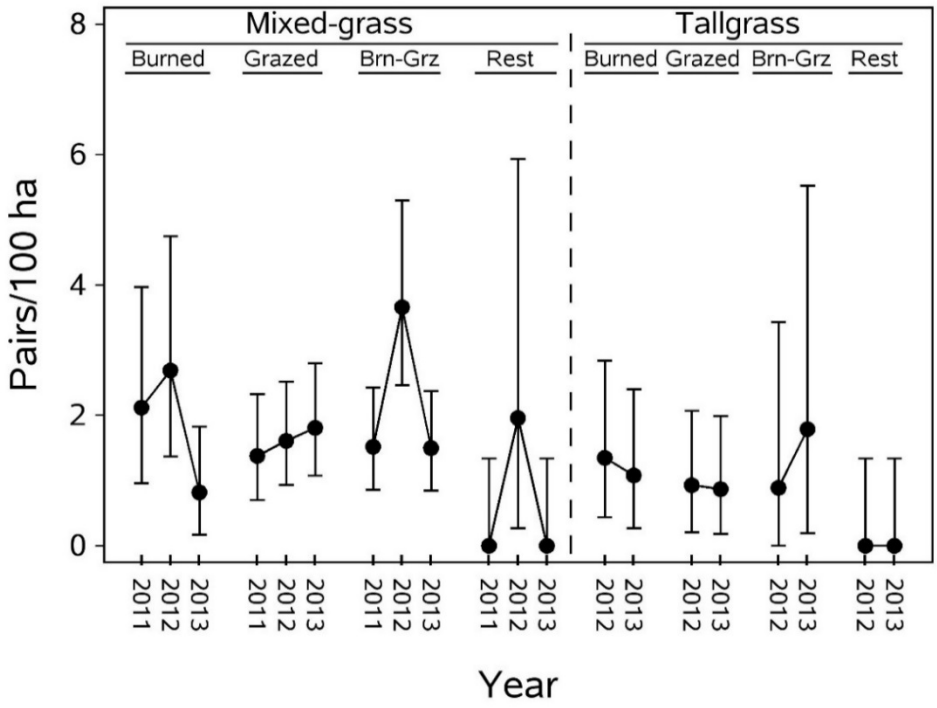
Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × regime × year	19	182.1	2.47	0.0011**
Contrasts:	Mixed: regime effect	3	78.1	2.14	0.1023
	Mixed: year effect	2	131.8	7.98	0.0005**
	Mixed: interaction	6	137.7	2.37	0.0329**
	Tall: regime effect	3	106.7	1.47	0.2276
	Tall: year effect	1	118.6	0.08	0.7838
	Tall: interaction	3	118.6	0.23	0.8730
	Mixed versus tall: burned only	1	94.3	0.77	0.3839
	Mixed versus tall: grazed only	1	100.7	2.08	0.1527
	Mixed versus tall: burned-grazed	1	103.9	0.67	0.4136
	Mixed versus tall: rest	1	91.7	0.64	0.4244

[1]Sources of variation for the model: Y=Unit(Grass type × Regime) + Grass type × Regime × Year + Year × Unit(Grass type × Regime), where Grass type × Regime × Year is a fixed effect, Unit(Grass type × Regime) and Year × Unit(Grass type × Regime) are random effects in a mixed-model framework, and Year is a repeated-measures factor.
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 5.40. Least squares mean (standard error) densities (pairs per 100 hectares) and back-transformed least squares mean (95-percent confidence intervals) densities (pairs per 100 hectares) of upland sandpipers (*Bartramia longicauda*), by grassland type (mixed-grass, tallgrass), overall treatment regime (burned only, grazed only, burned-grazed, or rest), and year (2011, 2012, 2013), on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

					Back-transformed		
						95-percent confidence intervals	
Grass	Regime	Year	LSMean	SE	LSMean	LCL	UCL
Mixed	Burned only	2011	1.14	0.24	2.12	0.96	3.97
		2012	1.31	0.23	2.69	1.37	4.75
		2013	0.60	0.23	0.82	0.17	1.83
	Grazed only	2011	0.87	0.17	1.38	0.70	2.33
		2012	0.96	0.15	1.61	0.93	2.52
		2013	1.03	0.15	1.81	1.08	2.80
	Burned-grazed	2011	0.93	0.16	1.52	0.86	2.43
		2012	1.54	0.15	3.66	2.46	5.30
		2013	0.91	0.15	1.50	0.85	2.37
	Rest	2011	0.00	0.43	0.00	0.00	1.34
		2012	1.09	0.43	1.96	0.27	5.93
		2013	0.00	0.43	0.00	0.00	1.34
Tall	Burned only	2012	0.86	0.25	1.35	0.44	2.84
		2013	0.73	0.25	1.08	0.27	2.40
	Grazed only	2012	0.66	0.24	0.93	0.21	2.07
		2013	0.63	0.24	0.87	0.18	1.99
	Burned-grazed	2012	0.64	0.43	0.89	0.00	3.43
		2013	1.03	0.43	1.79	0.19	5.52
	Rest	2012	0.00	0.43	0.00	0.00	1.34
		2013	0.00	0.43	0.00	0.00	1.34



[Brn-Grz, burned-grazed]

Figure 5.20. Back-transformed least squares mean densities (pairs per 100 hectares) of upland sandpipers (*Bartramia longicauda*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits.

U. Killdeer (*Charadrius vociferus*)

Table 5.41. Generalized linear mixed model (assuming a gamma distribution with a log link) testing the influence of management regime and year on breeding densities (pairs per 100 hectares) of killdeer (*Charadrius vociferus*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[<, less than; **, evidence for strong effect ($p \leq 0.05$)]

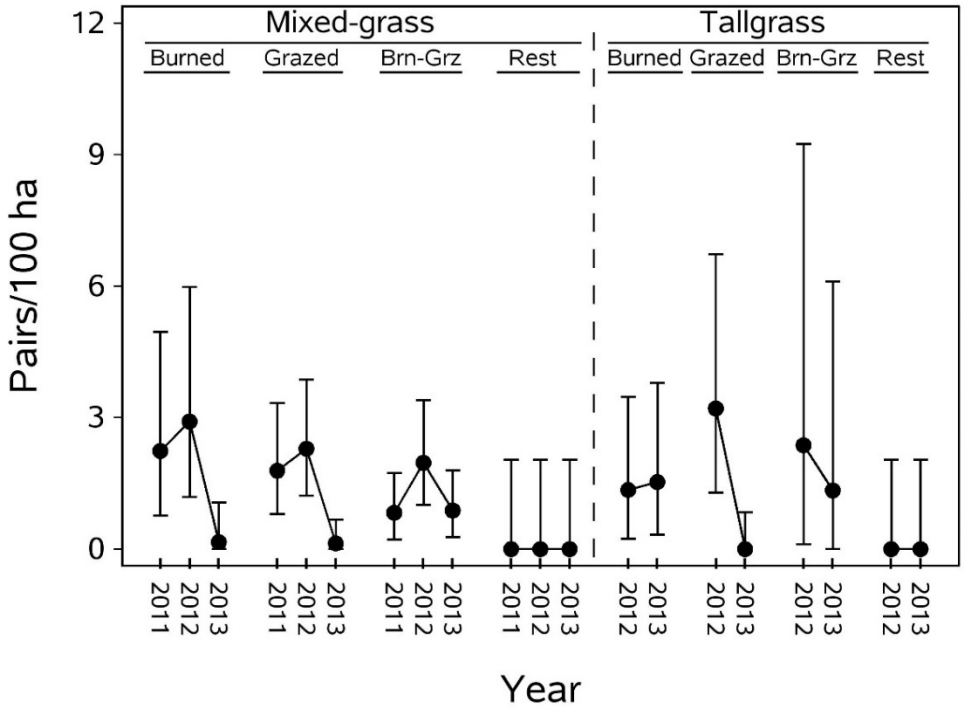
Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × regime × year	19	183.7	3.00	<0.0001**
Contrasts:	Mixed: regime effect	3	83.3	1.54	0.2100
	Mixed: year effect	2	136.5	4.94	0.0085**
	Mixed: interaction	6	142.6	1.48	0.1874
	Tall: regime effect	3	112.4	1.21	0.3110
	Tall: year effect	1	122.3	2.25	0.1360
	Tall: interaction	3	122.3	2.70	0.0487**
	Mixed versus tall: burned only	1	100.0	0.00	0.9925
	Mixed versus tall: grazed only	1	106.4	0.05	0.8287
	Mixed versus tall: burned-grazed	1	109.7	0.31	0.5761
	Mixed versus tall: rest	1	97.4	0.00	1.0000

[1]Sources of variation for the model: Y=Unit(Grass type × Regime) + Grass type × Regime × Year + Year × Unit(Grass type × Regime), where Grass type × Regime × Year is a fixed effect, Unit(Grass type × Regime) and Year × Unit(Grass type × Regime) are random effects in a mixed-model framework, and Year is a repeated-measures factor.
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 5.42. Least squares mean (standard error) densities (pairs per 100 hectares) and back-transformed least squares mean (confidence intervals) densities (pairs per 100 hectares) of killdeer (*Charadrius vociferus*), by grassland type (mixed-grass, tallgrass), overall treatment regime (burned only, grazed only, burned-grazed, or rest), and year (2011, 2012, 2013), on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

					Back-transformed		
						95-percent confidence intervals	
Grass	Regime	Year	LSMean	SE	LSMean	LCL	UCL
Mixed	Burned only	2011	1.18	0.31	2.24	0.77	4.95
		2012	1.36	0.30	2.91	1.19	5.98
		2013	0.14	0.30	0.16	0.00	1.06
	Grazed only	2011	1.03	0.22	1.79	0.80	3.33
		2012	1.19	0.20	2.29	1.22	3.87
		2013	0.12	0.20	0.13	0.00	0.67
	Burned-grazed	2011	0.60	0.20	0.83	0.22	1.73
		2012	1.09	0.20	1.97	1.01	3.40
		2013	0.63	0.20	0.88	0.27	1.79
	Rest	2011	0.00	0.57	0.00	0.00	2.04
		2012	0.00	0.57	0.00	0.00	2.04
		2013	0.00	0.57	0.00	0.00	2.04
Tall	Burned only	2012	0.86	0.33	1.35	0.24	3.47
		2013	0.93	0.33	1.53	0.33	3.79
	Grazed only	2012	1.44	0.31	3.21	1.29	6.73
		2013	0.00	0.31	0.00	0.00	0.84
	Burned-grazed	2012	1.22	0.57	2.37	0.11	9.24
		2013	0.85	0.57	1.34	0.00	6.11
	Rest	2012	0.00	0.57	0.00	0.00	2.04
		2013	0.00	0.57	0.00	0.00	2.04



[Brn-Grz, burned-grazed]

Figure 5.21. Back-transformed least squares mean densities (pairs per 100 hectares) of killdeer (*Charadrius vociferus*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits.

V. Tree Swallow (*Tachycineta bicolor*)

Table 5.43. Generalized linear mixed model (assuming a gamma distribution with a log link) testing the influence of management regime and year on breeding densities (pairs per 100 hectares) of tree swallows (*Tachycineta bicolor*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[**, evidence for strong effect ($p \leq 0.05$)]

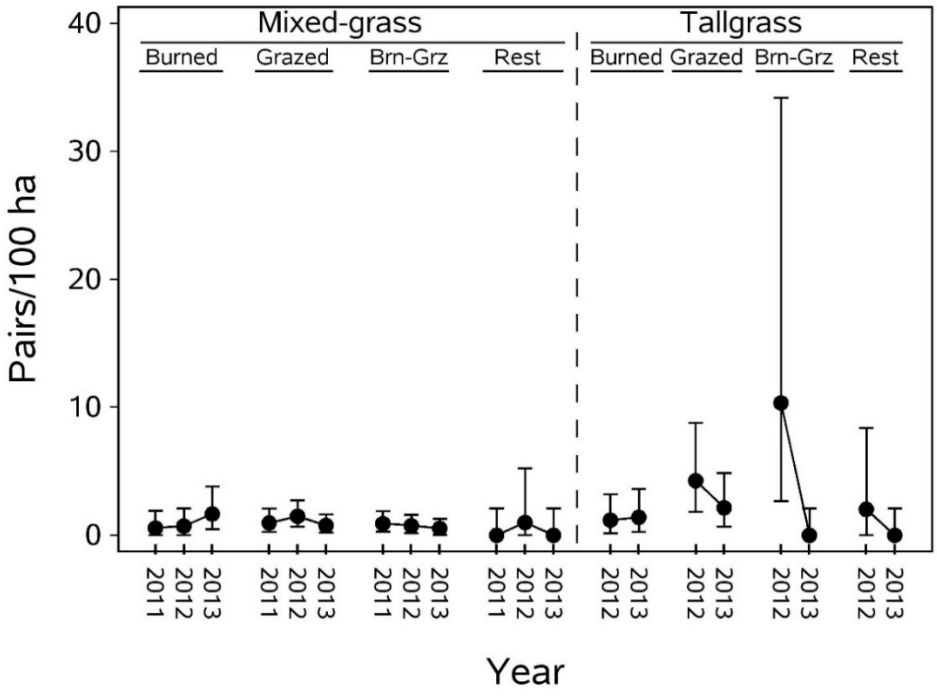
Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × regime × year	19	186.3	1.70	0.0393**
Contrasts:	Mixed: regime effect	3	96.7	0.75	0.5229
	Mixed: year effect	2	145.1	0.49	0.6116
	Mixed: interaction	6	152.4	0.71	0.6438
	Tall: regime effect	3	124.3	1.57	0.1988
	Tall: year effect	1	126.9	9.45	0.0026**
	Tall: interaction	3	126.9	2.70	0.0483**
	Mixed versus tall: burned only	1	113.2	0.33	0.5694
	Mixed versus tall: grazed only	1	119.3	6.79	0.0103**
	Mixed versus tall: burned-grazed	1	121.9	2.32	0.1305
	Mixed versus tall: rest	1	110.5	0.35	0.5549

[1]Sources of variation for the model: Y=Unit(Grass type × Regime) + Grass type × Regime × Year + Year × Unit(Grass type × Regime), where Grass type × Regime × Year is a fixed effect, Unit(Grass type × Regime) and Year × Unit(Grass type × Regime) are random effects in a mixed-model framework, and Year is a repeated-measures factor.
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 5.44. Least squares mean (standard error) densities (pairs per 100 hectares) and back-transformed least squares mean (95-percent confidence intervals) densities (pairs per 100 hectares) of tree swallows (*Tachycineta bicolor*), by grassland type (mixed-grass, tallgrass), overall treatment regime (burned only, grazed only, burned-grazed, or rest), and year (2011, 2012, 2013), on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

					Back-transformed		
						95-percent confidence intervals	
Grass	Regime	Year	LSMean	SE	LSMean	LCL	UCL
Mixed	Burned only	2011	0.45	0.32	0.57	0.00	1.92
		2012	0.54	0.30	0.72	0.00	2.10
		2013	0.98	0.30	1.67	0.48	3.81
	Grazed only	2011	0.68	0.23	0.97	0.25	2.08
		2012	0.91	0.20	1.49	0.67	2.71
		2013	0.57	0.20	0.77	0.19	1.64
	Burned-grazed	2011	0.65	0.21	0.92	0.28	1.89
		2012	0.56	0.20	0.75	0.17	1.61
		2013	0.43	0.20	0.54	0.03	1.30
	Rest	2011	0.00	0.58	0.00	0.00	2.10
		2012	0.69	0.58	1.00	0.00	5.21
		2013	0.00	0.58	0.00	0.00	2.10
Tall	Burned only	2012	0.78	0.33	1.18	0.14	3.20
		2013	0.88	0.33	1.41	0.25	3.63
	Grazed only	2012	1.66	0.32	4.27	1.84	8.79
		2013	1.15	0.32	2.15	0.69	4.85
	Burned-grazed	2012	2.43	0.58	10.34	2.66	34.16
		2013	0.00	0.58	0.00	0.00	2.10
	Rest	2012	1.11	0.58	2.03	0.00	8.38
		2013	0.00	0.58	0.00	0.00	2.10



[Brn-Grz, burned-grazed]

Figure 5.22. Back-transformed least squares mean densities (pairs per 100 hectares) of tree swallows (*Tachycineta bicolor*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits.

W. Barn Swallow (*Hirundo rustica*)

Table 5.45. Generalized linear mixed model (assuming a gamma distribution with a log link) testing the influence of management regime and year on breeding densities (pairs per 100 hectares) of barn swallows (*Hirundo rustica*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

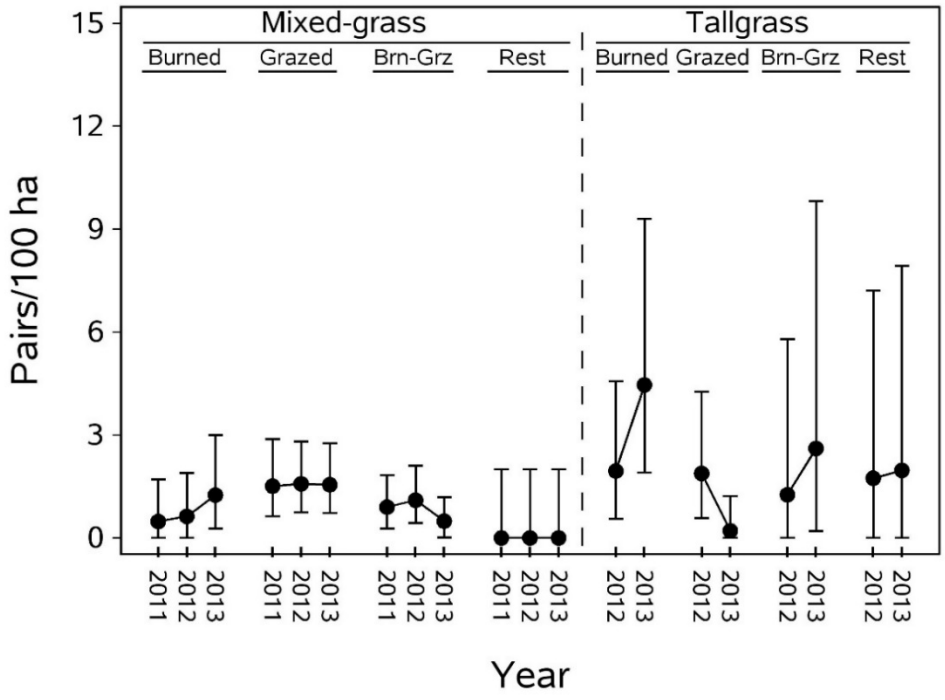
Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × regime × year	19	183.8	1.41	0.1256
Contrasts:	Mixed: regime effect	3	82.4	2.41	0.0725
	Mixed: year effect	2	136.1	0.04	0.9655
	Mixed: interaction	6	141.6	0.50	0.8082
	Tall: regime effect	3	111.0	1.54	0.2071
	Tall: year effect	1	123.6	0.08	0.7835
	Tall: interaction	3	123.6	2.78	0.0441
	Mixed versus tall: burned only	1	98.6	6.33	0.0135
	Mixed versus tall: grazed only	1	104.9	1.20	0.2750
	Mixed versus tall: burned-grazed	1	108.2	0.95	0.3319
	Mixed versus tall: rest	1	96.0	3.17	0.0781

[1]Sources of variation for the model: Y=Unit(Grass type × Regime) + Grass type × Regime × Year + Year × Unit(Grass type × Regime), where Grass type × Regime × Year is a fixed effect, Unit(Grass type × Regime) and Year × Unit(Grass type × Regime) are random effects in a mixed-model framework, and Year is a repeated-measures factor.
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 5.46. Least squares mean (standard error) densities (pairs per 100 hectares) and back-transformed least squares mean (95-percent confidence intervals) densities (pairs per 100 hectares) of barn swallows (*Hirundo rustica*), by grassland type (mixed-grass, tallgrass), overall treatment regime (burned only, grazed only, burned-grazed, or rest), and year (2011, 2012, 2013), on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

					Back-transformed		
						95-percent confidence intervals	
Grass	Regime	Year	LSMean	SE	LSMean	LCL	UCL
Mixed	Burned only	2011	0.39	0.31	0.48	0.00	1.70
		2012	0.49	0.29	0.63	0.00	1.89
		2013	0.81	0.29	1.25	0.27	3.00
	Grazed only	2011	0.92	0.22	1.51	0.63	2.88
		2012	0.95	0.20	1.58	0.75	2.81
		2013	0.94	0.20	1.55	0.73	2.76
	Burned-grazed	2011	0.64	0.20	0.90	0.28	1.83
		2012	0.74	0.20	1.10	0.43	2.10
		2013	0.40	0.20	0.49	0.01	1.19
	Rest	2011	0.00	0.56	0.00	0.00	2.00
		2012	0.00	0.56	0.00	0.00	2.00
		2013	0.00	0.56	0.00	0.00	2.00
Tall	Burned only	2012	1.08	0.32	1.95	0.56	4.56
		2013	1.70	0.32	4.46	1.90	9.30
	Grazed only	2012	1.06	0.31	1.88	0.58	4.26
		2013	0.19	0.31	0.21	0.00	1.22
	Burned-grazed	2012	0.82	0.56	1.26	0.00	5.79
		2013	1.28	0.56	2.61	0.20	9.82
	Rest	2012	1.01	0.56	1.74	0.00	7.21
		2013	1.09	0.56	1.97	0.00	7.93



[Brn-Grz, burned-grazed]

Figure 5.23. Back-transformed least squares mean densities (pairs per 100 hectares) of barn swallows (*Hirundo rustica*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits.

X. Mourning Dove (*Zenaida macroura*)

Table 5.47. Generalized linear mixed model (assuming a gamma distribution with a log link) testing the influence of management regime and year on breeding densities (pairs per 100 hectares) of mourning doves (*Zenaida macroura*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

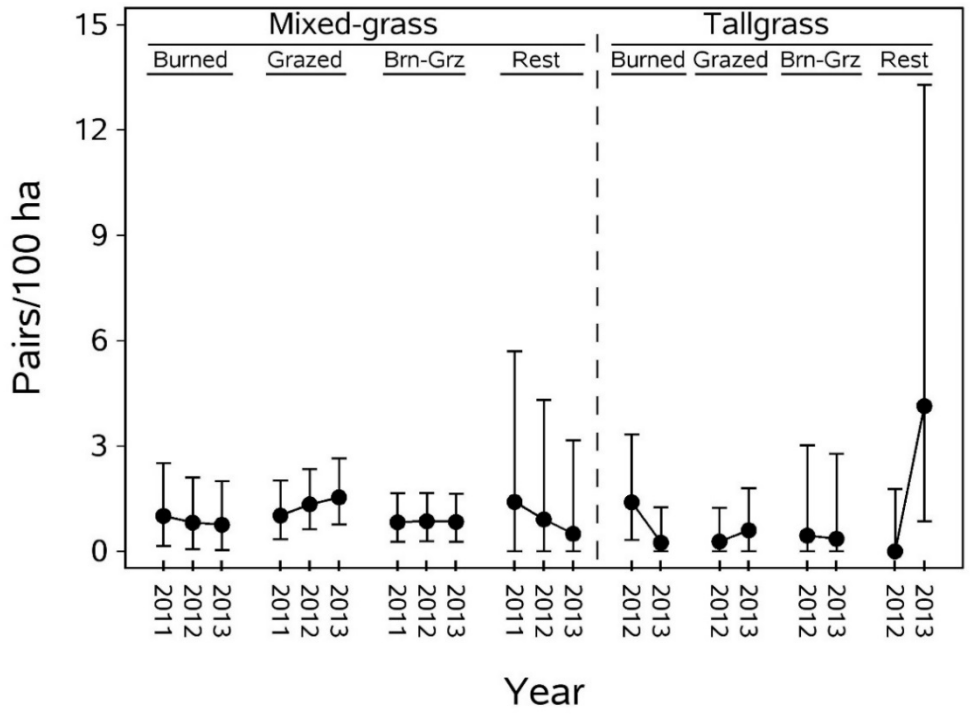
Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × regime × year	19	185.8	0.90	0.5859
Contrasts:	Mixed: regime effect	3	87.6	0.53	0.6627
	Mixed: year effect	2	141.1	0.09	0.9110
	Mixed: interaction	6	145.9	0.22	0.9699
	Tall: regime effect	3	115.6	0.37	0.7750
	Tall: year effect	1	130.4	1.35	0.2471
	Tall: interaction	3	130.4	3.73	0.0129
	Mixed versus tall: burned only	1	103.4	0.05	0.8194
	Mixed versus tall: grazed only	1	109.6	3.11	0.0808
	Mixed versus tall: burned-grazed	1	112.9	0.38	0.5399
	Mixed versus tall: rest	1	100.9	0.10	0.7571

[1]Sources of variation for the model: Y=Unit(Grass type × Regime) + Grass type × Regime × Year + Year × Unit(Grass type × Regime), where Grass type × Regime × Year is a fixed effect, Unit(Grass type × Regime) and Year × Unit(Grass type × Regime) are random effects in a mixed-model framework, and Year is a repeated-measures factor.
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 5.48. Least squares mean (standard error) densities (pairs per 100 hectares) and back-transformed least squares mean (95-percent confidence intervals) densities (pairs per 100 hectares) of mourning doves (*Zenaida macroura*), by grassland type (mixed-grass, tallgrass), overall treatment regime (burned only, grazed only, burned-grazed, or rest), and year (2011, 2012, 2013), on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

					Back-transformed		
						95-percent confidence intervals	
Grass	Regime	Year	LSMean	SE	LSMean	LCL	UCL
Mixed	Burned only	2011	0.70	0.28	1.01	0.15	2.51
		2012	0.60	0.27	0.82	0.07	2.10
		2013	0.56	0.27	0.76	0.03	2.00
	Grazed only	2011	0.70	0.20	1.02	0.35	2.02
		2012	0.85	0.18	1.34	0.63	2.35
		2013	0.93	0.18	1.54	0.77	2.65
	Burned-grazed	2011	0.61	0.19	0.83	0.27	1.65
		2012	0.62	0.18	0.86	0.29	1.66
		2013	0.61	0.18	0.84	0.28	1.64
	Rest	2011	0.88	0.52	1.41	0.00	5.70
		2012	0.65	0.52	0.91	0.00	4.31
		2013	0.41	0.52	0.50	0.00	3.17
Tall	Burned only	2012	0.88	0.30	1.40	0.33	3.33
		2013	0.22	0.30	0.25	0.00	1.25
	Grazed only	2012	0.25	0.29	0.28	0.00	1.24
		2013	0.47	0.29	0.60	0.00	1.80
	Burned-grazed	2012	0.37	0.52	0.45	0.00	3.02
		2013	0.31	0.52	0.36	0.00	2.78
	Rest	2012	0.00	0.52	0.00	0.00	1.78
		2013	1.64	0.52	4.14	0.85	13.29



[Brn-Grz, burned-grazed]

Figure 5.24. Back-transformed least squares mean densities (pairs per 100 hectares) of mourning doves (*Zenaida macroura*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits.

Y. Ring-necked Pheasant (*Phasianus colchicus*)

Table 5.49. Generalized linear mixed model (assuming a gamma distribution with a log link) testing the influence of management regime and year on breeding densities (pairs per 100 hectares) of ring-necked pheasants (*Phasianus colchicus*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[**, evidence for strong effect (≤0.05)]

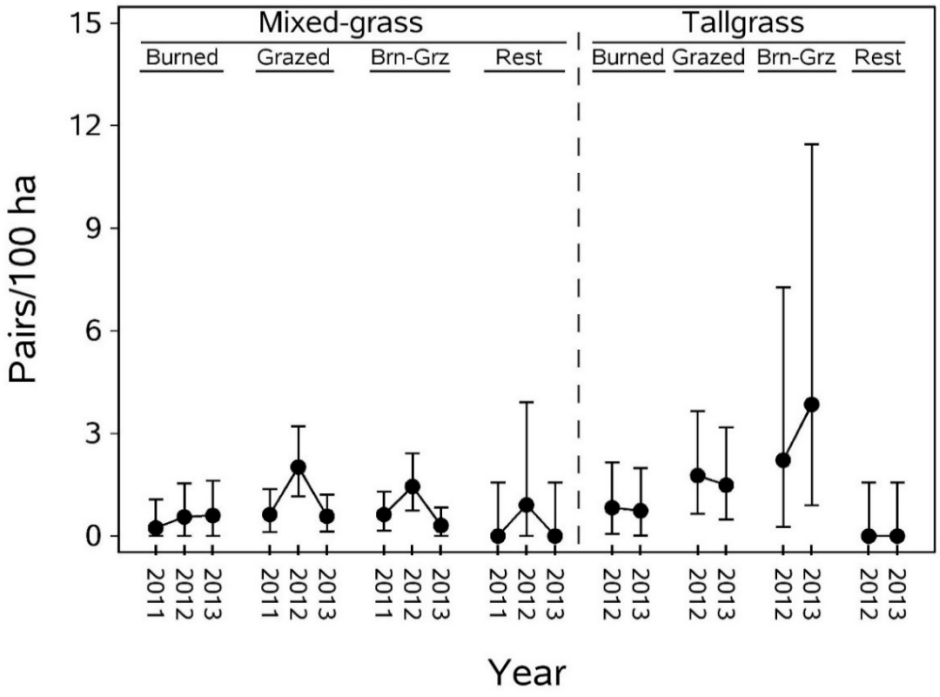
Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × regime × year	19	186.1	1.98	0.0112**
Contrasts:	Mixed: regime effect	3	91.2	1.21	0.3098
	Mixed: year effect	2	143.4	4.42	0.0138**
	Mixed: interaction	6	149.4	0.68	0.6680
	Tall: regime effect	3	120.5	2.90	0.0379**
	Tall: year effect	1	129.0	0.06	0.8023
	Tall: interaction	3	129.0	0.19	0.9048
	Mixed versus tall: burned only	1	108.2	0.57	0.4532
	Mixed versus tall: grazed only	1	114.6	1.47	0.2283
	Mixed versus tall: burned-grazed	1	117.8	4.52	0.0356**
	Mixed versus tall: rest	1	105.5	0.20	0.6576

[1]Sources of variation for the model: Y=Unit(Grass type × Regime) + Grass type × Regime × Year + Year × Unit(Grass type × Regime), where Grass type × Regime × Year is a fixed effect, Unit(Grass type × Regime) and Year × Unit(Grass type × Regime) are random effects in a mixed-model framework, and Year is a repeated-measures factor.
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 5.50. Least squares mean (standard error) densities (pairs per 100 hectares) and back-transformed least squares mean (95-percent confidence intervals) densities (pairs per 100 hectares) of ring-necked pheasants (*Phasianus colchicus*), by grassland type (mixed-grass, tallgrass), overall treatment regime (burned only, grazed only, burned-grazed, or rest), and year (2011, 2012, 2013), on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

					Back-transformed		
						95-percent confidence intervals	
Grass	Regime	Year	LSMean	SE	LSMean	LCL	UCL
Mixed	Burned only	2011	0.21	0.26	0.24	0.00	1.07
		2012	0.44	0.25	0.56	0.00	1.54
		2013	0.47	0.25	0.60	0.00	1.62
	Grazed only	2011	0.49	0.19	0.63	0.12	1.37
		2012	1.11	0.17	2.02	1.16	3.21
		2013	0.46	0.17	0.58	0.13	1.21
	Burned-grazed	2011	0.49	0.17	0.63	0.16	1.29
		2012	0.90	0.17	1.45	0.75	2.42
		2013	0.27	0.17	0.31	0.00	0.83
	Rest	2011	0.00	0.48	0.00	0.00	1.57
		2012	0.65	0.48	0.91	0.00	3.91
		2013	0.00	0.48	0.00	0.00	1.57
Tall	Burned only	2012	0.61	0.28	0.83	0.06	2.16
		2013	0.55	0.28	0.74	0.01	1.99
	Grazed only	2012	1.02	0.26	1.77	0.65	3.65
		2013	0.91	0.26	1.49	0.49	3.18
	Burned-grazed	2012	1.17	0.48	2.22	0.26	7.28
		2013	1.58	0.48	3.85	0.89	11.46
	Rest	2012	0.00	0.48	0.00	0.00	1.57
		2013	0.00	0.48	0.00	0.00	1.57



[Brn-Grz, burned-grazed]

Figure 5.25. Back-transformed least squares mean densities (pairs per 100 hectares) of ring-necked pheasants (*Phasianus colchicus*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits.

Z. Baird's Sparrow (*Centronyx bairdii*)

Table 5.51. Generalized linear mixed model (assuming a gamma distribution with a log link) testing the influence of management regime and year on breeding densities (pairs per 100 hectares) of Baird's sparrows (*Centronyx bairdii*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

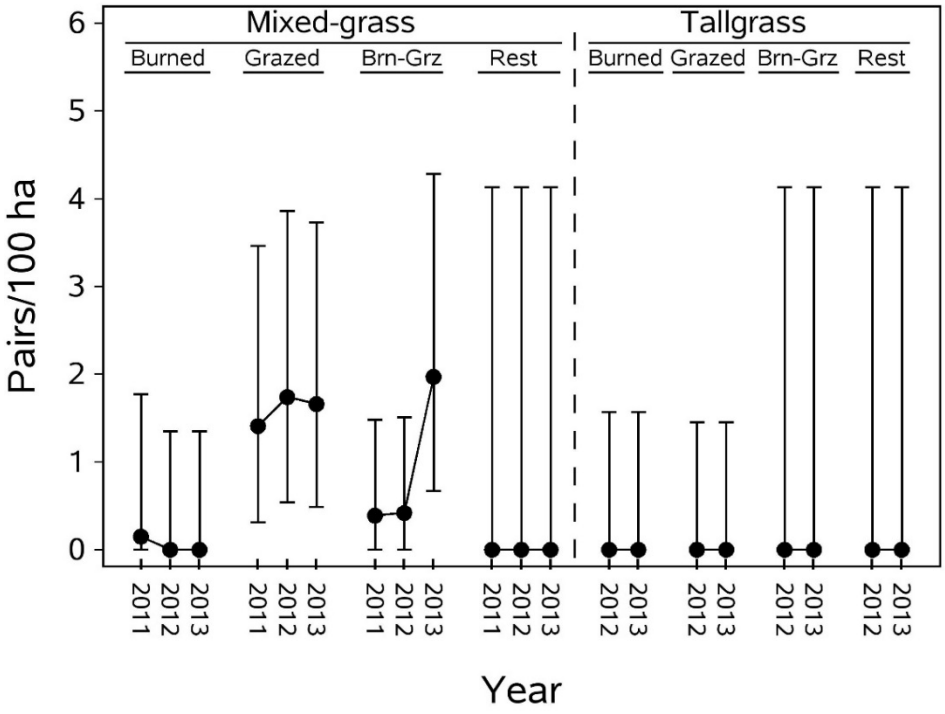
Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × regime × year	19	183.1	1.02	0.4345
Contrasts:	Mixed: regime effect	3	80.2	1.61	0.1939
	Mixed: year effect	2	131.5	0.38	0.6821
	Mixed: interaction	6	133.5	1.15	0.3395
	Tall: regime effect	3	96.3	0.00	1.0000
	Tall: year effect	1	128.4	0.00	1.0000
	Tall: interaction	3	128.4	0.00	1.0000
	Mixed versus tall: burned only	1	88.8	0.01	0.9356
	Mixed versus tall: grazed only	1	92.6	3.80	0.0542
	Mixed versus tall: burned-grazed	1	94.6	0.53	0.4672
	Mixed versus tall: rest	1	87.5	0.00	1.0000

[1]Sources of variation for the model: Y=Unit(Grass type × Regime) + Grass type × Regime × Year + Year × Unit(Grass type × Regime), where Grass type × Regime × Year is a fixed effect, Unit(Grass type × Regime) and Year × Unit(Grass type × Regime) are random effects in a mixed-model framework, and Year is a repeated-measures factor.
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 5.52. Least squares mean (standard error) densities (pairs per 100 hectares) and back-transformed least squares mean (95-percent confidence intervals) densities (pairs per 100 hectares) of Baird's sparrows (Centronyx *bairdii*), by grassland type (mixed-grass, tallgrass), overall treatment regime (burned only, grazed only, burned-grazed, or rest), and year (2011, 2012, 2013), on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

					Back-transformed		
						95-percent confidence intervals	
Grass	Regime	Year	LSMean	SE	LSMean	LCL	UCL
Mixed	Burned only	2011	0.14	0.45	0.15	0.00	1.77
		2012	0.00	0.44	0.00	0.00	1.35
		2013	0.00	0.44	0.00	0.00	1.35
	Grazed only	2011	0.88	0.31	1.41	0.31	3.46
		2012	1.01	0.29	1.74	0.54	3.86
		2013	0.98	0.29	1.66	0.49	3.73
	Burned-grazed	2011	0.33	0.30	0.39	0.00	1.48
		2012	0.35	0.29	0.42	0.00	1.51
		2013	1.09	0.29	1.97	0.67	4.28
	Rest	2011	0.00	0.83	0.00	0.00	4.13
		2012	0.00	0.83	0.00	0.00	4.13
		2013	0.00	0.83	0.00	0.00	4.13
Tall	Burned only	2012	0.00	0.48	0.00	0.00	1.57
		2013	0.00	0.48	0.00	0.00	1.57
	Grazed only	2012	0.00	0.46	0.00	0.00	1.45
		2013	0.00	0.46	0.00	0.00	1.45
	Burned-grazed	2012	0.00	0.83	0.00	0.00	4.13
		2013	0.00	0.83	0.00	0.00	4.13
	Rest	2012	0.00	0.83	0.00	0.00	4.13
		2013	0.00	0.83	0.00	0.00	4.13



[Brn-Grz, burned-grazed]

Figure 5.26. Back-transformed least squares mean densities (pairs per 100 hectares) of Baird's sparrows (Centronyx *bairdii*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits.

AA. Sharp-tailed Grouse (*Tympanuchus phasianellus*)

Table 5.53. Generalized linear mixed model (assuming a gamma distribution with a log link) testing the influence of management regime and year on breeding densities (pairs per 100 hectares) of sharp-tailed grouse (*Tympanuchus phasianellus*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

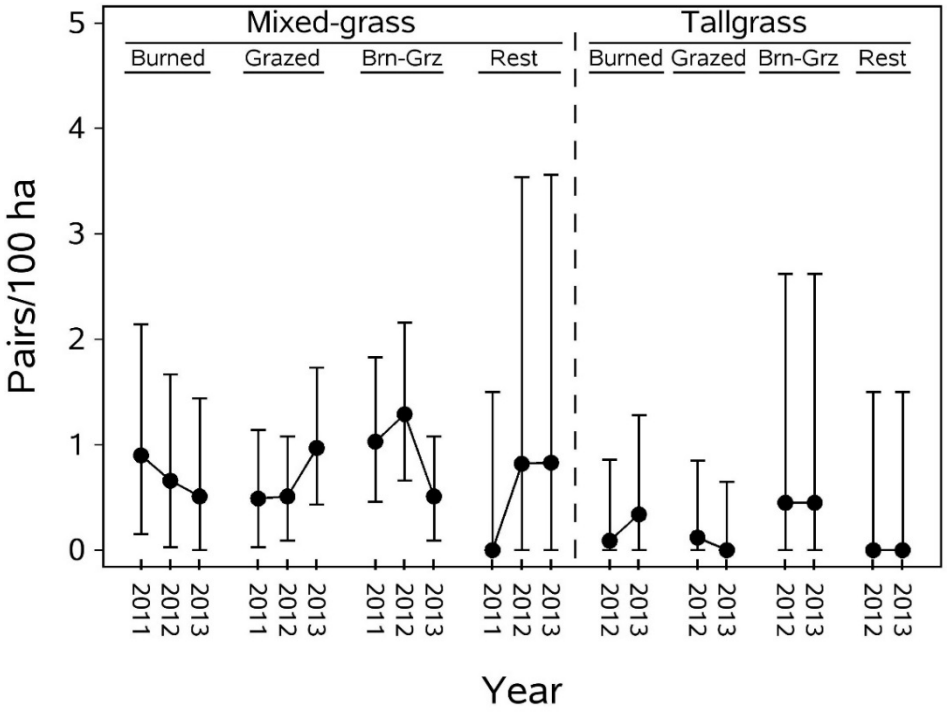
Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × regime × year	19	185.9	1.00	0.4665
Contrasts:	Mixed: regime effect	3	92.4	0.49	0.6921
	Mixed: year effect	2	143.3	0.29	0.7473
	Mixed: interaction	6	150.0	1.16	0.3335
	Tall: regime effect	3	121.3	0.28	0.8385
	Tall: year effect	1	127.0	0.01	0.9276
	Tall: interaction	3	127.0	0.14	0.9349
	Mixed versus tall: burned only	1	109.4	1.65	0.2020
	Mixed versus tall: grazed only	1	115.7	3.99	0.0480
	Mixed versus tall: burned-grazed	1	118.7	0.58	0.4461
	Mixed versus tall: rest	1	106.7	0.77	0.3828

[1]Sources of variation for the model: Y=Unit(Grass type × Regime) + Grass type × Regime × Year + Year × Unit(Grass type × Regime), where Grass type × Regime × Year is a fixed effect, Unit(Grass type × Regime) and Year × Unit(Grass type × Regime) are random effects in a mixed-model framework, and Year is a repeated-measures factor.
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 5.54. Least squares mean (standard error) densities (pairs per 100 hectares) and back-transformed least squares mean (95-percent confidence intervals) densities (pairs per 100 hectares) of sharp-tailed grouse (*Tympanuchus phasianellus*), by grassland type (mixed-grass, tallgrass), overall treatment regime (burned only, grazed only, burned-grazed, or rest), and year (2011, 2012, 2013), on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

					Back-transformed		
						95-percent confidence intervals	
Grass	Regime	Year	LSMean	SE	LSMean	LCL	UCL
Mixed	Burned only	2011	0.64	0.26	0.90	0.15	2.14
		2012	0.50	0.24	0.66	0.03	1.67
		2013	0.41	0.24	0.51	0.00	1.44
	Grazed only	2011	0.40	0.19	0.49	0.03	1.14
		2012	0.41	0.17	0.51	0.09	1.08
		2013	0.68	0.17	0.97	0.43	1.73
	Burned-grazed	2011	0.71	0.17	1.03	0.46	1.83
		2012	0.83	0.17	1.29	0.66	2.16
		2013	0.41	0.17	0.51	0.09	1.08
	Rest	2011	0.00	0.47	0.00	0.00	1.50
		2012	0.60	0.47	0.82	0.00	3.54
		2013	0.60	0.47	0.83	0.00	3.56
Tall	Burned only	2012	0.09	0.27	0.09	0.00	0.86
		2013	0.30	0.27	0.34	0.00	1.28
	Grazed only	2012	0.11	0.26	0.12	0.00	0.85
		2013	0.00	0.26	0.00	0.00	0.65
	Burned-grazed	2012	0.37	0.47	0.45	0.00	2.62
		2013	0.37	0.47	0.45	0.00	2.62
	Rest	2012	0.00	0.47	0.00	0.00	1.50
		2013	0.00	0.47	0.00	0.00	1.50



[Brn-Grz, burned-grazed]

Figure 5.27. Back-transformed least squares mean densities (pairs per 100 hectares) of sharp-tailed grouse (*Tympanuchus phasianellus*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits.

BB. Nelson's Sparrow (*Ammospiza nelsoni*)

Table 5.55. Generalized linear mixed model (assuming a gamma distribution with a log link) testing the influence of management regime and year on breeding densities (pairs per 100 hectares) of Nelson's sparrows (*Ammospiza nelsoni*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[*, evidence for moderate effect ($0.05<p\leq0.10$); **, evidence for strong effect ($p\leq0.05$)]

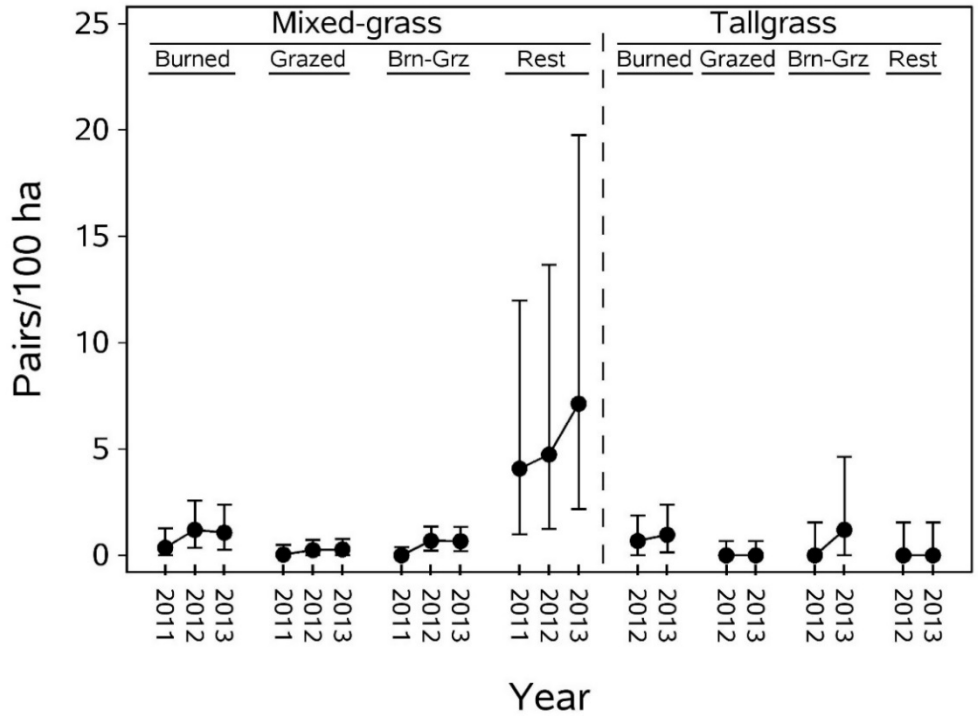
Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × regime × year	19	186.9	2.20	0.0040**
Contrasts:	Mixed: regime effect	3	90.4	7.05	0.0003**
	Mixed: year effect	2	143.5	2.60	0.0776*
	Mixed: interaction	6	147.7	0.39	0.8821
	Tall: regime effect	3	117.0	1.36	0.2583
	Tall: year effect	1	134.8	1.23	0.2690
	Tall: interaction	3	134.8	0.61	0.6105
	Mixed versus tall: burned only	1	105.3	0.00	0.9682
	Mixed versus tall: grazed only	1	111.2	0.45	0.5056
	Mixed versus tall: burned-grazed	1	114.4	0.02	0.9001
	Mixed versus tall: rest	1	103.0	11.73	0.0009**

[1]Sources of variation for the model: Y=Unit(Grass type × Regime) + Grass type × Regime × Year + Year × Unit(Grass type × Regime), where Grass type × Regime × Year is a fixed effect, Unit(Grass type × Regime) and Year × Unit(Grass type × Regime) are random effects in a mixed-model framework, and Year is a repeated-measures factor.
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 5.56. Least squares mean (standard error) densities (pairs per 100 hectares) and back-transformed least squares mean (95-percent confidence intervals) densities (pairs per 100 hectares) of Nelson's sparrows (*Ammospiza nelsoni*), by grassland type (mixed-grass, tallgrass), overall treatment regime (burned only, grazed only, burned-grazed, or rest), and year (2011, 2012, 2013), on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

					Back-transformed		
						95-percent confidence intervals	
Grass	Regime	Year	LSMean	SE	LSMean	LCL	UCL
Mixed	Burned only	2011	0.31	0.26	0.36	0.00	1.27
		2012	0.79	0.25	1.20	0.35	2.58
		2013	0.73	0.25	1.07	0.27	2.38
	Grazed only	2011	0.04	0.19	0.04	0.00	0.50
		2012	0.22	0.17	0.25	0.00	0.73
		2013	0.25	0.17	0.28	0.00	0.78
	Burned-grazed	2011	0.00	0.17	−0.01	0.00	0.38
		2012	0.52	0.17	0.69	0.21	1.35
		2013	0.52	0.17	0.67	0.20	1.33
	Rest	2011	1.63	0.48	4.08	0.99	11.98
		2012	1.75	0.48	4.74	1.25	13.67
		2013	2.10	0.48	7.13	2.18	19.76
Tall	Burned only	2012	0.52	0.28	0.68	0.00	1.88
		2013	0.68	0.28	0.97	0.14	2.38
	Grazed only	2012	0.00	0.26	0.00	0.00	0.67
		2013	0.00	0.26	0.00	0.00	0.67
	Burned-grazed	2012	0.00	0.48	0.00	0.00	1.55
		2013	0.79	0.48	1.20	0.00	4.62
	Rest	2012	0.00	0.48	0.00	0.00	1.55
		2013	0.00	0.48	0.00	0.00	1.55



[Brn-Grz, burned-grazed]

Figure 5.28. Back-transformed least squares mean densities (pairs per 100 hectares) of Nelson's sparrows (*Ammospiza nelsoni*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits.

CC. Marbled Godwit (*Limosa fedoa*)

Table 5.57. Generalized linear mixed model (assuming a gamma distribution with a log link) testing the influence of management regime and year on breeding densities (pairs per 100 hectares) of marbled godwits (*Limosa fedoa*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

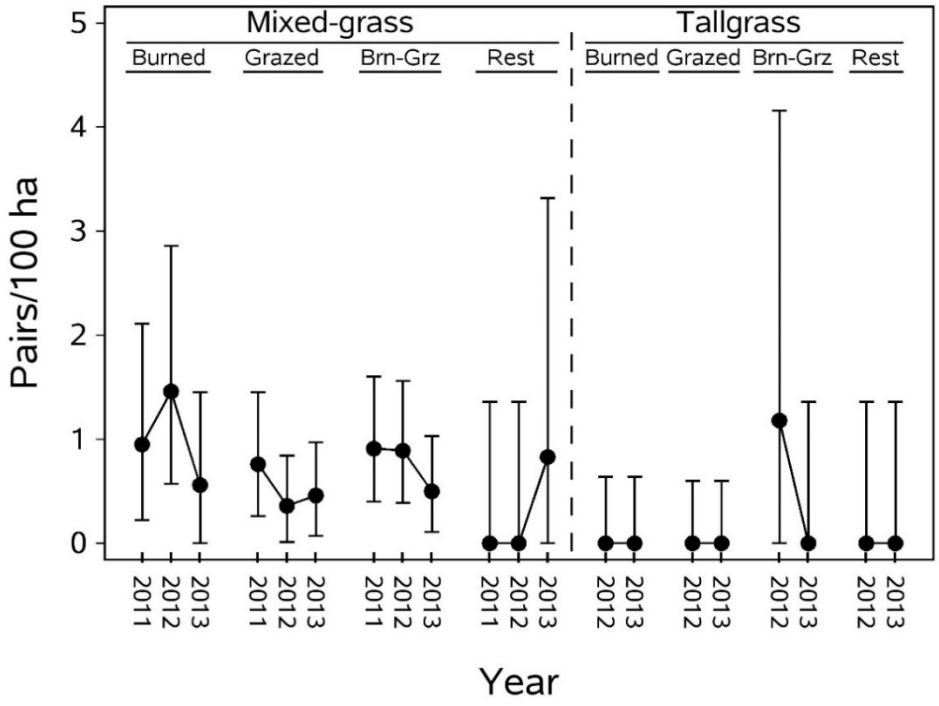
Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × regime × year	19	184.9	1.29	0.1957
Contrasts:	Mixed: regime effect	3	84.3	0.86	0.4645
	Mixed: year effect	2	137.9	0.00	0.9978
	Mixed: interaction	6	141.9	1.27	0.2756
	Tall: regime effect	3	109.8	0.32	0.8077
	Tall: year effect	1	129.7	1.05	0.3067
	Tall: interaction	3	129.7	0.81	0.4885
	Mixed versus tall: burned only	1	98.5	5.93	0.0167
	Mixed versus tall: grazed only	1	104.2	3.13	0.0800
	Mixed versus tall: burned-grazed	1	107.3	0.20	0.6591
	Mixed versus tall: rest	1	96.3	0.16	0.6868

[1]Sources of variation for the model: Y=Unit(Grass type × Regime) + Grass type × Regime × Year + Year × Unit(Grass type × Regime), where Grass type × Regime × Year is a fixed effect, Unit(Grass type × Regime) and Year × Unit(Grass type × Regime) are random effects in a mixed-model framework, and Year is a repeated-measures factor.
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 5.58. Least squares mean (standard error) densities (pairs per 100 hectares) and back-transformed least squares mean (95-percent confidence intervals) densities (pairs per 100 hectares) of marbled godwits (*Limosa fedoa*), by grassland type (mixed-grass, tallgrass), overall treatment regime (burned only, grazed only, burned-grazed, or rest), and year (2011, 2012, 2013), on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

					Back-transformed		
						95-percent confidence intervals	
Grass	Regime	Year	LSMean	SE	LSMean	LCL	UCL
Mixed	Burned only	2011	0.67	0.24	0.95	0.22	2.11
		2012	0.90	0.23	1.46	0.57	2.86
		2013	0.45	0.23	0.56	0.00	1.45
	Grazed only	2011	0.56	0.17	0.76	0.26	1.45
		2012	0.31	0.15	0.36	0.01	0.84
		2013	0.38	0.16	0.46	0.07	0.97
	Burned-grazed	2011	0.65	0.16	0.91	0.40	1.60
		2012	0.64	0.15	0.89	0.39	1.56
		2013	0.41	0.16	0.50	0.11	1.03
	Rest	2011	0.00	0.44	0.00	0.00	1.36
		2012	0.00	0.44	0.00	0.00	1.36
		2013	0.60	0.44	0.83	0.00	3.32
Tall	Burned only	2012	0.00	0.25	0.00	0.00	0.64
		2013	0.00	0.25	0.00	0.00	0.64
	Grazed only	2012	0.00	0.24	0.00	0.00	0.60
		2013	0.00	0.24	0.00	0.00	0.60
	Burned-grazed	2012	0.78	0.44	1.18	0.00	4.16
		2013	0.00	0.44	0.00	0.00	1.36
	Rest	2012	0.00	0.44	0.00	0.00	1.36
		2013	0.00	0.44	0.00	0.00	1.36



[Brn-Grz, burned-grazed]

Figure 5.29. Back-transformed least squares mean densities (pairs per 100 hectares) of marbled godwits (*Limosa fedoa*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits.

DD. Vesper Sparrow (*Pooecetes gramineus*)

Table 5.59. Generalized linear mixed model (assuming a gamma distribution with a log link) testing the influence of management regime and year on breeding densities (pairs per 100 hectares) of vesper sparrows (*Pooecetes gramineus*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

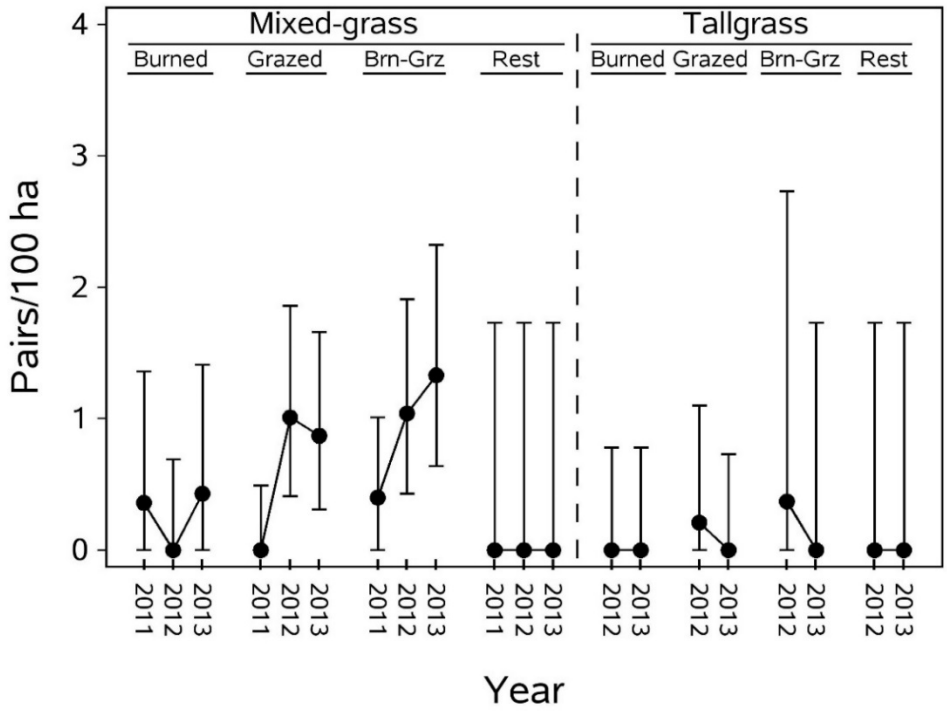
Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × regime × year	19	185.0	1.44	0.1125
Contrasts:	Mixed: regime effect	3	89.1	2.04	0.1146
	Mixed: year effect	2	141.1	0.90	0.4096
	Mixed: interaction	6	147.5	0.97	0.4478
	Tall: regime effect	3	118.3	0.06	0.9799
	Tall: year effect	1	125.6	0.22	0.6396
	Tall: interaction	3	125.6	0.08	0.9682
	Mixed versus tall: burned only	1	106.2	0.61	0.4364
	Mixed versus tall: grazed only	1	112.5	1.98	0.1620
	Mixed versus tall: burned-grazed	1	115.6	1.37	0.2443
	Mixed versus tall: rest	1	103.4	0.00	1.0000

[1]Sources of variation for the model: Y=Unit(Grass type × Regime) + Grass type × Regime × Year + Year × Unit(Grass type × Regime), where Grass type × Regime × Year is a fixed effect, Unit(Grass type × Regime) and Year × Unit(Grass type × Regime) are random effects in a mixed-model framework, and Year is a repeated-measures factor.
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 5.60. Least squares mean (standard error) densities (pairs per 100 hectares) and back-transformed least squares mean (95-percent confidence intervals) densities (pairs per 100 hectares) of vesper sparrows (*Pooecetes gramineus*), by grassland type (mixed-grass, tallgrass), overall treatment regime (burned only, grazed only, burned-grazed, or rest), and year (2011, 2012, 2013), on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

					Back-transformed		
						95-percent confidence intervals	
Grass	Regime	Year	LSMean	SE	LSMean	LCL	UCL
Mixed	Burned only	2011	0.31	0.28	0.36	0.00	1.36
		2012	0.00	0.27	0.00	0.00	0.69
		2013	0.36	0.27	0.43	0.00	1.41
	Grazed only	2011	0.00	0.20	0.00	0.00	0.49
		2012	0.70	0.18	1.01	0.41	1.86
		2013	0.62	0.18	0.87	0.31	1.66
	Burned-grazed	2011	0.34	0.18	0.40	0.00	1.01
		2012	0.71	0.18	1.04	0.43	1.91
		2013	0.85	0.18	1.33	0.64	2.32
	Rest	2011	0.00	0.51	0.00	0.00	1.73
		2012	0.00	0.51	0.00	0.00	1.73
		2013	0.00	0.51	0.00	0.00	1.73
Tall	Burned only	2012	0.00	0.30	0.00	0.00	0.78
		2013	0.00	0.30	0.00	0.00	0.78
	Grazed only	2012	0.19	0.28	0.21	0.00	1.10
		2013	0.00	0.28	0.00	0.00	0.73
	Burned-grazed	2012	0.31	0.51	0.37	0.00	2.73
		2013	0.00	0.51	0.00	0.00	1.73
	Rest	2012	0.00	0.51	0.00	0.00	1.73
		2013	0.00	0.51	0.00	0.00	1.73



[Brn-Grz, burned-grazed]

Figure 5.30. Back-transformed least squares mean densities (pairs per 100 hectares) of vesper sparrows (*Pooecetes gramineus*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits.

EE. LeConte's Sparrow (*Ammospiza leconteii*)

Table 5.61. Generalized linear mixed model (assuming a gamma distribution with a log link) testing the influence of management regime and year on breeding densities (pairs per 100 hectares) of LeConte's sparrows (*Ammospiza leconteii*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[<, less than; **, evidence for strong effect ($p \leq 0.05$)]

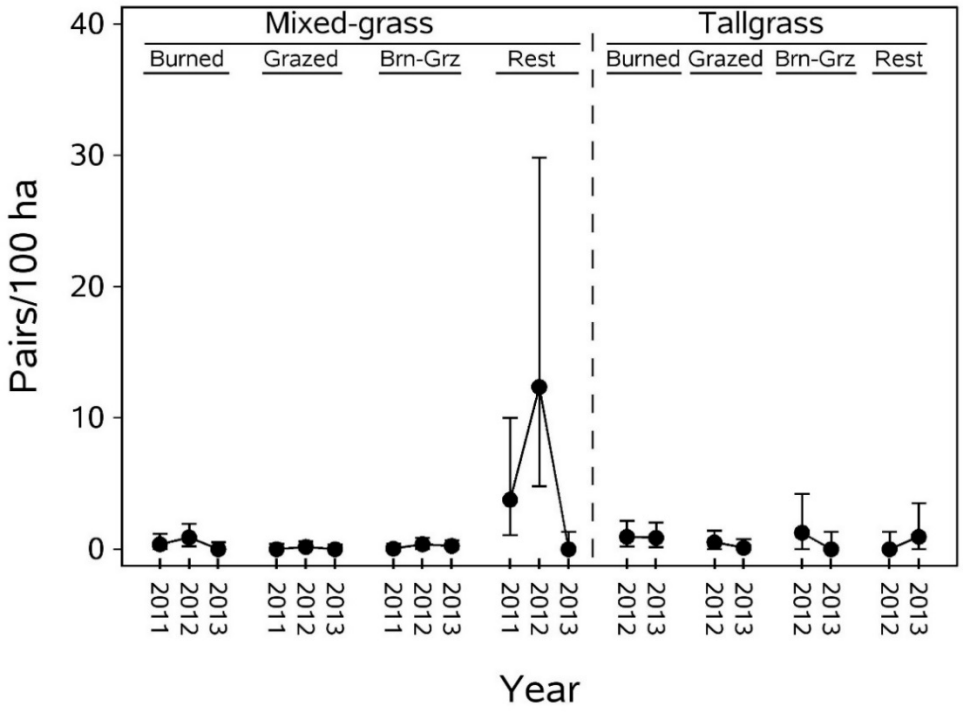
Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × regime × year	19	186.8	3.16	<0.0001**
Contrasts:	Mixed: regime effect	3	100.2	8.52	<0.0001**
	Mixed: year effect	2	146.9	11.25	<0.0001**
	Mixed: interaction	6	154.5	3.04	0.0078**
	Tall: regime effect	3	126.8	0.86	0.4614
	Tall: year effect	1	127.9	0.28	0.5958
	Tall: interaction	3	127.9	1.17	0.3237
	Mixed versus tall: burned only	1	116.3	2.19	0.1416
	Mixed versus tall: grazed only	1	122.1	1.20	0.2746
	Mixed versus tall: burned-grazed	1	124.5	0.43	0.5155
	Mixed versus tall: rest	1	113.6	7.10	0.0088**

[1]Sources of variation for the model: Y=Unit(Grass type × Regime) + Grass type × Regime × Year + Year × Unit(Grass type × Regime), where Grass type × Regime × Year is a fixed effect, Unit(Grass type × Regime) and Year × Unit(Grass type × Regime) are random effects in a mixed-model framework, and Year is a repeated-measures factor.
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 5.62. Least squares mean (standard error) densities (pairs per 100 hectares) and back-transformed least squares mean (95-percent confidence intervals) densities (pairs per 100 hectares) of LeConte's sparrows (*Ammospiza leconteii*), by grassland type (mixed-grass, tallgrass), overall treatment regime (burned only, grazed only, burned-grazed, or rest), and year (2011, 2012, 2013), on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

					Back-transformed		
						95-percent confidence intervals	
Grass	Regime	Year	LSMean	SE	LSMean	LCL	UCL
Mixed	Burned only	2011	0.32	0.23	0.38	0.00	1.18
		2012	0.64	0.22	0.90	0.22	1.93
		2013	0.00	0.22	0.00	0.00	0.55
	Grazed only	2011	0.00	0.17	0.00	0.00	0.39
		2012	0.16	0.15	0.18	0.00	0.59
		2013	0.00	0.15	0.00	0.00	0.34
	Burned-grazed	2011	0.05	0.15	0.05	0.00	0.42
		2012	0.32	0.15	0.38	0.03	0.86
		2013	0.23	0.15	0.26	0.00	0.69
	Rest	2011	1.56	0.43	3.77	1.07	10.01
		2012	2.59	0.43	12.36	4.79	29.84
		2013	0.00	0.43	0.00	0.00	1.31
Tall	Burned only	2012	0.67	0.25	0.95	0.20	2.16
		2013	0.63	0.25	0.87	0.15	2.03
	Grazed only	2012	0.43	0.23	0.53	0.00	1.42
		2013	0.10	0.23	0.11	0.00	0.75
	Burned-grazed	2012	0.82	0.43	1.26	0.00	4.22
		2013	0.00	0.43	0.00	0.00	1.31
	Rest	2012	0.00	0.43	0.00	0.00	1.31
		2013	0.67	0.43	0.95	0.00	3.50



[Brn-Grz, burned-grazed]

Figure 5.31. Back-transformed least squares mean densities (pairs per 100 hectares) of LeConte's sparrows (*Ammospiza leconteii*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits.

FF. Willet (*Tringa semipalmata*)

Table 5.63. Generalized linear mixed model (assuming a gamma distribution with a log link) testing the influence of management regime and year on breeding densities (pairs per 100 hectares) of willets (*Tringa semipalmata*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[**, evidence for strong effect ($p \leq 0.05$)]

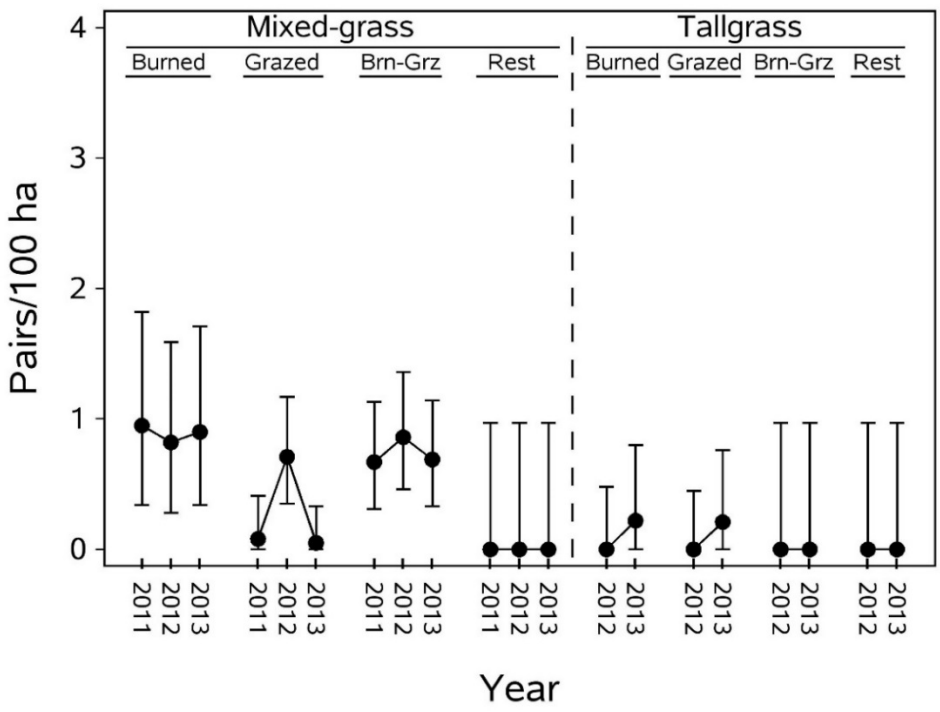
Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × regime × year	19	184.2	2.17	0.0046**
Contrasts:	Mixed: regime effect	3	87.6	5.62	0.0014**
	Mixed: year effect	2	138.7	0.59	0.5568
	Mixed: interaction	6	145.8	1.03	0.4108
	Tall: regime effect	3	116.3	0.07	0.9738
	Tall: year effect	1	121.7	0.28	0.5974
	Tall: interaction	3	121.7	0.09	0.9635
	Mixed versus tall: burned only	1	104.4	8.24	0.0050**
	Mixed versus tall: grazed only	1	110.8	0.59	0.4453
	Mixed versus tall: burned-grazed	1	113.7	4.20	0.0427**
	Mixed versus tall: rest	1	101.7	0.00	1.0000

[1]Sources of variation for the model: Y=Unit(Grass type × Regime) + Grass type × Regime × Year + Year × Unit(Grass type × Regime), where Grass type × Regime × Year is a fixed effect, Unit(Grass type × Regime) and Year × Unit(Grass type × Regime) are random effects in a mixed-model framework, and Year is a repeated-measures factor.
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 5.64. Least squares mean (standard error) densities (pairs per 100 hectares) and back-transformed least squares mean (95-percent confidence intervals) densities (pairs per 100 hectares) of willets (*Tringa semipalmata*), by grassland type (mixed-grass, tallgrass), overall treatment regime (burned only, grazed only, burned-grazed, or rest), and year (2011, 2012, 2013), on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

					Back-transformed		
						95-percent confidence intervals	
Grass	Regime	Year	LSMean	SE	LSMean	LCL	UCL
Mixed	Burned only	2011	0.67	0.19	0.95	0.34	1.82
		2012	0.60	0.18	0.82	0.28	1.59
		2013	0.64	0.18	0.90	0.34	1.71
	Grazed only	2011	0.08	0.14	0.08	0.00	0.41
		2012	0.54	0.12	0.71	0.35	1.17
		2013	0.05	0.12	0.05	0.00	0.33
	Burned-grazed	2011	0.51	0.12	0.67	0.31	1.13
		2012	0.62	0.12	0.86	0.46	1.36
		2013	0.52	0.12	0.69	0.33	1.14
	Rest	2011	0.00	0.34	0.00	0.00	0.97
		2012	0.00	0.34	0.00	0.00	0.97
		2013	0.00	0.34	0.00	0.00	0.97
Tall	Burned only	2012	0.00	0.20	0.00	0.00	0.48
		2013	0.20	0.20	0.22	0.00	0.80
	Grazed only	2012	0.00	0.19	0.00	0.00	0.45
		2013	0.19	0.19	0.21	0.00	0.76
	Burned-grazed	2012	0.00	0.34	0.00	0.00	0.97
		2013	0.00	0.34	0.00	0.00	0.97
	Rest	2012	0.00	0.34	0.00	0.00	0.97
		2013	0.00	0.34	0.00	0.00	0.97



[Brn-Grz, burned-grazed]

Figure 5.32. Back-transformed least squares mean densities (pairs per 100 hectares) of willets (*Tringa semipalmata*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits.

GG. Horned Lark (*Eremophila alpestris*)

Table 5.65. Generalized linear mixed model (assuming a gamma distribution with a log link) testing the influence of management regime and year on breeding densities (pairs per 100 hectares) of horned larks (*Eremophila alpestris*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

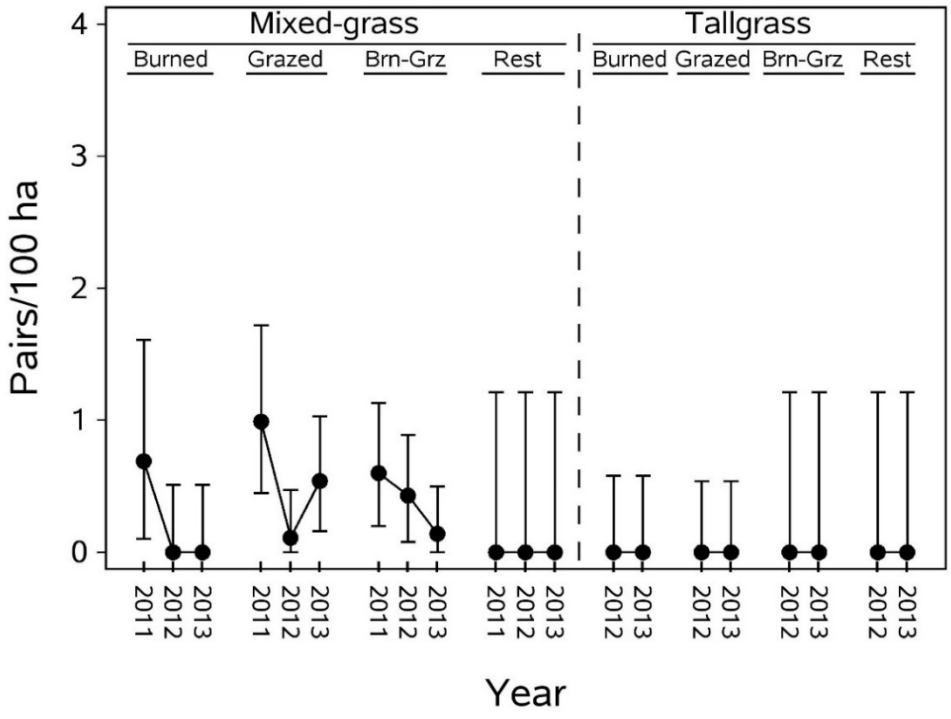
Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × regime × year	19	183.5	1.33	0.1714
Contrasts:	Mixed: regime effect	3	88.0	1.31	0.2773
	Mixed: year effect	2	137.5	1.85	0.1604
	Mixed: interaction	6	145.3	0.94	0.4693
	Tall: regime effect	3	115.8	0.00	1.0000
	Tall: year effect	1	118.6	0.00	1.0000
	Tall: interaction	3	118.6	0.00	1.0000
	Mixed versus tall: burned only	1	104.4	0.68	0.4131
	Mixed versus tall: grazed only	1	110.6	4.87	0.0294
	Mixed versus tall: burned-grazed	1	113.3	1.08	0.3014
	Mixed versus tall: rest	1	101.7	0.00	1.0000

[1]Sources of variation for the model: Y=Unit(Grass type × Regime) + Grass type × Regime × Year + Year × Unit(Grass type × Regime), where Grass type × Regime × Year is a fixed effect, Unit(Grass type × Regime) and Year × Unit(Grass type × Regime) are random effects in a mixed-model framework, and Year is a repeated-measures factor.
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 5.66. Least squares mean (standard error) densities (pairs per 100 hectares) and back-transformed least squares mean (95-percent confidence intervals) densities (pairs per 100 hectares) of horned larks (*Eremophila alpestris*), by grassland type (mixed-grass, tallgrass), overall treatment regime (burned only, grazed only, burned-grazed, or rest), and year (2011, 2012, 2013), on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

					Back-transformed		
						95-percent confidence intervals	
Grass	Regime	Year	LSMean	SE	LSMean	LCL	UCL
Mixed	Burned only	2011	0.52	0.22	0.69	0.10	1.61
		2012	0.00	0.21	0.00	0.00	0.51
		2013	0.00	0.21	0.00	0.00	0.51
	Grazed only	2011	0.69	0.16	0.99	0.45	1.72
		2012	0.10	0.14	0.11	0.00	0.47
		2013	0.43	0.14	0.54	0.16	1.03
	Burned-grazed	2011	0.47	0.15	0.60	0.20	1.13
		2012	0.35	0.14	0.43	0.08	0.89
		2013	0.13	0.14	0.14	0.00	0.50
	Rest	2011	0.00	0.40	0.00	0.00	1.21
		2012	0.00	0.40	0.00	0.00	1.21
		2013	0.00	0.40	0.00	0.00	1.21
Tall	Burned only	2012	0.00	0.23	0.00	0.00	0.58
		2013	0.00	0.23	0.00	0.00	0.58
	Grazed only	2012	0.00	0.22	0.00	0.00	0.54
		2013	0.00	0.22	0.00	0.00	0.54
	Burned-grazed	2012	0.00	0.40	0.00	0.00	1.21
		2013	0.00	0.40	0.00	0.00	1.21
	Rest	2012	0.00	0.40	0.00	0.00	1.21
		2013	0.00	0.40	0.00	0.00	1.21



[Brn-Grz, burned-grazed]

Figure 5.33. Back-transformed least squares mean densities (pairs per 100 hectares) of horned larks (*Eremophila alpestris*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits.

HH. Northern Harrier (*Circus hudsonius*)

Table 5.67. Generalized linear mixed model (assuming a gamma distribution with a log link) testing the influence of management regime and year on breeding densities (pairs per 100 hectares) of northern harriers (*Circus hudsonius*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

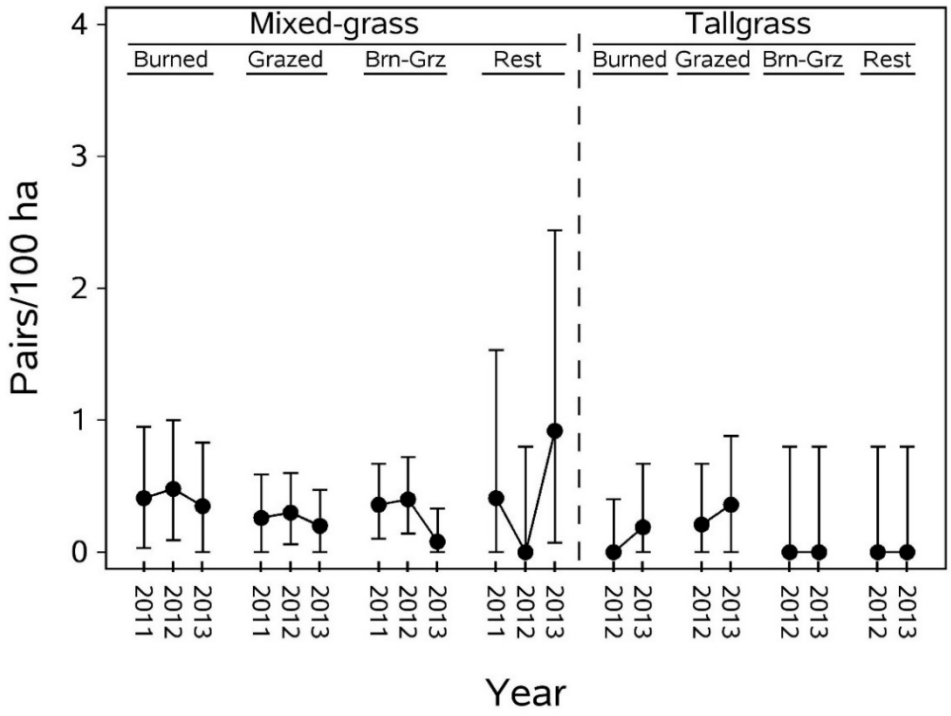
Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × regime × year	19	182.9	0.68	0.8390
Contrasts:	Mixed: regime effect	3	92.3	0.51	0.6730
	Mixed: year effect	2	137.1	0.12	0.8834
	Mixed: interaction	6	146.0	0.74	0.6206
	Tall: regime effect	3	116.6	0.68	0.5643
	Tall: year effect	1	114.9	0.18	0.6733
	Tall: interaction	3	114.9	0.07	0.9768
	Mixed versus tall: burned only	1	107.0	2.97	0.0878
	Mixed versus tall: grazed only	1	112.5	0.04	0.8387
	Mixed versus tall: burned-grazed	1	114.5	1.22	0.2724
	Mixed versus tall: rest	1	104.4	1.54	0.2177

[1]Sources of variation for the model: Y=Unit(Grass type × Regime) + Grass type × Regime × Year + Year × Unit(Grass type × Regime), where Grass type × Regime × Year is a fixed effect, Unit(Grass type × Regime) and Year × Unit(Grass type × Regime) are random effects in a mixed-model framework, and Year is a repeated-measures factor.
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 5.68. Least squares mean (standard error) densities (pairs per 100 hectares) and back-transformed least squares mean (95-percent confidence intervals) densities (pairs per 100 hectares) of northern harriers (*Circus hudsonius*), by grassland type (mixed-grass, tallgrass), overall treatment regime (burned only, grazed only, burned-grazed, or rest), and year (2011, 2012, 2013), on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

					Back-transformed		
						95-percent confidence intervals	
Grass	Regime	Year	LSMean	SE	LSMean	LCL	UCL
Mixed	Burned only	2011	0.35	0.16	0.41	0.03	0.95
		2012	0.39	0.16	0.48	0.09	1.00
		2013	0.30	0.16	0.35	0.00	0.83
	Grazed only	2011	0.23	0.12	0.26	0.00	0.59
		2012	0.26	0.11	0.30	0.06	0.60
		2013	0.18	0.11	0.20	0.00	0.47
	Burned-grazed	2011	0.30	0.11	0.36	0.10	0.67
		2012	0.33	0.11	0.40	0.14	0.72
		2013	0.08	0.11	0.08	0.00	0.33
	Rest	2011	0.34	0.30	0.41	0.00	1.53
		2012	0.00	0.30	0.00	0.00	0.80
		2013	0.65	0.30	0.92	0.07	2.44
Tall	Burned only	2012	0.00	0.17	0.00	0.00	0.40
		2013	0.18	0.17	0.19	0.00	0.67
	Grazed only	2012	0.19	0.16	0.21	0.00	0.67
		2013	0.31	0.16	0.36	0.00	0.88
	Burned-grazed	2012	0.00	0.30	0.00	0.00	0.80
		2013	0.00	0.30	0.00	0.00	0.80
	Rest	2012	0.00	0.30	0.00	0.00	0.80
		2013	0.00	0.30	0.00	0.00	0.80



[Brn-Grz, burned-grazed]

Figure 5.34. Back-transformed least squares mean densities (pairs per 100 hectares) of northern harriers (*Circus hudsonius*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits.

II. Sprague's Pipit (*Anthus spragueii*)

Table 5.69. Generalized linear mixed model (assuming a gamma distribution with a log link) testing the influence of management regime and year on breeding densities (pairs per 100 hectares) of Sprague's pipits (*Anthus spragueii*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

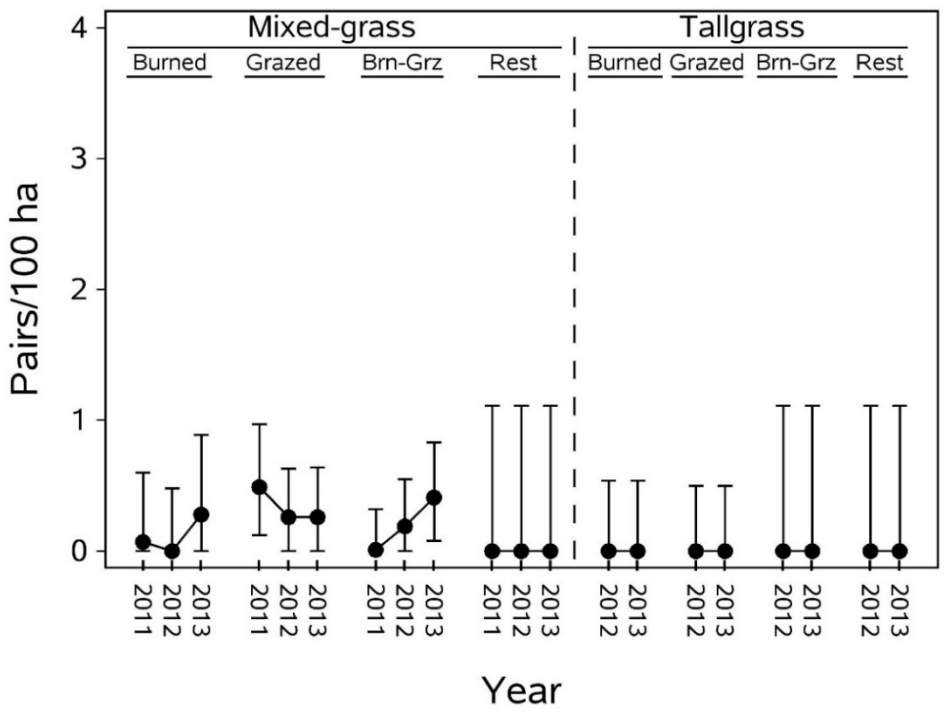
Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × regime × year	19	183.2	0.67	0.8498
Contrasts:	Mixed: regime effect	3	80.2	0.43	0.7338
	Mixed: year effect	2	131.7	0.57	0.5649
	Mixed: interaction	6	133.8	1.15	0.3372
	Tall: regime effect	3	97.0	0.00	1.0000
	Tall: year effect	1	128.2	0.00	1.0000
	Tall: interaction	3	128.2	0.00	1.0000
	Mixed versus tall: burned only	1	89.2	0.16	0.6895
	Mixed versus tall: grazed only	1	93.1	1.65	0.2024
	Mixed versus tall: burned-grazed	1	95.3	0.23	0.6309
	Mixed versus tall: rest	1	87.8	0.00	1.0000

[1]Sources of variation for the model: Y=Unit(Grass type × Regime) + Grass type × Regime × Year + Year × Unit(Grass type × Regime), where Grass type × Regime × Year is a fixed effect, Unit(Grass type × Regime) and Year × Unit(Grass type × Regime) are random effects in a mixed-model framework, and Year is a repeated-measures factor.
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 5.70. Least squares mean (standard error) densities (pairs per 100 hectares) and back-transformed least squares mean (95-percent confidence intervals) densities (pairs per 100 hectares) of Sprague's pipits (*Anthus spragueii*), by grassland type (mixed-grass, tallgrass), overall treatment regime (burned only, grazed only, burned-grazed, or rest), and year (2011, 2012, 2013), on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

					Back-transformed		
						95-percent confidence intervals	
Grass	Regime	Year	LSMean	SE	LSMean	LCL	UCL
Mixed	Burned only	2011	0.07	0.20	0.07	0.00	0.60
		2012	0.00	0.20	0.00	0.00	0.48
		2013	0.25	0.20	0.28	0.00	0.89
	Grazed only	2011	0.40	0.14	0.49	0.12	0.97
		2012	0.23	0.13	0.26	0.00	0.63
		2013	0.23	0.13	0.26	0.00	0.64
	Burned-grazed	2011	0.01	0.13	0.01	0.00	0.32
		2012	0.18	0.13	0.19	0.00	0.55
		2013	0.34	0.13	0.41	0.08	0.83
	Rest	2011	0.00	0.38	0.00	0.00	1.11
		2012	0.00	0.38	0.00	0.00	1.11
		2013	0.00	0.38	0.00	0.00	1.11
Tall	Burned only	2012	0.00	0.22	0.00	0.00	0.54
		2013	0.00	0.22	0.00	0.00	0.54
	Grazed only	2012	0.00	0.21	0.00	0.00	0.50
		2013	0.00	0.21	0.00	0.00	0.50
	Burned-grazed	2012	0.00	0.38	0.00	0.00	1.11
		2013	0.00	0.38	0.00	0.00	1.11
	Rest	2012	0.00	0.38	0.00	0.00	1.11
		2013	0.00	0.38	0.00	0.00	1.11



[Brn-Grz, burned-grazed]

Figure 5.35. Back-transformed least squares mean densities (pairs per 100 hectares) of Sprague's pipits (*Anthus spragueii*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits.

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Gannon, J.J., Shaffer, T.L., and Moore, C.T., 2013, Native Prairie Adaptive Management—A multi-region adaptive approach to invasive plant management on Fish and Wildlife Service owned native prairies: U.S. Geological Survey Open-File Report 2013–1279, 184 p. [Also available at *https://dx.doi.org/10.3133/ofr20131279*.]

Littell, R.C., Milliken, G.A., Stroup, W.W., Wolfinger, R.D., and Schabenberger, O., 2006, SAS® for mixed models (2d ed.): Cary, N.C., SAS Institute, Inc., 814 p.

Appendix 6. Testing the Influence of Post-Management Treatments on Breeding Densities (Pairs per 100 Hectares) of 35 Common Breeding Bird Species and Grassland Species of Conservation Concern on Federal Lands Managed under an Adaptive-Management Framework by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13

A. Red-winged Blackbird (*Agelaius phoeniceus*)

Table 6.1. Generalized linear mixed model, assuming a gamma distribution with a log link, $y = (y+1)$, testing the influence of post-management treatments on breeding densities (pairs per 100 hectares) of red-winged blackbird (*Agelaius phoeniceus*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[*, evidence for moderate effect ($0.05<p\leq0.10$)]

Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × treatment	18	145.6	1.66	0.0537*
Contrasts:	Mixed: burned linear	1	141.0	0.17	0.6846
	Mixed: burned quadratic	1	91.4	0.00	0.9799
	Mixed: BG0 vs BG1-3	1	124.7	0.41	0.5210
	Mixed: grazed linear	1	169.0	3.58	0.0601*
	Mixed: grazed quadratic	1	153.4	0.10	0.7473
	Tall: burned linear	1	123.1	1.42	0.2353
	Tall: grazed linear	1	152.6	0.17	0.6826
	Tall: grazed quadratic	1	133.2	0.06	0.8093
	B1: mixed versus tall	1	166.1	2.28	0.1329
	B2: mixed versus tall	1	167.6	0.16	0.6927
	G0: mixed versus tall	1	165.1	2.45	0.1191
	G: mixed versus tall	1	168.4	2.92	0.0893*
	G1: mixed versus tall	1	168.3	0.13	0.7160
	G2: mixed versus tall	1	168.1	0.25	0.6193
	Mixed: burned versus rest	1	141.8	0.03	0.8689
	Mixed: grazed versus rest	1	141.6	0.56	0.4556
	Mixed: burned-grazed versus rest	1	146.8	0.54	0.4633
	Mixed: burned versus grazed	1	162.6	2.05	0.1541
	Tall: burned versus rest	1	158.2	0.00	0.9894
	Tall: grazed versus rest	1	167.5	0.84	0.3606
	Tall: burned versus grazed	1	143.3	2.07	0.1526

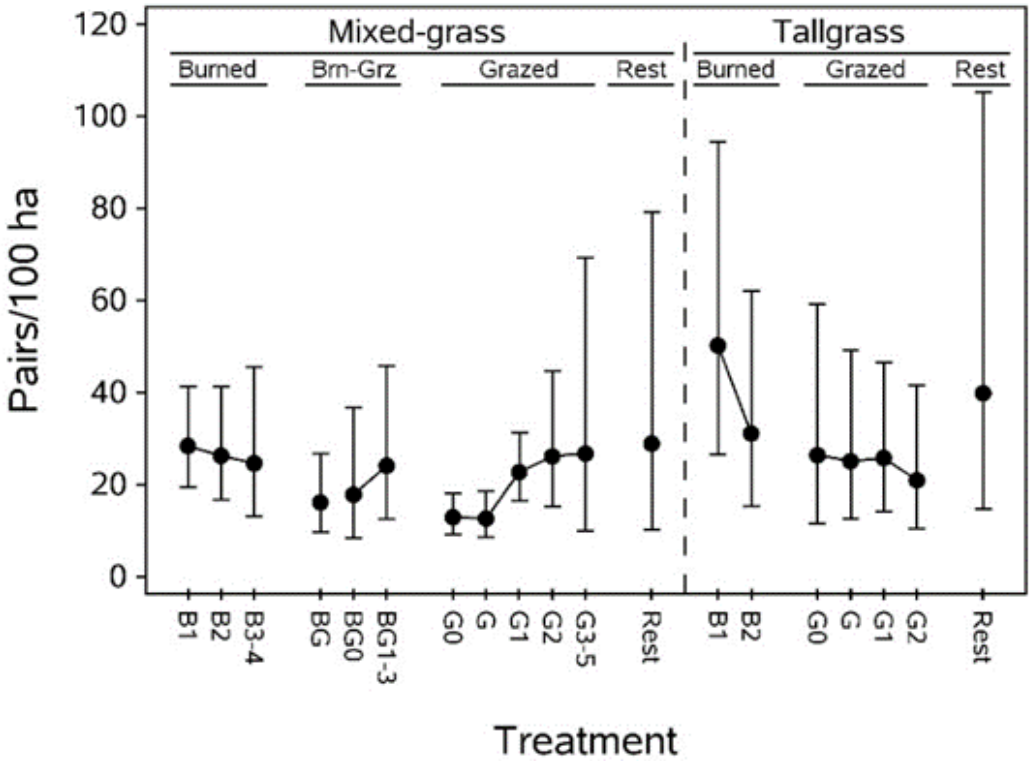
[1]Sources of variation for the model: Y=Unit(Grass type) + Grass type × Treatment + Residual, where Unit(Grass type) and Residual are random effects and Grass type × Treatment is a fixed effect in a mixed-model framework. Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 6.2. Least squares mean (standard error) densities (pairs per 100 hectares) and back-transformed least squares mean (95-percent confidence intervals) densities (pairs per 100 hectares) of red-winged blackbird (*Agelaius phoeniceus*), by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

				Back-transformed		
					95-percent confidence intervals	
Grass	Treatment[1]	LSMean	SE	LSMean	LCL	UCL
Mixed	B1	3.38	0.19	28.34	19.42	41.18
	B2	3.30	0.22	26.23	16.59	41.17
	B3-4	3.24	0.31	24.57	13.06	45.51
	BG	2.84	0.25	16.08	9.56	26.63
	BG0	2.93	0.36	17.76	8.35	36.63
	BG1-3	3.22	0.32	24.06	12.43	45.76
	G0	2.63	0.16	12.87	9.13	18.00
	G	2.61	0.18	12.58	8.49	18.44
	G1	3.16	0.16	22.67	16.37	31.27
	G2	3.30	0.26	26.10	15.14	44.50
	G3-5	3.32	0.47	26.69	9.92	69.22
	Rest	3.40	0.50	28.85	10.13	79.06
Tall	B1	3.93	0.32	50.16	26.43	94.42
	B2	3.47	0.35	31.05	15.29	62.04
	G0	3.31	0.40	26.35	11.43	59.21
	G	3.26	0.33	25.03	12.53	49.07
	G1	3.29	0.29	25.73	14.04	46.52
	G2	3.09	0.34	20.89	10.30	41.43
	Rest	3.71	0.49	39.79	14.67	105.15

[1]Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).



[Brn-Grz, burned-grazed]

Figure 6.1. Back-transformed least squares mean densities (pairs per 100 hectares) of red-winged blackbird (*Agelaius phoeniceus*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits. Treatments are defined in tables 6.1 and 6.2.

B. Clay-colored Sparrow (*Spizella pallida*)

Table 6.3. Generalized linear mixed model, assuming a normal distribution with a log link, $y = (y+1)$, testing the influence of post-management treatments on breeding densities (pairs per 100 hectares) of clay-colored sparrow (*Spizella pallida*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[**, evidence for strong effect ($p \leq 0.05$)]

Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × treatment	18	123.2	2.01	0.0138**
Contrasts:	Mixed: burned linear	1	151.4	7.00	0.0090**
	Mixed: burned quadratic	1	84.2	0.04	0.8390
	Mixed: BG0 vs BG1-3	1	93.0	0.08	0.7788
	Mixed: grazed linear	1	139.8	0.00	0.9777
	Mixed: grazed quadratic	1	125.1	0.15	0.7017
	Tall: burned linear	1	167.9	5.78	0.0173**
	Tall: grazed linear	1	124.8	0.01	0.9181
	Tall: grazed quadratic	1	123.4	0.85	0.3570
	B1: mixed versus tall	1	154.7	0.03	0.8684
	B2: mixed versus tall	1	168.6	10.19	0.0017**
	G0: mixed versus tall	1	168.6	0.28	0.5996
	G: mixed versus tall	1	164.0	0.17	0.6794
	G1: mixed versus tall	1	154.3	0.02	0.9002
	G2: mixed versus tall	1	168.4	0.02	0.8815
	Mixed: burned versus rest	1	123.5	12.21	0.0007**
	Mixed: grazed versus rest	1	107.8	8.56	0.0042**
	Mixed: burned-grazed versus rest	1	137.9	10.27	0.0017**
	Mixed: burned versus grazed	1	157.7	2.65	0.1055
	Tall: burned versus rest	1	158.8	0.75	0.3868
	Tall: grazed versus rest	1	165.3	1.05	0.3068
	Tall: burned versus grazed	1	162.4	0.05	0.8157

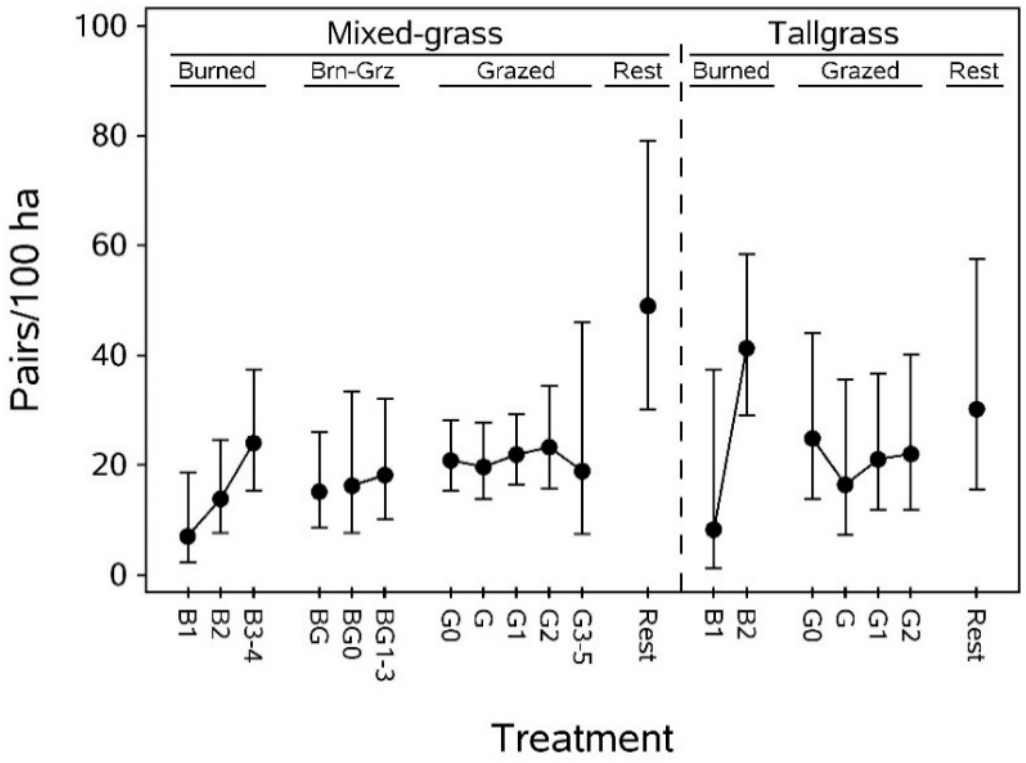
[1]Sources of variation for the model: Y=Unit(Grass type) + Grass type × Treatment + Residual, where Unit(Grass type) and Residual are random effects and Grass type × Treatment is a fixed effect in a mixed-model framework. Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 6.4. Least squares mean (standard error) densities (pairs per 100 hectares) and back-transformed least squares mean (95-percent confidence intervals) densities (pairs per 100 hectares) of clay-colored sparrows (*Spizella pallida*), by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

				Back-transformed		
					95-percent confidence intervals	
Grass	Treatment[1]	LSMean	SE	LSMean	LCL	UCL
Mixed	B1	2.08	0.46	7.02	2.26	18.70
	B2	2.70	0.28	13.84	7.61	24.59
	B3-4	3.22	0.22	24.02	15.30	37.39
	BG	2.78	0.26	15.14	8.66	25.96
	BG0	2.85	0.35	16.23	7.64	33.36
	BG1-3	2.95	0.28	18.18	10.15	32.00
	G0	3.08	0.15	20.84	15.34	28.19
	G	3.03	0.17	19.68	13.88	27.75
	G1	3.13	0.14	21.91	16.40	29.17
	G2	3.19	0.19	23.27	15.64	34.40
	G3-5	2.99	0.44	18.89	7.42	45.99
	Rest	3.91	0.24	48.98	30.21	79.03
Tall	B1	2.22	0.73	8.25	1.23	37.43
	B2	3.74	0.17	41.26	29.06	58.41
	G0	3.25	0.28	24.84	13.82	44.06
	G	2.86	0.38	16.42	7.30	35.58
	G1	3.09	0.27	21.04	11.90	36.68
	G2	3.14	0.29	22.02	11.92	40.05
	Rest	3.44	0.32	30.19	15.61	57.58

[1]Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).



[Brn-Grz, burned-grazed]

Figure 6.2. Back-transformed least squares mean densities (pairs per 100 hectares) of clay-colored sparrows (*Spizella pallida*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits. Treatments are defined in tables 6.3 and 6.4.

C. Bobolink (*Dolichonyx oryzivorus*)

Table 6.5. Generalized linear mixed model, assuming a gamma distribution with a log link, $y = (y+1)$, testing the influence of post-management treatments on breeding densities (pairs per 100 hectares) of bobolinks (*Dolichonyx oryzivorus*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[<, less than; *, evidence for moderate effect ($0.05<p\leq0.10$); **, evidence for strong effect ($p\leq0.05$)]

Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × treatment	18	153.1	4.87	<0.0001**
Contrasts:	Mixed: burned linear	1	155.4	3.41	0.0667*
	Mixed: burned quadratic	1	98.7	3.25	0.0747*
	Mixed: BG0 vs BG1-3	1	141.5	7.59	0.0066*
	Mixed: grazed linear	1	167.3	4.58	0.0339**
	Mixed: grazed quadratic	1	158.7	0.69	0.4078
	Tall: burned linear	1	127.2	4.67	0.0326**
	Tall: grazed linear	1	159.9	2.95	0.0878*
	Tall: grazed quadratic	1	142.2	0.32	0.5718
	B1: mixed versus tall	1	168.1	0.95	0.3322
	B2: mixed versus tall	1	168.7	1.31	0.2534
	G0: mixed versus tall	1	167.2	0.95	0.3315
	G: mixed versus tall	1	168.2	17.74	<0.0001**
	G1: mixed versus tall	1	168.9	11.93	0.0007**
	G2: mixed versus tall	1	168.3	1.71	0.1927
	Mixed: burned versus rest	1	155.8	0.44	0.5101
	Mixed: grazed versus rest	1	156.8	0.03	0.8595
	Mixed: burned-grazed versus rest	1	158.3	0.06	0.8005
	Mixed: burned versus grazed	1	148.5	1.45	0.2299
	Tall: burned versus rest	1	161.7	0.45	0.5014
	Tall: grazed versus rest	1	167.8	0.03	0.8626
	Tall: burned versus grazed	1	141.9	0.80	0.3720

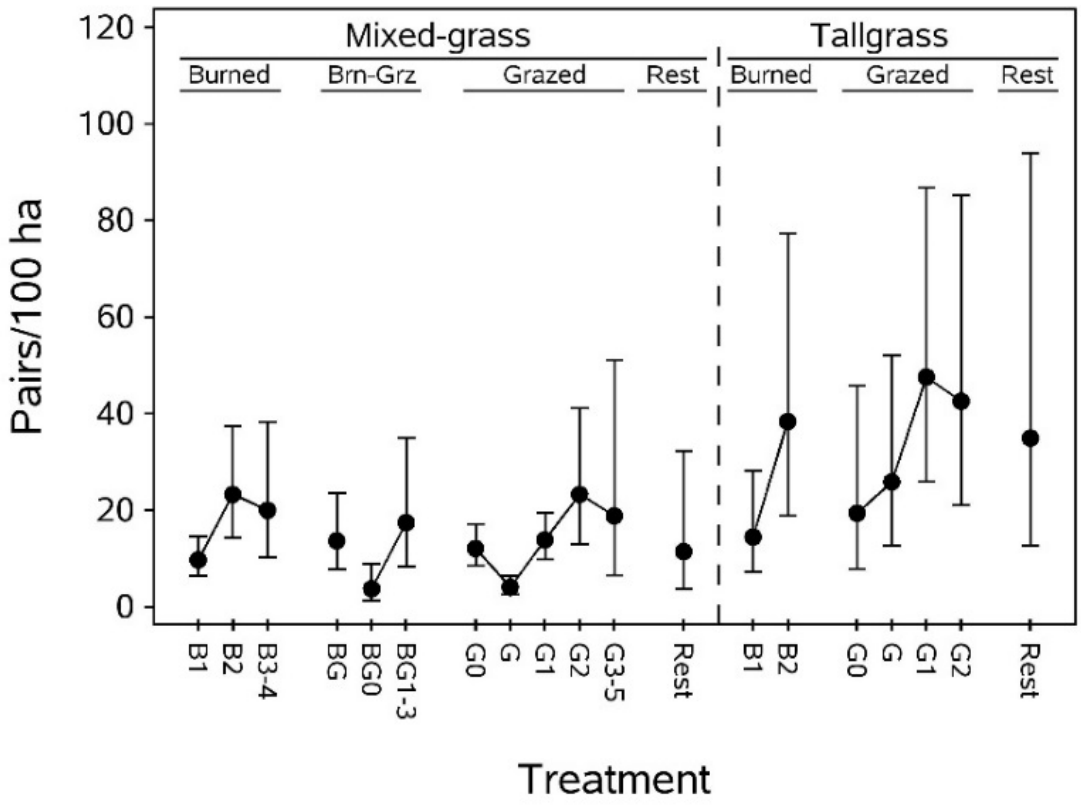
[1]Sources of variation for the model: Y=Unit(Grass type) + Grass type × Treatment + Residual, where Unit(Grass type) and Residual are random effects and Grass type × Treatment is a fixed effect in a mixed-model framework. Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 6.6. Least squares mean (standard error) densities (pairs per 100 hectares) and back-transformed least squares mean (95-percent confidence intervals) densities (pairs per 100 hectares) of bobolinks (*Dolichonyx oryzivorus*), by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

				Back-transformed		
					95-percent confidence intervals	
Grass	Treatment[1]	LSMean	SE	LSMean	LCL	UCL
Mixed	B1	2.37	0.19	9.71	6.37	14.57
	B2	3.19	0.23	23.28	14.33	37.45
	B3-4	3.04	0.32	20.00	10.21	38.34
	BG	2.69	0.26	13.66	7.74	23.62
	BG0	1.55	0.38	3.73	1.26	8.90
	BG1-3	2.91	0.34	17.42	8.42	35.02
	G0	2.57	0.17	12.09	8.45	17.14
	G	1.62	0.19	4.05	2.46	6.37
	G1	2.70	0.16	13.84	9.77	19.45
	G2	3.19	0.28	23.28	13.01	41.10
	G3-5	2.99	0.49	18.86	6.57	51.11
	Rest	2.52	0.50	11.44	3.67	32.17
Tall	B1	2.74	0.32	14.44	7.18	28.15
	B2	3.67	0.35	38.37	18.81	77.27
	G0	3.01	0.42	19.38	7.89	45.72
	G	3.29	0.35	25.85	12.61	51.98
	G1	3.88	0.30	47.56	25.88	86.71
	G2	3.77	0.35	42.57	21.03	85.18
	Rest	3.58	0.50	34.95	12.60	94.02

[1]Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).



[Brn-Grz, burned-grazed]

Figure 6.3. Back-transformed least squares mean densities (pairs per 100 hectares) of bobolinks (*Dolichonyx oryzivorus*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits. Treatments are defined in tables 6.5 and 6.6.

D. Grasshopper Sparrow (*Ammodramus savannarum*)

Table 6.7. Generalized linear mixed model, assuming a gamma distribution with a log link, $y = (y+1)$, testing the influence of post-management treatments on breeding densities (pairs per 100 hectares) of grasshopper sparrows (*Ammodramus savannarum*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[<, less than; *, evidence for moderate effect ($0.05<p\leq0.10$); **, evidence for strong effect ($p\leq0.05$)]

Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × treatment	18	148.0	7.22	<0.0001**
Contrasts:	Mixed: burned linear	1	146.6	10.05	0.0019**
	Mixed: burned quadratic	1	90.8	12.62	0.0006**
	Mixed: BG0 vs BG1-3	1	129.9	0.25	0.6167
	Mixed: grazed linear	1	168.5	1.15	0.2850
	Mixed: grazed quadratic	1	155.1	0.03	0.8705
	Tall: burned linear	1	122.5	3.48	0.0645*
	Tall: grazed linear	1	155.3	0.75	0.3892
	Tall: grazed quadratic	1	135.2	1.84	0.1776
	B1: mixed versus tall	1	167.1	1.91	0.1686
	B2: mixed versus tall	1	168.2	8.17	0.0048**
	G0: mixed versus tall	1	165.8	0.03	0.8592
	G: mixed versus tall	1	168.1	2.59	0.1092
	G1: mixed versus tall	1	168.7	2.26	0.1344
	G2: mixed versus tall	1	168.0	0.06	0.8118
	Mixed: burned versus rest	1	147.1	4.31	0.0395**
	Mixed: grazed versus rest	1	147.7	12.51	0.0005**
	Mixed: burned-grazed versus rest	1	151.4	8.38	0.0044**
	Mixed: burned versus grazed	1	155.1	12.24	0.0006**
	Tall: burned versus rest	1	158.9	0.12	0.7318
	Tall: grazed versus rest	1	167.4	9.83	0.0020**
	Tall: burned versus grazed	1	140.4	20.16	<0.0001**

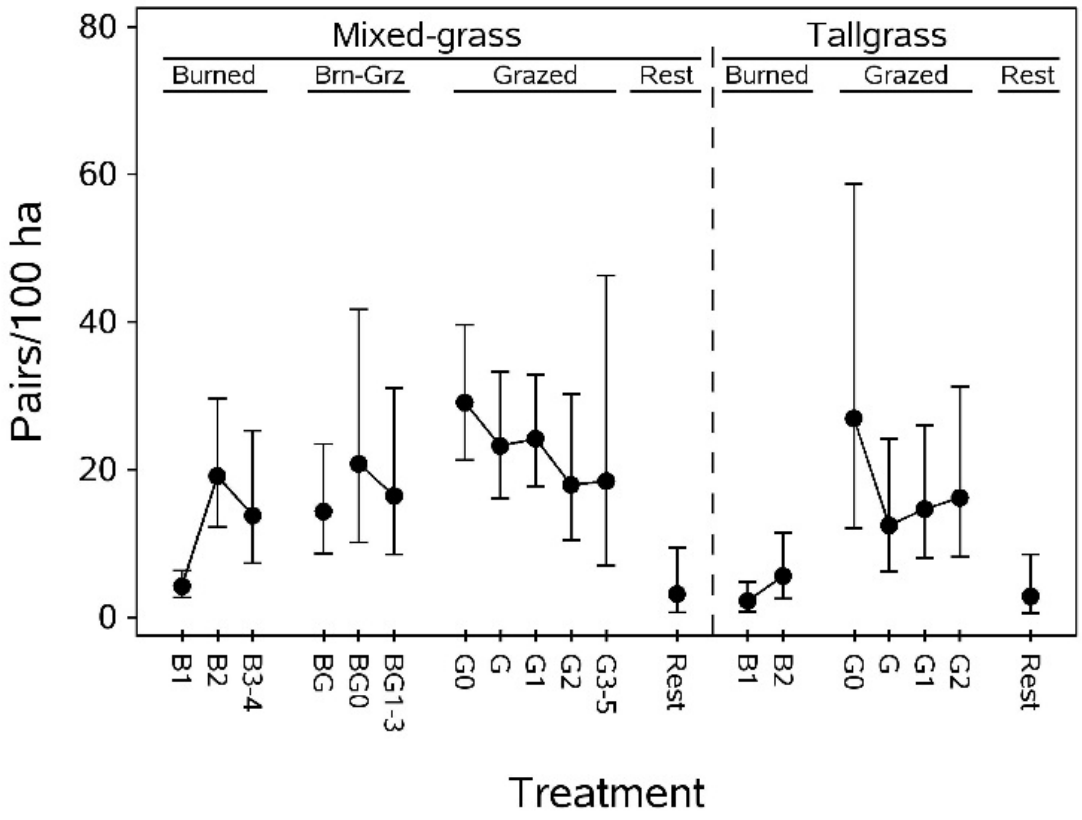
[1]Sources of variation for the model: Y=Unit(Grass type) + Grass type × Treatment + Residual, where Unit(Grass type) and Residual are random effects and Grass type × Treatment is a fixed effect in a mixed-model framework. Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 6.8. Least squares mean (standard error) densities (pairs per 100 hectares) and back-transformed least squares mean (95-percent confidence intervals) densities (pairs per 100 hectares) of grasshopper sparrows (*Ammodramus savannarum*), by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

				Back-transformed		
					95-percent confidence intervals	
Grass	Treatment[1]	LSMean	SE	LSMean	LCL	UCL
Mixed	B1	1.65	0.18	4.20	2.68	6.34
	B2	3.00	0.21	19.13	12.22	29.65
	B3-4	2.69	0.29	13.78	7.32	25.26
	BG	2.73	0.24	14.32	8.59	23.48
	BG0	3.08	0.34	20.78	10.11	41.69
	BG1-3	2.86	0.31	16.44	8.51	31.01
	G0	3.40	0.15	29.09	21.29	39.62
	G	3.19	0.18	23.21	16.13	33.20
	G1	3.23	0.15	24.19	17.75	32.83
	G2	2.94	0.26	17.94	10.48	30.26
	G3-5	2.97	0.45	18.45	7.00	46.30
	Rest	1.42	0.47	3.14	0.65	9.39
Tall	B1	1.17	0.30	2.21	0.78	4.79
	B2	1.89	0.33	5.60	2.49	11.50
	G0	3.33	0.39	26.95	12.09	58.68
	G	2.60	0.32	12.46	6.21	24.15
	G1	2.75	0.28	14.64	8.06	26.00
	G2	2.84	0.32	16.18	8.15	31.23
	Rest	1.35	0.46	2.85	0.56	8.49

[1]Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).



[Brn-Grz, burned-grazed]

Figure 6.4. Back-transformed least squares mean densities (pairs per 100 hectares) of grasshopper sparrows (*Ammodramus savannarum*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits. Treatments are defined in tables 6.7 and 6.8.

E. Savannah Sparrow (*Passerculus sandwichensis*)

Table 6.9. Generalized linear mixed model, assuming a gamma distribution with a log link, $y = (y+1)$, testing the influence of post-management treatments on breeding densities (pairs per 100 hectares) of Savannah sparrow (*Passerculus sandwichensis*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[*, evidence for moderate effect ($0.05<p\leq0.10$); **, evidence for strong effect ($p\leq0.05$)]

Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × treatment	18	130.5	3.62	<0.0001**
Contrasts:	Mixed: burned linear	1	116.1	10.48	0.0016**
	Mixed: burned quadratic	1	80.7	0.99	0.3226
	Mixed: BG0 vs BG1-3	1	102.1	0.70	0.4034
	Mixed: grazed linear	1	161.7	0.70	0.4049
	Mixed: grazed quadratic	1	139.1	0.01	0.9384
	Tall: burned linear	1	109.0	0.03	0.8664
	Tall: grazed linear	1	138.3	8.30	0.0046**
	Tall: grazed quadratic	1	117.8	0.05	0.8196
	B1: mixed versus tall	1	160.6	3.82	0.0524*
	B2: mixed versus tall	1	163.9	0.00	0.9559
	G0: mixed versus tall	1	164.0	4.35	0.0386**
	G: mixed versus tall	1	168.9	0.33	0.5680
	G1: mixed versus tall	1	163.9	0.26	0.6112
	G2: mixed versus tall	1	168.7	5.13	0.0247**
	Mixed: burned versus rest	1	117.7	1.81	0.1812
	Mixed: grazed versus rest	1	115.7	0.32	0.5716
	Mixed: burned-grazed versus rest	1	123.6	1.07	0.3038
	Mixed: burned versus grazed	1	167.5	4.44	0.0367**
	Tall: burned versus rest	1	156.7	14.58	0.0002**
	Tall: grazed versus rest	1	168.9	22.01	<0.0001**
	Tall: burned versus grazed	1	146.3	0.46	0.4991

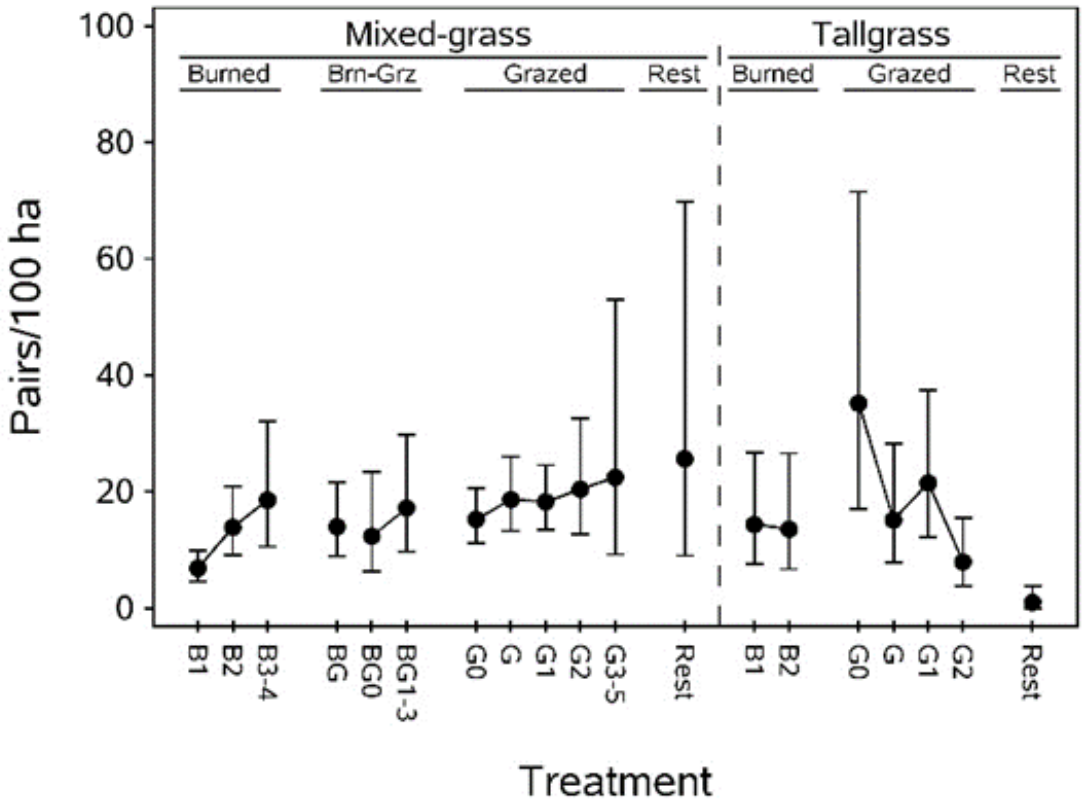
[1]Sources of variation for the model: Y=Unit(Grass type) + Grass type × Treatment + Residual, where Unit(Grass type) and Residual are random effects and Grass type × Treatment is a fixed effect in a mixed-model framework. Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 6.10. Least squares mean (standard error) densities (pairs per 100 hectares) and back-transformed least squares mean (95-percent confidence intervals) densities (pairs per 100 hectares) of Savannah sparrows (*Passerculus sandwichensis*), by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

				Back-transformed		
					95-percent confidence intervals	
Grass	Treatment[1]	LSMean	SE	LSMean	LCL	UCL
Mixed	B1	2.06	0.17	6.85	4.63	9.95
	B2	2.70	0.20	13.88	9.10	20.90
	B3-4	2.97	0.27	18.58	10.58	32.13
	BG	2.71	0.21	13.99	8.95	21.57
	BG0	2.59	0.31	12.38	6.35	23.35
	BG1-3	2.90	0.27	17.20	9.74	29.85
	G0	2.79	0.15	15.26	11.20	20.67
	G	2.98	0.16	18.66	13.30	26.04
	G1	2.96	0.15	18.26	13.49	24.59
	G2	3.06	0.23	20.43	12.67	32.60
	G3-5	3.16	0.43	22.48	9.21	53.04
	Rest	3.28	0.50	25.65	9.04	69.75
Tall	B1	2.73	0.30	14.38	7.56	26.64
	B2	2.68	0.33	13.56	6.68	26.60
	G0	3.59	0.35	35.19	17.06	71.49
	G	2.78	0.30	15.15	7.91	28.27
	G1	3.11	0.27	21.53	12.22	37.41
	G2	2.19	0.31	7.94	3.86	15.43
	Rest	0.68	0.46	0.98	0.00	3.86

[1]Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).



[Brn-Grz, burned-grazed]

Figure 6.5. Back-transformed least squares mean densities (pairs per 100 hectares) of Savannah sparrows (*Passerculus sandwichensis*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits. Treatments are defined in tables 6.9 and 6.10.

F. Western Meadowlark (*Sturnella neglecta*)

Table 6.11. Generalized linear mixed model, assuming a gamma distribution with a log link, $y = (y+1)$, testing the influence of post-management treatments on breeding densities (pairs per 100 hectares) of western meadowlarks (*Sturnella neglecta*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[*, evidence for moderate effect ($0.05<p\leq0.10$); **, evidence for strong effect ($p\leq0.05$)]

Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × treatment	18	132.8	2.28	0.0041**
Contrasts:	Mixed: burned linear	1	120.2	0.06	0.8069
	Mixed: burned quadratic	1	79.7	1.45	0.2315
	Mixed: BG0 vs BG1-3	1	104.6	0.00	0.9745
	Mixed: grazed linear	1	165.2	1.21	0.2728
	Mixed: grazed quadratic	1	142.1	0.59	0.4450
	Tall: burned linear	1	110.1	3.39	0.0682*
	Tall: grazed linear	1	140.7	2.04	0.1550
	Tall: grazed quadratic	1	119.1	0.07	0.7987
	B1: mixed versus tall	1	162.0	1.20	0.2746
	B2: mixed versus tall	1	165.0	0.01	0.9082
	G0: mixed versus tall	1	163.4	0.04	0.8489
	G: mixed versus tall	1	169.0	0.86	0.3560
	G1: mixed versus tall	1	165.4	0.18	0.6744
	G2: mixed versus tall	1	168.4	2.18	0.1421
	Mixed: burned versus rest	1	121.7	4.16	0.0435**
	Mixed: grazed versus rest	1	120.1	10.40	0.0016**
	Mixed: burned-grazed versus rest	1	128.0	9.88	0.0021**
	Mixed: burned versus grazed	1	169.0	8.86	0.0033**
	Tall: burned versus rest	1	155.3	0.90	0.3435
	Tall: grazed versus rest	1	168.3	3.07	0.0817*
	Tall: burned versus grazed	1	142.9	1.18	0.2796

Sources of variation for the model: Y=Unit(Grass type) + Grass type × Treatment + Residual, where Unit(Grass type) and Residual are random effects and Grass type × Treatment is a fixed effect in a mixed-model framework. Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).

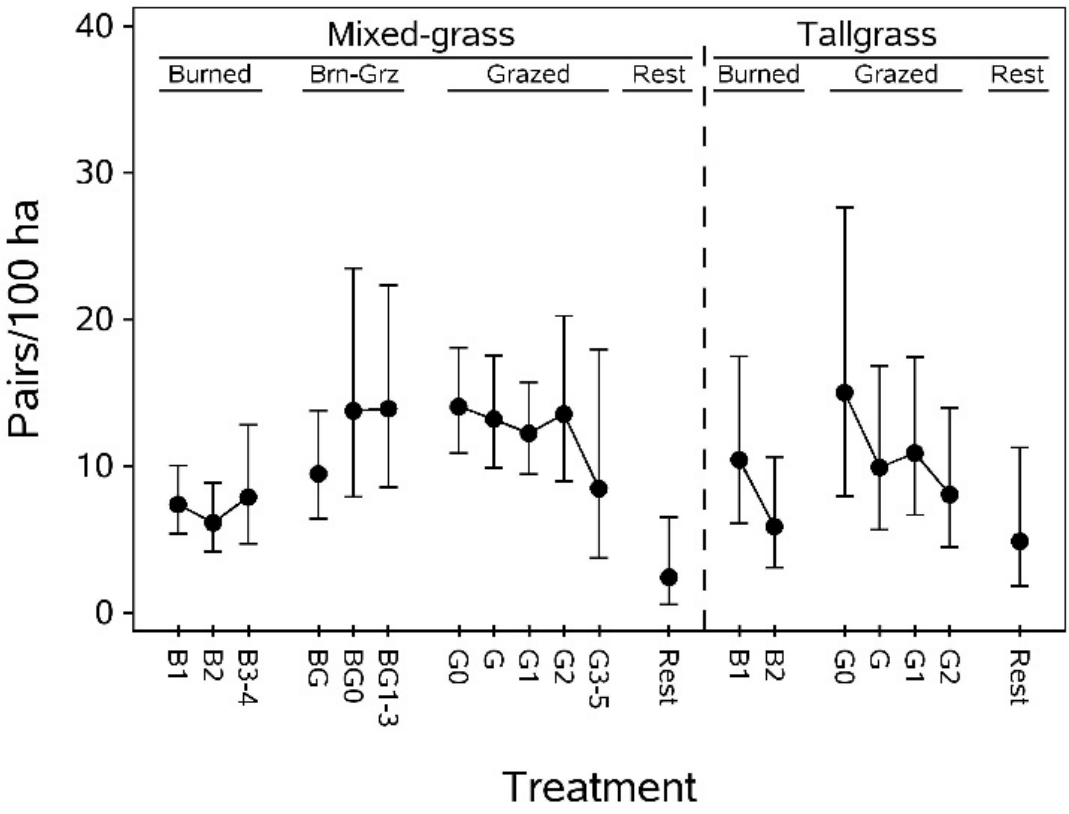
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 6.12. Least squares mean (standard error) densities (pairs per 100 hectares) and back-transformed least squares mean (95-percent confidence intervals) densities (pairs per 100 hectares) of western meadowlarks (*Sturnella neglecta*), by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

				Back-transformed		
					95-percent confidence intervals	
Grass	Treatment[1]	LSMean	SE	LSMean	LCL	UCL
Mixed	B1	2.13	0.14	7.38	5.36	10.03
	B2	1.96	0.17	6.13	4.16	8.85
	B3-4	2.18	0.23	7.88	4.71	12.81
	BG	2.35	0.18	9.46	6.40	13.78
	BG0	2.69	0.26	13.76	7.90	23.48
	BG1-3	2.70	0.23	13.91	8.53	22.33
	G0	2.71	0.12	14.05	10.87	18.08
	G	2.65	0.14	13.20	9.88	17.52
	G1	2.58	0.12	12.22	9.45	15.72
	G2	2.68	0.19	13.54	8.96	20.22
	G3-5	2.25	0.36	8.46	3.72	17.97
	Rest	1.23	0.40	2.41	0.55	6.51
Tall	B1	2.44	0.25	10.42	6.06	17.47
	B2	1.93	0.27	5.87	3.07	10.61
	G0	2.77	0.30	15.00	7.94	27.63
	G	2.39	0.25	9.90	5.66	16.84
	G1	2.47	0.22	10.88	6.65	17.43
	G2	2.20	0.26	8.05	4.48	13.97
	Rest	1.77	0.38	4.87	1.81	11.26

[1]Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).



[Brn-Grz, burned-grazed]

Figure 6.6. Back-transformed least squares mean densities (pairs per 100 hectares) of western meadowlarks (*Sturnella neglecta*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits. Treatments are defined in tables 6.11 and 6.12.

G. Brown-headed Cowbird (*Molothrus ater*)

Table 6.13. Generalized linear mixed model, assuming a normal distribution with a log link, $y = (y+1)$, testing the influence of post-management treatments on breeding densities (pairs per 100 hectares) (pairs per 100 hectares) of brown-headed cowbirds (*Molothrus ater*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × treatment	18	155.0	0.90	0.5847
Contrasts:	Mixed: burned linear	1	160.0	0.09	0.7690
	Mixed: burned quadratic	1	100.9	0.06	0.8053
	Mixed: BG0 vs BG1-3	1	152.5	0.89	0.3481
	Mixed: grazed linear	1	166.7	0.27	0.6067
	Mixed: grazed quadratic	1	160.4	0.42	0.5170
	Tall: burned linear	1	128.1	0.05	0.8285
	Tall: grazed linear	1	161.2	1.48	0.2257
	Tall: grazed quadratic	1	145.3	0.48	0.4917
	B1: mixed versus tall	1	168.3	1.16	0.2839
	B2: mixed versus tall	1	168.2	1.27	0.2614
	G0: mixed versus tall	1	168.0	1.00	0.3189
	G: mixed versus tall	1	168.7	2.20	0.1399
	G1: mixed versus tall	1	169.0	1.22	0.2713
	G2: mixed versus tall	1	169.0	3.05	0.0826
	Mixed: burned versus rest	1	158.2	0.73	0.3956
	Mixed: grazed versus rest	1	161.0	0.08	0.7815
	Mixed: burned-grazed versus rest	1	161.0	1.67	0.1981
	Mixed: burned versus grazed	1	142.4	1.47	0.2271
	Tall: burned versus rest	1	165.3	0.09	0.7704
	Tall: grazed versus rest	1	168.7	0.31	0.5791
	Tall: burned versus grazed	1	131.7	0.32	0.5739

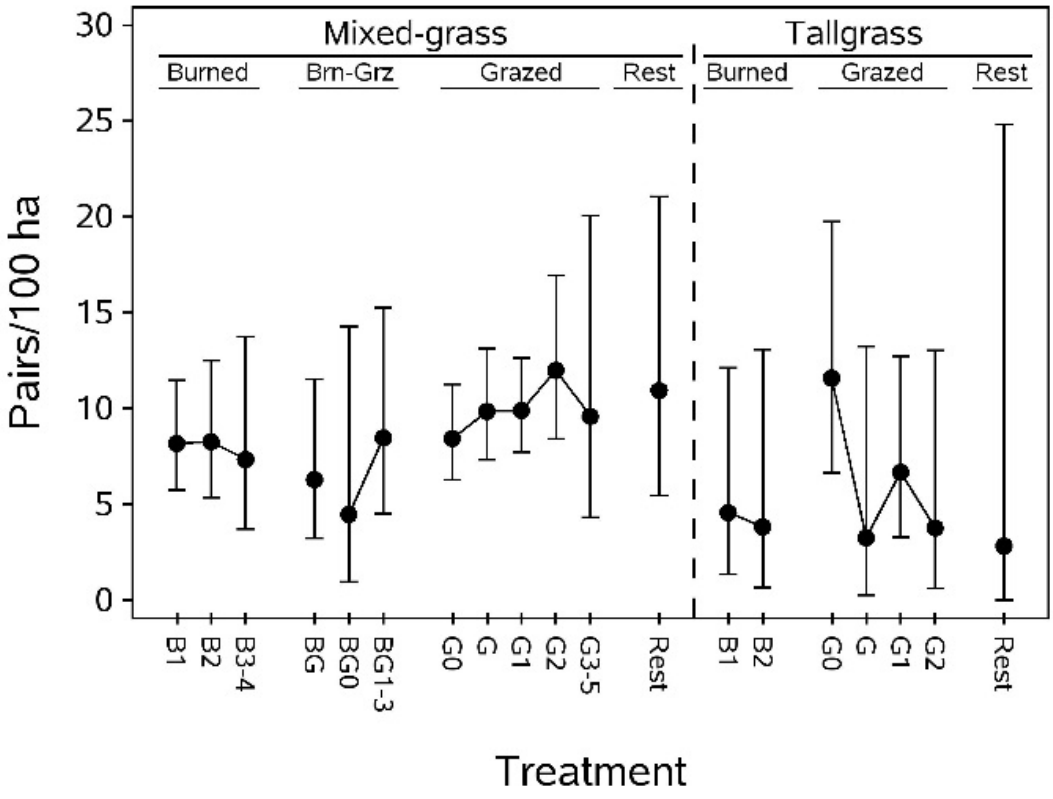
[1]Sources of variation for the model: Y=Unit(Grass type) + Grass type × Treatment + Residual, where Unit(Grass type) and Residual are random effects and Grass type × Treatment is a fixed effect in a mixed-model framework. Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 6.14. Least squares mean (standard error) densities (pairs per 100 hectares) and back-transformed least squares mean (95-percent confidence intervals) densities (pairs per 100 hectares) of brown-headed cowbirds (Molothrus ater), by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

				Back-transformed		
					95-percent confidence intervals	
Grass	Treatment[1]	LSMean	SE	LSMean	LCL	UCL
Mixed	B1	2.22	0.16	8.18	5.75	11.48
	B2	2.23	0.19	8.27	5.36	12.50
	B3-4	2.12	0.29	7.34	3.72	13.75
	BG	1.99	0.28	6.29	3.24	11.54
	BG0	1.70	0.52	4.48	0.97	14.27
	BG1-3	2.25	0.28	8.47	4.52	15.25
	G0	2.25	0.13	8.44	6.27	11.27
	G	2.38	0.14	9.85	7.32	13.14
	G1	2.39	0.11	9.90	7.73	12.62
	G2	2.57	0.16	12.00	8.43	16.94
	G3-5	2.36	0.35	9.59	4.32	20.06
	Rest	2.48	0.31	10.94	5.46	21.05
Tall	B1	1.72	0.44	4.57	1.36	12.13
	B2	1.58	0.55	3.83	0.66	13.07
	G0	2.53	0.25	11.59	6.64	19.75
	G	1.45	0.62	3.26	0.27	13.24
	G1	2.04	0.30	6.68	3.30	12.73
	G2	1.56	0.55	3.77	0.62	13.03
	Rest	1.34	0.97	2.83	0.00	24.81

[1]Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).



[Brn-Grz, burned-grazed]

Figure 6.7. Back-transformed least squares mean densities (pairs per 100 hectares) of brown-headed cowbirds (*Molothrus ater*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits. Treatments are defined in tables 6.13 and 6.14.

H. Sedge Wren (*Cistothorus platensis*)

Table 6.15. Generalized linear mixed model, assuming a normal distribution with a log link, $y = (y+1)$, testing the influence of post-management treatments on breeding densities (pairs per 100 hectares) (pairs per 100 hectares) of sedge wrens (*Cistothorus platensis*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[*, evidence for moderate effect ($0.05<p\leq0.10$); **, evidence for strong effect ($p\leq0.05$)]

Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × treatment	18	121.5	1.68	0.0517*
Contrasts:	Mixed: burned linear	1	114.5	0.48	0.4879
	Mixed: burned quadratic	1	117.6	2.56	0.1121
	Mixed: BG0 vs BG1-3	1	88.2	0.01	0.9221
	Mixed: grazed linear	1	167.2	1.28	0.2604
	Mixed: grazed quadratic	1	96.9	0.54	0.4640
	Tall: burned linear	1	103.0	3.61	0.0604*
	Tall: grazed linear	1	117.0	0.64	0.4250
	Tall: grazed quadratic	1	116.8	0.17	0.6820
	B1: mixed versus tall	1	167.8	3.12	0.0789*
	B2: mixed versus tall	1	167.5	7.20	0.0080**
	G0: mixed versus tall	1	168.6	3.63	0.0584*
	G: mixed versus tall	1	165.5	0.84	0.3609
	G1: mixed versus tall	1	167.3	8.60	0.0038**
	G2: mixed versus tall	1	148.3	2.05	0.1540
	Mixed: burned versus rest	1	115.6	3.71	0.0566*
	Mixed: grazed versus rest	1	97.1	5.76	0.0183**
	Mixed: burned-grazed versus rest	1	167.4	2.77	0.0980*
	Mixed: burned versus grazed	1	168.0	0.07	0.7951
	Tall: burned versus rest	1	141.0	0.25	0.6175
	Tall: grazed versus rest	1	166.4	2.37	0.1255
	Tall: burned versus grazed	1	129.4	1.55	0.2159

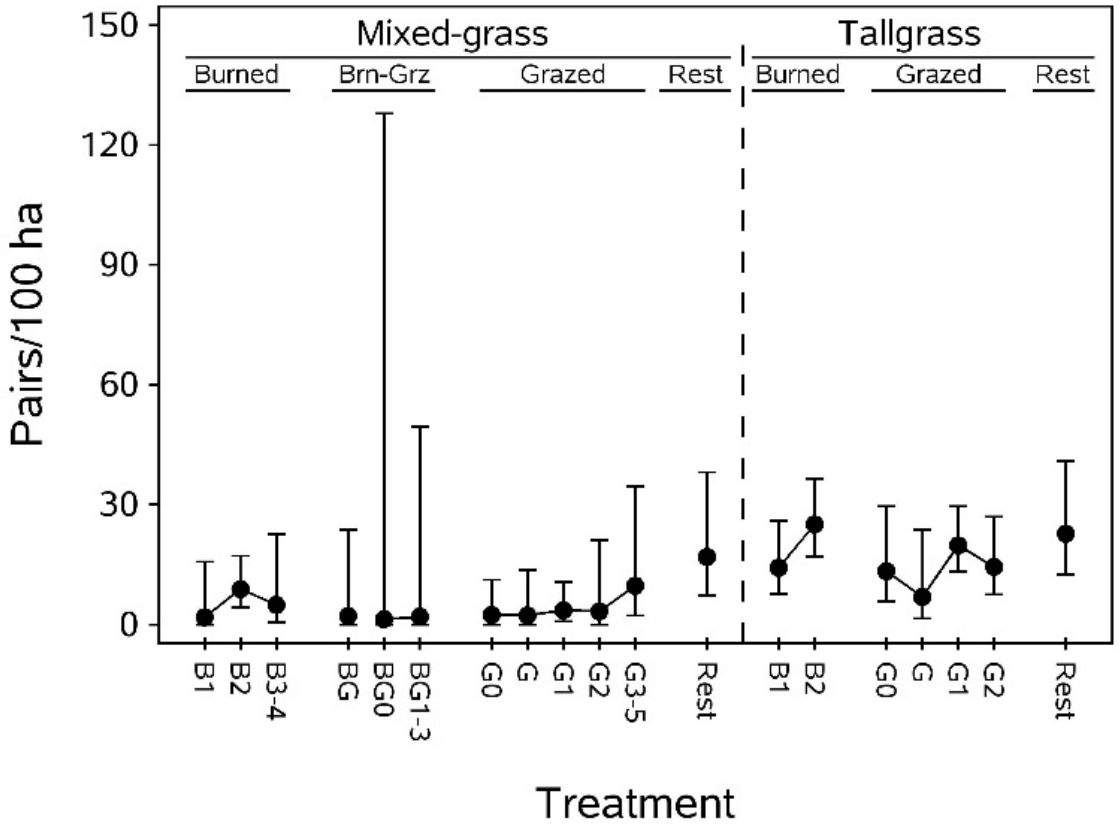
[1]Sources of variation for the model: Y=Unit(Grass type) + Grass type × Treatment + Residual, where Unit(Grass type) and Residual are random effects and Grass type × Treatment is a fixed effect in a mixed-model framework. Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 6.16. Least squares mean (standard error) densities (pairs per 100 hectares) and back-transformed least squares mean (95-percent confidence intervals) densities (pairs per 100 hectares) of sedge wrens (*Cistothorus platensis*), by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

				Back-transformed		
					95-percent confidence intervals	
Grass	Treatment[1]	LSMean	SE	LSMean	LCL	UCL
Mixed	B1	1.05	0.90	1.85	0.00	15.73
	B2	2.29	0.31	8.91	4.41	17.18
	B3-4	1.78	0.71	4.94	0.49	22.72
	BG	1.16	1.05	2.18	0.00	23.70
	BG0	0.87	2.04	1.38	0.00	127.86
	BG1-3	1.10	1.44	1.99	0.00	49.47
	G0	1.24	0.64	2.45	0.00	11.19
	G	1.20	0.76	2.31	0.00	13.64
	G1	1.53	0.48	3.61	0.82	10.71
	G2	1.46	0.84	3.32	0.00	21.23
	G3-5	2.37	0.61	9.75	2.24	34.68
	Rest	2.89	0.40	16.96	7.23	38.15
Tall	B1	2.72	0.29	14.25	7.61	26.03
	B2	3.26	0.19	25.10	17.14	36.54
	G0	2.67	0.38	13.39	5.78	29.56
	G	2.07	0.58	6.95	1.54	23.84
	G1	3.04	0.20	19.84	13.19	29.62
	G2	2.74	0.30	14.45	7.52	27.03
	Rest	3.17	0.29	22.78	12.52	40.80

[1]Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).



[Brn-Grz, burned-grazed]

Figure 6.8. Back-transformed least squares mean densities (pairs per 100 hectares) of sedge wrens (*Cistothorus platensis*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits. Treatments are defined in tables 6.15 and 6.16.

I. Common Yellowthroat (*Geothlypis trichas*)

Table 6.17. Generalized linear mixed model, assuming a normal distribution with a log link, $y = (y+1)$, testing the influence of post-management treatments on breeding densities (pairs per 100 hectares) of common yellowthroats (*Geothlypis trichas*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[*, evidence for moderate effect ($0.05<p\leq0.10$); **, evidence for strong effect ($p\leq0.05$)]

Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × treatment	18	131.6	2.71	0.0006**
Contrasts:	Mixed: burned linear	1	127.0	2.62	0.1080
	Mixed: burned quadratic	1	66.6	0.00	0.9803
	Mixed: BG0 vs BG1-3	1	132.2	0.55	0.4604
	Mixed: grazed linear	1	167.7	0.04	0.8450
	Mixed: grazed quadratic	1	152.4	0.30	0.5840
	Tall: burned linear	1	101.7	0.32	0.5725
	Tall: grazed linear	1	137.5	2.46	0.1189
	Tall: grazed quadratic	1	120.5	0.02	0.8899
	B1: mixed versus tall	1	167.8	10.35	0.0016**
	B2: mixed versus tall	1	167.5	8.99	0.0031**
	G0: mixed versus tall	1	168.6	9.22	0.0028**
	G: mixed versus tall	1	163.3	10.66	0.0013**
	G1: mixed versus tall	1	168.2	18.46	<0.0001**
	G2: mixed versus tall	1	155.0	10.13	0.0018**
	Mixed: burned versus rest	1	121.7	2.00	0.1595
	Mixed: grazed versus rest	1	129.7	4.49	0.0360*
	Mixed: burned-grazed versus rest	1	168.9	2.35	0.1273
	Mixed: burned versus grazed	1	165.4	1.34	0.2482
	Tall: burned versus rest	1	153.8	0.29	0.5922
	Tall: grazed versus rest	1	167.0	0.50	0.4791
	Tall: burned versus grazed	1	139.4	0.07	0.7982

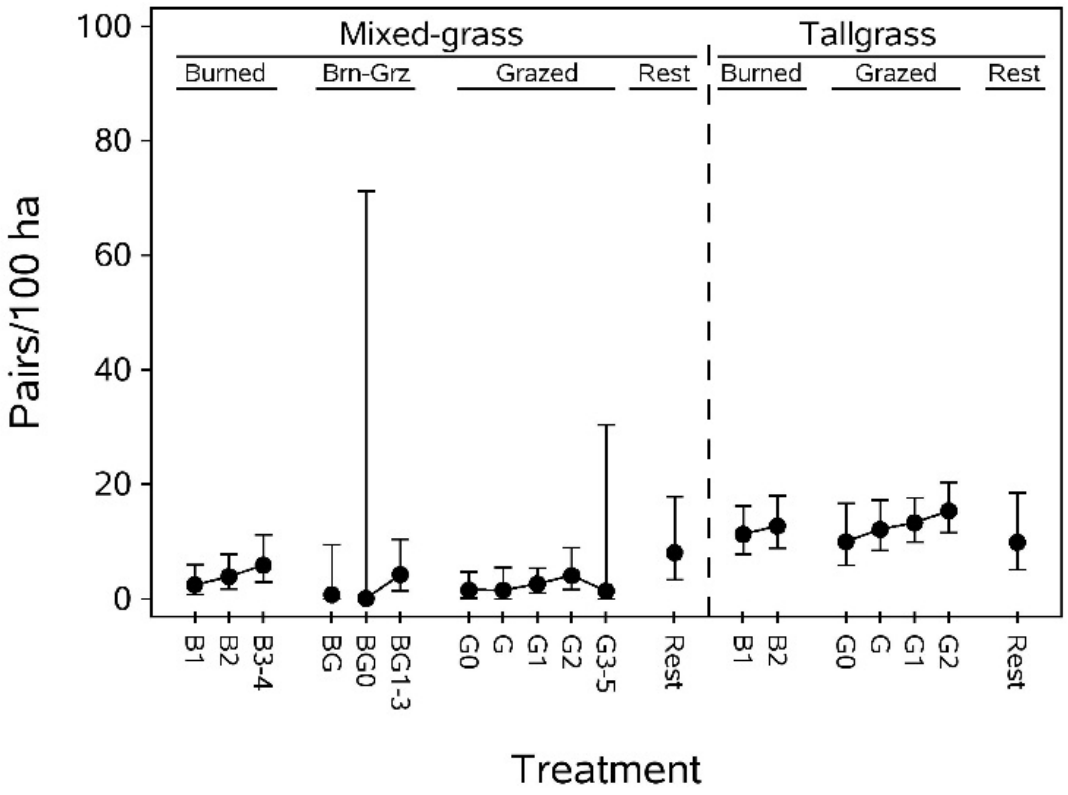
[1]Sources of variation for the model: Y=Unit(Grass type) + Grass type × Treatment + Residual, where Unit(Grass type) and Residual are random effects and Grass type × Treatment is a fixed effect in a mixed-model framework. Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 6.18. Least squares mean (standard error) densities (pairs per 100 hectares) and back-transformed least squares mean (95-percent confidence intervals) densities (pairs per 100 hectares) of common yellowthroats (*Geothlypis trichas*), by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

				Back-transformed		
					95-percent confidence intervals	
Grass	Treatment[1]	LSMean	SE	LSMean	LCL	UCL
Mixed	B1	1.24	0.36	2.45	0.72	5.93
	B2	1.59	0.30	3.91	1.74	7.83
	B3-4	1.93	0.29	5.89	2.89	11.20
	BG	0.57	0.91	0.76	0.00	9.47
	BG0	0.08	2.14	0.09	0.00	71.26
	BG1-3	1.66	0.40	4.25	1.42	10.40
	G0	0.94	0.41	1.56	0.14	4.77
	G	0.93	0.48	1.53	0.00	5.43
	G1	1.29	0.29	2.62	1.05	5.38
	G2	1.63	0.34	4.09	1.61	8.92
	G3-5	0.87	1.31	1.39	0.00	30.36
	Rest	2.20	0.37	8.06	3.36	17.83
Tall	B1	2.51	0.17	11.30	7.77	16.24
	B2	2.62	0.17	12.73	8.89	18.07
	G0	2.40	0.24	9.98	5.84	16.62
	G	2.58	0.17	12.15	8.46	17.27
	G1	2.66	0.14	13.29	9.94	17.67
	G2	2.80	0.14	15.37	11.52	20.40
	Rest	2.39	0.30	9.89	5.06	18.55

[1]Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).



[Brn-Grz, burned-grazed]

Figure 6.9. Back-transformed least squares mean densities (pairs per 100 hectares) of common yellowthroats (*Geothlypis trichas*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits. Treatments are defined in tables 6.17 and 6.18.

J. Dickcissel (*Spiza americana*)

Table 6.19. Generalized linear mixed model, assuming a normal distribution with an identity link, $y = (y+0.0)$, testing the influence of post-management treatments on breeding densities (pairs per 100 hectares) of dickcissels (*Spiza americana*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[*, evidence for moderate effect ($0.05<p\leq0.10$); **, evidence for strong effect ($p\leq0.05$)]

Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × treatment	18	154.3	1.89	0.0201**
Contrasts:	Mixed: burned linear	1	164.2	0.16	0.6939
	Mixed: burned quadratic	1	92.2	0.12	0.7301
	Mixed: BG0 vs BG1-3	1	153.6	1.49	0.2239
	Mixed: grazed linear	1	161.1	0.43	0.5111
	Mixed: grazed quadratic	1	159.3	0.62	0.4323
	Tall: burned linear	1	112.3	4.75	0.0314**
	Tall: grazed linear	1	163.6	0.00	0.9658
	Tall: grazed quadratic	1	142.2	3.23	0.0743*
	B1: mixed versus tall	1	168.9	13.12	0.0004**
	B2: mixed versus tall	1	169.0	0.58	0.4460
	G0: mixed versus tall	1	168.7	0.50	0.4821
	G: mixed versus tall	1	168.8	1.44	0.2312
	G1: mixed versus tall	1	169.0	3.42	0.0663*
	G2: mixed versus tall	1	168.8	0.08	0.7823
	Mixed: burned versus rest	1	164.8	0.03	0.8520
	Mixed: grazed versus rest	1	166.1	0.41	0.5243
	Mixed: burned-grazed versus rest	1	165.0	0.18	0.6713
	Mixed: burned versus grazed	1	120.3	1.28	0.2605
	Tall: burned versus rest	1	164.0	0.74	0.3916
	Tall: grazed versus rest	1	168.7	0.06	0.8111
	Tall: burned versus grazed	1	128.1	1.30	0.2568

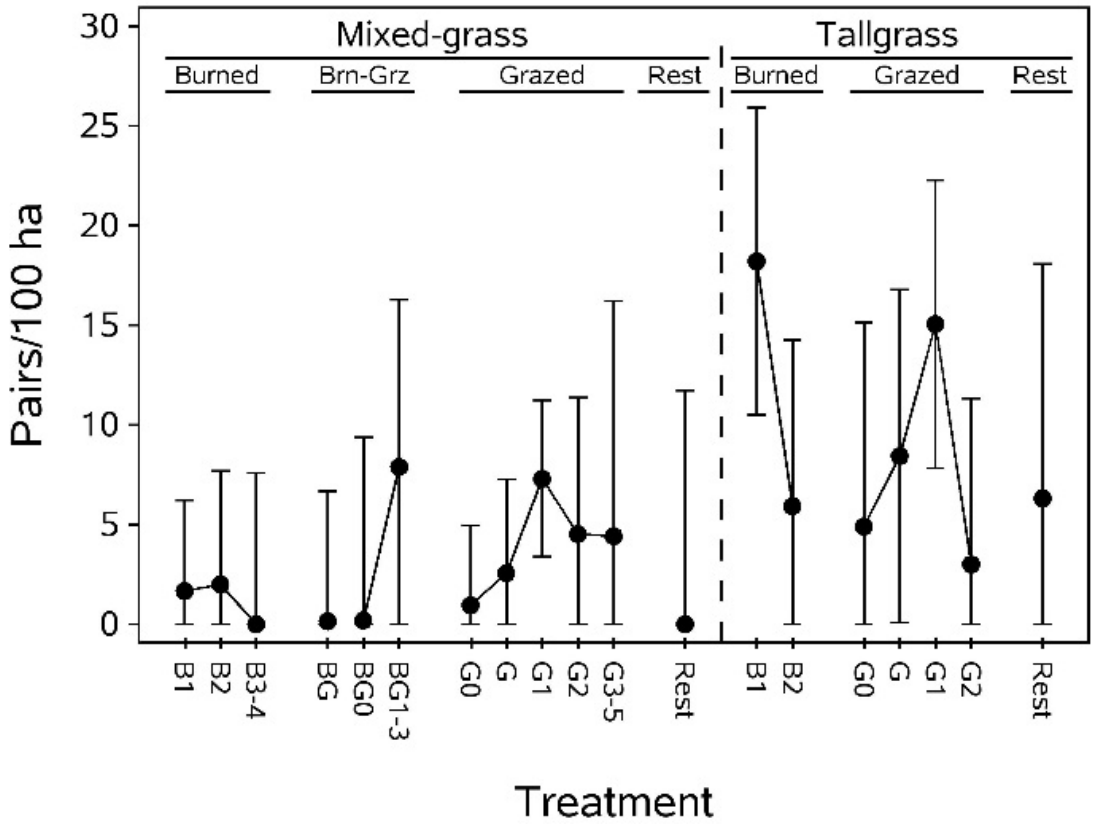
[1]Sources of variation for the model: Y=Unit(Grass type) + Grass type × Treatment + Residual, where Unit(Grass type) and Residual are random effects and Grass type × Treatment is a fixed effect in a mixed-model framework. Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 6.20. Least squares mean (standard error) densities (pairs per 100 hectares) of dickcissels (*Spiza americana*), by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

				95-percent confidence intervals	
Grass	Treatment[1]	LSMean[2]	SE	LCL	UCL
Mixed	B1	1.66	2.33	0.00	6.22
	B2	2.00	2.90	0.00	7.68
	B3-4	0.00	3.95	0.00	7.59
	BG	0.15	3.32	0.00	6.65
	BG0	0.19	4.68	0.00	9.37
	BG1-3	7.89	4.28	0.00	16.28
	G0	0.95	2.05	0.00	4.96
	G	2.56	2.40	0.00	7.26
	G1	7.30	2.01	3.37	11.24
	G2	4.52	3.49	0.00	11.36
	G3-5	4.42	6.02	0.00	16.22
	Rest	0.00	5.98	0.00	11.72
Tall	B1	18.21	3.93	10.51	25.91
	B2	5.92	4.24	0.00	14.24
	G0	4.90	5.22	0.00	15.14
	G	8.43	4.26	0.08	16.78
	G1	15.06	3.68	7.84	22.27
	G2	3.00	4.25	0.00	11.33
	Rest	6.32	6.00	0.00	18.08

[1]Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Densities were not transformed.



[Brn-Grz, burned-grazed]

Figure 6.10. Least squares mean densities (pairs per 100 hectares) of dickcissels (*Spiza americana*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits. Treatments are defined in tables 6.19 and 6.20.

K. Chestnut-collared Longspur (*Calcarius ornatus*)

Table 6.21. Generalized linear mixed model, assuming a normal distribution with an identity link, $y = (y+0.0)$, testing the influence of post-management treatments on breeding densities (pairs per 100 hectares) of chestnut-collared longspur (*Calcarius ornatus*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[**, evidence for strong effect ($p \leq 0.05$)]

Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × treatment	18	121.5	1.87	0.0243**
Contrasts:	Mixed: burned linear	1	103.0	0.78	0.3795
	Mixed: burned quadratic	1	79.5	0.19	0.6647
	Mixed: BG0 vs BG1-3	1	93.3	0.78	0.3807
	Mixed: grazed linear	1	145.3	0.59	0.4430
	Mixed: grazed quadratic	1	125.9	1.47	0.2283
	Tall: burned linear	1	101.4	0.00	1.0000
	Tall: grazed linear	1	129.7	0.00	1.0000
	Tall: grazed quadratic	1	111.6	0.00	1.0000
	B1: mixed versus tall	1	155.3	2.54	0.1132
	B2: mixed versus tall	1	160.1	0.95	0.3313
	G0: mixed versus tall	1	167.1	1.77	0.1853
	G: mixed versus tall	1	166.0	1.58	0.2099
	G1: mixed versus tall	1	156.8	1.45	0.2298
	G2: mixed versus tall	1	168.9	3.91	0.0497**
	Mixed: burned versus rest	1	104.6	0.56	0.4548
	Mixed: grazed versus rest	1	102.3	0.53	0.4683
	Mixed: burned-grazed versus rest	1	108.7	4.11	0.0452**
	Mixed: burned versus grazed	1	151.0	0.01	0.9300
	Tall: burned versus rest	1	162.5	0.00	1.0000
	Tall: grazed versus rest	1	167.1	0.00	1.0000
	Tall: burned versus grazed	1	156.4	0.00	1.0000

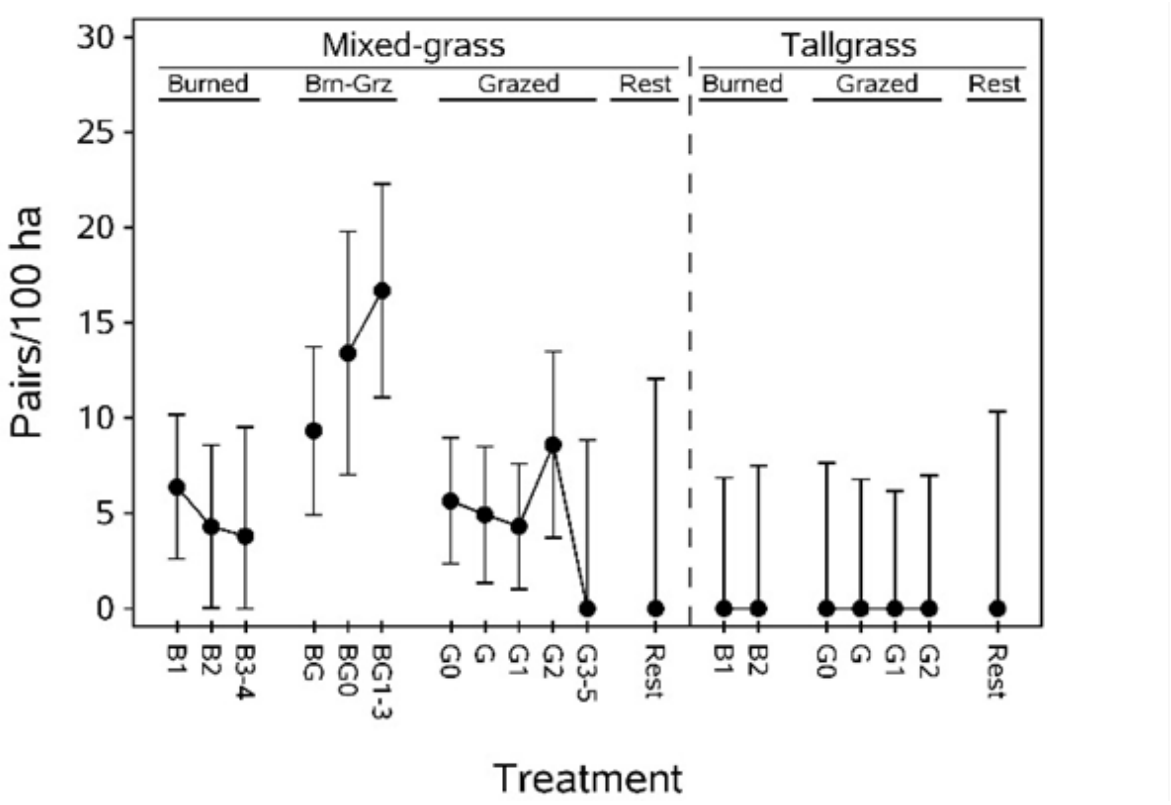
[1]Sources of variation for the model: Y=Unit(Grass type) + Grass type × Treatment + Residual, where Unit(Grass type) and Residual are random effects and Grass type × Treatment is a fixed effect in a mixed-model framework. Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 6.22. Least squares mean (standard error) densities (pairs per 100 hectares) of chestnut-collared longspurs (*Calcarius ornatus*), by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

				95-percent confidence intervals	
Grass	Treatment[1]	LSMean[2]	SE	LCL	UCL
Mixed	B1	6.37	1.93	2.59	10.16
	B2	4.30	2.19	0.01	8.58
	B3-4	3.80	2.92	0.00	9.52
	BG	9.34	2.25	4.92	13.75
	BG0	13.40	3.26	7.01	19.79
	BG1-3	16.69	2.85	11.10	22.28
	G0	5.65	1.69	2.34	8.96
	G	4.93	1.83	1.34	8.51
	G1	4.31	1.68	1.01	7.60
	G2	8.59	2.49	3.71	13.48
	G3-5	0.00	4.66	0.00	8.84
	Rest	0.00	6.15	0.00	12.05
Tall	B1	0.00	3.50	0.00	6.87
	B2	0.00	3.83	0.00	7.50
	G0	0.00	3.90	0.00	7.64
	G	0.00	3.46	0.00	6.79
	G1	0.00	3.15	0.00	6.18
	G2	0.00	3.56	0.00	6.98
	Rest	0.00	5.27	0.00	10.33

[1]Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Densities were not transformed.



[Brn-Grz, burned-grazed]

Figure 6.11. Least squares mean densities (pairs per 100 hectares) of chestnut-collared longspurs (*Calcarius ornatus*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits. Treatments are defined in tables 6.21 and 6.22.

L. Eastern Kingbird (*Tyrannus tyrannus*)

Table 6.23. Generalized linear mixed model, assuming a gamma distribution with a log link, $y = (y+1)$, testing the influence of post-management treatments on breeding densities (pairs per 100 hectares) of eastern kingbirds (*Tyrannus tyrannus*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[*, evidence for moderate effect ($0.05<p\leq0.10$); **, evidence for strong effect ($p\leq0.05$)]

Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × treatment	18	123.8	1.65	0.0580*
Contrasts:	Mixed: burned linear	1	106.3	2.37	0.1269
	Mixed: burned quadratic	1	78.5	0.03	0.8551
	Mixed: BG0 vs BG1-3	1	94.9	0.85	0.3598
	Mixed: grazed linear	1	152.0	2.63	0.1070
	Mixed: grazed quadratic	1	130.3	1.81	0.1810
	Tall: burned linear	1	102.9	0.72	0.3996
	Tall: grazed linear	1	132.0	0.05	0.8236
	Tall: grazed quadratic	1	112.5	9.25	0.0029**
	B1: mixed versus tall	1	157.1	0.39	0.5355
	B2: mixed versus tall	1	161.4	0.26	0.6119
	G0: mixed versus tall	1	165.6	2.42	0.1214
	G: mixed versus tall	1	167.7	1.00	0.3187
	G1: mixed versus tall	1	159.7	0.19	0.6654
	G2: mixed versus tall	1	169.0	1.74	0.1890
	Mixed: burned versus rest	1	108.0	0.72	0.3965
	Mixed: grazed versus rest	1	105.7	2.27	0.1351
	Mixed: burned-grazed versus rest	1	112.8	1.63	0.2042
	Mixed: burned versus grazed	1	158.6	3.32	0.0702*
	Tall: burned versus rest	1	159.6	0.00	0.9561
	Tall: grazed versus rest	1	168.6	0.04	0.8502
	Tall: burned versus grazed	1	151.6	0.03	0.8522

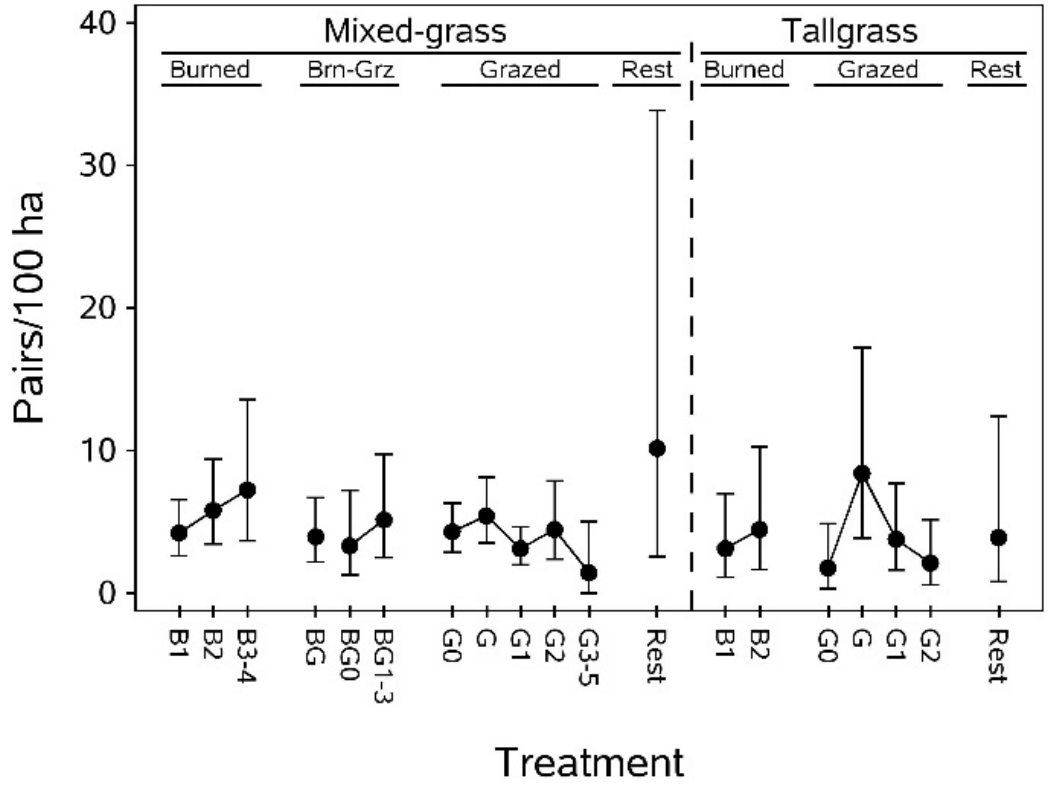
[1]Sources of variation for the model: Y=Unit(Grass type) + Grass type × Treatment + Residual, where Unit(Grass type) and Residual are random effects and Grass type × Treatment is a fixed effect in a mixed-model framework. Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 6.24. Least squares mean (standard error) densities (pairs per 100 hectares) and back-transformed least squares mean (95-percent confidence intervals) densities (pairs per 100 hectares) of eastern kingbirds (*Tyrannus tyrannus*), by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

				Back-transformed		
					95-percent confidence intervals	
Grass	Treatment[1]	LSMean	SE	LSMean	LCL	UCL
Mixed	B1	1.65	0.19	4.22	2.61	6.56
	B2	1.92	0.22	5.79	3.45	9.37
	B3-4	2.11	0.29	7.24	3.66	13.57
	BG	1.60	0.22	3.95	2.19	6.69
	BG0	1.46	0.33	3.31	1.27	7.19
	BG1-3	1.81	0.29	5.13	2.49	9.74
	G0	1.67	0.16	4.30	2.85	6.31
	G	1.86	0.18	5.41	3.51	8.11
	G1	1.41	0.16	3.11	1.99	4.65
	G2	1.70	0.25	4.46	2.36	7.87
	G3-5	0.88	0.46	1.42	0.00	5.00
	Rest	2.41	0.58	10.15	2.57	33.86
Tall	B1	1.41	0.34	3.11	1.12	6.97
	B2	1.70	0.37	4.46	1.65	10.27
	G0	1.02	0.39	1.76	0.30	4.88
	G	2.24	0.34	8.40	3.85	17.22
	G1	1.56	0.31	3.77	1.62	7.69
	G2	1.13	0.35	2.11	0.58	5.14
	Rest	1.59	0.51	3.90	0.79	12.38

[1]Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).



[Brn-Grz, burned-grazed]

Figure 6.12. Back-transformed least squares mean densities (pairs per 100 hectares) of eastern kingbirds (*Tyrannus tyrannus*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits. Treatments are defined in tables 6.23 and 6.24.

M. Yellow Warbler (*Setophaga petechia*)

Table 6.25. Generalized linear mixed model, assuming a normal distribution with a log link, $y = (y+1)$, testing the influence of post-management treatments on breeding densities (pairs per 100 hectares) of yellow warblers (*Setophaga petechia*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × treatment	18	115.1	1.14	0.3257
Contrasts:	Mixed: burned linear	1	112.1	2.10	0.1500
	Mixed: burned quadratic	1	96.6	1.40	0.2395
	Mixed: BG0 vs BG1-3	1	93.1	0.20	0.6595
	Mixed: grazed linear	1	116.0	0.01	0.9129
	Mixed: grazed quadratic	1	106.1	0.01	0.9292
	Tall: burned linear	1	110.7	0.10	0.7504
	Tall: grazed linear	1	143.3	0.66	0.4194
	Tall: grazed quadratic	1	129.9	0.19	0.6665
	B1: mixed versus tall	1	146.6	0.30	0.5872
	B2: mixed versus tall	1	153.4	0.14	0.7103
	G0: mixed versus tall	1	167.7	0.27	0.6046
	G: mixed versus tall	1	151.5	0.03	0.8619
	G1: mixed versus tall	1	142.3	0.49	0.4864
	G2: mixed versus tall	1	166.0	0.49	0.4863
	Mixed: burned versus rest	1	117.5	13.00	0.0005
	Mixed: grazed versus rest	1	107.2	14.71	0.0002
	Mixed: burned-grazed versus rest	1	141.9	12.05	0.0007
	Mixed: burned versus grazed	1	118.7	0.17	0.6788
	Tall: burned versus rest	1	168.4	0.14	0.7137
	Tall: grazed versus rest	1	146.4	0.03	0.8675
	Tall: burned versus grazed	1	169.0	0.12	0.7312

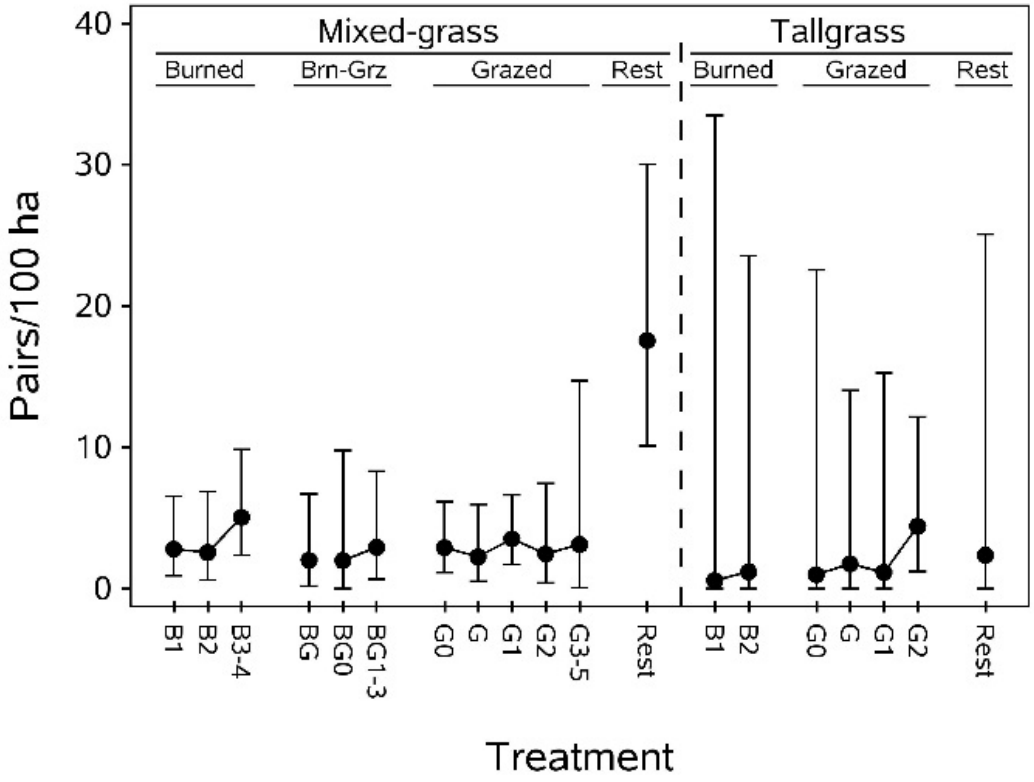
[1]Sources of variation for the model: Y=Unit(Grass type) + Grass type × Treatment + Residual, where Unit(Grass type) and Residual are random effects and Grass type × Treatment is a fixed effect in a mixed-model framework. Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 6.26. Least squares mean (standard error) densities (pairs per 100 hectares) and back-transformed least squares mean (95-percent confidence intervals) densities (pairs per 100 hectares) of yellow warblers (*Setophaga petechia*), by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

				Back-transformed		
					95-percent confidence intervals	
Grass	Treatment[1]	LSMean	SE	LSMean	LCL	UCL
Mixed	B1	1.34	0.35	2.80	0.91	6.55
	B2	1.27	0.40	2.56	0.61	6.85
	B3-4	1.80	0.30	5.05	2.37	9.87
	BG	1.10	0.48	2.01	0.18	6.70
	BG0	1.09	0.65	1.99	0.00	9.78
	BG1-3	1.37	0.44	2.93	0.66	8.31
	G0	1.36	0.31	2.91	1.13	6.17
	G	1.18	0.39	2.25	0.52	5.97
	G1	1.51	0.27	3.53	1.69	6.64
	G2	1.24	0.46	2.46	0.42	7.46
	G3-5	1.42	0.68	3.13	0.08	14.73
	Rest	2.92	0.26	17.56	10.10	30.04
Tall	B1	0.46	1.57	0.58	0.00	33.48
	B2	0.79	1.23	1.19	0.00	23.55
	G0	0.69	1.26	0.99	0.00	22.54
	G	1.01	0.86	1.76	0.00	14.02
	G1	0.77	1.03	1.15	0.00	15.27
	G2	1.69	0.45	4.42	1.23	12.15
	Rest	1.21	1.04	2.37	0.00	25.08

[1]Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).



[Brn-Grz, burned-grazed]

Figure 6.13. Back-transformed least squares mean densities (pairs per 100 hectares) of yellow warblers (*Setophaga petechia*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits. Treatments are defined in tables 6.25 and 6.26.

N. Brewer's Blackbird (*Euphagus cyanocephalus*)

Table 6.27. Generalized linear mixed model, assuming a normal distribution with an identity link, $y = (y+0.0)$, testing the influence of post-management treatments on breeding densities (pairs per 100 hectares) of Brewer's blackbirds (*Euphagus cyanocephalus*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[*, evidence for moderate effect ($0.05<p\leq0.10$); **, evidence for strong effect ($p\leq0.05$)]

Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × treatment	18	150.4	1.67	0.0502*
Contrasts:	Mixed: burned linear	1	154.6	4.35	0.0386**
	Mixed: burned quadratic	1	87.6	0.74	0.3926
	Mixed: BG0 vs BG1-3	1	138.4	0.00	0.9691
	Mixed: grazed linear	1	165.7	0.49	0.4832
	Mixed: grazed quadratic	1	156.4	0.11	0.7367
	Tall: burned linear	1	116.9	11.10	0.0012**
	Tall: grazed linear	1	158.7	0.04	0.8334
	Tall: grazed quadratic	1	136.7	0.05	0.8253
	B1: mixed versus tall	1	168.1	0.89	0.3456
	B2: mixed versus tall	1	168.7	1.36	0.2454
	G0: mixed versus tall	1	167.2	0.15	0.7006
	G: mixed versus tall	1	168.1	0.53	0.4685
	G1: mixed versus tall	1	169.0	0.84	0.3620
	G2: mixed versus tall	1	168.2	0.04	0.8506
	Mixed: burned versus rest	1	155.0	0.00	0.9695
	Mixed: grazed versus rest	1	156.5	0.34	0.5617
	Mixed: burned-grazed versus rest	1	157.5	0.17	0.6831
	Mixed: burned versus grazed	1	137.8	2.32	0.1302
	Tall: burned versus rest	1	160.4	1.23	0.2699
	Tall: grazed versus rest	1	167.7	0.01	0.9325
	Tall: burned versus grazed	1	133.5	3.28	0.0722*

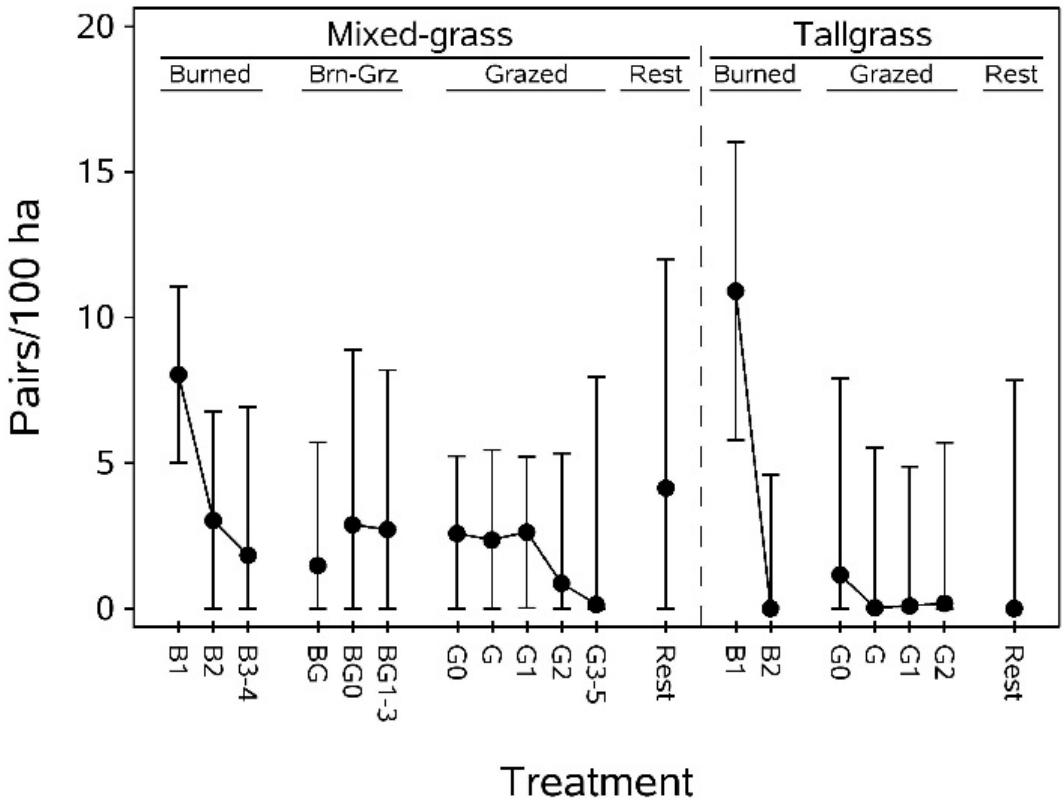
[1]Sources of variation for the model: Y=Unit(Grass type) + Grass type × Treatment + Residual, where Unit(Grass type) and Residual are random effects and Grass type × Treatment is a fixed effect in a mixed-model framework. Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 6.28. Least squares mean (standard error) densities (pairs per 100 hectares) of Brewer's blackbird (*Euphagus cyanocephalus*), by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

				95-percent confidence intervals	
Grass	Treatment[1]	LSMean[2]	SE	LCL	UCL
Mixed	B1	8.04	1.54	5.01	11.06
	B2	3.03	1.90	0.00	6.77
	B3-4	1.83	2.60	0.00	6.93
	BG	1.48	2.16	0.00	5.71
	BG0	2.88	3.07	0.00	8.89
	BG1-3	2.72	2.79	0.00	8.19
	G0	2.58	1.35	0.00	5.23
	G	2.36	1.57	0.00	5.44
	G1	2.63	1.32	0.03	5.22
	G2	0.87	2.28	0.00	5.34
	G3-5	0.14	3.98	0.00	7.95
	Rest	4.14	4.02	0.00	12.01
Tall	B1	10.91	2.62	5.78	16.03
	B2	0.00	2.83	0.00	4.60
	G0	1.16	3.44	0.00	7.90
	G	0.03	2.81	0.00	5.53
	G1	0.09	2.44	0.00	4.87
	G2	0.18	2.82	0.00	5.70
	Rest	0.00	4.00	0.00	7.84

[1]Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Densities were not transformed.



[Brn-Grz, burned-grazed]

Figure 6.14. Least squares mean densities (pairs per 100 hectares) of Brewer's blackbirds (*Euphagus cyanocephalus*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits. Treatments are defined in tables 6.27 and 6.28.

O. Common Grackle (*Quiscalus quiscula*)

Table 6.29. Generalized linear mixed model, assuming a normal distribution with an identity link, $y = (y+0.0)$, testing the influence of post-management treatments on breeding densities (pairs per 100 hectares) of common grackles (*Quiscalus quiscula*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × treatment	18	157.6	0.64	0.8633
Contrasts:	Mixed: burned linear	1	165.0	0.74	0.3894
	Mixed: burned quadratic	1	106.2	0.00	0.9445
	Mixed: BG0 vs BG1-3	1	156.7	0.00	0.9567
	Mixed: grazed linear	1	163.8	1.19	0.2779
	Mixed: grazed quadratic	1	161.9	0.31	0.5800
	Tall: burned linear	1	125.4	2.85	0.0938
	Tall: grazed linear	1	164.9	0.01	0.9305
	Tall: grazed quadratic	1	148.8	0.23	0.6321
	B1: mixed versus tall	1	168.9	2.54	0.1131
	B2: mixed versus tall	1	169.0	0.58	0.4469
	G0: mixed versus tall	1	168.7	0.87	0.3528
	G: mixed versus tall	1	168.8	0.84	0.3605
	G1: mixed versus tall	1	169.0	0.02	0.9027
	G2: mixed versus tall	1	168.9	0.60	0.4388
	Mixed: burned versus rest	1	165.4	0.05	0.8261
	Mixed: grazed versus rest	1	166.4	0.18	0.6760
	Mixed: burned-grazed versus rest	1	165.7	0.31	0.5766
	Mixed: burned versus grazed	1	133.1	0.24	0.6227
	Tall: burned versus rest	1	165.2	0.09	0.7701
	Tall: grazed versus rest	1	168.7	0.04	0.8473
	Tall: burned versus grazed	1	138.6	0.04	0.8448

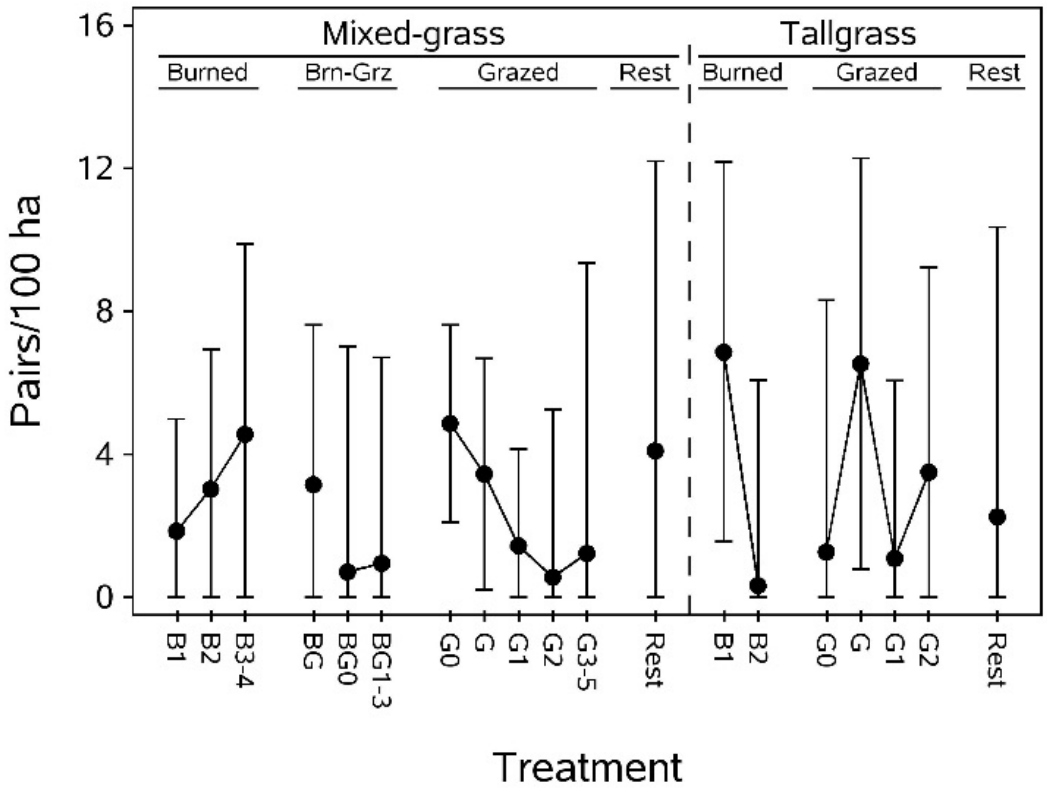
[1]Sources of variation for the model: Y=Unit(Grass type) + Grass type × Treatment + Residual, where Unit(Grass type) and Residual are random effects and Grass type × Treatment is a fixed effect in a mixed-model framework. Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 6.30. Least squares mean (standard error) densities (pairs per 100 hectares) of common crackles (*Quiscalus quiscula*), by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

				95-percent confidence intervals	
Grass	Treatment[1]	LSMean[2]	SE	LCL	UCL
Mixed	B1	1.85	1.61	0.00	4.99
	B2	3.03	1.99	0.00	6.94
	B3-4	4.56	2.72	0.00	9.89
	BG	3.15	2.28	0.00	7.62
	BG0	0.71	3.22	0.00	7.02
	BG1-3	0.95	2.94	0.00	6.71
	G0	4.86	1.41	2.10	7.62
	G	3.45	1.65	0.21	6.68
	G1	1.44	1.38	0.00	4.15
	G2	0.56	2.40	0.00	5.26
	G3-5	1.23	4.15	0.00	9.35
	Rest	4.10	4.13	0.00	12.20
Tall	B1	6.86	2.71	1.55	12.18
	B2	0.33	2.93	0.00	6.07
	G0	1.27	3.59	0.00	8.31
	G	6.53	2.93	0.78	12.28
	G1	1.09	2.54	0.00	6.06
	G2	3.50	2.93	0.00	9.24
	Rest	2.25	4.14	0.00	10.36

[1]Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Densities were not transformed.



[Brn-Grz, burned-grazed]

Figure 6.15. Least squares mean densities (pairs per 100 hectares) of common grackles (*Quiscalus quiscula*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits. Treatments are defined in tables 6.29 and 6.30.

P. Yellow-headed Blackbird (*Xanthocephalus xanthocephalus*)

Table 6.31. Generalized linear mixed model, assuming a gamma distribution with a log link, $y = (y+1)$, testing the influence of post-management treatments on breeding densities (pairs per 100 hectares) of yellow-headed blackbirds (*Xanthocephalus xanthocephalus*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × treatment	18	161.1	1.42	0.1277
Contrasts:	Mixed: burned linear	1	168.3	6.08	0.0146
	Mixed: burned quadratic	1	123.7	2.10	0.1494
	Mixed: BG0 vs BG1-3	1	165.1	0.48	0.4894
	Mixed: grazed linear	1	163.7	0.01	0.9229
	Mixed: grazed quadratic	1	165.0	0.10	0.7483
	Tall: burned linear	1	133.2	1.76	0.1864
	Tall: grazed linear	1	167.5	2.52	0.1140
	Tall: grazed quadratic	1	156.6	1.02	0.3144
	B1: mixed versus tall	1	169.0	0.67	0.4140
	B2: mixed versus tall	1	169.0	4.69	0.0318
	G0: mixed versus tall	1	169.0	1.73	0.1896
	G: mixed versus tall	1	169.0	0.03	0.8665
	G1: mixed versus tall	1	169.0	3.25	0.0733
	G2: mixed versus tall	1	169.0	0.00	0.9457
	Mixed: burned versus rest	1	168.5	0.00	0.9555
	Mixed: grazed versus rest	1	168.9	0.05	0.8178
	Mixed: burned-grazed versus rest	1	168.4	0.24	0.6270
	Mixed: burned versus grazed	1	135.4	0.55	0.4597
	Tall: burned versus rest	1	167.4	0.77	0.3822
	Tall: grazed versus rest	1	169.0	1.34	0.2491
	Tall: burned versus grazed	1	144.0	0.18	0.6692

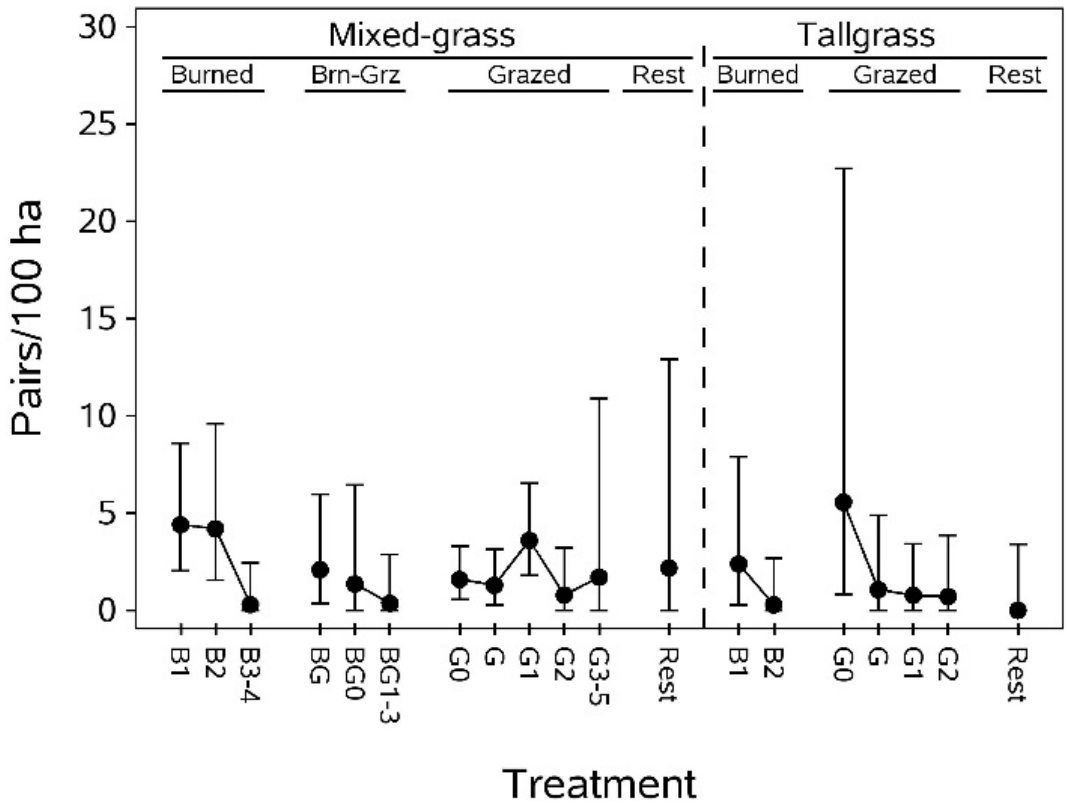
[1]Sources of variation for the model: Y=Unit(Grass type) + Grass type × Treatment + Residual, where Unit(Grass type) and Residual are random effects and Grass type × Treatment is a fixed effect in a mixed-model framework. Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 6.32. Least squares mean (standard error) densities (pairs per 100 hectares) and back-transformed least squares mean (95-percent confidence intervals) densities (pairs per 100 hectares) of yellow-headed blackbirds (*Xanthocephalus xanthocephalus*), by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

				Back-transformed		
					95-percent confidence intervals	
Grass	Treatment[1]	LSMean	SE	LSMean	LCL	UCL
Mixed	B1	1.69	0.29	4.40	2.04	8.59
	B2	1.65	0.36	4.20	1.55	9.61
	B3-4	0.27	0.50	0.30	0.00	2.44
	BG	1.13	0.42	2.08	0.36	5.96
	BG0	0.86	0.59	1.36	0.00	6.44
	BG1-3	0.30	0.54	0.36	0.00	2.88
	G0	0.95	0.26	1.59	0.57	3.29
	G	0.83	0.30	1.29	0.27	3.13
	G1	1.53	0.25	3.60	1.81	6.54
	G2	0.58	0.44	0.79	0.00	3.22
	G3-5	1.00	0.76	1.71	0.00	10.90
	Rest	1.16	0.75	2.18	0.00	12.89
Tall	B1	1.22	0.49	2.38	0.28	7.89
	B2	0.25	0.53	0.29	0.00	2.66
	G0	1.88	0.66	5.56	0.81	22.71
	G	0.73	0.54	1.07	0.00	4.89
	G1	0.58	0.46	0.78	0.00	3.41
	G2	0.53	0.53	0.71	0.00	3.86
	Rest	0.00	0.75	0.00	0.00	3.39

[1]Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).



[Brn-Grz, burned-grazed]

Figure 6.16. Back-transformed least squares mean densities (pairs per 100 hectares) of yellow-headed blackbirds (*Xanthocephalus xanthocephalus*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits. Treatments are defined in tables 6.31 and 6.32.

Q. Cliff Swallow (*Petrochelidon pyrrhonota*)

Table 6.33. Generalized linear mixed model, assuming a normal distribution with an identity link, $y = (y+0.0)$, testing the influence of post-management treatments on breeding densities (pairs per 100 hectares) of cliff swallows (*Petrochelidon pyrrhonota*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[*, evidence for moderate effect ($0.05<p\leq0.10$); **, evidence for strong effect ($p\leq0.05$)]

Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × treatment	18	142.1	1.63	0.0590**
Contrasts:	Mixed: burned linear	1	138.1	0.00	0.9900
	Mixed: burned quadratic	1	81.0	0.00	0.9554
	Mixed: BG0 vs BG1-3	1	119.2	1.11	0.2938
	Mixed: grazed linear	1	168.9	0.49	0.4859
	Mixed: grazed quadratic	1	150.8	0.08	0.7719
	Tall: burned linear	1	114.5	0.01	0.9210
	Tall: grazed linear	1	150.3	0.13	0.7179
	Tall: grazed quadratic	1	127.2	4.19	0.0426**
	B1: mixed versus tall	1	166.0	0.20	0.6523
	B2: mixed versus tall	1	167.6	0.29	0.5911
	G0: mixed versus tall	1	164.5	0.37	0.5439
	G: mixed versus tall	1	168.0	3.54	0.0615*
	G1: mixed versus tall	1	168.4	18.94	<0.0001**
	G2: mixed versus tall	1	167.8	1.62	0.2050
	Mixed: burned versus rest	1	138.9	0.00	0.9702
	Mixed: grazed versus rest	1	139.1	0.04	0.8456
	Mixed: burned-grazed versus rest	1	144.5	0.00	0.9682
	Mixed: burned versus grazed	1	156.8	0.15	0.7011
	Tall: burned versus rest	1	155.8	0.10	0.7488
	Tall: grazed versus rest	1	166.9	2.64	0.1059
	Tall: burned versus grazed	1	136.0	4.25	0.0412**

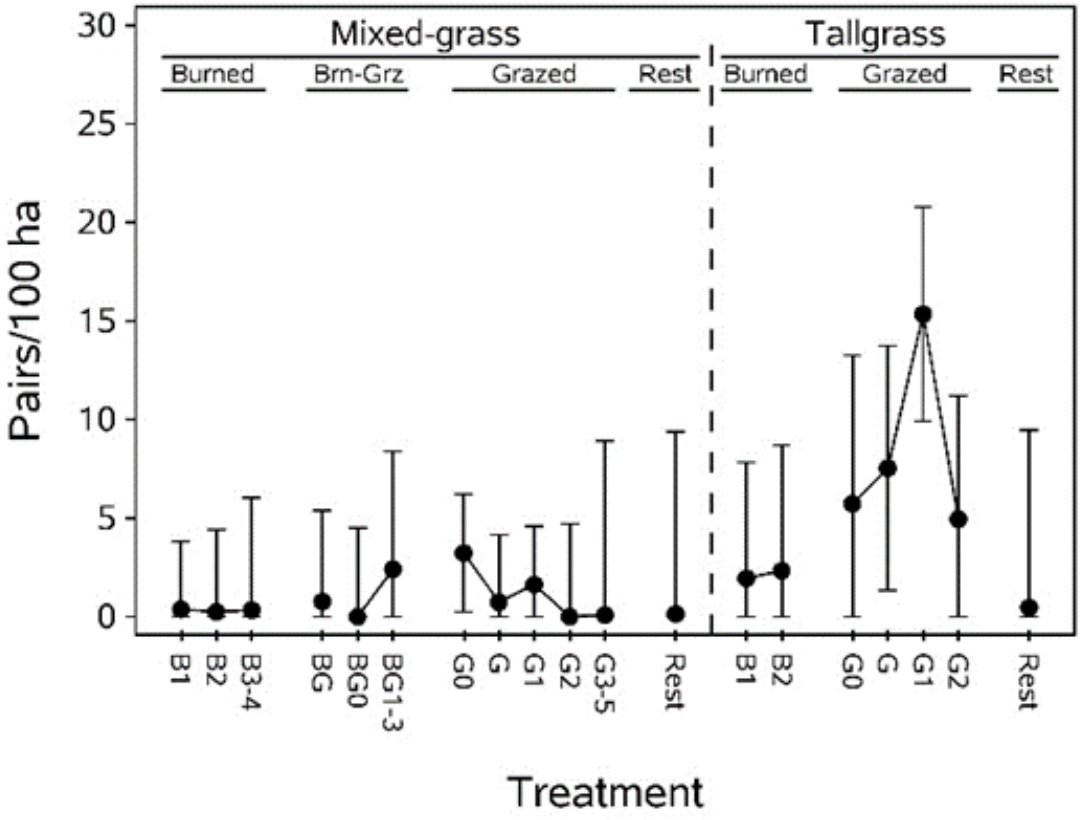
[1]Sources of variation for the model: Y=Unit(Grass type) + Grass type × Treatment + Residual, where Unit(Grass type) and Residual are random effects and Grass type × Treatment is a fixed effect in a mixed-model framework. Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 6.34. Least squares mean (standard error) densities (pairs per 100 hectares) of cliff swallows (*Petrochelidon pyrrhonota*), by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

				95-percent confidence intervals	
Grass	Treatment[1]	LSMean[2]	SE	LCL	UCL
Mixed	B1	0.38	1.75	0.00	3.82
	B2	0.24	2.12	0.00	4.40
	B3-4	0.34	2.91	0.00	6.04
	BG	0.77	2.35	0.00	5.38
	BG0	0.00	3.39	0.00	4.49
	BG1-3	2.41	3.05	0.00	8.39
	G0	3.23	1.52	0.25	6.21
	G	0.74	1.74	0.00	4.16
	G1	1.63	1.50	0.00	4.57
	G2	0.00	2.52	0.00	4.71
	G3-5	0.09	4.50	0.00	8.92
	Rest	0.14	4.71	0.00	9.36
Tall	B1	1.95	3.00	0.00	7.83
	B2	2.33	3.25	0.00	8.70
	G0	5.73	3.83	0.00	13.25
	G	7.54	3.16	1.34	13.74
	G1	15.35	2.77	9.91	20.79
	G2	4.94	3.19	0.00	11.20
	Rest	0.46	4.60	0.00	9.48

[1]Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Densities were not transformed.



[Brn-Grz, burned-grazed]

Figure 6.17. Least squares mean densities (pairs per 100 hectares) of cliff swallows (*Petrochelidon pyrrhonota*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits. Treatments are defined in tables 6.33 and 6.34.

R. Song Sparrow (*Melospiza melodia*)

Table 6.35. Generalized linear mixed model, assuming a normal distribution with a log link, $y = (y+1)$, testing the influence of post-management treatments on breeding densities (pairs per 100 hectares) of song sparrows (*Melospiza melodia*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[*, evidence for moderate effect ($0.05<p\leq0.10$); **, evidence for strong effect ($p\leq0.05$)]

Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × treatment	18	143.0	1.53	0.0884*
Contrasts:	Mixed: burned linear	1	136.7	0.32	0.5748
	Mixed: burned quadratic	1	95.0	0.07	0.7950
	Mixed: BG0 vs BG1-3	1	120.5	0.45	0.5058
	Mixed: grazed linear	1	168.3	0.42	0.5183
	Mixed: grazed quadratic	1	154.4	0.00	0.9562
	Tall: burned linear	1	121.5	0.14	0.7123
	Tall: grazed linear	1	149.5	0.18	0.6762
	Tall: grazed quadratic	1	127.0	0.00	0.9633
	B1: mixed versus tall	1	163.7	0.20	0.6591
	B2: mixed versus tall	1	166.6	0.00	0.9806
	G0: mixed versus tall	1	165.2	0.13	0.7158
	G: mixed versus tall	1	168.8	0.01	0.9399
	G1: mixed versus tall	1	167.4	1.64	0.2018
	G2: mixed versus tall	1	166.0	0.20	0.6541
	Mixed: burned versus rest	1	145.9	12.44	0.0006**
	Mixed: grazed versus rest	1	150.0	13.01	0.0004**
	Mixed: burned-grazed versus rest	1	168.7	6.97	0.0091**
	Mixed: burned versus grazed	1	168.5	0.57	0.4504
	Tall: burned versus rest	1	158.4	0.00	0.9793
	Tall: grazed versus rest	1	168.5	0.01	0.9028
	Tall: burned versus grazed	1	143.4	0.02	0.8843

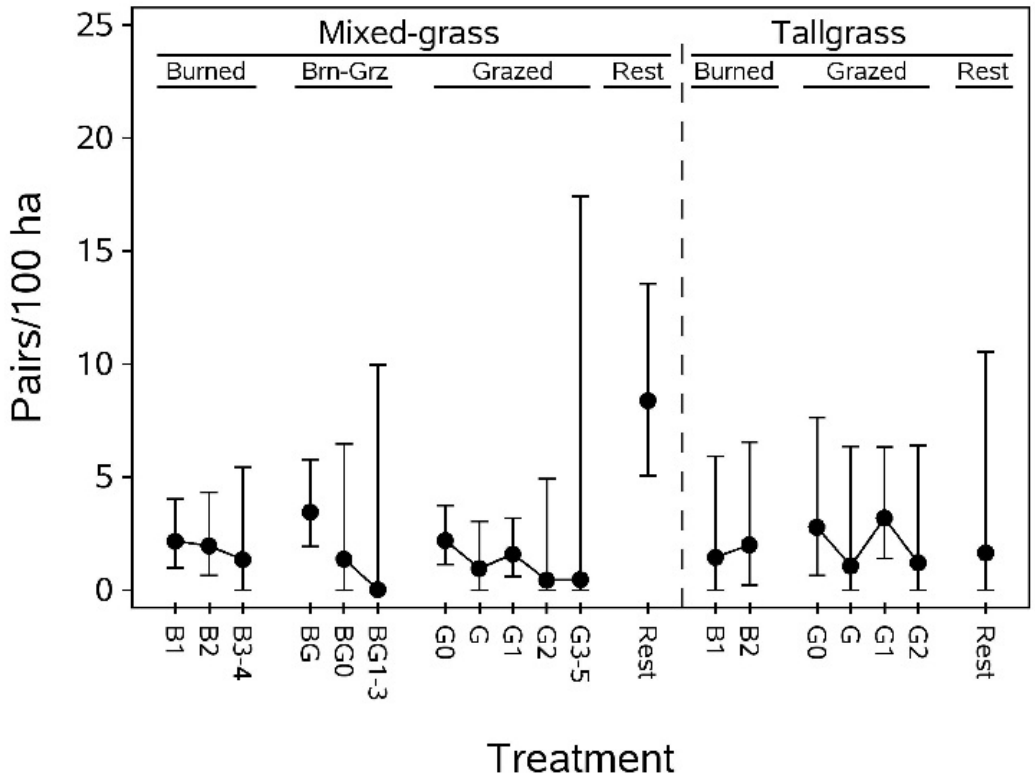
[1]Sources of variation for the model: Y=Unit(Grass type) + Grass type × Treatment + Residual, where Unit(Grass type) and Residual are random effects and Grass type × Treatment is a fixed effect in a mixed-model framework. Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 6.36. Least squares mean (standard error) densities (pairs per 100 hectares) and back-transformed least squares mean (95-percent confidence intervals) densities (pairs per 100 hectares) of song sparrows (*Melospiza melodia*), by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

				Back-transformed		
					95-percent confidence intervals	
Grass	Treatment[1]	LSMean	SE	LSMean	LCL	UCL
Mixed	B1	1.15	0.24	2.16	0.99	4.02
	B2	1.09	0.30	1.96	0.65	4.32
	B3-4	0.86	0.51	1.35	0.00	5.43
	BG	1.49	0.21	3.45	1.93	5.78
	BG0	0.86	0.59	1.37	0.00	6.48
	BG1-3	0.02	1.21	0.02	0.00	9.96
	G0	1.16	0.20	2.19	1.14	3.74
	G	0.67	0.37	0.96	0.00	3.05
	G1	0.95	0.25	1.59	0.60	3.19
	G2	0.37	0.72	0.44	0.00	4.91
	G3-5	0.38	1.29	0.47	0.00	17.43
	Rest	2.24	0.22	8.38	5.05	13.56
Tall	B1	0.89	0.53	1.45	0.00	5.92
	B2	1.10	0.47	2.00	0.20	6.54
	G0	1.33	0.42	2.78	0.65	7.63
	G	0.73	0.65	1.07	0.00	6.35
	G1	1.43	0.28	3.19	1.40	6.31
	G2	0.79	0.62	1.21	0.00	6.40
	Rest	0.98	0.75	1.65	0.00	10.54

[1]Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).



[Brn-Grz, burned-grazed]

Figure 6.18. Back-transformed least squares mean densities (pairs per 100 hectares) of song sparrows (*Melospiza melodia*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits. Treatments are defined in tables 6.35 and 6.36.

S. American Goldfinch (*Spinus tristis*)

Table 6.37. Generalized linear mixed model, assuming a gamma distribution with a log link, $y = (y+1)$, testing the influence of post-management treatments on breeding densities (pairs per 100 hectares) of American goldfinches (*Spinus tristis*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × treatment	18	134.8	1.20	0.2662
Contrasts:	Mixed: burned linear	1	122.6	0.39	0.5326
	Mixed: burned quadratic	1	83.8	2.39	0.1259
	Mixed: BG0 vs BG1-3	1	107.7	0.25	0.6201
	Mixed: grazed linear	1	165.0	0.10	0.7489
	Mixed: grazed quadratic	1	143.7	0.77	0.3813
	Tall: burned linear	1	113.4	1.66	0.2003
	Tall: grazed linear	1	142.4	0.01	0.9028
	Tall: grazed quadratic	1	122.0	0.75	0.3885
	B1: mixed versus tall	1	162.4	0.00	0.9547
	B2: mixed versus tall	1	165.1	2.91	0.0897
	G0: mixed versus tall	1	164.0	0.11	0.7462
	G: mixed versus tall	1	169.0	0.50	0.4807
	G1: mixed versus tall	1	165.5	0.95	0.3318
	G2: mixed versus tall	1	168.5	0.68	0.4120
	Mixed: burned versus rest	1	124.1	1.12	0.2927
	Mixed: grazed versus rest	1	122.4	2.86	0.0933
	Mixed: burned-grazed versus rest	1	130.0	2.10	0.1494
	Mixed: burned versus grazed	1	168.9	2.59	0.1095
	Tall: burned versus rest	1	156.6	0.49	0.4846
	Tall: grazed versus rest	1	168.5	2.60	0.1088
	Tall: burned versus grazed	1	145.4	1.66	0.2000

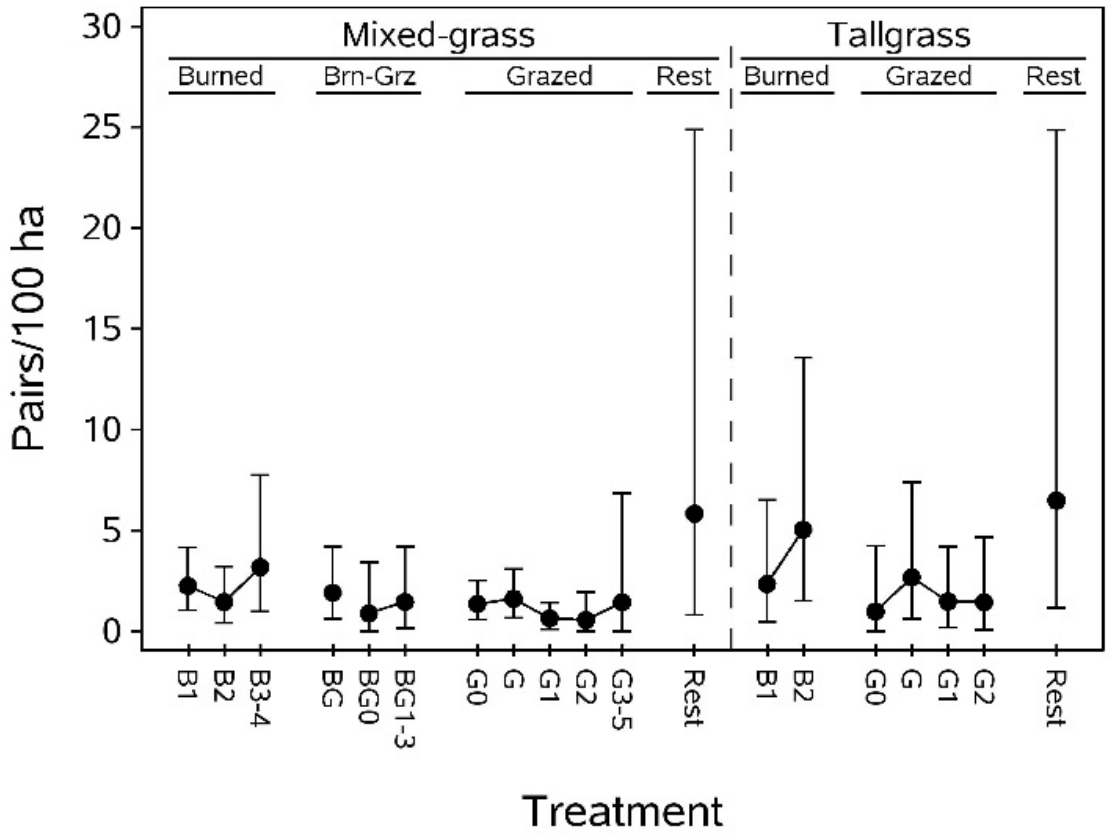
[1]Sources of variation for the model: Y=Unit(Grass type) + Grass type × Treatment + Residual, where Unit(Grass type) and Residual are random effects and Grass type × Treatment is a fixed effect in a mixed-model framework. Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 6.38. Least squares mean (standard error) densities (pairs per 100 hectares) and back-transformed least squares mean (95-percent confidence intervals) densities (pairs per 100 hectares) of American goldfinches (*Spinus tristis*), by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

				Back-transformed		
					95-percent confidence intervals	
Grass	Treatment[1]	LSMean	SE	LSMean	LCL	UCL
Mixed	B1	1.18	0.24	2.25	1.05	4.15
	B2	0.90	0.28	1.45	0.42	3.21
	B3-4	1.43	0.38	3.18	0.99	7.75
	BG	1.07	0.30	1.91	0.63	4.20
	BG0	0.64	0.43	0.89	0.00	3.42
	BG1-3	0.90	0.38	1.46	0.16	4.20
	G0	0.86	0.20	1.36	0.58	2.51
	G	0.96	0.23	1.61	0.67	3.08
	G1	0.49	0.20	0.64	0.10	1.43
	G2	0.45	0.32	0.56	0.00	1.95
	G3-5	0.89	0.60	1.44	0.00	6.85
	Rest	1.92	0.68	5.84	0.81	24.88
Tall	B1	1.20	0.41	2.34	0.48	6.50
	B2	1.80	0.45	5.04	1.50	13.58
	G0	0.68	0.50	0.98	0.00	4.25
	G	1.30	0.42	2.67	0.60	7.40
	G1	0.91	0.38	1.48	0.19	4.20
	G2	0.89	0.43	1.44	0.05	4.67
	Rest	2.01	0.63	6.48	1.17	24.86

[1]Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).



[Brn-Grz, burned-grazed]

Figure 6.19. Back-transformed least squares mean densities (pairs per 100 hectares) of American goldfinches (*Spinus tristis*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits. Treatments are defined in tables 6.37 and 6.38.

T. Upland Sandpiper (*Bartramia longicauda*)

Table 6.39. Generalized linear mixed model, assuming a gamma distribution with a log link, $y = (y+1)$, testing the influence of post-management treatments on breeding densities (pairs per 100 hectares) of upland sandpipers (*Bartramia longicauda*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[*, evidence for moderate effect ($0.05<p\leq0.10$); **, evidence for strong effect ($p\leq0.05$)]

Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × treatment	18	143.4	2.25	0.0043**
Contrasts:	Mixed: burned linear	1	138.1	9.64	0.0023**
	Mixed: burned quadratic	1	86.8	0.89	0.3491
	Mixed: BG0 vs BG1-3	1	120.9	6.69	0.0109**
	Mixed: grazed linear	1	169.0	0.06	0.8003
	Mixed: grazed quadratic	1	151.7	0.04	0.8510
	Tall: burned linear	1	119.3	1.23	0.2687
	Tall: grazed linear	1	150.8	0.01	0.9175
	Tall: grazed quadratic	1	130.0	0.37	0.5433
	B1: mixed versus tall	1	165.8	1.37	0.2429
	B2: mixed versus tall	1	167.5	0.09	0.7653
	G0: mixed versus tall	1	164.7	0.88	0.3501
	G: mixed versus tall	1	168.3	0.65	0.4195
	G1: mixed versus tall	1	168.1	0.20	0.6572
	G2: mixed versus tall	1	168.0	0.56	0.4568
	Mixed: burned versus rest	1	138.9	0.20	0.6581
	Mixed: grazed versus rest	1	138.8	1.32	0.2526
	Mixed: burned-grazed versus rest	1	144.4	5.02	0.0265
	Mixed: burned versus grazed	1	162.2	2.97	0.0867*
	Tall: burned versus rest	1	157.0	1.46	0.2291
	Tall: grazed versus rest	1	167.3	2.36	0.1267
	Tall: burned versus grazed	1	140.9	0.14	0.7107

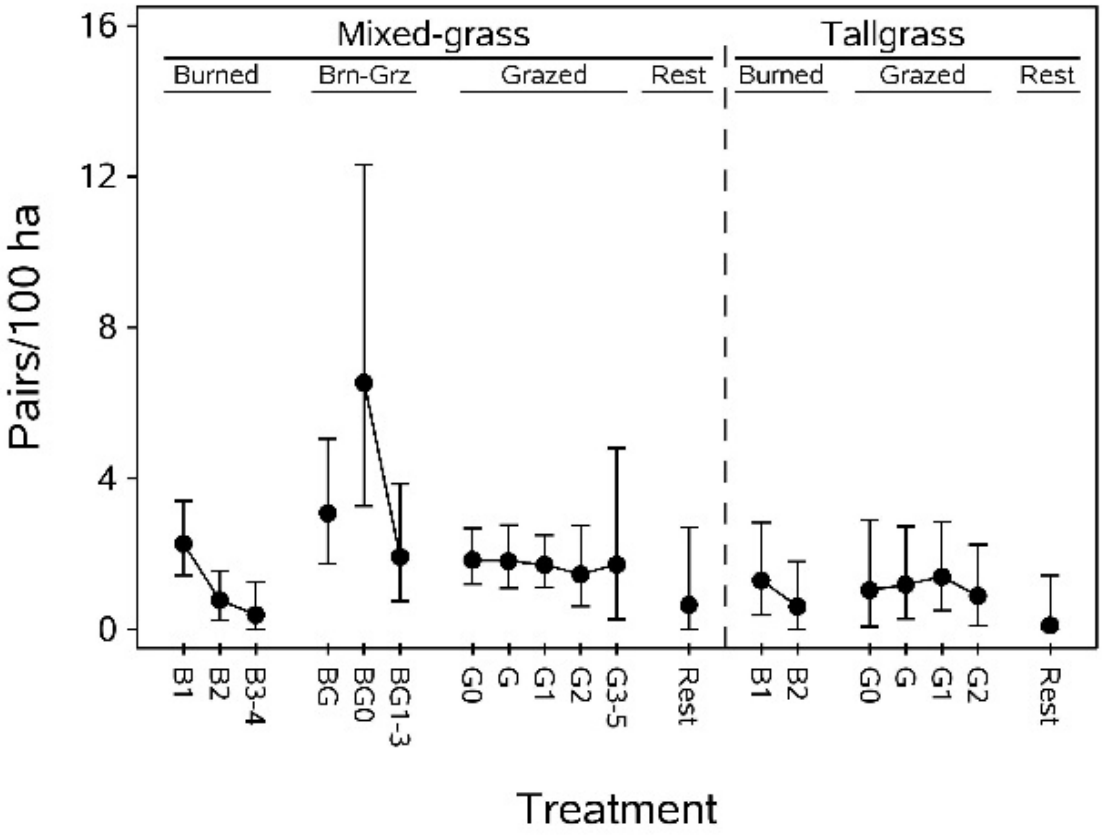
[1]Sources of variation for the model: Y=Unit(Grass type) + Grass type × Treatment + Residual, where Unit(Grass type) and Residual are random effects and Grass type × Treatment is a fixed effect in a mixed-model framework. Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 6.40. Least squares mean (standard error) densities (pairs per 100 hectares) and back-transformed least squares mean (95-percent confidence intervals) densities (pairs per 100 hectares) of upland sandpipers (*Bartramia longicauda*), by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

				Back-transformed		
					95-percent confidence intervals	
Grass	Treatment[1]	LSMean	SE	LSMean	LCL	UCL
Mixed	B1	1.18	0.15	2.27	1.43	3.40
	B2	0.58	0.18	0.78	0.24	1.54
	B3-4	0.33	0.25	0.39	0.00	1.26
	BG	1.41	0.20	3.08	1.75	5.05
	BG0	2.02	0.29	6.54	3.27	12.32
	BG1-3	1.07	0.26	1.92	0.75	3.85
	G0	1.05	0.13	1.84	1.20	2.68
	G	1.03	0.15	1.81	1.10	2.77
	G1	1.00	0.13	1.71	1.11	2.50
	G2	0.90	0.22	1.46	0.61	2.75
	G3-5	1.00	0.39	1.72	0.27	4.81
	Rest	0.50	0.41	0.65	0.00	2.71
Tall	B1	0.83	0.26	1.30	0.38	2.83
	B2	0.48	0.28	0.61	0.00	1.80
	G0	0.71	0.33	1.04	0.07	2.89
	G	0.78	0.27	1.19	0.28	2.73
	G1	0.88	0.24	1.40	0.50	2.85
	G2	0.64	0.28	0.89	0.10	2.25
	Rest	0.10	0.40	0.11	0.00	1.43

[1]Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).



[Brn-Grz, burned-grazed]

Figure 6.20. Back-transformed least squares mean densities (pairs per 100 hectares) of upland sandpipers (*Bartramia longicauda*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits. Treatments are defined in tables 6.39 and 6.40.

U. Killdeer (*Charadrius vociferus*)

Table 6.41. Generalized linear mixed model, assuming a normal distribution with a log link, $y = (y+1)$, testing the influence of post-management treatments on breeding densities (pairs per 100 hectares) of killdeer (*Charadrius vociferus*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × treatment	18	158.0	0.76	0.7469
Contrasts:	Mixed: burned linear	1	168.4	1.02	0.3143
	Mixed: burned quadratic	1	117.2	0.15	0.7001
	Mixed: BG0 vs BG1-3	1	161.1	0.06	0.8034
	Mixed: grazed linear	1	165.8	0.21	0.6500
	Mixed: grazed quadratic	1	165.4	0.30	0.5829
	Tall: burned linear	1	152.8	1.78	0.1847
	Tall: grazed linear	1	169.0	1.17	0.2811
	Tall: grazed quadratic	1	151.9	0.89	0.3464
	B1: mixed versus tall	1	169.0	1.35	0.2470
	B2: mixed versus tall	1	169.0	0.00	0.9672
	G0: mixed versus tall	1	169.0	1.56	0.2130
	G: mixed versus tall	1	169.0	0.63	0.4267
	G1: mixed versus tall	1	169.0	0.79	0.3746
	G2: mixed versus tall	1	169.0	0.32	0.5706
	Mixed: burned versus rest	1	168.2	0.07	0.7884
	Mixed: grazed versus rest	1	168.6	0.16	0.6858
	Mixed: burned-grazed versus rest	1	168.6	0.45	0.5054
	Mixed: burned versus grazed	1	139.4	0.18	0.6745
	Tall: burned versus rest	1	168.7	0.27	0.6032
	Tall: grazed versus rest	1	169.0	0.30	0.5834
	Tall: burned versus grazed	1	151.2	0.00	0.9544

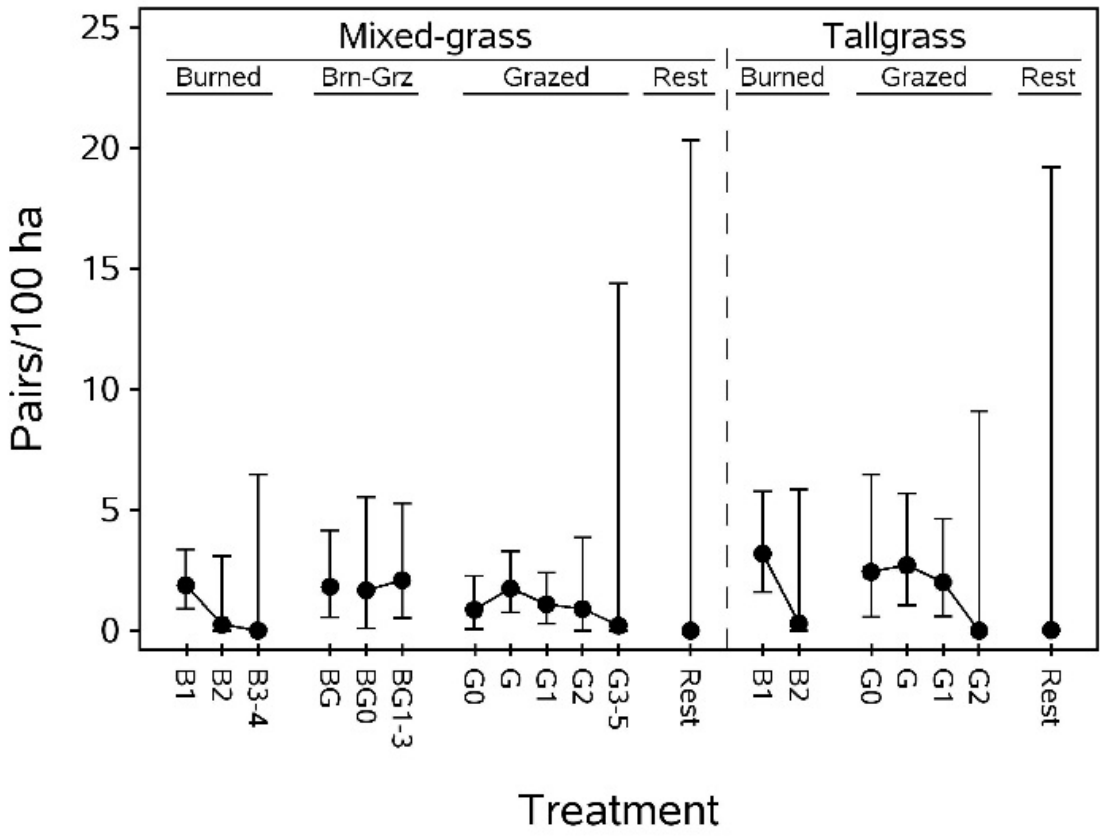
[1]Sources of variation for the model: Y=Unit(Grass type) + Grass type × Treatment + Residual, where Unit(Grass type) and Residual are random effects and Grass type × Treatment is a fixed effect in a mixed-model framework. Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 6.42. Least squares mean (standard error) densities (pairs per 100 hectares) and back-transformed least squares mean (95-percent confidence intervals) densities (pairs per 100 hectares) of killdeer (*Charadrius vociferus*), by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

				Back-transformed		
					95-percent confidence intervals	
Grass	Treatment[1]	LSMean	SE	LSMean	LCL	UCL
Mixed	B1	1.06	0.21	1.89	0.91	3.37
	B2	0.23	0.60	0.26	0.00	3.09
	B3-4	0.01	1.02	0.01	0.00	6.48
	BG	1.04	0.31	1.83	0.56	4.16
	BG0	0.99	0.46	1.68	0.10	5.55
	BG1-3	1.13	0.36	2.10	0.53	5.28
	G0	0.62	0.29	0.87	0.07	2.27
	G	1.02	0.23	1.76	0.77	3.31
	G1	0.74	0.25	1.10	0.29	2.42
	G2	0.65	0.48	0.91	0.00	3.86
	G3-5	0.19	1.30	0.21	0.00	14.40
	Rest	0.00	1.56	0.00	0.00	20.33
Tall	B1	1.44	0.24	3.20	1.60	5.78
	B2	0.27	0.84	0.31	0.00	5.86
	G0	1.24	0.40	2.44	0.58	6.48
	G	1.31	0.30	2.72	1.07	5.69
	G1	1.10	0.32	2.01	0.61	4.63
	G2	0.00	1.23	0.00	0.00	9.11
	Rest	0.03	1.52	0.03	0.00	19.21

[1]Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).



[Brn-Grz, burned-grazed]

Figure 6.21. Back-transformed least squares mean densities (pairs per 100 hectares) of killdeer (*Charadrius vociferus*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits. Treatments are defined in tables 6.41 and 6.42.

V. Tree Swallow (*Tachycineta bicolor*)

Table 6.43. Generalized linear mixed model, assuming a gamma distribution with a log link, $y = (y+1)$, testing the influence of post-management treatments on breeding densities (pairs per 100 hectares) of tree swallows (*Tachycineta bicolor*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × treatment	18	157.0	1.21	0.2573
Contrasts:	Mixed: burned linear	1	167.2	0.33	0.5693
	Mixed: burned quadratic	1	102.9	0.94	0.3342
	Mixed: BG0 vs BG1-3	1	160.6	0.00	0.9545
	Mixed: grazed linear	1	160.9	0.26	0.6083
	Mixed: grazed quadratic	1	161.9	0.05	0.8180
	Tall: burned linear	1	117.2	4.03	0.0470
	Tall: grazed linear	1	165.9	0.39	0.5326
	Tall: grazed quadratic	1	148.2	3.06	0.0823
	B1: mixed versus tall	1	169.0	5.80	0.0171
	B2: mixed versus tall	1	169.0	0.11	0.7373
	G0: mixed versus tall	1	169.0	0.00	0.9855
	G: mixed versus tall	1	169.0	2.98	0.0862
	G1: mixed versus tall	1	169.0	4.27	0.0403
	G2: mixed versus tall	1	169.0	0.51	0.4781
	Mixed: burned versus rest	1	167.6	0.43	0.5144
	Mixed: grazed versus rest	1	168.3	0.30	0.5876
	Mixed: burned-grazed versus rest	1	167.4	0.09	0.7697
	Mixed: burned versus grazed	1	121.3	0.09	0.7657
	Tall: burned versus rest	1	165.9	0.21	0.6483
	Tall: grazed versus rest	1	168.9	0.09	0.7697
	Tall: burned versus grazed	1	131.6	0.10	0.7486

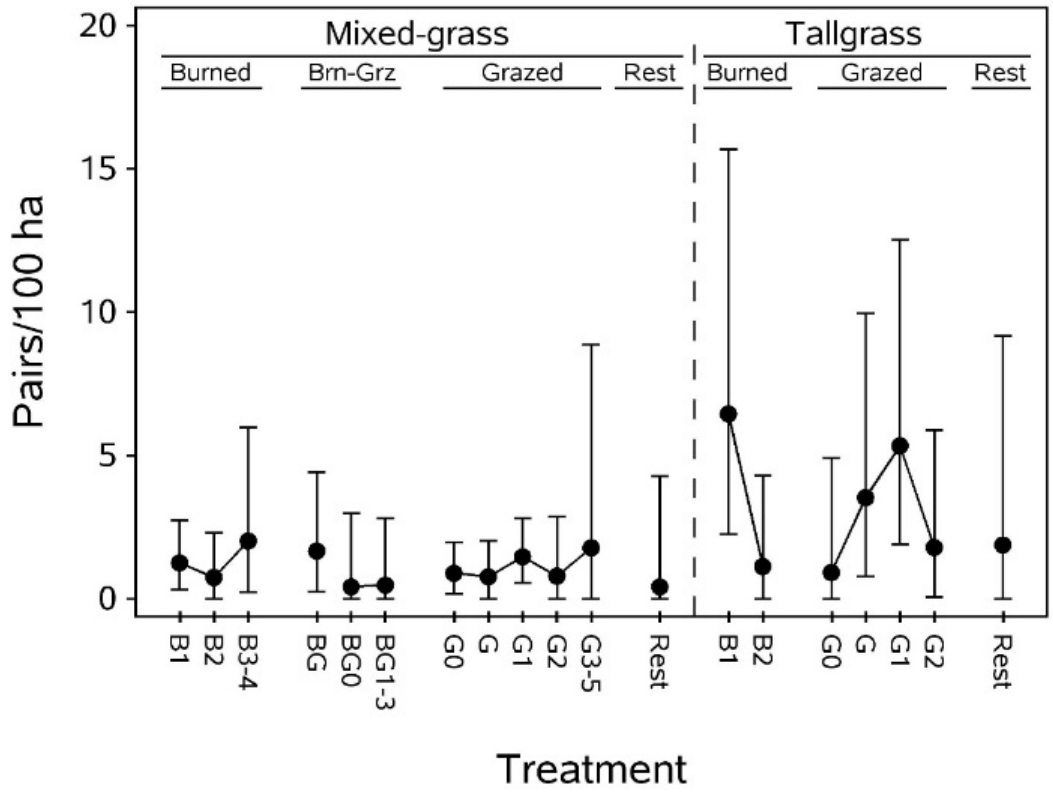
[1]Sources of variation for the model: Y=Unit(Grass type) + Grass type × Treatment + Residual, where Unit(Grass type) and Residual are random effects and Grass type × Treatment is a fixed effect in a mixed-model framework. Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 6.44. Least squares mean (standard error) densities (pairs per 100 hectares) and back-transformed least squares mean (95-percent confidence intervals) densities (pairs per 100 hectares) of tree swallows (*Tachycineta bicolor*), by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

				Back-transformed		
					95-percent confidence intervals	
Grass	Treatment[1]	LSMean	SE	LSMean	LCL	UCL
Mixed	B1	0.69	0.24	1.00	0.25	2.19
	B2	0.46	0.30	0.59	0.00	1.84
	B3-4	0.96	0.40	1.61	0.18	4.77
	BG	0.84	0.34	1.33	0.20	3.53
	BG0	0.28	0.48	0.33	0.00	2.39
	BG1-3	0.32	0.44	0.38	0.00	2.25
	G0	0.54	0.21	0.71	0.14	1.58
	G	0.48	0.25	0.61	0.00	1.61
	G1	0.78	0.21	1.17	0.45	2.25
	G2	0.49	0.36	0.63	0.00	2.28
	G3-5	0.88	0.62	1.42	0.00	7.09
	Rest	0.29	0.61	0.33	0.00	3.42
Tall	B1	1.82	0.40	5.16	1.80	12.54
	B2	0.64	0.43	0.90	0.00	3.44
	G0	0.55	0.53	0.73	0.00	3.93
	G	1.34	0.44	2.82	0.62	7.97
	G1	1.66	0.38	4.27	1.52	10.02
	G2	0.89	0.44	1.43	0.04	4.70
	Rest	0.92	0.61	1.50	0.00	7.33

[1]Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).



[Brn-Grz, burned-grazed]

Figure 6.22. Back-transformed least squares mean densities (pairs per 100 hectares) of tree swallows (*Tachycineta bicolor*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits. Treatments are defined in tables 6.43 and 6.44.

W. Barn Swallow (*Hirundo rustica*)

Table 6.45. Generalized linear mixed model, assuming a gamma distribution with a log link, $y = (y+1)$, testing the influence of post-management treatments on breeding densities (pairs per 100 hectares) of barn swallows (*Hirundo rustica*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × treatment	18	151.5	1.41	0.1358
Contrasts:	Mixed: burned linear	1	155.5	0.41	0.5249
	Mixed: burned quadratic	1	91.1	0.00	0.9985
	Mixed: BG0 vs BG1-3	1	140.2	2.00	0.1600
	Mixed: grazed linear	1	166.0	1.08	0.3006
	Mixed: grazed quadratic	1	157.3	0.15	0.6983
	Tall: burned linear	1	119.9	5.79	0.0176
	Tall: grazed linear	1	159.4	6.06	0.0149
	Tall: grazed quadratic	1	138.7	1.73	0.1909
	B1: mixed versus tall	1	168.2	5.46	0.0207
	B2: mixed versus tall	1	168.7	0.49	0.4829
	G0: mixed versus tall	1	167.3	7.02	0.0088
	G: mixed versus tall	1	168.2	1.22	0.2717
	G1: mixed versus tall	1	169.0	0.89	0.3455
	G2: mixed versus tall	1	168.3	0.02	0.8906
	Mixed: burned versus rest	1	155.9	1.60	0.2078
	Mixed: grazed versus rest	1	157.3	1.69	0.1955
	Mixed: burned-grazed versus rest	1	158.2	1.74	0.1886
	Mixed: burned versus grazed	1	140.1	0.00	0.9633
	Tall: burned versus rest	1	161.0	0.08	0.7824
	Tall: grazed versus rest	1	167.8	0.01	0.9156
	Tall: burned versus grazed	1	135.8	0.10	0.7564

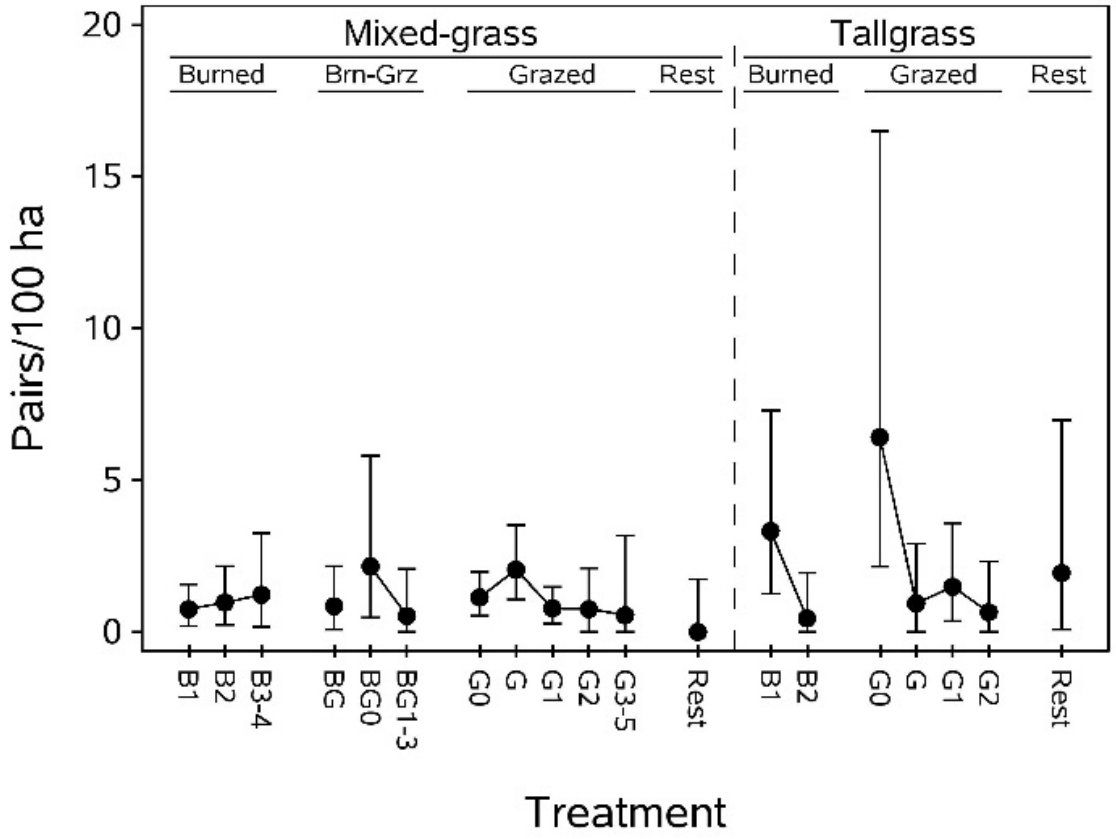
[1]Sources of variation for the model: Y=Unit(Grass type) + Grass type × Treatment + Residual, where Unit(Grass type) and Residual are random effects and Grass type × Treatment is a fixed effect in a mixed-model framework. Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 6.46. Least squares mean (standard error) densities (pairs per 100 hectares) and back-transformed least squares mean (95-percent confidence intervals) densities (pairs per 100 hectares) of barn swallows (*Hirundo rustica*), by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

				Back-transformed		
					95-percent confidence intervals	
Grass	Treatment[1]	LSMean	SE	LSMean	LCL	UCL
Mixed	B1	0.56	0.20	0.75	0.19	1.57
	B2	0.68	0.24	0.97	0.23	2.17
	B3-4	0.80	0.33	1.23	0.16	3.26
	BG	0.62	0.27	0.85	0.08	2.17
	BG0	1.15	0.39	2.16	0.47	5.80
	BG1-3	0.43	0.35	0.53	0.00	2.07
	G0	0.76	0.17	1.14	0.53	1.99
	G	1.11	0.20	2.05	1.06	3.51
	G1	0.58	0.17	0.78	0.28	1.48
	G2	0.56	0.29	0.75	0.00	2.10
	G3-5	0.44	0.51	0.55	0.00	3.18
	Rest	0.00	0.51	0.00	0.00	1.73
Tall	B1	1.46	0.33	3.32	1.25	7.29
	B2	0.37	0.36	0.45	0.00	1.95
	G0	2.00	0.44	6.42	2.15	16.49
	G	0.66	0.36	0.94	0.00	2.91
	G1	0.91	0.31	1.49	0.36	3.58
	G2	0.50	0.36	0.65	0.00	2.32
	Rest	1.08	0.51	1.94	0.08	6.97

[1]Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).



[Brn-Grz, burned-grazed]

Figure 6.23. Back-transformed least squares mean densities (pairs per 100 hectares) of barn swallows (*Hirundo rustica*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits. Treatments are defined in tables 6.45 and 6.46.

X. Mourning Dove (*Zenaida macroura*)

Table 6.47. Generalized linear mixed model, assuming a gamma distribution with a log link, $y = (y+1)$, testing the influence of post-management treatments on breeding densities (pairs per 100 hectares) of mourning doves (*Zenaida macroura*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × treatment	18	143.8	1.35	0.1638
Contrasts:	Mixed: burned linear	1	142.5	0.04	0.8490
	Mixed: burned quadratic	1	79.7	0.30	0.5838
	Mixed: BG0 vs BG1-3	1	123.0	2.39	0.1244
	Mixed: grazed linear	1	168.1	0.73	0.3944
	Mixed: grazed quadratic	1	151.8	0.14	0.7098
	Tall: burned linear	1	112.9	0.06	0.7998
	Tall: grazed linear	1	152.3	4.52	0.0352
	Tall: grazed quadratic	1	128.2	0.06	0.7992
	B1: mixed versus tall	1	166.7	0.07	0.7934
	B2: mixed versus tall	1	168.1	0.19	0.6643
	G0: mixed versus tall	1	165.2	0.34	0.5588
	G: mixed versus tall	1	167.8	1.81	0.1804
	G1: mixed versus tall	1	168.7	2.25	0.1355
	G2: mixed versus tall	1	167.8	0.02	0.8947
	Mixed: burned versus rest	1	143.1	0.08	0.7715
	Mixed: grazed versus rest	1	144.0	0.01	0.9402
	Mixed: burned-grazed versus rest	1	148.1	0.00	0.9993
	Mixed: burned versus grazed	1	148.9	0.29	0.5928
	Tall: burned versus rest	1	156.4	1.66	0.2002
	Tall: grazed versus rest	1	166.9	2.86	0.0927
	Tall: burned versus grazed	1	132.9	0.27	0.6043

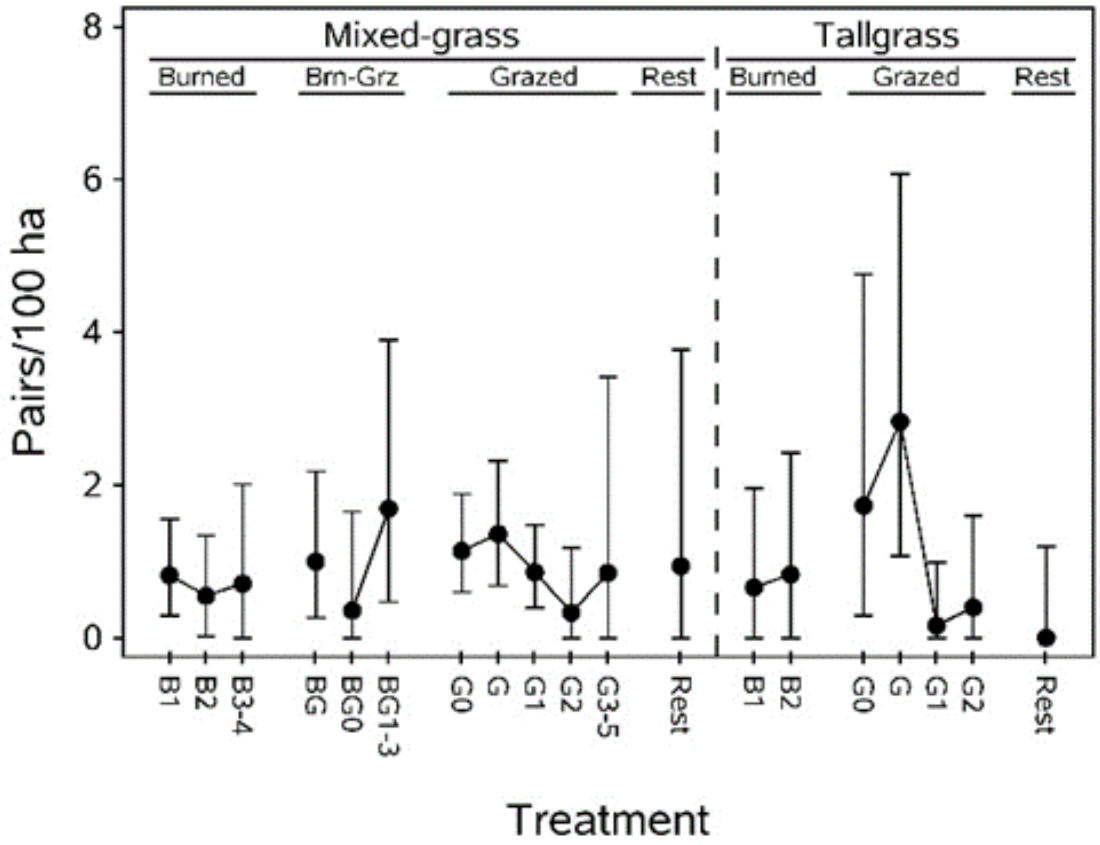
[1]Sources of variation for the model: Y=Unit(Grass type) + Grass type × Treatment + Residual, where Unit(Grass type) and Residual are random effects and Grass type × Treatment is a fixed effect in a mixed-model framework. Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 6.48. Least squares mean (standard error) densities (pairs per 100 hectares) and back-transformed least squares mean (95-percent confidence intervals) densities (pairs per 100 hectares) of mourning doves (*Zenaida macroura*), by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

				Back-transformed		
					95-percent confidence intervals	
Grass	Treatment[1]	LSMean	SE	LSMean	LCL	UCL
Mixed	B1	0.60	0.17	0.82	0.29	1.55
	B2	0.44	0.21	0.55	0.02	1.34
	B3-4	0.53	0.29	0.71	0.00	2.01
	BG	0.69	0.24	1.00	0.26	2.18
	BG0	0.31	0.34	0.36	0.00	1.65
	BG1-3	0.99	0.31	1.69	0.47	3.90
	G0	0.76	0.15	1.14	0.60	1.88
	G	0.86	0.17	1.36	0.68	2.32
	G1	0.62	0.15	0.86	0.39	1.48
	G2	0.28	0.25	0.33	0.00	1.18
	G3-5	0.61	0.45	0.85	0.00	3.42
	Rest	0.66	0.46	0.94	0.00	3.77
Tall	B1	0.51	0.29	0.66	0.00	1.96
	B2	0.60	0.32	0.83	0.00	2.42
	G0	1.00	0.38	1.73	0.29	4.76
	G	1.34	0.31	2.83	1.07	6.07
	G1	0.15	0.27	0.16	0.00	0.99
	G2	0.34	0.32	0.40	0.00	1.60
	Rest	0.00	0.45	0.00	0.00	1.19

[1]Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).



[Brn-Grz, burned-grazed]

Figure 6.24. Back-transformed least squares mean densities (pairs per 100 hectares) of mourning doves (*Zenaida macroura*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits. Treatments are defined in tables 6.47 and 6.48.

Y. Ring-necked Pheasant (*Phasianus colchicus*)

Table 6.49. Generalized linear mixed model, assuming a gamma distribution with a log link, $y = (y+1)$, testing the influence of post-management treatments on breeding densities (pairs per 100 hectares) of ring-necked pheasants (*Phasianus colchicus*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × treatment	18	152.8	1.35	0.1676
Contrasts:	Mixed: burned linear	1	155.5	0.71	0.4018
	Mixed: burned quadratic	1	94.1	0.18	0.6685
	Mixed: BG0 vs BG1-3	1	141.6	0.02	0.8974
	Mixed: grazed linear	1	164.3	0.19	0.6668
	Mixed: grazed quadratic	1	152.6	3.04	0.0832
	Tall: burned linear	1	148.4	2.31	0.1307
	Tall: grazed linear	1	159.9	1.31	0.2549
	Tall: grazed quadratic	1	142.9	1.79	0.1828
	B1: mixed versus tall	1	168.6	3.47	0.0643
	B2: mixed versus tall	1	168.4	0.19	0.6624
	G0: mixed versus tall	1	167.9	7.26	0.0078
	G: mixed versus tall	1	167.2	3.71	0.0557
	G1: mixed versus tall	1	169.0	0.82	0.3664
	G2: mixed versus tall	1	166.1	3.15	0.0779
	Mixed: burned versus rest	1	157.8	0.14	0.7039
	Mixed: grazed versus rest	1	158.6	0.15	0.6982
	Mixed: burned-grazed versus rest	1	159.3	0.43	0.5142
	Mixed: burned versus grazed	1	137.7	0.00	0.9869
	Tall: burned versus rest	1	165.1	0.31	0.5759
	Tall: grazed versus rest	1	168.2	1.37	0.2440
	Tall: burned versus grazed	1	139.6	2.07	0.1521

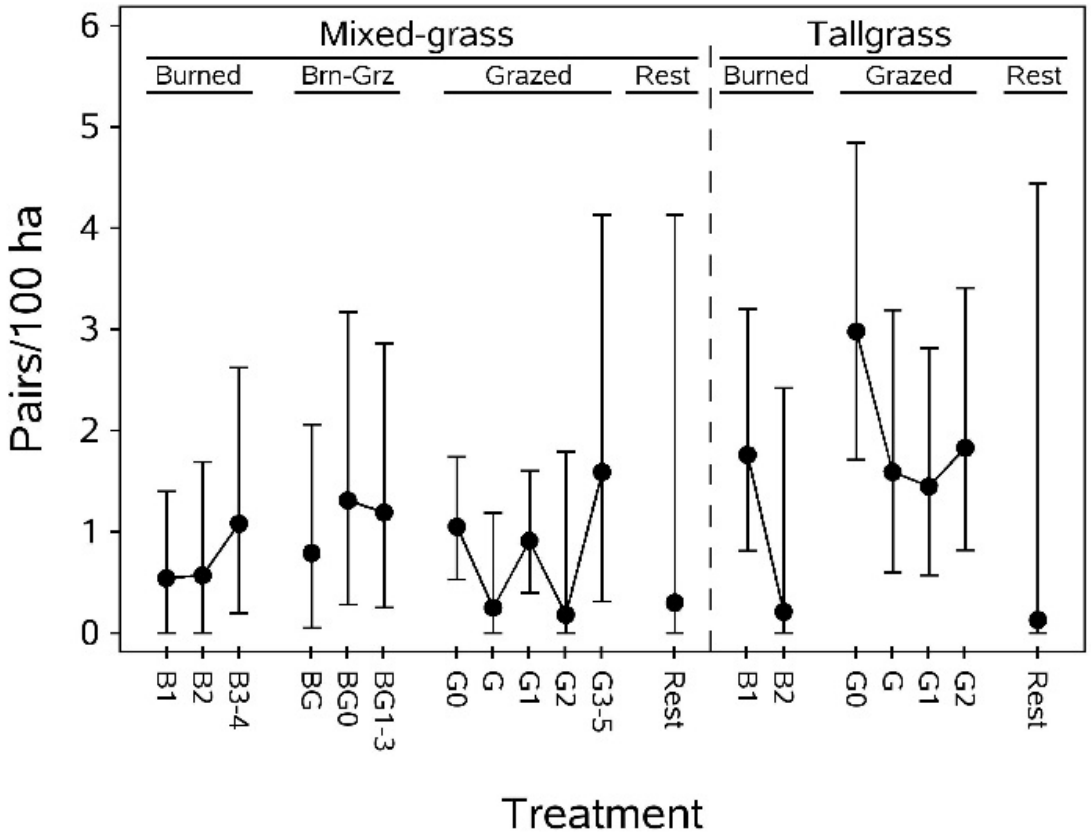
[1]Sources of variation for the model: Y=Unit(Grass type) + Grass type × Treatment + Residual, where Unit(Grass type) and Residual are random effects and Grass type × Treatment is a fixed effect in a mixed-model framework. Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 6.50. Least squares mean (standard error) densities (pairs per 100 hectares) and back-transformed least squares mean (95-percent confidence intervals) densities (pairs per 100 hectares) of ring-necked pheasants (*Phasianus colchicus*), by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

				Back-transformed		
					95-percent confidence intervals	
Grass	Treatment[1]	LSMean	SE	LSMean	LCL	UCL
Mixed	B1	0.43	0.23	0.54	0.00	1.40
	B2	0.45	0.27	0.57	0.00	1.69
	B3-4	0.73	0.28	1.08	0.19	2.62
	BG	0.58	0.27	0.79	0.05	2.06
	BG0	0.84	0.30	1.31	0.28	3.17
	BG1-3	0.79	0.29	1.19	0.25	2.86
	G0	0.72	0.15	1.05	0.53	1.74
	G	0.23	0.28	0.25	0.00	1.19
	G1	0.65	0.16	0.91	0.40	1.60
	G2	0.17	0.44	0.18	0.00	1.79
	G3-5	0.95	0.35	1.59	0.31	4.13
	Rest	0.27	0.70	0.30	0.00	4.13
Tall	B1	1.01	0.22	1.76	0.81	3.20
	B2	0.19	0.53	0.21	0.00	2.42
	G0	1.38	0.20	2.98	1.71	4.84
	G	0.95	0.25	1.59	0.60	3.19
	G1	0.90	0.23	1.45	0.57	2.81
	G2	1.04	0.23	1.83	0.82	3.41
	Rest	0.12	0.80	0.13	0.00	4.44

[1]Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).



[Brn-Grz, burned-grazed]

Figure 6.25. Back-transformed least squares mean densities (pairs per 100 hectares) of ring-necked pheasants (*Phasianus colchicus*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits. Treatments are defined in tables 6.49 and 6.50.

Z. Baird's Sparrow (*Centronyx bairdii*)

Table 6.51. Generalized linear mixed model, assuming a normal distribution with an identity link, $y = (y+0.0)$, testing the influence of post-management treatments on breeding densities (pairs per 100 hectares) of Baird's sparrows (*Centronyx bairdii*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × treatment	18	139.3	0.94	0.5301
Contrasts:	Mixed: burned linear	1	129.7	0.00	0.9864
	Mixed: burned quadratic	1	87.3	0.08	0.7767
	Mixed: BG0 vs BG1-3	1	114.2	0.01	0.9200
	Mixed: grazed linear	1	167.4	0.06	0.8086
	Mixed: grazed quadratic	1	148.0	0.09	0.7667
	Tall: burned linear	1	118.0	0.00	1.0000
	Tall: grazed linear	1	146.6	0.00	1.0000
	Tall: grazed quadratic	1	126.7	0.00	1.0000
	B1: mixed versus tall	1	164.0	0.05	0.8191
	B2: mixed versus tall	1	166.3	0.13	0.7185
	G0: mixed versus tall	1	164.2	1.99	0.1605
	G: mixed versus tall	1	168.8	0.14	0.7065
	G1: mixed versus tall	1	166.8	1.03	0.3127
	G2: mixed versus tall	1	168.4	1.87	0.1733
	Mixed: burned versus rest	1	131.0	0.04	0.8440
	Mixed: grazed versus rest	1	129.8	0.50	0.4816
	Mixed: burned-grazed versus rest	1	136.9	0.00	0.9934
	Mixed: burned versus grazed	1	168.5	1.65	0.2013
	Tall: burned versus rest	1	157.0	0.00	1.0000
	Tall: grazed versus rest	1	168.1	0.00	1.0000
	Tall: burned versus grazed	1	144.9	0.00	1.0000

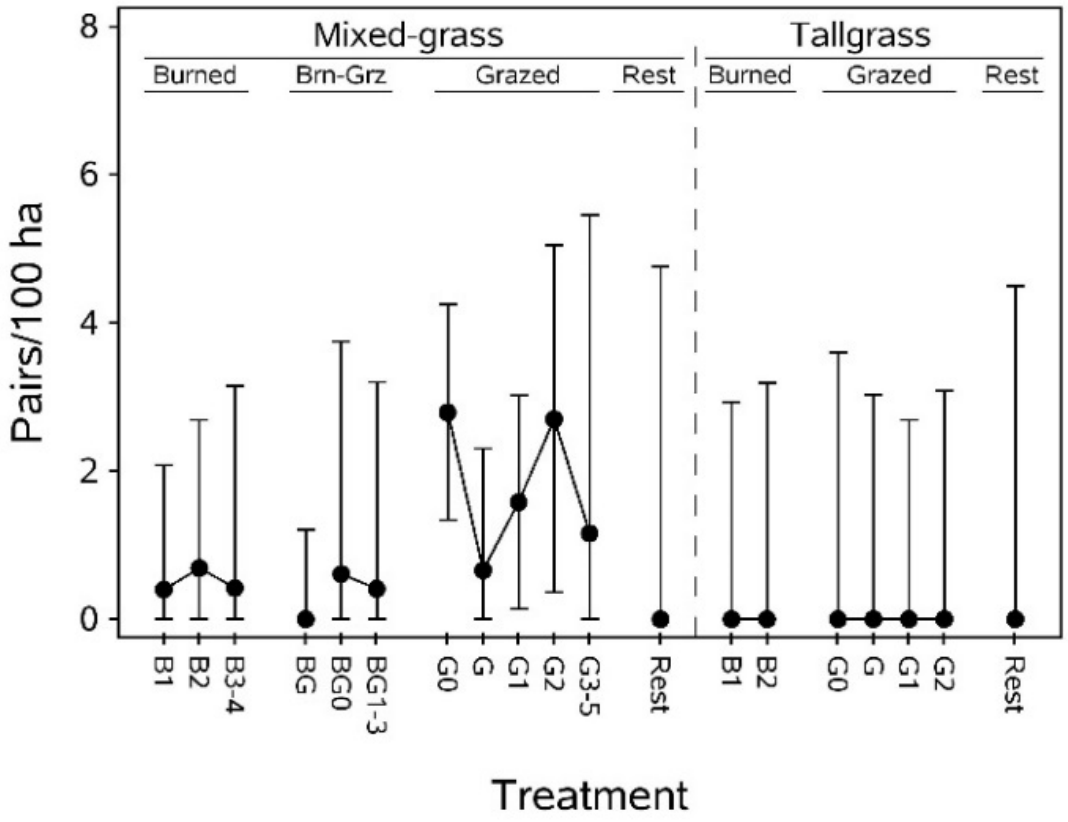
[1]Sources of variation for the model: Y=Unit(Grass type) + Grass type × Treatment + Residual, where Unit(Grass type) and Residual are random effects and Grass type × Treatment is a fixed effect in a mixed-model framework. Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 6.52. Least squares mean (standard error) densities (pairs per 100 hectares) of Baird's sparrows (*Centronyx bairdii*), by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

				95-percent confidence intervals	
Grass	Treatment[1]	LSMean[2]	SE	LCL	UCL
Mixed	B1	0.40	0.86	0.00	2.08
	B2	0.69	1.02	0.00	2.69
	B3-4	0.42	1.39	0.00	3.15
	BG	0.00	1.10	0.00	1.21
	BG0	0.61	1.60	0.00	3.75
	BG1-3	0.41	1.42	0.00	3.20
	G0	2.79	0.74	1.34	4.25
	G	0.66	0.84	0.00	2.30
	G1	1.58	0.73	0.14	3.02
	G2	2.70	1.20	0.36	5.05
	G3-5	1.16	2.19	0.00	5.45
	Rest	0.00	2.43	0.00	4.76
Tall	B1	0.00	1.50	0.00	2.93
	B2	0.00	1.63	0.00	3.19
	G0	0.00	1.84	0.00	3.60
	G	0.00	1.55	0.00	3.03
	G1	0.00	1.37	0.00	2.69
	G2	0.00	1.57	0.00	3.08
	Rest	0.00	2.30	0.00	4.50

[1]Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Densities were not transformed.



[Brn-Grz, burned-grazed]

Figure 6.26. Least squares mean densities (pairs per 100 hectares) of Baird's sparrows (*Centronyx bairdii*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits. Treatments are defined in tables 6.51 and 6.52.

AA. Sharp-tailed Grouse (*Tympanuchus phasianellus*)

Table 6.53. Generalized linear mixed model, assuming a gamma distribution with a log link, $y = (y+1)$, testing the influence of post-management treatments on breeding densities (pairs per 100 hectares) of sharp-tailed grouse (*Tympanuchus phasianellus*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × treatment	18	159.9	1.35	0.1615
Contrasts:	Mixed: burned linear	1	169.0	1.52	0.2193
	Mixed: burned quadratic	1	120.7	0.00	0.9849
	Mixed: BG0 vs BG1-3	1	167.1	1.67	0.1984
	Mixed: grazed linear	1	161.2	0.57	0.4504
	Mixed: grazed quadratic	1	165.0	0.29	0.5881
	Tall: burned linear	1	124.8	0.08	0.7738
	Tall: grazed linear	1	168.0	0.46	0.4990
	Tall: grazed quadratic	1	156.0	0.03	0.8693
	B1: mixed versus tall	1	169.0	1.82	0.1787
	B2: mixed versus tall	1	169.0	0.11	0.7394
	G0: mixed versus tall	1	168.9	1.25	0.2643
	G: mixed versus tall	1	168.9	0.82	0.3678
	G1: mixed versus tall	1	169.0	0.85	0.3588
	G2: mixed versus tall	1	168.9	1.97	0.1625
	Mixed: burned versus rest	1	169.0	0.05	0.8295
	Mixed: grazed versus rest	1	168.9	0.02	0.8834
	Mixed: burned-grazed versus rest	1	168.9	0.52	0.4738
	Mixed: burned versus grazed	1	125.0	0.03	0.8526
	Tall: burned versus rest	1	167.8	0.49	0.4871
	Tall: grazed versus rest	1	169.0	0.06	0.8010
	Tall: burned versus grazed	1	137.3	0.71	0.4010

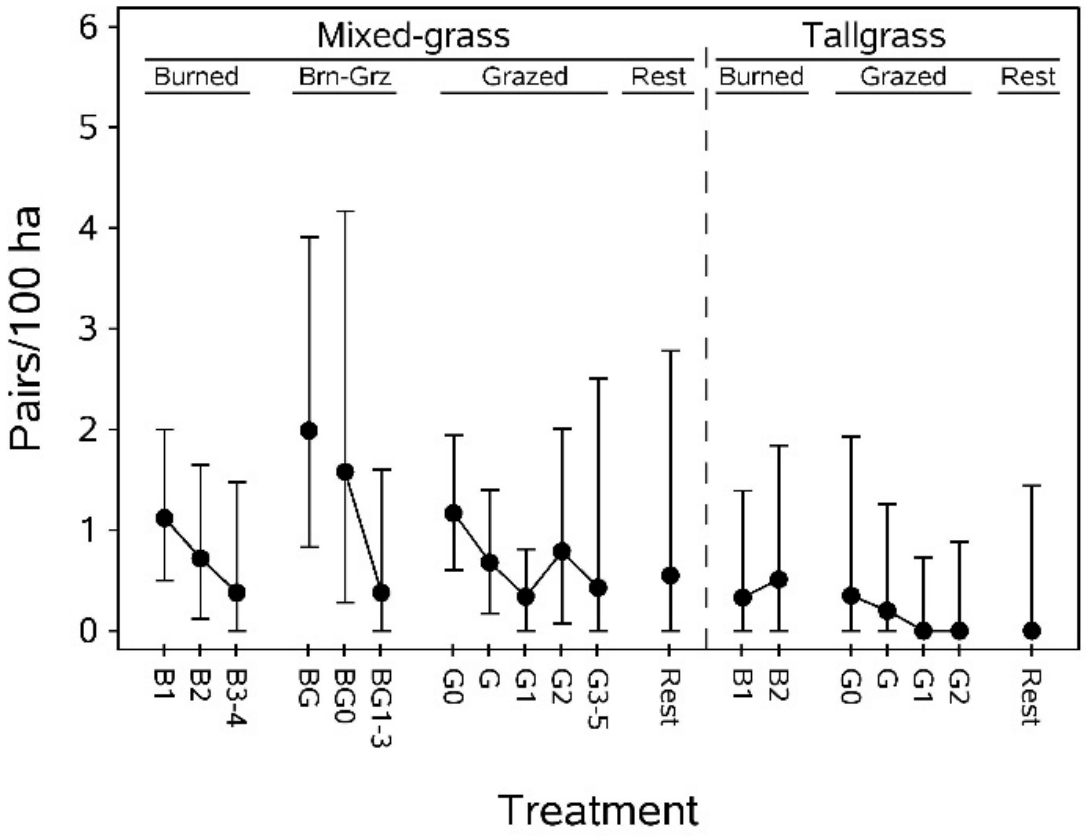
[1]Sources of variation for the model: Y=Unit(Grass type) + Grass type × Treatment + Residual, where Unit(Grass type) and Residual are random effects and Grass type × Treatment is a fixed effect in a mixed-model framework. Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 6.54. Least squares mean (standard error) densities (pairs per 100 hectares) and back-transformed least squares mean (95-percent confidence intervals) densities (pairs per 100 hectares) of sharp-tailed grouse (*Tympanuchus phasianellus*), by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

				Back-transformed		
					95-percent confidence intervals	
Grass	Treatment[1]	LSMean	SE	LSMean	LCL	UCL
Mixed	B1	0.75	0.18	1.12	0.50	2.00
	B2	0.54	0.22	0.72	0.12	1.65
	B3-4	0.32	0.30	0.38	0.00	1.48
	BG	1.10	0.25	1.99	0.83	3.91
	BG0	0.95	0.36	1.58	0.28	4.17
	BG1-3	0.32	0.33	0.38	0.00	1.60
	G0	0.77	0.16	1.17	0.60	1.94
	G	0.52	0.18	0.68	0.17	1.40
	G1	0.29	0.15	0.34	0.00	0.81
	G2	0.58	0.27	0.79	0.07	2.01
	G3-5	0.36	0.46	0.43	0.00	2.51
	Rest	0.44	0.46	0.55	0.00	2.78
Tall	B1	0.28	0.30	0.33	0.00	1.39
	B2	0.41	0.32	0.51	0.00	1.84
	G0	0.30	0.40	0.35	0.00	1.93
	G	0.18	0.32	0.20	0.00	1.26
	G1	0.00	0.28	0.00	0.00	0.73
	G2	0.00	0.32	0.00	0.00	0.88
	Rest	0.00	0.46	0.00	0.00	1.44

[1]Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).



[Brn-Grz, burned-grazed]

Figure 6.27. Back-transformed least squares mean densities (pairs per 100 hectares) of sharp-tailed grouse (*Tympanuchus phasianellus*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits. Treatments are defined in tables 6.53 and 6.54.

BB. Nelson's Sparrow (*Ammospiza nelsoni*)

Table 6.55. Generalized linear mixed model, assuming a gamma distribution with a log link, $y = (y+1)$, testing the influence of post-management treatments on breeding densities (pairs per 100 hectares) of Nelson's sparrows (*Ammospiza nelsoni*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[*, evidence for moderate effect ($0.05<p\leq0.10$); **, evidence for strong effect ($p\leq0.05$)]

Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × treatment	18	143.5	2.49	0.0014**
Contrasts:	Mixed: burned linear	1	135.9	1.72	0.1925
	Mixed: burned quadratic	1	93.2	6.66	0.0114**
	Mixed: BG0 vs BG1-3	1	121.0	0.39	0.5337
	Mixed: grazed linear	1	168.2	1.42	0.2350
	Mixed: grazed quadratic	1	151.5	0.01	0.9323
	Tall: burned linear	1	123.4	9.82	0.0022**
	Tall: grazed linear	1	150.3	0.01	0.9432
	Tall: grazed quadratic	1	131.9	0.00	0.9552
	B1: mixed versus tall	1	165.1	1.06	0.3044
	B2: mixed versus tall	1	166.9	1.17	0.2814
	G0: mixed versus tall	1	164.9	0.58	0.4473
	G: mixed versus tall	1	168.8	0.36	0.5501
	G1: mixed versus tall	1	167.5	0.82	0.3665
	G2: mixed versus tall	1	168.3	0.19	0.6632
	Mixed: burned versus rest	1	137.0	8.65	0.0038**
	Mixed: grazed versus rest	1	136.1	13.55	0.0003**
	Mixed: burned-grazed versus rest	1	142.3	6.26	0.0135**
	Mixed: burned versus grazed	1	167.6	3.09	0.0807*
	Tall: burned versus rest	1	158.4	1.71	0.1934
	Tall: grazed versus rest	1	168.0	0.00	0.9813
	Tall: burned versus grazed	1	146.7	4.78	0.0303

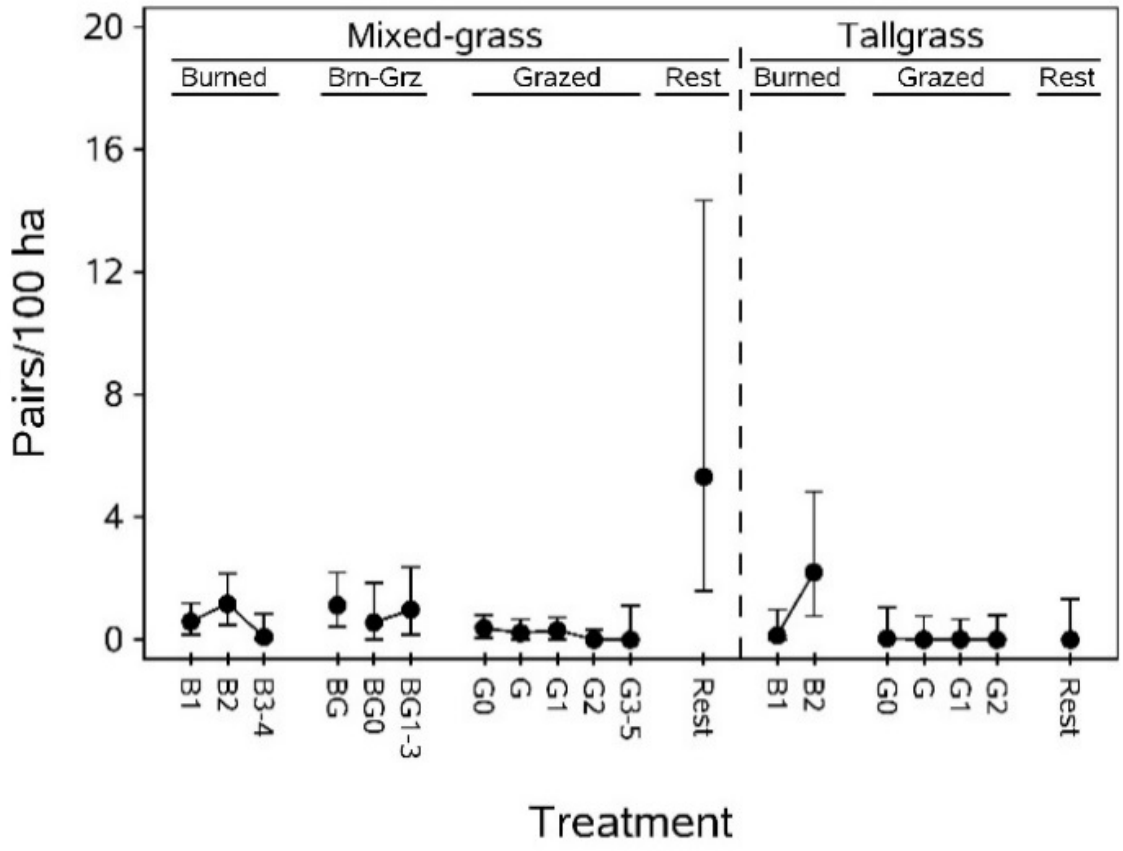
[1]Sources of variation for the model: Y=Unit(Grass type) + Grass type × Treatment + Residual, where Unit(Grass type) and Residual are random effects and Grass type × Treatment is a fixed effect in a mixed-model framework. Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 6.56. Least squares mean (standard error) densities (pairs per 100 hectares) and back-transformed least squares mean (95-percent confidence intervals) densities (pairs per 100 hectares) of Nelson's sparrows (*Ammospiza nelsoni*), by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

				Back-transformed		
					95-percent confidence intervals	
Grass	Treatment[1]	LSMean	SE	LSMean	LCL	UCL
Mixed	B1	0.46	0.16	0.59	0.16	1.18
	B2	0.77	0.19	1.17	0.48	2.16
	B3-4	0.09	0.26	0.09	0.00	0.83
	BG	0.75	0.21	1.12	0.41	2.20
	BG0	0.45	0.30	0.56	0.00	1.84
	BG1-3	0.68	0.27	0.98	0.16	2.37
	G0	0.32	0.14	0.38	0.05	0.81
	G	0.20	0.16	0.22	0.00	0.67
	G1	0.27	0.14	0.31	0.00	0.72
	G2	0.00	0.23	0.00	0.00	0.33
	G3-5	0.00	0.41	0.00	0.00	1.10
	Rest	1.84	0.45	5.32	1.60	14.35
Tall	B1	0.13	0.28	0.14	0.00	0.97
	B2	1.16	0.31	2.20	0.76	4.83
	G0	0.04	0.35	0.04	0.00	1.05
	G	0.00	0.29	0.00	0.00	0.77
	G1	0.01	0.26	0.01	0.00	0.67
	G2	0.00	0.30	0.00	0.00	0.79
	Rest	0.00	0.43	0.00	0.00	1.33

[1]Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).



[Brn-Grz, burned-grazed]

Figure 6.28. Back-transformed least squares mean densities (pairs per 100 hectares) of Nelson's sparrows (*Ammospiza nelsoni*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits. Treatments are defined in tables 6.55 and 6.56.

CC. Marbled Godwit (*Limosa fedoa*)

Table 6.57. Generalized linear mixed model, assuming a gamma distribution with a log link, $y = (y+1)$, testing the influence of post-management treatments on breeding densities (pairs per 100 hectares) of marbled godwit (*Limosa fedoa*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[*, evidence for moderate effect ($0.05<p\leq0.10$); **, evidence for strong effect ($p\leq0.05$)]

Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × treatment	18	135.5	2.13	0.0076**
Contrasts:	Mixed: burned linear	1	124.2	1.57	0.2128
	Mixed: burned quadratic	1	82.3	5.63	0.0200**
	Mixed: BG0 vs BG1-3	1	108.3	6.94	0.0097**
	Mixed: grazed linear	1	166.4	0.09	0.7584
	Mixed: grazed quadratic	1	144.7	0.01	0.9141
	Tall: burned linear	1	113.0	0.98	0.3239
	Tall: grazed linear	1	143.1	0.28	0.5995
	Tall: grazed quadratic	1	122.0	0.17	0.6810
	B1: mixed versus tall	1	162.9	3.10	0.0804*
	B2: mixed versus tall	1	165.6	0.57	0.4494
	G0: mixed versus tall	1	163.7	4.07	0.0453**
	G: mixed versus tall	1	168.9	2.47	0.1177
	G1: mixed versus tall	1	166.2	3.90	0.0500**
	G2: mixed versus tall	1	168.4	0.55	0.4610
	Mixed: burned versus rest	1	125.6	1.01	0.3175
	Mixed: grazed versus rest	1	124.2	0.11	0.7453
	Mixed: burned-grazed versus rest	1	131.8	0.21	0.6459
	Mixed: burned versus grazed	1	168.9	3.11	0.0795*
	Tall: burned versus rest	1	155.7	0.56	0.4561
	Tall: grazed versus rest	1	168.1	0.03	0.8546
	Tall: burned versus grazed	1	143.2	2.40	0.1234

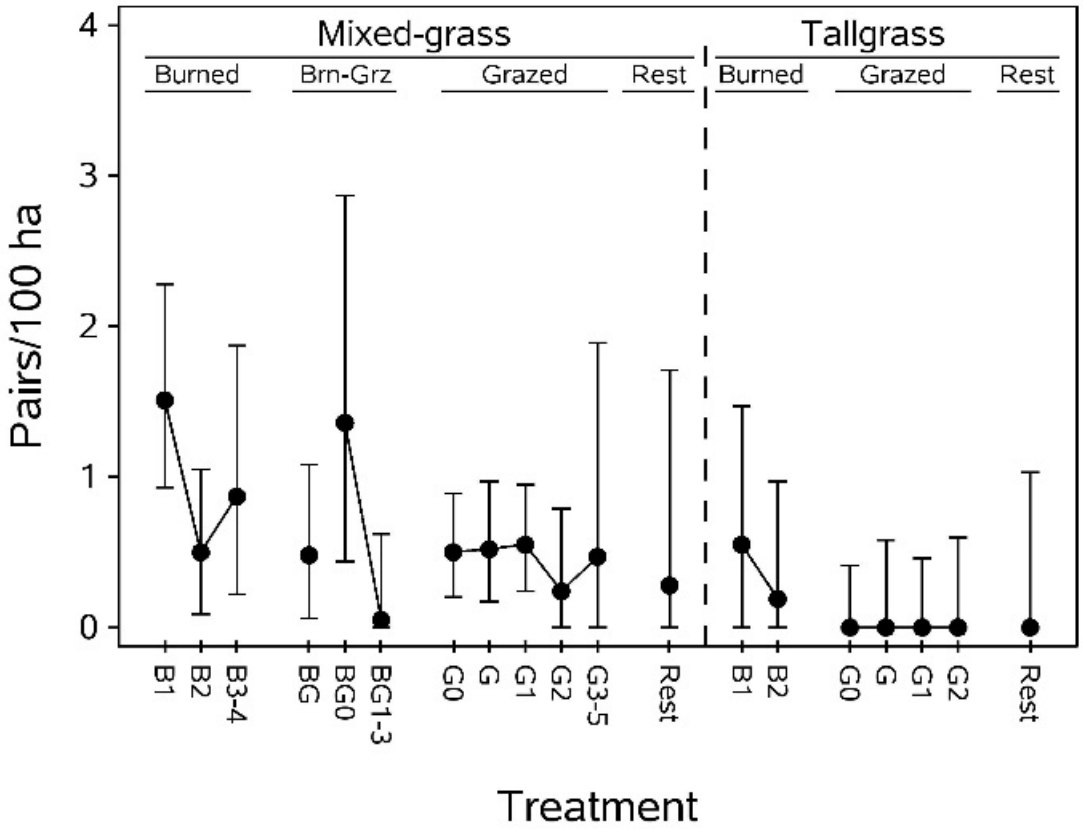
[1]Sources of variation for the model: Y=Unit(Grass type) + Grass type × Treatment + Residual, where Unit(Grass type) and Residual are random effects and Grass type × Treatment is a fixed effect in a mixed-model framework. Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 6.58. Least squares mean (standard error) densities (pairs per 100 hectares) and back-transformed least squares mean (95-percent confidence intervals) densities (pairs per 100 hectares) of marbled godwits (*Limosa fedoa*), by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

				Back-transformed		
					95-percent confidence intervals	
Grass	Treatment[1]	LSMean	SE	LSMean	LCL	UCL
Mixed	B1	0.92	0.14	1.51	0.93	2.28
	B2	0.40	0.16	0.50	0.09	1.05
	B3-4	0.63	0.22	0.87	0.22	1.87
	BG	0.39	0.17	0.48	0.06	1.08
	BG0	0.86	0.25	1.36	0.44	2.87
	BG1-3	0.05	0.22	0.05	0.00	0.62
	G0	0.41	0.12	0.50	0.20	0.89
	G	0.42	0.13	0.52	0.17	0.97
	G1	0.44	0.12	0.55	0.24	0.95
	G2	0.21	0.19	0.24	0.00	0.79
	G3-5	0.39	0.34	0.47	0.00	1.89
	Rest	0.24	0.39	0.28	0.00	1.71
Tall	B1	0.44	0.24	0.55	0.00	1.47
	B2	0.17	0.26	0.19	0.00	0.97
	G0	0.00	0.29	0.00	0.00	0.41
	G	0.00	0.24	0.00	0.00	0.58
	G1	0.00	0.22	0.00	0.00	0.46
	G2	0.00	0.25	0.00	0.00	0.60
	Rest	0.00	0.36	0.00	0.00	1.03

[1]Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).



[Brn-Grz, burned-grazed]

Figure 6.29. Back-transformed least squares mean densities (pairs per 100 hectares) of marbled godwit (*Limosa fedoa*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits. Treatments are defined in tables 6.57 and 6.58.

DD. Vesper Sparrow (*Pooecetes gramineus*)

Table 6.59. Generalized linear mixed model, assuming a gamma distribution with a log link, $y = (y+1)$, testing the influence of post-management treatments on breeding densities (pairs per 100 hectares) of vesper sparrows (*Pooecetes gramineus*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[*, evidence for moderate effect ($0.05<p\leq0.10$); **, evidence for strong effect ($p\leq0.05$)]

Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × treatment	18	158.9	1.81	0.0280**
Contrasts:	Mixed: burned linear	1	165.8	0.02	0.8860
	Mixed: burned quadratic	1	111.9	0.56	0.4557
	Mixed: BG0 vs BG1-3	1	158.8	1.81	0.1802
	Mixed: grazed linear	1	164.3	0.35	0.5571
	Mixed: grazed quadratic	1	162.9	0.62	0.4315
	Tall: burned linear	1	129.6	0.10	0.7565
	Tall: grazed linear	1	165.5	0.03	0.8585
	Tall: grazed quadratic	1	151.4	0.10	0.7529
	B1: mixed versus tall	1	168.9	0.18	0.6683
	B2: mixed versus tall	1	169.0	0.07	0.7902
	G0: mixed versus tall	1	168.8	1.41	0.2366
	G: mixed versus tall	1	168.9	6.46	0.0119**
	G1: mixed versus tall	1	169.0	0.12	0.7285
	G2: mixed versus tall	1	168.9	3.35	0.0691*
	Mixed: burned versus rest	1	166.1	0.27	0.6051
	Mixed: grazed versus rest	1	167.0	1.83	0.1776
	Mixed: burned-grazed versus rest	1	166.3	2.99	0.0854*
	Mixed: burned versus grazed	1	136.3	4.38	0.0382**
	Tall: burned versus rest	1	165.8	0.02	0.8833
	Tall: grazed versus rest	1	168.8	0.01	0.9121
	Tall: burned versus grazed	1	141.7	0.01	0.9403

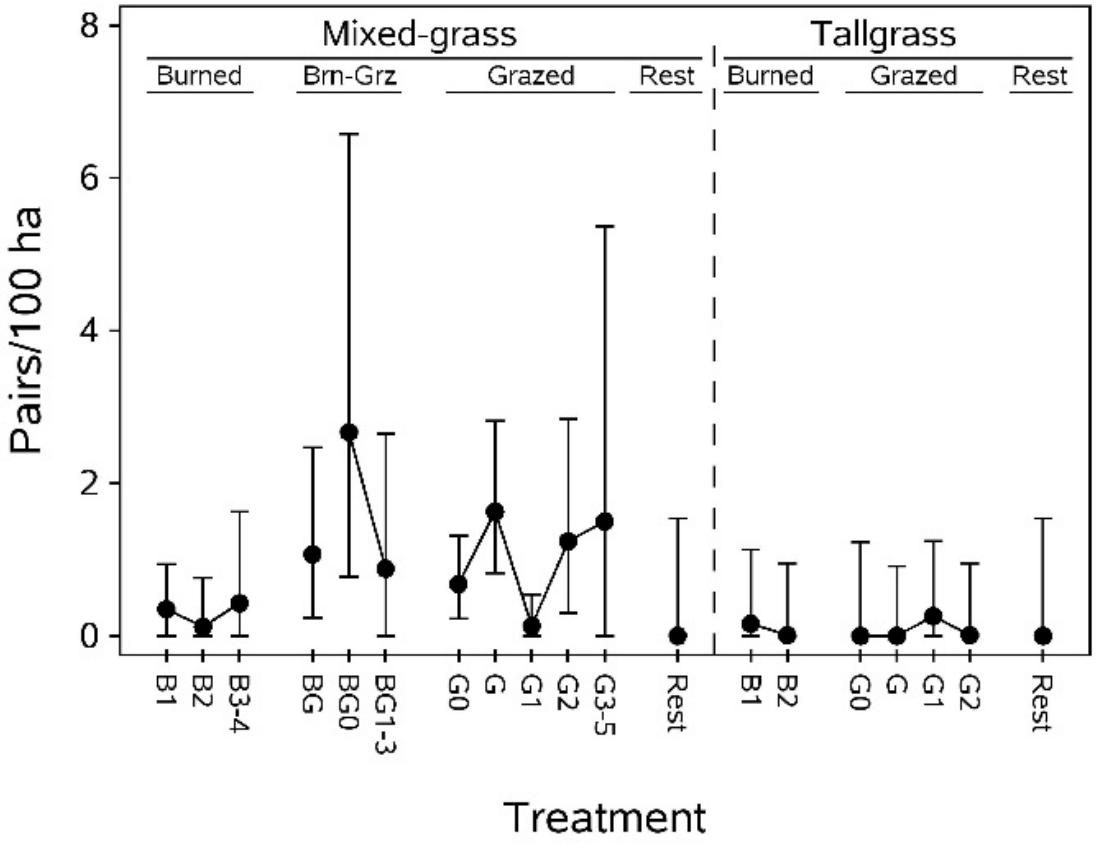
[1]Sources of variation for the model: Y=Unit(Grass type) + Grass type × Treatment + Residual, where Unit(Grass type) and Residual are random effects and Grass type × Treatment is a fixed effect in a mixed-model framework. Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 6.60. Least squares mean (standard error) densities (pairs per 100 hectares) and back-transformed least squares mean (95-percent confidence intervals) densities (pairs per 100 hectares) of vesper sparrows (*Pooecetes gramineus*), by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

				Back-transformed		
					95-percent confidence intervals	
Grass	Treatment[1]	LSMean	SE	LSMean	LCL	UCL
Mixed	B1	0.30	0.18	0.35	0.00	0.94
	B2	0.12	0.23	0.12	0.00	0.76
	B3-4	0.35	0.31	0.43	0.00	1.63
	BG	0.73	0.26	1.07	0.24	2.47
	BG0	1.30	0.37	2.67	0.78	6.58
	BG1-3	0.63	0.34	0.88	0.00	2.65
	G0	0.52	0.16	0.68	0.23	1.31
	G	0.97	0.19	1.63	0.82	2.82
	G1	0.12	0.16	0.13	0.00	0.54
	G2	0.81	0.28	1.24	0.30	2.84
	G3-5	0.92	0.48	1.50	0.00	5.37
	Rest	0.00	0.48	0.00	0.00	1.54
Tall	B1	0.15	0.31	0.16	0.00	1.13
	B2	0.01	0.34	0.01	0.00	0.95
	G0	0.00	0.41	0.00	0.00	1.23
	G	0.00	0.34	0.00	0.00	0.91
	G1	0.23	0.29	0.26	0.00	1.24
	G2	0.01	0.34	0.01	0.00	0.95
	Rest	0.00	0.48	0.00	0.00	1.54

[1]Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).



[Brn-Grz, burned-grazed]

Figure 6.30. Back-transformed least squares mean densities (pairs per 100 hectares) of vesper sparrows (*Pooecetes gramineus*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits. Treatments are defined in tables 6.59 and 6.60.

EE. LeConte's Sparrow (*Ammospiza leconteii*)

Table 6.61. Generalized linear mixed model, assuming a gamma distribution with a log link, $y = (y+1)$, testing the influence of post-management treatments on breeding densities (pairs per 100 hectares) of LeConte's sparrows (*Ammospiza leconteii*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[<, less than; *, evidence for moderate effect ($0.05<p\leq0.10$); **, evidence for strong effect ($p\leq0.05$)]

Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × treatment	18	158.2	3.81	<0.0001**
Contrasts:	Mixed: burned linear	1	168.0	0.13	0.7227
	Mixed: burned quadratic	1	108.7	3.61	0.0600*
	Mixed: BG0 vs BG1-3	1	163.2	5.04	0.0261**
	Mixed: grazed linear	1	161.1	0.55	0.4581
	Mixed: grazed quadratic	1	163.0	1.04	0.3095
	Tall: burned linear	1	120.1	2.70	0.1029
	Tall: grazed linear	1	166.7	1.56	0.2132
	Tall: grazed quadratic	1	151.0	0.24	0.6283
	B1: mixed versus tall	1	169.0	3.82	0.0522*
	B2: mixed versus tall	1	169.0	4.25	0.0408**
	G0: mixed versus tall	1	169.0	0.00	0.9998
	G: mixed versus tall	1	169.0	1.89	0.1707
	G1: mixed versus tall	1	169.0	0.26	0.6094
	G2: mixed versus tall	1	169.0	0.03	0.8520
	Mixed: burned versus rest	1	168.3	18.30	<0.0001**
	Mixed: grazed versus rest	1	168.8	23.09	<0.0001**
	Mixed: burned-grazed versus rest	1	168.1	18.10	<0.0001**
	Mixed: burned versus grazed	1	122.8	1.56	0.2141
	Tall: burned versus rest	1	166.6	5.74	0.0177**
	Tall: grazed versus rest	1	169.0	0.48	0.4886
	Tall: burned versus grazed	1	133.8	10.06	0.0019**

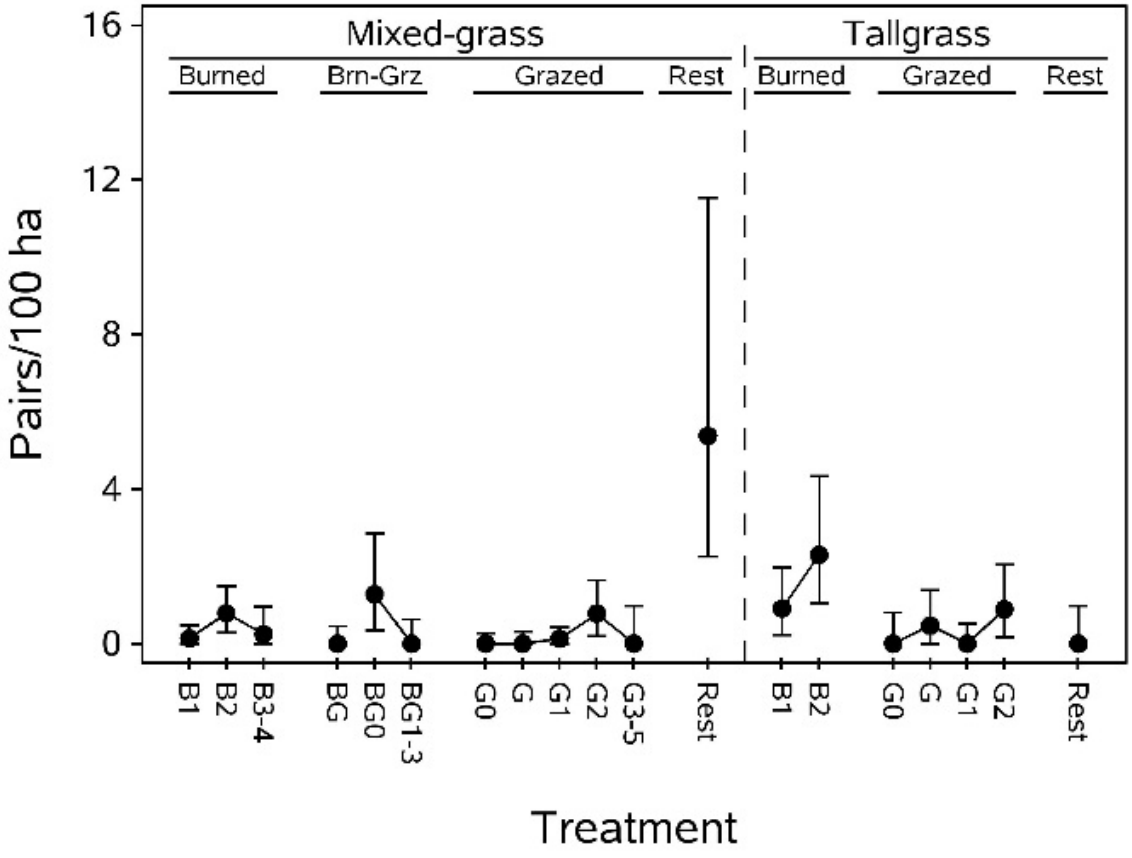
[1]Sources of variation for the model: Y=Unit(Grass type) + Grass type × Treatment + Residual, where Unit(Grass type) and Residual are random effects and Grass type × Treatment is a fixed effect in a mixed-model framework. Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 6.62. Least squares mean (standard error) densities (pairs per 100 hectares) and back-transformed least squares mean (95-percent confidence intervals) densities (pairs per 100 hectares) of LeConte's sparrows (*Ammospiza leconteii*), by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

				Back-transformed		
					95-percent confidence intervals	
Grass	Treatment[1]	LSMean	SE	LSMean	LCL	UCL
Mixed	B1	0.13	0.13	0.14	0.00	0.48
	B2	0.58	0.17	0.79	0.29	1.49
	B3-4	0.22	0.23	0.25	0.00	0.96
	BG	0.00	0.19	0.00	0.00	0.46
	BG0	0.82	0.27	1.28	0.34	2.86
	BG1-3	0.00	0.25	0.00	0.00	0.62
	G0	0.00	0.12	0.00	0.00	0.26
	G	0.00	0.14	0.00	0.00	0.31
	G1	0.12	0.12	0.13	0.00	0.42
	G2	0.57	0.20	0.78	0.20	1.64
	G3-5	0.00	0.35	0.00	0.00	0.97
	Rest	1.85	0.34	5.38	2.25	11.53
Tall	B1	0.65	0.23	0.91	0.22	1.97
	B2	1.19	0.24	2.30	1.04	4.33
	G0	0.00	0.30	0.00	0.00	0.80
	G	0.39	0.25	0.47	0.00	1.39
	G1	0.00	0.21	0.00	0.00	0.52
	G2	0.63	0.25	0.89	0.17	2.05
	Rest	0.00	0.35	0.00	0.00	0.97

[1]Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).



[Brn-Grz, burned-grazed]

Figure 6.31. Back-transformed least squares mean densities (pairs per 100 hectares) of LeConte's sparrows (*Ammospiza leconteii*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits. Treatments are defined in tables 6.61 and 6.62.

FF. Willet (*Tringa semipalmata*)

Table 6.63. Generalized linear mixed model, assuming a gamma distribution with a log link, $y = (y+1)$, testing the influence of post-management treatments on breeding densities (pairs per 100 hectares) of willets (*Tringa semipalmata*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[*, evidence for moderate effect ($0.05<p\leq0.10$); **, evidence for strong effect ($p\leq0.05$)]

Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × treatment	18	160.4	1.55	0.0792*
Contrasts:	Mixed: burned linear	1	168.0	1.85	0.1761
	Mixed: burned quadratic	1	119.3	0.15	0.6971
	Mixed: BG0 vs BG1-3	1	164.0	0.07	0.7976
	Mixed: grazed linear	1	163.3	0.18	0.6697
	Mixed: grazed quadratic	1	164.4	4.20	0.0420**
	Tall: burned linear	1	130.5	0.70	0.4056
	Tall: grazed linear	1	167.1	0.54	0.4627
	Tall: grazed quadratic	1	155.0	0.34	0.5581
	B1: mixed versus tall	1	169.0	6.23	0.0135**
	B2: mixed versus tall	1	169.0	0.92	0.3395
	G0: mixed versus tall	1	169.0	0.73	0.3953
	G: mixed versus tall	1	169.0	1.39	0.2406
	G1: mixed versus tall	1	169.0	7.46	0.0070**
	G2: mixed versus tall	1	169.0	0.64	0.4250
	Mixed: burned versus rest	1	168.3	1.96	0.1634
	Mixed: grazed versus rest	1	168.7	1.04	0.3104
	Mixed: burned-grazed versus rest	1	168.1	0.64	0.4244
	Mixed: burned versus grazed	1	133.4	1.04	0.3096
	Tall: burned versus rest	1	167.1	0.13	0.7208
	Tall: grazed versus rest	1	169.0	0.04	0.8419
	Tall: burned versus grazed	1	142.0	0.09	0.7611

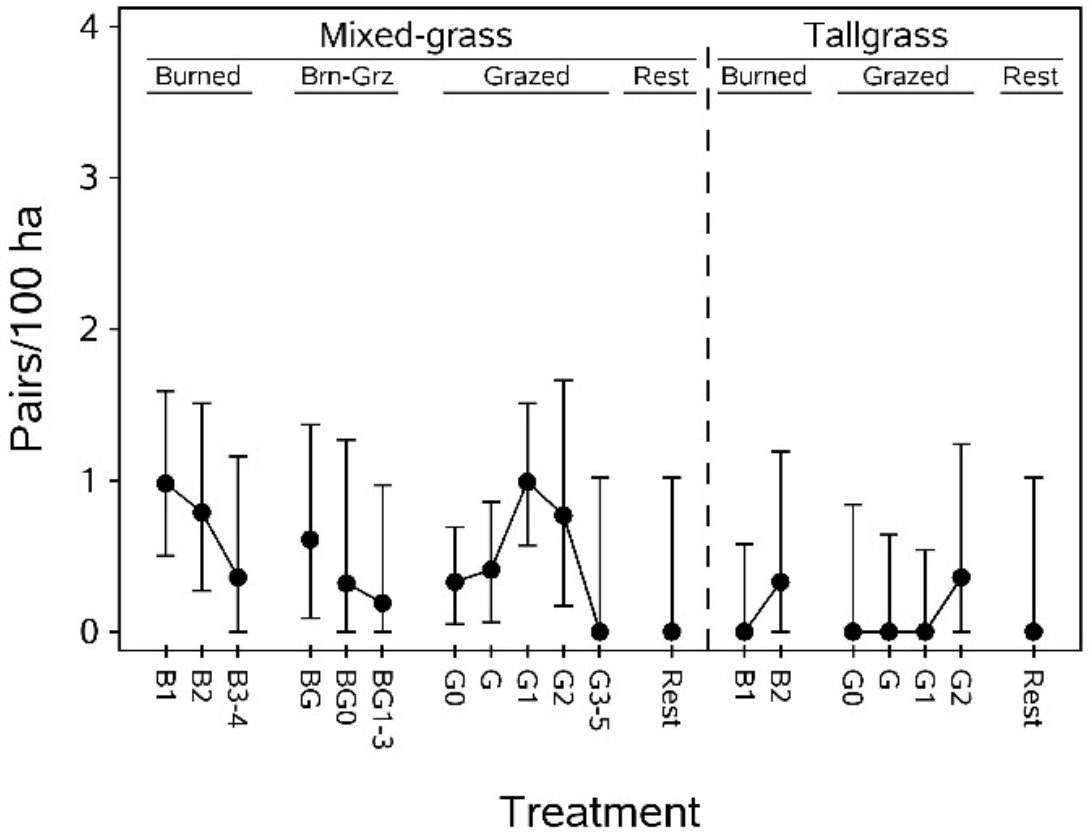
[1]Sources of variation for the model: Y=Unit(Grass type) + Grass type × Treatment + Residual, where Unit(Grass type) and Residual are random effects and Grass type × Treatment is a fixed effect in a mixed-model framework. Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 6.64. Least squares mean (standard error) densities (pairs per 100 hectares) and back-transformed least squares mean (95-percent confidence intervals) densities (pairs per 100 hectares) of willets (*Tringa semipalmata*), by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

				Back-transformed		
					95-percent confidence intervals	
Grass	Treatment[1]	LSMean	SE	LSMean	LCL	UCL
Mixed	B1	0.68	0.14	0.98	0.50	1.59
	B2	0.58	0.17	0.79	0.27	1.51
	B3-4	0.31	0.24	0.36	0.00	1.16
	BG	0.47	0.20	0.61	0.09	1.37
	BG0	0.27	0.28	0.32	0.00	1.27
	BG1-3	0.18	0.26	0.19	0.00	0.97
	G0	0.29	0.12	0.33	0.05	0.69
	G	0.34	0.14	0.41	0.06	0.86
	G1	0.69	0.12	0.99	0.57	1.51
	G2	0.57	0.21	0.77	0.17	1.66
	G3-5	0.00	0.36	0.00	0.00	1.02
	Rest	0.00	0.36	0.00	0.00	1.02
Tall	B1	0.00	0.23	0.00	0.00	0.58
	B2	0.29	0.25	0.33	0.00	1.19
	G0	0.00	0.31	0.00	0.00	0.84
	G	0.00	0.25	0.00	0.00	0.64
	G1	0.00	0.22	0.00	0.00	0.54
	G2	0.31	0.25	0.36	0.00	1.24
	Rest	0.00	0.36	0.00	0.00	1.02

[1]Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).



[Brn-Grz, burned-grazed]

Figure 6.32. Back-transformed least squares mean densities (pairs per 100 hectares) of willets (*Tringa semipalmata*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits. Treatments are defined in tables 6.63 and 6.64.

GG. Horned Lark (*Eremophila alpestris*)

Table 6.65. Generalized linear mixed model, assuming a gamma distribution with a log link, $y = (y+1)$, testing the influence of post-management treatments on breeding densities (pairs per 100 hectares) of horned larks (*Eremophila alpestris*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × treatment	18	156.8	1.36	0.1591
Contrasts:	Mixed: burned linear	1	163.3	2.95	0.0879
	Mixed: burned quadratic	1	104.3	1.27	0.2627
	Mixed: BG0 vs BG1-3	1	153.5	0.61	0.4350
	Mixed: grazed linear	1	164.6	2.15	0.1440
	Mixed: grazed quadratic	1	161.2	0.35	0.5562
	Tall: burned linear	1	126.2	0.00	1.0000
	Tall: grazed linear	1	163.9	0.00	1.0000
	Tall: grazed quadratic	1	147.5	0.00	1.0000
	B1: mixed versus tall	1	168.8	3.09	0.0806
	B2: mixed versus tall	1	168.9	0.00	0.9684
	G0: mixed versus tall	1	168.5	0.91	0.3426
	G: mixed versus tall	1	168.7	3.84	0.0518
	G1: mixed versus tall	1	169.0	0.76	0.3838
	G2: mixed versus tall	1	168.7	0.04	0.8441
	Mixed: burned versus rest	1	163.7	0.20	0.6544
	Mixed: grazed versus rest	1	164.8	0.38	0.5384
	Mixed: burned-grazed versus rest	1	164.3	1.35	0.2465
	Mixed: burned versus grazed	1	136.4	0.16	0.6853
	Tall: burned versus rest	1	164.5	0.00	1.0000
	Tall: grazed versus rest	1	168.6	0.00	1.0000
	Tall: burned versus grazed	1	139.5	0.00	1.0000

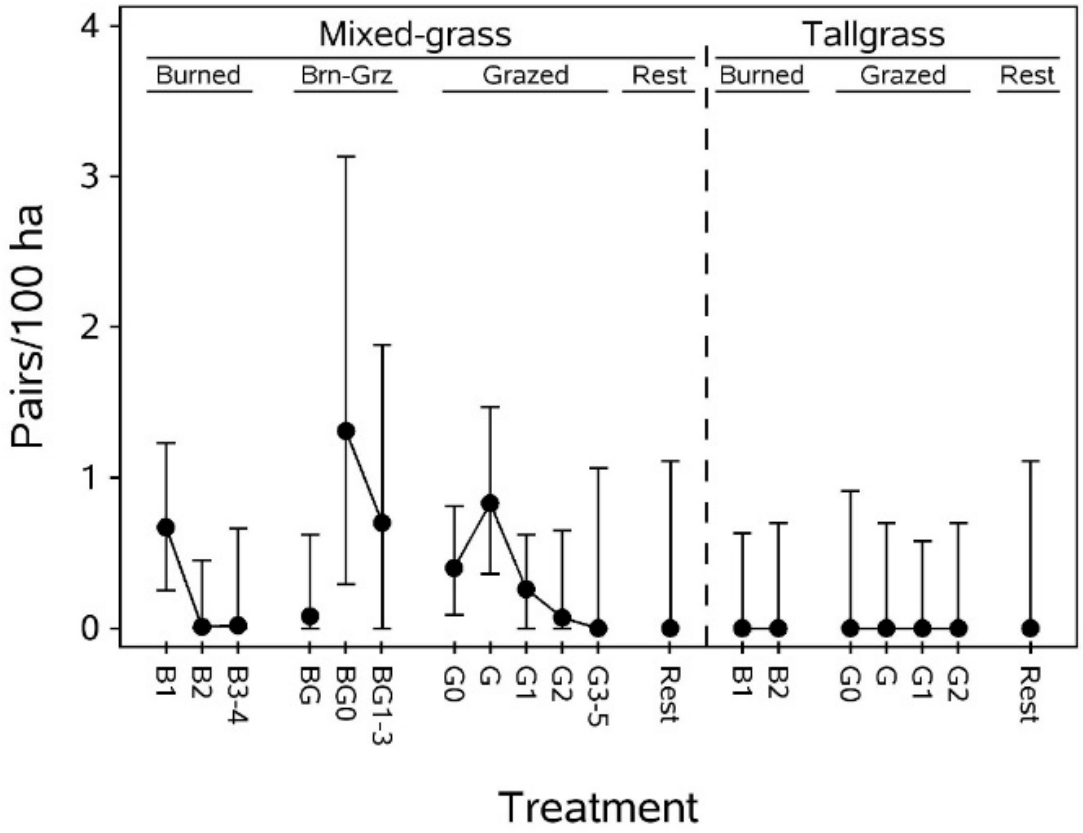
[1]Sources of variation for the model: Y=Unit(Grass type) + Grass type × Treatment + Residual, where Unit(Grass type) and Residual are random effects and Grass type × Treatment is a fixed effect in a mixed-model framework. Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 6.66. Least squares mean (standard error) densities (pairs per 100 hectares) and back-transformed least squares mean (95-percent confidence intervals) densities (pairs per 100 hectares) of horned larks (*Eremophila alpestris*), by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

				Back-transformed		
					95-percent confidence intervals	
Grass	Treatment[1]	LSMean	SE	LSMean	LCL	UCL
Mixed	B1	0.51	0.15	0.67	0.25	1.23
	B2	0.01	0.18	0.01	0.00	0.45
	B3-4	0.02	0.25	0.02	0.00	0.66
	BG	0.07	0.21	0.08	0.00	0.62
	BG0	0.84	0.30	1.31	0.29	3.13
	BG1-3	0.53	0.27	0.70	0.00	1.88
	G0	0.34	0.13	0.40	0.09	0.81
	G	0.61	0.15	0.83	0.36	1.47
	G1	0.23	0.13	0.26	0.00	0.62
	G2	0.07	0.22	0.07	0.00	0.65
	G3-5	0.00	0.38	0.00	0.00	1.06
	Rest	0.00	0.38	0.00	0.00	1.11
Tall	B1	0.00	0.25	0.00	0.00	0.63
	B2	0.00	0.27	0.00	0.00	0.70
	G0	0.00	0.33	0.00	0.00	0.91
	G	0.00	0.27	0.00	0.00	0.70
	G1	0.00	0.23	0.00	0.00	0.58
	G2	0.00	0.27	0.00	0.00	0.70
	Rest	0.00	0.38	0.00	0.00	1.11

[1]Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).



[Brn-Grz, burned-grazed]

Figure 6.33. Back-transformed least squares mean densities (pairs per 100 hectares) of horned larks (*Eremophila alpestris*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits. Treatments are defined in tables 6.65 and 6.66.

HH. Northern Harrier (*Circus hudsonius*)

Table 6.67. Generalized linear mixed model, assuming a gamma distribution with a log link, $y = (y+1)$, testing the influence of post-management treatments on breeding densities (pairs per 100 hectares) of northern harriers (*Circus hudsonius*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × treatment	18	159.3	0.76	0.7394
Contrasts:	Mixed: burned linear	1	167.5	2.03	0.1558
	Mixed: burned quadratic	1	113.7	0.00	0.9889
	Mixed: BG0 vs BG1-3	1	162.5	0.72	0.3966
	Mixed: grazed linear	1	162.9	0.11	0.7399
	Mixed: grazed quadratic	1	163.6	0.43	0.5128
	Tall: burned linear	1	126.9	0.84	0.3605
	Tall: grazed linear	1	166.6	1.63	0.2041
	Tall: grazed quadratic	1	152.7	0.10	0.7567
	B1: mixed versus tall	1	169.0	0.95	0.3299
	B2: mixed versus tall	1	169.0	0.24	0.6244
	G0: mixed versus tall	1	169.0	1.29	0.2577
	G: mixed versus tall	1	169.0	1.67	0.1985
	G1: mixed versus tall	1	169.0	0.40	0.5293
	G2: mixed versus tall	1	169.0	0.04	0.8515
	Mixed: burned versus rest	1	167.8	0.00	0.9731
	Mixed: grazed versus rest	1	168.4	0.05	0.8289
	Mixed: burned-grazed versus rest	1	167.7	0.49	0.4852
	Mixed: burned versus grazed	1	130.6	0.41	0.5224
	Tall: burned versus rest	1	166.6	0.15	0.6979
	Tall: grazed versus rest	1	169.0	0.23	0.6354
	Tall: burned versus grazed	1	139.3	0.01	0.9040

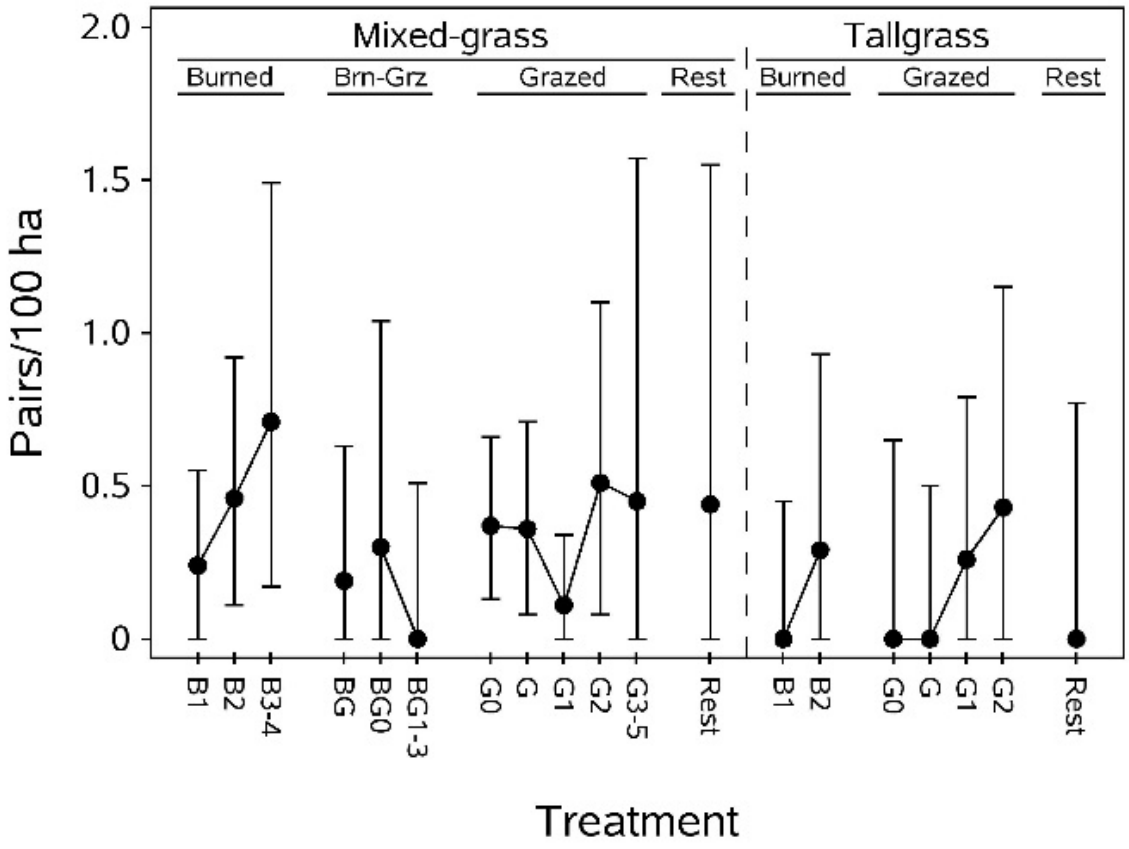
[1]Sources of variation for the model: Y=Unit(Grass type) + Grass type × Treatment + Residual, where Unit(Grass type) and Residual are random effects and Grass type × Treatment is a fixed effect in a mixed-model framework. Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 6.68. Least squares mean (standard error) densities (pairs per 100 hectares) and back-transformed least squares mean (95-percent confidence intervals) densities (pairs per 100 hectares) of northern harriers (*Circus hudsonius*), by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

				Back-transformed		
					95-percent confidence intervals	
Grass	Treatment[1]	LSMean	SE	LSMean	LCL	UCL
Mixed	B1	0.22	0.11	0.24	0.00	0.55
	B2	0.38	0.14	0.46	0.11	0.92
	B3-4	0.53	0.19	0.71	0.17	1.49
	BG	0.17	0.16	0.19	0.00	0.63
	BG0	0.26	0.23	0.30	0.00	1.04
	BG1-3	0.00	0.21	0.00	0.00	0.51
	G0	0.31	0.10	0.37	0.13	0.66
	G	0.31	0.12	0.36	0.08	0.71
	G1	0.10	0.10	0.11	0.00	0.34
	G2	0.41	0.17	0.51	0.08	1.10
	G3-5	0.37	0.29	0.45	0.00	1.57
	Rest	0.37	0.29	0.44	0.00	1.55
Tall	B1	0.00	0.19	0.00	0.00	0.45
	B2	0.25	0.21	0.29	0.00	0.93
	G0	0.00	0.25	0.00	0.00	0.65
	G	0.00	0.21	0.00	0.00	0.50
	G1	0.23	0.18	0.26	0.00	0.79
	G2	0.36	0.21	0.43	0.00	1.15
	Rest	0.00	0.29	0.00	0.00	0.77

[1]Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).



[Brn-Grz, burned-grazed]

Figure 6.34. Back-transformed least squares mean densities (pairs per 100 hectares) of northern harriers (*Circus hudsonius*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits. Treatments are defined in tables 6.67 and 6.68.

II. Sprague's Pipit (*Anthus spragueii*)

Table 6.69. Generalized linear mixed model, assuming a gamma distribution with a log link, $y = (y+1)$, testing the influence of post-management treatments on breeding densities (pairs per 100 hectares) of Sprague's pipit (*Anthus spragueii*) on two grass types (mixed-grass, tallgrass) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

Effect	Sources of variation[1]	Numerator degrees of freedom	Denominator degrees of freedom[2]	*F*-statistic	*p*-value
Overall	Grass type × treatment	18	136.4	0.67	0.8349
Contrasts:	Mixed: burned linear	1	86.6	1.15	0.2870
	Mixed: burned quadratic	1	110.1	0.02	0.8980
	Mixed: BG0 vs BG1-3	1	165.1	0.08	0.7727
	Mixed: grazed linear	1	144.9	0.21	0.6492
	Mixed: grazed quadratic	1	115.7	0.00	1.0000
	Tall: burned linear	1	143.7	0.00	1.0000
	Tall: grazed linear	1	124.1	0.00	1.0000
	Tall: grazed quadratic	1	162.7	0.00	0.9952
	B1: mixed versus tall	1	165.3	0.03	0.8685
	B2: mixed versus tall	1	164.3	1.07	0.3028
	G0: mixed versus tall	1	169.0	1.28	0.2596
	G: mixed versus tall	1	165.7	2.92	0.0894
	G1: mixed versus tall	1	168.6	0.75	0.3862
	G2: mixed versus tall	1	126.0	0.02	0.8888
	Mixed: burned versus rest	1	124.3	0.58	0.4475
	Mixed: grazed versus rest	1	131.7	0.09	0.7623
	Mixed: burned-grazed versus rest	1	168.9	2.59	0.1093
	Mixed: burned versus grazed	1	157.4	0.00	1.0000
	Tall: burned versus rest	1	168.6	0.00	1.0000
	Tall: grazed versus rest	1	146.9	0.00	1.0000
	Tall: burned versus grazed	1	86.6	1.15	0.2870

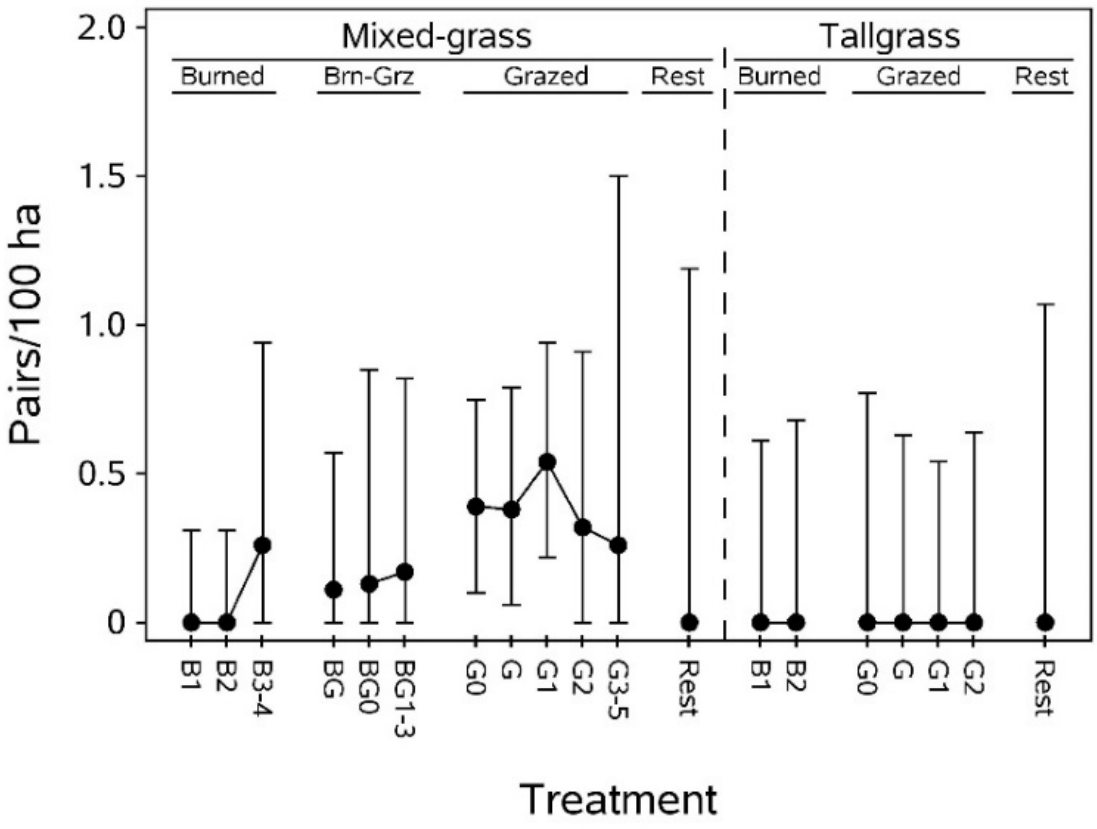
[1]Sources of variation for the model: Y=Unit(Grass type) + Grass type × Treatment + Residual, where Unit(Grass type) and Residual are random effects and Grass type × Treatment is a fixed effect in a mixed-model framework. Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).
[2]Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

Table 6.70. Least squares mean (standard error) densities (pairs per 100 hectares) and back-transformed least squares mean (95-percent confidence intervals) densities (pairs per 100 hectares) of Sprague's pipits (*Anthus spragueii*), by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[LSMean, least squares mean; SE, standard error; LCL, lower confidence limit; UCL, upper confidence limit]

				Back-transformed		
					95-percent confidence intervals	
Grass	Treatment[1]	LSMean	SE	LSMean	LCL	UCL
Mixed	B1	0.00	0.14	0.00	0.00	0.31
	B2	0.00	0.16	0.00	0.00	0.31
	B3-4	0.23	0.22	0.26	0.00	0.94
	BG	0.11	0.17	0.11	0.00	0.57
	BG0	0.12	0.25	0.13	0.00	0.85
	BG1-3	0.16	0.22	0.17	0.00	0.82
	G0	0.33	0.12	0.39	0.10	0.75
	G	0.32	0.13	0.38	0.06	0.79
	G1	0.43	0.12	0.54	0.22	0.94
	G2	0.28	0.19	0.32	0.00	0.91
	G3-5	0.23	0.35	0.26	0.00	1.50
	Rest	0.00	0.40	0.00	0.00	1.19
Tall	B1	0.00	0.24	0.00	0.00	0.61
	B2	0.00	0.26	0.00	0.00	0.68
	G0	0.00	0.29	0.00	0.00	0.77
	G	0.00	0.25	0.00	0.00	0.63
	G1	0.00	0.22	0.00	0.00	0.54
	G2	0.00	0.25	0.00	0.00	0.64
	Rest	0.00	0.37	0.00	0.00	1.07

[1]Post-management treatments were generally defined by the number of growing seasons after the management treatment (for example, B1 = first growing season after burn; B3-4, three to four growing seasons after burning; G0 = grazed during growing season; BG3 = third growing season after burned-grazed; rest = no management treatment within previous 5 years).



[Brn-Grz, burned-grazed]

Figure 6.35. Back-transformed least squares mean densities (pairs per 100 hectares) of Sprague's pipits (*Anthus spragueii*) in Native Prairie Adaptive Management (NPAM) units managed by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Bars represent 95-percent confidence limits. Treatments are defined in tables 6.69 and 6.70.

References

Gannon, J.J., Shaffer, T.L., and Moore, C.T., 2013, Native Prairie Adaptive Management—A multi-region adaptive approach to invasive plant management on Fish and Wildlife Service owned native prairies: U.S. Geological Survey Open-File Report 2013–1279, 184 p. [Also available at *https://dx.doi.org/10.3133/ofr20131279*.]

Littell, R.C., Milliken, G.A., Stroup, W.W., Wolfinger, R.D., and Schabenberger, O., 2006, SAS® for mixed models (2d ed.): Cary, N.C., SAS Institute, Inc., 814 p.

Appendix 7. Model Selection Results for Candidate Sets of Models Relating Vegetation Structure and Vegetation Composition and Other Variables to Breeding Densities (Pairs per 100 Hectares) of 23 Common Breeding Bird Species and Grassland Species of Conservation Concern on Federal Lands Managed under an Adaptive-Management Framework by the U.S. Fish and Wildlife Service in North Dakota, South Dakota, Minnesota, and Montana, 2011–13

A. Red-winged Blackbird (*Agelaius phoeniceus*)

Table 7.1. Model selection results for candidate sets of models relating vegetation structure and vegetation composition and other variables to breeding densities (pairs per 100 hectares) of red-winged blackbirds (*Agelaius phoeniceus*) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Vegetation structural models were evaluated first, and then vegetation composition and other variables were added to the vegetation structural model with the lowest AIC_C to see if they improved the model fit.

[k, number of parameters considered in the model; AIC_C, Akaike Information Criterion corrected for small samples; ΔAIC_C, difference between the model with the lowest AIC_C and each subsequent model; ω_i, Akaike weights indicating the relative likelihood of each model; VOR, vertical obstruction reading (decimeters); StandDead, cover of standing dead vegetation (percent); BareGround, cover of bare ground (percent); LitDepth, litter depth (centimeters); MaxHeight, maximum vegetation height (centimeters); DefIndex, Defoliation Index; NonNativeGrass, nonnative grass (percent); Non/NativeForb, ratio of nonnative to native forbs (percent); Brome/NativeGrass, ratio of smooth brome (*Bromus inermis*) to native grass (percent); KYBlue/NativeGrass, ratio of Kentucky bluegrass (*Poa pratensis*) to native grass (percent); Easting, eastward-measured distance (kilometer); Northing, northward-measured distance (kilometers); Area, total area surveyed for breeding birds (hectares)]

Variables[1]	k	AIC_C	ΔAIC_C	ω_i
Vegetation structural models				
Year, VOR	8	674.96	0.00	0.9992
Year, VOR, StandDead	11	689.66	14.70	0.0006
Year	5	692.85	17.89	0.0001
Year, VOR, BareGround	11	701.12	26.16	0.0000
Year, MaxHeight	8	702.56	27.60	0.0000
Year, MaxHeight, StandDead	11	718.61	43.65	0.0000
Year, MaxHeight, LitDepth	11	719.70	44.74	0.0000
Year, MaxHeight, BareGround	11	727.71	52.75	0.0000
Year, VOR, LitDepth	11	727.84	52.88	0.0000
Null	2	894.23	219.27	0.0000
Vegetation composition and other variable models				
Year, VOR	8	674.96	0.00	0.9980
Year, VOR, DefIndex	11	688.03	13.07	0.0015
Year, VOR, Non/NativeForb	11	690.07	15.11	0.0005
Year, VOR, Brome/NativeGrass, KYBlue/NativeGrass	14	698.78	23.82	0.0000
Year, VOR, NonNativeGrass	11	700.28	25.32	0.0000
Year, VOR, Northing	11	704.75	29.79	0.0000
Year, VOR, Easting	11	706.37	31.41	0.0000
Year, VOR, Area	11	708.78	33.82	0.0000

[1]Explanatory variables included Year and the listed covariates. All covariates were included in the candidate models only as interaction terms with year.

Table 7.2. Maximum likelihood parameter estimates (intercepts and slopes for each year) from model with the lowest Akaike Information Criteria (AIC_C; table 7.1) for red-winged blackbirds (*Agelaius phoeniceus*) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[SE, standard error; r, model fit; VOR, vertical obstruction reading (decimeters); ln, natural logarithm]

Model parameters					Model fit[1]
Type	Effect	Year	Parameter[2]	SE	r
Intercept	Year	2011	2.46	0.28	0.16
	Year	2012	2.27	0.21	0.40
	Year	2013	1.44	0.24	0.47
Slope	Year × VOR	2011	0.17	0.12	
	Year × VOR	2012	0.27	0.07	
	Year × VOR	2013	0.40	0.09	

[1]Correlation between observed ln(pairs per 100 hectares) and predicted ln(pairs per 100 hectares) for each year.
[2]Parameter estimates are on a log-normal scale.

B. Clay-colored Sparrow (*Spizella pallida*)

Table 7.3. Model selection results for candidate sets of models relating vegetation structure and vegetation composition and other variables to breeding densities (pairs per s100 hectares) of clay-colored sparrow (*Spizella pallida*) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Vegetation structural models were evaluated first, and then vegetation composition and other variables were added to the vegetation structural model with the lowest AIC_C to see if they improved the model fit.

[k, number of parameters considered in the model; AIC_C, Akaike Information Criterion corrected for small samples; ΔAIC_C, difference between the model with the lowest AIC_C and each subsequent model; ω_i, Akaike weights indicating the relative likelihood of each model; VOR, vertical obstruction reading (decimeters); StandDead, cover of standing dead vegetation (percent); BareGround, cover of bare ground (percent); LitDepth, litter depth (centimeters); MaxHeight, maximum vegetation height (centimeters); DefIndex, Defoliation Index; NonNativeGrass, nonnative grass (percent); Non/NativeForb, ratio of nonnative to native forbs (percent); Brome/NativeGrass, ratio of smooth brome (*Bromus inermis*) to native grass (percent); KYBlue/NativeGrass, ratio of Kentucky bluegrass (*Poa pratensis*) to native grass (percent); Easting, eastward-measured distance (kilometers); Northing, northward-measured distance (kilometers); Area, total area surveyed for breeding birds (hectares)]

Variables[1]	k	AIC_C	ΔAIC_C	ω_i
Vegetation structural models				
Year, VOR, LitDepth	11	715.96	0.00	0.97565
Year	5	724.37	8.41	0.01456
Year, VOR	8	725.17	9.21	0.00976
Year, MaxHeight, LitDepth	11	737.19	21.23	0.00002
Year, VOR, StandDead	11	739.66	23.70	0.00001
Year, VOR, BareGround	11	739.99	24.03	0.00001
Year, MaxHeight	8	748.54	32.58	0.00000
Year, MaxHeight, BareGround	11	761.33	45.37	0.00000
Year, MaxHeight, StandDead	11	763.53	47.57	0.00000
Null	2	834.78	118.82	0.00000
Vegetation composition and other variable models				
Year, VOR, LitDepth	11	715.96	0.00	0.99773
Year, VOR, LitDepth, DefIndex	14	728.92	12.96	0.00153
Year, VOR, LitDepth NonNative/Native Forb	14	730.53	14.57	0.00068
Year, VOR, LitDepth, Northing	14	735.98	20.02	0.00004
Year, VOR, LitDepth, Brome/NativeGrass, KYBlue/NativeGrass	17	740.38	24.42	0.00000
Year, VOR, LitDepth, NonNativeGrass	14	743.16	27.20	0.00000
Year, VOR, LitDepth, Area	14	748.32	32.36	0.00000
Year, VOR, LitDepth, Easting	14	753.76	37.80	0.00000

[1]Explanatory variables included Year and the listed covariates. All covariates were included in the candidate models only as interaction terms with year.

Table 7.4. Maximum likelihood parameter estimates (intercepts and slopes for each year) from model with the lowest Akaike Information Criteria (AIC_C; table 7.3) for clay-colored sparrows (*Spizella pallida*) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[SE, standard error; r, model fit; VOR, vertical obstruction reading (decimeters); LitDepth, litter depth (centimeters) ln, natural logarithm]

Model parameters					Model fit[1]
Type	Effect	Year	Parameter[2]	SE	r
Intercept	Year	2011	0.77	0.31	0.45
	Year	2012	1.77	0.23	0.29
	Year	2013	1.88	0.26	0.20
Slope	Year × VOR	2011	0.21	0.13	
	Year × VOR	2012	0.03	0.08	
	Year × VOR	2013	0.18	0.09	
	Year × LitDepth	2011	0.28	0.06	
	Year × LitDepth	2012	0.16	0.06	
	Year × LitDepth	2013	0.06	0.04	

[1]Correlation between observed ln(pairs per 100 hectares) and predicted ln(pairs per 100 hectares) for each year.
[2]Parameter estimates are on a log-normal scale.

C. Bobolink (*Dolichonyx oryzivorus*)

Table 7.5. Model selection results for candidate sets of models relating vegetation structure and vegetation composition and other variables to breeding densities (pairs per 100 hectares) of bobolinks (*Dolichonyx oryzivorus*) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Vegetation structural models were evaluated first, and then vegetation composition and other variables were added to the vegetation structural model with the lowest AIC_C to see if they improved the model fit.

[k, number of parameters considered in the model; AIC_C, Akaike Information Criterion corrected for small samples; ΔAIC_C, difference between the model with the lowest AIC_C and each subsequent model; ω_i, Akaike weights indicating the relative likelihood of each model; VOR, vertical obstruction reading (decimeters); StandDead, cover of standing dead vegetation (percent); BareGround, cover of bare ground (percent); LitDepth, litter depth (centimeters); MaxHeight, maximum vegetation height (centimeters); DefIndex, Defoliation Index; NonNativeGrass, nonnative grass (percent); Non/NativeForb, ratio of nonnative to native forbs (percent); Brome/NativeGrass, ratio of smooth brome (*Bromus inermis*) to native grass (percent); KYBlue/NativeGrass, ratio of Kentucky bluegrass (*Poa pratensis*) to native grass (percent); Easting, eastward-measured distance (kilometers); Northing, northward-measured distance (kilometers); Area, total area surveyed for breeding birds (hectares)]

Variables[1]	k	AIC_C	ΔAIC_C	ω_i
Vegetation structural models				
Year, VOR	8	686.68	0.00	0.99751
Year, MaxHeight	8	699.19	12.51	0.00192
Year, VOR, LitDepth	11	701.85	15.17	0.00051
Year, VOR, StandDead	11	706.42	19.74	0.00005
Year, VOR, BareGround	11	709.11	22.43	0.00001
Year, MaxHeight, LitDepth	11	713.62	26.94	0.00000
Year, MaxHeight, StandDead	11	720.66	33.98	0.00000
Year, MaxHeight, BareGround	11	723.67	36.99	0.00000
Year	5	755.87	69.19	0.00000
Null	2	938.79	252.11	0.00000
Vegetation composition and other variable models				
Year, VOR	8	686.68	0.00	0.98717
Year, VOR, NonNativeGrass	11	696.42	9.74	0.00757
Year, VOR, Non/NativeForb	11	697.78	11.10	0.00384
Year, VOR, DefIndex	11	700.04	13.36	0.00124
Year, VOR, Brome/NativeGrass, KYBlue/NativeGrass	14	703.91	17.23	0.00018
Year, VOR, Area	11	714.21	27.53	0.00000
Year, VOR, Northing	11	715.36	28.68	0.00000
Year, VOR, Easting	11	724.79	38.11	0.00000

[1]Explanatory variables included Year and the listed covariates. All covariates were included in the candidate models only as interaction terms with year.

Table 7.6. Maximum likelihood parameter estimates (intercepts and slopes for each year) from model with the lowest Akaike Information Criteria (AIC_C; table 7.5) for bobolinks (*Dolichonyx oryzivorus*) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[SE, standard error; r, model fit; VOR, vertical obstruction reading (decimeters); ln, natural logarithm]

Model parameters					Model fit[1]
Type	Effect	Year	Parameter[2]	SE	r
Intercept	Year	2011	0.78	0.29	0.57
	Year	2012	0.76	0.23	0.55
	Year	2013	1.23	0.25	0.52
Slope	Year × VOR	2011	0.67	0.14	
	Year × VOR	2012	0.56	0.08	
	Year × VOR	2013	0.55	0.09	

[1]Correlation between observed ln(pairs per 100 hectares) and predicted ln(pairs per 100 hectares) for each year.
[2]Parameter estimates are on a log-normal scale.

D. Grasshopper Sparrow (*Ammodramus savannarum*)

Table 7.7. Model selection results for candidate sets of models relating vegetation structure and vegetation composition and other variables to breeding densities (pairs per 100 hectares) of grasshopper sparrows (*Ammodramus savannarum*) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Vegetation structural models were evaluated first, and then vegetation composition and other variables were added to the vegetation structural model with the lowest AIC_C to see if they improved the model fit.

[k, number of parameters considered in the model; AIC_C, Akaike Information Criterion corrected for small samples; ΔAIC_C, difference between the model with the lowest AIC_C and each subsequent model; ω_i, Akaike weights indicating the relative likelihood of each model; VOR, vertical obstruction reading (decimeters); StandDead, cover of standing dead vegetation (percent); BareGround, cover of bare ground (percent); LitDepth, litter depth (centimeters); MaxHeight, maximum vegetation height (centimeters); DefIndex, Defoliation Index; NonNativeGrass, nonnative grass (percent); Non/NativeForb, ratio of nonnative to native forbs (percent); Brome/NativeGrass, ratio of smooth brome (*Bromus inermis*) to native grass (percent); KYBlue/NativeGrass, ratio of Kentucky bluegrass (*Poa pratensis*) to native grass (percent); Easting, eastward-measured distance (kilometers); Northing, northward-measured distance (kilometers); Area, total area surveyed for breeding birds (hectares)]

Variables[1]	k	AIC_C	ΔAIC_C	ω_i
Vegetation structural models:				
Year, VOR, BareGround	11	704.31	0.00	0.99856
Year, VOR, LitDepth	11	718.71	14.40	0.00075
Year, VOR	8	719.08	14.77	0.00062
Year, VOR, StandDead	11	723.44	19.13	0.00007
Year	5	741.29	36.98	0.00000
Year, MaxHeight, BareGround	11	751.37	47.06	0.00000
Year, MaxHeight, LitDepth	11	758.44	54.13	0.00000
Year, MaxHeight	8	760.23	55.92	0.00000
Year, MaxHeight, StandDead	11	763.97	59.66	0.00000
Null	2	881.89	177.58	0.00000
Vegetation composition and other variable models:				
Year, VOR, BareGround	11	704.31	0.00	0.98942
Year, VOR, BareGround, DefIndex	14	714.70	10.39	0.00549
Year, VOR, BareGround, Non/NativeForb	14	714.85	10.54	0.00509
Year, VOR, BareGround, NonNativeGrass	14	728.62	24.31	0.00001
Year, VOR, BareGround, Area	14	730.48	26.17	0.00000
Year, VOR, BareGround, Brome/NativeGrass, KYBlue/NativeGrass	17	733.42	29.11	0.00000
Year, VOR, BareGround, Easting	14	736.76	32.45	0.00000
Year, VOR, BareGround, Northing	14	745.20	40.89	0.00000

[1]Explanatory variables included Year and the listed covariates. All covariates were included in the candidate models only as interaction terms with year.

Table 7.8. Maximum likelihood parameter estimates (intercepts and slopes for each year) from model with the lowest Akaike Information Criteria (AIC_C; table 7.7) for grasshopper sparrows (*Ammodramus savannarum*) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[SE, standard error; r, model fit; VOR, vertical obstruction reading (decimeters); BareGround, cover of bare ground (percent); ln, natural logarithm]

Model parameters					Model fit[1]
Type	Effect	Year	Parameter[2]	SE	r
Intercept	Year	2011	3.02	0.34	0.44
	Year	2012	3.79	0.26	0.53
	Year	2013	3.80	0.28	0.64
Slope	Year × VOR	2011	−0.24	0.14	
	Year × VOR	2012	−0.46	0.08	
	Year × VOR	2013	−0.55	0.09	
	Year × BareGround	2011	−0.04	0.01	
	Year × BareGround	2012	−0.04	0.01	
	Year × BareGround	2013	−0.03	0.01	

[1]Correlation between observed ln(pairs per 100 hectares) and predicted ln(pairs per 100 hectares) for each year.
[2]Parameter estimates are on a log-normal scale.

E. Savannah Sparrow (*Passerculus sandwichensis*)

Table 7.9. Model selection results for candidate sets of models relating vegetation structure and vegetation composition and other variables to breeding densities (pairs per 100 hectares) of Savannah sparrows (*Passerculus sandwichensis*) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Vegetation structural models were evaluated first, and then vegetation composition and other variables were added to the vegetation structural model with the lowest AIC_C to see if they improved the model fit.

[k, number of parameters considered in the model; AIC_C, Akaike Information Criterion corrected for small samples; ΔAIC_C, difference between the model with the lowest AIC_C and each subsequent model; ω_i, Akaike weights indicating the relative likelihood of each model; VOR, vertical obstruction reading (decimeters); StandDead, cover of standing dead vegetation (percent); BareGround, cover of bare ground (percent); LitDepth, litter depth (centimeters); MaxHeight, maximum vegetation height (centimeters); DefIndex, Defoliation Index; NonNativeGrass, nonnative grass (percent); Non/NativeForb, ratio of nonnative to native forbs (percent); Brome/NativeGrass, ratio of smooth brome (*Bromus inermis*) to native grass (percent); KYBlue/NativeGrass, ratio of Kentucky bluegrass (*Poa pratensis*) to native grass (percent); Easting, eastward-measured distance (kilometers); Northing, northward-measured distance (kilometers); Area, total area surveyed for breeding birds (hectares)]

Variables[1]	k	AIC_C	ΔAIC_C	ω_i
Vegetation structural models				
Year	5	675.88	0.00	0.97276
Year, VOR	8	683.04	7.16	0.02712
Year, VOR, LitDepth	11	694.58	18.70	0.00008
Year, MaxHeight	8	696.50	20.62	0.00003
Year, VOR, BareGround	11	700.97	25.09	0.00000
Year, VOR, StandDead	11	704.62	28.74	0.00000
Year, MaxHeight, LitDepth	11	709.46	33.58	0.00000
Year, MaxHeight, BareGround	11	712.05	36.17	0.00000
Year, MaxHeight, StandDead	11	717.52	41.64	0.00000
Null	2	844.07	168.19	0.00000
Vegetation composition and other variable models				
Year	5	675.88	0.00	0.99852
Year, Non/NativeForb	8	689.69	13.81	0.00100
Year, DefIndex	8	691.28	15.40	0.00045
Year, Brome/NativeGrass, KYBlue/NativeGrass	11	697.43	21.55	0.00002
Year, Easting	8	700.62	24.74	0.00000
Year, NonNativeGrass	8	703.15	27.27	0.00000
Year, Northing	8	707.91	32.03	0.00000
Year, Area	8	709.82	33.94	0.00000

[1]Explanatory variables included Year and the listed covariates. All covariates were included in the candidate models only as interaction terms with year.

Table 7.10. Maximum likelihood parameter estimates (intercepts and slopes for each year) from model with the lowest Akaike Information Criteria (AIC_C; table 7.9) for Savannah sparrows (*Passerculus sandwichensis*) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[SE, standard error; r, model fit; NC, not computable; ln, natural logarithm]

Model parameters					Model fit[1]
Type	Effect	Year	Parameter[2]	SE	r
Intercept	Year	2011	2.26	0.15	NC
	Year	2012	2.05	0.13	NC
	Year	2013	2.47	0.13	NC

[1]Correlation between observed ln(pairs per 100 hectares) and predicted ln(pairs per 100 hectares) for each year. NC = Not computable because year is considered a discrete fixed effect.
[2]Parameter estimates are on a log-normal scale.

F. Western Meadowlark (*Sturnella neglecta*)

Table 7.11. Model selection results for candidate sets of models relating vegetation structure and vegetation composition and other variables to breeding densities (pairs per 100 hectares) of western meadowlarks (*Sturnella neglecta*) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Vegetation structural models were evaluated first, and then vegetation composition and other variables were added to the vegetation structural model with the lowest AIC_C to see if they improved the model fit.

[k, number of parameters considered in the model; AIC_C, Akaike Information Criterion corrected for small samples; ΔAIC_C, difference between the model with the lowest AIC_C and each subsequent model; ω_i, Akaike weights indicating the relative likelihood of each model; VOR, vertical obstruction reading (decimeters); StandDead, cover of standing dead vegetation (percent); BareGround, cover of bare ground (percent); LitDepth, litter depth (centimeters); MaxHeight, maximum vegetation height (centimeters); DefIndex, Defoliation Index; NonNativeGrass, nonnative grass (percent); Non/NativeForb, ratio of nonnative to native forbs (percent); Brome/NativeGrass, ratio of smooth brome (*Bromus inermis*) to native grass (percent); KYBlue/NativeGrass, ratio of Kentucky bluegrass (*Poa pratensis*) to native grass (percent); Easting, eastward-measured distance (kilometers); Northing, northward-measured distance (kilometers); Area, total area surveyed for breeding birds (hectares)]

Variables[1]	k	AIC_C	ΔAIC_C	ω_i
Vegetation structural models				
Year	5	595.91	0.00	0.99075
Year, VOR	8	605.26	9.35	0.00924
Year, MaxHeight	8	619.11	23.20	0.00001
Year, VOR, LitDepth	11	622.69	26.78	0.00000
Year, VOR, StandDead	11	627.99	32.08	0.00000
Year, VOR, BareGround	11	631.66	35.75	0.00000
Year, MaxHeight, LitDepth	11	634.69	38.78	0.00000
Year, MaxHeight, StandDead	11	642.35	46.44	0.00000
Year, MaxHeight, BareGround	11	647.03	51.12	0.00000
Null	2	751.10	155.19	0.00000
Vegetation composition and other variable models				
Year	5	595.91	0.00	0.99698
Year, DefIndex	8	607.69	11.78	0.00276
Year, Non/NativeForb	8	612.38	16.47	0.00026
Year, NonNativeGrass	8	624.76	28.85	0.00000
Year, Brome/NativeGrass, KYBlue/NativeGrass	11	626.39	30.48	0.00000
Year, Area	8	631.05	35.14	0.00000
Year, Northing	8	632.59	36.68	0.00000
Year, Easting	8	638.63	42.72	0.00000

[1]Explanatory variables included Year and the listed covariates. All covariates were included in the candidate models only as interaction terms with year.

Table 7.12. Maximum likelihood parameter estimates (intercepts and slopes for each year) from model with the lowest Akaike Information Criteria (AIC_C; table 7.11) for western meadowlarks (*Sturnella neglecta*) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[SE, standard error; r, model fit; NC, not computable; ln, natural logarithm]

Model parameters					Model fit[1]
Type	Effect	Year	Parameter[2]	SE	r
Intercept	Year	2011	2.03	0.13	NC
	Year	2012	1.99	0.11	NC
	Year	2013	2.10	0.11	NC

[1]Correlation between observed ln(pairs per 100 hectares) and predicted ln(pairs per 100 hectares) for each year. NC = Not computable because year is considered a discrete fixed effect.
[2]Parameter estimates are on a log-normal scale.

G. Brown-headed Cowbird (*Molothrus ater*)

Table 7.13. Model selection results for candidate sets of models relating vegetation structure and vegetation composition and other variables to breeding densities (pairs per 100 hectares) of brown-headed cowbirds (*Molothrus ater*) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Vegetation structural models were evaluated first, and then vegetation composition and other variables were added to the vegetation structural model with the lowest AIC_C to see if they improved the model fit.

[k, number of parameters considered in the model; AIC_C, Akaike Information Criterion corrected for small samples; ΔAIC_C, difference between the model with the lowest AIC_C and each subsequent model; ω_i, Akaike weights indicating the relative likelihood of each model; VOR, vertical obstruction reading (decimeters); StandDead, cover of standing dead vegetation (percent); BareGround, cover of bare ground (percent); LitDepth, litter depth (centimeters); MaxHeight, maximum vegetation height (centimeters); DefIndex, Defoliation Index; NonNativeGrass, nonnative grass (percent); Non/NativeForb, ratio of nonnative to native forbs (percent); Brome/NativeGrass, ratio of smooth brome (*Bromus inermis*) to native grass (percent); KYBlue/NativeGrass, ratio of Kentucky bluegrass (*Poa pratensis*) to native grass (percent); Easting, eastward-measured distance (kilometers); Northing, northward-measured distance (kilometers); Area, total area surveyed for breeding birds (hectares)]

Variables[1]	k	AIC_C	ΔAIC_C	ω_i
Vegetation structural models				
Year	5	587.62	0.00	0.99382
Year, VOR	8	597.78	10.16	0.00618
Year, MaxHeight	8	615.72	28.10	0.00000
Year, VOR, LitDept	11	616.61	28.99	0.00000
Year, VOR, StandDead	11	619.52	31.90	0.00000
Year, VOR, BareGround	11	623.48	35.86	0.00000
Year, MaxHeight, LitDepth	11	633.71	46.09	0.00000
Year, MaxHeight, StandDead	11	638.85	51.23	0.00000
Year, MaxHeight, BareGround	11	640.68	53.06	0.00000
Null	2	790.04	202.42	0.00000
Vegetation composition and other variable models				
Year	5	587.62	0.00	0.95842
Year, Brome/NativeGrass, KYBlue/NativeGrass	11	594.02	6.40	0.03907
Year, DefIndex	8	600.75	13.13	0.00135
Year, NonNativeGrass	8	602.32	14.70	0.00062
Year, Non/NativeForb	8	602.55	14.93	0.00055
Year, Area	8	620.06	32.44	0.00000
Year, Easting	8	622.11	34.49	0.00000
Year, Northing	8	624.73	37.11	0.00000

[1]Explanatory variables included Year and the listed covariates. All covariates were included in the candidate models only as interaction terms with year.

Table 7.14. Maximum likelihood parameter estimates (intercepts and slopes for each year) from model with the lowest Akaike Information Criteria (AIC_C; table 7.13) for brown-headed cowbirds (*Molothrus ater*) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[SE, standard error; r, model fit; NC, not computable; ln, natural logarithm]

Model Parameters					Model fit[1]
Type	Effect	Year	Parameter[2]	SE	r
Intercept	Year	2011	2.29	0.12	NC
	Year	2012	1.79	0.09	NC
	Year	2013	1.74	0.09	NC

[1]Correlation between observed ln(pairs per 100 hectares) and predicted ln(pairs per 100 hectares) for each year. NC = Not computable because year is considered a discrete fixed effect.
[2]Parameter estimates are on a log-normal scale.

H. Sedge Wren (*Cistothorus platensis*)

Table 7.15. Model selection results for candidate sets of models relating vegetation structure and vegetation composition and other variables to breeding densities (pairs per 100 hectares) of sedge wrens (*Cistothorus platensis*) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Vegetation structural models were evaluated first, and then vegetation composition and other variables were added to the vegetation structural model with the lowest AIC_C to see if they improved the model fit.

[k, number of parameters considered in the model; AIC_C, Akaike Information Criterion corrected for small samples; ΔAIC_C, difference between the model with the lowest AIC_C and each subsequent model; ω_i, Akaike weights indicating the relative likelihood of each model; VOR, vertical obstruction reading (decimeters); StandDead, cover of standing dead vegetation (percent); BareGround, cover of bare ground (percent); LitDepth, litter depth (centimeters); MaxHeight, maximum vegetation height (centimeters); DefIndex, Defoliation Index; NonNativeGrass, nonnative grass (percent); Non/NativeForb, ratio of nonnative to native forbs (percent); Brome/NativeGrass, ratio of smooth brome (*Bromus inermis*) to native grass (percent); KYBlue/NativeGrass, ratio of Kentucky bluegrass (*Poa pratensis*) to native grass (percent); Easting, eastward-measured distance (kilometers); Northing, northward-measured distance (kilometers); Area, total area surveyed for breeding birds (hectares)]

Variables[1]	k	AIC_C	ΔAIC_C	ω_i
Vegetation structural models				
Year, VOR, LitDepth	11	689.28	0.00	0.96575
Year, VOR	8	695.96	6.68	0.03422
Year, VOR, StandDead	11	710.58	21.30	0.00002
Year, MaxHeight, LitDepth	11	714.59	25.31	0.00000
Year, VOR, BareGround	11	716.47	27.19	0.00000
Year	5	727.79	38.51	0.00000
Year, MaxHeight	8	735.49	46.21	0.00000
Year, MaxHeight, BareGround	11	752.44	63.16	0.00000
Year, MaxHeight, StandDead	11	752.72	63.44	0.00000
Null	2	795.96	106.68	0.00000
Vegetation composition and other variable models				
Year, VOR, LitDepth	11	689.28	0.00	0.93628
Year, VOR, LitDepth, DefIndex	14	694.71	5.43	0.06199
Year, VOR, LitDepth, Non/NativeForb	14	701.86	12.58	0.00174
Year, VOR, LitDepth, NonNativeGrass	14	716.66	27.38	0.00000
Year, VOR, LitDepth, Brome/NativeGrass, KYBlue/NativeGrass	17	717.79	28.51	0.00000
Year, VOR, LitDepth, Easting	14	719.70	30.42	0.00000
Year, VOR, LitDepth, Area	14	723.27	33.99	0.00000
Year, VOR, LitDepth, Northing	14	731.91	42.63	0.00000

[1]Explanatory variables included Year and the listed covariates. All covariates were included in the candidate models only as interaction terms with year.

Table 7.16. Maximum likelihood parameter estimates (intercepts and slopes for each year) from model with the lowest Akaike Information Criteria (AIC_C; table 7.15) for sedge wrens (*Cistothorus platensis*) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[SE, standard error; r, model fit; VOR, vertical obstruction reading (decimeters); LitDepth, litter depth (centimeters); ln, natural logarithm]

Model parameters					Model fit[1]
Type	Effect	Year	Parameter[2]	SE	r
Intercept	Year	2011	0.07	0.31	0.37
	Year	2012	0.16	0.22	0.56
	Year	2013	−0.35	0.25	0.68
Slope	Year × VOR	2011	0.17	0.14	
	Year × VOR	2012	0.29	0.10	
	Year × VOR	2013	0.35	0.10	
	Year × LitDepth	2011	0.12	0.07	
	Year × LitDepth	2012	0.20	0.08	
	Year × LitDepth	2013	0.17	0.04	

[1]Correlation between observed ln(pairs per 100 hectares) and predicted ln(pairs per 100 hectares) for each year.
[2]Parameter estimates are on a log-normal scale.

I. Common Yellowthroat (*Geothlypis trichas*)

Table 7.17. Model selection results for candidate sets of models relating vegetation structure and vegetation composition and other variables to breeding densities (pairs per 100 hectares) of common yellowthroats (*Geothlypis trichas*) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Vegetation structural models were evaluated first, and then vegetation composition and other variables were added to the vegetation structural model with the lowest AIC_C to see if they improved the model fit.

[k, number of parameters considered in the model; AIC_C, Akaike Information Criterion corrected for small samples; ΔAIC_C, difference between the model with the lowest AICC and each subsequent model; ω_i, Akaike weights indicating the relative likelihood of each model; VOR, vertical obstruction reading (decimeters); StandDead, cover of standing dead vegetation (percent); BareGround, cover of bare ground (percent); LitDepth, litter depth (centimeters); MaxHeight, maximum vegetation height (centimeters); DefIndex, Defoliation Index; NonNativeGrass, nonnative grass (percent); Non/NativeForb, ratio of nonnative to native forbs (percent); Brome/NativeGrass, ratio of smooth brome (*Bromus inermis*) to native grass (percent); KYBlue/NativeGrass, ratio of Kentucky bluegrass (*Poa pratensis*) to native grass (percent); Easting, eastward-measured distance (kilometers); Northing, northward-measured distance (kilometers); Area, total area surveyed for breeding birds (hectares)]

Variables[1]	k	AIC_C	ΔAIC_C	ω_i
Vegetation structural models				
Year, VOR	8	560.69	0.00	0.97723
Year, VOR, LitDepth	11	568.21	7.52	0.02275
Year, VOR, StandDead	11	583.30	22.61	0.00001
Year, VOR, BareGround	11	589.45	28.76	0.00000
Year, MaxHeight	8	618.33	57.64	0.00000
Year, MaxHeight, LitDepth	11	618.60	57.91	0.00000
Year	5	629.26	68.57	0.00000
Year, MaxHeight, StandDead	11	642.70	82.01	0.00000
Year, MaxHeight, BareGround	11	647.23	86.54	0.00000
Null	2	709.80	149.11	0.00000
Vegetation composition and other variable models				
Year, VOR	8	560.69	0.00	0.61490
Year, VOR, DefIndex	11	561.63	0.94	0.38431
Year, VOR, Non/NativeForb	11	574.00	13.31	0.00079
Year, VOR, NonNativeGrass	11	592.78	32.09	0.00000
Year, VOR, Area	11	593.02	32.33	0.00000
Year, VOR, Brome/NativeGrass, KYBlue/NativeGrass	14	594.55	33.86	0.00000
Year, VOR, Easting	11	599.07	38.38	0.00000
Year, VOR, Northing	11	599.32	38.63	0.00000

[1]Explanatory variables included Year and the listed covariates. All covariates were included in the candidate models only as interaction terms with year.

Table 7.18. Maximum likelihood parameter estimates (intercepts and slopes for each year) from model with the lowest Akaike Information Criteria (AIC_C; table 7.17) for common yellowthroats (*Geothlypis trichas*) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[SE, standard error; r, model fit; VOR, vertical obstruction reading (decimeters); ln, natural logarithm]

Model parameters					Model fit[1]
Type	Effect	Year	Parameter[2]	SE	r
Intercept	Year	2011	0.10	0.22	0.54
	Year	2012	0.20	0.17	0.71
	Year	2013	0.13	0.19	0.66
Slope	Year × VOR	2011	0.44	0.10	
	Year × VOR	2012	0.42	0.06	
	Year × VOR	2013	0.52	0.07	

[1]Correlation between observed ln(pairs per 100 hectares) and predicted ln(pairs per 100 hectares) for each year.
[2]Parameter estimates are on a log-normal scale.

J. Chestnut-collared Longspur (*Calcarius ornatus*)

Table 7.19. Model selection results for candidate sets of models relating vegetation structure and vegetation composition and other variables to breeding densities (pairs per 100 hectares) of chestnut-collared longspurs (*Calcarius ornatus*) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Vegetation structural models were evaluated first, and then vegetation composition and other variables were added to the vegetation structural model with the lowest AIC_C to see if they improved the model fit.

[k, number of parameters considered in the model; AIC_C, Akaike Information Criterion corrected for small samples; ΔAIC_C, difference between the model with the lowest AIC_C and each subsequent model; ω_i, Akaike weights indicating the relative likelihood of each model; VOR, vertical obstruction reading (decimeters); StandDead, cover of standing dead vegetation (percent); BareGround, cover of bare ground (percent); LitDepth, litter depth (centimeters); MaxHeight, maximum vegetation height (centimeters); DefIndex, Defoliation Index; NonNativeGrass, nonnative grass (percent); Non/NativeForb, ratio of nonnative to native forbs (percent); Brome/NativeGrass, ratio of smooth brome (*Bromus inermis*) to native grass (percent); KYBlue/NativeGrass, ratio of Kentucky bluegrass (*Poa pratensis*) to native grass (percent); Easting, eastward-measured distance (kilometers); Northing, northward-measured distance (kilometers); Area, total area surveyed for breeding birds (hectares)]

Variables[1]	k	AIC_C	ΔAIC_C	ω_i
Vegetation structural models				
Year	5	625.54	0.00	0.52490
Year, VOR	8	625.76	0.22	0.47022
Year, VOR, LitDepth	11	635.32	9.78	0.00395
Null	2	638.47	12.93	0.00082
Year, MaxHeight	8	643.09	17.55	0.00008
Year, VOR, BareGround	11	645.23	19.69	0.00003
Year, VOR, StandDead	11	648.49	22.95	0.00001
Year, MaxHeight, LitDepth	11	651.87	26.33	0.00000
Year, MaxHeight, BareGround	11	662.90	37.36	0.00000
Year, MaxHeight, StandDead	11	664.70	39.16	0.00000
Vegetation composition and other variable models				
Year	5	625.54	0.00	0.99609
Year, DefIndex	8	637.68	12.14	0.00230
Year, Non/NativeForb	8	638.65	13.11	0.00142
Year, Easting	8	642.73	17.19	0.00018
Year, NonNativeGrass	8	651.03	25.49	0.00000
Year, Brome/NativeGrass, KYBlue/NativeGrass	11	655.62	30.08	0.00000
Year, Area	8	659.79	34.25	0.00000
Year, Northing	8	669.77	44.23	0.00000

[1]Explanatory variables included Year and the listed covariates. All covariates were included in the candidate models only as interaction terms with year.

Table 7.20. Maximum likelihood parameter estimates (intercepts and slopes for each year) from model with the lowest Akaike Information Criteria (AIC_C; table 7.19) for chestnut-collared longspurs (*Calcarius ornatus*) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[SE, standard error; r, model fit; NC, not computable; ln, natural logarithm]

Model Parameters					Model fit[1]
Type	Effect	Year	Parameter[2]	SE	r
Intercept	Year	2011	0.70	0.14	NC
	Year	2012	0.64	0.13	NC
	Year	2013	0.57	0.13	NC

[1]Correlation between observed ln(pairs per 100 hectares) and predicted ln(pairs per 100 hectares) for each year. NC = Not computable because year is considered a discrete fixed effect.
[2]Parameter estimates are on a log-normal scale.

K. Eastern Kingbird (*Tyrannus tyrannus*)

Table 7.21. Model selection results for candidate sets of models relating vegetation structure and vegetation composition and other variables to breeding densities (pairs per 100 hectares) of eastern kingbirds (*Tyrannus tyrannus*) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Vegetation structural models were evaluated first, and then vegetation composition and other variables were added to the vegetation structural model with the lowest AIC_C to see if they improved the model fit.

[k, number of parameters considered in the model; AIC_C, Akaike Information Criterion corrected for small samples; ΔAIC_C, difference between the model with the lowest AIC_C and each subsequent model; ω_i, Akaike weights indicating the relative likelihood of each model; VOR, vertical obstruction reading (decimeters); StandDead, cover of standing dead vegetation (percent); BareGround, cover of bare ground (percent); LitDepth, litter depth (centimeters); MaxHeight, maximum vegetation height (centimeters); DefIndex, Defoliation Index; NonNativeGrass, nonnative grass (percent); Non/NativeForb, ratio of nonnative to native forbs (percent); Brome/NativeGrass, ratio of smooth brome (*Bromus inermis*) to native grass (percent); KYBlue/NativeGrass, ratio of Kentucky bluegrass (*Poa pratensis*) to native grass (percent); Easting, eastward-measured distance (kilometers); Northing, northward-measured distance (kilometers); Area, total area surveyed for breeding birds (hectares)]

Variables[1]	k	AIC_C	ΔAIC_C	ω_i
Vegetation structural models				
Year	5	582.80	0.00	0.99868
Year, VOR	8	596.06	13.26	0.00132
Year, VOR, LitDepth	11	608.75	25.95	0.00000
Year, MaxHeight	8	609.06	26.26	0.00000
Year, MaxHeight, LitDepth	11	620.78	37.98	0.00000
Year, VOR, StandDead	11	621.35	38.55	0.00000
Year, VOR, BareGround	11	626.05	43.25	0.00000
Year, MaxHeight, StandDead	11	634.54	51.74	0.00000
Year, MaxHeight, BareGround	11	639.67	56.87	0.00000
Null	2	666.29	83.49	0.00000
Vegetation composition and other variable models				
Year	5	582.80	0.00	0.99870
Year, DefIndex	8	597.01	14.21	0.00082
Year, Non/NativeForb	8	598.09	15.29	0.00048
Year, Brome/NativeGrass, KYBlue/NativeGrass	11	612.60	29.80	0.00000
Year, NonNativeGrass	8	615.07	32.27	0.00000
Year, Area	8	617.11	34.31	0.00000
Year, Northing	8	618.97	36.17	0.00000
Year, Easting	8	622.52	39.72	0.00000

[1]Explanatory variables included Year and the listed covariates. All covariates were included in the candidate models only as interaction terms with year.

Table 7.22. Maximum likelihood parameter estimates (intercepts and slopes for each year) from model with the lowest Akaike Information Criteria (AIC_C; table 7.21) for eastern kingbirds (*Tyrannus tyrannus*) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[SE, standard error; r, model fit; NC, not computable; ln, natural logarithm]

Model parameters					Model fit[1]
Type	Effect	Year	Parameter[2]	SE	r
Intercept	Year	2011	1.14	0.12	NC
	Year	2012	1.25	0.10	NC
	Year	2013	1.18	0.10	NC

[1]Correlation between observed ln(pairs per 100 hectares) and predicted ln(pairs per 100 hectares) for each year. NC = Not computable because year is considered a discrete fixed effect.
[2]Parameter estimates are on a log-normal scale.

L. Yellow Warbler (*Setophaga petechia*)

Table 7.23. Model selection results for candidate sets of models relating vegetation structure and vegetation composition and other variables to breeding densities (pairs per 100 hectares) of yellow warblers (*Setophaga petechia*) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Vegetation structural models were evaluated first, and then vegetation composition and other variables were added to the vegetation structural model with the lowest AIC_C to see if they improved the model fit.

[k, number of parameters considered in the model; AIC_C, Akaike Information Criterion corrected for small samples; ΔAIC_C, difference between the model with the lowest AIC_C and each subsequent model; ω_i, Akaike weights indicating the relative likelihood of each model; VOR, vertical obstruction reading (decimeters); StandDead, cover of standing dead vegetation (percent); BareGround, cover of bare ground (percent); LitDepth, litter depth (centimeters); MaxHeight, maximum vegetation height (centimeters); DefIndex, Defoliation Index; NonNativeGrass, nonnative grass (percent); Non/NativeForb, ratio of nonnative to native forbs (percent); Brome/NativeGrass, ratio of smooth brome (*Bromus inermis*) to native grass (percent); KYBlue/NativeGrass, ratio of Kentucky bluegrass (*Poa pratensis*) to native grass (percent); Easting, eastward-measured distance (kilometers); Northing, northward-measured distance (kilometers); Area, total area surveyed for breeding birds (hectares)]

Variables[1]	k	AIC_C	ΔAIC_C	ω_i
Vegetation structural models				
Year	5	438.07	0.00	0.99992
Year, VOR	8	457.05	18.98	0.00008
Null	2	463.96	25.89	0.00000
Year, MaxHeight	8	474.40	36.33	0.00000
Year, VOR, LitDepth	11	478.45	40.38	0.00000
Year, VOR, StandDead	11	486.22	48.15	0.00000
Year, VOR, BareGround	11	487.24	49.17	0.00000
Year, MaxHeight, LitDepth	11	495.86	57.79	0.00000
Year, MaxHeight, StandDead	11	503.32	65.25	0.00000
Year, MaxHeight, BareGround	11	504.99	66.92	0.00000
Vegetation composition and other variable models				
Year	5	438.07	0.00	0.99621
Year, Non/NativeForb	8	449.24	11.17	0.00374
Year, DefIndex	8	457.99	19.92	0.00005
Year, Brome/NativeGrass, KYBlue/NativeGrass	11	469.39	31.32	0.00000
Year, NonNativeGrass	8	469.52	31.45	0.00000
Year, Area	8	475.56	37.49	0.00000
Year, Easting	8	480.18	42.11	0.00000
Year, Northing	8	484.19	46.12	0.00000

[1]Explanatory variables included Year and the listed covariates. All covariates were included in the candidate models only as interaction terms with year.

Table 7.24. Maximum likelihood parameter estimates (intercepts and slopes for each year) from model with the lowest Akaike Information Criteria (AIC_C; table 7.23) for yellow warblers (*Setophaga petechia*) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[SE, standard error; r, model fit; NC, not computable; ln, natural logarithm]

Model parameters					Model fit[1]
Type	Effect	Year	Parameter[2]	SE	r
Intercept	Year	2011	0.53	0.12	NC
	Year	2012	0.49	0.12	NC
	Year	2013	0.68	0.12	NC

[1]Correlation between observed ln(pairs per 100 hectares) and predicted ln(pairs per 100 hectares) for each year. NC = Not computable because year is considered a discrete fixed effect.
[2]Parameter estimates are on a log-normal scale.

M. Brewer's Blackbird (*Euphagus cyanocephalus*)

Table 7.25. Model selection results for candidate sets of models relating vegetation structure and vegetation composition and other variables to breeding densities (pairs per 100 hectares) of Brewer's blackbird (*Euphagus cyanocephalus*) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Vegetation structural models were evaluated first, and then vegetation composition and other variables were added to the vegetation structural model with the lowest AIC_C to see if they improved the model fit.

[k, number of parameters considered in the model; AIC_C, Akaike Information Criterion corrected for small samples; ΔAIC_C, difference between the model with the lowest AIC_C and each subsequent model; ω_i, Akaike weights indicating the relative likelihood of each model; VOR, vertical obstruction reading (decimeters); StandDead, cover of standing dead vegetation (percent); BareGround, cover of bare ground (percent); LitDepth, litter depth (centimeters); MaxHeight, maximum vegetation height (centimeters); DefIndex, Defoliation Index; NonNativeGrass, nonnative grass (percent); Non/NativeForb, ratio of nonnative to native forbs (percent); Brome/NativeGrass, ratio of smooth brome (*Bromus inermis*) to native grass (percent); KYBlue/NativeGrass, ratio of Kentucky bluegrass (*Poa pratensis*) to native grass (percent); Easting, eastward-measured distance (kilometers); Northing, northward-measured distance (kilometers); Area, total area surveyed for breeding birds (ha)]

Variables[1]	k	AIC_C	ΔAIC_C	ω_i
Vegetation structural models				
Year	5	654.63	0.00	0.98213
Year, VOR	8	662.74	8.11	0.01703
Year, VOR, BareGround	11	670.12	15.49	0.00043
Year, VOR, LitDepth	11	670.15	15.52	0.00042
Year, MaxHeight	8	682.78	28.15	0.00000
Year, VOR, StandDead	11	683.73	29.10	0.00000
Year, MaxHeight, BareGround	11	689.80	35.17	0.00000
Null	2	692.89	38.26	0.00000
Year, MaxHeight, LitDepth	11	693.95	39.32	0.00000
Year, MaxHeight, StandDead	11	704.06	49.43	0.00000
Vegetation composition and other variable models				
Year	5	654.63	0.00	0.99535
Year, DefIndex	8	665.72	11.09	0.00389
Year, Non/NativeForb	8	669.01	14.38	0.00075
Year, Northing	8	678.25	23.62	0.00001
Year, NonNativeGrasses	8	679.34	24.71	0.00000
Year, Area	8	681.63	27.00	0.00000
Year, Brome/NativeGrass, KYBlue/NativeGrass	11	684.65	30.02	0.00000
Year, Easting	8	689.16	34.53	0.00000

[1]Explanatory variables included Year and the listed covariates. All covariates were included in the candidate models only as interaction terms with year.

Table 7.26. Maximum likelihood parameter estimates (intercepts and slopes for each year) from model with the lowest Akaike Information Criteria (AIC_C; table 7.25) for Brewer's blackbird (*Euphagus cyanocephalus*) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[SE, standard error; r, model fit; not computable; ln, natural logarithm]

Model parameters					Model fit[1]
Type	Effect	Year	Parameter[2]	SE	r
Intercept	Year	2011	0.97	0.14	NC
	Year	2012	0.59	0.11	NC
	Year	2013	0.46	0.11	NC

[1]Correlation between observed ln(pairs per 100 hectares) and predicted ln(pairs per 100 hectares) for each year. NC = Not computable because year is considered a discrete fixed effect.
[2]Parameter estimates are on a log-normal scale.

N. Common Grackle (*Quiscalus quiscula*)

Table 7.27. Model selection results for candidate sets of models relating vegetation structure and vegetation composition and other variables to breeding densities (pairs per 100 hectares) of common grackle (*Quiscalus quiscula*) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Vegetation structural models were evaluated first, and then vegetation composition and other variables were added to the vegetation structural model with the lowest AIC_C to see if they improved the model fit.

[k, number of parameters considered in the model; AIC_C, Akaike Information Criterion corrected for small samples; ΔAIC_C, difference between the model with the lowest AIC_C and each subsequent model; ω_i, Akaike weights indicating the relative likelihood of each model; VOR, vertical obstruction reading (decimeters); StandDead, cover of standing dead vegetation (percent); BareGround, cover of bare ground (percent); LitDepth, litter depth (centimeters); MaxHeight, maximum vegetation height (centimeters); DefIndex, Defoliation Index; NonNativeGrass, nonnative grass (percent); Non/NativeForb, ratio of nonnative to native forbs (percent); Brome/NativeGrass, ratio of smooth brome (*Bromus inermis*) to native grass (percent); KYBlue/NativeGrass, ratio of Kentucky bluegrass (*Poa pratensis*) to native grass (percent); Easting, eastward-measured distance (kilometers); Northing, northward-measured distance (kilometers); Area, total area surveyed for breeding birds (hectares)]

Variables[1]	k	AIC_C	ΔAIC_C	ω_i
Vegetation structural models				
Year	5	660.48	0.00	0.99375
Year, VOR	8	670.62	10.14	0.00624
Year, VOR, LitDepth	11	683.50	23.02	0.00001
Year, MaxHeight	8	688.37	27.89	0.00000
Year, VOR, StandDead	11	694.54	34.06	0.00000
Year, VOR, BareGround	11	696.06	35.58	0.00000
Year, MaxHeight, LitDepth	11	698.84	38.36	0.00000
Null	2	709.19	48.71	0.00000
Year, MaxHeight, StandDead	11	712.10	51.62	0.00000
Year, MaxHeight, BareGround	11	713.23	52.75	0.00000
Vegetation composition and other variable models				
Year	5	660.48	0.00	0.98705
Year, DefIndex	8	669.86	9.38	0.00907
Year, Non/NativeForb	8	671.56	11.08	0.00388
Year, NonNativeGrass	8	685.48	25.00	0.00000
Year, Brome/NativeGrass, KYBlue/NativeGrass	11	689.63	29.15	0.00000
Year, Area	8	693.70	33.22	0.00000
Year, Easting	8	697.50	37.02	0.00000
Year, Northing	8	704.30	43.82	0.00000

[1]Explanatory variables included Year and the listed covariates. All covariates were included in the candidate models only as interaction terms with year.

Table 7.28. Maximum likelihood parameter estimates (intercepts and slopes for each year) from model with the lowest Akaike Information Criteria (AIC_C; table 7.27) for common grackles (*Quiscalus quiscula*) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[SE, standard error; r, model fit; NC, not computable; ln, natural logarithm]

Model parameters					Model fit[1]
Type	Effect	Year	Parameter[2]	SE	r
Intercept	Year	2011	0.47	0.13	NC
	Year	2012	0.81	0.11	NC
	Year	2013	0.68	0.11	NC

[1]Correlation between observed ln(pairs per 100 hectares) and predicted ln(pairs per 100 hectares) for each year. NC = Not computable because year is considered a discrete fixed effect.
[2]Parameter estimates are on a log-normal scale.

O. Yellow-headed Blackbird (*Xanthocephalus xanthocephalus*)

Table 7.29. Model selection results for candidate sets of models relating vegetation structure and vegetation composition and other variables to breeding densities (pairs per 100 hectares) of yellow-headed blackbirds (*Xanthocephalus xanthocephalus*) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Vegetation structural models were evaluated first, and then vegetation composition and other variables were added to the vegetation structural model with the lowest AIC_C to see if they improved the model fit.

[k, number of parameters considered in the model; AIC_C, Akaike Information Criterion corrected for small samples; ΔAIC_C, difference between the model with the lowest AIC_C and each subsequent model; ω_i, Akaike weights indicating the relative likelihood of each model; VOR, vertical obstruction reading (decimeters); StandDead, cover of standing dead vegetation (percent); BareGround, cover of bare ground (percent); LitDepth, litter depth (centimeters); MaxHeight, maximum vegetation height (centimeters); DefIndex, Defoliation Index; NonNativeGrass, nonnative grass (percent); Non/NativeForb, ratio of nonnative to native forbs (percent); Brome/NativeGrass, ratio of smooth brome (*Bromus inermis*) to native grass (percent); KYBlue/NativeGrass, ratio of Kentucky bluegrass (*Poa pratensis*) to native grass (percent); Easting, eastward-measured distance (kilometers); Northing, northward-measured distance (kilometers); Area, total area surveyed for breeding birds (hectares)]

Variables[1]	k	AIC_C	ΔAIC_C	ω_i
Vegetation structural models				
Year	5	612.56	0.00	0.98191
Year, VOR	8	620.55	7.99	0.01807
Year, MaxHeight	8	635.62	23.06	0.00001
Year, VOR, LitDepth	11	637.70	25.14	0.00000
Year, VOR, StandDead	11	642.96	30.40	0.00000
Year, VOR, BareGround	11	645.79	33.23	0.00000
Year, MaxHeight, LitDepth	11	653.06	40.50	0.00000
Year, MaxHeight, StandDead	11	658.93	46.37	0.00000
Year, MaxHeight, BareGround	11	661.64	49.08	0.00000
Null	2	667.69	55.13	0.00000
Vegetation composition and other variable models				
Year	5	612.56	0.00	0.99457
Year, Non/NativeForb	8	623.08	10.52	0.00517
Year, DefIndex	8	629.22	16.66	0.00024
Year, Brome/NativeGrass, KYBlue/NativeGrass	11	633.95	21.39	0.00002
Year, Area	8	639.54	26.98	0.00000
Year, NonNativeGrass	11	639.60	27.04	0.00000
Year, Northing	8	640.34	27.78	0.00000
Year, Easting	8	654.58	42.02	0.00000

[1]Explanatory variables included Year and the listed covariates. All covariates were included in the candidate models only as interaction terms with year.

Table 7.30. Maximum likelihood parameter estimates (intercepts and slopes for each year) from model with the lowest Akaike Information Criteria (AIC_C; table 7.29) for yellow-headed blackbirds (*Xanthocephalus xanthocephalus*) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[SE, standard error; r, model fit; NC, not computable; ln, natural logarithm]

Model parameters					Model fit[1]
Type	Effect	Year	Parameter[2]	SE	r
Intercept	Year	2011	0.94	0.12	NC
	Year	2012	0.64	0.10	NC
	Year	2013	0.29	0.10	NC

[1]Correlation between observed ln(pairs per 100 hectares) and predicted ln(pairs per 100 hectares) for each year. NC = Not computable because year is considered a discrete fixed effect.
[2]Parameter estimates are on a log-normal scale.

P. Song Sparrow (*Melospiza melodia*)

Table 7.31. Model selection results for candidate sets of models relating vegetation structure and vegetation composition and other variables to breeding densities (pairs per 100 hectares) of song sparrows (*Melospiza melodia*) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Vegetation structural models were evaluated first, and then vegetation composition and other variables were added to the vegetation structural model with the lowest AIC_C to see if they improved the model fit.

[k, number of parameters considered in the model; AIC_C, Akaike Information Criterion corrected for small samples; ΔAIC_C, difference between the model with the lowest AIC_C and each subsequent model; ω_i, Akaike weights indicating the relative likelihood of each model; VOR, vertical obstruction reading (decimeters); StandDead, cover of standing dead vegetation (percent); BareGround, cover of bare ground (percent); LitDepth, litter depth (centimeters); MaxHeight, maximum vegetation height (centimeters); DefIndex, Defoliation Index; NonNativeGrass, nonnative grass (percent); Non/NativeForb, ratio of nonnative to native forbs (percent); Brome/NativeGrass, ratio of smooth brome (*Bromus inermis*) to native grass (percent); KYBlue/NativeGrass, ratio of Kentucky bluegrass (*Poa pratensis*) to native grass (percent); Easting, eastward-measured distance (kilometers); Northing, northward-measured distance (kilometers); Area, total area surveyed for breeding birds (hectares)]

Variables[1]	k	AIC_C	ΔAIC_C	ω_i
Vegetation structural models				
Year	5	542.53	0.00	0.98210
Year, VOR	8	550.54	8.01	0.01790
Year, VOR, LitDepth	11	569.94	27.41	0.00000
Year, MaxHeight	8	570.95	28.42	0.00000
Year, VOR, StandDead	11	574.06	31.53	0.00000
Year, VOR, BareGround	11	579.81	37.28	0.00000
Null	2	581.95	39.42	0.00000
Year, MaxHeight, LitDepth	11	590.18	47.65	0.00000
Year, MaxHeight, StandDead	11	594.65	52.12	0.00000
Year, MaxHeight, BareGround	11	601.30	58.77	0.00000
Vegetation composition and other variable models				
Year	5	542.53	0.00	0.99969
Year, Non/NativeForb	8	559.73	17.20	0.00018
Year, DefIndex	8	560.53	18.00	0.00012
Year, NonNativeGrass	8	570.23	27.70	0.00000
Year, Brome/NativeGrass, KYBlue/NativeGrass	11	576.45	33.92	0.00000
Year, Area	8	576.91	34.38	0.00000
Year, Easting	8	582.56	40.03	0.00000
Year, Northing	8	586.04	43.51	0.00000

[1]Explanatory variables included Year and the listed covariates. All covariates were included in the candidate models only as interaction terms with year.

Table 7.32. Maximum likelihood parameter estimates (intercepts and slopes for each year) from model with the lowest Akaike Information Criteria (AIC_C; table 7.31) for song sparrows (*Melospiza melodia*) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[SE, standard error; r, model fit; NC, not computable; ln, natural logarithm]

Model parameters					Model fit[1]
Type	Effect	Year	Parameter[2]	SE	r
Intercept	Year	2011	0.47	0.11	NC
	Year	2012	0.76	0.09	NC
	Year	2013	0.57	0.09	NC

[1]Correlation between observed ln(pairs per 100 hectares) and predicted ln(pairs per 100 hectares) for each year. NC = Not computable because year is considered a discrete fixed effect.
[2]Parameter estimates are on a log-normal scale.

Q. American Goldfinch (*Spinus tristis*)

Table 7.33. Model selection results for candidate sets of models relating vegetation structure and vegetation composition and other variables to breeding densities (pairs per 100 hectares) of American goldfinches (*Spinus tristis*) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Vegetation structural models were evaluated first, and then vegetation composition and other variables were added to the vegetation structural model with the lowest AIC_C to see if they improved the model fit.

[k, number of parameters considered in the model; AIC_C, Akaike Information Criterion corrected for small samples; ΔAIC_C, difference between the model with the lowest AIC_C and each subsequent model; ω_i, Akaike weights indicating the relative likelihood of each model; VOR, vertical obstruction reading (decimeters); StandDead, cover of standing dead vegetation (percent); BareGround, cover of bare ground (percent); LitDepth, litter depth (centimeters); MaxHeight, maximum vegetation height (centimeters); DefIndex, Defoliation Index; NonNativeGrass, nonnative grass (percent); Non/NativeForb, ratio of nonnative to native forbs (percent); Brome/NativeGrass, ratio of smooth brome (*Bromus inermis*) to native grass (percent); KYBlue/NativeGrass, ratio of Kentucky bluegrass (*Poa pratensis*) to native grass (percent); Easting, eastward-measured distance (kilometers); Northing, northward-measured distance (kilometers); Area, total area surveyed for breeding birds (hectares)]

Variables[1]	k	AIC_C	ΔAIC_C	ω_i
Vegetation structural models				
Year, VOR	8	515.08	0.00	0.94514
Year	5	520.78	5.70	0.05467
Year, MaxHeight	8	532.72	17.64	0.00014
Year, VOR, LitDepth	11	535.10	20.02	0.00004
Year, VOR, StandDead	11	538.38	23.30	0.00001
Year, VOR, BareGround	11	545.25	30.17	0.00000
Year, MaxHeight, LitDepth	11	551.97	36.89	0.00000
Year, MaxHeight, StandDead	11	555.46	40.38	0.00000
Year, MaxHeight, BareGround	11	562.33	47.25	0.00000
Null	2	574.10	59.02	0.00000
Vegetation composition and other variable models				
Year, VOR	8	515.08	0.00	0.99953
Year, VOR, Non/NativeForb	11	531.39	16.31	0.00029
Year, VOR DefIndex	11	532.33	17.25	0.00018
Year, VOR, NonNativeGrass	11	539.23	24.15	0.00001
Year, VOR, Brome/NativeGrass, KYBlue/NativeGrass	14	544.98	29.90	0.00000
Year, VOR Easting	11	549.58	34.50	0.00000
Year, VOR Area	11	551.23	36.15	0.00000
Year, VOR Northing	11	561.04	45.96	0.00000

[1]Explanatory variables included Year and the listed covariates. All covariates were included in the candidate models only as interaction terms with year.

Table 7.34. Maximum likelihood parameter estimates (intercepts and slopes for each year) from model with the lowest Akaike Information Criteria (AIC_C; table 7.33) for American goldfinches (*Spinus tristis*) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[SE, standard error; r, model fit; VOR, vertical obstruction reading (decimeters); ln, natural logarithm]

Model parameters					Model fit[1]
Type	Effect	Year	Parameter[2]	SE	r
Intercept	Year	2011	0.50	0.19	0.21
	Year	2012	0.54	0.15	0.30
	Year	2013	0.46	0.17	-0.17
Slope	Year × VOR	2011	0.02	0.09	
	Year × VOR	2012	0.10	0.05	
	Year × VOR	2013	−0.01	0.06	

[1]Correlation between observed ln(pairs per 100 hectares) and predicted ln(pairs per 100 hectares) for each year.
[2]Parameter estimates are on a log-normal scale.

R. Upland Sandpiper (*Bartramia longicauda*)

Table 7.35. Model selection results for candidate sets of models relating vegetation structure and vegetation composition and other variables to breeding densities (pairs per 100 hectares) of upland sandpipers (*Bartramia longicauda*) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Vegetation structural models were evaluated first, and then vegetation composition and other variables were added to the vegetation structural model with the lowest AIC_C to see if they improved the model fit.

[k, number of parameters considered in the model; AIC_C, Akaike Information Criterion corrected for small samples; ΔAIC_C, difference between the model with the lowest AIC_C and each subsequent model; ω_i, Akaike weights indicating the relative likelihood of each model; VOR, vertical obstruction reading (decimeters); StandDead, cover of standing dead vegetation (percent); BareGround, cover of bare ground (percent); LitDepth, litter depth (centimeters); MaxHeight, maximum vegetation height (centimeters); DefIndex, Defoliation Index; NonNativeGrass, nonnative grass (percent); Non/NativeForb, ratio of nonnative to native forbs (percent); Brome/NativeGrass, ratio of smooth brome (*Bromus inermis*) to native grass (percent); KYBlue/NativeGrass, ratio of Kentucky bluegrass (*Poa pratensis*) to native grass (percent); Easting, eastward-measured distance (kilometers); Northing, northward-measured distance (kilometers); Area, total area surveyed for breeding birds (hectares)]

Variables[1]	k	AIC_C	ΔAIC_C	ω_i
Vegetation structural models				
Year, VOR, LitDepth	11	509.47	0.00	0.83459
Year, VOR	8	512.73	3.26	0.16352
Year	5	522.20	12.73	0.00144
Year, VOR, BareGround	11	524.75	15.28	0.00040
Year, VOR, StandDead	11	529.08	19.61	0.00005
Year, MaxHeight, LitDepth	11	532.56	23.09	0.00001
Year, MaxHeight	8	536.44	26.97	0.00000
Year, MaxHeight, BareGround	11	549.47	40.00	0.00000
Year, MaxHeight, StandDead	11	554.78	45.31	0.00000
Null	2	601.69	92.22	0.00000
Vegetation composition and other variable models				
Year, VOR, LitDepth	11	509.47	0.00	0.99958
Year, VOR, LitDepth, NonNative/Native Forb	14	525.87	16.40	0.00027
Year, VOR, LitDepth, DefIndex	14	527.23	17.76	0.00014
Year, VOR, LitDepth, NonNativeGrass	14	535.63	26.16	0.00000
Year, VOR, LitDepth, Area	14	543.61	34.14	0.00000
Year, VOR, LitDepth, Brome/NativeGrass, KYBlue/NativeGrass	17	544.16	34.69	0.00000
Year, VOR, LitDepth, Northing	14	547.79	38.32	0.00000
Year, VOR, LitDepth, Easting	14	553.88	44.41	0.00000

[1]Explanatory variables included Year and the listed covariates. All covariates were included in the candidate models only as interaction terms with year.

Table 7.36. Maximum likelihood parameter estimates (intercepts and slopes for each year) from model with the lowest Akaike Information Criteria (AIC_C; table 7.35) for upland sandpipers (*Bartramia longicauda*) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[SE, standard error; r, model fit; VOR, vertical obstruction reading (decimeters); LitDepth, litter depth (centimeters); ln, natural logarithm]

Model parameters					Model fit[1]
Type	Effect	Year	Parameter[2]	SE	r
Intercept	Year	2011	1.13	0.20	0.31
	Year	2012	1.26	0.15	0.51
	Year	2013	1.12	0.16	0.36
Slope	Year × VOR	2011	−0.13	0.09	
	Year × VOR	2012	0.01	0.07	
	Year × VOR	2013	−0.22	0.06	
	Year × LitDepth	2011	−0.09	0.04	
	Year × LitDepth	2012	−0.23	0.05	
	Year × LitDepth	2013	−0.01	0.03	

[1]Correlation between observed ln(pairs per 100 hectares) and predicted ln(pairs per 100 hectares) for each year.
[2]Parameter estimates are on a log-normal scale.

S. Killdeer (*Charadrius vociferus*)

Table 7.37. Model selection results for candidate sets of models relating vegetation structure and vegetation composition and other variables to breeding densities (pairs per 100 hectares) of killdeer (*Charadrius vociferus*) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Vegetation structural models were evaluated first, and then vegetation composition and other variables were added to the vegetation structural model with the lowest AIC_C to see if they improved the model fit.

[k, number of parameters considered in the model; AIC_C, Akaike Information Criterion corrected for small samples; ΔAIC_C, difference between the model with the lowest AIC_C and each subsequent model; ω_i, Akaike weights indicating the relative likelihood of each model; VOR, vertical obstruction reading (decimeters); StandDead, cover of standing dead vegetation (percent); BareGround, cover of bare ground (percent); LitDepth, litter depth (centimeters); MaxHeight, maximum vegetation height (centimeters); DefIndex, Defoliation Index; NonNativeGrass, nonnative grass (percent); Non/NativeForb, ratio of nonnative to native forbs (percent); Brome/NativeGrass, ratio of smooth brome (*Bromus inermis*) to native grass (percent); KYBlue/NativeGrass, ratio of Kentucky bluegrass (*Poa pratensis*) to native grass (percent); Easting, eastward-measured distance (kilometers); Northing, northward-measured distance (kilometers); Area, total area surveyed for breeding birds (hectares)]

Variables[1]	k	AIC_C	ΔAIC_C	ω_i
Vegetation structural models				
Year, VOR	8	514.11	0.00	0.95679
Year	5	520.53	6.42	0.03861
Year, MaxHeight	8	525.03	10.92	0.00407
Year, VOR, StandDead	11	529.27	15.16	0.00049
Year, VOR, LitDepth	11	534.18	20.07	0.00004
Year, VOR, BareGround	11	541.90	27.79	0.00000
Year, MaxHeight, StandDead	11	543.26	29.15	0.00000
Year, MaxHeight, LitDepth	11	544.98	30.87	0.00000
Year, MaxHeight, BareGround	11	552.30	38.19	0.00000
Null	2	580.49	66.38	0.00000
Vegetation composition and other variable models				
Year, VOR	8	514.11	0.00	0.99958
Year, VOR, Non/NativeForb	11	530.61	16.50	0.00026
Year, VOR DefIndex	11	531.76	17.65	0.00015
Year, VOR, NonNativeGrass	11	536.49	22.38	0.00001
Year, VOR Brome/NativeGrass, KYBlue/NativeGrass	14	541.30	27.19	0.00000
Year, VOR Northing	11	543.65	29.54	0.00000
Year, VOR Area	11	547.60	33.49	0.00000
Year, VOR Easting	11	552.66	38.55	0.00000

[1]Explanatory variables included Year and the listed covariates. All covariates were included in the candidate models only as interaction terms with year.

Table 7.38. Maximum likelihood parameter estimates (intercepts and slopes for each year) from model with the lowest Akaike Information Criteria (AIC_C; table 7.37) for killdeer (*Charadrius vociferus*) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[SE, standard error; r, model fit; VOR, vertical obstruction reading (decimeters); ln, natural logarithm]

Model parameters					Model fit[1]
Type	Effect	Year	Parameter[2]	SE	r
Intercept	Year	2011	0.85	0.20	0.26
	Year	2012	1.26	0.16	0.35
	Year	2013	0.43	0.17	0.15
Slope	Year × VOR	2011	−0.20	0.09	
	Year × VOR	2012	−0.22	0.05	
	Year × VOR	2013	−0.10	0.06	

[1]Correlation between observed ln(pairs per 100 hectares) and predicted ln(pairs per 100 hectares) for each year.
[2]Parameter estimates are on a log-normal scale.

T. Tree Swallow (*Tachycineta bicolor*)

Table 7.39. Model selection results for candidate sets of models relating vegetation structure and vegetation composition and other variables to breeding densities (pairs per 100 hectares) of tree swallows (*Tachycineta bicolor*) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Vegetation structural models were evaluated first, and then vegetation composition and other variables were added to the vegetation structural model with the lowest AIC_C to see if they improved the model fit.

[k, number of parameters considered in the model; AIC_C, Akaike Information Criterion corrected for small samples; ΔAIC_C, difference between the model with the lowest AIC_C and each subsequent model; ω_i, Akaike weights indicating the relative likelihood of each model; VOR, vertical obstruction reading (decimeters); StandDead, cover of standing dead vegetation (percent); BareGround, cover of bare ground (percent); LitDepth, litter depth (centimeters); MaxHeight, maximum vegetation height (centimeters); DefIndex, Defoliation Index; NonNativeGrass, nonnative grass (percent); Non/NativeForb, ratio of nonnative to native forbs (percent); Brome/NativeGrass, ratio of smooth brome (*Bromus inermis*) to native grass (percent); KYBlue/NativeGrass, ratio of Kentucky bluegrass (*Poa pratensis*) to native grass (percent); Easting, eastward-measured distance (kilometers); Northing, northward-measured distance (kilometers); Area, total area surveyed for breeding birds (hectares)]

Variables[1]	k	AIC_C	ΔAIC_C	ω_i
Vegetation structural models				
Year	5	503.86	0.00	0.98803
Year, VOR	8	512.69	8.83	0.01195
Year, MaxHeight	8	526.18	22.32	0.00001
Year, VOR, LitDepth	11	530.46	26.60	0.00000
Year, VOR, BareGround	11	536.61	32.75	0.00000
Year, VOR, StandDead	11	543.08	39.22	0.00000
Null	11	544.40	40.54	0.00000
Year, MaxHeight, LitDepth	2	549.26	45.40	0.00000
Year, MaxHeight, BareGround	11	549.68	45.82	0.00000
Year, MaxHeight, StandDead	11	556.68	52.82	0.00000
Vegetation composition and other variable models				
Year	5	503.86	0.00	0.99903
Year, Non/NativeForb	8	518.20	14.34	0.00077
Year, DefIndex	8	522.33	18.47	0.00010
Year, NonNativeGrass	8	535.94	32.08	0.00000
Year, Brome/NativeGrass, KYBlue/NativeGrass	8	537.30	33.44	0.00000
Year, Area	8	539.14	35.28	0.00000
Year, Northing	11	539.81	35.95	0.00000
Year, Easting	8	543.68	39.82	0.00000

[1]Explanatory variables included Year and the listed covariates. All covariates were included in the candidate models only as interaction terms with year.

Table 7.40. Maximum likelihood parameter estimates (intercepts and slopes for each year) from model with the lowest Akaike Information Criteria (AIC_C; table 7.39) for tree swallows (*Tachycineta bicolor*) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[SE, standard error; r, model fit; NC, not computable; ln, natural logarithm]

Model parameters					Model fit[1]
Type	Effect	Year	Parameter[2]	SE	r
Intercept	Year	2011	0.36	0.09	NC
	Year	2012	0.54	0.08	NC
	Year	2013	0.42	0.08	NC

[1]Correlation between observed ln(pairs per 100 hectares) and predicted ln(pairs per 100 hectares) for each year. NC = Not computable because year is considered a discrete fixed effect.
[2]Parameter estimates are on a log-normal scale.

U. Barn Swallow (*Hirundo rustica*)

Table 7.41. Model selection results for candidate sets of models relating vegetation structure and vegetation composition and other variables to breeding densities (pairs per 100 hectares) of barn swallows (*Hirundo rustica*) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Vegetation structural models were evaluated first, and then vegetation composition and other variables were added to the vegetation structural model with the lowest AIC_C to see if they improved the model fit.

[k, number of parameters considered in the model; AIC_C, Akaike Information Criterion corrected for small samples; ΔAIC_C, difference between the model with the lowest AIC_C and each subsequent model; ω_i, Akaike weights indicating the relative likelihood of each model; VOR, vertical obstruction reading (decimeters); StandDead, cover of standing dead vegetation (percent); BareGround, cover of bare ground (percent); LitDepth, litter depth (centimeters); MaxHeight, maximum vegetation height (centimeters); DefIndex, Defoliation Index; NonNativeGrass, nonnative grass (percent); Non/NativeForb, ratio of nonnative to native forbs (percent); Brome/NativeGrass, ratio of smooth brome (*Bromus inermis*) to native grass (percent); KYBlue/NativeGrass, ratio of Kentucky bluegrass (*Poa pratensis*) to native grass (percent); Easting, eastward-measured distance (kilometers); Northing, northward-measured distance (kilometers); Area, total area surveyed for breeding birds (hectares)]

Variables[1]	k	AIC_C	ΔAIC_C	ω_i
Vegetation structural models				
Year	5	510.94	0.00	0.99459
Year, VOR	8	521.37	10.43	0.00541
Year, MaxHeight	8	537.06	26.12	0.00000
Year, VOR, LitDepth	11	538.60	27.66	0.00000
Year, VOR, BareGround	11	544.23	33.29	0.00000
Year, VOR, StandDead	11	545.69	34.75	0.00000
Null	2	551.54	40.60	0.00000
Year, MaxHeight, LitDepth	11	553.49	42.55	0.00000
Year, MaxHeight, BareGround	11	558.24	47.30	0.00000
Year, MaxHeight, StandDead	11	561.22	50.28	0.00000
Vegetation composition and other variable models				
Year	5	510.94	0.00	0.99964
Year, Non/NativeForb	8	527.83	16.89	0.00021
Year, DefIndex	8	528.56	17.62	0.00015
Year, NonNativeGrass	8	542.07	31.13	0.00000
Year, Brome/NativeGrass, KYBlue/NativeGrass	11	543.13	32.19	0.00000
Year, Area	8	545.31	34.37	0.00000
Year, Northing	8	549.79	38.85	0.00000
Year, Easting	8	553.43	42.49	0.00000

[1]Explanatory variables included Year and the listed covariates. All covariates were included in the candidate models only as interaction terms with year.

Table 7.42. Maximum likelihood parameter estimates (intercepts and slopes for each year) from model with the lowest Akaike Information Criteria (AIC_C; table 7.41) for barn swallows (*Hirundo rustica*) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[SE, standard error; r, model fit; NC, not computable; ln, natural logarithm]

Model parameters					Model fit[1]
Type	Effect	Year	Parameter[2]	SE	r
Intercept	Year	2011	0.42	0.10	NC
	Year	2012	0.52	0.08	NC
	Year	2013	0.48	0.08	NC

[1]Correlation between observed ln(pairs per 100 hectares) and predicted ln(pairs per 100 hectares) for each year. NC = Not computable because year is considered a discrete fixed effect.
[2]Parameter estimates are on a log-normal scale.

V. Mourning Dove (*Zenaida macroura*)

Table 7.43. Model selection results for candidate sets of models relating vegetation structure and vegetation composition and other variables to breeding densities (pairs per 100 hectares) of mourning doves (*Zenaida macroura*) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Vegetation structural models were evaluated first, and then vegetation composition and other variables were added to the vegetation structural model with the lowest AIC_C to see if they improved the model fit.

[k, number of parameters considered in the model; AIC_C, Akaike Information Criterion corrected for small samples; ΔAIC_C, difference between the model with the lowest AIC_C and each subsequent model; ω_i, Akaike weights indicating the relative likelihood of each model; VOR, vertical obstruction reading (decimeters); StandDead, cover of standing dead vegetation (percent); BareGround, cover of bare ground (percent); LitDepth, litter depth (centimeters); MaxHeight, maximum vegetation height (centimeters); DefIndex, Defoliation Index; NonNativeGrass, nonnative grass (percent); Non/NativeForb, ratio of nonnative to native forbs (percent); Brome/NativeGrass, ratio of smooth brome (*Bromus inermis*) to native grass (percent); KYBlue/NativeGrass, ratio of Kentucky bluegrass (*Poa pratensis*) to native grass (percent); Easting, eastward-measured distance (kilometers); Northing, northward-measured distance (kilometers); Area, total area surveyed for breeding birds (hectares)]

Variables[1]	k	AIC_C	ΔAIC_C	ω_i
Vegetation structural models				
Year	5	446.90	0.00	0.85630
Year, VOR	8	450.47	3.57	0.14369
Year, MaxHeight	8	470.68	23.78	0.00001
Year, VOR, LitDepth	11	471.11	24.21	0.00000
Year, VOR, StandDead	11	476.68	29.78	0.00000
Year, VOR, BareGround	11	480.56	33.66	0.00000
Null	2	481.73	34.83	0.00000
Year, MaxHeight, LitDepth	11	491.28	44.38	0.00000
Year, MaxHeight, StandDead	11	496.72	49.82	0.00000
Year, MaxHeight, BareGround	11	499.66	52.76	0.00000
Vegetation composition and other variable models				
Year	5	446.90	0.00	0.99715
Year, DefIndex	8	459.28	12.38	0.00204
Year, Non/NativeForb	8	461.14	14.24	0.00081
Year, NonNativeGrass	8	479.86	32.96	0.00000
Year, Brome/NativeGrass, KYBlue/NativeGrass	11	483.37	36.47	0.00000
Year, Area	8	483.66	36.76	0.00000
Year, Easting	8	489.35	42.45	0.00000
Year, Northing	8	494.48	47.58	0.00000

[1]Explanatory variables included Year and the listed covariates. All covariates were included in the candidate models only as interaction terms with year.

Table 7.44. Maximum likelihood parameter estimates (intercepts and slopes for each year) from model with the lowest Akaike Information Criteria (AIC_C; table 7.43) for mourning doves (*Zenaida macroura*) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[SE, standard error; r, model fit; NC, not computable; ln, natural logarithm]

Model parameters					Model fit[1]
Type	Effect	Year	Parameter[2]	SE	r
Intercept	Year	2011	0.46	0.08	NC
	Year	2012	0.37	0.07	NC
	Year	2013	0.43	0.07	NC

[1]Correlation between observed ln(pairs per 100 hectares) and predicted ln(pairs per 100 hectares) for each year. NC = Not computable because year is considered a discrete fixed effect.
[2]Parameter estimates are on a log-normal scale.

W. Ring-necked Pheasant (*Phasianus colchicus*)

Table 7.45. Model selection results for candidate sets of models relating vegetation structure and vegetation composition and other variables to breeding densities (pairs per 100 hectares) of ring-necked pheasants (*Phasianus colchicus*) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13. Vegetation structural models were evaluated first, and then vegetation composition and other variables were added to the vegetation structural model with the lowest AIC_C to see if they improved the model fit.

[k, number of parameters considered in the model; AIC_C, Akaike Information Criterion corrected for small samples; ΔAIC_C, difference between the model with the lowest AIC_C and each subsequent model; ω_i, Akaike weights indicating the relative likelihood of each model; VOR, vertical obstruction reading (decimeters); StandDead, cover of standing dead vegetation (percent); BareGround, cover of bare ground (percent); LitDepth, litter depth (centimeters); MaxHeight, maximum vegetation height (centimeters); DefIndex, Defoliation Index; NonNativeGrass, nonnative grass (percent); Non/NativeForb, ratio of nonnative to native forbs (percent); Brome/NativeGrass, ratio of smooth brome (*Bromus inermis*) to native grass (percent); KYBlue/NativeGrass, ratio of Kentucky bluegrass (*Poa pratensis*) to native grass (percent); Easting, eastward-measured distance (kilometers); Northing, northward-measured distance (kilometers); Area, total area surveyed for breeding birds (hectares)]

Variables[1]	k	AIC_C	ΔAIC_C	ω_i
Vegetation structural models				
Year	5	440.92	0.00	0.61648
Year, VOR	8	441.87	0.95	0.38338
Year, MaxHeight	8	457.85	16.93	0.00013
Year, VOR, LitDepth	11	462.37	21.45	0.00001
Year, VOR, StandDead	11	466.15	25.23	0.00000
Year, VOR, BareGround	11	472.29	31.37	0.00000
Year, MaxHeight, LitDepth	11	478.46	37.54	0.00000
Year, MaxHeight, StandDead	11	482.43	41.51	0.00000
Year, MaxHeight, BareGround	11	488.49	47.57	0.00000
Null	2	490.21	49.29	0.00000
Vegetation composition and other variable models				
Year	5	440.92	0.00	0.99976
Year, Non/NativeForb	8	458.48	17.56	0.00015
Year, DefIndex	8	460.88	19.96	0.00005
Year, NonNativeGrass	8	461.87	20.95	0.00003
Year, Northing	8	463.32	22.40	0.00001
Year, Brome/NativeGrass, KYBlue/NativeGrass	11	473.33	32.41	0.00000
Year, Area	8	478.12	37.20	0.00000
Year, Easting	8	481.81	40.89	0.00000

[1]Explanatory variables included Year and the listed covariates. All covariates were included in the candidate models only as interaction terms with year.

Table 7.46. Maximum likelihood parameter estimates (intercepts and slopes for each year) from model with the lowest Akaike Information Criteria (AIC_C; table 7.45) for ring-necked pheasants (*Phasianus colchicus*) on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon and others, 2013) in North Dakota, South Dakota, Minnesota, and Montana, 2011–13.

[SE, standard error; r, model fit; NC, not computable; ln, natural logarithm]

Model parameters					Model fit[1]
Type	Effect	Year	Parameter[2]	SE	r
Intercept	Year	2011	0.25	0.08	NC
	Year	2012	0.57	0.07	NC
	Year	2013	0.32	0.07	NC

[1]Correlation between observed ln(pairs per 100 hectares) and predicted ln(pairs per 100 hectares) for each year. NC = Not computable because year is considered a discrete fixed effect.
[2]Parameter estimates are on a log-normal scale.

References

Gannon, J.J., Shaffer, T.L., and Moore, C.T., 2013, Native Prairie Adaptive Management—A multi-region adaptive approach to invasive plant management on Fish and Wildlife Service owned native prairies: U.S. Geological Survey Open-File Report 2013–1279, 184 p. [Also available at *https://dx.doi.org/10.3133/ofr20131279*.]