

**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 ( $0.05 < p \leq 0.10$ )]

Effect	Sources of variation <sup>1</sup>	Numerator degrees of freedom	Denominator degrees of freedom <sup>2</sup>	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

<sup>1</sup>Sources of variation for the model:  $Y = \text{Unit}(\text{Grass type}) + \text{Grass type} \times \text{Treatment} + \text{Residual}$ , where  $\text{Unit}(\text{Grass type})$  and  $\text{Residual}$  are random effects and  $\text{Grass type} \times \text{Treatment}$  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).

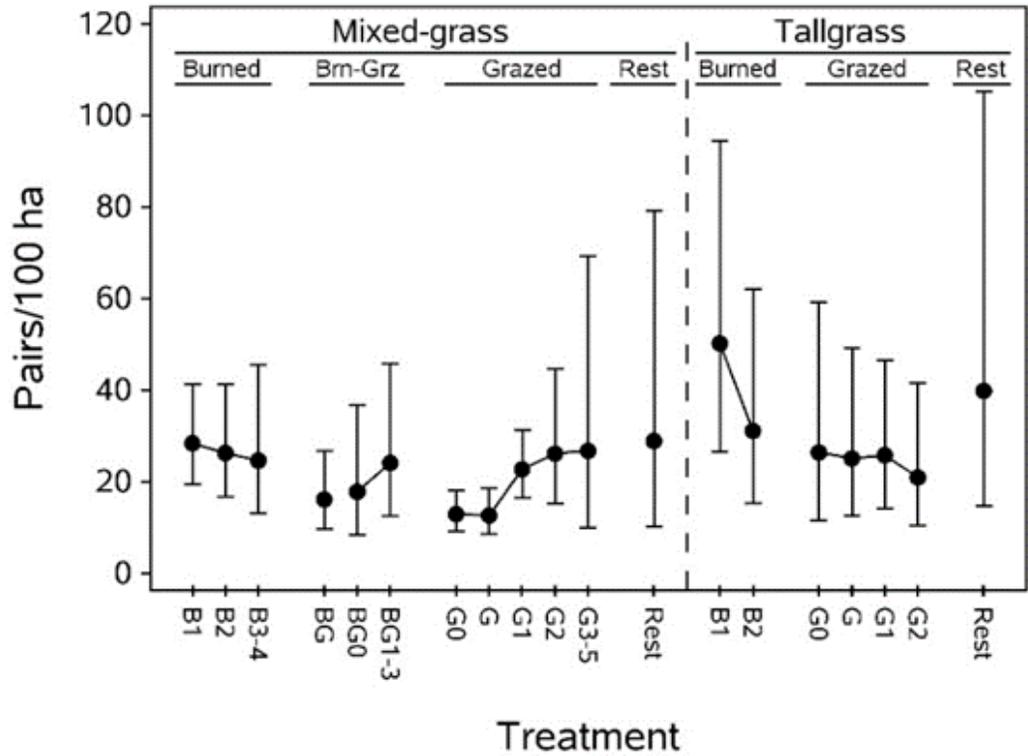
<sup>2</sup>Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

**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]

Grass	Treatment <sup>1</sup>	LSMean	SE	Back-transformed		
				LSMean	95-percent confidence intervals	
				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

<sup>1</sup>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 <sup>1</sup>	Numerator degrees of freedom	Denominator degrees of freedom <sup>2</sup>	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	

<sup>1</sup>Sources of variation for the model:  $Y = \text{Unit}(\text{Grass type}) + \text{Grass type} \times \text{Treatment} + \text{Residual}$ , where  $\text{Unit}(\text{Grass type})$  and  $\text{Residual}$  are random effects and  $\text{Grass type} \times \text{Treatment}$  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).

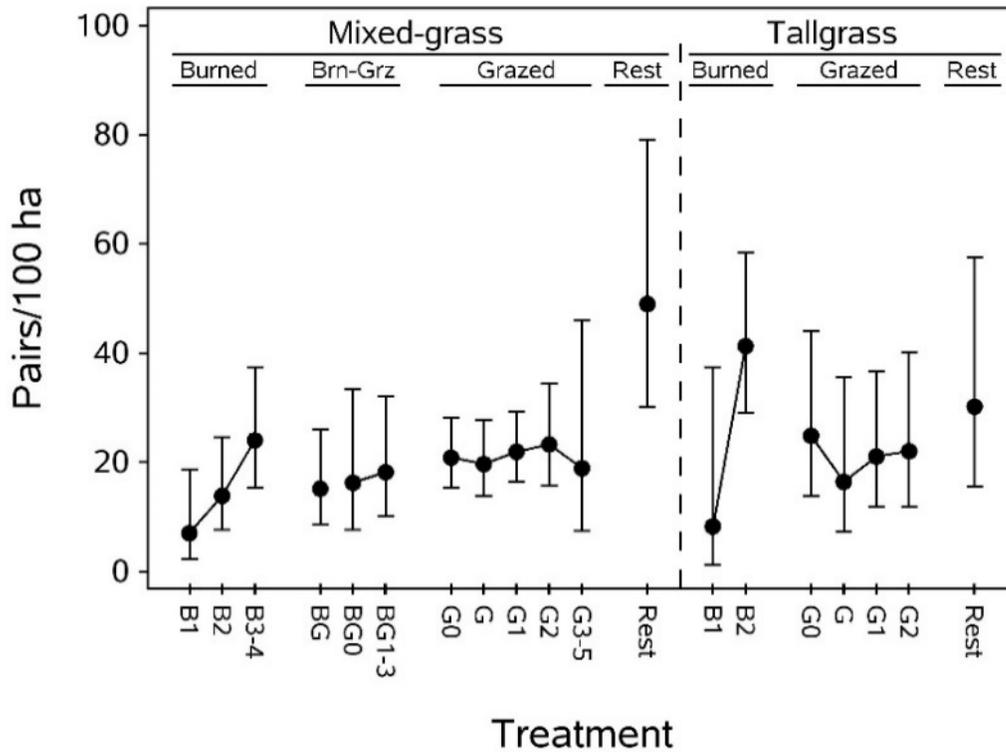
<sup>2</sup>Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

**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]

Grass	Treatment <sup>1</sup>	LSMean	SE	Back-transformed		
				LSMean	95-percent confidence intervals	
				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

<sup>1</sup>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 ( $0.05 < p \leq 0.10$ ); \*\*, evidence for strong effect ( $p \leq 0.05$ )]

Effect	Sources of variation <sup>1</sup>	Numerator degrees of freedom	Denominator degrees of freedom <sup>2</sup>	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	

<sup>1</sup>Sources of variation for the model:  $Y = \text{Unit}(\text{Grass type}) + \text{Grass type} \times \text{Treatment} + \text{Residual}$ , where  $\text{Unit}(\text{Grass type})$  and  $\text{Residual}$  are random effects and  $\text{Grass type} \times \text{Treatment}$  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).

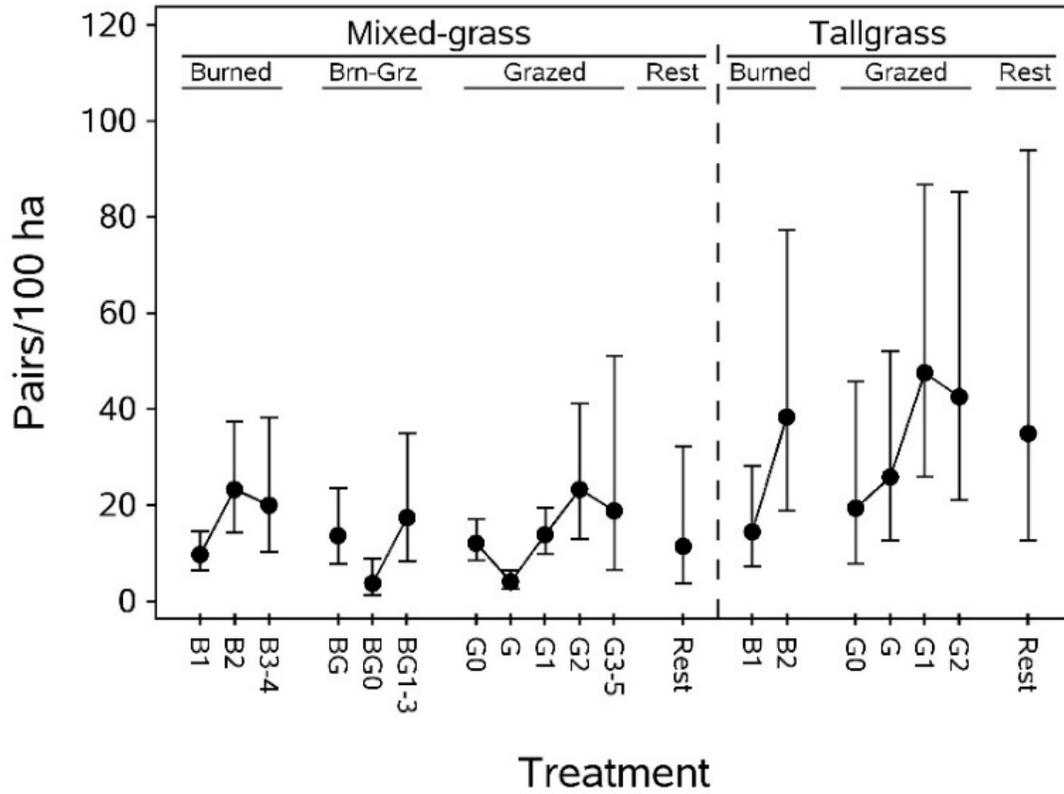
<sup>2</sup>Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

**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]

Grass	Treatment <sup>1</sup>	LSMean	SE	Back-transformed		
				LSMean	95-percent confidence intervals	
				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

<sup>1</sup>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 ( $0.05 < p \leq 0.10$ ); \*\*, evidence for strong effect ( $p \leq 0.05$ )]

Effect	Sources of variation <sup>1</sup>	Numerator degrees of freedom	Denominator degrees of freedom <sup>2</sup>	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**	

<sup>1</sup>Sources of variation for the model:  $Y = \text{Unit}(\text{Grass type}) + \text{Grass type} \times \text{Treatment} + \text{Residual}$ , where  $\text{Unit}(\text{Grass type})$  and  $\text{Residual}$  are random effects and  $\text{Grass type} \times \text{Treatment}$  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).

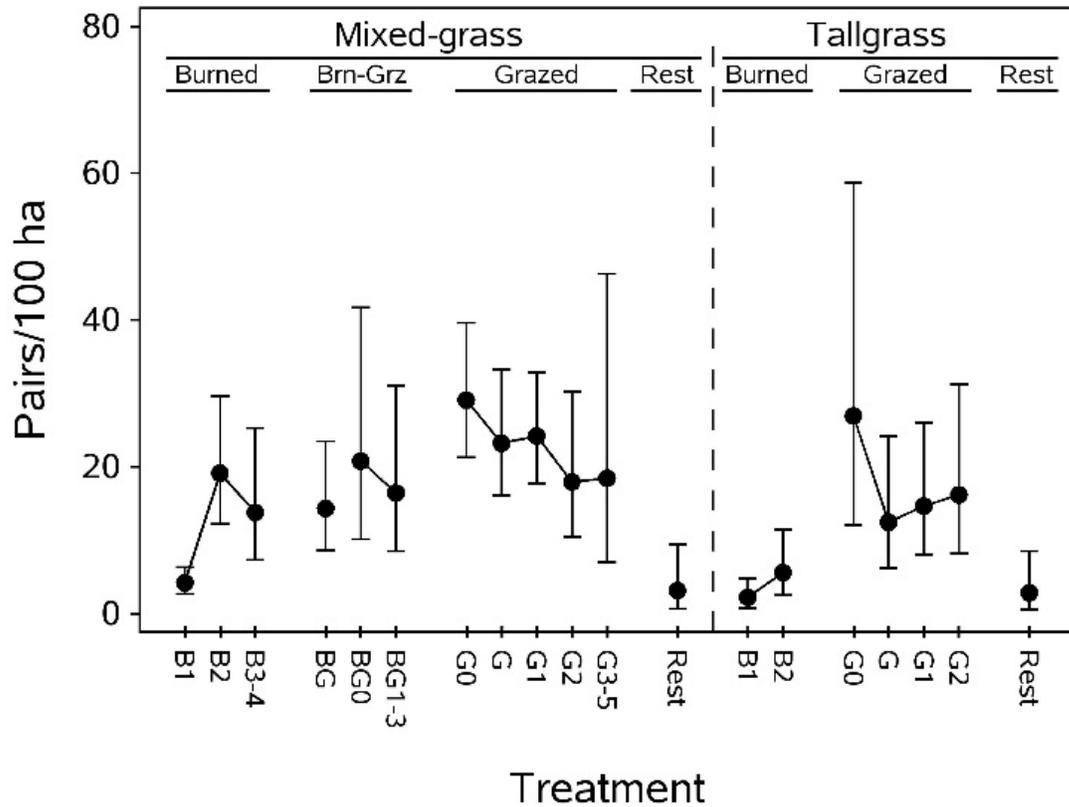
<sup>2</sup>Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

**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]

Grass	Treatment <sup>1</sup>	LSMean	SE	Back-transformed		
				LSMean	95-percent confidence intervals	
				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

<sup>1</sup>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 ( $0.05 < p \leq 0.10$ ); \*\*, evidence for strong effect ( $p \leq 0.05$ )]

Effect	Sources of variation <sup>1</sup>	Numerator degrees of freedom	Denominator degrees of freedom <sup>2</sup>	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	

<sup>1</sup>Sources of variation for the model:  $Y = \text{Unit}(\text{Grass type}) + \text{Grass type} \times \text{Treatment} + \text{Residual}$ , where  $\text{Unit}(\text{Grass type})$  and  $\text{Residual}$  are random effects and  $\text{Grass type} \times \text{Treatment}$  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).

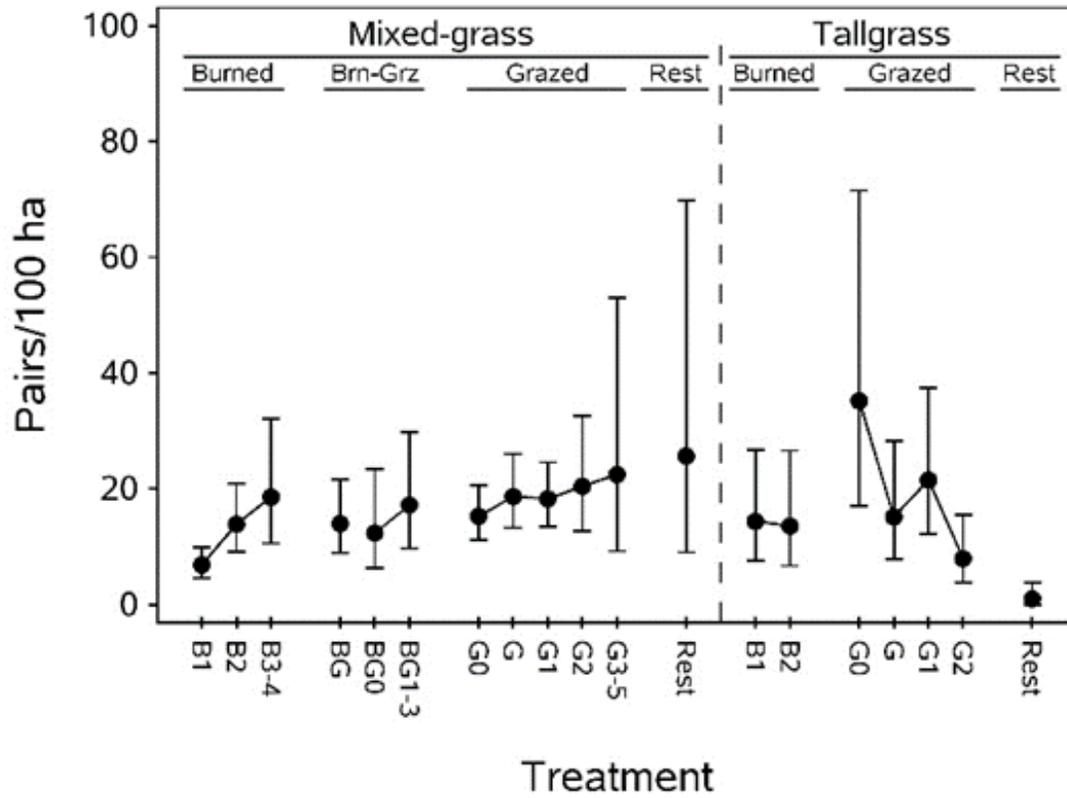
<sup>2</sup>Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

**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]

Grass	Treatment <sup>1</sup>	LSMean	SE	Back-transformed		
				LSMean	95-percent confidence intervals	
				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

<sup>1</sup>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 ( $0.05 < p \leq 0.10$ ); \*\*, evidence for strong effect ( $p \leq 0.05$ )]

Effect	Sources of variation <sup>1</sup>	Numerator degrees of freedom	Denominator degrees of freedom <sup>2</sup>	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:  $Y = \text{Unit}(\text{Grass type}) + \text{Grass type} \times \text{Treatment} + \text{Residual}$ , 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).

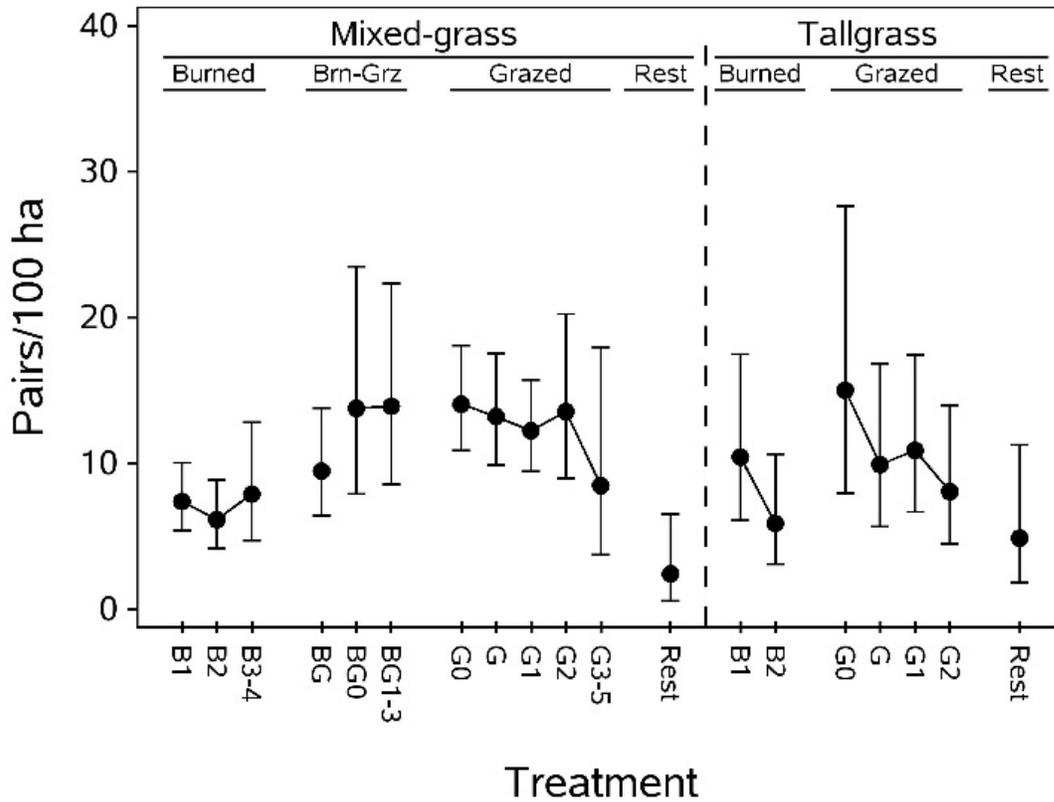
<sup>2</sup>Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

**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]

Grass	Treatment <sup>1</sup>	LSMean	SE	Back-transformed		
				LSMean	95-percent confidence intervals	
				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

<sup>1</sup>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) 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 <sup>1</sup>	Numerator degrees of freedom	Denominator degrees of freedom <sup>2</sup>	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

<sup>1</sup>Sources of variation for the model:  $Y = \text{Unit}(\text{Grass type}) + \text{Grass type} \times \text{Treatment} + \text{Residual}$ , where  $\text{Unit}(\text{Grass type})$  and  $\text{Residual}$  are random effects and  $\text{Grass type} \times \text{Treatment}$  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).

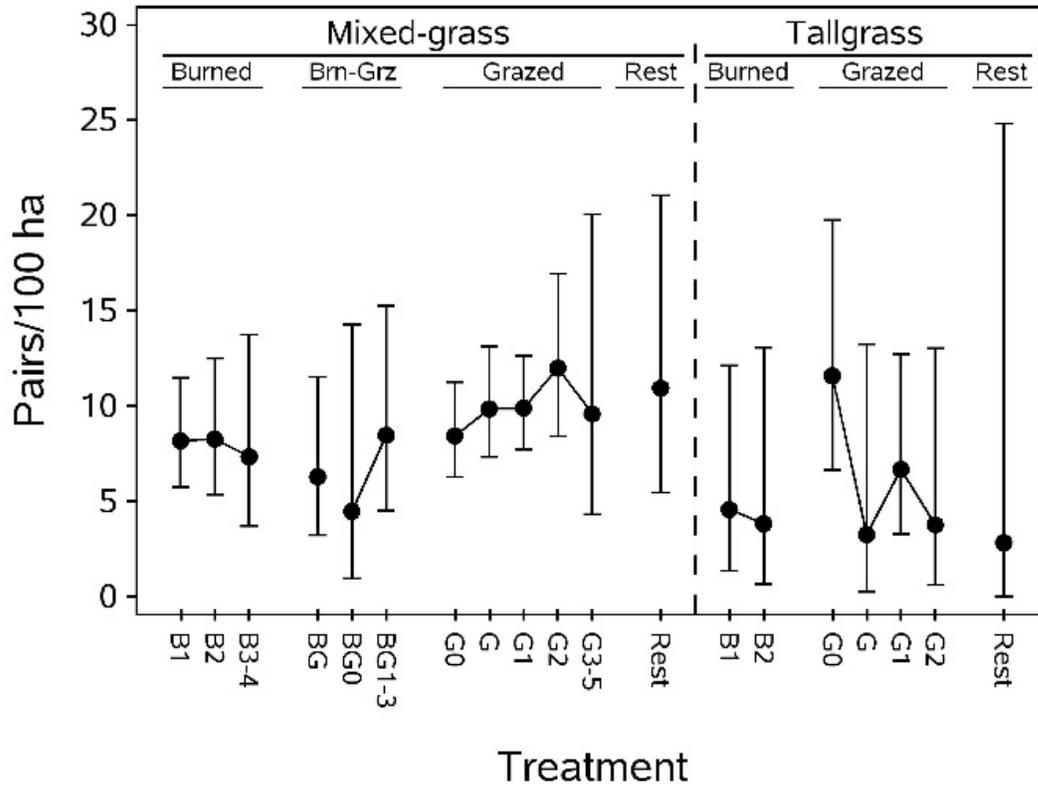
<sup>2</sup>Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

**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]

Grass	Treatment <sup>1</sup>	LSMean	SE	Back-transformed		
				LSMean	95-percent confidence intervals	
				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

<sup>1</sup>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) 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 ( $0.05 < p \leq 0.10$ ); \*\*, evidence for strong effect ( $p \leq 0.05$ )]

Effect	Sources of variation <sup>1</sup>	Numerator degrees of freedom	Denominator degrees of freedom <sup>2</sup>	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	

<sup>1</sup>Sources of variation for the model:  $Y = \text{Unit}(\text{Grass type}) + \text{Grass type} \times \text{Treatment} + \text{Residual}$ , where  $\text{Unit}(\text{Grass type})$  and  $\text{Residual}$  are random effects and  $\text{Grass type} \times \text{Treatment}$  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).

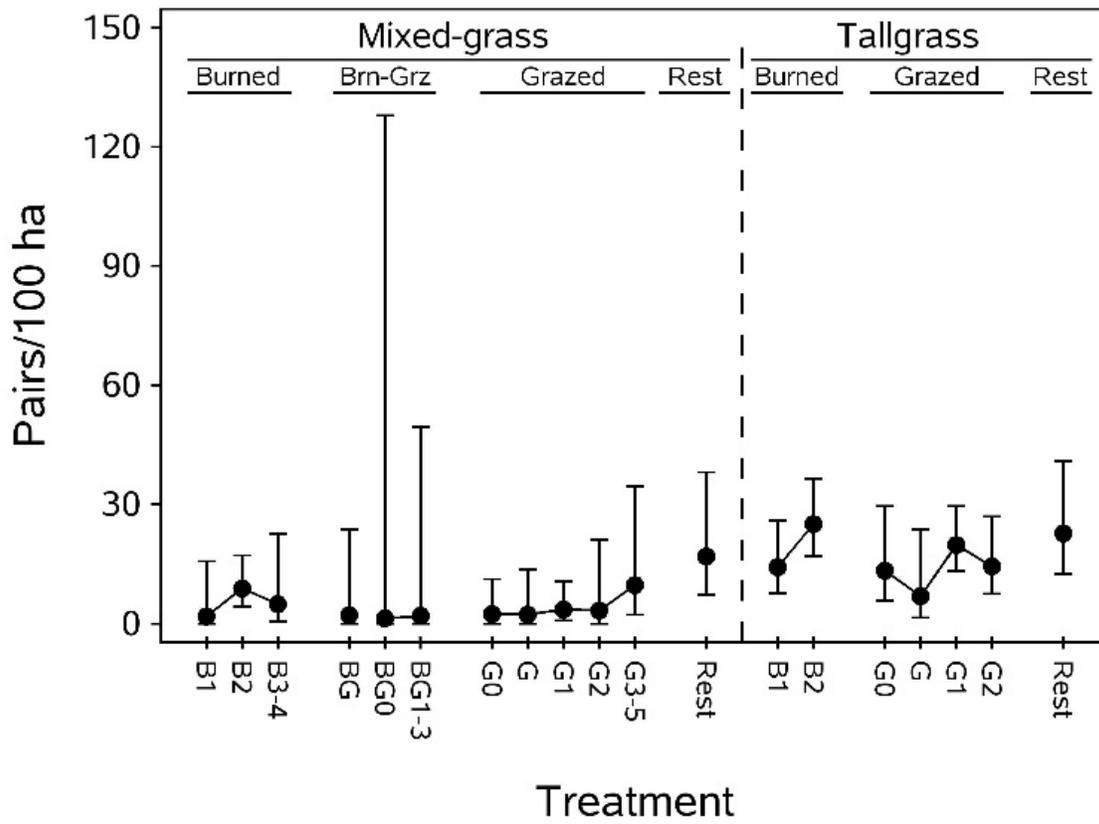
<sup>2</sup>Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

**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]

Grass	Treatment <sup>1</sup>	LSMean	SE	Back-transformed		
				LSMean	95-percent confidence intervals	
				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

<sup>1</sup>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 ( $0.05 < p \leq 0.10$ ); \*\*, evidence for strong effect ( $p \leq 0.05$ )]

Effect	Sources of variation <sup>1</sup>	Numerator degrees of freedom	Denominator degrees of freedom <sup>2</sup>	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	

<sup>1</sup>Sources of variation for the model:  $Y = \text{Unit}(\text{Grass type}) + \text{Grass type} \times \text{Treatment} + \text{Residual}$ , where  $\text{Unit}(\text{Grass type})$  and  $\text{Residual}$  are random effects and  $\text{Grass type} \times \text{Treatment}$  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).

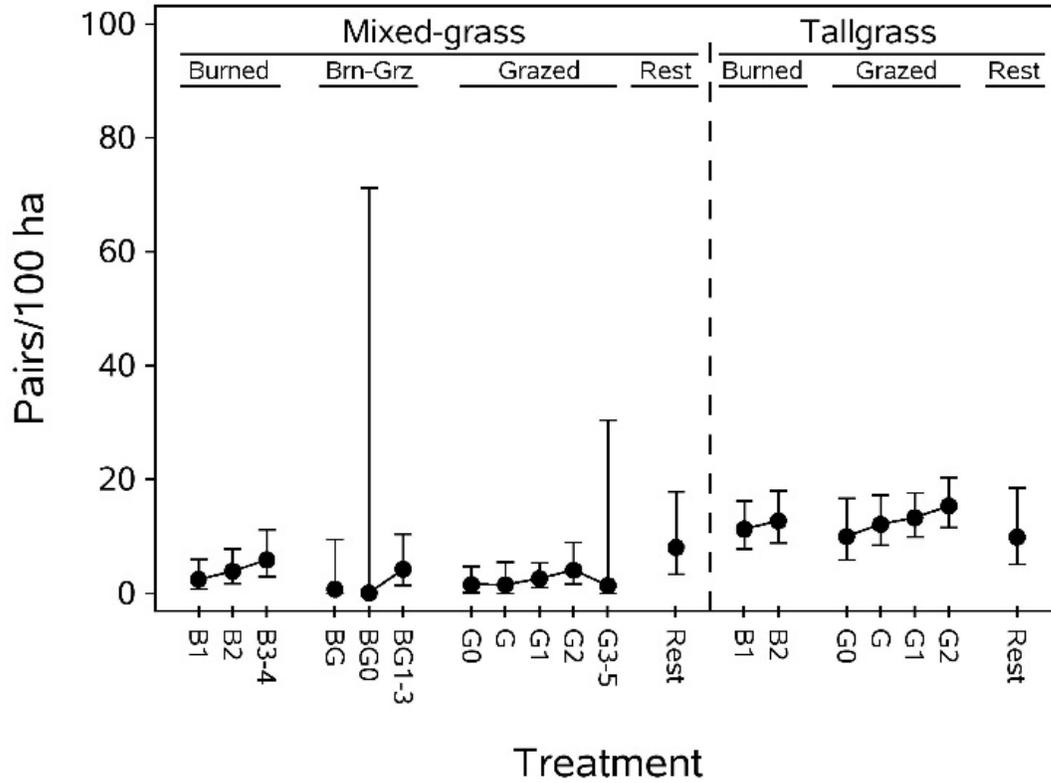
<sup>2</sup>Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

**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]

Grass	Treatment <sup>1</sup>	LSMean	SE	Back-transformed		
				LSMean	95-percent confidence intervals	
				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

<sup>1</sup>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 ( $0.05 < p \leq 0.10$ ); \*\*, evidence for strong effect ( $p \leq 0.05$ )]

Effect	Sources of variation <sup>1</sup>	Numerator degrees of freedom	Denominator degrees of freedom <sup>2</sup>	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	

<sup>1</sup>Sources of variation for the model:  $Y = \text{Unit}(\text{Grass type}) + \text{Grass type} \times \text{Treatment} + \text{Residual}$ , where  $\text{Unit}(\text{Grass type})$  and  $\text{Residual}$  are random effects and  $\text{Grass type} \times \text{Treatment}$  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).

<sup>2</sup>Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

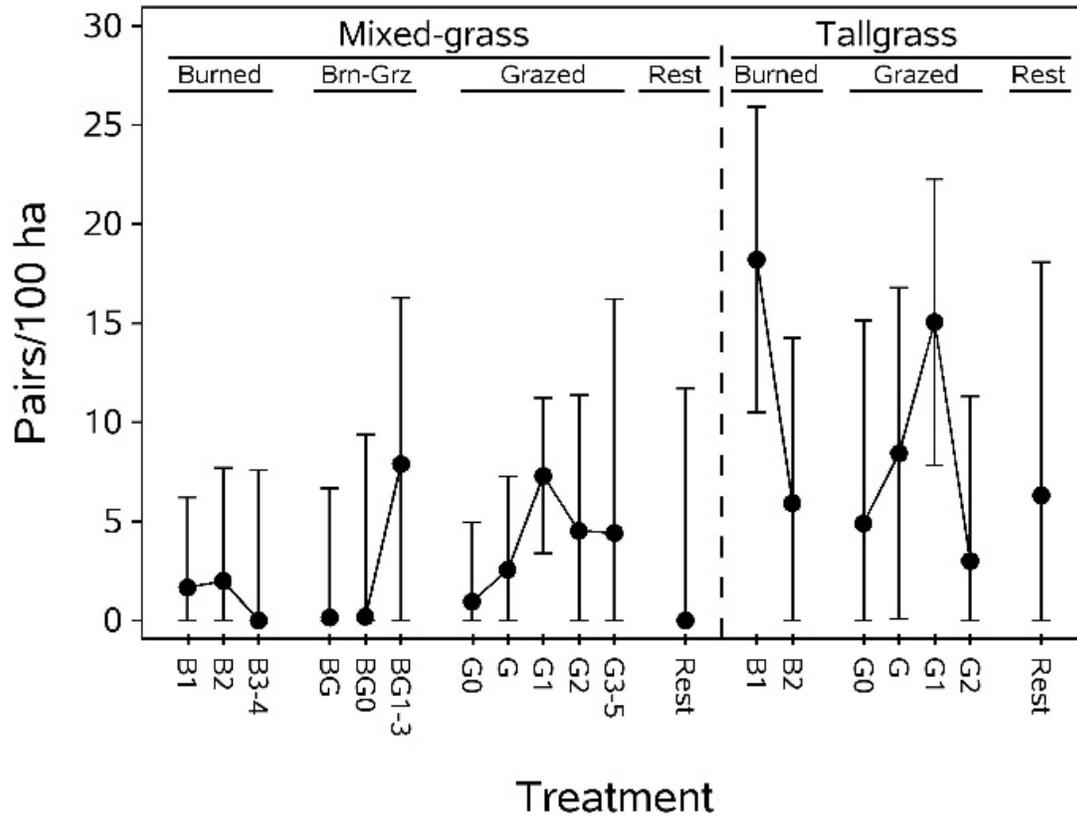
**Table 6.20.** Least squares mean (standard error) densities (pairs per 100 hectares) of dickcissels (*Spiza americana*), by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (Gannon 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]

Grass	Treatment <sup>1</sup>	LSMean <sup>2</sup>	SE	95-percent confidence intervals	
				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

<sup>1</sup>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).

<sup>2</sup>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 <sup>1</sup>	Numerator degrees of freedom	Denominator degrees of freedom <sup>2</sup>	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	

<sup>1</sup>Sources of variation for the model:  $Y = \text{Unit}(\text{Grass type}) + \text{Grass type} \times \text{Treatment} + \text{Residual}$ , where  $\text{Unit}(\text{Grass type})$  and  $\text{Residual}$  are random effects and  $\text{Grass type} \times \text{Treatment}$  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).

<sup>2</sup>Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

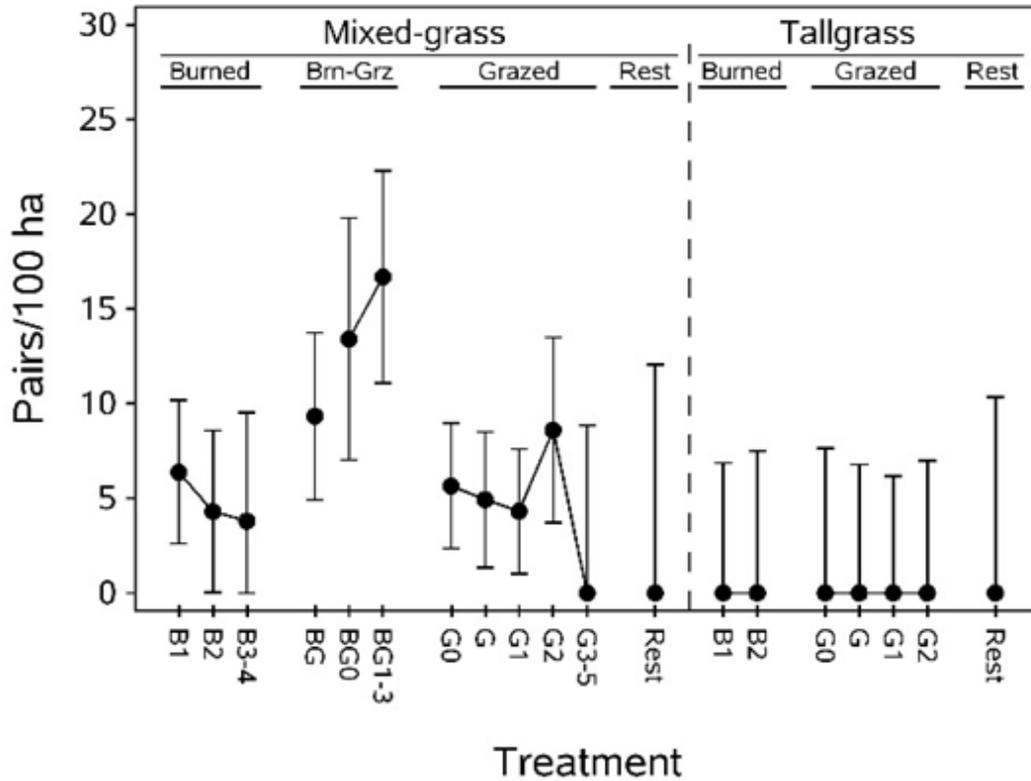
**Table 6.22.** Least squares mean (standard error) densities (pairs per 100 hectares) of chestnut-collared longspurs (*Calcarius ornatus*), by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife 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]

Grass	Treatment <sup>1</sup>	LSMean <sup>2</sup>	SE	95-percent confidence intervals	
				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

<sup>1</sup>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).

<sup>2</sup>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 ( $0.05 < p \leq 0.10$ ); \*\*, evidence for strong effect ( $p \leq 0.05$ )]

Effect	Sources of variation <sup>1</sup>	Numerator degrees of freedom	Denominator degrees of freedom <sup>2</sup>	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	

<sup>1</sup>Sources of variation for the model:  $Y = \text{Unit}(\text{Grass type}) + \text{Grass type} \times \text{Treatment} + \text{Residual}$ , 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).

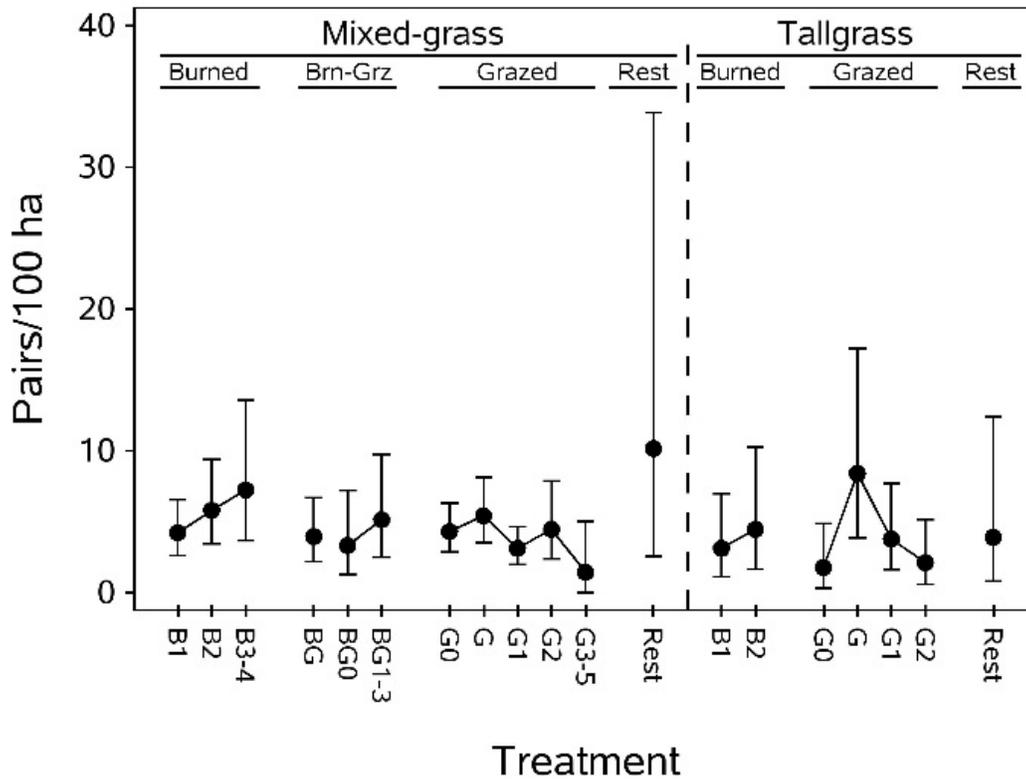
<sup>2</sup>Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

**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]

Grass	Treatment <sup>1</sup>	LSMean	SE	Back-transformed		
				LSMean	95-percent confidence intervals	
				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

<sup>1</sup>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 <sup>1</sup>	Numerator degrees of freedom	Denominator degrees of freedom <sup>2</sup>	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	

<sup>1</sup>Sources of variation for the model:  $Y = \text{Unit}(\text{Grass type}) + \text{Grass type} \times \text{Treatment} + \text{Residual}$ , where  $\text{Unit}(\text{Grass type})$  and  $\text{Residual}$  are random effects and  $\text{Grass type} \times \text{Treatment}$  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).

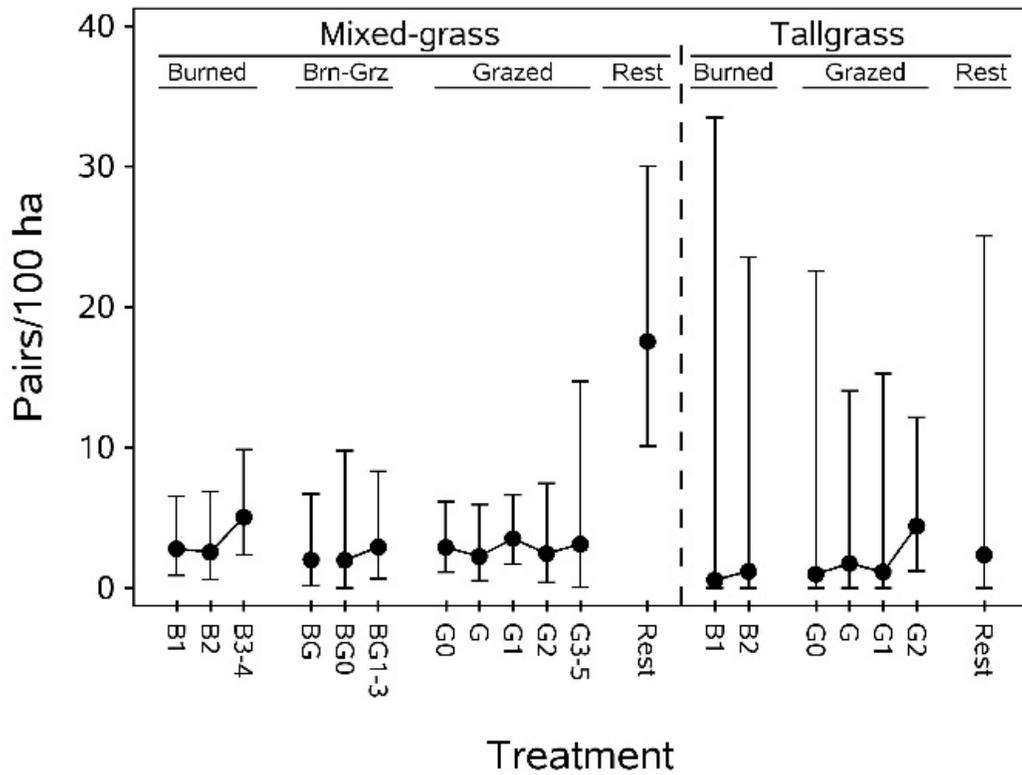
<sup>2</sup>Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

**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]

Grass	Treatment <sup>1</sup>	LSMean	SE	Back-transformed		
				LSMean	95-percent confidence intervals	
				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

<sup>1</sup>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 ( $0.05 < p \leq 0.10$ ); \*\*, evidence for strong effect ( $p \leq 0.05$ )]

Effect	Sources of variation <sup>1</sup>	Numerator degrees of freedom	Denominator degrees of freedom <sup>2</sup>	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*	

<sup>1</sup>Sources of variation for the model:  $Y = \text{Unit}(\text{Grass type}) + \text{Grass type} \times \text{Treatment} + \text{Residual}$ , where  $\text{Unit}(\text{Grass type})$  and  $\text{Residual}$  are random effects and  $\text{Grass type} \times \text{Treatment}$  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).

<sup>2</sup>Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

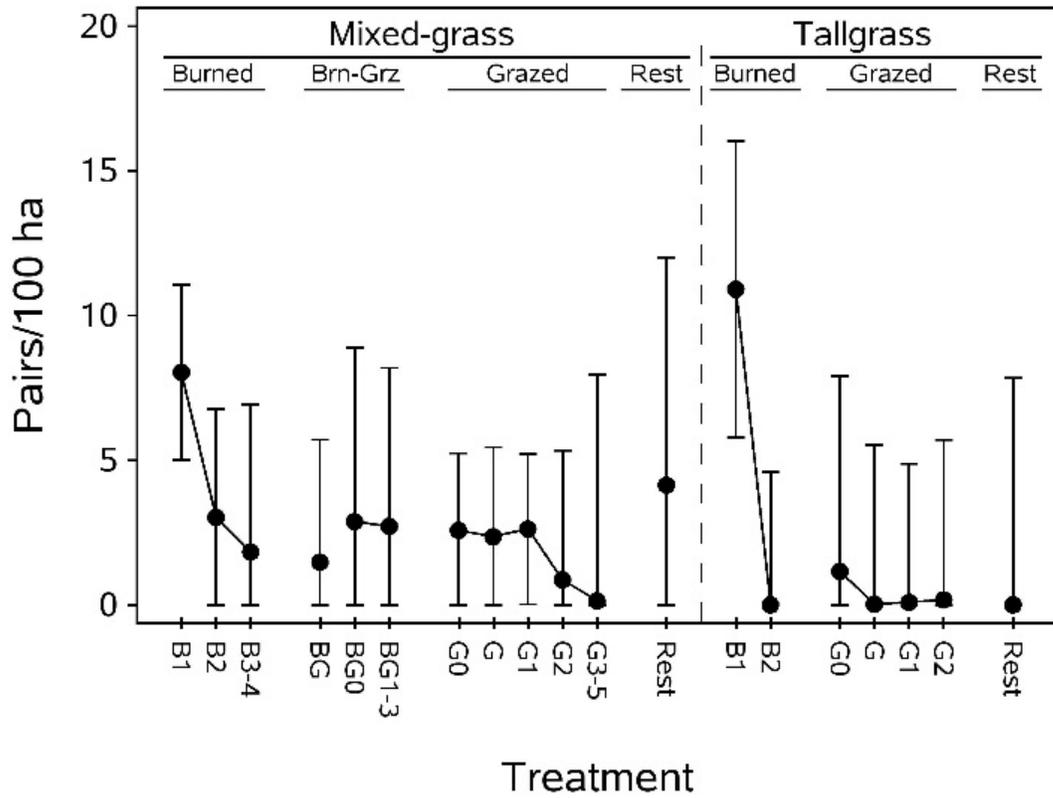
**Table 6.28.** Least squares mean (standard error) densities (pairs per 100 hectares) of Brewer's blackbird (*Euphagus cyanocephalus*), by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife 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]

Grass	Treatment <sup>1</sup>	LSMean <sup>2</sup>	SE	95-percent confidence intervals	
				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

<sup>1</sup>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).

<sup>2</sup>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 <sup>1</sup>	Numerator degrees of freedom	Denominator degrees of freedom <sup>2</sup>	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	

<sup>1</sup>Sources of variation for the model:  $Y = \text{Unit}(\text{Grass type}) + \text{Grass type} \times \text{Treatment} + \text{Residual}$ , where  $\text{Unit}(\text{Grass type})$  and  $\text{Residual}$  are random effects and  $\text{Grass type} \times \text{Treatment}$  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).

<sup>2</sup>Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

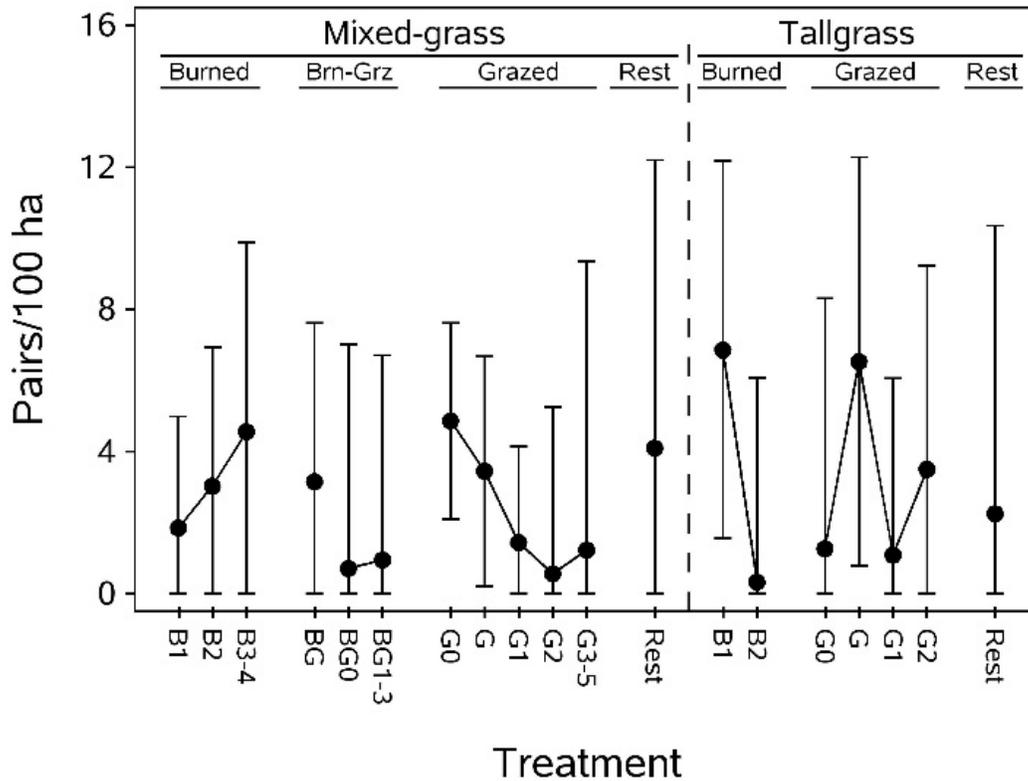
**Table 6.30.** Least squares mean (standard error) densities (pairs per 100 hectares) of common crackles (*Quiscalus quiscula*), by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (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]

Grass	Treatment <sup>1</sup>	LSMean <sup>2</sup>	SE	95-percent confidence intervals	
				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

<sup>1</sup>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).

<sup>2</sup>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 <sup>1</sup>	Numerator degrees of freedom	Denominator degrees of freedom <sup>2</sup>	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

<sup>1</sup>Sources of variation for the model:  $Y = \text{Unit}(\text{Grass type}) + \text{Grass type} \times \text{Treatment} + \text{Residual}$ , where  $\text{Unit}(\text{Grass type})$  and  $\text{Residual}$  are random effects and  $\text{Grass type} \times \text{Treatment}$  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).

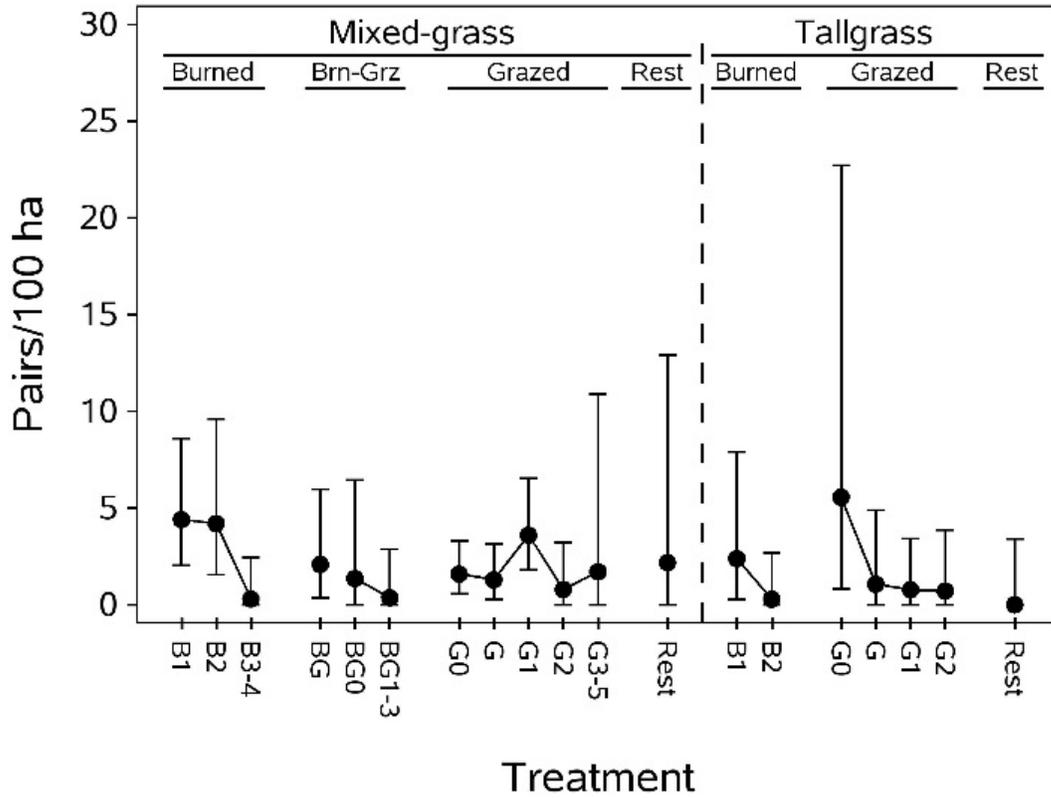
<sup>2</sup>Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

**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]

Grass	Treatment <sup>1</sup>	LSMean	SE	Back-transformed		
				LSMean	95-percent confidence intervals	
				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

<sup>1</sup>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 ( $0.05 < p \leq 0.10$ ); \*\*, evidence for strong effect ( $p \leq 0.05$ )]

Effect	Sources of variation <sup>1</sup>	Numerator degrees of freedom	Denominator degrees of freedom <sup>2</sup>	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**	

<sup>1</sup>Sources of variation for the model:  $Y = \text{Unit}(\text{Grass type}) + \text{Grass type} \times \text{Treatment} + \text{Residual}$ , where  $\text{Unit}(\text{Grass type})$  and  $\text{Residual}$  are random effects and  $\text{Grass type} \times \text{Treatment}$  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).

<sup>2</sup>Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

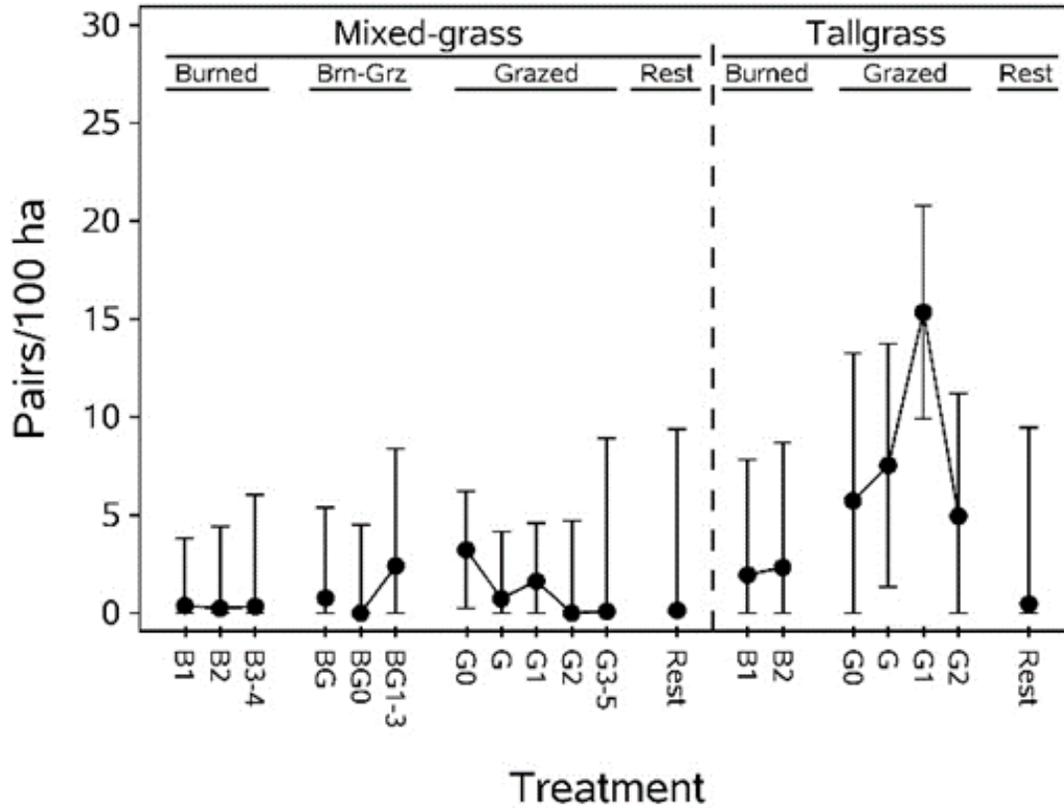
**Table 6.34.** Least squares mean (standard error) densities (pairs per 100 hectares) of cliff swallows (*Petrochelidon pyrrhonota*), by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife 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]

Grass	Treatment <sup>1</sup>	LSMean <sup>2</sup>	SE	95-percent confidence intervals	
				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

<sup>1</sup>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).

<sup>2</sup>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 ( $0.05 < p \leq 0.10$ ); \*\*, evidence for strong effect ( $p \leq 0.05$ )]

Effect	Sources of variation <sup>1</sup>	Numerator degrees of freedom	Denominator degrees of freedom <sup>2</sup>	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	

<sup>1</sup>Sources of variation for the model:  $Y = \text{Unit}(\text{Grass type}) + \text{Grass type} \times \text{Treatment} + \text{Residual}$ , where  $\text{Unit}(\text{Grass type})$  and  $\text{Residual}$  are random effects and  $\text{Grass type} \times \text{Treatment}$  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).

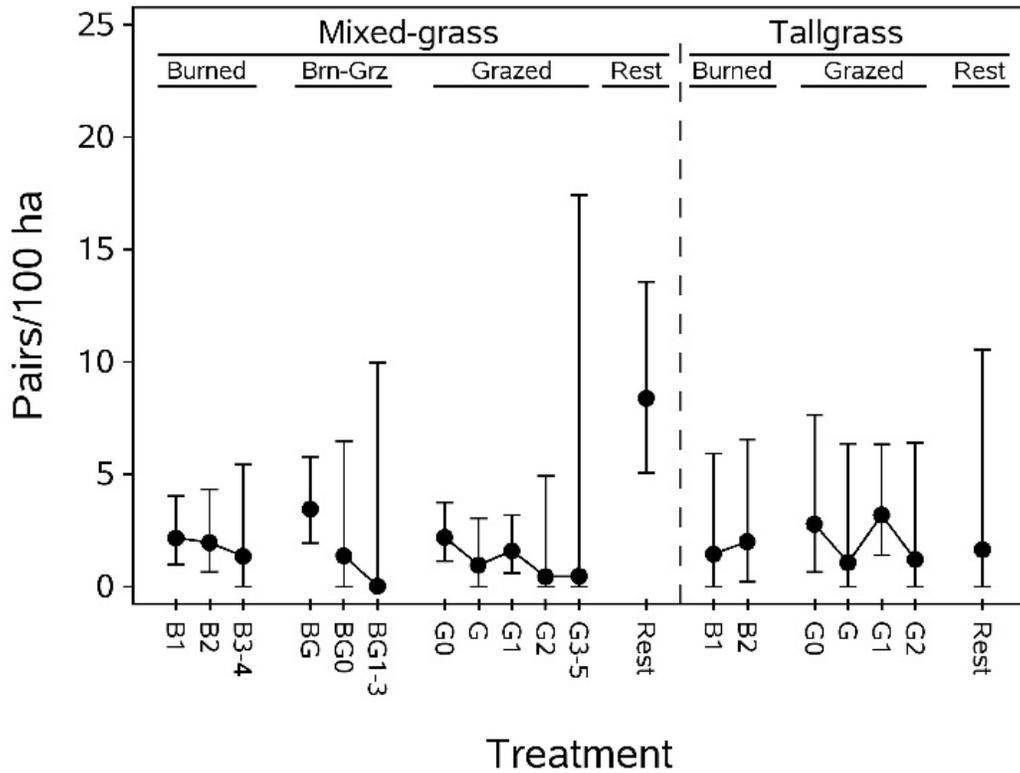
<sup>2</sup>Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

**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]

Grass	Treatment <sup>1</sup>	LSMean	SE	Back-transformed		
				LSMean	95-percent confidence intervals	
				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

<sup>1</sup>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 <sup>1</sup>	Numerator degrees of freedom	Denominator degrees of freedom <sup>2</sup>	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	

<sup>1</sup>Sources of variation for the model:  $Y = \text{Unit}(\text{Grass type}) + \text{Grass type} \times \text{Treatment} + \text{Residual}$ , where  $\text{Unit}(\text{Grass type})$  and  $\text{Residual}$  are random effects and  $\text{Grass type} \times \text{Treatment}$  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).

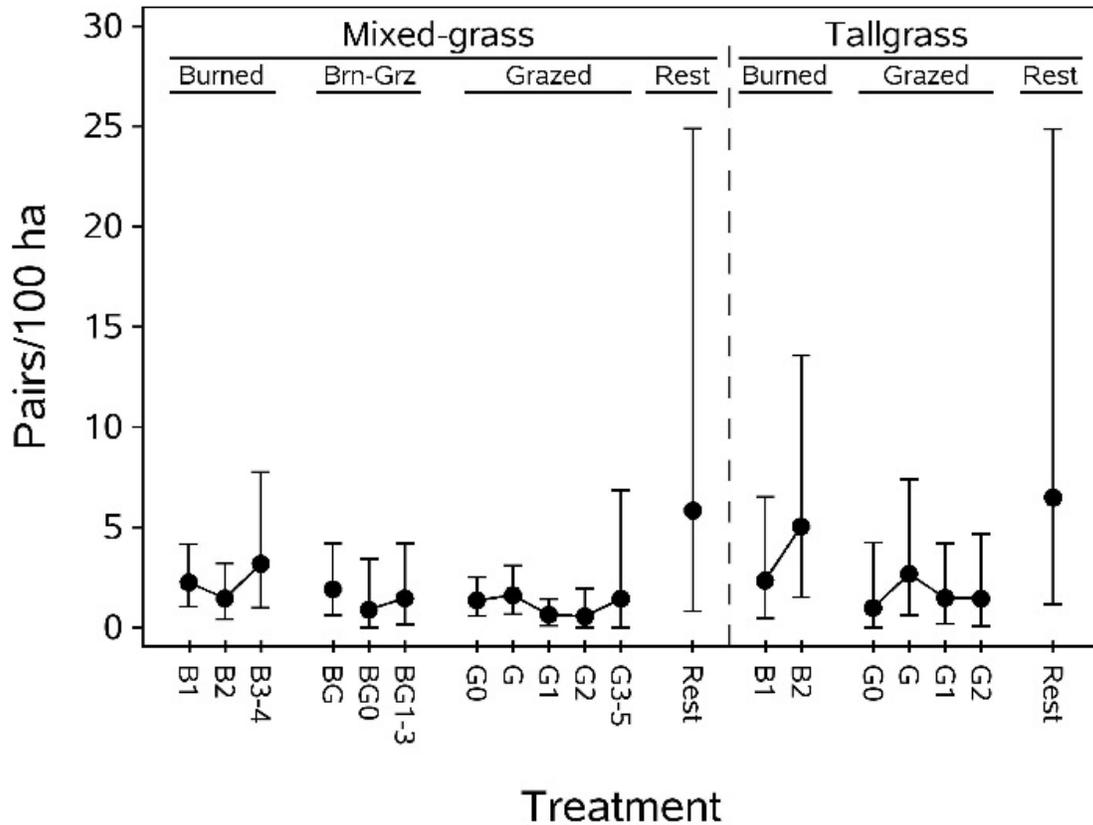
<sup>2</sup>Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

**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]

Grass	Treatment <sup>1</sup>	LSMean	SE	Back-transformed		
				LSMean	95-percent confidence intervals	
				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

<sup>1</sup>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 ( $0.05 < p \leq 0.10$ ); \*\*, evidence for strong effect ( $p \leq 0.05$ )]

Effect	Sources of variation <sup>1</sup>	Numerator degrees of freedom	Denominator degrees of freedom <sup>2</sup>	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	

<sup>1</sup>Sources of variation for the model:  $Y = \text{Unit}(\text{Grass type}) + \text{Grass type} \times \text{Treatment} + \text{Residual}$ , 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).

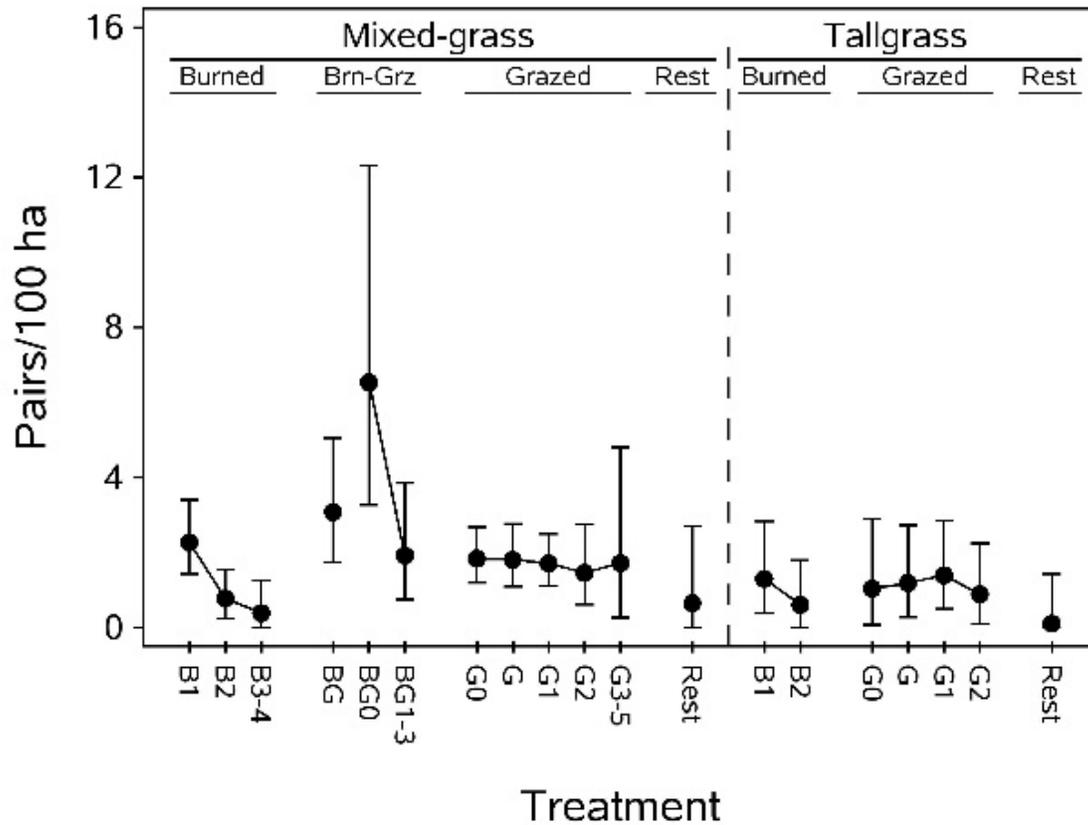
<sup>2</sup>Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

**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]

Grass	Treatment <sup>1</sup>	LSMean	SE	Back-transformed		
				LSMean	95-percent confidence intervals	
				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

<sup>1</sup>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 <sup>1</sup>	Numerator degrees of freedom	Denominator degrees of freedom <sup>2</sup>	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	

<sup>1</sup>Sources of variation for the model:  $Y = \text{Unit}(\text{Grass type}) + \text{Grass type} \times \text{Treatment} + \text{Residual}$ , where  $\text{Unit}(\text{Grass type})$  and  $\text{Residual}$  are random effects and  $\text{Grass type} \times \text{Treatment}$  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).

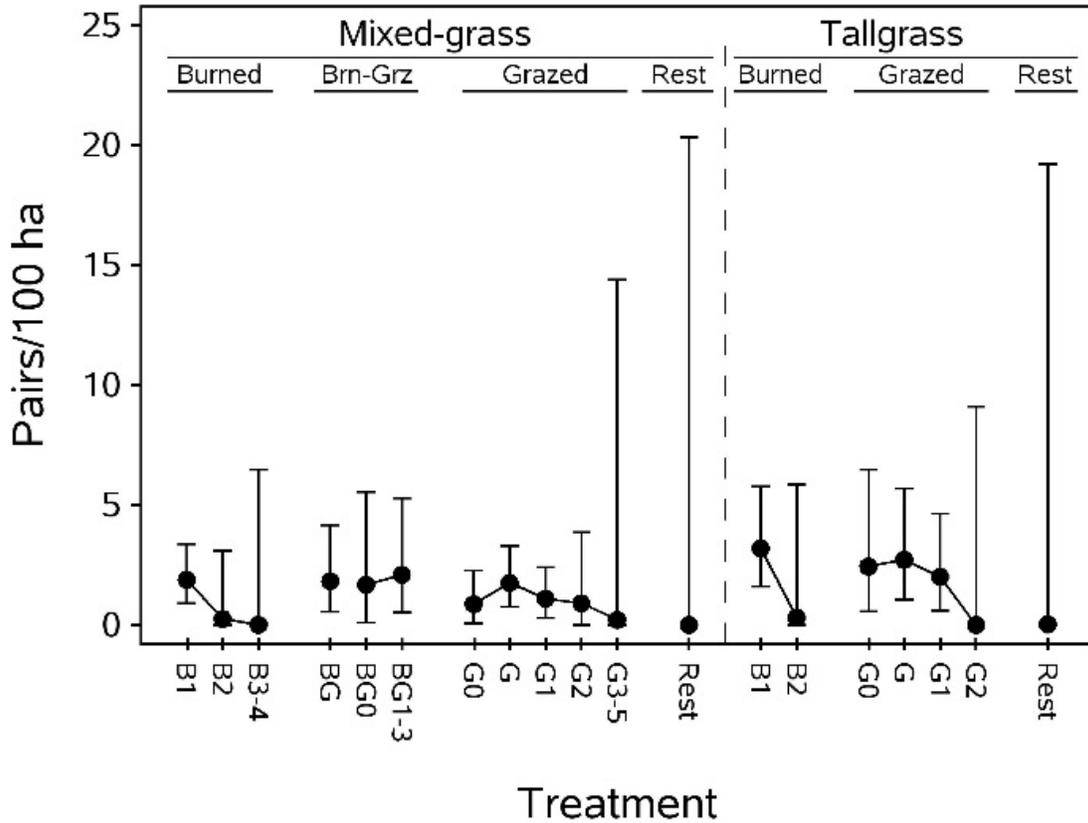
<sup>2</sup>Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

**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]

Grass	Treatment <sup>1</sup>	LSMean	SE	Back-transformed		
				LSMean	95-percent confidence intervals	
				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

<sup>1</sup>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 <sup>1</sup>	Numerator degrees of freedom	Denominator degrees of freedom <sup>2</sup>	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	

<sup>1</sup>Sources of variation for the model:  $Y = \text{Unit}(\text{Grass type}) + \text{Grass type} \times \text{Treatment} + \text{Residual}$ , where  $\text{Unit}(\text{Grass type})$  and  $\text{Residual}$  are random effects and  $\text{Grass type} \times \text{Treatment}$  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).

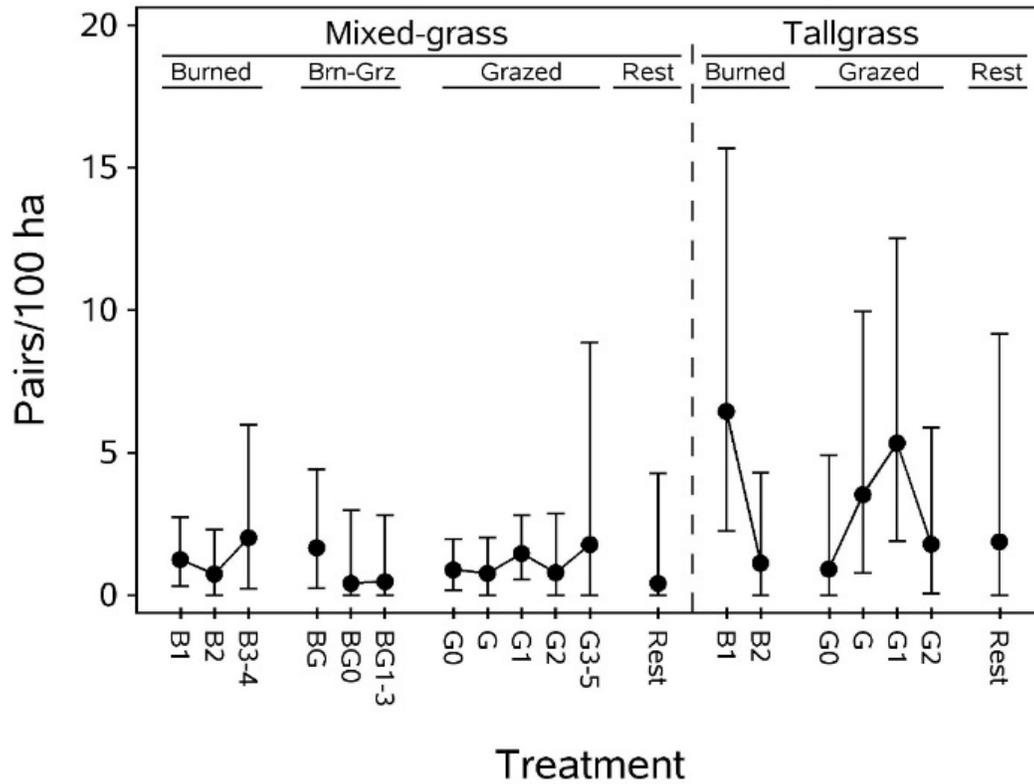
<sup>2</sup>Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

**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]

Grass	Treatment <sup>1</sup>	LSMean	SE	Back-transformed		
				LSMean	95-percent confidence intervals	
				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

<sup>1</sup>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 <sup>1</sup>	Numerator degrees of freedom	Denominator degrees of freedom <sup>2</sup>	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

<sup>1</sup>Sources of variation for the model:  $Y = \text{Unit}(\text{Grass type}) + \text{Grass type} \times \text{Treatment} + \text{Residual}$ , where  $\text{Unit}(\text{Grass type})$  and  $\text{Residual}$  are random effects and  $\text{Grass type} \times \text{Treatment}$  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).

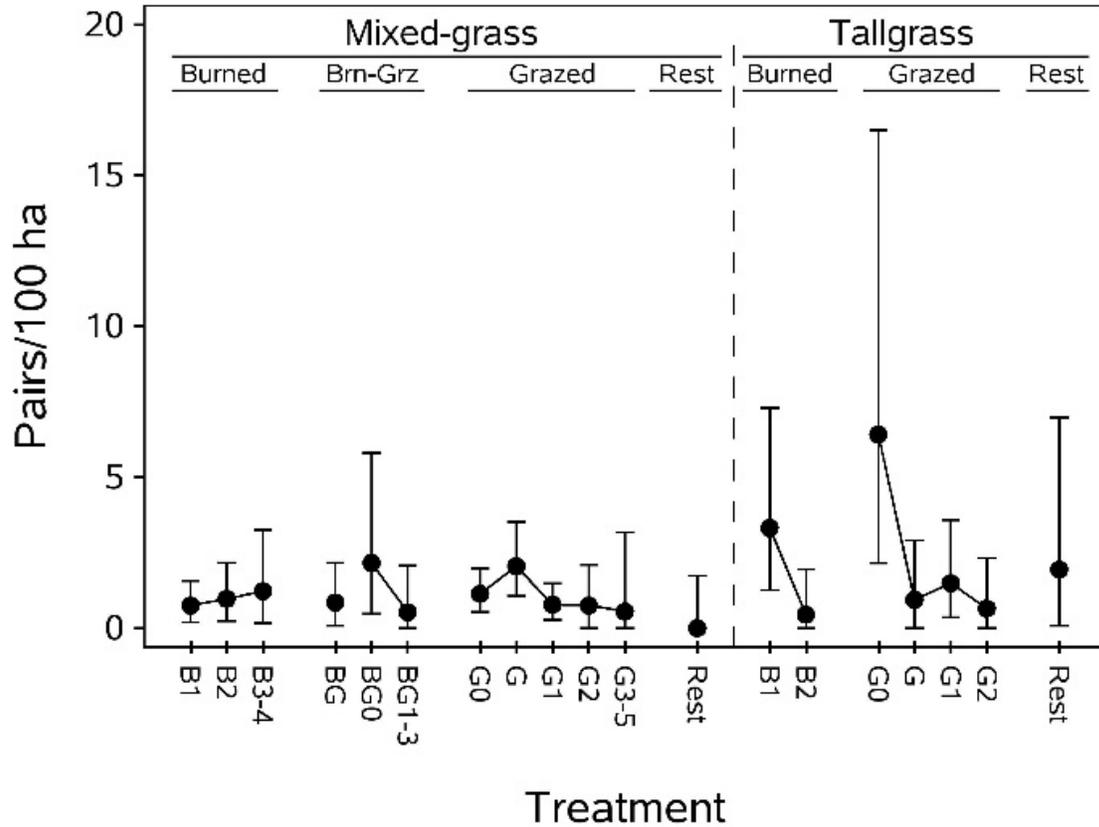
<sup>2</sup>Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

**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]

Grass	Treatment <sup>1</sup>	LSMean	SE	Back-transformed		
				LSMean	95-percent confidence intervals	
				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

<sup>1</sup>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 <sup>1</sup>	Numerator degrees of freedom	Denominator degrees of freedom <sup>2</sup>	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	

<sup>1</sup>Sources of variation for the model:  $Y = \text{Unit}(\text{Grass type}) + \text{Grass type} \times \text{Treatment} + \text{Residual}$ , where  $\text{Unit}(\text{Grass type})$  and  $\text{Residual}$  are random effects and  $\text{Grass type} \times \text{Treatment}$  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).

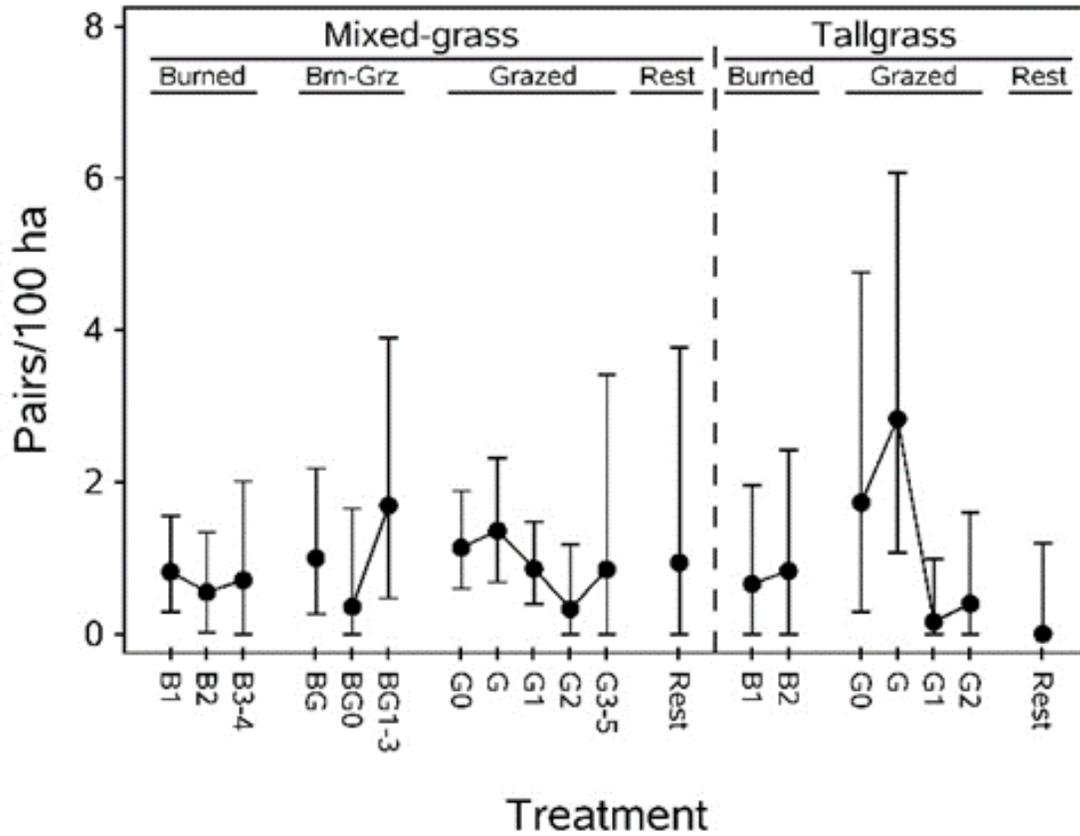
<sup>2</sup>Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

**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]

Grass	Treatment <sup>1</sup>	LSMean	SE	Back-transformed		
				LSMean	95-percent confidence intervals	
				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

<sup>1</sup>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 <sup>1</sup>	Numerator degrees of freedom	Denominator degrees of freedom <sup>2</sup>	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

<sup>1</sup>Sources of variation for the model:  $Y = \text{Unit}(\text{Grass type}) + \text{Grass type} \times \text{Treatment} + \text{Residual}$ , where  $\text{Unit}(\text{Grass type})$  and  $\text{Residual}$  are random effects and  $\text{Grass type} \times \text{Treatment}$  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).

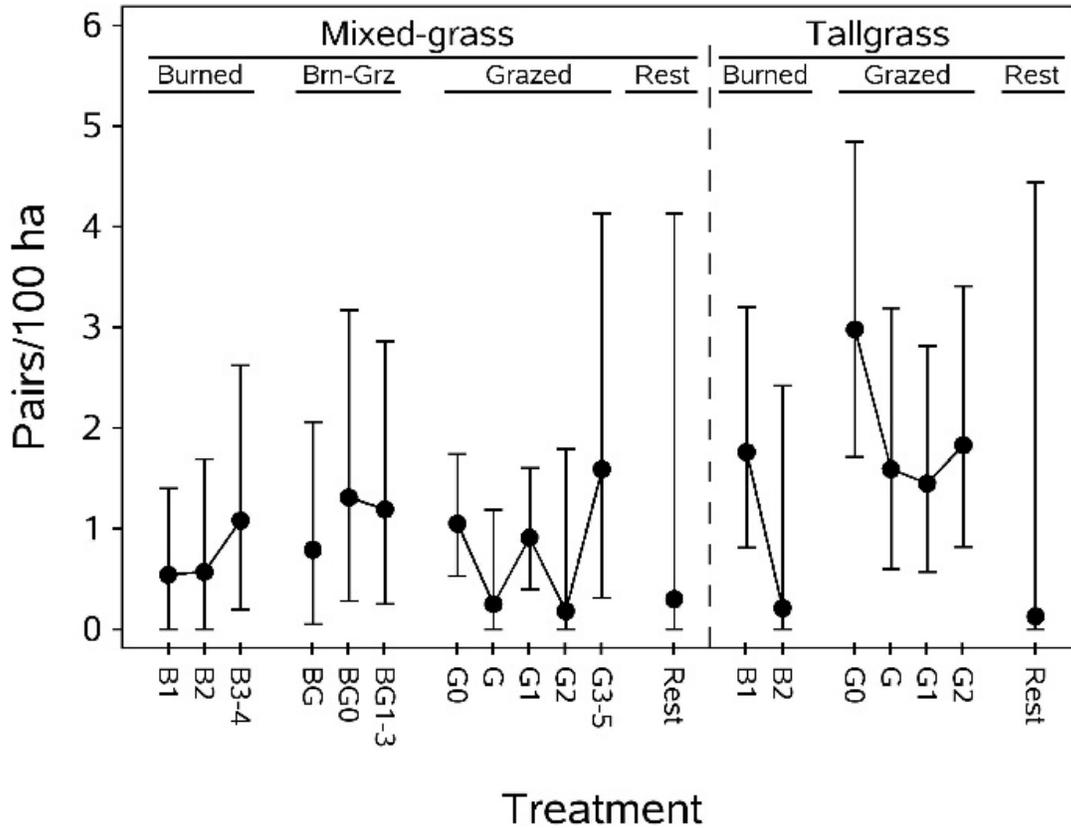
<sup>2</sup>Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

**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]

Grass	Treatment <sup>1</sup>	LSMean	SE	Back-transformed		
				LSMean	95-percent confidence intervals	
				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

<sup>1</sup>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 <sup>1</sup>	Numerator degrees of freedom	Denominator degrees of freedom <sup>2</sup>	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

<sup>1</sup>Sources of variation for the model:  $Y = \text{Unit}(\text{Grass type}) + \text{Grass type} \times \text{Treatment} + \text{Residual}$ , where  $\text{Unit}(\text{Grass type})$  and  $\text{Residual}$  are random effects and  $\text{Grass type} \times \text{Treatment}$  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).

<sup>2</sup>Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

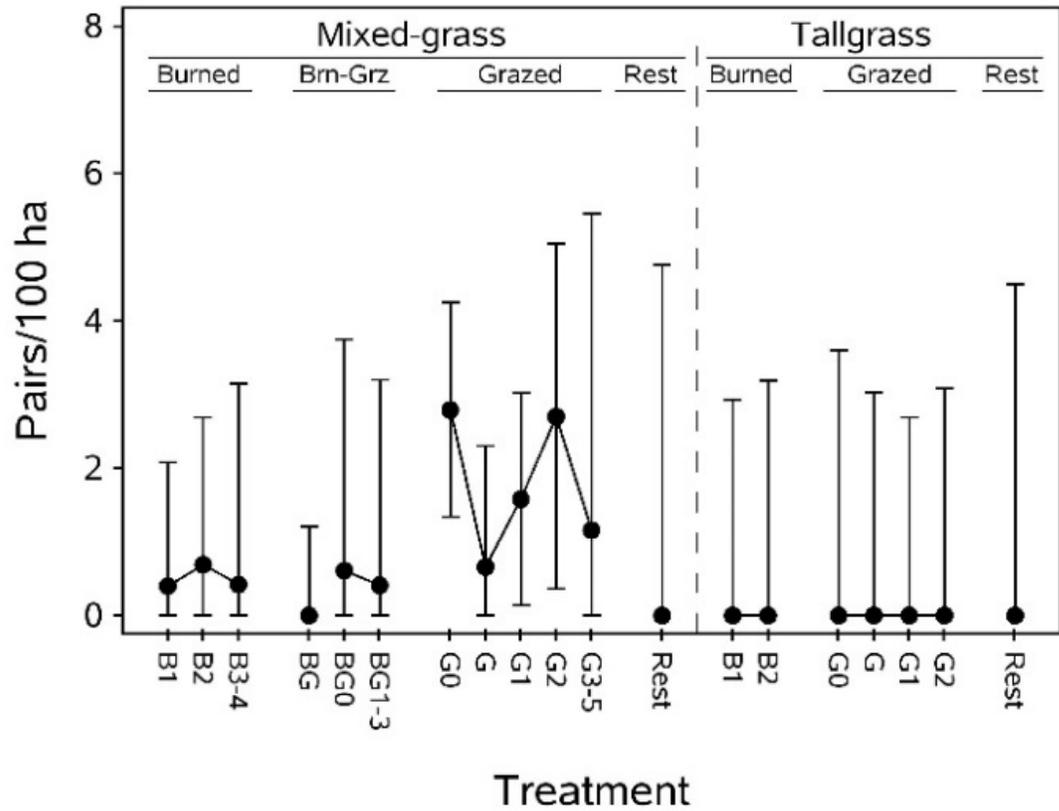
**Table 6.52.** Least squares mean (standard error) densities (pairs per 100 hectares) of Baird's sparrows (*Centronyx bairdii*), by grassland type (mixed-grass, tallgrass) and post-management treatment, on Federal lands managed under an adaptive-management framework by the U.S. Fish and Wildlife Service (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]

Grass	Treatment <sup>1</sup>	LSMean <sup>2</sup>	SE	95-percent confidence intervals	
				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

<sup>1</sup>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).

<sup>2</sup>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 <sup>1</sup>	Numerator degrees of freedom	Denominator degrees of freedom <sup>2</sup>	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	

<sup>1</sup>Sources of variation for the model:  $Y = \text{Unit}(\text{Grass type}) + \text{Grass type} \times \text{Treatment} + \text{Residual}$ , where  $\text{Unit}(\text{Grass type})$  and  $\text{Residual}$  are random effects and  $\text{Grass type} \times \text{Treatment}$  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).

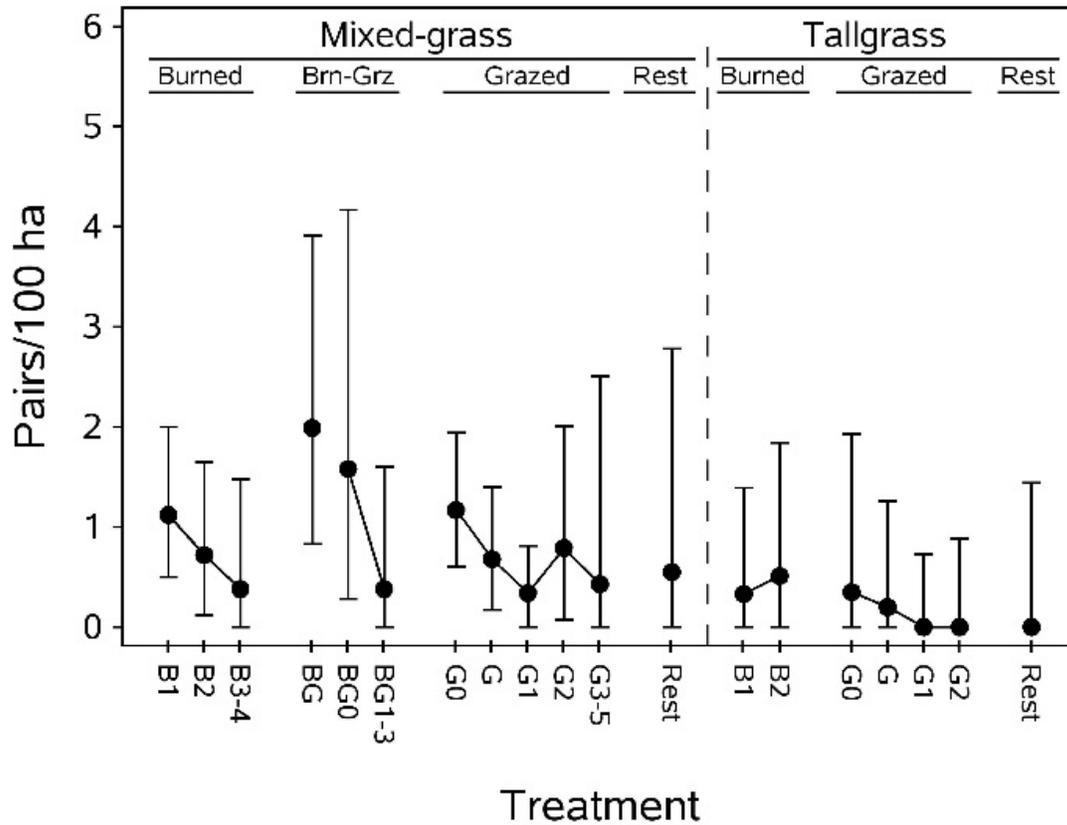
<sup>2</sup>Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

**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]

Grass	Treatment <sup>1</sup>	LSMean	SE	Back-transformed		
				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

<sup>1</sup>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 ( $0.05 < p \leq 0.10$ ); \*\*, evidence for strong effect ( $p \leq 0.05$ )]

Effect	Sources of variation <sup>1</sup>	Numerator degrees of freedom	Denominator degrees of freedom <sup>2</sup>	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	

<sup>1</sup>Sources of variation for the model:  $Y = \text{Unit}(\text{Grass type}) + \text{Grass type} \times \text{Treatment} + \text{Residual}$ , 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).

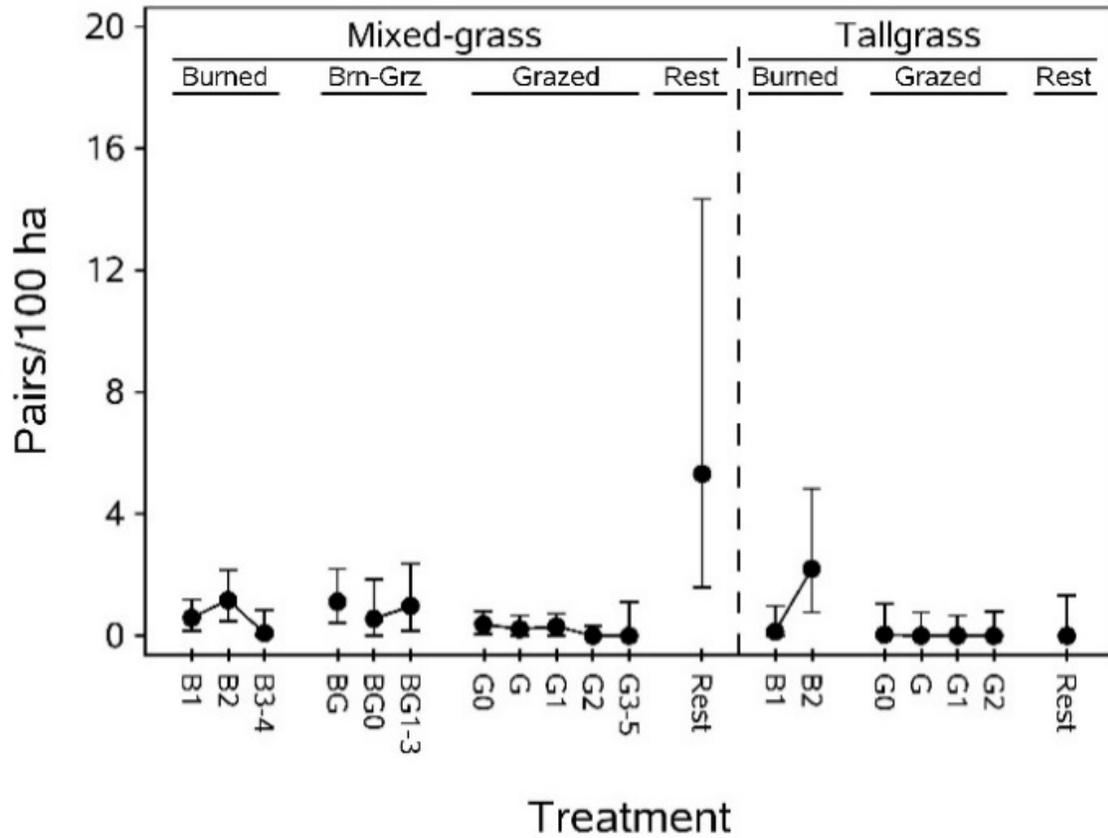
<sup>2</sup>Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

**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 (*Ammodramus 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]

Grass	Treatment <sup>1</sup>	LSMean	SE	Back-transformed		
				LSMean	95-percent confidence intervals	
				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

<sup>1</sup>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 (*Ammodramus 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 ( $0.05 < p \leq 0.10$ ); \*\*, evidence for strong effect ( $p \leq 0.05$ )]

Effect	Sources of variation <sup>1</sup>	Numerator degrees of freedom	Denominator degrees of freedom <sup>2</sup>	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

<sup>1</sup>Sources of variation for the model:  $Y = \text{Unit}(\text{Grass type}) + \text{Grass type} \times \text{Treatment} + \text{Residual}$ , 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).

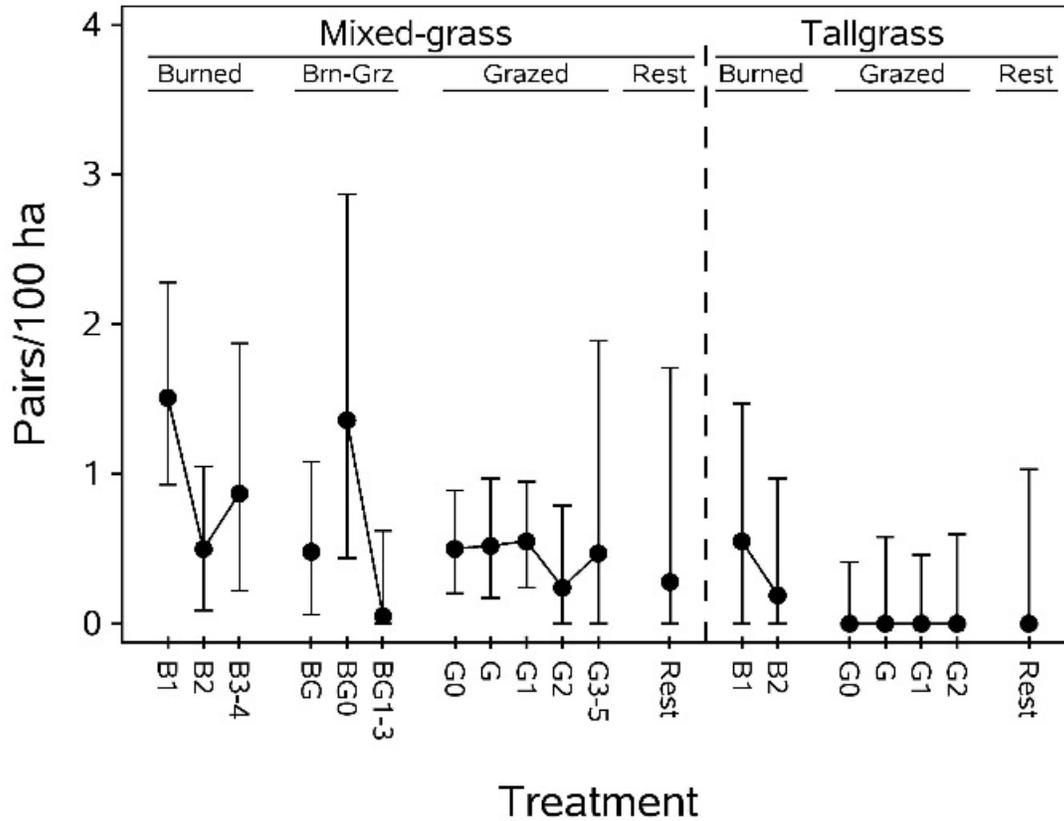
<sup>2</sup>Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

**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]

Grass	Treatment <sup>1</sup>	LSMean	SE	Back-transformed		
				LSMean	95-percent confidence intervals	
				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

<sup>1</sup>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 ( $0.05 < p \leq 0.10$ ); \*\*, evidence for strong effect ( $p \leq 0.05$ )]

Effect	Sources of variation <sup>1</sup>	Numerator degrees of freedom	Denominator degrees of freedom <sup>2</sup>	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

<sup>1</sup>Sources of variation for the model:  $Y = \text{Unit}(\text{Grass type}) + \text{Grass type} \times \text{Treatment} + \text{Residual}$ , 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).

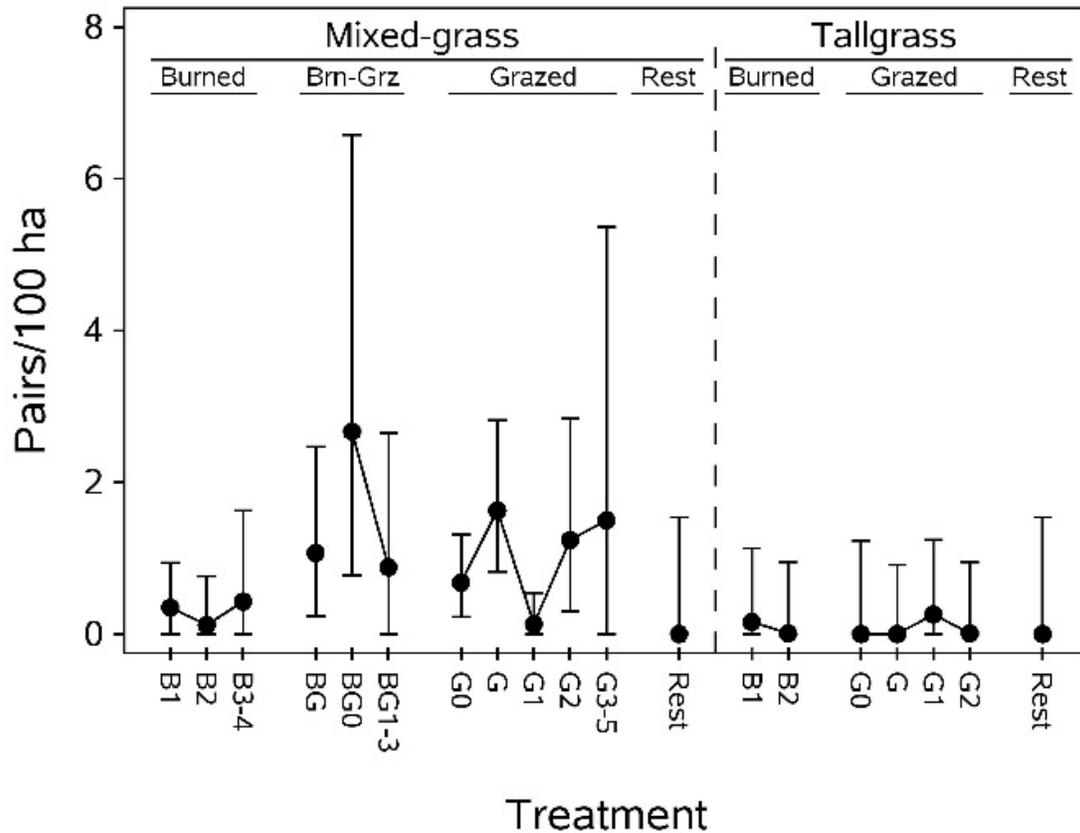
<sup>2</sup>Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

**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]

Grass	Treatment <sup>1</sup>	LSMean	SE	Back-transformed		
				LSMean	95-percent confidence intervals	
				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

<sup>1</sup>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 ( $0.05 < p \leq 0.10$ ); \*\*, evidence for strong effect ( $p \leq 0.05$ )]

Effect	Sources of variation <sup>1</sup>	Numerator degrees of freedom	Denominator degrees of freedom <sup>2</sup>	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**	

<sup>1</sup>Sources of variation for the model:  $Y = \text{Unit}(\text{Grass type}) + \text{Grass type} \times \text{Treatment} + \text{Residual}$ , where  $\text{Unit}(\text{Grass type})$  and  $\text{Residual}$  are random effects and  $\text{Grass type} \times \text{Treatment}$  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).

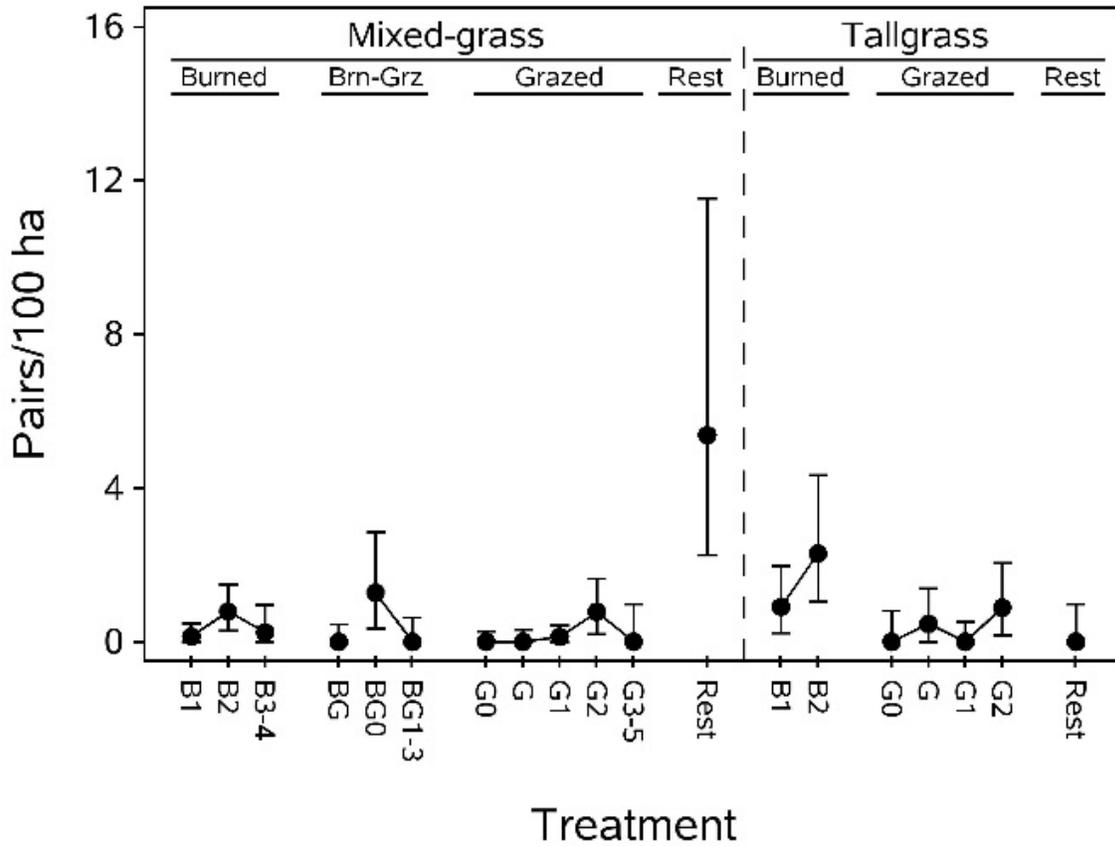
<sup>2</sup>Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

**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]

Grass	Treatment <sup>1</sup>	LSMean	SE	Back-transformed		
				LSMean	95-percent confidence intervals	
				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

<sup>1</sup>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 (*Ammodramus 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 ( $0.05 < p \leq 0.10$ ); \*\*, evidence for strong effect ( $p \leq 0.05$ )]

Effect	Sources of variation <sup>1</sup>	Numerator degrees of freedom	Denominator degrees of freedom <sup>2</sup>	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

<sup>1</sup>Sources of variation for the model:  $Y = \text{Unit}(\text{Grass type}) + \text{Grass type} \times \text{Treatment} + \text{Residual}$ , 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).

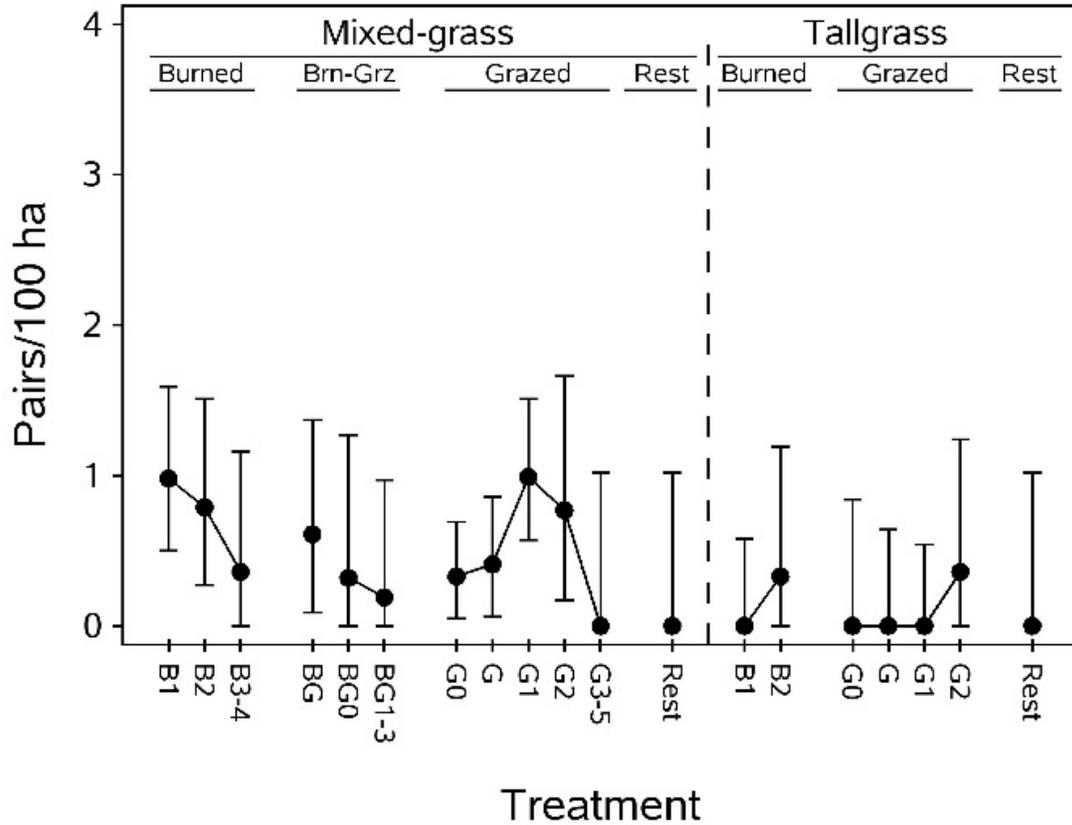
<sup>2</sup>Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

**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]

Grass	Treatment <sup>1</sup>	LSMean	SE	Back-transformed		
				LSMean	95-percent confidence intervals	
				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

<sup>1</sup>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 <sup>1</sup>	Numerator degrees of freedom	Denominator degrees of freedom <sup>2</sup>	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	

<sup>1</sup>Sources of variation for the model:  $Y = \text{Unit}(\text{Grass type}) + \text{Grass type} \times \text{Treatment} + \text{Residual}$ , where  $\text{Unit}(\text{Grass type})$  and  $\text{Residual}$  are random effects and  $\text{Grass type} \times \text{Treatment}$  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).

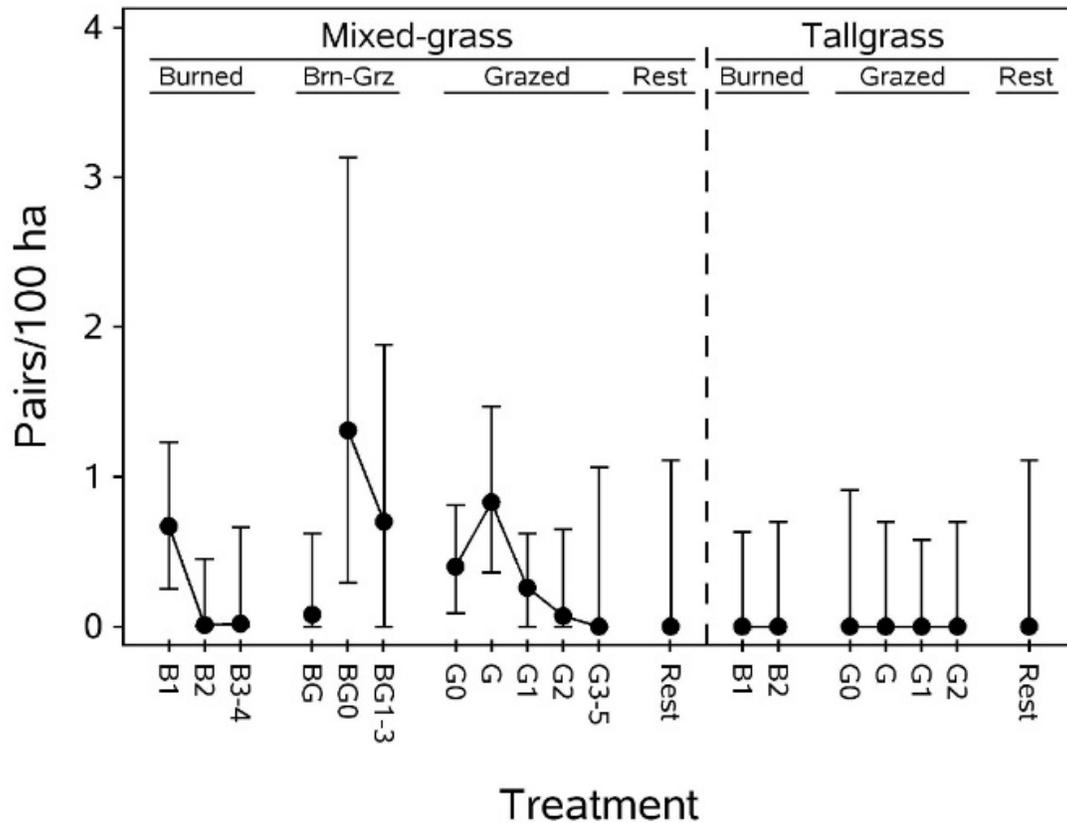
<sup>2</sup>Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

**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]

Grass	Treatment <sup>1</sup>	LSMean	SE	Back-transformed		
				LSMean	95-percent confidence intervals	
				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

<sup>1</sup>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 <sup>1</sup>	Numerator degrees of freedom	Denominator degrees of freedom <sup>2</sup>	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	

<sup>1</sup>Sources of variation for the model:  $Y = \text{Unit}(\text{Grass type}) + \text{Grass type} \times \text{Treatment} + \text{Residual}$ , where  $\text{Unit}(\text{Grass type})$  and  $\text{Residual}$  are random effects and  $\text{Grass type} \times \text{Treatment}$  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).

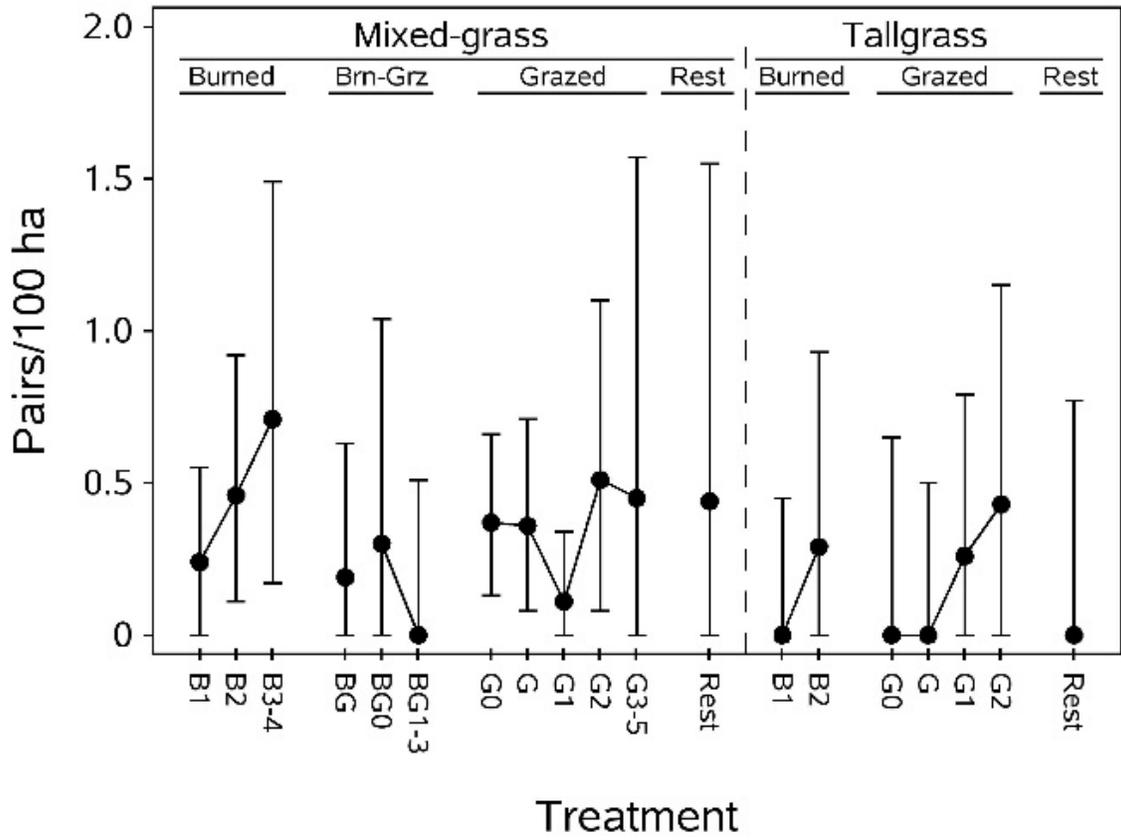
<sup>2</sup>Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

**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]

Grass	Treatment <sup>1</sup>	LSMean	SE	Back-transformed		
				LSMean	95-percent confidence intervals	
				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

<sup>1</sup>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 <sup>1</sup>	Numerator degrees of freedom	Denominator degrees of freedom <sup>2</sup>	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	

<sup>1</sup>Sources of variation for the model:  $Y = \text{Unit}(\text{Grass type}) + \text{Grass type} \times \text{Treatment} + \text{Residual}$ , where  $\text{Unit}(\text{Grass type})$  and  $\text{Residual}$  are random effects and  $\text{Grass type} \times \text{Treatment}$  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).

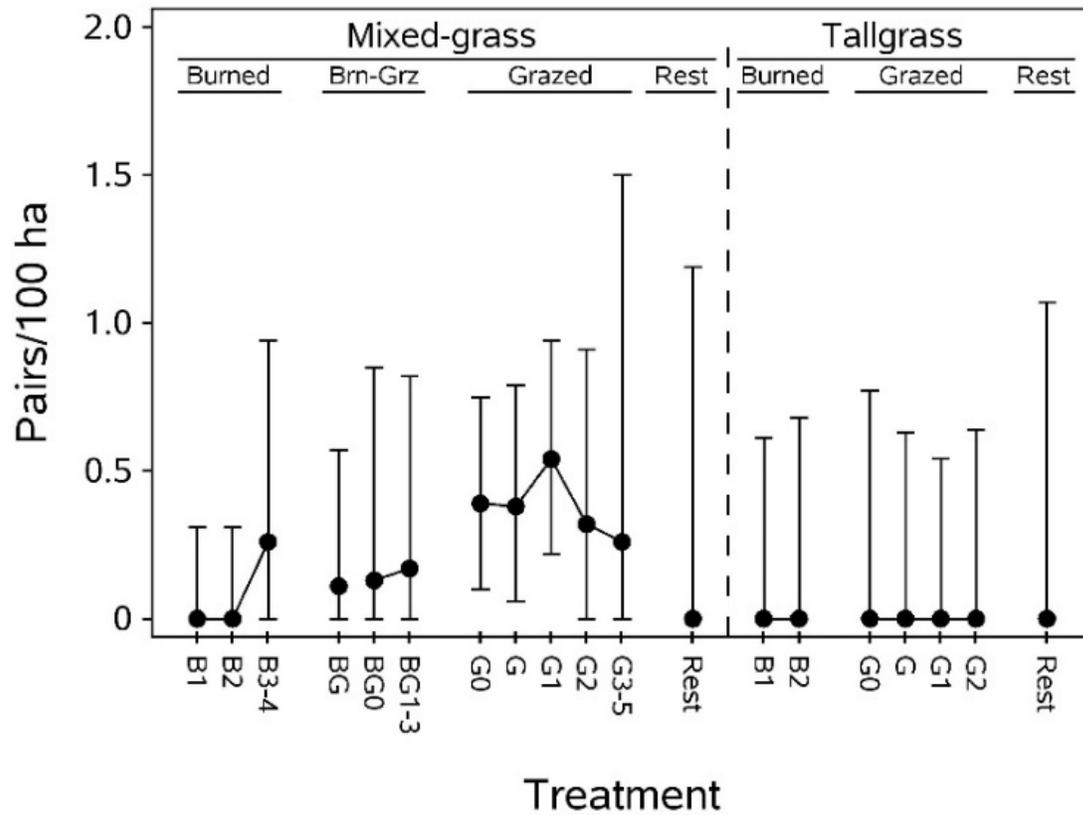
<sup>2</sup>Degrees of freedom are based on Kenward-Roger correction for repeated-measures models (Littell and others, 2006).

**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]

Grass	Treatment <sup>1</sup>	LSMean	SE	Back-transformed		
				LSMean	95-percent confidence intervals	
				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

<sup>1</sup>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<sup>®</sup> for mixed models (2d ed.): Cary, N.C., SAS Institute, Inc., 814 p.