BIRTLE TRANSMISSION PROJECT

BIRD SPECIES OF CONSERVATION CONCERN MONITORING 2017-2023

BIRTLE TRANSMISSION PROJECT

ENVIRONMENTAL MONITORING PLAN

BIRD SPECIES OF CONSERVATION CONCERN MONITORING 2017-2023

Prepared for

Manitoba Hydro, Transmission & Distribution Environment and Engagement

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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 Spy Hill-Ellice Community Pasture, which may be subject to disturbance due to Project construction and operation, provides grazing for livestock and important habitat for grassland birds. 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 both. Both species have noted population declines, due in part to the loss of grassland habitat. 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, 2022, and 2023, the first three years of Project operation. Point counts for birds were conducted at approximately 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, distance to nearest forest, and average vegetation height 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 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. Statistical analyses were conducted to compare the abundance of raptors and nest predators at sites with and without perch deterrents from 2021-2023 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.

Bird monitoring during pre-construction (2017 and 2019) and during operation (2021-2023) 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 measurable 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 measurable 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 measurable 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 concluded 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

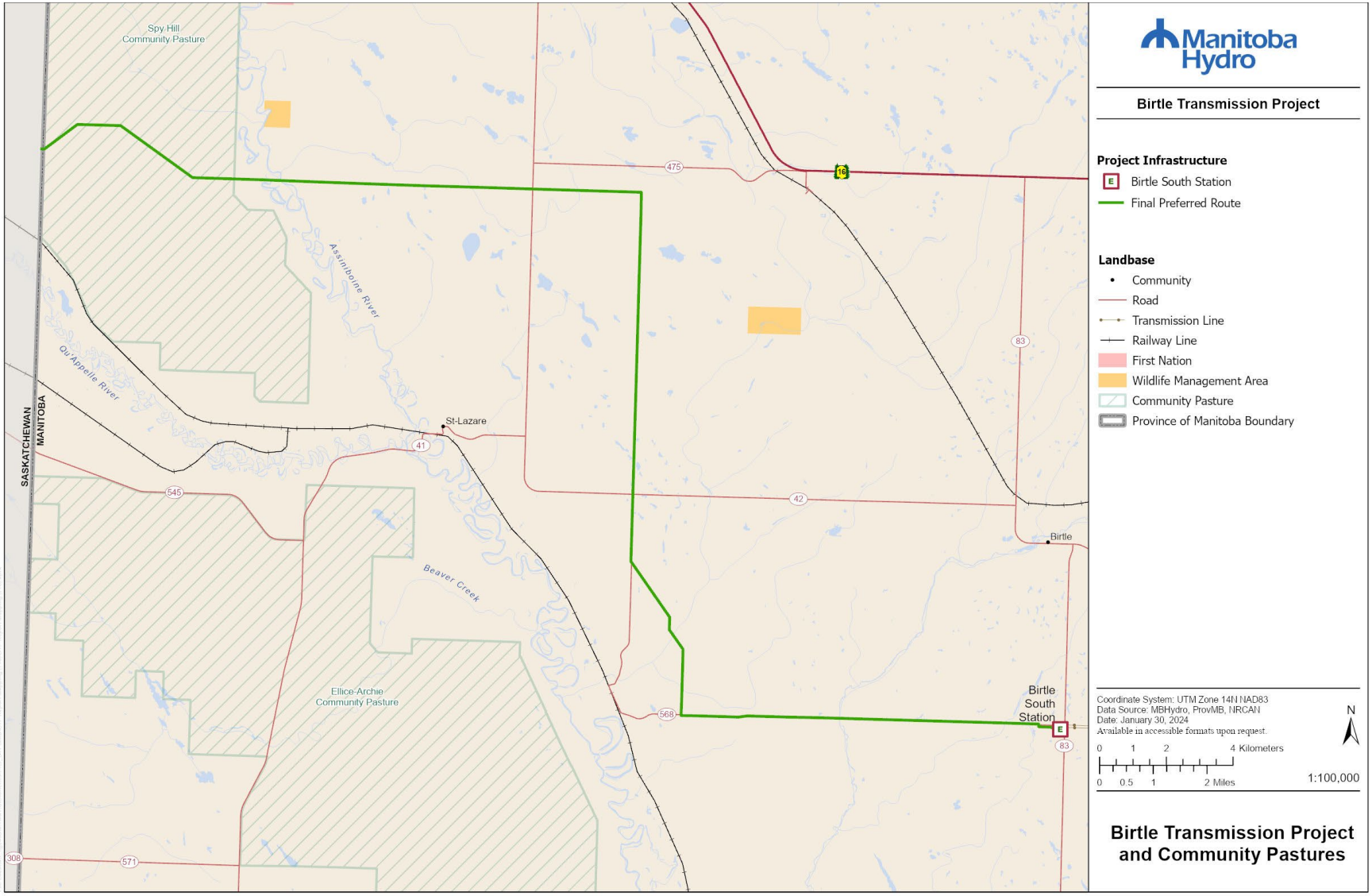
The Birtle Transmission Project (the Project) is a 230 kV AC transmission line that spans 46.2 km from the Birtle South Station, through the Spy Hill-Ellice Community Pasture, to the Saskatchewan border (Map 1-1). Project construction began in July 2020 and was completed by March 2021. The transmission 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, 2022, and 2023, the first three years of Project operation.

There are two intact native mixed-grass prairies in the Project region, the Spy Hill-Ellice Community Pasture and Ellice-Archie Community Pasture, 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 (COSEWIC 2010; COSEWIC 2019). 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 articles of legislation. Both species are relatively common in the Spy Hill-Ellice Community Pasture, which may be subject to disturbance due Project construction and operation.

Both species are considered grassland specialists. Sprague's pipits prefer to breed and forage on native grasslands of moderate height (10-30 cm) with some litter, typically in areas that are not heavily grazed (COSEWIC 2010). Chestnut-collared longspurs prefer to breed in recently mowed or grazed short- or mixed-grass prairie of less than 20-30 cm, with low amounts of litter (COSEWIC 2019). Breeding locations and nest site selection of these species are thought to shift as grassland conditions fluctuate from disturbances such as drought, floods, fire, and grazing.

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. 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. Monitoring was conducted during the

pre-construction period in 2017 and 2019, and during the operation period from 2021-2023 (WRCS 2017; WRCS 2019; WRCS 2021; WRCS 2022.)



Map 1-1: Birtle Transmission Project and Spy-Hill Ellice and Ellice-Archie Community Pastures in western Manitoba

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 approximately 300 sites in the Spy Hill-Ellice Community Pasture prior to construction (pre-construction) in 2017 and 2019, and repeated during operation from 2021-2023 (Map 2-1). 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 2-1). Main roads and trails were used to access survey points Sites in grassland habitat were at various distances from the ROW (Table 2-2). An observer listened and looked for birds (Photo 5) or took recordings for three minutes at sites in forest habitat and for 10 minutes at all other sites. 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.

In 2023, a similar method was used to measure grass heights at 99 grassland habitat sites. Two readings of grass height, the minimum and maximum, were taken to the north of each survey location. These were averaged to produce a range and categorized similarly to those in 2022.

Table 2-1: Number of point count sites surveyed in four habitat types during pre-construction (2017, 2019) and operation (2021-2023)

Habitat Type	Description	2017	2019	2021	2022	2023
Grassland	Grassland-dominated, few shrubs	153	170	164	164	170
Shrubland	Shrub/small tree-dominated	27	31	31	30	31
Forest	Dense trees with overhead canopy	55	56	52	53	54
Edge	Transition between grassland and forest	51	53	44	53	52
Total		286	310	291	300	307

Table 2-2: Number of point count sites surveyed at various distances from the right-of-way in grassland habitat pre-construction (2017, 2019) and operation (2021-2023)

Distance from ROW (m)	2017	2019	2021	2022	2023
0–1000	36	46	43	42	45
1001–2000	28	31	29	30	30
>2000	89	93	92	92	95

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 were performed to analyze differences between individual survey years. Because multiple comparisons were made, a Bonferroni correction of 0.05/10 = 0.005 was applied to determine statistical significance when individual years were compared (McDonald 2014).

The relationship between the presence or absence of chestnut-collared longspur (Photo 6) 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.

An additional stepwise, binary logistic regression was also conducted using distance to the ROW, distance to forest habitat, and average grassland height (average of lowest and highest reading) in 2022 and 2023, to examine the relationships of these variables on the presence of chestnut-collared longspurs and Sprague's pipits. Significance was determined at the $\alpha = 0.05$ level.

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

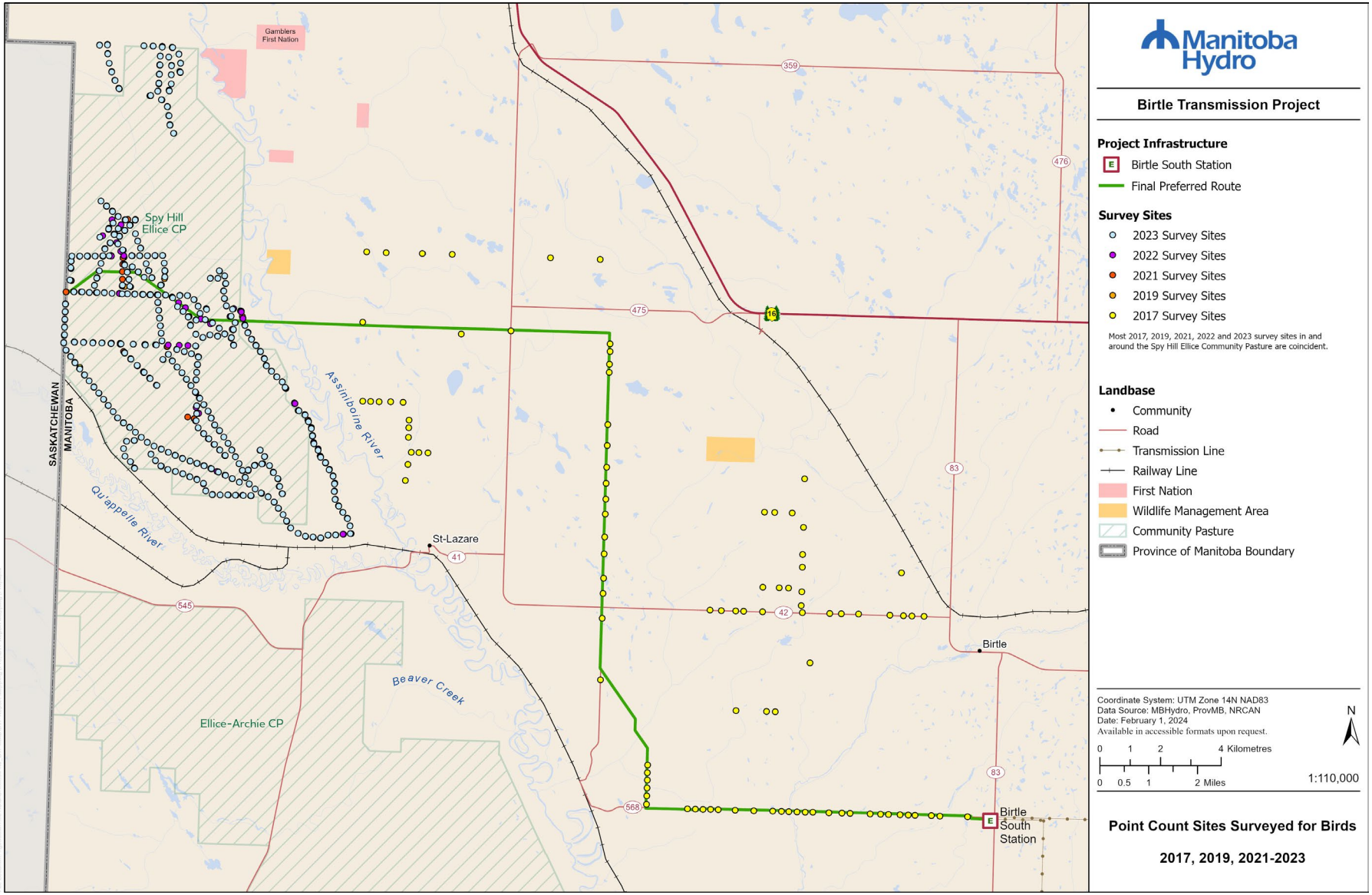
Photo 2: Shrubland habitat in the Spy Hill-Ellice Community Pasture

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

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

Photo 5: Observer looking for birds in grassland habitat with the Birtle Transmission Project in the distance

Photo 6: Chestnut-collared longspur observed during the 2023 survey



Map 2-1: Point count sites surveyed for birds 2017, 2019, 2021-2023

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.

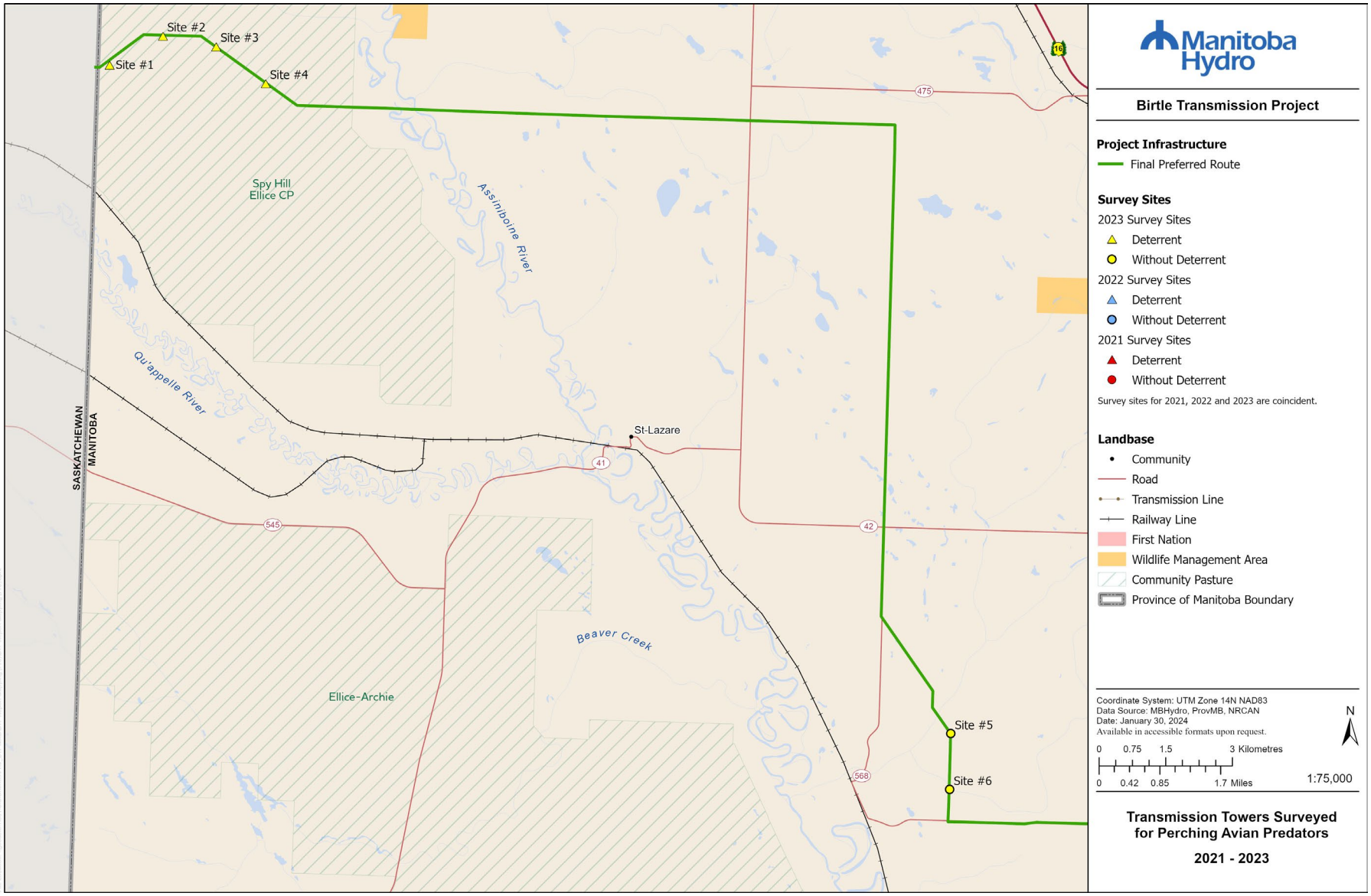
- H_1 (alternative): The construction and operation of the transmission line does affect the abundance of perching avian predators.

To test Hypothesis 2, avian predator perch surveys were conducted from 2021-2023. Six sites were surveyed, four at transmission towers where perch deterrents were installed (Photo 7) and two at transmission towers with no deterrents (Map 2-2). At each site, two tower spans (three towers) were monitored for one hour in 2021 and 2022, and for half an hour in 2023. In 2021, each site was visited daily from April 20 to 23, 2021, and again from June 20-24, 2021. In 2022, each site was visited daily from May 2-5, 2022, and again from June 20-23, 2022. In 2023, each site was visited daily from June 26-29, 2023.

During the survey an observer 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.

Statistical analyses were conducted with SYSTAT 13. Observations of perched raptors and nest predators from 2021-2023 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 7: Perch deterrents on a transmission tower in the Spy Hill-Ellice Community Pasture



Map 2-2: Transmission towers surveyed for perching avian predators, 2021-2023

2.3 Brood Parasites

As described in section 6.2.1 of the Environmental Monitoring Plan, the purpose of monitoring the brood parasite, brown-headed cowbird, 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 0.05/10 = 0.005 was applied to determine statistical significance when individual years were compared (McDonald 2014).

3.0 RESULTS

3.1 Grassland Bird Species of Conservation Concern

During all monitoring years, 135 bird species were detected in the study area (Appendix A). During pre-construction surveys conducted in 2017 and 2019, 113 species were detected. The most common species observed included the western meadowlark (*Sturnella neglecta*), savannah sparrow (*Passerculus sandwichensis*), and clay-coloured sparrow (*Spizella pallida*). The greatest number of species were observed on grassland and forest habitat sites, with 86 species, respectively. Edge habitat sites also contained a relatively high number of species (84), and shrubland sites supported the fewest species (65).

During operation surveys, conducted from 2021-2023, 122 species were detected. The most common species observed included the western meadowlark, vesper sparrow (*Pooecetes gramineus*), and savannah sparrow. The greatest number of species were observed on grassland habitat sites (103 species), followed by forest sites (93), edge (91), and shrubland (69).

Ten species of conservation concern (SOCC) were observed during surveys. Two species, the Canada warbler and eastern whip-poor-will were detected in the pre-construction surveys that was not detected in the operation surveys (Table 3-1). Observations of these species were uncommon, with only a single detection of Canada warbler in both 2017 and 2019, and three detections of eastern whip-poor-wills in 2017 (Table 3-2).

Sprague's pipit, chestnut collared longspur, and Baird's sparrow (*Ammodramus bairdii*) were the most common SOCC observed in all survey years, comprising 55%, 25%, and 6% of all SOCC observations (Table 3-2). In 2023, a relatively high number of Baird's sparrows (Photo 8) and Sprague's pipits were observed in comparison to other survey years at a greater number of sites (Table 3-2). Additionally, two bobolinks (*Dolichonyx oryzivorus*), a SOCC 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, and one was observed in 2023 in edge habitat.

The majority of Sprague's pipit and chestnut-collared longspur observations during both the pre-construction and operation surveys were in grassland habitat. Grassland habitat supported 87% and 83% of all Sprague's pipit observations during the pre-construction and operation surveys, respectively. Grassland habitat supported 93% of all chestnut-collared longspur observations during both the pre-construction and operation surveys.

Table 3-1: Species of conservation concern observed during pre-construction surveys (2017 and 2019) and operation surveys (2021-2023)

Species of Conservation Concern	SARA Status	ESEA Status	Detected during pre-construction? (2017, 2019)	Detected during operation? (2021-2023)
Baird's Sparrow	Special Concern	Endangered	Yes	Yes
Bank Swallow	Threatened	Not listed	Yes	Yes
Barn Swallow	Threatened	Not listed	Yes	Yes
Bobolink	Threatened	Not listed	Yes	Yes
Canada Warbler	Threatened	Threatened	Yes	No
Chestnut-collared Longspur	Threatened	Endangered	Yes	Yes
Common Nighthawk	Threatened	Threatened	Yes	Yes
Eastern Whip-poor-will	Threatened	Threatened	Yes	No
Eastern Wood-pewee	Special Concern	Not listed	Yes	Yes
Olive-sided Flycatcher	Threatened	Threatened	Yes	Yes
Sprague's Pipit	Threatened	Threatened	Yes	Yes

Photo 8: Baird's sparrow near a probable nest on the Birtle Transmission Project ROW

Table 3-2: The number of individuals and number of sites species of conservation concern were observed during pre-construction surveys (2017 and 2019) and operation surveys (2021-2023)

Species of Conservation Concern	2017		2019		2021		2022		2023		Total No. Indivs.
	No. Indivs.	No. Sites	No. Indivs.	No. Sites	No. Indivs.	No. Sites	No. Indivs.	No. Sites	No. Indivs.	No. Sites	
Baird's Sparrow	2	2	17	14	9	7	13	13	52	49	93
Bank Swallow	0	0	2	1	2	2	0	0	1	1	5
Barn Swallow	6	5	38	18	20	11	1	1	14	4	79
Bobolink	0	0	2	1	3	3	0	0	1	1	6
Canada Warbler	1	1	1	1	0	0	0	0	0	0	2
Chestnut-collared Longspur	65	35	76	42	84	34	73	37	77	38	375
Common Nighthawk	1	1	19	14	7	7	11	9	21	15	59
Eastern Whip-poor-will	3	3	0	0	0	0	0	0	0	0	3
Eastern Wood-Pewee	0	0	7	7	3	3	4	4	20	18	34
Olive-sided Flycatcher	1	1	2	2	1	1	0	0	0	0	4
Sprague's Pipit	139	90	141	94	77	46	167	100	289	141	813

Twelve additional bird species typically associated with grassland habitat were observed at grassland habitat sites over the five-year survey period. Western meadowlark was the most common each survey year (Table 3-3). 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.

Table 3-3: Number of grassland birds observed at grassland habitat sites during point counts, during pre-construction (2017, 2019) and operation (2021-2023)

Species	Pre-construction		Operation		
	2017	2019	2021	2022	2023
American Kestrel	0	2	3	0	3
Eastern Bluebird	0	3	7	2	0
Grasshopper Sparrow	15	57	64	72	120
Horned Lark	44	128	77	79	147
Lark Sparrow	0	7	12	3	1
Marbled Godwit	10	25	72	40	66
Northern Harrier	4	1	11	0	5
Savannah Sparrow	181	400	177	187	211
Sharp-tailed Grouse	14	41	40	40	15
Upland Sandpiper	87	199	144	111	233
Vesper Sparrow	73	270	118	156	236
Western Meadowlark	232	547	462	555	685

3.2 Chestnut-collared Longspur

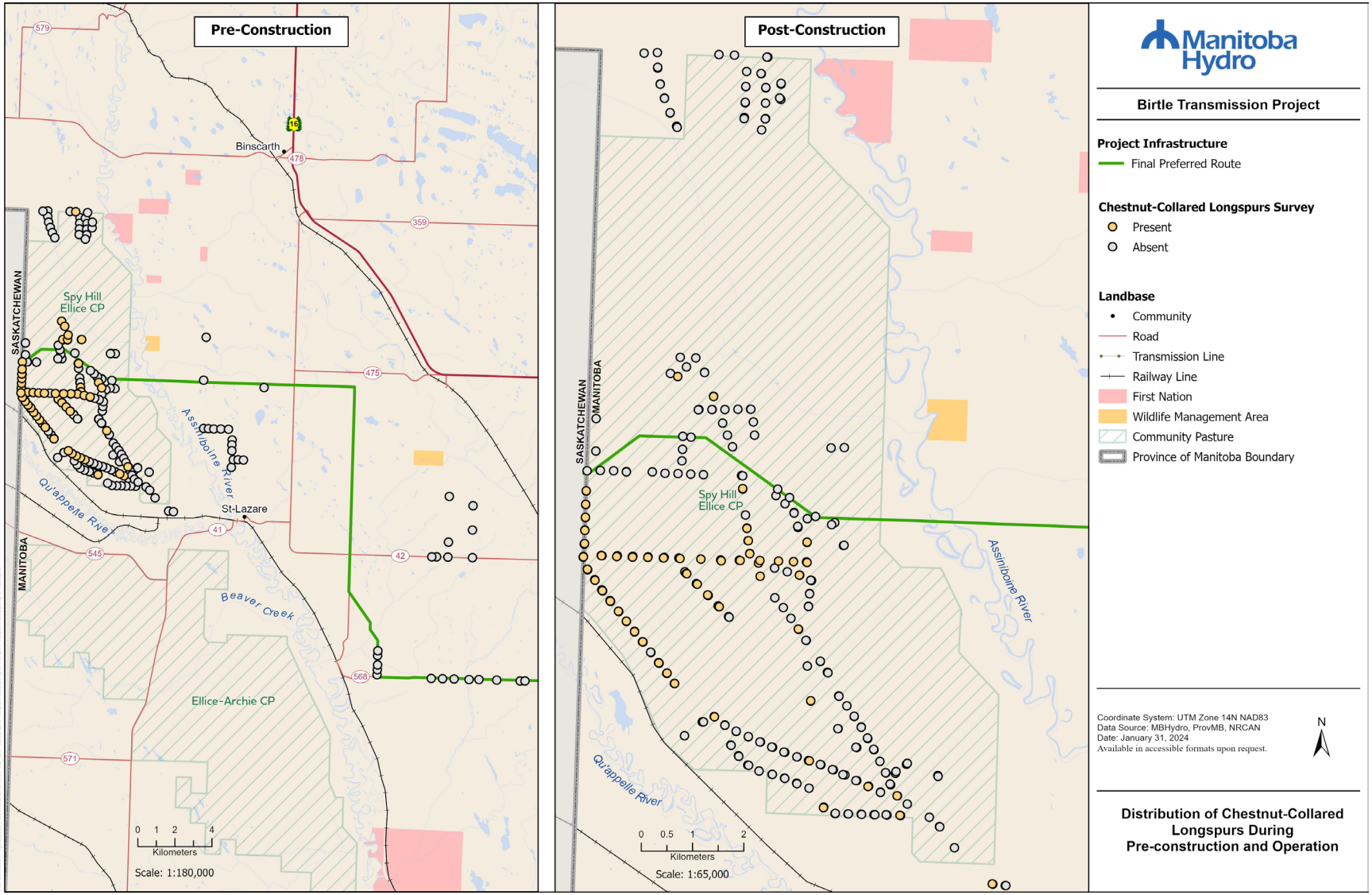
Chestnut-collared longspur abundance (number observed and mean number of observations per site) in grassland sites remained steady, or was higher, during the operation surveys from 2021-2023 in comparison to the pre-construction surveys in 2017 and 2019 (Table 3-4).

The distribution of chestnut-collared longspurs also remained similar between the pre-construction and operation surveys (Table 3-4; Map 3-1). The number of sites where the species were observed and the percentage of sites where they were observed being similar between the two survey periods (Table 3-4).

Abundance data of chestnut-collared longspurs in grassland habitat sites were non-normal for all survey years ($p = 0.000$). Results of the Kruskal-Wallis test showed that there was no significant difference in the abundance of chestnut-collared longspurs among survey years ($H = 1.901$, $p = 0.754$), indicating there was no change in the abundance of chestnut-collared longspurs in the Spy Hill-Ellice Community Pasture during the first three years of operation monitoring.

Table 3-4: Chestnut-collared longspurs observed at grassland habitat sites during pre-construction (2017, 2019) and operation (2021-2023)

Year	No. Observed	No. of Sites at which Observed	Percent of Sites at which Observed	Mean No. 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
2023	69	33	19	0.41	0.97



Map 3-1: Distribution of chestnut-collared longspurs at grassland habitat sites during pre-construction (2017, 2019) and operation (2021-2023)

Chestnut-collared longspurs were generally observed at similar percentages of grassland habitat sites at all distance from the ROW categories during pre-construction (2017, 2019) and during operation (2021-2023) (Figure 1). However, chestnut-collared longspurs were observed at a relatively small percentage of sites within 1,000 m of the ROW in 2022 and 2023 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 (Figure 2). 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.

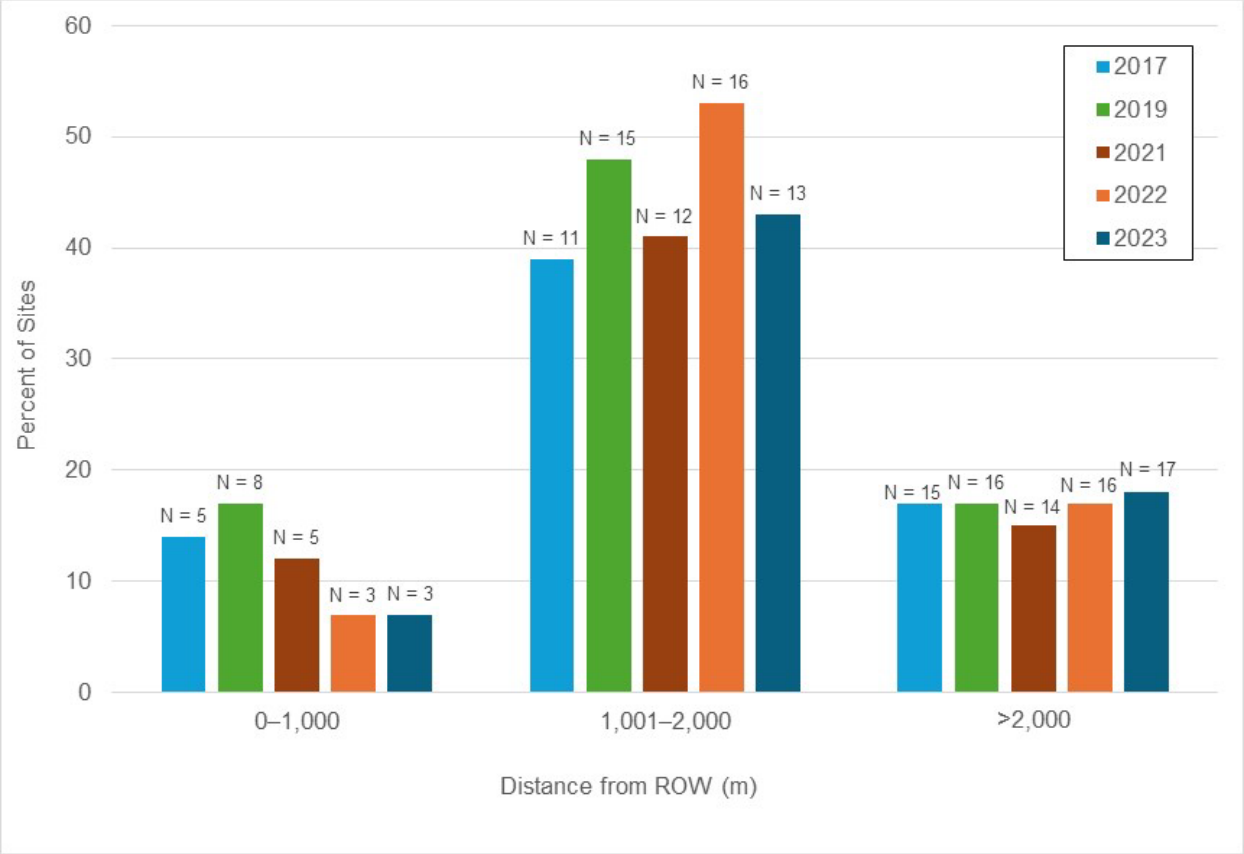


Figure 3-1: Percent of sites where chestnut-collared longspurs were observed at various distances from the right-of-way in grassland habitat during pre-construction (2017, 2019) and operation (2021-2023)

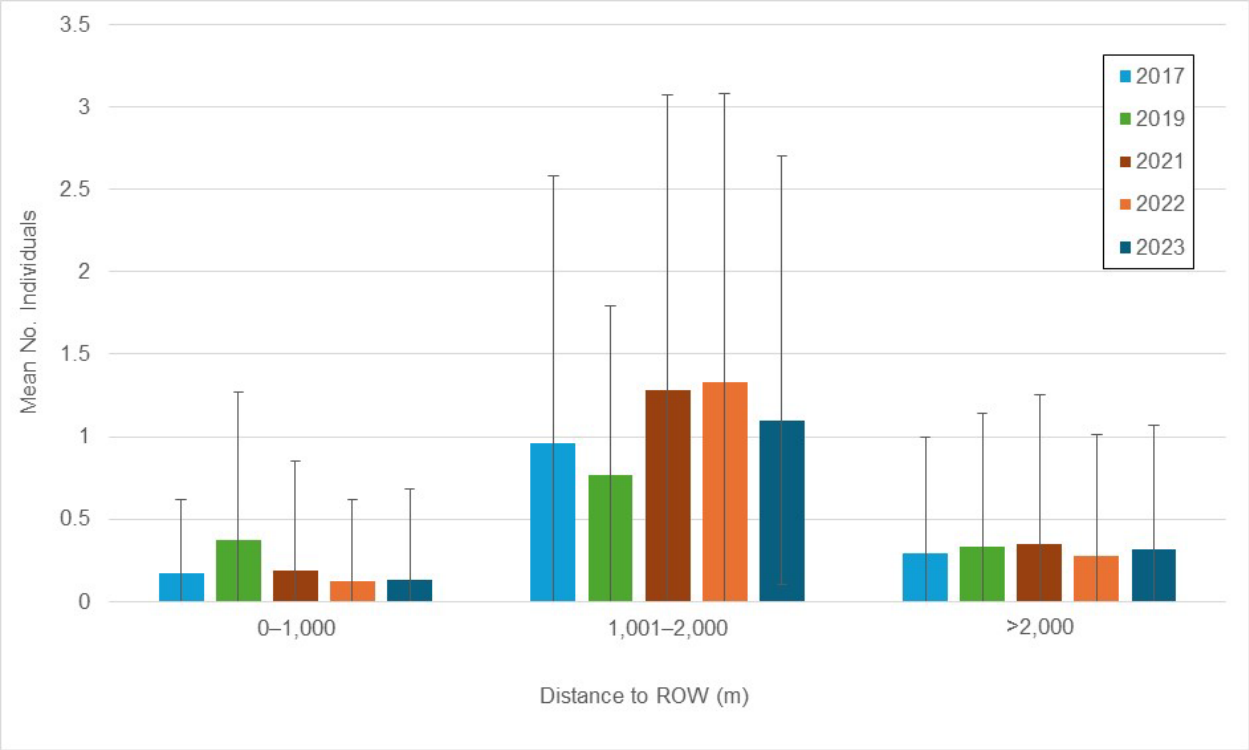


Figure 3-2: Mean number and standard deviation of individual chestnut-collared longspurs observed at sites at various distances from the right-of-way in grassland habitat during pre-construction (2017, 2019) and operation (2021-2023)

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 habitat. There was a statistically significant association between the presence of chestnut-collared longspurs and distance from the ROW during all survey years, including 2017 and 2019, when the ROW did not exist (Table 3-5). Additionally, 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. The association between the presence of chestnut-collared longspur and distance to nearest forest habitat was also statistically significant during all survey years (Table 3-6). Odds ratios of 0.998 or 0.999 for distance to nearest forest habitat 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%, 26% and 25% of the variation was attributed to the model in 2021, 2022, and 2023 (Naglekerke's R^2 = 0.260, 0.230, and 0.245 respectively). Overall model fit (p = 0.000 for all survey years) indicates that the variables examined are not an adequate predictor of chestnut-collared longspur presence in the Spy Hill-Ellice Community Pasture

Table 3-5: Binary logistic regression results of chestnut-collared longspur presence in relation to the distance to the ROW during pre-construction (2017, 2019) and operation (2021-2023)

Year	Parameter Estimate	Odds Ratio Estimate	Z	p-Value
2017	0.000	1.000	2.728	0.006
2019	0.000	1.000	2.584	0.010
2021	0.000	1.000	2.334	0.020
2022	0.000	1.000	2.547	0.011
2023	0.000	1.000	2.635	0.008

Table 3-6: Binary logistic regression results of chestnut-collared longspur presence in relation to the distance to forest habitat during pre-construction (2017, 2019) and operation (2021-2023)

Year	Parameter Estimate	Odds Ratio Estimate	Z	p -Value
2017	-0.001	0.999	-2.892	0.004
2019	-0.001	0.999	-3.476	0.001
2021	-0.002	0.998	-4.438	0.000
2022	-0.002	0.998	-4.143	0.000
2023	-0.002	0.998	-4.351	0.000

A binary logistic regression with stepwise variable selection was used to analyze the relationship between the presence of chestnut-collared longspurs and the distance to the ROW, distance to forest habitat, and average grass height for 2022 and 2023.

The best fitting model used all three variables and there was a significant relationship between the presence of chestnut-collared longspurs to all variables (Table 3-7). Odds ratio estimates indicated that the distance to forest habitat and increasing grass height both had a small, negative effect on presence (Table 3-7). While distance to the ROW was significant, the odds ratio was equal to one, indicating this variable was not associated with presence.

Table 3-7: Binary logistic regression results of chestnut-collared longspur presence in relation to the distance to forest habitat, average vegetation height, and distance to the ROW in 2022 and 2023

Parameter	Estimate	Odds Ratio	Z	p-Value
CONSTANT	2.675	--	4.994	0.000
Distance to Forest	-0.002	0.998	-4.901	0.000
Average Vegetation Height	-0.064	0.938	-3.099	0.002
Distance to ROW	0.000	1.000	3.097	0.002

When the average height of the vegetation at grassland habitat sites was considered, most chestnut-collared longspur activity was at sites in the 15-30 cm height category in 2022 and 2023. Chestnut-collared longspurs were observed at the greatest percentage of grassland habitat sites with vegetation 15-30 cm tall, and the mean number of chestnut-collared longspur observations per site was also greatest in this category (Table 3-8). A similar percentage of sites in the >30 cm category was used by chestnut-collared longspurs, but the mean number of observations in this category were relatively fewer in comparison to the 15-30 cm category. There was considerably less chestnut-collared longspur activity at sites with vegetation less than 15 cm tall.

Table 3-8: Chestnut-collared longspurs observed at grassland habitat sites in three vegetation height categories, 2022-2023

Height Category (cm)	No. Sites	No. Sites Observed	Percent Sites Observed	Mean No. Observations per Site	SD
<15	128	21	16	0.27	0.74
15-30	106	34	32	0.71	1.28
>30	13	4	31	0.54	0.97

3.3 Sprague's Pipit

When only grassland habitat sites were considered, the abundance Sprague's pipits declined in 2021, the first year of Project operation, in comparison to the pre-construction abundances observed in 2017 and 2019 (Table 3-9). Abundances increased in 2022 and 2023, to greater numbers observed in either 2017 or 2019 and the greatest number was observed in 2023, the third 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 and 2023 than before Project construction. Overall, the distribution of Sprague's pipits was similar before and after Project construction (Map 3-2).

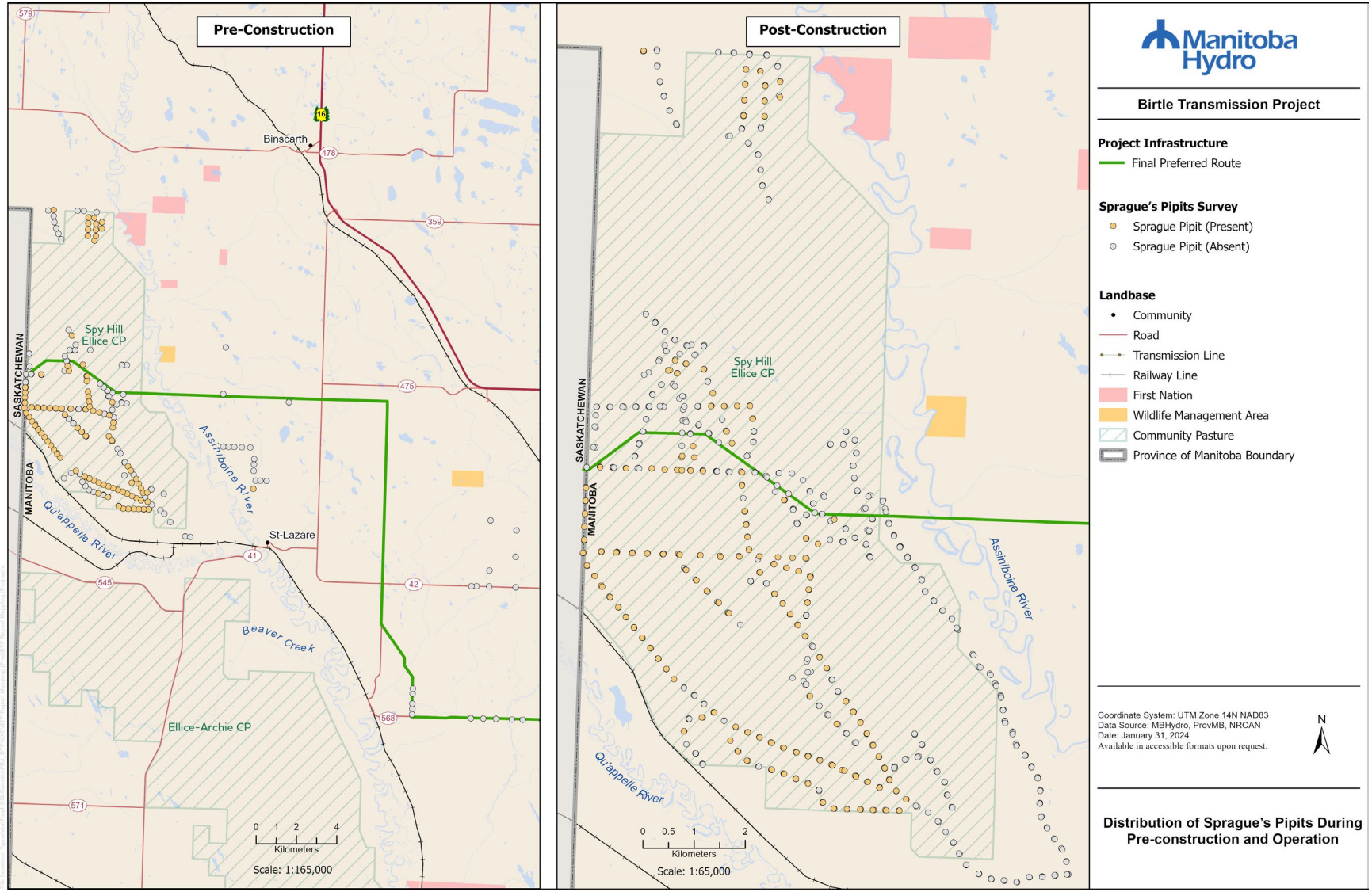
Table 3-9: Sprague's pipits observed at grassland habitat sites during pre-construction (2017, 2019) and operation (2021-2023)

Year	No. Observed	No. of Sites at which Observed	Percent of Sites at which Observed	Mean No. 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
2023	235	116	68	1.38	1.29

Abundance data of Sprague's pipits in grassland habitat were non-normal for all survey years ($p = 0.000$). Results of the Kruskal-Wallis test indicated that there was a significant difference in the abundance of Sprague's pipits among years ($H = 81.560$, $p = 0.000$). Post-hoc analysis indicated that there was a significant difference in abundance between 2017 and 2021, 2017 and 2023, 2019 and 2021, 2019 and 2023, 2021 and 2022, 2021 and 2023, and 2022 and 2023 (Table 3-10), where fewer Sprague's pipits were observed in 2021 than in other survey years, and more were observed in 2023 than in other survey years.

Table 3-10: Conover-Inman post-hoc test results for pairwise comparisons of Sprague's pipits during pre-construction (2017, 2019) and operation (2021-2023)

Group(i)	Group(j)	Statistic	p-Value
2017	2019	1.055	0.292
2017	2021	4.631	0.000
2017	2022	0.562	0.575
2017	2023	5.209	0.000
2019	2021	3.681	0.000
2019	2022	1.651	0.099
2019	2023	6.244	0.000
2021	2022	5.285	0.000
2021	2023	9.368	0.000
2022	2023	4.783	0.000



Map 3-2: Distribution of Sprague's pipits at point count sites in grassland habitat during pre-construction (2017, 2019) and operation (2021-2023)

Sprague's pipit abundance declined in all distance categories in 2021 in comparison to the 2017 and 2019 pre-construction surveys (Figure 3). In 2022 and 2023, there was a relatively large increase in the number of Sprague's pipits observed and the percentage of sites on which they were observed in all distance categories (Figure 3; Figure 4).

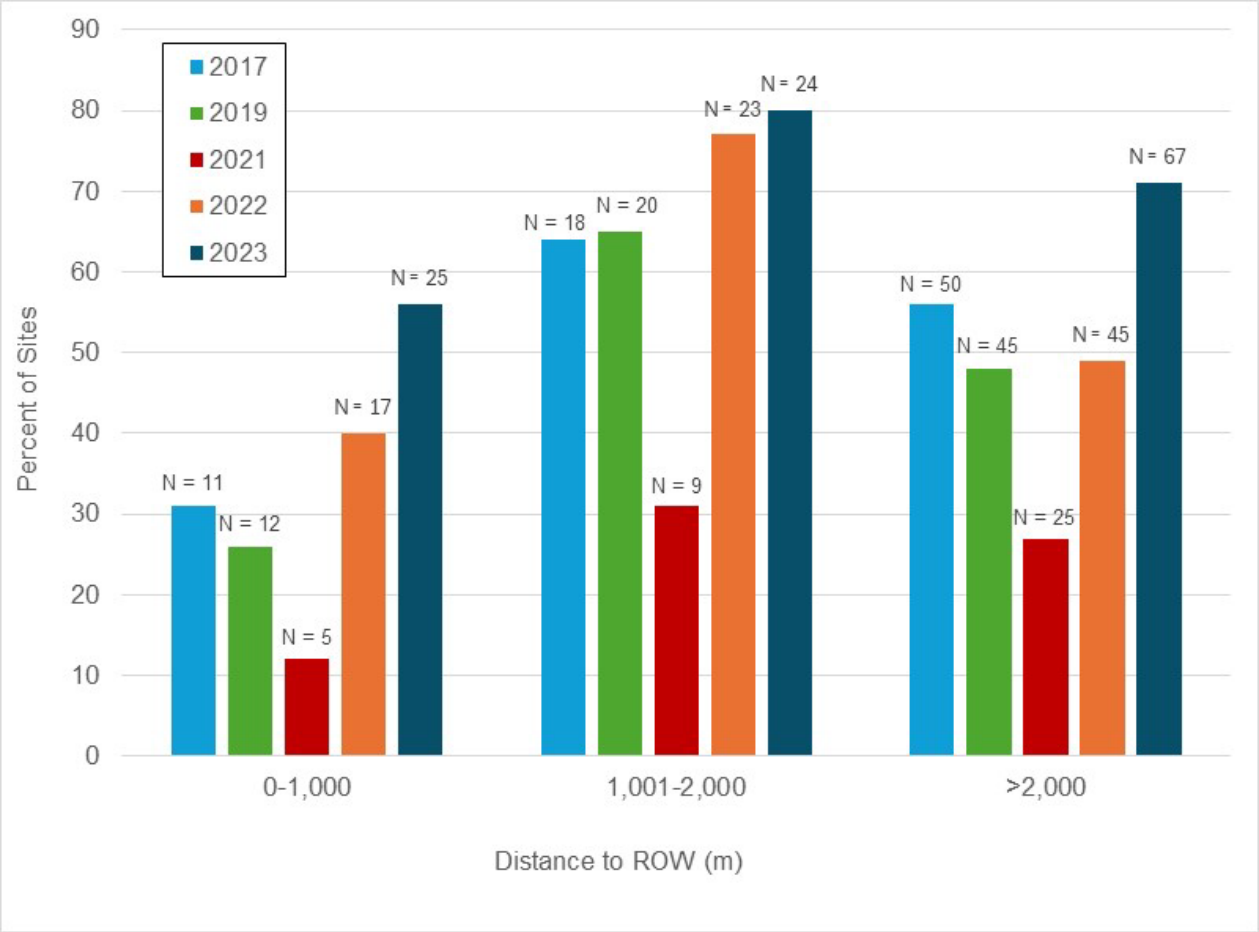


Figure 3-3: Percent of sites where Sprague's pipits were observed at various distances from the right-of-way in grassland habitat during pre-construction (2017, 2019) and operation (2021-2023)

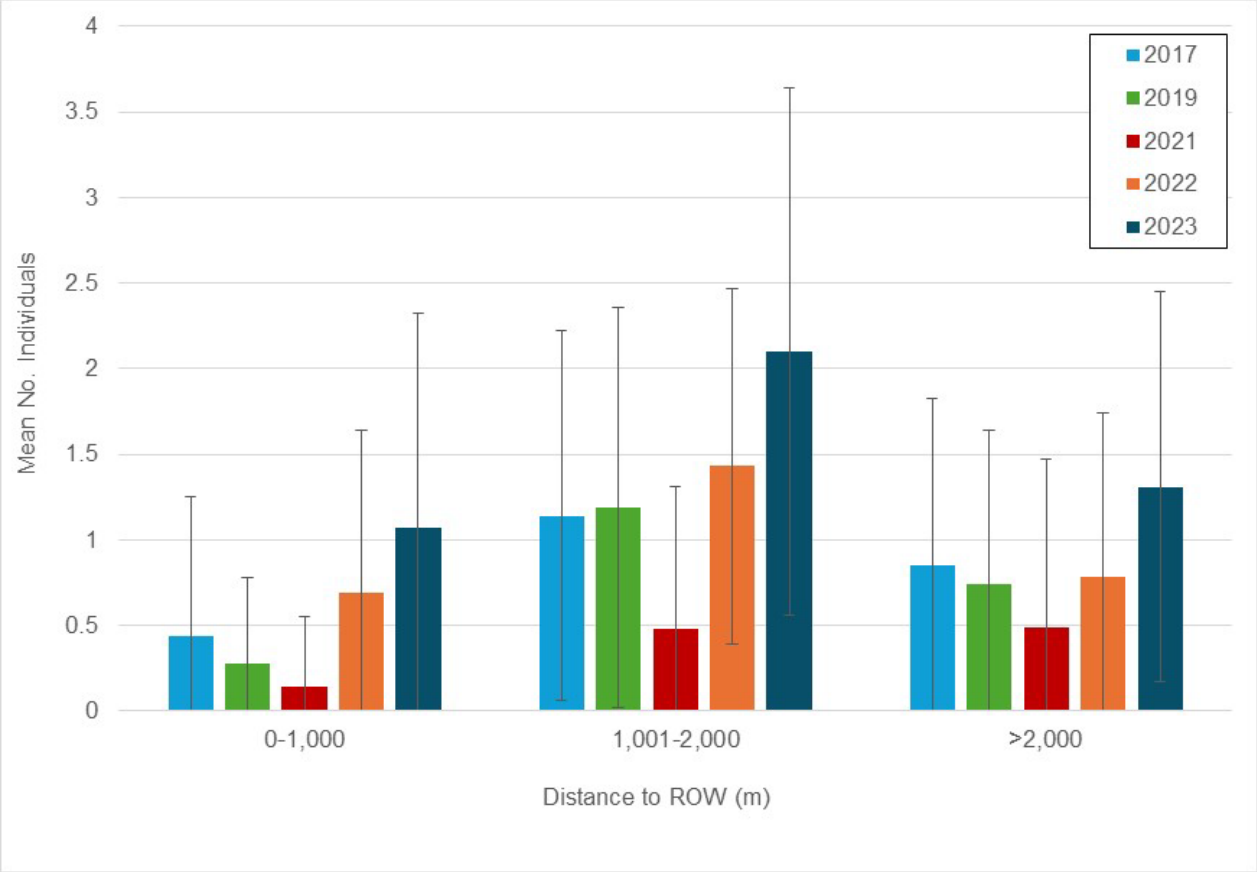


Figure 3-4: Mean number and standard deviation of individual Sprague's pipits observed at sites at various distances from the right-of-way in grassland habitat during pre-construction (2017, 2019) and operation (2021-2023)

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 habitat. There was no statistically significant association between the presence of Sprague's pipit and distance from the ROW during any survey year (Table 3-11). 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. The association between the presence of Sprague's pipit and distance to nearest forest habitat was statistically significant in 2017, 2019, 2022, and 2023, but not in 2021 (Table 3-12). Odds ratios of 0.998 or 0.999 for distance to nearest forest habitat each survey year suggest that Sprague's pipits were no more or less likely to be present at various distances from nearest forest habitat.

Between 2% and 23% of the variation in the presence of Sprague's pipit could be attributed to the model in 2017, 2019, 2021, 2022, and 2023 (Naglekerke's R^2 = 0.052, 0.138, 0.022, 0.230, 0.156 respectively). Overall model fit indicates that the variables examined were inadequate predictors

of Sprague's pipit presence in 2017 (p = 0.049), 2019 (p = 0.000), 2022 (p = 0.000), and 2023 (p = 0.000). In 2021, the model was an adequate predictor of Sprague's pipit presence (p = 0.292).

Table 3-11: Binary logistic regression results of Sprague's pipit presence in relation to the distance to the ROW during pre-construction (2017, 2019) and operation (2021-2023)

Year	Parameter Estimate	Odds Ratio Estimate	Z	p-Value
2017	0.000	1	-1.235	0.217
2019	0.000	1	-0.538	0.590
2021	0.000	1	0.173	0.863
2022	0.000	1	1.019	0.308
2023	0.000	1	-0.118	0.906

Table 3-12: Binary logistic regression results of Sprague's pipit presence in relation to the distance to forest habitat during pre-construction (2017, 2019) and operation (2021-2023)

Year	Parameter Estimate	Odds Ratio Estimate	Z	p-Value
2017	-0.001	0.999	-2.186	0.029
2019	-0.001	0.999	-3.994	0.000
2021	-0.002	0.998	-1.554	0.120
2022	-0.002	0.998	-4.687	0.000
2023	-0.002	0.998	-3.877	0.000

A binary logistic regression with stepwise variable selection was used to analyze the relationship between the presence of Sprague's pipits and the distance to the ROW, distance to forest habitat, and average grass height in 2022 and 2023.

The best fitting model used two variables: distance to forest habitat and average vegetation height. Distance to the ROW did not make the selection. Distance to forest was the only significant variable in the model and the odds ratio estimate it had a small, negative effect on presence (Table 3-13).

Table 3-13: Binary logistic regression results of Sprague's pipit presence in relation to the distance to forest habitat, average vegetation height, and distance to the ROW in 2022 and 2023

Parameter*	Estimate	Odds Ratio	Z	p-Value
CONSTANT	1.151	--	2.818	0.005
Distance to Forest	-0.002	0.998	-5.288	0.000
Average Vegetation Height	-0.033	0.967	-1.755	0.079

* Distance to ROW did not make selection

Despite average vegetation height not being a significant variable, when the average height of the vegetation at grassland habitat sites was considered, there was more Sprague's pipit activity at sites in the >30 cm taller vegetation height category (Table 3-14). Sprague's pipits were observed in the greatest percentage of sites where vegetation was taller than 30 cm, and 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 3-14: Sprague's pipits observed at grassland habitat sites in three vegetation height categories, 2022-2023

Height Category (cm)	No. Sites	No. Sites Observed	Percent Sites Observed	Mean No. Observations per Site	SD
<15	128	78	61	1.05	1.07
15-30	106	68	64	1.33	1.27
>30	13	10	77	1.54	1.33

3.4 Perching Avian Predators

A total of five instances of perching raptors were recorded from 2021-2023; two were recorded on a tower with perch deterrents and the remaining three were recorded on a tower without perch deterrents (Table 3-15). 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 from 2021-2023. The mean number of nest predators was also greater on towers with perch deterrents both years. Common ravens accounted for 85% (n = 23) of the 27 total observations of perched nest predators over the two-year survey period. American crow (n = 3) and black-billed magpie (n = 1) were also observed.

Combined abundance data were non-normal for perching raptors and nest predators (p = 0.000–0.001) from 2021-2023. While the mean number of raptors perched at sites with perch deterrents was lower than at sites with no deterrents (Table 3-15), the difference was not statistically significant (U = 39.500, p = 0.548) 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 = 20.500, p = 0.110).

Table 3-15: Raptors and nest predators perched at sites with and without perch deterrents, 2021-2023

Perch Deterrents	Site	Number of Raptors				Number of Nest Predators			
		2021	2022	2023	Total	2021	2022	2023	Total
Yes	1	0	0	0	0	0	2	0	2
	2	0	0	0	0	0	2	1	3
	3	0	2	0	2	11	5	0	16
	4	0	0	0	0	1	3	0	4
	Total	0	2	0	2	12	12	1	25
	Mean	0	0.5	0	0.2	3.0	3.0	0.25	2.1
	SD	0	1.0	0	0.6	5.4	1.4	0.5	3.2
No	5	3	0	0	3	2	0	0	2
	6	0	0	0	0	0	0	0	0
	Total	3	0	0	3	2	0	0	2
	Mean	1.5	0	0	0.5	1.0	0	0	0.3
	SD	2.1	0	0	1.2	1.4	0	0	0.8

3.5 Brood Parasites

The abundance and distribution of brown-headed cowbirds was greatest in forest habitat during all study years (Table 3-16). Overall abundance and distribution were greatest in 2019, before Project construction, and were lowest in 2022, during Project operation.

Table 3-16: Abundance and distribution of brown-headed cowbirds in four habitat types before (2017, 2019) and after (2021-2023) Project construction

Habitat	Metric	2017	2019	2021	2022	2023
Grassland	No. of sites at which observed	9	19	9	6	6
	Percent of sites	6	11	5	4	4
	No. observed	9	22	14	9	7
	Mean	0.06	0.13	0.09	0.06	0.04
	SD	0.24	0.39	0.42	0.32	0.23
Shrubland	No. of sites at which observed	2	5	6	1	0
	Percent of sites	7	16	19	3	0
	No. observed	2	8	12	1	0
	Mean	0.07	0.26	0.39	0.03	0
	SD	0.27	0.68	0.92	0.18	0
Forest	No. of sites at which observed	33	33	22	19	19
	Percent of sites	60	59	42	36	35
	No. observed	41	64	38	21	23
	Mean	0.75	1.14	0.73	0.40	0.43
	SD	0.70	1.41	1.17	0.57	0.63
Edge	No. of sites at which observed	20	19	10	7	10
	Percent of sites	39	36	23	13	19
	No. observed	20	30	17	7	10
	Mean	0.39	0.57	0.39	0.13	0.19
	SD	0.49	0.88	0.95	0.34	0.40
Total	No. of sites at which observed	64	76	47	33	35
	Percent of sites	22	25	16	11	11
	No. observed	72	124	81	38	40
	Mean	0.25	0.40	0.28	0.13	0.13
	SD	0.50	0.87	0.79	0.39	0.38

Abundance data of brown-headed cowbirds were non-normal for all survey years and habitat types ($p = 0.000$).

Results of the Kruskal-Wallis test indicated that there were significant differences in brown-headed cowbird abundance among survey years in all combined habitats ($H = 34.493$, $p = 0.000$),

in grassland habitat (H = 11.509, p = 0.021), shrubland habitat (H = 10.254, p = 0.036), forest habitat (H = 16.605, p = 0.002), and edge habitat (H = 13.930, p = 0.008) (Table 3-17).

Post-hoc analyses indicated significant differences in the different habitat classes between pre-construction and operation years, with the most significant differences were noticeable in the combined habitat class (Table 3-17). These differences indicate that Brown-headed cowbird abundance in the Spy Hill-Ellice Community Pasture was significantly lower after Project construction than before.

Table 3-17: Post-hoc analysis of brown-headed cowbird abundance in four habitat types during point counts, 2017, 2019, 2021-2023

Comparison	Grassland		Shrubland		Forest		Edge		All Habitats[1]	
	Statistic	p^2	Statistic	p^2	Statistic	p^2	Statistic	p^2	Statistic	p^2
2017 and 2019	2.029	0.043	1.195	0.234	0.714	0.476	0.076	0.940	1.055	0.292
2017 and 2021	0.105	0.917	1.681	0.095	1.330	0.185	1.557	0.121	1.689	0.091
2017 and 2022	0.801	0.424	0.516	0.607	2.580	0.010	2.923	**0.004**	3.594	**0.000**
2017 and 2023	0.872	0.383	0.945	0.346	2.491	0.013	2.236	0.026	3.478	**0.001**
2019 and 2021	2.174	0.030	0.503	0.615	2.040	0.042	1.644	0.101	2.782	**0.005**
2019 and 2022	2.888	**0.004**	1.763	0.080	3.299	**0.001**	3.028	**0.003**	4.735	**<0.001**
2019 and 2023	2.981	**0.003**	2.218	0.028	3.213	**0.001**	2.333	0.020	**4.624**	**<0.001**
2021 and 2022	0.708	0.436	2.262	0.025	1.226	0.221	1.240	0.216	1.901	0.057
2021 and 2023	0.780	0.436	2.722	0.007	1.132	0.259	0.587	0.558	1.775	0.076
2022 and 2023	0.066	0.948	0.437	0.663	0.101	0.920	0.680	0.497	0.138	0.891

1. Includes shrubland habitat.
2. Bold font indicates statistical significance ($\alpha = 0.005$)

4.0 DISCUSSION

There were no significant changes observed in the abundance or distribution of chestnut-collared longspurs or Sprague's pipits observed after Project construction in the Spy Hill-Ellice Community Pasture. 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 abundance and distribution of chestnut-collared longspurs in grassland habitat was unchanged during Project operation. Within 1,000 m of the ROW there was a small decrease in the number of chestnut-collared longspurs observed during Project operation in 2022 and 2023, but this difference was not statistically significant, and the total number of individuals observed was relatively low in all survey years in comparison to other distance categories. There was a statistically significant association between the presence of chestnut-collared longspurs and distance from the ROW and distance to nearest forest in all survey years, including 2017 and 2019 when the ROW did not exist, which suggests the ROW itself was not the actual variable influencing distribution. A maximum of 26% of the variation in chestnut-collared longspur presence was attributable to these factors each survey year, suggesting that these variables did not adequately explain the presence of chestnut-collared longspurs. Other statistical measures (odds ratio estimates) indicated that chestnut-collared longspurs were no more or less likely to be present at various distances to either the ROW or forest habitat.

Additional modeling indicated that other factors, such as grass height, influenced the presence of chestnut-collared longspurs in the Spy Hill-Ellice Community Pasture, which is a known driver of distribution. A grass height of less than 30 cm, with low levels of litter, and minimal woody vegetation cover is preferred by nesting chestnut-collared longspurs (COSEWIC 2019). In this study, chestnut-collared longspurs were most abundant in areas with a grass height of 15-30 cm, which is consistent with the literature and likely one of the main drivers of their distribution in the Spy Hill-Ellice Community Pasture.

Sprague's pipit abundance was variable during the survey, showing a statistically significant decline during the first year of Project operation (2021), and increasing during the second (2022) and third year (2023) of operation to the highest numbers observed during the survey. 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 categories from the ROW and was not limited to sites near the ROW, which suggests that overall populations numbers were lower in 2021, or local habitat conditions, including grass heights, or food availability, were not favourable. 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 except for 2021, when relatively few birds were observed in the community pasture. However,

based on statistical tests, Sprague's pipits were no more or less likely to be present at various distances from the ROW, and the distance to forest habitat had a small, negative effect on presence. A maximum of 23% of the variation in the presence of Sprague's pipits was attributable to the distance to the ROW and the distance to forest habitat, indicating these variables were not sufficient in predicting the presence of Sprague's pipits.

Additional modeling that included vegetation height as a variable, which is a known driver of Sprague's pipit habitat use, did not appear to be a significant factor in 2022/2023. This result was unexpected as grass height is a main driver of distribution and may have been due to a limited range of vegetation heights encountered during the survey and the data being limited to two operation years. Sprague's pipits prefer grass of intermediate height of 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). In this study, Sprague's pipit abundance was lower at sites with vegetation less than 15 cm tall during the survey, which is consistent with the literature and suggests that grass height is one of the main drivers of their distribution in the Spy Hill-Ellice Community Pasture.

For both the chestnut-collared longspur and Sprague's pipit there are likely other factors that influenced their distribution in the Spy Hill-Ellice Community Pasture that were not examined in this study. It has been well documented that in addition to vegetation height, other vegetation characteristics, including grass species and litter density can affect habitat use and distribution (Davis et al. 1999; Madden et al. 2000). Factors that affect grassland habitat, including stocking rates and grazing pressure by cattle, as well as precipitation, can also affect the vegetation and insect populations and the subsequent use by grassland specialist birds, such as chestnut-collared longspurs and Sprague's pipits (Davis et al. 1999; Lehart et al. 2015; Sliwinski and Koper 2015; Gorzo et al. 2016).

In the Spy-Hill Elice Community Pasture rotational grazing is used to mimic natural disturbances and likely creates a mosaic of different grassland habitat types spatially and temporally. The effects of this on grassland bird species, including chestnut-collared longspur and Sprague's pipits during the study are unknown. Additionally, differences in precipitation likely also contributed to grass density, height, and habitat patchiness in the area. Differences in precipitation among study years were noticeable in the area, and likely contributed to habitat use patterns observed during the study (Appendix A).

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 and potentially altering habitat use and distribution. In this study, perching avian predators were observed at sites with and without perch deterrents from 2021-2023. There was no significant difference in the abundance of perched raptors or nest predators at these sites over the combined survey period. However, data were limited as few perching events occurred during the study, (32 over three years) with the majority of these from common ravens, a potential nest predator. 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 were observed at point count sites in all habitat types over the survey period. They were most abundant in forest habitat in 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. As brown-headed cowbird abundance has been shown to increase with increased availability of forest edge habitat, including linear features such as transmission lines (Chace et al. 2005; DeGregorio 2014; Bernath-Plaisted 2017), this suggests that Project operation was not responsible for affecting the local population and was likely a result of other factors. The decline in brown-headed cowbird abundance may have been influenced by other factors including host availability/density, habitat types, vegetation structure, or availability of feeding areas (Lowther 1993; Morrison and Hahn 2002; Chace et al. 2005). 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.

Besides chestnut-collared longspur and Sprague's pipit, other SOCC grassland birds found in the Spy Hill-Ellice Community Pasture included Baird's sparrow, bank swallow, barn swallow, bobolink, Canada warbler, common nighthawk, eastern whip-poor-will, eastern wood-pewee, and olive-sided flycatcher. The lack of suitable habitats in the region most likely limited the abundance and distribution for most SOCC including bank swallow, barn swallow, Canada warbler, eastern whip-poor-will and olive-sided flycatcher. For example, only two cattle stations and one private residence with outbuildings are observed on the community pasture. The lack of human structures limited nesting habitat suitable for barn swallow. Bank swallow colonies are in suitable steep clay banks, and usually near water, or in gravel piles/pits associated with construction. Neither of these features were observed in the pasture.

The Spy Hill-Ellice Community Pasture contained high abundances and wide distributions of grassland bird specialists before and after construction of the Birtle Transmission Project, including grasshopper sparrow, marbled godwit, and western meadowlark among other species. Noteworthy, was the variable, yet generally increasing abundance of Baird's sparrow found in the Spy Hill-Ellice Community Pasture found between 2017 and 2023. The surprisingly highest count of 52 individuals coincided with highest counts of Sprague's pipits in 2023. Baird's sparrows tend to select nesting sites that are more heavily vegetated than the surrounding ground cover. Vegetation height ranges from 10 – 40 cm (15 – 30 cm is optimal) (Michalsky et al. 2019). One nest area was incidentally found on the Birtle Transmission Project ROW while monitoring for perching avian predators. Baird's sparrow is listed under *The Endangered Species and Ecosystems Act* of Manitoba as Endangered.

In summary, no Project-related effects were observed on chestnut-collared longspur, Sprague's pipit, perching avian predators, or brown-headed cowbirds. As a result, no further mitigation measures are recommended and 2023 will be the final year of monitoring.

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APPENDIX A
Tables

Table A-1: Bird species detected during point counts, 2017, 2019, 2021-2023

Species	Scientific Name	SOCC[1]	ESEA[2]	SARA[3]	COSEWIC[4]
Alder Flycatcher	*Empidonax alnorum*	No	Not Listed	Not Listed	Not Listed
American Bittern	*Botaurus lentiginosus*	No	Not Listed	Not Listed	Not Listed
American Coot	*Fulica americana*	No	Not Listed	Not Listed	Not Listed
American Crow	*Corvus brachyrhynchos*	No	Not Listed	Not Listed	Not Listed
American Goldfinch	*Spinus tristis*	No	Not Listed	Not Listed	Not Listed
American Kestrel	*Falco sparverius*	No	Not Listed	Not Listed	Not Listed
American Redstart	*Setophaga ruticilla*	No	Not Listed	Not Listed	Not Listed
American Robin	*Turdus migratorius*	No	Not Listed	Not Listed	Not Listed
Baird's Sparrow	*Ammodramus bairdii*	Yes	Endangered	Special Concern	Special Concern
Bald Eagle	*Haliaeetus leucocephalus*	No	Not Listed	None	Not at Risk
Baltimore Oriole	*Icterus galbula*	No	Not Listed	Not Listed	Not Listed
Bank Swallow	*Riparia riparia*	Yes	Not Listed	Threatened	Threatened
Barn Swallow	*Hirundo rustica*	Yes	Not Listed	Threatened	Threatened
Belted Kingfisher	*Megaceryle alcyon*	No	Not Listed	Not Listed	Not Listed
Black Tern	*Childonias niger*	No	Not Listed	Not Listed	Not Listed
Black-and-white Warbler	*Mniotilta varia*	No	Not Listed	Not Listed	Not Listed
Black-billed Cuckoo	*Coccyzus erythropthalmus*	No	Not Listed	Not Listed	Not Listed
Black-billed Magpie	*Pica hudsonia*	No	Not Listed	Not Listed	Not Listed
Black-capped Chickadee	*Poecile atricapillus*	No	Not Listed	Not Listed	Not Listed
Black-throated Green Warbler	*Setophaga virens*	No	Not Listed	Not Listed	Not Listed
Blue Jay	*Cyanocitta cristata*	No	Not Listed	Not Listed	Not Listed
Blue-winged Teal	*Anas discors*	No	Not Listed	Not Listed	Not Listed
Bobolink	*Dolichonyx oryzivorus*	Yes	Not Listed	Threatened	Special Concern
Brewer's Blackbird	*Euphagus cyanocephalus*	No	Not Listed	Not Listed	Not Listed
Brown Thrasher	*Toxostoma rufum*	No	Not Listed	Not Listed	Not Listed
Brown-headed Cowbird	*Molothrus ater*	No	Not Listed	Not Listed	Not Listed
Canada Goose	*Branta canadensis*	No	Not Listed	Not Listed	Not Listed
Canada Goose	*Branta canadensis*	No	Not Listed	Not Listed	Not Listed
Canada Warbler	*Cardellina canadensis*	Yes	Threatened	Threatened	Threatened
Cedar Waxwing	*Bombycilla cedrorum*	No	Not Listed	Not Listed	Not Listed
Chestnut-collared Longspur	*Calcarius ornatus*	Yes	Endangered	Threatened	Threatened
Chestnut-sided Warbler	*Setophaga pensylvanica*	No	Not Listed	Not Listed	Not Listed

Species	Scientific Name	SOCC[1]	ESEA[2]	SARA[3]	COSEWIC[4]
Chipping Sparrow	*Spizella passerina*	No	Not Listed	Not Listed	Not Listed
Clay-colored Sparrow	*Spizella pallida*	No	Not Listed	Not Listed	Not Listed
Common Grackle	*Quiscalus quiscula*	No	Not Listed	Not Listed	Not Listed
Common Loon	*Gavia immer*	No	Not Listed	Not Listed	Not Listed
Common Nighthawk	*Chordeiles minor*	Yes	Threatened	Threatened	Threatened
Common Raven	*Corvus corax*	No	Not Listed	Not Listed	Not Listed
Common Yellowthroat	*Geothlypis trichas*	No	Not Listed	Not Listed	Not Listed
Connecticut Warbler	*Oporornis agilis*	No	Not Listed	Not Listed	Not Listed
Downy Woodpecker	*Picoides pubescens*	No	Not Listed	Not Listed	Not Listed
Eastern Bluebird	*Sialia sialis*	No	Not Listed	Not Listed	Not Listed
Eastern Kingbird	*Tyrannus tyrannus*	No	Not Listed	Not Listed	Not Listed
Eastern Phoebe	*Sayornis phoebe*	No	Not Listed	Not Listed	Not Listed
Eastern Towhee	*Pipilo erythrophthalmus*	No	Not Listed	Not Listed	Not Listed
Eastern Whip-poor-will	*Antrostomus vociferus*	Yes	Threatened	Threatened	Threatened
Eastern Wood-Pewee	*Contopus virens*	Yes	Not Listed	Special Concern	Special Concern
European Starling	*Sturnus vulgaris*	No	Not Listed	Not Listed	Not Listed
Franklin's Gull	*Leucophaeus pipixcan*	No	Not Listed	Not Listed	Not Listed
Grasshopper Sparrow	*Ammodramus savannarum*	No	Not Listed	Not Listed	Not Listed
Gray Catbird	*Dumetella carolinensis*	No	Not Listed	Not Listed	Not Listed
Great Blue Heron	*Ardea herodias*	No	Not Listed	Not Listed	Not Listed
Great Crested Flycatcher	*Myiarchus crinitus*	No	Not Listed	Not Listed	Not Listed
Greater Snow Goose	*Chen caerulescens*	No	Not listed	Not listed	Not listed
Green-winged Teal	*Anas crecca*	No	Not listed	Not listed	Not listed
Hairy Woodpecker	*Picoides villosus*	No	Not Listed	Not Listed	Not Listed
Hermit Thrush	*Catharus guttatus*	No	Not Listed	Not Listed	Not Listed
Horned Lark	*Eremophila alpestris*	No	Not Listed	Not Listed	Not Listed
House Sparrow	*Passer domesticus*	No	Not listed	Not listed	Not listed
House Wren	*Troglodytes aedon*	No	Not Listed	Not Listed	Not Listed
Indigo Bunting	*Passerina cyanea*	No	Not Listed	Not Listed	Not Listed
Killdeer	*Charadrius vociferus*	No	Not Listed	Not Listed	Not Listed
Lark Sparrow	*Chondestes grammacus*	No	Not Listed	Not Listed	Not Listed
Least Flycatcher	*Empidonax minimus*	No	Not Listed	Not Listed	Not Listed
LeConte's Sparrow	*Ammodramus leconteii*	No	Not listed	Not listed	Not listed
Lincoln's Sparrow	*Melospiza lincolnii*	No	Not listed	Not listed	Not listed
Magnolia Warbler	*Setophaga magnolia*	No	Not Listed	Not Listed	Not Listed
Mallard	*Anas platyrhynchos*	No	Not Listed	Not Listed	Not Listed
Marbled Godwit	*Limosa fedoa*	No	Not Listed	Not Listed	Not Listed
Marsh Wren	*Cistothorus palustris*	No	Not Listed	Not Listed	Not Listed

Species	Scientific Name	SOCC[1]	ESEA[2]	SARA[3]	COSEWIC[4]
Merlin	*Falco columbarius*	No	Not Listed	Not Listed	Not Listed
Mountain Bluebird	*Sialia currucoides*	No	Not Listed	Not Listed	Not Listed
Mourning Dove	*Zenaida macroura*	No	Not Listed	Not Listed	Not Listed
Mourning Warbler	*Geothlypis philadelphia*	No	Not Listed	Not Listed	Not Listed
Myrtle warbler	*Setophaga coronata*	No	Not listed	Not listed	Not listed
Nashville Warbler	*Leiothylpis ruficapilla*	No	Not Listed	Not Listed	Not Listed
Nelson's Sparrow	*Ammodramus nelsoni*	No	Not Listed	Not Listed	Not Listed
Northern Flicker	*Colaptes auratus*	No	Not Listed	Not Listed	Not Listed
Northern Harrier	*Circus hudsonius*	No	Not Listed	Not Listed	Not Listed
Northern Pintail	*Anas acuta*	No	Not listed	Not listed	Not listed
Northern Waterthrush	*Parkesia noveboracensis*	No	Not Listed	Not Listed	Not Listed
Olive-sided Flycatcher	*Contopus cooperi*	Yes	Threatened	Threatened	Threatened
Orange-crowned Warbler	*Leiothylpis celata*	No	Not Listed	Not Listed	Not Listed
Orchard Oriole	*Icterus spurius*	No	Not Listed	Not Listed	Not Listed
Ovenbird	*Seiurus aurocapilla*	No	Not Listed	Not Listed	Not Listed
Philadelphia Vireo	*Vireo philadelphicus*	No	Not Listed	Not Listed	Not Listed
Pied-billed Grebe	*Podilymbus podiceps*	No	Not Listed	Not Listed	Not Listed
Pileated Woodpecker	*Dryocopus pileatus*	No	Not Listed	Not Listed	Not Listed
Purple Finch	*Haemorhous purpureus*	No	Not Listed	Not Listed	Not Listed
Purple Martin	*Progne subis*	No	Not Listed	Not Listed	Not Listed
Red-breasted Nuthatch	*Sitta canadensis*	No	Not Listed	Not Listed	Not Listed
Red-eyed Vireo	*Vireo olivaceus*	No	Not Listed	Not Listed	Not Listed
Red-eyed Vireo	*Vireo olivaceus*	No	Not Listed	Not Listed	Not Listed
Red-necked Grebe	*Podiceps grisegena*	No	Not Listed	Not Listed	Not Listed
Red-tailed Hawk	*Buteo jamaicensis*	No	Not Listed	Not Listed	Not Listed
Red-winged Blackbird	*Agelaius phoeniceus*	No	Not Listed	Not Listed	Not Listed
Ring-billed Gull	*Larus delawarensis*	No	Not Listed	Not Listed	Not Listed
Rock Pigeon	*Columbia livia*	No	Not Listed	Not Listed	Not Listed
Rose-breasted Grosbeak	*Pheucticus ludovicianus*	No	Not Listed	Not Listed	Not Listed
Ruby-throated Hummingbird	*Archilochus colubris*	No	Not Listed	Not Listed	Not Listed
Ruffed Grouse	*Bonasa umbellus*	No	Not Listed	Not Listed	Not Listed
Sandhill Crane	*Grus canadensis*	No	Not Listed	Not Listed	Not Listed
Savannah Sparrow	*Passerculus sandwichensis*	No	Not Listed	Not Listed	Not Listed
Say's Phoebe	*Sayornis saya*	No	Not listed	Not listed	Not listed
Scarlet Tanager	*Piranga olivacea*	No	Not Listed	Not Listed	Not Listed
Sedge Wren	*Cistothorus platensis*	No	Not Listed	Not Listed	Not Listed
Sharp-shinned Hawk	*Accipiter striatus*	No	Not Listed	Not Listed	Not Listed

Species	Scientific Name	SOCC[1]	ESEA[2]	SARA[3]	COSEWIC[4]
Sharp-tailed Grouse	*Tympanuchus phasianellus*	No	Not Listed	Not Listed	Not Listed
Song Sparrow	*Melospiza melodia*	No	Not Listed	Not Listed	Not Listed
Sora	*Porzana carolina*	No	Not Listed	Not Listed	Not Listed
Spotted Sandpiper	*Actitis macularius*	No	Not Listed	Not Listed	Not Listed
Spotted Towhee	*Pipilo maculatus*	No	Not Listed	Not Listed	Not Listed
Sprague's Pipit	*Anthus spragueii*	Yes	Threatened	Threatened	Threatened
Swainson's Thrush	*Catharus ustulatus*	No	Not Listed	Not Listed	Not Listed
Swamp Sparrow	*Melospiza georgiana*	No	Not Listed	Not Listed	Not Listed
Tennessee Warbler	*Oreothlypis peregrina*	No	Not Listed	Not Listed	Not Listed
Tree Swallow	*Tachycineta bicolor*	No	Not Listed	Not Listed	Not Listed
Turkey Vulture	*Cathartes aura*	No	Not Listed	Not Listed	Not Listed
Upland Sandpiper	*Bartramia longicauda*	No	Not Listed	Not Listed	Not Listed
Veery	*Catharus fuscescens*	No	Not Listed	Not Listed	Not Listed
Vesper Sparrow	*Pooecetes gramineus*	No	Not Listed	Not Listed	Not Listed
Warbling Vireo	*Vireo gilvus*	No	Not Listed	Not Listed	Not Listed
Western Kingbird	*Tyrannus verticalis*	No	Not Listed	Not Listed	Not Listed
Western Meadowlark	*Sturnella neglecta*	No	Not Listed	Not Listed	Not Listed
Western Wood-pewee	*Contopus sordidulus*	No	Not Listed	Not Listed	Not Listed
White-breasted Nuthatch	*Sitta carolinensis*	No	Not Listed	Not Listed	Not Listed
White-throated Sparrow	*Zonotrichia albicollis*	No	Not Listed	Not Listed	Not Listed
Willet	*Tringa semipalmata*	No	Not Listed	Not Listed	Not Listed
Wilson's Snipe	*Gallinago delicata*	No	Not Listed	Not Listed	Not Listed
Yellow Warbler	*Setophaga petechia*	No	Not Listed	Not Listed	Not Listed
Yellow-bellied Flycatcher	*Empidonax flaviventris*	No	Not listed	Not listed	Not listed
Yellow-bellied Sapsucker	*Sphyrapicus varius*	No	Not Listed	Not Listed	Not Listed
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*	No	Not Listed	Not Listed	Not Listed
Yellow-shafted Flicker	*Colaptes auratus*	No	Not Listed	Not Listed	Not Listed
Yellow-throated Vireo	*Vireo flavifrons*	No	Not Listed	Not Listed	Not Listed

1. Species of conservation concern
2. Species listing under Manitoba's Endangered Species and Ecosystems Act
3. Species listing under the federal Species at Risk Act
4. Species listing by the Committee on the Status of Endangered Wildlife in Canada

Table A-2: Total precipitation (mm) at Shoal Lake, Manitoba from April-June, 2017-2023

Year	Total Precipitation (mm)
2023	119
2022	200
2021	122
2020	196
2019	90
2018	113
2017	109

Available in accessible formats upon request