BIRTLE TRANSMISSION PROJECT

BIRD SPECIES OF CONSERVATION CONCERN MONITORING 2022

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ENVIRONMENTAL MONITORING PLAN

BIRD SPECIES OF CONSERVATION CONCERN MONITORING 2022

Prepared for

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EXECUTIVE SUMMARY

The Birtle Transmission Project (the Project) is a 230 kV AC transmission line that spans 46.2 km from the Birtle South Station, through the Spy Hill-Ellice Community Pasture, to the Saskatchewan border. Project construction began in July 2020 and was completed by March 2021.

The chestnut-collared longspur (*Calcarius ornatus*) is listed as Threatened under the federal *Species at Risk Act* and Endangered under *The Endangered Species and Ecosystems Act* of Manitoba. The Sprague's pipit (*Anthus spragueii*) is listed as Threatened under each. The species' population declines are due in part to the loss of grassland habitat. The Spy Hill-Ellice Community Pasture, which may be subject to disturbance due Project construction and operation, provides grazing for livestock and important habitat for grassland birds. As described in the Birtle Transmission Project Environmental Monitoring Plan, the objectives of grassland bird species of conservation concern (SOCC) monitoring were to identify the location of chestnut-collared longspurs and Sprague's pipits within or near the Project footprint to compare their abundance before and after Project construction; to monitor perching avian predators and brood parasites near the transmission line and compare abundance to nearby reference sites; and to determine the effectiveness of mitigation measures and, if appropriate, propose revisions to existing plans or develop new mitigation options should unexpected impacts to grassland bird SOCCs occur as a result of Project construction or operation activities.

Pre-construction surveys for grassland bird SOCCs conducted in 2017 and 2019 were continued in 2021 and 2022, the first and second years after Project construction. Point counts for birds were conducted at 300 sites within four broad habitat classes in the Spy Hill-Ellice Community Pasture. Surveys focused mainly on chestnut-collared longspur and Sprague's pipit; however, aural and visual observations of all bird species, including other SOCCs, were recorded. Statistical analyses were conducted to compare the abundance of chestnut-collared longspurs and Sprague's pipits at grassland habitat sites before and after Project construction, to test the hypothesis that the construction and operation of the transmission line affects the abundance of each species. The relationship between the presence of chestnut-collared longspurs and Sprague's pipits, distance from the ROW, and distance to nearest forest was also tested.

To monitor the abundance of perching avian predators, surveys were conducted at four sites where perch deterrents were installed on transmission towers and at two sites with no deterrents. At each site, two tower spans (three towers) were monitored for one hour by an observer who noted the species and behaviour of raptors (falcons, hawks, eagles) and of black-billed magpie (*Pica hudsonia*), common raven (*Corvus corax*), and American crow *(Corvus brachyrhynchos*), which are common nest predators. Each site was surveyed eight times. Statistical analyses were conducted to compare the abundance of raptors and nest predators at sites with and without perch deterrents in 2021 and 2022, to test the hypothesis that the construction and operation of the transmission line affects the abundance of perching avian predators.

Monitoring for brown-headed cowbird (*Molothrus ater*), a brood parasite, was conducted in conjunction with grassland bird SOCCs. Statistical analyses were conducted to compare its

abundance in four broad habitat classes before and after Project construction, to test the hypothesis that the construction and operation of the transmission line affects brown-headed cowbird abundance.

Second-year operation monitoring indicated that:

- Chestnut-collared longspur and Sprague's pipit were relatively widely distributed in the Spy Hill-Ellice Community Pasture and were the most frequently detected SOCCs. No adverse Project effects on the abundance of chestnut-collared longspurs or Sprague's pipits resulted from the construction and operation of the transmission line.

- Perching avian predators were observed at sites with and without perch deterrents. There was no difference in the abundance of perched raptors or nest predators at each; no Project effects on the abundance of perching avian predators were observed in the Spy Hill-Ellice Community Pasture during operation monitoring and no adverse effect on grassland bird SOCCs resulted from the construction and operation of the transmission line.

- Brown-headed cowbird abundance in the Spy Hill-Ellice Community Pasture was significantly lower after Project construction than before. Because no increase was observed, no adverse effect on grassland bird SOCCs resulted from the construction and operation of the transmission line.

Operation monitoring for grassland bird SOCCs and perching avian predators will continue in 2023. To date, no Project effects on grassland bird SOCCs have been observed, and no further mitigation is recommended.

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1.0 INTRODUCTION

The Birtle Transmission Project (the Project) is a 230 kV AC transmission line that spans 46.2 km from the Birtle South Station, through the Spy Hill-Ellice Community Pasture, to the Saskatchewan border. Project construction began in July 2020 and was completed by March 2021. The transmission line right-of-way (ROW), described as the Project footprint, is 184.7 hectares (ha) in area and is where most direct effects were expected to occur. In 2017, a baseline breeding bird study was conducted in the region where the Project was to be constructed, which was incorporated into the description of the existing environment. The study, which focused on species of conservation concern (SOCCs) listed under the federal *Species at Risk Act* (SARA) and *The Endangered Species and Ecosystems Act* (ESEA) of Manitoba, was repeated in 2019 to describe the pre-construction bird community and again in 2021 and 2022, the first and second years of Project operation.

There are two intact native mixed-grass prairies in the Project region, the Spy Hill-Ellice and Ellice-Archie community pastures, which encompass a combined 23,000 hectares (Manitoba Hydro 2018). These flat, open pastures provide grazing for livestock and important habitat for grassland birds, particularly SOCCs such as chestnut-collared longspur (*Calcarius ornatus*) and Sprague's pipit (*Anthus spragueii*), whose populations are in decline due in part to habitat loss (Committee on the Status of Endangered Wildlife in Canada [COSEWIC] 2019 and 2010, respectively). The chestnut-collared longspur is listed as Threatened under the SARA and Endangered under the ESEA and the Sprague's pipit is listed as Threatened under both. These species are relatively common in the Spy Hill-Ellice Community Pasture, which may be subject to disturbance due Project construction and operation.

As described in the Birtle Transmission Project Environmental Monitoring Plan (Manitoba Hydro 2020), the objectives of grassland bird SOCC monitoring were to identify the location of chestnut-collared longspurs and Sprague's pipits within or near the Project footprint to compare their abundance before and after Project construction; to monitor perching avian predators and brood parasites near the transmission line and compare abundances to nearby reference sites; and to determine the effectiveness of mitigation measures and, if appropriate, propose revisions to existing plans or develop new mitigation options should unexpected impacts to grassland bird SOCCs occur as a result of Project construction or operation activities. Potential Project effects on chestnut-collared longspur and Sprague's pipit included displacement of birds and/or decreased nesting success due to habitat disturbance during construction and long-term habitat loss during operation. Grassland bird SOCC monitoring tested the hypothesis that development of the transmission line will adversely affect the two focal species.

2.0 METHODS

2.1 Grassland Bird Species of Conservation Concern

As described in section 6.2.1 of the Environmental Monitoring Plan, the purpose of grassland bird SOCC monitoring was to test the following hypothesis:

Hypothesis 1:

- H_0 (null): The construction and operation of the transmission line does not affect the abundance of chestnut-collared longspur and Sprague's pipit.

- H_1 (alternative): The construction and operation of the transmission line does affect the abundance of chestnut-collared longspur and Sprague's pipit.

To test Hypothesis 1, point counts for birds were conducted at 300 sites in the Spy Hill-Ellice Community Pasture in 2022 (Map 1), repeating the pre-construction surveys conducted in 2017 and 2019 and the first post-construction survey conducted in 2021. Point count sites were spaced a minimum of 250 m apart within four broad habitat classes: grassland (Photo 1), shrubland (Photo 2), forest (Photo 3), and edge (Photo 4; Table 1). Sites in grassland habitat were at various distances from the ROW (Table 2). An observer listened for birds or recordings were made for three minutes at sites in forest habitat and for 10 minutes at all other sites from June 20 to 28, 2022. Recordings were reviewed by a qualified biologist. Surveys focused mainly on chestnut-collared longspur and Sprague's pipit; however, aural and visual observations of all bird species, including other SOCCs, were recorded. In 2022, a flat wooden stake marked with 10-cm intervals similar to a Robel pole (Robel et al. 1970) was placed in the ground to the north, east, south, and west at 148 grassland habitat sites and was photographed. The photos were reviewed, and the minimum and maximum heights of the vegetation were estimated in 2.5-cm increments. The four minimum heights and the four maximum heights were each averaged to produce a range of vegetation lengths at each site, which were categorized as less than 15 cm, 15 to 30 cm, and more than 30 cm in height. Adjustments were made to the habitat type initially identified at 26 sites based on the vegetation photos, mainly shrubland re-classified as grassland, and were applied to previous survey years for consistency.

Table 1: Number of point count sites surveyed in four habitat types before (2017, 2019) and after (2021, 2022) Project construction

Habitat Type	Description	2017	2019	2021	2022
Grassland	Grassland-dominated, few shrubs	153	170	164	164
Shrubland	Shrub/small tree-dominated	27	31	31	30
Forest	Dense trees with overhead canopy	55	56	52	53
Edge	Transition between grassland and forest	51	53	44	53
Total		286	310	291	300

Table 2: Number of point count sites surveyed at various distances from the right-of-way in grassland habitat before (2017, 2019) and after (2021, 2022) Project construction

Distance from ROW (m)	2017	2019	2021	2022
0–1000	36	46	43	42
1001–2000	28	31	29	30
>2000	89	93	92	92

Statistical analyses were conducted with SYSTAT 13. Abundance data for chestnut-collared longspur and Sprague's pipit in grassland habitat were tested for normality with a Shapiro-Wilk test and the number of each species observed at grassland habitat sites was compared among survey years with a nonparametric Kruskal-Wallis test (McDonald 2014). Significance was determined at the $\alpha = 0.05$ level. Where the results were significant, a Conover-Inman test for all pairwise comparisons was performed to analyze differences between individual survey years. Because multiple comparisons were made, a Bonferroni correction of 0.05/6 = 0.008 was applied to determine statistical significance when individual years were compared (McDonald 2014).

The relationship between the presence or absence of chestnut-collared longspur and Sprague's pipit in grassland habitat and distance to the ROW and distance to nearest forest habitat was tested with binary logistic regression (McDonald 2014) each survey year. Distance to nearest forest was defined as the linear distance of each survey site to the nearest forest patch greater than 1 ha in area. Significance was determined at the $\alpha = 0.05$ level.

Photo 1: Grassland habitat in the Spy Hill-Ellice Community Pasture

Photo 2: Shrubland habitat in the Spy Hill-Ellice Community Pasture

Photo 3: Forest habitat in the Spy Hill-Ellice Community Pasture

Photo 4: Edge habitat in the Spy Hill-Ellice Community Pasture

2.2 Perching Avian Predators

As described in section 6.2.1 of the Environmental Monitoring Plan, the purpose of perching avian predator monitoring was to test the following hypothesis:

Hypothesis 2:

- H_0 (null): The construction and operation of the transmission line does not affect the abundance of perching avian predators.

- H_1 (alternative): The construction and operation of the transmission line does affect the abundance of perching avian predators.

To test Hypothesis 2, avian predator perch surveys that began in 2021 were repeated from May 2 to 5 and from June 20 to 23, 2022, the second year of Project operation. Six sites were surveyed, four at transmission towers where perch deterrents were installed (Photo 5) and two at transmission towers with no deterrents (Map 2). At each site, two tower spans (three towers) were monitored for one hour by an observer who noted the species and behaviour of raptors (falcons, hawks, eagles) and of common raven (*Corvus corax*), American crow *(Corvus brachyrhynchos*), and black-billed magpie (*Pica hudsonia*), which are common nest predators. The total number of observations of each species perching was recorded each day, as it was not possible to determine whether an individual was returning to the location or if more than one was observed. Each site was surveyed daily over the four-day period in May. In June, sites with perch deterrents were surveyed daily over the four-day period and sites without deterrents were surveyed four times over three days, with morning and afternoon surveys on June 21. A total of 16 man-hours were surveyed in May and June. The number of perching avian predators was compared at sites with and without perch deterrents.

Statistical analyses were conducted with SYSTAT 13. Observations of perched raptors and nest predators from 2021 and 2022 were combined and tested for normality with a Shapiro-Wilk test. For non-normal data, the number of raptors and nest predators observed at sites with and without perch deterrents was compared with a nonparametric Mann-Whitney test (McDonald 2014). Significance was determined at the $\alpha = 0.05$ level.

Photo 5: Perch deterrents on a transmission tower in the Spy Hill-Ellice Community Pasture

2.3 Brood Parasites

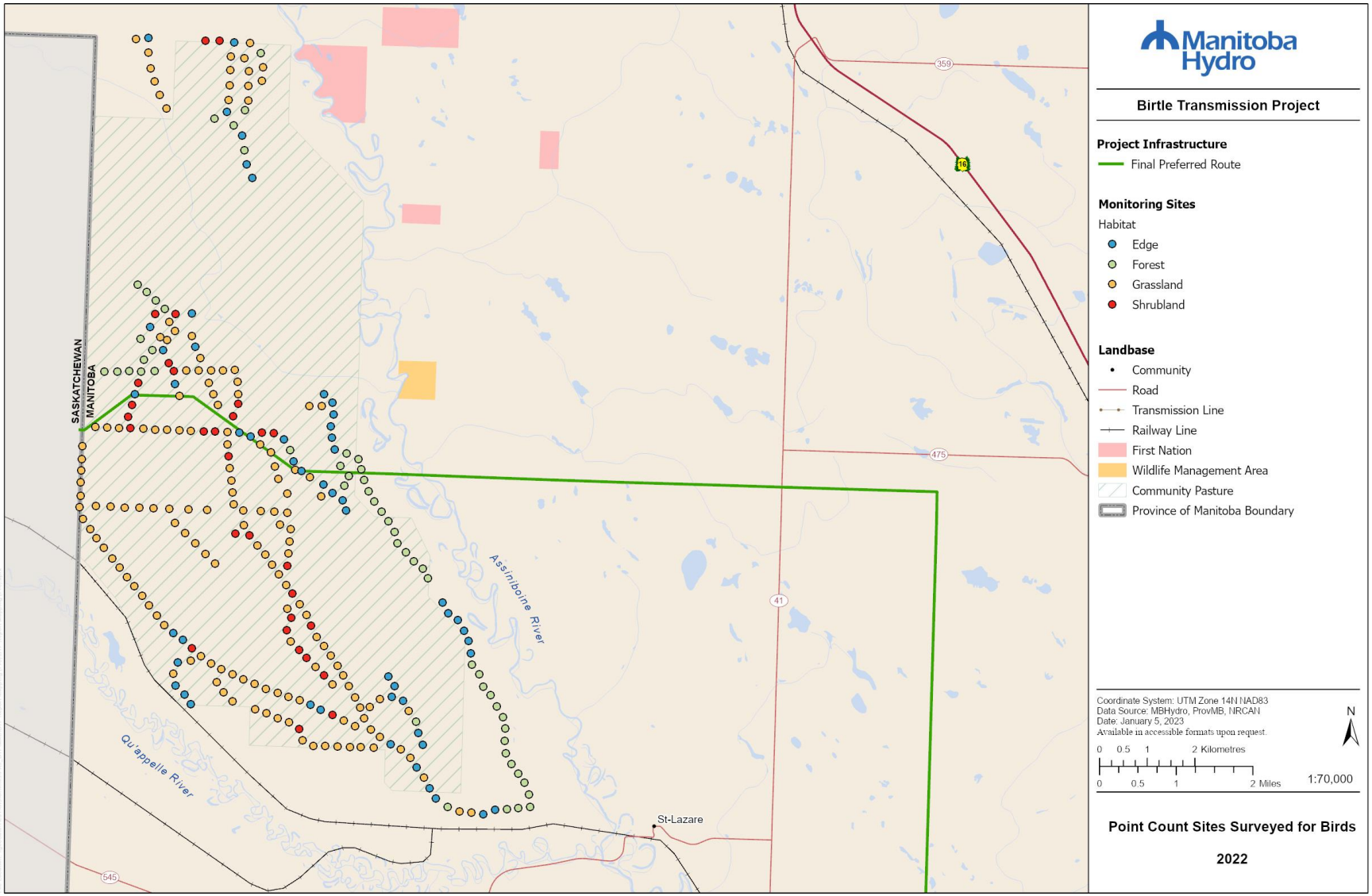
As described in section 6.2.1 of the Environmental Monitoring Plan, the purpose of brood parasite (brown-headed cowbird, *Molothrus ater*) monitoring was to test the following hypothesis:

Hypothesis 3:

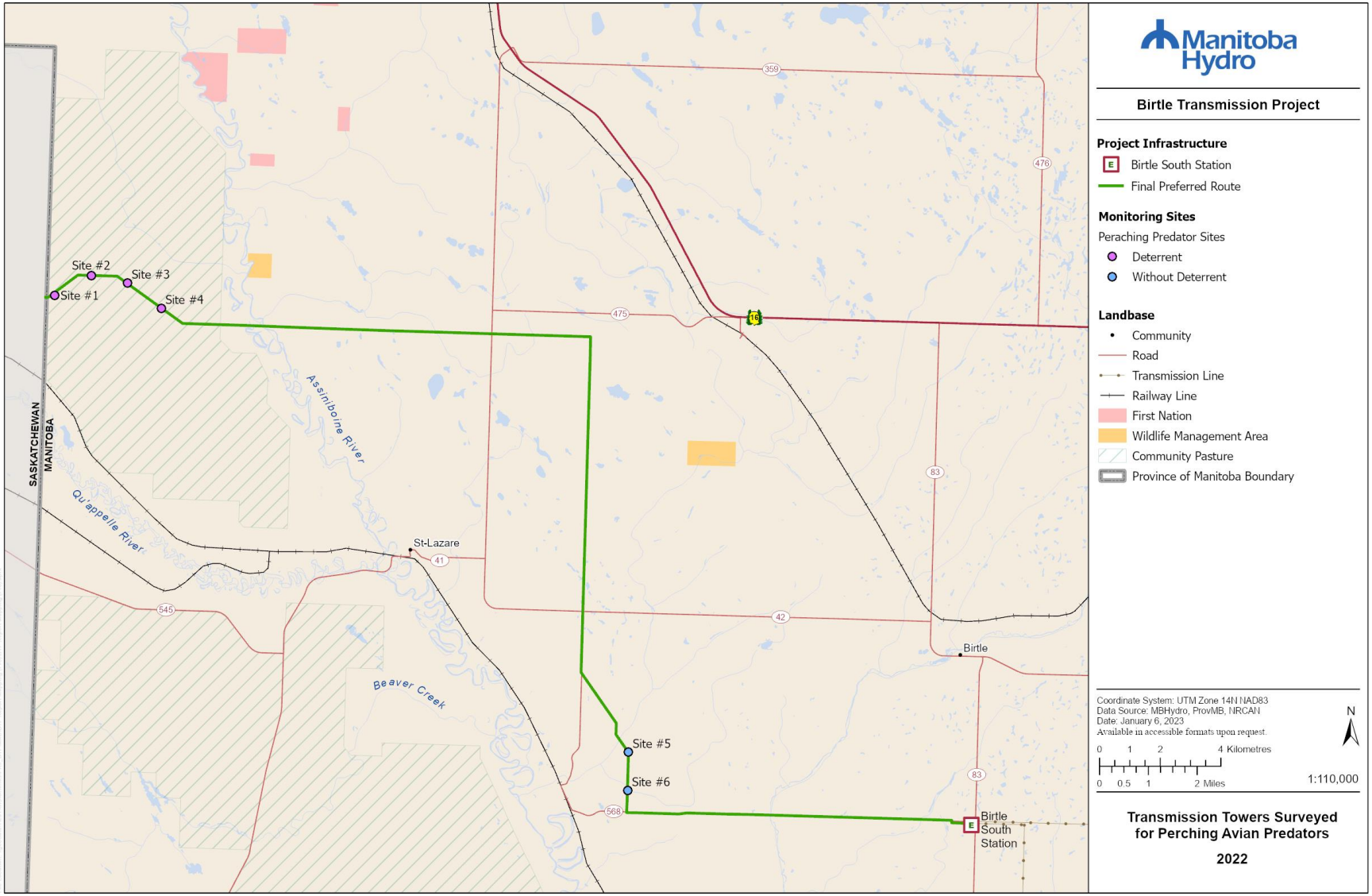
- H_0 (null): The construction and operation of the transmission line does not affect the abundance of brown-headed cowbirds.

- H_1 (alternative): The construction and operation of the transmission line does affect the abundance of brown-headed cowbirds.

To test Hypothesis 3, observations of brown-headed cowbirds were recorded during grassland bird SOCC surveys (see Section 2.1). Statistical analyses were conducted with SYSTAT 13. Abundance data were tested for normality with a Shapiro-Wilk test. For non-normal data, the number of brown-headed cowbirds observed in four habitat types was compared among survey years with a nonparametric Kruskal-Wallis test (McDonald 2014). Significance was determined at the $\alpha = 0.05$ level. Where the results were significant, a Conover-Inman test for all pairwise comparisons was performed to analyze differences between individual survey years. Because multiple comparisons were made, a Bonferroni correction of 0.05/6 = 0.008 was applied to determine statistical significance when individual years were compared (McDonald 2014).



Map 1: Point count sites surveyed for birds, 2022



Map 2: Transmission towers surveyed for perching avian predators, 2022

3.0 RESULTS

3.1 Grassland Bird Species of Conservation Concern

Eighty-nine bird species were detected at the 300 point count sites surveyed in 2022. Western meadowlark (*Sturnella neglecta*) and vesper sparrow (*Pooecetes gramineus*) were the most widespread species, found at 74% and 53% of sites, respectively (Appendix A, Table A-1). Seventy-one species were observed at sites in grassland habitat, 45 in shrubland habitat, 65 in forest habitat, and 60 in edge habitat (Appendix A, Table A-2). Six SOCCs, including chestnut-collared longspur and Sprague's pipit, were detected (Table 3). Chestnut-collared longspurs and Sprague's pipits were observed at 12% and 33% of point count sites, respectively (Table 4). Chestnut-collared longspur and Sprague's pipit were also detected at a few sites in shrubland and edge habitat. Neither species was detected in forest habitat.

Table 3: Species of conservation concern observed during point counts, 2022

Species	SARA Status	ESEA Status
Baird's sparrow	Special Concern	Endangered
Barn swallow	Threatened	Not listed
Chestnut-collared longspur	Threatened	Endangered
Common nighthawk	Threatened	Threatened
Eastern wood-pewee	Special Concern	Not listed
Sprague's pipit	Threatened	Threatened

Table 4: Percentage and (number) of point count sites in four habitat types at which species of conservation concern were observed, 2022

Species	Grassland	Shrubland	Forest	Edge	Total
Chestnut-collared longspur	21 (35)	3 (1)	0	2 (1)	12 (37)
Sprague's pipit	52 (85)	33 (10)	0	8 (4)	33 (99)
Baird's sparrow	7 (11)	3 (1)	0	0	4 (12)
Barn swallow	0	3 (1)	0	0	<1 (1)
Common nighthawk	1 (1)	0	11 (6)	4 (2)	3 (9)
Eastern wood-pewee	1 (2)	0	4 (2)	0	1 (4)

In 2022, Sprague's pipit was the most abundant of the SOCCs, with 167 individuals detected (Table 5) and comprising 62% of 269 total SOCC observations. Chestnut-collared longspur was the next most abundant with 73 individuals representing 27% of SOCC observations. Most observations of chestnut-collared longspurs and Sprague's pipits (97% and 86%, respectively) were at sites in grassland habitat. A single barn swallow (*Hirundo rustica*) was detected in shrubland habitat.

Table 5: Number of species of conservation concern observed in four habitat types during point counts, 2022

Species	Grassland	Shrubland	Forest	Edge	Total
Chestnut-collared longspur	71	0	0	1	73
Sprague's pipit	144	19	0	4	167
Baird's sparrow	11	1	1	0	13
Barn swallow	0	1	0	0	1
Common nighthawk	1	0	7	3	11
Eastern wood-pewee	2	0	2	0	4

Twelve additional bird species typically associated with grassland habitat were observed at grassland habitat sites over the four-year survey period. Western meadowlark was the most common each survey year (Table 6). Other large grassland specialists such as grasshopper sparrow (*Ammodramus savannarum*), marbled godwit (*Limosa fedoa*), and upland sandpiper (*Bartramia longicauda*) were prominent. Species such as American kestrel (*Falco sparverius*) and northern harrier (*Circus hudsonius*) were less common, likely because they are more difficult to detect during point count surveys than singing breeding birds, and because they require larger territories than other breeding bird species. Additionally, two bobolinks (*Dolichonyx oryzivorus*), a species of conservation concern listed as Threatened under the SARA, were detected at a shrubland habitat site in 2019. Three bobolinks were observed in 2021, two in shrubland and one in edge habitat.

Table 6: Number of grassland birds observed at grassland habitat sites during point counts, 2017, 2019, 2021, and 2022

Species	2017	2019	2021	2022
American kestrel	0	2	3	0
Eastern bluebird	0	3	7	2
Grasshopper sparrow	15	57	64	72
Horned lark	44	128	77	79
Lark sparrow	0	7	12	3
Marbled godwit	10	25	72	40
Northern harrier	4	1	11	0
Savannah sparrow	181	400	177	187
Sharp-tailed grouse	14	41	40	40
Upland sandpiper	87	199	144	111
Vesper sparrow	73	270	118	156
Western meadowlark	232	547	462	555

Chestnut-collared Longspur

All observations of chestnut-collared longspur in 2017, 2019, 2021, and 2022 are listed in Appendix A, Table A-3. Five chestnut-collared longspurs were observed incidentally in 2022. When only grassland habitat sites were considered, more chestnut-collared longspurs were observed in 2021, after Project construction, than in 2017 or 2019, before construction (Table 7).

Chestnut-collared longspur observations in 2022 (Map 3) were within the range observed before Project construction. The mean number of observations per site was greater after construction than before. Overall, there was relatively little difference in the distribution of chestnut-collared longspurs before and after Project construction (

Note that some sites were re-classified to grassland habitat in 2022.

Map 4), with birds detected at 19% to 23% of sites over the four-year survey period.

Table 7: Chestnut-collared longspurs observed at grassland habitat sites before (2017, 2019) and after (2021, 2022) Project construction

Year	Number Observed	Number of Sites at which Observed	Percentage of Sites at which Observed	Mean Number of Observations per Site	SD
2017	59	31	20	0.39	0.94
2019	72	39	23	0.42	0.89
2021	77	31	19	0.47	1.12
2022	71	35	21	0.43	1.05

Chestnut-collared longspurs were generally observed at similar percentages of grassland habitat sites at all distance from the ROW categories before (2017, 2019) and after (2021, 2022) Project construction (Table 8). However, chestnut-collared longspurs were observed at a relatively small percentage of sites within 1,000 m of the ROW in 2022 compared with previous survey years. At sites within 1,000 m of the ROW, the mean number of individuals observed in 2021 was within the range of pre-construction observations and was lowest in 2022. At sites between 1,001 and 2,000 m from the ROW, the mean number of individuals observed was lowest in 2019 and greatest in 2022. At sites more than 2,000 m from the ROW, the mean number of individuals observed was greatest in 2021 and lowest in 2022.

Table 8: Chestnut-collared longspurs observed at various distances from the right-of-way in grassland habitat before (2017, 2019) and after (2021, 2022) Project construction

Distance from ROW (m)	Metric	2017	2019	2021	2022
0–1000	Number of sites at which observed	5	8	5	3
	Percentage of sites	14	17	12	7
	Number observed	6	17	8	5
	Mean	0.17	0.37	0.19	0.12
	SD	0.45	0.90	0.66	0.50
1001–2000	Number of sites at which observed	11	15	12	16
	Percentage of sites	39	48	41	53
	Number observed	27	24	37	40
	Mean	0.96	0.77	1.28	1.33
	SD	1.62	1.02	1.79	1.75
>2000	Number of sites at which observed	15	16	14	16
	Percentage of sites	17	17	15	17
	Number observed	26	31	32	26

Mean	0.29	0.33	0.35	0.28
SD	0.71	0.81	0.90	0.73

When the average height of the vegetation at grassland habitat sites was considered, most chestnut-collared longspur activity was at sites in the intermediate vegetation height category in 2022. Chestnut-collared longspurs were observed at the greatest percentage of grassland habitat sites with vegetation 15 to 30 cm tall (Table 9). The mean number of chestnut-collared longspur observations per site was also greatest in the intermediate vegetation height category. There was considerably less chestnut-collared longspur activity at sites with vegetation taller than 30 cm.

Table 9: Chestnut-collared longspurs observed at grassland habitat sites in three vegetation height categories, 2022

Height Category (cm)	Number of Sites	Number of Sites at which Observed	Percentage of Sites at which Observed	Mean Number of Observations per Site	SD
<15	61	8	13	0.23	0.78
15–30	78	24	31	0.67	1.27
>30	9	1	11	0.11	0.33

Abundance data were non-normal for all survey years (p = 0.000). There was no significant difference in the abundance of chestnut-collared longspurs among survey years (H = 0.535, p = 0.911). There was no change in the abundance of chestnut-collared longspurs in the Spy Hill-Ellice Community Pasture during the first or second years of operation monitoring.

Binary logistic regression was used to analyze the relationship between the presence of chestnut-collared longspurs and distance from the ROW and distance to nearest forest. There was a statistically significant association between the presence of chestnut-collared longspurs and distance from the ROW in 2017 (Z = 2.728, p = 0.006), 2019 (Z = 2.584, p = 0.010), 2021 (Z = 2.334, p = 0.020), and 2022 (Z = 2.547, p = 0.011). The association between the presence of chestnut-collared longspur and distance to nearest forest was also statistically significant in 2017 (Z = -2.892, p = 0.004), 2019 (Z = -3.476, p = 0.001), 2021 (Z = -4.438, p = 0.000), and 2022 (Z = -4.143, p = 0.000). However, the odds ratio for distance from the ROW was 1.000 each year, suggesting that chestnut-collared longspurs were no more or less likely to be present at various distances from the ROW. Odds ratios of 0.998 or 0.999 for distance to nearest forest each survey year suggest that chestnut-collared longspurs were no more or less likely to be present at various distances from nearest forest. Only 17% of the variation in the presence of chestnut-collared longspur could be attributed to the model in 2017 and 2019 (Naglekerke's R^2 = 0.168 and 0.166, respectively), and 23% to 26% of the variation was attributed to the model in 2021 and 2022 (Naglekerke's R^2 = 0.260 and 0.230, respectively). Overall model fit (p = 0.000 for all survey years) indicates that the model was an inadequate predictor of chestnut-collared longspur presence in the Spy Hill-Ellice Community Pasture.

Sprague's Pipit

All observations of Sprague's pipits in 2017, 2019, 2021, and 2022 are listed in Appendix A, Table A-4. When only grassland habitat sites were considered, fewer Sprague's pipits were observed in 2021, the first year of Project operation, than in 2017 and 2019, before construction (Table 10). The greatest number was observed in 2022 (Map 5), the second year of Project operation. The mean number of observations per site was lowest in 2021 and Sprague's pipits were less widely distributed that year, having been observed at a smaller percentage of sites than in previous or subsequent survey years. However, Sprague's pipits were more abundant and widely distributed in 2022 than before Project construction. Overall, the distribution of Sprague's pipits was similar before and after Project construction (Map 6).

Table 10: Sprague's pipits observed at grassland habitat sites before (2017, 2019) and after (2021, 2022) Project construction

Year	Number Observed	Number of Sites at which Observed	Percentage of Sites at which Observed	Mean Number of Observations per Site	SD
2017	124	79	52	0.81	0.99
2019	119	77	45	0.70	0.92
2021	65	39	24	0.40	0.85
2022	144	85	52	0.88	1.00

Sprague's pipits were observed at similar percentages of grassland habitat sites within and beyond 2,000 m of the ROW in 2017 and 2019, before Project construction, and in 2022, the second year of operation (Table 11). Observations were made at smaller percentages of sites at all distance from the ROW categories in 2021, the first year of Project operation. The mean number of individuals observed was also lower in 2021 than in all other survey years at all distance from the ROW categories.

Table 11: Sprague's pipits observed at various distances from the right-of-way in grassland habitat before (2017, 2019) and after (2021, 2022) Project construction

Distance from ROW (m)	Metric	2017	2019	2021	2022
0–1000	Number of sites at which observed	11	12	5	17
	Percentage of sites	31	26	12	40
	Number observed	16	13	6	29
	Mean	0.44	0.28	0.14	0.69
	SD	0.81	0.50	0.41	0.95
1001–2000	Number of sites at which observed	18	20	9	23
	Percentage of sites	64	65	31	77
	Number observed	32	37	14	43
	Mean	1.14	1.19	0.48	1.43
	SD	1.08	1.17	0.83	1.04
>2000	Number of sites at which observed	50	45	25	45
	Percentage of sites	56	48	27	49
	Number observed	76	69	45	72

Mean	0.85	0.74	0.49	0.78
SD	0.98	0.90	0.98	0.96

When the average height of the vegetation at grassland habitat sites was considered, there was more Sprague's pipit activity at sites with taller vegetation in 2022. Sprague's pipits were observed in the greatest percentage of sites where vegetation was taller than 30 cm (Table 12). The mean number of Sprague's pipit observations per site was also greatest at these sites. Sprague's pipits were observed at the smallest percentage of sites with vegetation shorter than 15 cm. The mean number of Sprague's pipits observed was also lowest where vegetation was shortest.

Table 12: Sprague's pipits observed at grassland habitat sites in three vegetation height categories, 2022

Height Category (cm)	Number of Sites	Number of Sites at which Observed	Percentage of Sites at which Observed	Mean Number of Observations per Site	SD
<15	61	32	52	0.80	0.87
15–30	78	43	55	0.99	1.06
>30	9	6	67	1.33	1.41

Abundance data were non-normal for all survey years (p = 0.000). There was a significant difference in the abundance of Sprague's pipits among years (H = 33.053, p = 0.000). Post hoc analysis indicated that there was a significant difference in abundance between 2017 and 2021 (test statistic = 4.724, p = 0.000), 2019 and 2021 (test statistic = 3.766, p = 0.000), and 2021 and 2022 (test statistic = 5.354, p = 0.000), where fewer Sprague's pipits were observed in 2021 than in other survey years.

Binary logistic regression was used to analyze the relationship between the presence of Sprague's pipits and distance from the ROW and distance to nearest forest. There was no statistically significant association between the presence of Sprague's pipit and distance from the ROW in 2017 (Z = -1.235, p = 0.217), 2019 (Z = -0.538, p = 0.590), 2021 (Z = 0.173, p = 0.863), and 2022 (Z = 1.019, p = 0.308). The association between the presence of Sprague's pipit and distance to nearest forest was statistically significant in 2017 (Z = -2.186, p = 0.029), 2019 (Z =-3.994, p = 0.000), and 2022 (Z = -4.687, p = 0.000). The association between Sprague's pipit presence and distance to nearest forest was not statistically significant in 2021 (Z = -1.554, p = 0.120). The odds ratio for distance from the ROW was 1.000 each year, suggesting that Sprague's pipits were no more or less likely to be present at various distances from the ROW. Odds ratios of 0.998 or 0.999 for distance to nearest forest each survey year suggest that Sprague's pipits were no more or less likely to be present at various distances from nearest forest. Between 2% and 23% of the variation in the presence of Sprague's pipit could be attributed to the model in 2017, 2019, 2021, and 2022 (Naglekerke's R^2 = 0.052, 0.138, 0.022, and 0.230, respectively). Overall model fit indicates that the model was an inadequate predictor of Sprague's pipit presence in 2017 (p = 0.049), 2019 (p = 0.000), and 2022 (p = 0.000). In 2021, the model was an adequate predictor of Sprague's pipit presence (p = 0.292).

3.2 Perching Avian Predators

A total of 14 observations of avian predators perched on transmission towers were made in 2022 (Appendix A, Table A-5). Only five instances of perching raptors were recorded in 2021 and 2022 (Table 13). A pair of red-tailed hawks (*Buteo jamaicensis*) were observed perched at a nest below the deterrents on a tower at site 3 in May 2022. The other three observations were of a rough-legged hawk (*Buteo lagopus*), an American kestrel, and a red-tailed hawk perched on a tower with no deterrents at site 5 in 2021. More nest predators were observed on transmission towers with perch deterrents than without in 2021 and 2022. The mean number of nest predators was also greater on towers with perch deterrents both years. Common ravens accounted for 88% (n = 23) of the 26 total observations of perched nest predators over the two-year survey period. American crow (n = 2) and black-billed magpie (n = 1) were also observed. No avian predators were observed perching on the perch deterrents.

Combined abundance data were non-normal for perching raptors and nest predators (p = 0.000–0.030) in 2021 and 2022. While the mean number of raptors perched at sites with perch deterrents was lower than at sites with no deterrents (Table 13), the difference was not statistically significant (U = 18.500, p = 0.514) The mean number of perched nest predators was greater at sites with perch deterrents than with no deterrents, but the difference was not statistically significant (U = 7.000, p = 0.110).

Table 13: Raptors and nest predators perched at sites with and without perch deterrents, 2021 and 2022

Perch Deterrents	Site	Number of Raptors			Number of Nest Predators		
		2021	2022	Total	2021	2022	Total
Yes	1	0	0	0	0	2	2
	2	0	0	0	0	2	2
	3	0	2	2	11	5	16
	4	0	0	0	1	3	4
	Total	0	2	2	12	12	24
	Mean	0	0.5	0.3	3.0	3.0	3.0
	SD	0	1.0	0.7	5.4	1.4	3.6
No	5	3	0	3	2	0	2
	6	0	0	0	0	0	0
	Total	3	0	3	2	0	2
	Mean	1.5	0	0.8	1.0	0	0.5
	SD	2.1	0	1.5	1.4	0	1.0

3.3 Brood Parasites

The abundance and distribution of brown-headed cowbirds was greatest in forest habitat during all study years (Table 14). Overall abundance and distribution were greatest in 2019, before Project construction, and were lowest in 2022, during Project operation.

Table 14: Abundance and distribution of brown-headed cowbirds in four habitat types during point counts, 2017, 2019, 2021, and 2022

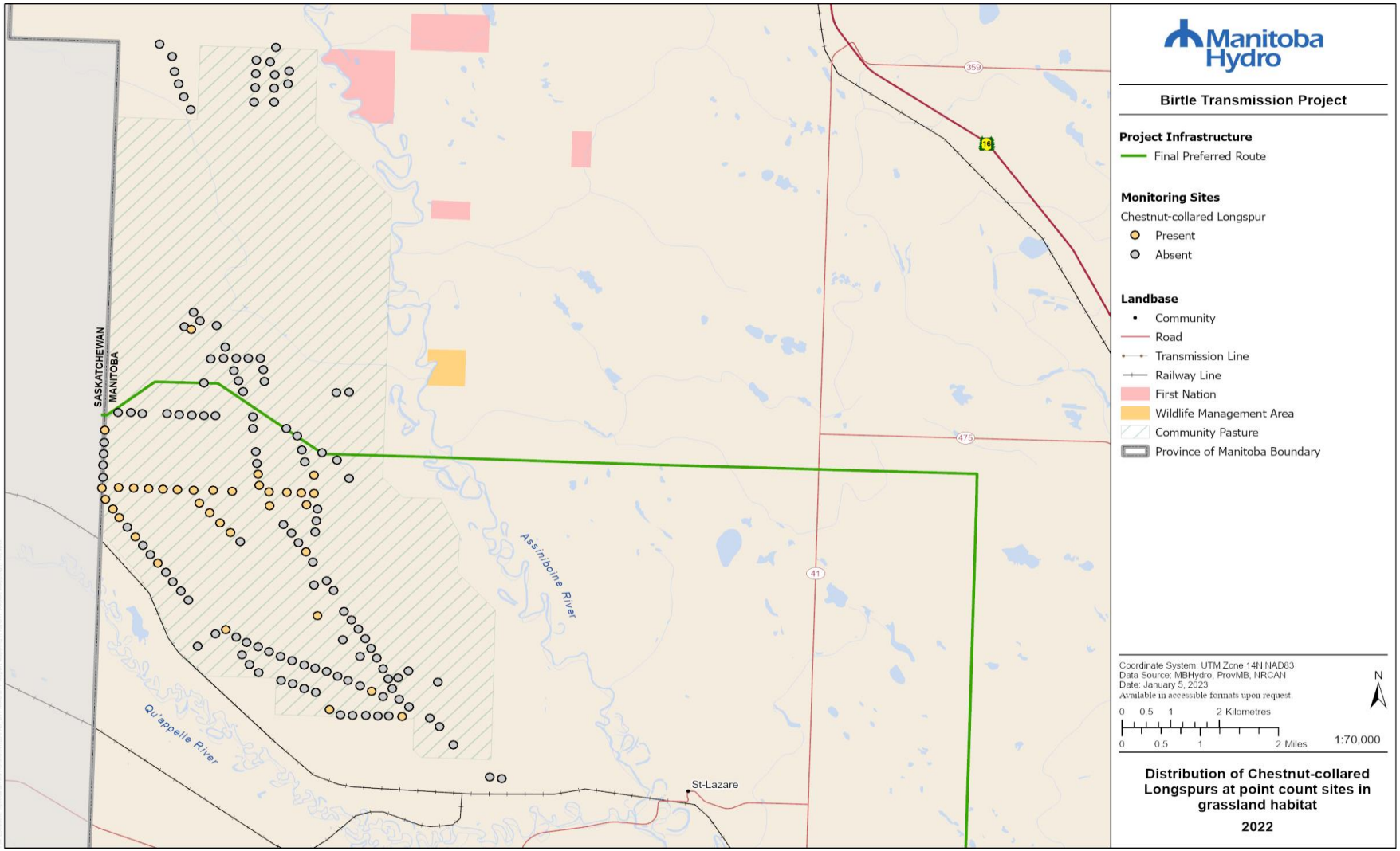
Habitat	Metric	2017	2019	2021	2022
Grassland	Number of sites at which observed	9	19	9	6
	Percentage of sites	6	11	5	4
	Number observed	9	22	14	9
	Mean	0.06	0.13	0.09	0.06
	SD	0.24	0.39	0.42	0.32
Shrubland	Number of sites at which observed	2	5	6	1
	Percentage of sites	7	16	19	3
	Number observed	2	8	12	1
	Mean	0.07	0.26	0.39	0.03
	SD	0.27	0.68	0.92	0.18
Forest	Number of sites at which observed	33	33	22	19
	Percentage of sites	60	59	42	36
	Number observed	41	64	38	21
	Mean	0.75	1.14	0.73	0.40
	SD	0.70	1.41	1.17	0.57
Edge	Number of sites at which observed	20	19	10	7
	Percentage of sites	39	36	23	13
	Number observed	20	30	17	7
	Mean	0.39	0.57	0.39	0.13
	SD	0.49	0.88	0.95	0.34
Total	Number of sites at which observed	64	76	47	33
	Percentage of sites	22	25	16	11
	Number observed	72	124	81	38
	Mean	0.25	0.40	0.28	0.13
	SD	0.50	0.87	0.79	0.39

Abundance data were non-normal for all survey years and habitat types (p = 0.000). There was a significant difference in brown-headed cowbird abundance in grassland habitat among survey years (H = 8.379, p = 0.039). Post hoc analysis indicated that there was a significant difference in abundance between 2019 and 2022 (Table 15). There was no significant difference in brown-headed cowbird abundance in shrubland habitat among survey years (H = 5.177, p = 0.159). There was a significant difference in brown-headed cowbird abundance in forest habitat among survey years (H = 11.929, p = 0.008). Post hoc analysis indicated that there was a significant difference in abundance between 2019 and 2022 (Table 15). There was a significant difference in brown-headed cowbird abundance in edge habitat among survey years (H = 11.263, p = 0.010). Post hoc analysis indicated that there was a significant difference in abundance between 2017 and 2022 and between 2019 and 2022. There was a significant difference in brown-headed cowbird abundance in all combined habitats among survey years (H = 23.639, p = 0.000). Post hoc analysis indicated that there was a significant difference in abundance between 2017 and 2022, 2019 and 2021, and 2019 and 2022 (Table 15).

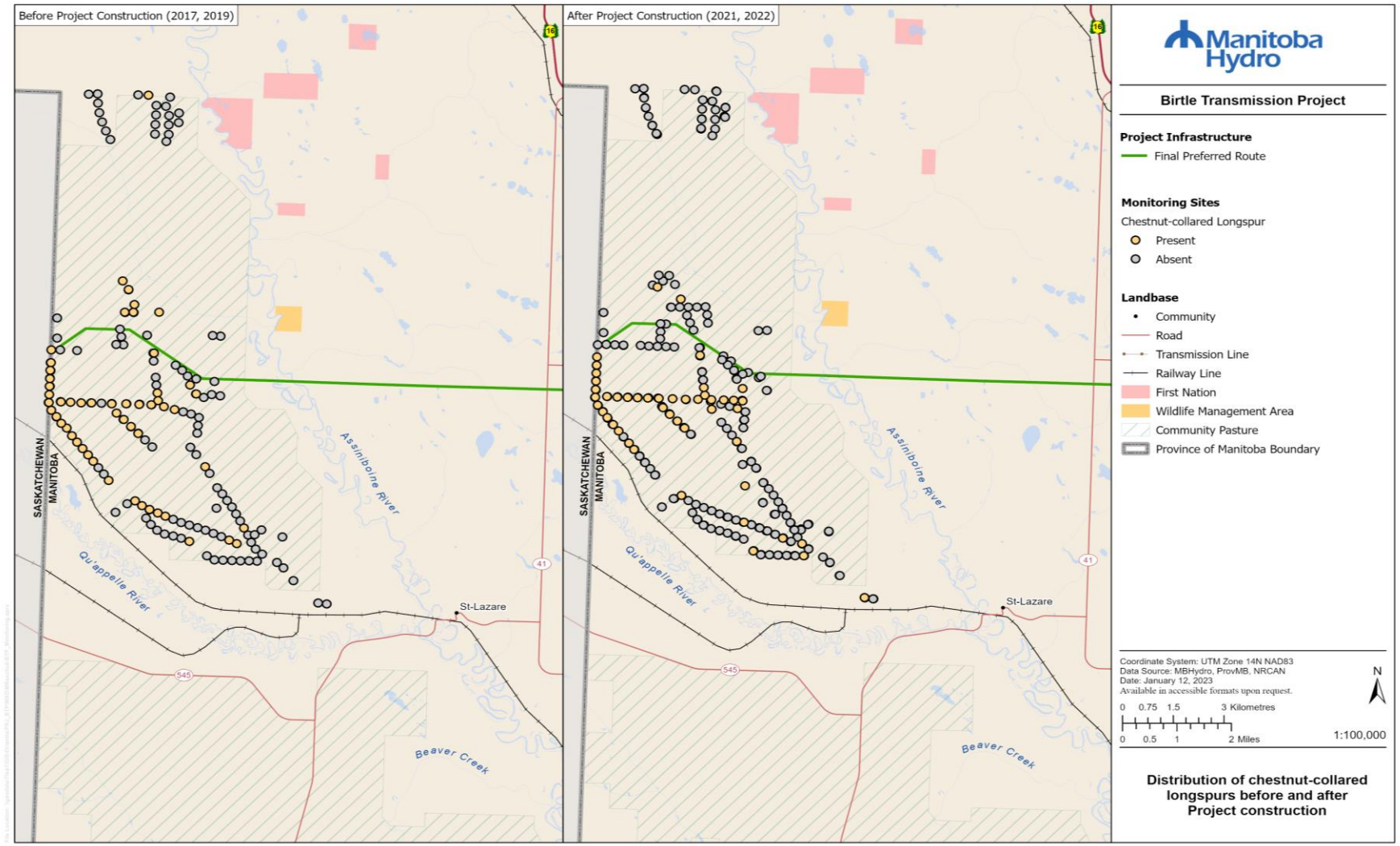
Table 15: Post hoc analysis of brown-headed cowbird abundance in four habitat types during point counts, 2017, 2019, 2021, and 2022

Comparison	Grassland		Forest		Edge		All Habitats[1]	
	Statistic	p^2	Statistic	p^2	Statistic	p^2	Statistic	p^2
2017 and 2019	1.935	0.053	0.755	0.451	0.107	0.915	1.045	0.296
2017 and 2021	0.096	0.924	1.264	0.208	1.487	0.139	1.598	0.110
2017 and 2022	0.759	0.448	2.520	0.012	2.825	**0.005**	3.450	**0.001**
2019 and 2021	2.069	0.039	2.013	0.045	1.603	0.111	2.680	**0.007**
2019 and 2022	2.750	**0.006**	3.279	**0.001**	2.960	**0.003**	4.579	**<0.001**
2021 and 2022	0.675	0.500	1.233	0.219	1.217	0.225	1.848	0.065

1. Includes shrubland habitat.
2. Bold font indicates statistical significance (α = 0.008).

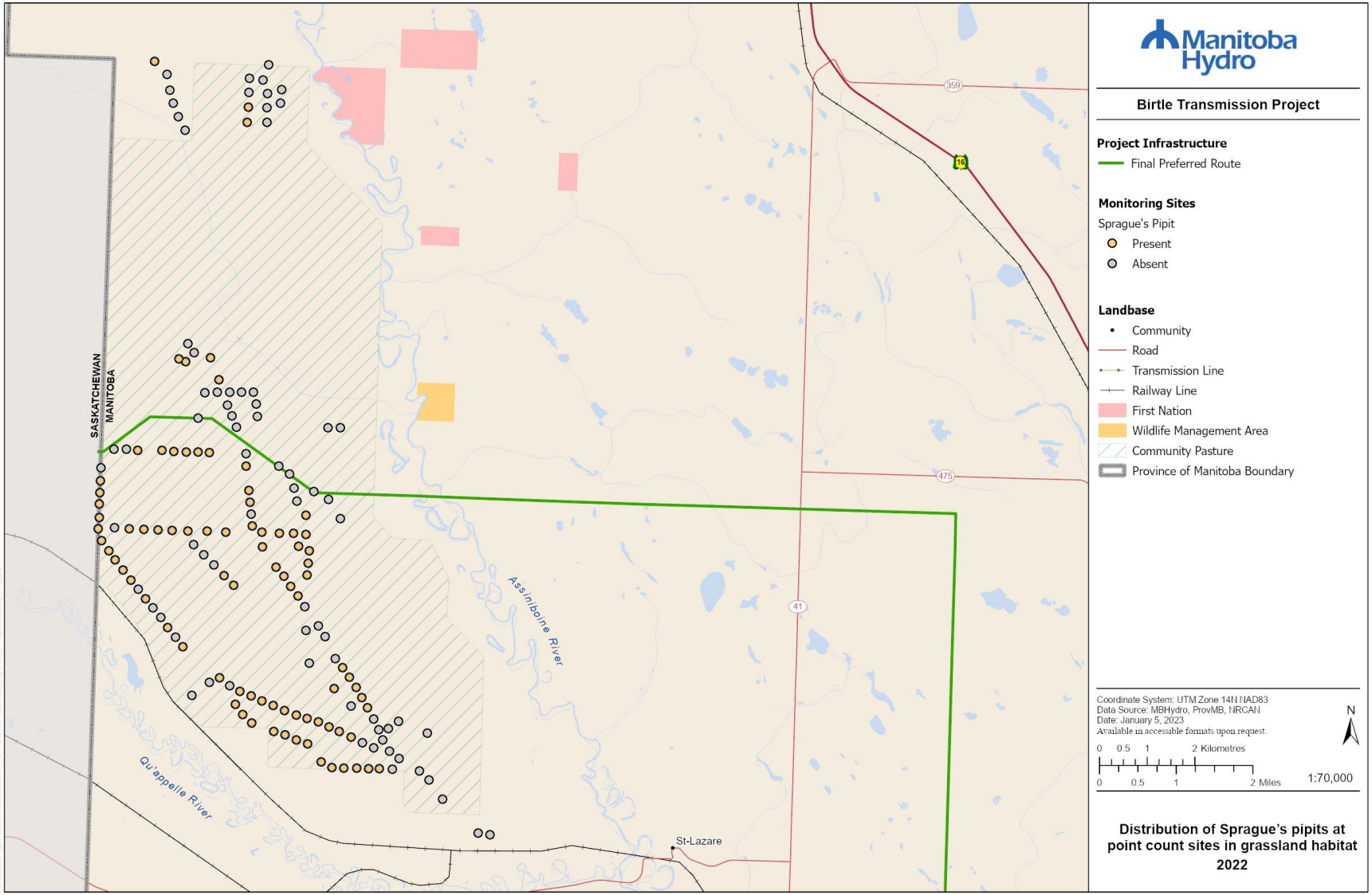


Map 3: Distribution of chestnut-collared longspurs at point count sites in grassland habitat, 2022

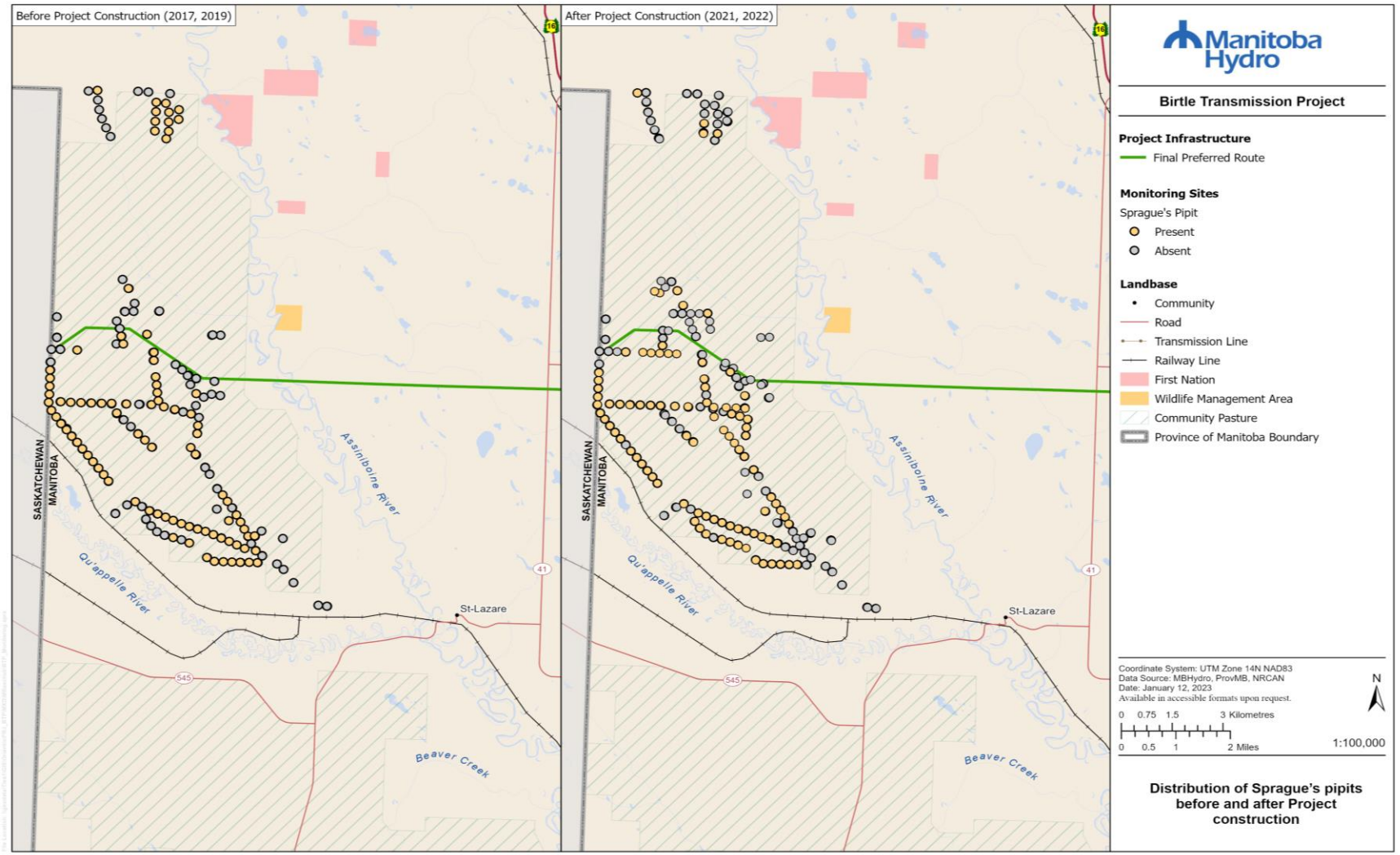


Note that some sites were re-classified to grassland habitat in 2022.

Map 4: Distribution of chestnut-collared longspurs at point count sites in grassland habitat before (2017, 2019) and after (2021, 2022) Project construction



Map 5: Distribution of Sprague's pipits at point count sites in grassland habitat, 2022



Note that some sites were re-classified to grassland habitat in 2022.

Map 6: Distribution of Sprague's pipits at point count sites in grassland habitat before (2017, 2019) and after (2021, 2022) Project construction

4.0 DISCUSSION

Chestnut-collared longspur and Sprague's pipit were relatively widely distributed in the Spy Hill-Ellice Community Pasture and were the most frequently detected SOCCs in 2022. Few were observed in habitat other than grassland. The abundance and distribution of chestnut-collared longspurs in grassland habitat was unchanged during the first and second years after Project construction; no adverse Project effects on chestnut-collared longspur were detected. A statistically significant decline in the abundance of Sprague's pipits was observed during the first year of Project operation. However, abundance increased significantly from the first to second years of operation, with similar mean numbers of individuals per site observed in 2022 and in 2017, before Project construction. It is unlikely that the lower abundance of Sprague's pipits in 2021 was a result of construction and operation of the transmission line. The decline was observed at all distance from the ROW categories and was not limited to sites near the ROW. As there were no adverse Project effects on grassland habitat (Szwaluk Environmental Consulting Ltd. and Newman 2021) and no increase in the abundance of perching avian predators or brown-headed cowbirds during the first year of operation, there were likely no associated Project-related effects on Sprague's pipit productivity or mortality that year. Sprague's pipits prefer grass of intermediate height (10–30 cm; COSEWIC 2010) and may avoid vegetation less than 14 cm high (Dale 1983, 1990, 1992, Prescott et al. 1993, and Prescott and Wagner 1996 in Robbins and Dale 1999), as suggested by the lower activity levels at sites with vegetation less than 15 cm tall on average in 2022. The drought in 2021 likely resulted in shorter and less dense grasses in the community pasture, which many have influenced Sprague's pipit abundance and distribution. At some sites in grassland habitat, the difference in grass height and density was apparent from 2021 to 2022 (see Appendix B for examples). For Hypothesis 1, the alternative hypothesis (the construction and operation of the transmission line affects the abundance of chestnut-collared longspur and Sprague's pipit) was not supported as no effect of transmission line construction and operation on the abundance of these species was detected. The null hypothesis (the construction and operation of the transmission line does not affect the abundance of chestnut-collared longspur and Sprague's pipit) was not rejected.

The relationship between the presence of chestnut-collared longspur or Sprague's pipit and distance from the ROW and distance to nearest forest was tested. While there was a statistically significant association between the presence of chestnut-collared longspurs and distance from the ROW and distance to nearest forest, they were no more or less likely to be present at various distances to each. A maximum of 26% of the variation in chestnut-collared longspur presence was attributable to these factors each survey year. The results indicate that other unknown factors influenced the presence of chestnut-collared longspurs in the Spy Hill-Ellice Community Pasture, especially given that there was no ROW in 2017 or 2019 to affect habitat selection. There was no statistically significant association between the presence of Sprague's pipit and distance from the ROW during any survey year. There was a statistically significant relationship between the presence of Sprague's pipit and distance to nearest forest each year but 2021, when relatively few birds were observed in the community pasture. However, Sprague's pipits were no more or less likely to be present at various distances from the ROW or to the nearest forest. A maximum of 23% of the variation in the presence of Sprague's pipits was attributable to these factors over

the survey period. The model was an inadequate predictor of the Sprague's pipit presence in three of four survey years. The results indicate that other unknown factors influenced the presence of Sprague's pipits in the community pasture. The model was an adequate predictor of Sprague's pipit presence in 2021. The anomalous model results during the first year of operation monitoring could be related to the low number of Sprague's pipits detected that year, particularly because little to no change in distance to nearest forest at grassland habitat sites would be expected over the survey period.

Transmission towers can provide hunting perches for avian predators (e.g., Lammers and Collopy 2007; Dwyer and Doloughan 2014), increasing the mortality of prey species. Perching avian predators were observed at sites with and without perch deterrents in 2021 and 2022. There was no significant difference in the abundance of perched raptors or nest predators at these sites over the combined two-year survey period. Avian predators were observed on transmission towers with deterrents, indicating that some individuals were not dissuaded from perching at these sites; however, none were observed perching on the deterrents. For Hypothesis 2, the alternative hypothesis (the construction and operation of the transmission line affects the abundance of perching avian predators) was not supported as no effect of transmission line construction and operation on the abundance of perching avian predators was detected. The null hypothesis (the construction and operation of the transmission line does not affect the abundance of perching avian predators) was not rejected.

Brown-headed cowbirds are brood parasites that lay their eggs in other species' nests, reducing the host's productivity (Sealy 2018). If the eggs are not rejected the host provides parental care, often at the expense of the host's own offspring (Lowther 1993). Brown-headed cowbirds are relatively common in Manitoba and are associated with pastures and feedlots (Sealy 2018). They have not been associated with species declines in Manitoba but may affect species at risk such as Sprague's pipit (Sealy 2018). Brown-headed cowbirds were observed at point count sites in all habitat types over the four-year study period. They were most abundant in forest habitat all years and were relatively sparse in grassland and shrubland. Brown-headed cowbird abundance in the Spy Hill-Ellice Community Pasture was significantly lower after Project construction than before. The variation in abundance among survey years before and after Project construction suggests that the change is not Project-related. For Hypothesis 3 (the construction and operation of the transmission line does/does not affect the abundance of brown-headed cowbird), a change in the abundance of brown-headed cowbird was detected. Because no increase was observed, no adverse effect on grassland bird SOCCs resulted from the construction and operation of the transmission line.

Monitoring for grassland bird SOCCs and perching avian predators will continue in 2023. To date, no Project-related effects on chestnut-collared longspur and Sprague's pipit have been observed; no further mitigation is recommended.

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APPENDIX A
Tables

Table A-1; Bird species detected during point counts, 2022

Common Name	Scientific Name	Number of Sites	Percentage of Sites
Alder flycatcher	*Empidonax alnorum*	7	2
American crow	*Corvus brachyrhynchos*	147	49
American goldfinch	*Spinus tristis*	112	37
American kestrel	*Falco sparverius*	1	0
American redstart	*Setophaga ruticilla*	32	11
American robin	*Turdus migratorius*	60	20
Baird's sparrow	*Ammodramus bairdii*	12	4
Baltimore oriole	*Icterus galbula*	14	5
Barn swallow	*Hirundo rustica*	1	0
Belted kingfisher	*Megaceryle alcyon*	1	0
Black tern	*Childonias niger*	2	1
Black-and-white warbler	*Mniotilta varia*	10	3
Black-billed magpie	*Pica hudsonia*	22	7
Blue jay	*Cyanocitta cristata*	16	5
Blue-winged teal	*Anas discors*	1	0
Brewer's blackbird	*Euphagus cyanocephalus*	5	2
Brown thrasher	*Toxostoma rufum*	10	3
Brown-headed cowbird	*Molothrus ater*	33	11
Canada goose	*Branta canadensis*	13	4
Cedar waxwing	*Bombycilla cedrorum*	53	18
Chestnut-collared longspur	*Calcarius ornatus*	37	12
Chestnut-sided warbler	*Setophaga pensylvanica*	12	4
Chipping sparrow	*Spizella passerina*	4	1
Clay-colored sparrow	*Spizella pallida*	141	47
Common grackle	*Quiscalus quiscula*	1	0
Common loon	*Gavia immer*	2	1
Common nighthawk	*Chordeiles minor*	9	3
Common raven	*Corvus corax*	19	6
Common yellowthroat	*Geothlypis trichas*	28	9
Connecticut warbler	*Oporornis agilis*	1	0
Downy woodpecker	*Picoides pubescens*	1	0
Eastern bluebird	*Sialia sialis*	5	2
Eastern kingbird	*Tyrannus tyrannus*	6	2
Eastern phoebe	*Sayornis phoebe*	1	0
Eastern towhee	*Pipilo erythrophthalmus*	19	6
Eastern wood-pewee	*Contopus virens*	4	1
Grasshopper sparrow	*Ammodramus savannarum*	68	23
Gray catbird	*Dumetella carolinensis*	35	12
Great Crested flycatcher	*Myiarchus crinitus*	54	18
Green-winged teal	*Anas crecca*	1	0
Hairy woodpecker	*Picoides villosus*	9	3

Common Name	Scientific Name	Number of Sites	Percentage of Sites
Hermit thrush	*Catharus guttatus*	4	1
Horned lark	*Eremophila alpestris*	52	17
House wren	*Troglodytes aedon*	96	32
Indigo bunting	*Passerina cyanea*	1	0
Killdeer	*Charadrius vociferus*	6	2
Lark sparrow	*Chondestes grammacus*	8	3
Least flycatcher	*Empidonax minimus*	121	40
LeConte's sparrow	*Ammodramus leconteii*	3	1
Lincoln's sparrow	*Melospiza lincolnii*	5	2
Magnolia warbler	*Setophaga magnolia*	1	0
Mallard	*Anas platyrhynchos*	10	3
Marbled godwit	*Limosa fedoa*	35	12
Merlin	*Falco columbarius*	2	1
Mourning dove	*Zenaida macroura*	74	25
Mourning warbler	*Geothlypis philadelphia*	1	0
Nashville warbler	*Leiothylpis ruficapilla*	1	0
Northern flicker	*Colaptes auratus*	11	4
Northern harrier	*Circus hudsonius*	1	0
Northern waterthrush	*Parkesia noveboracensis*	6	2
Orange-crowned warbler	*Leiothylpis celata*	7	2
Ovenbird	*Seiurus aurocapilla*	3	1
Philadelphia vireo	*Vireo philadelphicus*	2	1
Pied-billed grebe	*Podilymbus podiceps*	5	2
Pileated woodpecker	*Dryocopus pileatus*	2	1
Red-eyed vireo	*Vireo olivaceus*	84	28
Red-winged blackbird	*Agelaius phoeniceus*	31	10
Ring-billed gull	*Larus delawarensis*	2	1
Rose-breasted grosbeak	*Pheucticus ludovicianus*	24	8
Savannah sparrow	*Passerculus sandwichensis*	150	50
Sedge wren	*Cistothorus platensis*	1	0
Sharp-tailed grouse	*Tympanuchus phasianellus*	19	6
Song sparrow	*Melospiza melodia*	7	2
Sora	*Porzana carolina*	3	1
Spotted sandpiper	*Actitis macularius*	2	1
Spotted towhee	*Pipilo maculatus*	5	2
Sprague's pipit	*Anthus spragueii*	99	33
Tree swallow	*Tachycineta bicolor*	9	3
Upland sandpiper	*Bartramia longicauda*	125	42
Veery	*Catharus fuscescens*	44	15
Vesper sparrow	*Pooecetes gramineus*	159	53
Warbling vireo	*Vireo gilvus*	88	29
Western kingbird	*Tyrannus verticalis*	2	1
Western meadowlark	*Sturnella neglecta*	223	74

Common Name	Scientific Name	Number of Sites	Percentage of Sites
White-throated sparrow	*Zonotrichia albicollis*	7	2
Wilson's snipe	*Gallinago delicata*	29	10
Yellow warbler	*Setophaga petechia*	101	34
Yellow-bellied sapsucker	*Sphyrapicus varius*	5	2
Yellow-throated vireo	*Vireo flavifrons*	9	3

Table A-2: Bird species detected in four habitat types during point counts, 2022

Habitat	Site	Location	Number of Species	Number of Individuals
Grassland	110	14 U 327532 5607231	12	19
	111	14 U 327518 5606932	14	19
	112	14 U 327501 5606629	13	21
	113	14 U 327489 5606326	12	17
	187	14 U 327814 5607200	10	14
	188	14 U 327909 5606911	11	19
	189	14 U 327900 5606611	15	19
	190	14 U 327899 5606311	18	20
	192	14 U 328194 5606690	16	19
	193	14 U 328204 5606993	15	19
	195	14 U 327936 5607503	17	20
	197	14 U 325801 5607302	13	13
	198	14 U 325847 5606998	14	16
	199	14 U 325930 5606706	14	15
	200	14 U 326043 5606425	16	16
	201	14 U 326175 5606153	15	16
	202	14 U 325531 5607587	13	14
	48	14 U 324698 5597804	5	13
	49	14 U 324997 5597784	5	16
	50	14 U 325305 5597770	6	16
	51	14 U 325603 5597762	7	15
	52	14 U 325909 5597752	5	13
	53	14 U 326213 5597731	8	19
	55	14 U 327026 5597717	6	14
	56	14 U 326636 5597731	7	17
	57	14 U 326359 5597444	6	16
	58	14 U 326566 5597233	8	17
	59	14 U 326780 5597016	6	11
	60	14 U 326993 5596799	5	11
	61	14 U 327194 5596592	3	8
	G1	14 U 324683 5599454	9	15
	G12	14 U 327457 5599356	14	19
	G120	14 U 329434 5599896	7	8
	G121	14 U 329179 5599896	10	11
	G123	14 U 329249 5598439	10	12
	G125	14 U 329417 5597994	16	23
	G128	14 U 328706 5598052	11	20
	G129	14 U 326552 5599619	6	9
	G130	14 U 326499 5599862	2	3
	G131	14 U 326444 5600106	11	14
	G134	14 U 326598 5600649	8	11
	G135	14 U 326857 5600650	5	7

Habitat	Site	Location	Number of Species	Number of Individuals
Grassland	G145	14 U 326537 5601648	4	4
	G163	14 U 326887 5600898	6	7
	G165	14 U 326712 5601367	11	14
	G168	14 U 327614 5600647	10	14
	G175	14 U 327260 5599919	11	14
	G182	14 U 329314 5594418	10	16
	G184	14 U 329670 5594052	6	10
	G185	14 U 330138 5593176	5	8
	G186	14 U 329912 5593288	5	8
	G187	14 U 329683 5593399	8	10
	G188	14 U 329452 5593506	6	10
	G189	14 U 329220 5593613	4	6
	G190	14 U 328986 5593715	5	9
	G191	14 U 328748 5593791	4	7
	G192	14 U 328510 5593870	5	9
	G193	14 U 328272 5593956	3	6
	G194	14 U 328033 5594058	6	9
	G195	14 U 327800 5594160	5	10
	G196	14 U 327566 5594262	5	8
	G197	14 U 327331 5594368	5	8
	G198	14 U 327110 5594496	7	9
	G199	14 U 326908 5594649	7	9
	G203	14 U 326122 5595295	6	7
	G204	14 U 325979 5595503	4	4
	G205	14 U 325819 5595705	5	8
	G206	14 U 325662 5595909	4	10
	G207	14 U 325506 5596113	7	10
	G208	14 U 325348 5596314	6	23
	G209	14 U 325189 5596517	4	7
	G21	14 U 328710 5598524	5	6
	G210	14 U 325033 5596716	9	17
	G211	14 U 324878 5596913	8	16
	G212	14 U 324721 5597114	8	12
	G213	14 U 324579 5597321	5	11
	G214	14 U 324428 5597529	8	11
	G215	14 U 324350 5597777	5	10
	G216	14 U 324370 5598031	7	15
	G217	14 U 324380 5598290	5	12
	G218	14 U 324388 5598545	8	13
	G219	14 U 324394 5598800	7	14
	G22	14 U 328535 5598343	19	43
	G220	14 U 324402 5599051	7	14
	G221	14 U 326347 5599623	6	9
	G222	14 U 328702 5597675	7	31

Habitat	Site	Location	Number of Species	Number of Individuals
Grassland	G223	14 U 330528 5592729	6	9
	G224	14 U 330269 5592738	8	10
	G225	14 U 330014 5592744	8	12
	G226	14 U 329763 5592753	6	9
	G227	14 U 329508 5592758	5	10
	G228	14 U 329251 5592767	4	9
	G229	14 U 329029 5592890	8	14
	G23	14 U 327456 5599099	11	29
	G232	14 U 328504 5593352	4	9
	G233	14 U 328270 5593450	5	11
	G234	14 U 328028 5593525	5	14
	G235	14 U 327781 5593593	8	13
	G236	14 U 327553 5593707	6	12
	G237	14 U 327375 5593888	6	10
	G238	14 U 327228 5594097	12	19
	G239	14 U 326672 5594550	4	7
	G241	14 U 326320 5594282	10	16
	G245	14 U 330442 5593563	7	11
	G246	14 U 330642 5593724	15	18
	G249	14 U 331270 5593497	16	21
	G25	14 U 327511 5598585	6	10
	G26	14 U 327539 5598333	7	14
	G27	14 U 327566 5598082	5	10
	G28	14 U 327593 5597828	6	14
	G29	14 U 327758 5597641	8	12
	G3	14 U 325189 5599429	11	21
	G356	14 U 328481 5598637	11	14
	G357	14 U 328289 5598805	3	3
	G358	14 U 328100 5598970	5	6
	G36	14 U 328545 5596358	8	15
	G363	14 U 324595 5599830	6	10
	G37	14 U 328688 5596147	9	17
	G39	14 U 328738 5596799	8	16
	G40	14 U 328759 5597046	7	16
	G41	14 U 328789 5597302	8	15
	G42	14 U 328562 5597412	6	12
	G43	14 U 328322 5597483	10	18
	G44	14 U 328075 5597555	9	17
	G46	14 U 328975 5595733	7	14
	G47	14 U 329110 5595522	5	10
	G49	14 U 329330 5595063	6	12
	G50	14 U 329489 5594868	6	12
	G51	14 U 329632 5594661	8	14
	G52	14 U 329771 5594454	5	9

Habitat	Site	Location	Number of Species	Number of Individuals
Grassland	G53	14 U 329897 5594233	7	9
	G54	14 U 330015 5594008	6	9
	G55	14 U 330131 5593783	6	10
	G56	14 U 330242 5593558	9	13
	G57	14 U 330337 5593329	7	12
	G58	14 U 330466 5593111	6	9
	G59	14 U 330664 5592950	8	13
	G61	14 U 331096 5592691	8	10
	G62	14 U 331289 5592518	8	12
	G64	14 U 331587 5592105	11	13
	G68	14 U 332320 5591394	7	8
	G69	14 U 332575 5591361	8	9
	S138	14 U 326185 5601288	11	14
	S139	14 U 326152 5601536	8	9
	S142	14 U 326010 5601355	10	14
	S144	14 U 326357 5601473	7	8
	S166	14 U 327108 5600643	7	12
	S167	14 U 327362 5600646	6	10
	S169	14 U 327664 5600396	6	6
	S170	14 U 327684 5600143	11	15
	S173	14 U 327068 5600384	10	16
	S174	14 U 327157 5600149	12	14
	S176	14 U 328741 5595698	6	13
	S179	14 U 328781 5594961	10	17
	S2	14 U 324940 5599448	6	9
	S30	14 U 327802 5597392	11	27
	S33	14 U 328091 5596973	6	14
	S34	14 U 328255 5596780	7	15
	S35	14 U 328401 5596567	7	14
	S5	14 U 325692 5599427	5	11
	S6	14 U 325945 5599407	9	17
	S7	14 U 326196 5599395	7	14
	S8	14 U 326445 5599391	6	15
	S9	14 U 326696 5599381	11	16
	Total		71	2143
Shrubland	121	14 U 327298 5607558	6	7
	122	14 U 326994 5607570	12	12
	S10	14 U 326952 5599374	11	16
	S11	14 U 327204 5599366	8	12
	S133	14 U 326344 5600593	8	10
	S136	14 U 326294 5600840	13	16
	S140	14 U 325982 5601725	10	11
	S147	14 U 326370 5601834	10	11
	S15	14 U 328177 5599336	11	13

Habitat	Site	Location	Number of Species	Number of Individuals
Shrubland	S159	14 U 325579 5600388	8	9
	S16	14 U 328431 5599329	6	8
	S161	14 U 325446 5599902	7	8
	S162	14 U 325361 5599668	4	4
	S171	14 U 327671 5599891	11	13
	S172	14 U 327548 5599672	12	16
	S177	14 U 328737 5595442	6	13
	S178	14 U 328707 5595201	9	15
	S180	14 U 328960 5594779	9	13
	S181	14 U 329132 5594598	5	10
	S183	14 U 329492 5594236	9	13
	S200	14 U 326712 5594819	5	6
	S230	14 U 328958 5593131	6	11
	S24	14 U 327485 5598846	5	11
	S31	14 U 327623 5597219	9	17
	S32	14 U 327937 5597176	6	14
	S359	14 U 327001 5599931	11	15
	S38	14 U 328712 5596546	7	13
	S4	14 U 325441 5599434	10	15
	S45	14 U 328836 5595940	9	12
	S48	14 U 329218 5595286	6	12
	Total		45	356
Forest	115	14 U 327578 5605794	11	12
	117	14 U 327817 5605260	9	11
	120	14 U 327220 5605926	21	22
	191	14 U 327828 5606084	8	8
	194	14 U 328153 5607293	15	20
	F100	14 U 330838 5597482	13	14
	F101	14 U 330691 5597690	9	13
	F102	14 U 330541 5597894	9	11
	F103	14 U 330427 5598116	14	17
	F104	14 U 330324 5598345	9	12
	F105	14 U 330266 5598586	11	13
	F106	14 U 330183 5598824	6	10
	F107	14 U 329942 5598890	9	10
	F108	14 U 329872 5598650	7	8
	F109	14 U 330005 5598431	5	6
	F110	14 U 329936 5598191	8	11
	F143	14 U 325542 5601255	8	9
	F148	14 U 326146 5601947	11	12
	F149	14 U 325952 5602111	11	17
	F150	14 U 325763 5602281	11	11
	F151	14 U 325578 5602452	10	12
	F152	14 U 325881 5601057	10	10

Habitat	Site	Location	Number of Species	Number of Individuals
Forest	F153	14 U 325703 5600878	12	13
	F154	14 U 325630 5600638	14	15
	F155	14 U 325379 5600637	16	16
	F156	14 U 325128 5600638	13	13
	F157	14 U 324872 5600637	10	10
	F18	14 U 328780 5598979	12	13
	F250	14 U 331410 5593283	11	14
	F362	14 U 325911 5600648	12	14
	F67	14 U 332087 5591487	7	8
	F72	14 U 333317 5591436	4	4
	F73	14 U 333569 5591460	14	19
	F74	14 U 333824 5591480	10	13
	F75	14 U 333793 5591730	11	19
	F76	14 U 333709 5591971	11	17
	F77	14 U 333558 5592173	11	13
	F78	14 U 333416 5592383	14	18
	F79	14 U 333306 5592607	12	17
	F80	14 U 333278 5592863	10	17
	F81	14 U 333280 5593116	9	14
	F82	14 U 333232 5593364	8	12
	F83	14 U 333113 5593587	10	16
	F84	14 U 332983 5593809	10	14
	F85	14 U 332820 5594001	7	11
	F86	14 U 332744 5594238	11	11
	F87	14 U 332599 5594447	12	21
	F94	14 U 331682 5596267	13	16
	F95	14 U 331558 5596483	12	20
	F96	14 U 331373 5596652	15	18
	F97	14 U 331201 5596835	11	14
	F98	14 U 331032 5597021	12	15
	F99	14 U 330964 5597262	8	13
	Total		64	717
Edge	109	14 U 327601 5607527	5	9
	114	14 U 327451 5606069	10	10
	116	14 U 327772 5605562	13	16
	118	14 U 327857 5604957	12	19
	119	14 U 327977 5604681	12	15
	196	14 U 325795 5607604	15	15
	E111	14 U 329877 5597943	10	10
	E112	14 U 329952 5597697	13	17
	E113	14 U 329658 5598069	11	13
	E114	14 U 329711 5598985	8	9
	E115	14 U 329652 5599230	10	12
	E116	14 U 329624 5599480	10	10

Habitat	Site	Location	Number of Species	Number of Individuals
Edge	E117	14 U 329690 5599724	9	10
	E118	14 U 329662 5599974	6	9
	E119	14 U 329479 5600147	7	8
	E122	14 U 329017 5598534	15	17
	E124	14 U 329478 5598249	14	15
	E13	14 U 327709 5599347	14	16
	E132	14 U 326363 5600342	7	7
	E137	14 U 326138 5601041	12	13
	E14	14 U 327944 5599252	6	11
	E141	14 U 325827 5601525	11	12
	E146	14 U 326713 5601828	11	12
	E160	14 U 325519 5600146	12	14
	E164	14 U 326788 5601130	6	9
	E17	14 U 328644 5599195	12	16
	E19	14 U 328846 5598737	14	19
	E201	14 U 326521 5594981	9	12
	E202	14 U 326313 5595132	13	16
	E240	14 U 326420 5594520	11	15
	E242	14 U 326368 5594029	11	15
	E243	14 U 326547 5593848	11	15
	E244	14 U 326686 5593634	13	17
	E247	14 U 330891 5593777	12	19
	E248	14 U 331139 5593716	15	19
	E251	14 U 331465 5593030	12	15
	E252	14 U 331563 5592791	12	16
	E253	14 U 330972 5594014	11	17
	E254	14 U 330828 5594230	11	16
	E360	14 U 326800 5600107	9	12
	E361	14 U 326607 5600276	10	11
	E60	14 U 330872 5592811	10	13
	E63	14 U 331435 5592306	11	13
	E65	14 U 331702 5591880	12	15
	E66	14 U 331835 5591664	7	9
	E70	14 U 332824 5591333	9	9
	E71	14 U 333066 5591425	10	10
	E88	14 U 332556 5594695	8	13
	E89	14 U 332516 5594948	12	18
	E90	14 U 332417 5595184	15	21
	E91	14 U 332299 5595404	14	18
	E92	14 U 332090 5595543	10	14
	E93	14 U 331972 5595764	9	17
	Total		60	728

Table A-3: Number of chestnut-collared longspurs detected in four habitat types during point counts, 2017, 2019, 2021, and 2022

Habitat	Site	Location	Distance from ROW (m)	Distance to Nearest Forest (m)	2017	2019	2021	2022
Grassland	48	14 U 324698 5597804	1001–2000	524	0	1	4	4
	49	14 U 324997 5597784	1001–2000	783	1	3	3	6
	50	14 U 325305 5597770	1001–2000	1074	0	4	2	4
	51	14 U 325603 5597762	1001–2000	1364	0	1	2	1
	52	14 U 325909 5597752	>2000	1631	0	0	1	2
	53	14 U 326213 5597731	>2000	1897	1	3	2	3
	54	14 U 327379 5597705	1001–2000	1157	1	2	6	–
	55	14 U 327026 5597717	1001–2000	1441	1	1	5	3
	56	14 U 326636 5597731	1001–2000	1783	4	1	3	4
	57	14 U 326359 5597444	>2000	1943	2	0	4	4
	58	14 U 326566 5597233	>2000	1878	1	1	3	3
	59	14 U 326780 5597016	>2000	1716	2	3	4	1
	60	14 U 326993 5596799	>2000	1596	0	1	2	1
	61	14 U 327194 5596592	>2000	1487	0	0	0	0
	62	14 U 327400 5596372	>2000	1411	0	0	–	–
	110	14 U 327532 5607231	>2000	291	0	0	0	0
	111	14 U 327518 5606932	>2000	513	0	0	0	0
	112	14 U 327501 5606629	>2000	519	0	0	0	0
	113	14 U 327489 5606326	>2000	224	0	0	0	0
	187	14 U 327814 5607200	>2000	158	0	0	0	0
	188	14 U 327909 5606911	>2000	234	0	0	0	0
	189	14 U 327900 5606611	>2000	192	0	0	0	0
	190	14 U 327899 5606311	>2000	17	0	0	0	0
	192	14 U 328194 5606690	>2000	30	0	0	0	0
	193	14 U 328204 5606993	>2000	38	0	0	0	0
	195	14 U 327936 5607503	>2000	27	0	0	0	0
	197	14 U 325801 5607302	>2000	11	0	0	0	0
	198	14 U 325847 5606998	>2000	52	0	0	0	0
	199	14 U 325930 5606706	>2000	102	0	0	0	0
	200	14 U 326043 5606425	>2000	125	0	0	0	0
	201	14 U 326175 5606153	>2000	71	0	0	0	0
	202	14 U 325531 5607587	>2000	126	0	0	0	0
	G0	14 U 324429 5599448	0–1000	224	0	1	0	–

Habitat	Site	Location	Distance from ROW (m)	Distance to Nearest Forest (m)	2017	2019	2021	2022
Grassland	G1	14 U 324683 5599454	0–1000	256	0	0	0	0
	G12	14 U 327457 5599356	0–1000	185	0	0	0	0
	G120	14 U 329434 5599896	1001–2000	217	0	0	–	0
	G121	14 U 329179 5599896	1001–2000	123	0	0	–	0
	G123	14 U 329249 5598439	0–1000	61	0	0	0	0
	G125	14 U 329417 5597994	0–1000	146	0	0	0	0
	G126	14 U 329168 5598031	0–1000	19	0	0	–	–
	G127	14 U 328932 5597945	0–1000	225	0	0	–	–
	G128	14 U 328706 5598052	0–1000	201	1	1	0	3
	G129	14 U 326552 5599619	0–1000	299	0	0	–	0
	G130	14 U 326499 5599862	0–1000	164	0	0	0	0
	G131	14 U 326444 5600106	0–1000	73	0	0	0	0
	G134	14 U 326598 5600649	0–1000	209	0	3	0	0
	G135	14 U 326857 5600650	0–1000	421	–	2	0	0
	G145	14 U 326537 5601648	1001–2000	47	–	2	0	0
	G163	14 U 326887 5600898	0–1000	245	–	1	1	0
	G165	14 U 326712 5601367	1001–2000	120	1	1	0	0
	G168	14 U 327614 5600647	0–1000	193	1	0	0	0
	G175	14 U 327260 5599919	0–1000	192	–	0	0	0
	G182	14 U 329314 5594418	0–1000	1433	0	0	0	0
	G184	14 U 329670 5594052	>2000	987	–	0	0	0
	G185	14 U 330138 5593176	>2000	633	–	0	0	0
	G186	14 U 329912 5593288	>2000	878	–	2	2	1
	G187	14 U 329683 5593399	>2000	1047	–	1	0	0
	G188	14 U 329452 5593506	>2000	1172	0	0	0	0
	G189	14 U 329220 5593613	>2000	1263	0	0	0	0
	G190	14 U 328986 5593715	>2000	1378	0	0	0	0
	G191	14 U 328748 5593791	>2000	1440	0	0	2	0
	G192	14 U 328510 5593870	>2000	1347	0	0	0	0
	G193	14 U 328272 5593956	>2000	1263	0	0	0	0
	G194	14 U 328033 5594058	>2000	1175	0	0	0	0
	G195	14 U 327800 5594160	>2000	1140	2	0	0	0
	G196	14 U 327566 5594262	>2000	1065	1	0	0	0
	G197	14 U 327331 5594368	>2000	832	0	1	0	0
	G198	14 U 327110 5594496	>2000	587	0	1	0	0
	G199	14 U 326908 5594649	>2000	376	0	2	0	1

Habitat	Site	Location	Distance from ROW (m)	Distance to Nearest Forest (m)	2017	2019	2021	2022
Grassland	G203	14 U 326122 5595295	>2000	110	0	1	0	0
	G204	14 U 325979 5595503	>2000	281	0	0	0	0
	G205	14 U 325819 5595705	>2000	488	0	0	0	0
	G206	14 U 325662 5595909	>2000	358	2	2	0	0
	G207	14 U 325506 5596113	>2000	385	2	0	0	1
	G208	14 U 325348 5596314	>2000	483	2	0	1	0
	G209	14 U 325189 5596517	>2000	533	3	0	0	0
	G21	14 U 328710 5598524	0–1000	55	0	0	0	0
	G210	14 U 325033 5596716	>2000	481	1	0	2	1
	G211	14 U 324878 5596913	>2000	374	2	0	2	0
	G212	14 U 324721 5597114	>2000	283	1	3	0	2
	G213	14 U 324579 5597321	>2000	342	1	2	2	2
	G214	14 U 324428 5597529	1001–2000	166	0	2	0	1
	G215	14 U 324350 5597777	1001–2000	268	0	1	2	1
	G216	14 U 324370 5598031	1001–2000	514	1	0	1	0
	G217	14 U 324380 5598290	1001–2000	768	2	2	3	0
	G218	14 U 324388 5598545	0–1000	1021	2	3	4	0
	G219	14 U 324394 5598800	0–1000	873	0	3	1	0
	G22	14 U 328535 5598343	0–1000	149	1	0	0	0
	G220	14 U 324402 5599051	0–1000	622	0	3	1	1
	G221	14 U 326347 5599623	0–1000	440	–	0	0	0
	G222	14 U 328702 5597675	0–1000	350	–	0	0	1
	G223	14 U 330528 5592729	>2000	149	0	0	0	1
	G224	14 U 330269 5592738	>2000	334	0	0	0	0
	G225	14 U 330014 5592744	>2000	551	0	0	0	0
	G226	14 U 329763 5592753	>2000	643	0	0	0	0
	G227	14 U 329508 5592758	>2000	476	0	0	0	0
	G228	14 U 329251 5592767	>2000	417	0	0	0	0
	G229	14 U 329029 5592890	>2000	559	0	0	0	1
	G23	14 U 327456 5599099	0–1000	406	0	0	1	0
	G232	14 U 328504 5593352	>2000	957	0	2	0	0
	G233	14 U 328270 5593450	>2000	867	0	0	0	0
	G234	14 U 328028 5593525	>2000	788	0	0	0	0
	G235	14 U 327781 5593593	>2000	659	0	0	0	0
	G236	14 U 327553 5593707	>2000	625	0	0	0	0
	G237	14 U 327375 5593888	>2000	666	0	0	0	0
	G238	14 U 327228 5594097	>2000	710	0	0	0	0

Habitat	Site	Location	Distance from ROW (m)	Distance to Nearest Forest (m)	2017	2019	2021	2022
Grassland	G239	14 U 326672 5594550	>2000	149	0	0	0	0
	G241	14 U 326320 5594282	>2000	183	0	0	0	0
	G245	14 U 330442 5593563	>2000	326	0	0	0	0
	G246	14 U 330642 5593724	>2000	89	0	0	0	0
	G249	14 U 331270 5593497	>2000	73	0	0	0	0
	G25	14 U 327511 5598585	0–1000	761	0	0	0	0
	G26	14 U 327539 5598333	0–1000	741	0	0	0	0
	G27	14 U 327566 5598082	1001–2000	792	6	0	0	3
	G28	14 U 327593 5597828	1001–2000	914	4	0	4	5
	G29	14 U 327758 5597641	1001–2000	950	4	1	2	1
	G3	14 U 325189 5599429	0–1000	439	0	0	0	0
	G356	14 U 328481 5598637	0–1000	97	0	0	0	0
	G357	14 U 328289 5598805	0–1000	174	0	0	0	0
	G358	14 U 328100 5598970	0–1000	259	0	0	0	0
	G36	14 U 328545 5596358	>2000	648	0	0	0	1
	G363	14 U 324595 5599830	0–1000	133	0	0	0	0
	G364	14 U 324592 5600470	0–1000	50	0	0	0	–
	G37	14 U 328688 5596147	>2000	648	0	0	0	0
	G39	14 U 328738 5596799	1001–2000	424	0	0	0	0
	G40	14 U 328759 5597046	1001–2000	537	0	0	0	0
	G41	14 U 328789 5597302	1001–2000	420	–	0	0	0
	G42	14 U 328562 5597412	1001–2000	536	0	0	0	1
	G43	14 U 328322 5597483	1001–2000	745	–	0	0	2
	G44	14 U 328075 5597555	1001–2000	907	2	1	0	1
	G46	14 U 328975 5595733	>2000	893	0	3	0	0
	G47	14 U 329110 5595522	>2000	1088	0	0	0	0
	G49	14 U 329330 5595063	>2000	1263	0	0	0	0
	G50	14 U 329489 5594868	>2000	1151	0	0	0	0
	G51	14 U 329632 5594661	>2000	1082	0	0	0	0
	G52	14 U 329771 5594454	>2000	993	0	0	0	0
	G53	14 U 329897 5594233	>2000	824	0	0	0	0
	G54	14 U 330015 5594008	>2000	640	0	0	0	0
	G55	14 U 330131 5593783	>2000	512	3	0	0	0
	G56	14 U 330242 5593558	>2000	478	0	0	0	0
	G57	14 U 330337 5593329	>2000	498	0	0	0	0
	G58	14 U 330466 5593111	>2000	299	0	0	2	0
	G59	14 U 330664 5592950	>2000	102	0	0	0	0
	G61	14 U 331096 5592691	>2000	96	0	0	0	0

Habitat	Site	Location	Distance from ROW (m)	Distance to Nearest Forest (m)	2017	2019	2021	2022
Grassland	G62	14 U 331289 5592518	>2000	234	0	0	0	0
	G64	14 U 331587 5592105	>2000	105	0	0	0	0
	G68	14 U 332320 5591394	>2000	38	0	0	3	0
	G69	14 U 332575 5591361	>2000	75	0	0	0	0
	S138	14 U 326185 5601288	1001–2000	247	0	0	0	1
	S139	14 U 326152 5601536	1001–2000	284	0	0	0	0
	S142	14 U 326010 5601355	1001–2000	172	0	0	0	0
	S144	14 U 326357 5601473	1001–2000	185	0	0	0	0
	S166	14 U 327108 5600643	0–1000	368	–	0	0	0
	S167	14 U 327362 5600646	0–1000	228	1	0	0	0
	S169	14 U 327664 5600396	0–1000	445	–	0	0	0
	S170	14 U 327684 5600143	0–1000	306	–	0	0	0
	S173	14 U 327068 5600384	0–1000	426	–	0	0	0
	S174	14 U 327157 5600149	0–1000	315	0	0	0	0
	S176	14 U 328741 5595698	0–1000	996	–	0	0	0
	S179	14 U 328781 5594961	>2000	1688	0	3	0	1
	S2	14 U 324940 5599448	0–1000	280	0	0	0	0
	S30	14 U 327802 5597392	1001–2000	1149	0	1	0	2
	S33	14 U 328091 5596973	1001–2000	1094	0	0	0	0
	S34	14 U 328255 5596780	1001–2000	894	0	0	0	0
	S35	14 U 328401 5596567	>2000	742	0	0	0	0
	S5	14 U 325692 5599427	0–1000	758	0	0	0	0
	S6	14 U 325945 5599407	0–1000	745	0	0	0	0
	S7	14 U 326196 5599395	0–1000	708	0	0	0	0
	S8	14 U 326445 5599391	0–1000	535	0	0	0	0
	S9	14 U 326696 5599381	0–1000	345	0	0	0	0
	Total				59	72	77	71
Shrubland	121	14 U 327298 5607558	–	–	0	0	0	0
	122	14 U 326994 5607570	–	–	0	0	0	0
	S10	14 U 326952 5599374	–	–	0	0	0	0
	S11	14 U 327204 5599366	–	–	1	0	0	0
	S133	14 U 326344 5600593	–	–	0	0	0	0
	S136	14 U 326294 5600840	–	–	0	0	0	0
	S140	14 U 325982 5601725	–	–	0	0	0	0
	S147	14 U 326370 5601834	–	–	0	0	0	0
	S15	14 U 328177 5599336	–	–	0	0	0	0
	S159	14 U 325579 5600388	–	–	0	0	0	0
	S16	14 U 328431 5599329	–	–	0	0	0	0

Habitat	Site	Location	Distance from ROW (m)	Distance to Nearest Forest (m)	2017	2019	2021	2022
Shrubland	S161	14 U 325446 5599902	–	–	0	0	0	0
	S162	14 U 325361 5599668	–	–	0	0	0	0
	S171	14 U 327671 5599891	–	–	–	0	0	0
	S172	14 U 327548 5599672	–	–	–	0	0	0
	S177	14 U 328737 5595442	–	–	0	0	2	0
	S178	14 U 328707 5595201	–	–	0	0	0	0
	S180	14 U 328960 5594779	–	–	0	0	0	0
	S181	14 U 329132 5594598	–	–	0	0	0	0
	S183	14 U 329492 5594236	–	–	–	0	0	0
	S200	14 U 326712 5594819	–	–	0	0	0	0
	S230	14 U 328958 5593131	–	–	0	0	0	0
	S231	14 U 328744 5593264	–	–	0	0	0	–
	S24	14 U 327485 5598846	–	–	0	0	0	0
	S31	14 U 327623 5597219	–	–	–	2	3	0
	S32	14 U 327937 5597176	–	–	0	1	0	0
	S359	14 U 327001 5599931	–	–	0	0	0	0
	S38	14 U 328712 5596546	–	–	0	0	0	0
	S4	14 U 325441 5599434	–	–	0	0	0	1
	S45	14 U 328836 5595940	–	–	0	0	0	0
	S48	14 U 329218 5595286	–	–	0	0	0	0
	Total				1	3	5	1
Forest	115	14 U 327578 5605794	–	–	0	0	–	0
	117	14 U 327817 5605260	–	–	0	0	–	0
	120	14 U 327220 5605926	–	–	0	0	–	0
	191	14 U 327828 5606084	–	–	0	0	0	0
	194	14 U 328153 5607293	–	–	0	0	0	0
	F100	14 U 330838 5597482	–	–	0	0	0	0
	F101	14 U 330691 5597690	–	–	0	0	0	0
	F102	14 U 330541 5597894	–	–	0	0	0	0
	F103	14 U 330427 5598116	–	–	0	0	0	0
	F104	14 U 330324 5598345	–	–	0	0	0	0
	F105	14 U 330266 5598586	–	–	0	0	0	0
	F106	14 U 330183 5598824	–	–	0	0	0	0
	F107	14 U 329942 5598890	–	–	0	0	0	0
	F108	14 U 329872 5598650	–	–	0	0	0	0
	F109	14 U 330005 5598431	–	–	0	0	0	0
	F110	14 U 329936 5598191	–	–	0	0	0	0
	F143	14 U 325542 5601255	–	–	–	0	–	0

Habitat	Site	Location	Distance from ROW (m)	Distance to Nearest Forest (m)	2017	2019	2021	2022
Forest	F148	14 U 326146 5601947	–	–	0	0	0	0
	F149	14 U 325952 5602111	–	–	0	0	0	0
	F150	14 U 325763 5602281	–	–	0	0	0	0
	F151	14 U 325578 5602452	–	–	0	0	0	0
	F152	14 U 325881 5601057	–	–	0	0	0	0
	F153	14 U 325703 5600878	–	–	0	0	0	0
	F154	14 U 325630 5600638	–	–	0	0	0	0
	F155	14 U 325379 5600637	–	–	0	0	0	0
	F156	14 U 325128 5600638	–	–	0	0	0	0
	F157	14 U 324872 5600637	–	–	0	0	0	0
	F158	14 U 324620 5600633	–	–	0	0	0	–
	F18	14 U 328780 5598979	–	–	0	0	0	0
	F20	14 U 329061 5598873	–	–	0	0	0	–
	F250	14 U 331410 5593283	–	–	0	0	0	0
	F362	14 U 325911 5600648	–	–	0	0	0	0
	F365	14 U 324594 5600227	–	–	0	0	0	–
	F67	14 U 332087 5591487	–	–	0	0	0	0
	F72	14 U 333317 5591436	–	–	0	0	0	0
	F73	14 U 333569 5591460	–	–	0	0	0	0
	F74	14 U 333824 5591480	–	–	0	0	0	0
	F75	14 U 333793 5591730	–	–	0	0	0	0
	F76	14 U 333709 5591971	–	–	0	0	0	0
	F77	14 U 333558 5592173	–	–	0	0	0	0
	F78	14 U 333416 5592383	–	–	0	0	0	0
	F79	14 U 333306 5592607	–	–	0	0	0	0
	F80	14 U 333278 5592863	–	–	0	0	0	0
	F81	14 U 333280 5593116	–	–	0	0	0	0
	F82	14 U 333232 5593364	–	–	0	0	0	0
	F83	14 U 333113 5593587	–	–	0	0	0	0
	F84	14 U 332983 5593809	–	–	0	0	0	0
	F85	14 U 332820 5594001	–	–	0	0	0	0
	F86	14 U 332744 5594238	–	–	0	0	0	0
	F87	14 U 332599 5594447	–	–	0	0	0	0
	F94	14 U 331682 5596267	–	–	0	0	0	0
	F95	14 U 331558 5596483	–	–	0	0	0	0
	F96	14 U 331373 5596652	–	–	0	0	0	0
	F97	14 U 331201 5596835	–	–	0	0	0	0
	F98	14 U 331032 5597021	–	–	0	0	0	0

Habitat	Site	Location	Distance from ROW (m)	Distance to Nearest Forest (m)	2017	2019	2021	2022
Forest	F99	14 U 330964 5597262	–	–	0	0	0	0
	Total				0	0	0	0
Edge	109	14 U 327601 5607527	–	–	0	0	0	0
	114	14 U 327451 5606069	–	–	0	0	0	0
	116	14 U 327772 5605562	–	–	0	0	–	0
	118	14 U 327857 5604957	–	–	0	0	–	0
	119	14 U 327977 5604681	–	–	0	0	–	0
	196	14 U 325795 5607604	–	–	0	0	0	0
	E111	14 U 329877 5597943	–	–	0	0	0	0
	E112	14 U 329952 5597697	–	–	0	0	0	0
	E113	14 U 329658 5598069	–	–	0	0	0	0
	E114	14 U 329711 5598985	–	–	0	0	–	0
	E115	14 U 329652 5599230	–	–	0	0	–	0
	E116	14 U 329624 5599480	–	–	0	0	–	0
	E117	14 U 329690 5599724	–	–	0	0	–	0
	E118	14 U 329662 5599974	–	–	0	0	–	0
	E119	14 U 329479 5600147	–	–	0	0	–	0
	E122	14 U 329017 5598534	–	–	0	0	0	0
	E124	14 U 329478 5598249	–	–	0	0	0	0
	E13	14 U 327709 5599347	–	–	2	0	0	0
	E132	14 U 326363 5600342	–	–	0	0	0	0
	E137	14 U 326138 5601041	–	–	0	0	0	1
	E14	14 U 327944 5599252	–	–	2	0	0	0
	E141	14 U 325827 5601525	–	–	0	0	0	0
	E146	14 U 326713 5601828	–	–	0	0	0	0
	E160	14 U 325519 5600146	–	–	0	0	0	0
	E164	14 U 326788 5601130	–	–	0	1	0	0
	E17	14 U 328644 5599195	–	–	0	0	0	0
	E19	14 U 328846 5598737	–	–	1	0	0	0
	E201	14 U 326521 5594981	–	–	0	0	0	0
	E202	14 U 326313 5595132	–	–	0	0	0	0
	E240	14 U 326420 5594520	–	–	0	0	0	0
	E242	14 U 326368 5594029	–	–	0	0	0	0
	E243	14 U 326547 5593848	–	–	0	0	0	0
	E244	14 U 326686 5593634	–	–	0	0	0	0
	E247	14 U 330891 5593777	–	–	0	0	0	0
	E248	14 U 331139 5593716	–	–	0	0	0	0
	E251	14 U 331465 5593030	–	–	0	0	0	0

Habitat	Site	Location	Distance from ROW (m)	Distance to Nearest Forest (m)	2017	2019	2021	2022
Edge	E252	14 U 331563 5592791	–	–	0	0	0	0
	E253	14 U 330972 5594014	–	–	–	0	0	0
	E254	14 U 330828 5594230	–	–	–	0	0	0
	E360	14 U 326800 5600107	–	–	0	0	0	0
	E361	14 U 326607 5600276	–	–	0	0	0	0
	E60	14 U 330872 5592811	–	–	0	0	0	0
	E63	14 U 331435 5592306	–	–	0	0	0	0
	E65	14 U 331702 5591880	–	–	0	0	0	0
	E66	14 U 331835 5591664	–	–	0	0	0	0
	E70	14 U 332824 5591333	–	–	0	0	2	0
	E71	14 U 333066 5591425	–	–	0	0	0	0
	E88	14 U 332556 5594695	–	–	0	0	0	0
	E89	14 U 332516 5594948	–	–	0	0	0	0
	E90	14 U 332417 5595184	–	–	0	0	0	0
	E91	14 U 332299 5595404	–	–	0	0	0	0
	E92	14 U 332090 5595543	–	–	0	0	0	0
	E93	14 U 331972 5595764	–	–	0	0	0	0
	Total				5	1	2	1

Table A-4: Number of Sprague's pipits detected in four habitat types during point counts, 2017, 2019, 2021, and 2022

Habitat	Site	Location	Distance from ROW (m)	Distance to Nearest Forest (m)	2017	2019	2021	2022
Grassland	48	14 U 324698 5597804	1001–2000	524	2	4	3	0
	49	14 U 324997 5597784	1001–2000	783	3	3	2	1
	50	14 U 325305 5597770	1001–2000	1074	2	2	0	2
	51	14 U 325603 5597762	1001–2000	1364	1	4	1	3
	52	14 U 325909 5597752	>2000	1631	2	3	2	3
	53	14 U 326213 5597731	>2000	1897	1	1	1	1
	54	14 U 327379 5597705	1001–2000	1157	3	1	0	–
	55	14 U 327026 5597717	1001–2000	1441	0	0	0	1
	56	14 U 326636 5597731	1001–2000	1783	0	1	0	1
	57	14 U 326359 5597444	>2000	1943	1	0	0	0
	58	14 U 326566 5597233	>2000	1878	0	0	0	0
	59	14 U 326780 5597016	>2000	1716	0	0	0	0
	60	14 U 326993 5596799	>2000	1596	2	2	0	2
	61	14 U 327194 5596592	>2000	1487	0	2	0	3
	62	14 U 327400 5596372	>2000	1411	0	1	–	–
	110	14 U 327532 5607231	>2000	291	1	0	0	0
	111	14 U 327518 5606932	>2000	513	2	1	0	0
	112	14 U 327501 5606629	>2000	519	3	1	0	1
	113	14 U 327489 5606326	>2000	224	3	0	0	1
	187	14 U 327814 5607200	>2000	158	0	1	0	0
	188	14 U 327909 5606911	>2000	234	3	1	0	0
	189	14 U 327900 5606611	>2000	192	4	1	0	0
	190	14 U 327899 5606311	>2000	17	3	1	1	0
	192	14 U 328194 5606690	>2000	30	2	0	0	0
	193	14 U 328204 5606993	>2000	38	1	0	0	0
	195	14 U 327936 5607503	>2000	27	0	0	0	0
	197	14 U 325801 5607302	>2000	11	0	0	0	0
	198	14 U 325847 5606998	>2000	52	0	0	0	0
	199	14 U 325930 5606706	>2000	102	0	0	0	0
	200	14 U 326043 5606425	>2000	125	0	0	0	0
	201	14 U 326175 5606153	>2000	71	0	0	0	0
	202	14 U 325531 5607587	>2000	126	0	0	0	1
	G0	14 U 324429 5599448	0–1000	224	0	0	0	–

Habitat	Site	Location	Distance from ROW (m)	Distance to Nearest Forest (m)	2017	2019	2021	2022
Grassland	G1	14 U 324683 5599454	0–1000	256	0	0	0	0
	G12	14 U 327457 5599356	0–1000	185	1	0	0	0
	G120	14 U 329434 5599896	1001–2000	217	0	0	–	0
	G121	14 U 329179 5599896	1001–2000	123	0	0	–	0
	G123	14 U 329249 5598439	0–1000	61	0	0	0	0
	G125	14 U 329417 5597994	0–1000	146	0	0	0	0
	G126	14 U 329168 5598031	0–1000	19	0	0	–	–
	G127	14 U 328932 5597945	0–1000	225	0	0	–	–
	G128	14 U 328706 5598052	0–1000	201	0	0	0	1
	G129	14 U 326552 5599619	0–1000	299	1	1	–	2
	G130	14 U 326499 5599862	0–1000	164	0	1	0	0
	G131	14 U 326444 5600106	0–1000	73	0	0	0	0
	G134	14 U 326598 5600649	0–1000	209	0	0	0	0
	G135	14 U 326857 5600650	0–1000	421	–	0	0	0
	G145	14 U 326537 5601648	1001–2000	47	–	0	0	0
	G163	14 U 326887 5600898	0–1000	245	–	0	0	1
	G165	14 U 326712 5601367	1001–2000	120	0	1	0	1
	G168	14 U 327614 5600647	0–1000	193	0	0	1	0
	G175	14 U 327260 5599919	0–1000	192	–	1	0	0
	G182	14 U 329314 5594418	0–1000	1433	0	1	0	1
	G184	14 U 329670 5594052	>2000	987	–	2	0	0
	G185	14 U 330138 5593176	>2000	633	–	1	0	0
	G186	14 U 329912 5593288	>2000	878	–	3	0	0
	G187	14 U 329683 5593399	>2000	1047	–	2	0	1
	G188	14 U 329452 5593506	>2000	1172	1	1	0	1
	G189	14 U 329220 5593613	>2000	1263	1	2	0	1
	G190	14 U 328986 5593715	>2000	1378	0	2	1	2
	G191	14 U 328748 5593791	>2000	1440	1	3	1	2
	G192	14 U 328510 5593870	>2000	1347	1	3	0	2
	G193	14 U 328272 5593956	>2000	1263	1	2	1	2
	G194	14 U 328033 5594058	>2000	1175	1	1	1	2
	G195	14 U 327800 5594160	>2000	1140	1	0	2	3
	G196	14 U 327566 5594262	>2000	1065	1	0	1	1
	G197	14 U 327331 5594368	>2000	832	2	1	0	2
	G198	14 U 327110 5594496	>2000	587	0	0	0	0
	G199	14 U 326908 5594649	>2000	376	2	0	0	1

Habitat	Site	Location	Distance from ROW (m)	Distance to Nearest Forest (m)	2017	2019	2021	2022
Grassland	G203	14 U 326122 5595295	>2000	110	1	0	1	1
	G204	14 U 325979 5595503	>2000	281	1	1	2	0
	G205	14 U 325819 5595705	>2000	488	1	1	1	2
	G206	14 U 325662 5595909	>2000	358	1	1	2	0
	G207	14 U 325506 5596113	>2000	385	0	1	3	0
	G208	14 U 325348 5596314	>2000	483	1	1	1	1
	G209	14 U 325189 5596517	>2000	533	0	1	0	0
	G21	14 U 328710 5598524	0–1000	55	0	0	0	0
	G210	14 U 325033 5596716	>2000	481	1	2	5	3
	G211	14 U 324878 5596913	>2000	374	2	1	2	2
	G212	14 U 324721 5597114	>2000	283	1	1	1	2
	G213	14 U 324579 5597321	>2000	342	2	1	1	2
	G214	14 U 324428 5597529	1001–2000	166	2	2	1	1
	G215	14 U 324350 5597777	1001–2000	268	2	2	0	2
	G216	14 U 324370 5598031	1001–2000	514	3	2	0	3
	G217	14 U 324380 5598290	1001–2000	768	1	0	1	3
	G218	14 U 324388 5598545	0–1000	1021	1	1	0	2
	G219	14 U 324394 5598800	0–1000	873	1	1	0	2
	G22	14 U 328535 5598343	0–1000	149	0	0	0	0
	G220	14 U 324402 5599051	0–1000	622	0	0	0	0
	G221	14 U 326347 5599623	0–1000	440	–	0	2	2
	G222	14 U 328702 5597675	0–1000	350	–	0	0	1
	G223	14 U 330528 5592729	>2000	149	1	0	0	0
	G224	14 U 330269 5592738	>2000	334	2	2	0	1
	G225	14 U 330014 5592744	>2000	551	0	1	4	1
	G226	14 U 329763 5592753	>2000	643	3	2	3	2
	G227	14 U 329508 5592758	>2000	476	4	2	3	2
	G228	14 U 329251 5592767	>2000	417	2	1	2	2
	G229	14 U 329029 5592890	>2000	559	1	2	0	1
	G23	14 U 327456 5599099	0–1000	406	1	2	1	3
	G232	14 U 328504 5593352	>2000	957	0	1	0	1
	G233	14 U 328270 5593450	>2000	867	0	0	0	1
	G234	14 U 328028 5593525	>2000	788	1	0	0	1
	G235	14 U 327781 5593593	>2000	659	0	0	0	0
	G236	14 U 327553 5593707	>2000	625	0	0	0	1
	G237	14 U 327375 5593888	>2000	666	0	0	0	1
	G238	14 U 327228 5594097	>2000	710	0	0	0	4

Habitat	Site	Location	Distance from ROW (m)	Distance to Nearest Forest (m)	2017	2019	2021	2022
Grassland	G239	14 U 326672 5594550	>2000	149	0	0	0	0
	G241	14 U 326320 5594282	>2000	183	0	0	0	0
	G245	14 U 330442 5593563	>2000	326	1	0	0	0
	G246	14 U 330642 5593724	>2000	89	0	0	0	0
	G249	14 U 331270 5593497	>2000	73	0	0	0	0
	G25	14 U 327511 5598585	0–1000	761	2	0	0	1
	G26	14 U 327539 5598333	0–1000	741	0	1	0	2
	G27	14 U 327566 5598082	1001–2000	792	1	1	0	0
	G28	14 U 327593 5597828	1001–2000	914	0	2	0	1
	G29	14 U 327758 5597641	1001–2000	950	0	1	0	2
	G3	14 U 325189 5599429	0–1000	439	0	0	0	2
	G356	14 U 328481 5598637	0–1000	97	0	0	0	0
	G357	14 U 328289 5598805	0–1000	174	0	0	1	0
	G358	14 U 328100 5598970	0–1000	259	0	0	0	0
	G36	14 U 328545 5596358	>2000	648	1	2	0	1
	G363	14 U 324595 5599830	0–1000	133	0	0	0	0
	G364	14 U 324592 5600470	0–1000	50	0	0	0	–
	G37	14 U 328688 5596147	>2000	648	0	2	1	0
	G39	14 U 328738 5596799	1001–2000	424	2	2	2	1
	G40	14 U 328759 5597046	1001–2000	537	1	2	0	2
	G41	14 U 328789 5597302	1001–2000	420	–	0	0	2
	G42	14 U 328562 5597412	1001–2000	536	1	0	0	2
	G43	14 U 328322 5597483	1001–2000	745	–	0	1	2
	G44	14 U 328075 5597555	1001–2000	907	0	2	0	2
	G46	14 U 328975 5595733	>2000	893	0	0	2	0
	G47	14 U 329110 5595522	>2000	1088	0	0	0	0
	G49	14 U 329330 5595063	>2000	1263	0	0	0	0
	G50	14 U 329489 5594868	>2000	1151	1	0	0	1
	G51	14 U 329632 5594661	>2000	1082	1	0	0	1
	G52	14 U 329771 5594454	>2000	993	0	0	0	1
	G53	14 U 329897 5594233	>2000	824	1	2	0	1
	G54	14 U 330015 5594008	>2000	640	1	0	0	2
	G55	14 U 330131 5593783	>2000	512	1	0	0	0
	G56	14 U 330242 5593558	>2000	478	1	0	0	0
	G57	14 U 330337 5593329	>2000	498	0	0	0	0
	G58	14 U 330466 5593111	>2000	299	1	1	0	0
	G59	14 U 330664 5592950	>2000	102	0	0	0	0
	G61	14 U 331096 5592691	>2000	96	0	0	0	0

Habitat	Site	Location	Distance from ROW (m)	Distance to Nearest Forest (m)	2017	2019	2021	2022
Grassland	G62	14 U 331289 5592518	>2000	234	0	0	0	0
	G64	14 U 331587 5592105	>2000	105	0	0	0	0
	G68	14 U 332320 5591394	>2000	38	0	0	0	0
	G69	14 U 332575 5591361	>2000	75	0	0	0	0
	S138	14 U 326185 5601288	1001–2000	247	2	1	0	2
	S139	14 U 326152 5601536	1001–2000	284	1	0	0	0
	S142	14 U 326010 5601355	1001–2000	172	1	0	0	1
	S144	14 U 326357 5601473	1001–2000	185	3	0	0	0
	S166	14 U 327108 5600643	0–1000	368	–	0	0	0
	S167	14 U 327362 5600646	0–1000	228	0	0	0	0
	S169	14 U 327664 5600396	0–1000	445	–	0	1	0
	S170	14 U 327684 5600143	0–1000	306	–	0	0	0
	S173	14 U 327068 5600384	0–1000	426	–	0	0	0
	S174	14 U 327157 5600149	0–1000	315	0	0	0	0
	S176	14 U 328741 5595698	0–1000	996	–	0	0	0
	S179	14 U 328781 5594961	>2000	1688	1	0	0	0
	S2	14 U 324940 5599448	0–1000	280	0	0	0	0
	S30	14 U 327802 5597392	1001–2000	1149	0	1	2	2
	S33	14 U 328091 5596973	1001–2000	1094	0	1	1	3
	S34	14 U 328255 5596780	1001–2000	894	1	2	0	3
	S35	14 U 328401 5596567	>2000	742	1	2	0	2
	S5	14 U 325692 5599427	0–1000	758	1	0	0	2
	S6	14 U 325945 5599407	0–1000	745	1	1	0	3
	S7	14 U 326196 5599395	0–1000	708	1	1	0	2
	S8	14 U 326445 5599391	0–1000	535	3	1	0	1
	S9	14 U 326696 5599381	0–1000	345	3	1	0	1
	Total				124	119	65	144
Shrubland	121	14 U 327298 5607558	–	–	0	0	0	0
	122	14 U 326994 5607570	–	–	0	0	0	0
	S10	14 U 326952 5599374	–	–	3	2	1	2
	S11	14 U 327204 5599366	–	–	0	1	0	0
	S133	14 U 326344 5600593	–	–	0	0	0	0
	S136	14 U 326294 5600840	–	–	0	0	0	0
	S140	14 U 325982 5601725	–	–	0	0	0	0
	S147	14 U 326370 5601834	–	–	0	0	0	0
	S15	14 U 328177 5599336	–	–	0	0	0	0
	S159	14 U 325579 5600388	–	–	0	1	0	0
	S16	14 U 328431 5599329	–	–	0	0	0	0

Habitat	Site	Location	Distance from ROW (m)	Distance to Nearest Forest (m)	2017	2019	2021	2022
Shrubland	S161	14 U 325446 5599902	–	–	0	2	0	1
	S162	14 U 325361 5599668	–	–	0	1	0	1
	S171	14 U 327671 5599891	–	–	–	0	1	0
	S172	14 U 327548 5599672	–	–	–	1	0	0
	S177	14 U 328737 5595442	–	–	0	0	0	0
	S178	14 U 328707 5595201	–	–	1	0	0	0
	S180	14 U 328960 5594779	–	–	0	0	0	0
	S181	14 U 329132 5594598	–	–	0	0	0	0
	S183	14 U 329492 5594236	–	–	–	1	0	0
	S200	14 U 326712 5594819	–	–	0	2	1	0
	S230	14 U 328958 5593131	–	–	0	0	0	1
	S231	14 U 328744 5593264	–	–	0	2	0	–
	S24	14 U 327485 5598846	–	–	1	1	0	4
	S31	14 U 327623 5597219	–	–	–	0	2	2
	S32	14 U 327937 5597176	–	–	1	1	0	4
	S359	14 U 327001 5599931	–	–	0	1	0	0
	S38	14 U 328712 5596546	–	–	2	2	2	2
	S4	14 U 325441 5599434	–	–	2	0	0	1
	S45	14 U 328836 5595940	–	–	0	0	3	1
	S48	14 U 329218 5595286	–	–	0	0	0	0
	Total				10	18	10	19
Forest	115	14 U 327578 5605794	–	–	0	0	–	0
	117	14 U 327817 5605260	–	–	0	0	–	0
	120	14 U 327220 5605926	–	–	0	0	–	0
	191	14 U 327828 5606084	–	–	1	0	0	0
	194	14 U 328153 5607293	–	–	0	0	0	0
	F100	14 U 330838 5597482	–	–	0	0	0	0
	F101	14 U 330691 5597690	–	–	0	0	0	0
	F102	14 U 330541 5597894	–	–	0	0	0	0
	F103	14 U 330427 5598116	–	–	0	0	0	0
	F104	14 U 330324 5598345	–	–	0	0	0	0
	F105	14 U 330266 5598586	–	–	0	0	0	0
	F106	14 U 330183 5598824	–	–	0	0	0	0
	F107	14 U 329942 5598890	–	–	0	0	0	0
	F108	14 U 329872 5598650	–	–	0	0	0	0
	F109	14 U 330005 5598431	–	–	0	0	0	0
	F110	14 U 329936 5598191	–	–	0	0	0	0
	F143	14 U 325542 5601255	–	–	–	0	–	0

Habitat	Site	Location	Distance from ROW (m)	Distance to Nearest Forest (m)	2017	2019	2021	2022
Forest	F148	14 U 326146 5601947	–	–	0	0	0	0
	F149	14 U 325952 5602111	–	–	0	0	0	0
	F150	14 U 325763 5602281	–	–	0	0	0	0
	F151	14 U 325578 5602452	–	–	0	0	0	0
	F152	14 U 325881 5601057	–	–	0	0	0	0
	F153	14 U 325703 5600878	–	–	0	0	0	0
	F154	14 U 325630 5600638	–	–	0	0	0	0
	F155	14 U 325379 5600637	–	–	0	0	0	0
	F156	14 U 325128 5600638	–	–	0	0	0	0
	F157	14 U 324872 5600637	–	–	0	0	0	0
	F158	14 U 324620 5600633	–	–	0	0	0	–
	F18	14 U 328780 5598979	–	–	0	0	0	0
	F20	14 U 329061 5598873	–	–	0	0	0	–
	F250	14 U 331410 5593283	–	–	0	0	0	0
	F362	14 U 325911 5600648	–	–	0	0	0	0
	F365	14 U 324594 5600227	–	–	0	0	0	–
	F67	14 U 332087 5591487	–	–	0	0	0	0
	F72	14 U 333317 5591436	–	–	0	0	0	0
	F73	14 U 333569 5591460	–	–	0	0	0	0
	F74	14 U 333824 5591480	–	–	0	0	0	0
	F75	14 U 333793 5591730	–	–	0	0	0	0
	F76	14 U 333709 5591971	–	–	0	0	0	0
	F77	14 U 333558 5592173	–	–	0	0	0	0
	F78	14 U 333416 5592383	–	–	0	0	0	0
	F79	14 U 333306 5592607	–	–	0	0	0	0
	F80	14 U 333278 5592863	–	–	0	0	0	0
	F81	14 U 333280 5593116	–	–	0	0	0	0
	F82	14 U 333232 5593364	–	–	0	0	0	0
	F83	14 U 333113 5593587	–	–	0	0	0	0
	F84	14 U 332983 5593809	–	–	0	0	0	0
	F85	14 U 332820 5594001	–	–	0	0	0	0
	F86	14 U 332744 5594238	–	–	0	0	0	0
	F87	14 U 332599 5594447	–	–	0	0	0	0
	F94	14 U 331682 5596267	–	–	0	0	0	0
	F95	14 U 331558 5596483	–	–	0	0	0	0
	F96	14 U 331373 5596652	–	–	0	0	0	0
	F97	14 U 331201 5596835	–	–	0	0	0	0
	F98	14 U 331032 5597021	–	–	0	0	0	0

Habitat	Site	Location	Distance from ROW (m)	Distance to Nearest Forest (m)	2017	2019	2021	2022
Forest	F99	14 U 330964 5597262	–	–	0	0	0	0
	Total				1	0	0	0
Edge	109	14 U 327601 5607527	–	–	0	0	0	0
	114	14 U 327451 5606069	–	–	1	0	0	0
	116	14 U 327772 5605562	–	–	0	0	–	0
	118	14 U 327857 5604957	–	–	0	0	–	0
	119	14 U 327977 5604681	–	–	0	0	–	0
	196	14 U 325795 5607604	–	–	1	0	0	1
	E111	14 U 329877 5597943	–	–	0	0	0	0
	E112	14 U 329952 5597697	–	–	0	0	0	0
	E113	14 U 329658 5598069	–	–	0	0	0	0
	E114	14 U 329711 5598985	–	–	0	0	–	0
	E115	14 U 329652 5599230	–	–	0	0	–	0
	E116	14 U 329624 5599480	–	–	0	0	–	0
	E117	14 U 329690 5599724	–	–	0	0	–	0
	E118	14 U 329662 5599974	–	–	0	0	–	0
	E119	14 U 329479 5600147	–	–	0	0	–	0
	E122	14 U 329017 5598534	–	–	0	0	0	0
	E124	14 U 329478 5598249	–	–	0	0	0	0
	E13	14 U 327709 5599347	–	–	1	0	0	0
	E132	14 U 326363 5600342	–	–	0	0	0	0
	E137	14 U 326138 5601041	–	–	1	0	0	1
	E14	14 U 327944 5599252	–	–	0	0	0	0
	E141	14 U 325827 5601525	–	–	0	0	0	0
	E146	14 U 326713 5601828	–	–	0	0	0	0
	E160	14 U 325519 5600146	–	–	0	1	0	1
	E164	14 U 326788 5601130	–	–	0	1	0	1
	E17	14 U 328644 5599195	–	–	0	0	0	0
	E19	14 U 328846 5598737	–	–	0	0	0	0
	E201	14 U 326521 5594981	–	–	0	1	2	0
	E202	14 U 326313 5595132	–	–	0	0	0	0
	E240	14 U 326420 5594520	–	–	0	0	0	0
	E242	14 U 326368 5594029	–	–	0	0	0	0
	E243	14 U 326547 5593848	–	–	0	0	0	0
	E244	14 U 326686 5593634	–	–	0	0	0	0
	E247	14 U 330891 5593777	–	–	0	0	0	0
	E248	14 U 331139 5593716	–	–	0	0	0	0
	E251	14 U 331465 5593030	–	–	0	0	0	0

Habitat	Site	Location	Distance from ROW (m)	Distance to Nearest Forest (m)	2017	2019	2021	2022
Edge	E252	14 U 331563 5592791	–	–	0	0	0	0
	E253	14 U 330972 5594014	–	–	–	0	0	0
	E254	14 U 330828 5594230	–	–	–	0	0	0
	E360	14 U 326800 5600107	–	–	0	1	0	0
	E361	14 U 326607 5600276	–	–	0	0	0	0
	E60	14 U 330872 5592811	–	–	0	0	0	0
	E63	14 U 331435 5592306	–	–	0	0	0	0
	E65	14 U 331702 5591880	–	–	0	0	0	0
	E66	14 U 331835 5591664	–	–	0	0	0	0
	E70	14 U 332824 5591333	–	–	0	0	0	0
	E71	14 U 333066 5591425	–	–	0	0	0	0
	E88	14 U 332556 5594695	–	–	0	0	0	0
	E89	14 U 332516 5594948	–	–	0	0	0	0
	E90	14 U 332417 5595184	–	–	0	0	0	0
	E91	14 U 332299 5595404	–	–	0	0	0	0
	E92	14 U 332090 5595543	–	–	0	0	0	0
	E93	14 U 331972 5595764	–	–	0	0	0	0
	Total				4	4	2	4

Table A-5: Raptors and nest predators detected during perching avian predator surveys, 2022

Perch Deterrents	Site	Centre Tower Location	Date	Type	Common Name	Scientific Name	Number Observations	Number Perched
Yes	1	14 U 324678 5599456	2-May	Nest predator	American crow	*Corvus brachyrhynchos*	6	0
			3-May	Nest predator	Black-billed magpie	*Pica hudsonia*	1	0
					American crow	*Corvus brachyrhynchos*	1	0
					Common raven	*Corvus corax*	2	2
			4-May	Raptor	Bald eagle	*Haliaeetus leucocephalus*	1	0
					Broad-winged hawk	*Buteo platypterus*	1	0
					Merlin	*Falco columbarius*	1	0
				Nest predator	American crow	*Corvus brachyrhynchos*	1	0
			20-Jun	Raptor	Buteo species	–	1	0
				Nest predator	American crow	*Corvus brachyrhynchos*	1	0
					Common raven	*Corvus corax*	2	0
			21-Jun	Nest predator	Common raven	*Corvus corax*	2	0
			22-Jun	Nest predator	Common raven	*Corvus corax*	1	0
			23-Jun	Nest predator	American crow	*Corvus brachyrhynchos*	1	0
	2	14 U 325878 5600107	2-May	Raptor	Turkey vulture	*Cathartes aura*	1	0
				Nest predator	American crow	*Corvus brachyrhynchos*	1	0
			3-May	Nest predator	Common raven	*Corvus corax*	5	0
			4-May	Raptor	American kestrel	*Falco sparverius*	1	0
					Bald eagle	*Haliaeetus leucocephalus*	1	0
				Nest predator	American crow	*Corvus brachyrhynchos*	4	0
			5-May	Nest predator	American crow	*Corvus brachyrhynchos*	4	0
					Common raven	*Corvus corax*	1	0
			20-Jun	Nest predator	American crow	*Corvus brachyrhynchos*	8	2
			21-Jun	Raptor	Northern harrier	*Circus cyaneus*	1	0

Perch Deterrents	Site	Centre Tower Location	Date	Type	Common Name	Scientific Name	Number Observations	Number Perched
Yes	3	14 U 327076 5599870	2-May	Raptor	American kestrel	*Falco sparverius*	1	0
					Red-tailed hawk	*Buteo jamaicensis*	2	0
				Nest predator	American crow	*Corvus brachyrhynchos*	1	0
					Common raven	*Corvus corax*	1	1
			3-May	Nest predator	Common raven	*Corvus corax*	1	0
			4-May	Raptor	Red-tailed hawk	*Buteo jamaicensis*	1	0
				Nest predator	Common raven	*Corvus corax*	3	1
			5-May	Raptor	Red-tailed hawk	*Buteo jamaicensis*	2	1
				Nest predator	Common raven	*Corvus corax*	5	3
			20-Jun	Raptor	Northern harrier	*Circus cyaneus*	1	0
			23-Jun	Raptor	Turkey vulture	*Cathartes aura*	1	0
				Nest predator	American crow	*Corvus brachyrhynchos*	1	0
	4	14 U 328190 5599037	2-May	Nest predator	American crow	*Corvus brachyrhynchos*	1	0
			3-May	Nest predator	American crow	*Corvus brachyrhynchos*	5	0
					Common raven	*Corvus corax*	1	0
			4-May	Raptor	Buteo species	–	1	0
					Turkey vulture	*Cathartes aura*	1	0
				Nest predator	American crow	*Corvus brachyrhynchos*	2	0
					Common raven	*Corvus corax*	9	3
			5-May	Raptor	Broad-winged hawk	*Buteo platypterus*	2	0
				Nest predator	American crow	*Corvus brachyrhynchos*	6	0
					Common raven	*Corvus corax*	1	0
			20-Jun	Nest predator	American crow	*Corvus brachyrhynchos*	2	0
			21-Jun	Raptor	Accipiter species	–	1	0
					Red-tailed hawk	*Buteo jamaicensis*	1	0
				Nest predator	American crow	*Corvus brachyrhynchos*	1	0
			23-Jun	Raptor	Northern harrier	*Circus cyaneus*	1	0
No	5	14 U 343606 5584402	2-May	Raptor	Turkey vulture	*Cathartes aura*	4	0
				Nest predator	American crow	*Corvus brachyrhynchos*	1	0
			3-May	Raptor	Turkey vulture	*Cathartes aura*	11	0

Perch Deterrents	Site	Centre Tower Location	Date	Type	Common Name	Scientific Name	Number Observations	Number Perched
No	5	14 U 343606 5584402	3-May	Nest predator	Common raven	*Corvus corax*	2	0
			4-May	Raptor	Swainson's hawk	*Buteo swainsoni*	1	0
					Turkey vulture	*Cathartes aura*	5	0
				Nest predator	American crow	*Corvus brachyrhynchos*	2	0
					Common raven	*Corvus corax*	4	0
			5-May	Raptor	Buteo species	–	1	0
					Turkey vulture	*Cathartes aura*	2	0
				Nest predator	Common raven	*Corvus corax*	1	0
			20-Jun	Raptor	Red-tailed hawk	*Buteo jamaicensis*	1	0
			22-Jun	Raptor	Red-tailed hawk	*Buteo jamaicensis*	1	0
				Nest predator	Common raven	*Corvus corax*	3	0
	6	14 U 343581 5583145	2-May	Raptor	Turkey vulture	*Cathartes aura*	3	0
				Nest predator	Common raven	*Corvus corax*	1	0
			3-May	Raptor	Merlin	*Falco columbarius*	1	0
				Nest predator	Common raven	*Corvus corax*	1	0
			20-Jun	Raptor	Northern harrier	*Circus cyaneus*	2	0
			21-Jun	Raptor	Accipiter species	–	1	0
				Nest predator	American crow	*Corvus brachyrhynchos*	2	0
			22-Jun	Raptor	Accipiter species	–	1	0
					Northern harrier	*Circus cyaneus*	1	0

APPENDIX B
Site Photos 2021 and 2022

Photo B-1: Grass at Site 112 in the Spy Hill-Ellice Community Pasture in 2021 (above) and 2022 (below)

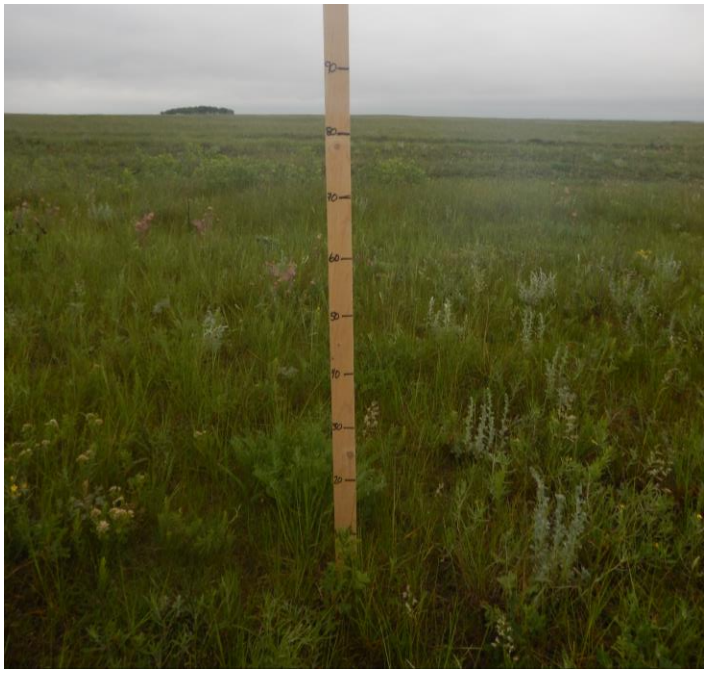

Photo B-2: Grass at Site G197 in the Spy Hill-Ellice Community Pasture in 2021 (above) and 2022 (below)

Available in accessible formats upon request