

Wildlife Research Permit Summary Report

Wildlife Research Permit Number: WL500701

Title: Winter Road Long-term Landbird Monitoring Program

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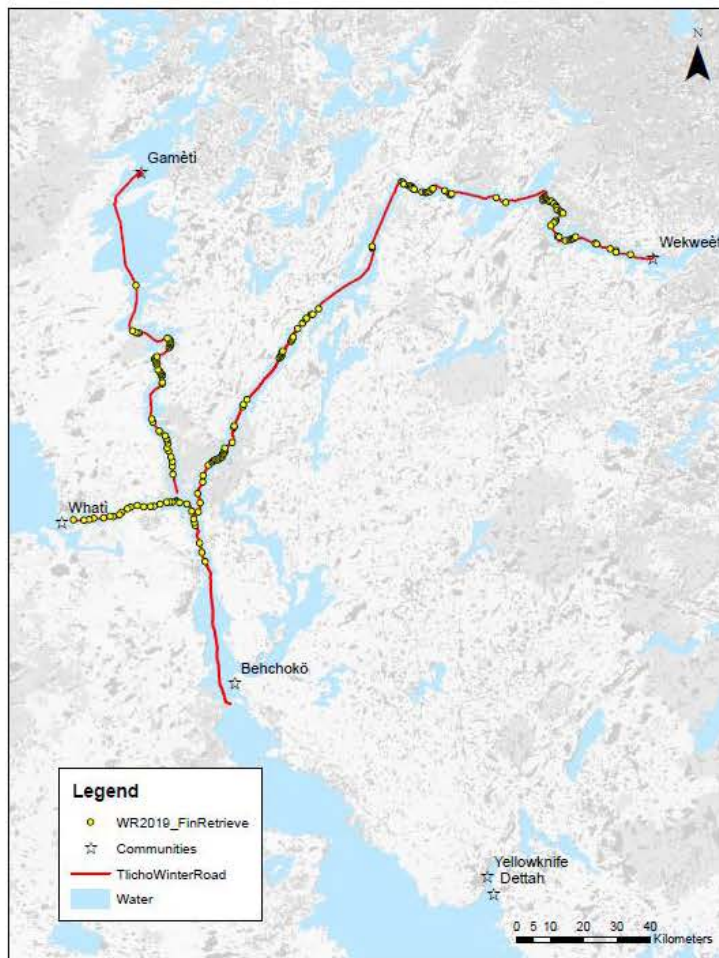


Figure 1. Location of 170 ARU deployments (yellow) along Tlicho Winter Road.

LOCATION

Autonomous Recording Units (ARUs) were deployed along the Tlicho winter road in early 2019 (Figure 1).

SPECIES

Landbirds (e.g. vultures, hawks, grouse, doves, cuckoos, owls, nighthawks, swifts, hummingbirds, kingfishers, woodpeckers and passerines).

OBJECTIVES

Short-term:

- 1) Document habitat-specific species composition and abundance in the northern boreal portion of NWT.
- 2) Provide information to help update the northern limit of the breeding range for most landbirds.
- 3) Increase geographic coverage of the landbird monitoring program to support national habitat modelling initiatives.

Long-term:

- 1) Monitor the population status of landbirds in the boreal portion of NWT by estimating population trends and quantifying effects threats (e.g. Climate change, anthropogenic disturbance, etc.) that birds are facing at breeding, wintering, and migratory sites.

SYNOPSIS

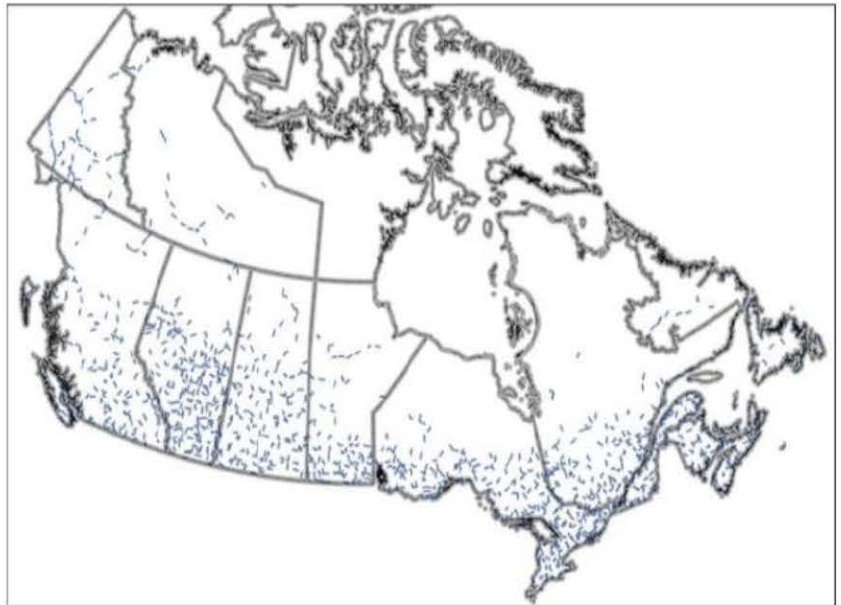
A total of 170 ARUs were successfully deployed along the Tlicho winter road in March 2019 (Figure 2). In March 2020, 169 units were successfully retrieved, of which 165 recorded data.

INTRODUCTION

Environment and Climate Change Canada (ECCC) has an obligation under the Migratory Birds Act, 1994 (MBCA) to monitor and conserve migratory bird populations. Currently, monitoring of migratory bird populations nesting in the boreal portion of the Northwest Territories is inadequate to determine the status of these species, which also include some Species at Risk (e.g. Olive-sided Flycatcher) for which ECCC also has an obligation to protect under the Species at Risk Act, 2002. Information required for species status assessments includes species distribution, habitat association, population size, and trends.

The Breeding Bird Survey (BBS) is the primary long-term bird-monitoring program used for generating population trends in North America (<https://www.canada.ca/en/environment-climate-change/services/bird-surveys/landbird/north-american-breeding/overview.html>). As a road-based survey, it covers only a small portion of the Northwest Territories (Figure 2) due to limited access. Alternatively, projects in remote areas are often very expensive due to the cost of accessing sites via helicopter or plane. These constraints explain why migratory birds breeding in the Northwest Territories are not well monitored and population trends remain largely unknown.

BBS surveys are conducted using avian point counts, in which the majority of birds detected are identified by sound. Typically, point count surveys are a laborious process involving highly trained individuals conducting surveys during the early mornings of the breeding season (mainly in June). These requirements limit staffing opportunities, survey dates, and times. By using Automated Recording Units (ARUs; Figure 3), many of the challenges associated with



traditional avian point count surveys can be avoided. These devices can be programmed to record at specific dates and times, making them particularly useful to monitor bird populations. Devices can be deployed by individuals, regardless of bird identification experience and at any time of day or year. Because the majority of birds can be identified to species by their song (Figure 3), surveys can be conducted without actually observing individual birds.

There are four main winter roads in the Northwest Territories: 1) Wrigley to Deline/Colville Lake (940 km; hereafter “Mackenzie Valley Winter Road”); 2) Behchokò to



Figure 3. Picture of an ARU deployed along the Tlìchò winter road during March 2020.

Gamètì/Wekweètì/Whatì (361 km; hereafter “Tlìchò Winter Road”); 3) Tibbitt to Contwoyto (375 km; hereafter “Tibbitt Winter Road”); and Mackenzie Highway to Trout Lake (126 km; hereafter “Sambaa K’e Winter Road”). This network of winter roads goes through the northern portion of the Bird Conservation Region (BCR) 6, northwestern portion of BCR 7, and a wide range of level III ecoregions (Ecosystem Classification Group 2007; Figure 4). These roads almost double the road access in the territory and considerably increase the latitudinal coverage in the NT.

In 2015, ECCC initiated a pilot program along the Tibbitt Winter Road to test the feasibility of a winter-based ARU program. Since 2016, ECCC deployed units along the

Mackenzie Valley Winter Road, the Sambaa K’e Winter Road, the Tibbitt Winter Road, and the Tlìchò Winter Road. Additionally, ARUs were deployed by the Kátł’odeeche First Nation on snowmobile trails in their territory. In this report, we provide the preliminary results from data collected between 2015 and 2018. Recordings from the Tlìchò Winter Road data and Kátł’odeeche First Nation from the 2019 breeding season are currently being transcribed.

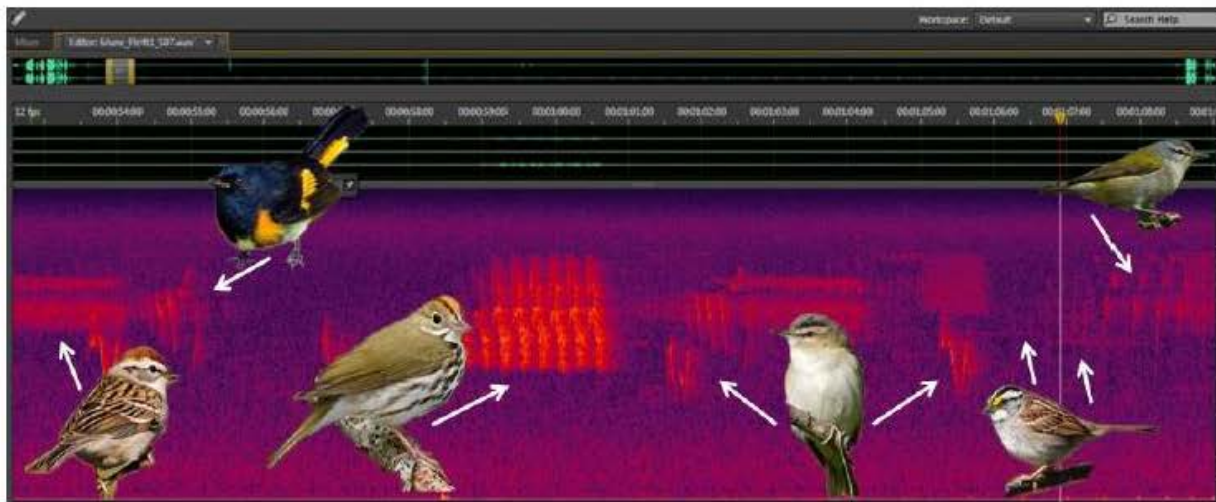


Figure 3. An example of a spectrogram (a visualization of sound). Within this recording, there are 6 different species: Chipping Sparrow, American Redstart, Ovenbird, Red-eyed Vireo, White-throated Sparrow, and Tennessee Warbler (left to right).

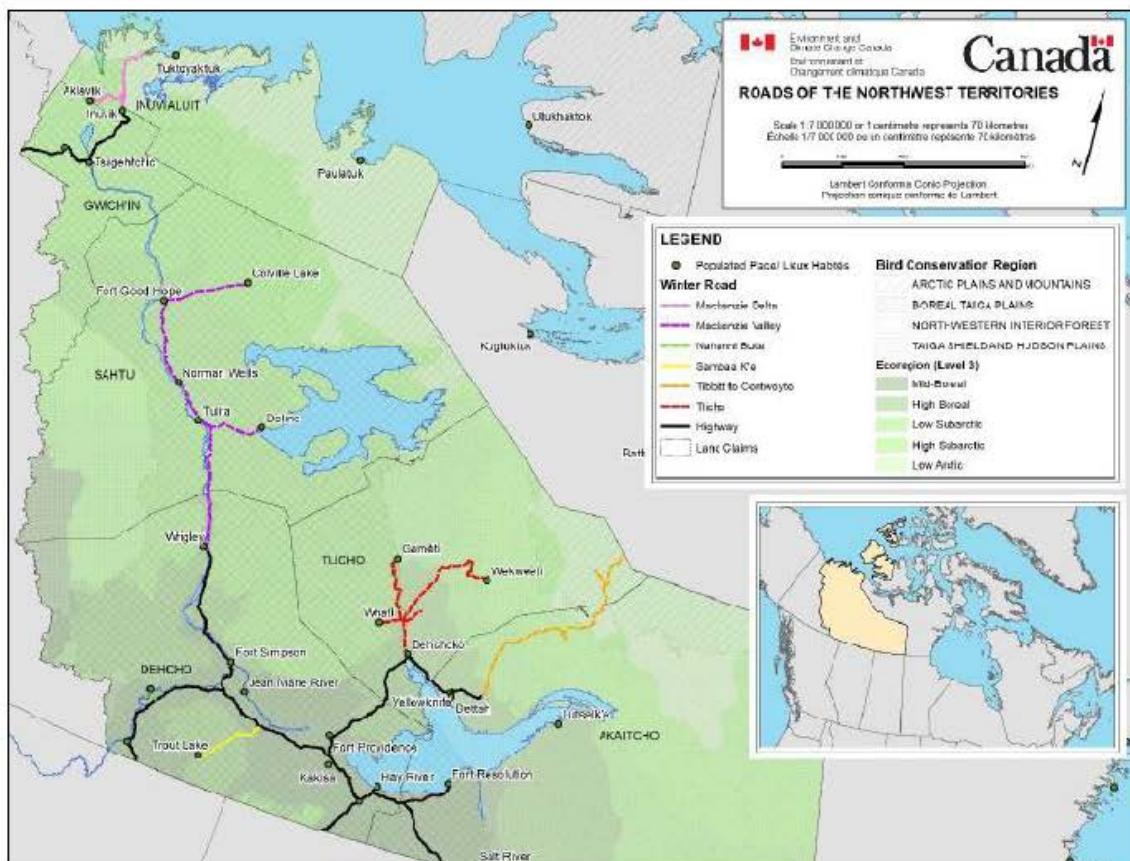


Figure 4. Location of the winter roads located in the Northwest Territories. Also indicated are the Bird Conservation Regions and the Ecoregions of the Northwest Territories.

METHODS

From 2015 to 2019, ECCC deployed ARUs along all 4 main winter roads in the Northwest Territories. Specifically, in March 2015, we deployed 10 units along the Tibbitt Winter Road and the following March (2016) we retrieved 9 of the 10 deployed units and deployed another 99 units. In March 2017, we retrieved 95 of 99 units, and all retrieved units recorded data.

The same winter following the Tibbitt retrieval, we deployed 164 units along the Mackenzie Valley Winter Road. The following February (2018), we retrieved all deployed units however; only 161 recorded data, as three units malfunctioned.

Following the Mackenzie Valley Winter Road retrieval in March 2018, we successfully deployed 175 units along the Sambaa K'e Winter Road with the assistance of community partners. In the fall of 2018, prior to the opening of the winter road, the community, led by Jessica Jumbo, successfully retrieved 173 of these 175 ARUs, all except one recorded data.

In March 2019, we deployed 170 ARUs along the Tł̨chq Winter Road (Figure 5). We successfully retrieved 169 units in February and March 2020 of which 165 recorded data. Additionally, 10 ARUs were deployed by members of K'atl'odeeche First Nation led by Patrick Riley near the NT-AB border along snowmobile trails. 7 of these units were retrieved. KFN deployed an additional 22 units along snowmobile trails and another 47 units under the Boreal Monitoring strategy framework elsewhere in their territory.



Figure 5. Field crews from the 2019 (left) and 2020 (right) field seasons along the Tł̨chq Winter Road.

The sampling design used for each winter road was spatially balanced (Generalized Random Tessellation Stratified sampling design or GRTS). ARUs were programed to “sleep” until April when they would “wake-up” and record every day until September. Each day, a unit would record the soundscape (including all biotic and abiotic sounds) of its surrounding environment for approximately 100 minutes per day (i.e. 10×10 -min recordings at predetermined times each day).

A selection of recordings from all stations along each winter road were interpreted by individuals trained in bird identification using computer software to visualize the bird songs (Figure 3). In addition, automated recognizer algorithms (hereafter “recognizers”) were used to detect the presence of Species at Risk (SAR; i.e. Canada Warbler [*Cardellina canadensis*], Common Nighthawk [*Chordeiles minor*], Olive-sided Flycatcher [*Contopus cooperi*], Rusty Blackbird [*Euphagus carolinus*], and Yellow Rail [*Coturnicops noveboracensis*]) or other species of interest over large amounts of recording data.



Figure 6. Top left: Swainson's Thrush (Credit: T. Zahner, Macaulay Library); top right: Varied Thrush (N. Voaden, Macaulay Library); bottom left: Harris's Sparrow (Jim Robinson); bottom right: Willow Ptarmigan (M. Burrell, Macaulay Library).

For March 2021, we are planning to deploy 150 units at new and existing sampling locations along the Tibbitt to Contwoyto winter road in collaboration with Yellowknife Dene First Nation and the North Slave Metis Alliance.

RESULTS

We have detected 66 species on the Tibbitt Winter Road, 95 species

on the Mackenzie Valley Winter Road, and 84 on the Samba K'e Winter Road. There was **considerable species overlap across roads (i.e. 50% of species are in the top 20 on all roads), but** they differed substantially in abundance (Table 1). For example, the most abundant species on the Mackenzie Valley Winter Road, the Swainson's Thrush (*Catharus ustulatus*; Figure 6), which was **detected at 83% of the sampling locations, is the 10th and 11th most common bird on the Samba K'e (40% of stations) and Tibbitt Winter Roads (30% of stations), respectively. The Varied Thrush** (*Ixoreus naevius*) only occurred along the Mackenzie Valley Winter Road, while the Willow Ptarmigan (*Lagopus lagopus*) was only detected on the Tibbitt Winter Road. The Harris's Sparrow (*Zonotrichia querula*), a Species at Risk in Canada (designation: “Special Concern”) was the most abundant species on the Tibbitt winter road, was only detected once on the Mackenzie Valley Winter Road and was not detected on the Samba K'e Winter Road (Table 1).

Data collected through the winter road program has increased the known distribution of SAR in the Northwest Territories. For example, the distribution of Common Nighthawk (*Chordeiles minor*) increased by 30,214 km² (Figure 7).

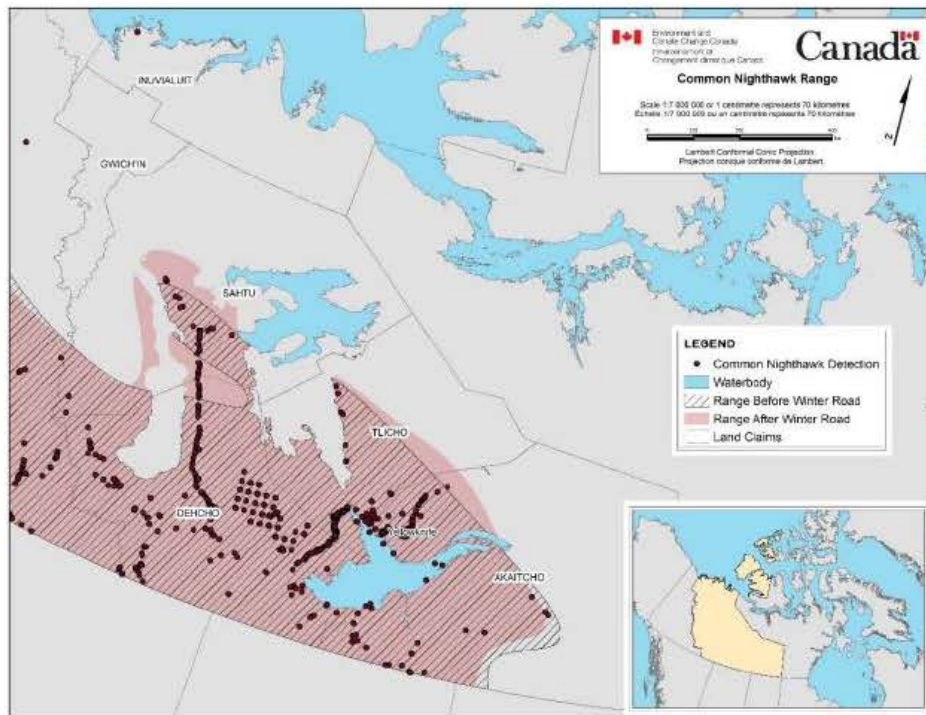


Figure 7. Existing distribution of the Common Nighthawk in the Northwest Territories and Yukon. Hatched area is predicted range prior to the addition of the winter road data and the red area is after the inclusion of this data.

Non-avian Detections

At least seven non-avian species were detected on recordings including: two species of frog (Boreal Chorus Frog; *Pseudacris maculata* and Wood Frog; *Lithobates sylvaticus*), American Beaver (*Castor Canadensis*), domestic dog (*Canis lupus familiaris*), Red Squirrel (*Tamiasciurus hudsonicus*), Gray Wolf (*Canis lupus*) and at

least one species of undetermined mammal. Red Squirrels were the most detected non-avian species on recordings, occurring on up to 22% of stations on the Mackenzie Valley, 7% on the Sambaa K'e, and 3% on the Tibbitt Winter Roads. Boreal Chorus Frogs occurred on all winter roads, but were most abundant on the Sambaa K'e Winter Road (10%) followed by Mackenzie Valley (6%) and the Tibbitt Winter Roads (1%). Beaver, Wolf, and Wood Frog were only detected on the Sambaa K'e Winter Road and domestic dog was only detected on the Mackenzie Valley Winter Road. The undetermined mammal species were detected on both the Sambaa K'e and Mackenzie Valley Winter Roads.

Table 1. Total number of individuals detected and number of sampling stations with at least one detection for the 20 most common species on all winter roads. Of note is that the species monitored along one road are not necessarily monitored on the other, and that species detections differ across these projects. The top 5 (see rank) most abundant species from each road are highlighted in grey.

Species	2015 and 2016 Tibbitt Winter Road			2017 Mackenzie Valley Winter Road			2018 Samba K'e Winter Road		
	Rank	Stations Detected	# Detected	Rank	Stations Detected	# Detected	Rank	Stations Detected	# Detected
Alder Flycatcher	24	11%	18	9	46%	209	7	39%	125
American Robin	5	55%	104	7	74%	245	9	46%	104
American Tree Sparrow	3	56%	167	28	12%	38	91	0%	0
Blackpoll Warbler	8	40%	69	15	27%	121	26	7%	17
Canada Jay	37	4%	4	22	25%	47	13	37%	73
Chipping Sparrow	6	44%	80	6	67%	282	2	84%	294
Common Loon	19	19%	28	50	5%	9	27	8%	17
Common Yellowthroat	68	0%	0	44	8%	15	16	11%	39
Dark-eyed Junco	14	32%	50	11	58%	181	8	43%	112
Fox Sparrow	20	18%	28	13	39%	146	41	4%	7
Gray-cheeked Thrush	4	50%	114	16	22%	120	37	3%	9
Greater Yellowlegs	69	0%	0	68	1%	3	19	17%	32
Harris's Sparrow	1	64%	199	92	1%	1	92	0%	0
Hermit Thrush	10	29%	63	5	69%	365	3	79%	268
LeConte's Sparrow	70	0%	0	101	0%	0	18	10%	33
Lincoln Sparrow	9	43%	68	3	73%	412	1	72%	323
Magnolia Warbler	63	1%	1	19	16%	56	45	3%	6
Northern Waterthrush	18	20%	29	18	19%	58	42	3%	7
Orange-crowned Warbler	16	26%	43	12	29%	156	20	14%	32
Palm Warbler	12	34%	57	20	16%	49	11	31%	88
Ruby-crowned Kinglet	23	17%	22	14	45%	132	14	23%	47
Sandhill Crane	46	3%	3	31	13%	30	17	17%	34
Savannah Sparrow	7	32%	77	30	9%	33	53	2%	4
Swamp Sparrow	35	4%	5	25	16%	44	15	19%	45
Swainson's Thrush	11	30%	62	1	83%	617	10	40%	98
Tennessee Warbler	17	17%	30	2	58%	482	4	57%	194
White-crowned Sparrow	2	74%	182	8	43%	243	28	7%	17
Wilson's Snipe	25	11%	14	17	33%	109	12	32%	74
White-throated Sparrow	30	5%	7	4	66%	390	5	61%	192
Yellow Warbler	15	26%	44	21	16%	49	56	2%	4
Yellow-rumped Warbler	13	34%	52	10	60%	186	6	58%	162

DISCUSSION

The Winter Road Long-term Monitoring Program has considerably increased the coverage of boreal bird monitoring in the Northwest Territories. Data available from previously unmonitored regions is providing new insights into bird distributions and habitat associations. This program has also allowed ECCC to create new partnerships and has expanded collaboration between ECCC and local communities. ECCC plans to expand the program into other regions of the Northwest Territories and to continue to build meaningful partnerships that foster an increasing role of local community members in program logistics, data collection, and management.

The data collected through this program is already expanding our knowledge of birds in the NT, as demonstrated by the improved range delineation for Common Nighthawk and other SAR. Ultimately, the goal of this monitoring program is to collect data required to assess whether population sizes and distribution are changing in response to climate change and other threats that birds are facing on the breeding grounds (e.g. natural disturbance such as wildfires or insect outbreaks) or elsewhere (e.g. habitat loss at migratory stopover sites and on the wintering grounds).

Any data collected as part of the winter road program are also being integrated within other research projects. For example, the data has been incorporated within a larger dataset that is currently being analyzed to evaluate the conservation potential of woodland caribou management plans to maintain bird diversity in the Northwest Territories, i.e. multi-species management planning. Additionally, since ARUs collect a significant amount of data over long periods, these data can be used to answer questions about timing of arrival from migration and species activity levels both during the day, or across an entire season. Though our focus has been on birds, data collected by ARUs can also be used for other species, such as mammals. Even though we had few detections for most other taxa, targeted listening protocols (i.e. during the spring for frogs) or species-specific recognizers, would be an efficient way to gather such data.

The variation in species distribution and abundance between winter roads can be explained by the different ecoregions and corresponding differences in habitat types. For example, the Mackenzie Valley Winter Road covers primarily mid-boreal and low subarctic ecoregions, which is why both Magnolia Warbler (*Setophaga magnolia*), a species that prefers deciduous forests typical in the mid-boreal ecoregion, and Gray-cheeked Thrush (*Catharus minimus*), a species that prefers shrubby scattered treed habitats typical in the low subarctic ecoregion, are both found along this road. Moreover, the Tibbitt Winter Road is the only road that extends into the high subarctic and low arctic ecoregions, which explains why Willow Ptarmigan, a species that breeds on the tundra,

was only detected there. The Sambaa K'e Winter Road is almost exclusively high boreal, which explains the relatively high abundance of White-throated Sparrow (*Zonotrichia albicollis*) and low abundance of White-crowned Sparrow (*Zonotrichia leucophrys*), a species that prefers low-subarctic habitats (Figure 4).

Acknowledgements

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References

Ecosystem Classification Group. 2007 (rev. 2009). Ecological Regions of the Northwest Territories – Taiga Plains. Department of Environment and Natural Resources, Government of the Northwest Territories, Yellowknife, NT, Canada. viii + 173 pp. + folded insert map.