

Alberta Northwest Species at Risk: Acoustic Monitoring Summary 2020-2023

Autonomous Recording Unit (ARU) Pilot

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Abstract

This report presents findings from a four-year acoustic monitoring pilot (2020–2023) conducted in Alberta's Chinchaga and Caribou Mountains caribou ranges. Using Autonomous Recording Units (ARUs), researchers detected 104 bird species across 20 sites, including species listed under Canada's Species at Risk Act and Alberta's provincial conservation rankings. Notably, 32 species were detected in all four years, including generalist species such as Chipping Sparrow, Dark-eyed Junco, Hermit Thrush, Swainson's Thrush, Tennessee Warbler, and Yellow-rumped Warbler. Three provincially Sensitive species—Cape May Warbler, Common Yellowthroat, and Sora—were also detected consistently across all years. In contrast, 31 species were detected at only one site, and several federally listed species (e.g., Bank Swallow, Canada Warbler, Rusty Blackbird, Common Nighthawk, Western Grebe) were detected infrequently. The study demonstrates the effectiveness of ARUs in capturing spatial and temporal patterns in bird communities and supports their use as a scalable, cost-efficient tool for biodiversity monitoring in species-at-risk landscapes.

Background and Methods

Birds are one of the most prominent forms of wildlife in Alberta. Birds are a well studied taxonomic group making them easier to create models to predict impacts to populations due to different land use and stressors on the environment. Birds are also shown to respond both positively and negatively to human disturbances such as forestry, agriculture and industry development. Additionally they are also sensitive to pollutants, industrial noise and climate change (ABMI, 2020).

Autonomous recording units (ARUs) are used to monitor a wide range of vocalizing species such as birds, bats and amphibians. The units are deployed on a tree and programmed to record ambient sounds at set times over long durations of time. ARUs have been studied extensively to see how they compare to point counts and a study conducted by Darras et al. (2019) showed that ARUs allow for better spatial coverage and can be more scalable and reliable in larger scale studies. ARUs are often more cost effective than using human observations alone.

ARUs were deployed as part of the existing study that started in 2019 for four years from 2020 to 2023. This existing study was designed to document mammal communities (through the use of remote cameras) and ARUs to monitor the acoustic community of birds. Up to twenty ARUs (or stations) per year were deployed across



five grids in two caribou ranges - Chinchaga and Caribou Mountains. Sites were positioned across a range of latitudes and habitats (Figure 1). Birds were identified by expert listeners from the memory cards collected from the ARUs. The recordings span from early April to mid July in each year, and are a mix of recordings collected at midnight for nocturnal species and recordings collected during dawn chorus between 3:00 am and 7:00 am for diurnal species. Due to differences in the number of stations and recording effort per station between years, results are reported as percent of sites with detections per species as opposed to number of detections, as in previous years. The Northern Chinchaga grid (RBW) was not refreshed after 2021, so there is no data from that grid for most of the project.

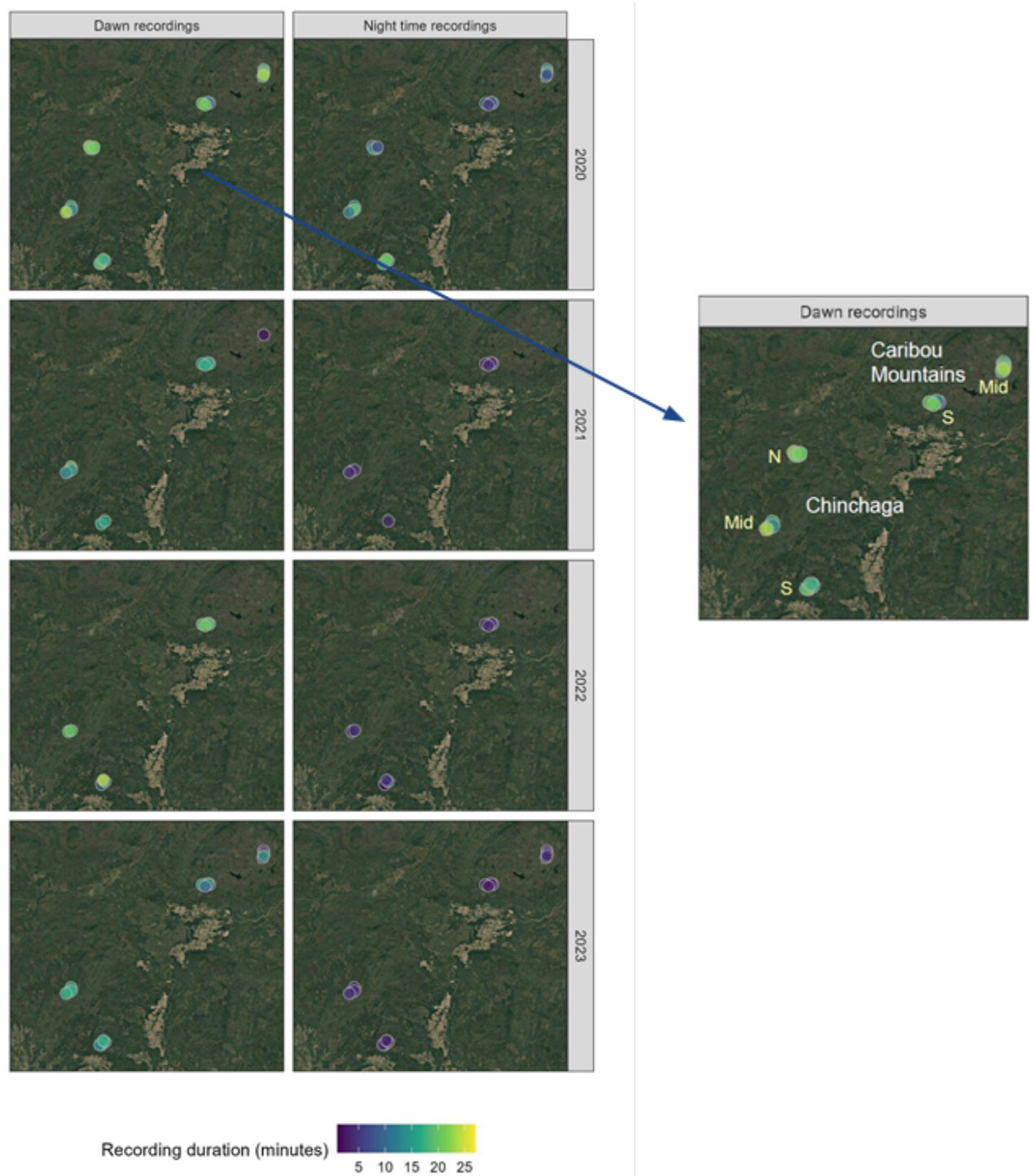


Figure 1. Location and sampling effort of ARUs deployed to monitor acoustic bird species in 2020 through 2023 in two Caribou Ranges: Chinchaga and Caribou Mountains.



Results

One hundred and four bird species were detected across the 20 sites between 2020 and 2023, with 89 of those species detected in 2020, 50 detected in 2021, 50 detected in 2022, and 72 detected in 2023 (Table 1). Under Canada's *Species at Risk Act (SARA)*, four of the detected species are listed as Special Concern on Schedule 2 and two are listed as Threatened under Schedule 1. Alberta's Endangered Species Conservation Committee considers 18 of the species detected as Sensitive, one At Risk, and one May be At Risk.

There were substantially fewer species detected in 2021 and 2022 than 2020 and 2023, and species that were in 2021, likely a result of the differences in number of sites sampled and total recording durations between years (Figure 1).

The most common species detected across years were Chipping Sparrow, Dark-eyed Junco, Hermit Thrush, Swainson's Thrush, Tennessee Warbler, and Yellow-rumped Warbler. These species are relatively generalist species that typically occupy upland deciduous forests of early to mid seral stage. Thirty one of the 104 detected species were only detected at one site across years, while 32 of the species were detected in all four years, including the most common species listed above. Nine of the Sensitive species, the At Risk, and May be At Risk species were all detected in only one year, while the other nine Sensitive species were detected in more than one year, with three Sensitive species detected in all four years (Cape May Warbler, Common Yellowthroat, Sora).



Table 1. The federal and provincial (as of 2020) status of acoustic species detected by ARUs and the percent of sites that each species was detected at in each year and the total number of years each species was detected across 2020 to 2023. Location detected indicates which grid species were detected within the Chinchaga or Caribou Mountains ranges.

Common name	% of Sites				Number of years detected	Federal Status	Provincial Status	Location Detected
	2020	2021	2022	2023				
Alder Flycatcher	40	9	11	44	4		Secure	All
American Bittern	10	0	0	0	1		Sensitive	Chinchaga (N), Caribou Mountains (Mid)
American Coot	5	9	0	12	3		Secure	Chinchaga (S), Caribou Mountains (All)
American Redstart	0	0	0	6	1		Secure	Caribou Mountains (
American Robin	30	9	0	19	3		Secure	All
American Widgeon	15	0	0	12	2		Secure	Caribou Mountains (All)
American Three-toed Woodpecker	0	9	0	0	1		Secure	Chinchaga (S)
Bald Eagle	5	0	0	0	1		Sensitive	Caribou Mountains (



Common name	% of Sites				Number of years detected	Federal Status	Provincial Status	Location Detected
	2020	2021	2022	2023				
Bank Swallow	0	0	0	6	1	Threatened	Sensitive	Caribou Mountains (S)
Black-and-white Warbler	10	0	11	6	3		Secure	Chinchaga (N), Caribou Mountains (Mid)
Bay-breasted Warbler	0	0	11	6	2		Sensitive	Caribou Mountains (Mid)
Black-backed Woodpecker	10	0	0	0	1		Sensitive	Chinchaga (S)
Black-capped Chickadee	5	9	22	6	4		Secure	Chinchaga (S), Caribou Mountains (Mid)
Blue-headed Vireo	5	9	11	0	3		Secure	Chinchaga (N, Mid), Caribou Mountains (Mid)
Blackpoll Warbler	5	9	11	12	4		Secure	Chinchaga (Mid), Caribou Mountains (S)
Black Tern	5	0	0	0	1		Sensitive	Chinchaga (Mid)
Boreal Chickadee	5	18	22	25	4		Secure	Chinchaga (N, Mid), Caribou Mountains (Mid)
Bonaparte's Gull	15	0	0	0	1		Secure	Chinchaga (N), Caribou Mountains (S)
Boreal Owl	5	18	0	12	3		Secure	Chinchaga (N, Mid), Caribou Mountains (Mid)
Brown Creeper	0	9	0	0	1		Sensitive	Chinchaga (S)
Blue-winged Teal	15	0	0	0	1		Secure	Chinchaga (N, Mid), Caribou Mountains (Mid)
Canada Jay	45	27	89	56	4		Secure	All
Canada Goose	10	0	0	6	2		Secure	Chinchaga (N, S)



Common name	% of Sites				Number of years detected	Federal Status	Provincial Status	Location Detected
	2020	2021	2022	2023				
<i>Canada Warbler</i>	0	0	11	0	1	Threatened	May Be at Risk	Caribou Mountains (Mid)
<i>Clay-colored Sparrow</i>	15	9	0	19	3		Secure	Chinchaga (N, Mid), Caribou Mountains (S)
<i>Cedar Waxwing</i>	5	0	0	0	1		Secure	Chinchaga (N)
<i>Chipping Sparrow</i>	65	45	78	62	4		Secure	All
<i>Cape May Warbler</i>	5	9	11	6	4		Sensitive	Chinchaga (N), Caribou Mountains (Mid)
<i>Common Grackle</i>	0	0	0	6	1		Secure	Caribou Mountains (Mid)
<i>Common Loon</i>	20	0	0	6	2		Secure	Chinchaga (N), Caribou Mountains (All)
<i>Common Nighthawk</i>	10	18	0	19	3	Special Concern	Sensitive	Chinchaga (S), Caribou Mountains (All)
<i>Common Raven</i>	10	9	11	25	4		Secure	Chinchaga (Mid, S), Caribou Mountains (All)
<i>Common Tern</i>	5	0	0	0	1		Secure	Chinchaga (Mid)
<i>Common Yellowthroat</i>	20	9	11	25	4		Sensitive	Chinchaga (N, S), Caribou Mountains (All)
<i>Dark-eyed Junco</i>	75	55	78	62	4		Secure	All
<i>Evening Grosbeak</i>	5	0	0	0	1	Special Concern	Secure	Chinchaga (N)
<i>Golden-crowned Kinglet</i>	5	9	11	6	4		Secure	Chinchaga (Mid, S)



Common name	% of Sites				Number of years detected	Federal Status	Provincial Status	Location Detected
	2020	2021	2022	2023				
<i>Great Horned Owl</i>	10	18	0	12	3		Secure	Chinchaga (Mid, S), Caribou Mountains (All)
<i>Greater Yellowlegs</i>	30	0	0	6	2		Secure	Chinchaga (S), Caribou Mountains (All)
<i>Greater White-fronted Goose</i>	10	0	0	6	2		Secure	Chinchaga (All)
<i>Green-winged Teal</i>	15	0	11	19	3		Secure	Caribou Mountains (All)
<i>Hairy Woodpecker</i>	5	9	0	0	2		Secure	Chinchaga (N), Caribou Mountains (Mid)
<i>Herring Gull</i>	10	0	0	0	1		Secure	Caribou Mountains (S)
<i>Hermit Thrush</i>	65	73	78	62	4		Secure	All
<i>House Wren</i>	5	0	0	6	2		Secure	Chinchaga (Mid), Caribou Mountains (S)
<i>Le Conte's Sparrow</i>	20	0	0	19	2		Secure	Caribou Mountains (All)
<i>Least Flycatcher</i>	5	0	0	0	1		Secure	Chinchaga (N)
<i>Lesser Yellowlegs</i>	5	0	22	25	3		Secure	Chinchaga (Mid, S), Caribou Mountains (All)
<i>Lincoln's Sparrow</i>	65	36	33	50	4		Secure	All
<i>Mallard</i>	15	9	0	6	3		Secure	Chinchaga (Mid), Caribou Mountains (All)
<i>Magnolia Warbler</i>	10	9	22	6	4		Secure	Chinchaga (N), Caribou Mountains (Mid)



Common name	% of Sites				Number of years detected	Federal Status	Provincial Status	Location Detected
	2020	2021	2022	2023				
<i>Marsh Wren</i>	5	9	11	6	4		Secure	Caribou Mountains (Mid)
<i>Mourning Warbler</i>	5	0	0	0	1		Secure	Chinchaga (N)
<i>Nashville Warbler</i>	10	0	0	6	2		Secure	Chinchaga (Mid), Caribou Mountains (S)
<i>Nelson's Sparrow</i>	5	0	0	6	2		Secure	Caribou Mountains (All)
<i>Northern Flicker</i>	20	9	22	6	4		Secure	Chinchaga (Mid, S), Caribou Mountains (All)
<i>Northern Goshawk</i>	5	0	0	0	1		Sensitive	Chinchaga (N)
<i>Northern Pintail</i>	5	0	0	0	1		Secure	Caribou Mountains (S)
<i>Northern Pygmy-owl</i>	0	0	11	0	1		Sensitive	Caribou Mountains (Mid)
<i>Northern Waterthrush</i>	10	0	11	6	3		Secure	Chinchaga (N), Caribou Mountains (Mid)
<i>Orange-crowned Warbler</i>	15	9	44	12	4		Secure	Chinchaga (Mid, S), Caribou Mountains (All)
<i>Ovenbird</i>	30	36	44	31	4		Secure	Chinchaga (All), Caribou Mountains (Mid)
<i>Palm Warbler</i>	30	18	33	19	4		Secure	Chinchaga (Mid, S), Caribou Mountains (All)
<i>Pied-billed Grebe</i>	10	9	0	0	2		Sensitive	Caribou Mountains (All)
<i>Philadelphia Vireo</i>	0	0	33	0	1		Secure	Chinchaga (Mid), Caribou Mountains (Mid)



Common name	% of Sites				Number of years detected	Federal Status	Provincial Status	Location Detected
	2020	2021	2022	2023				
<i>Pine Siskin</i>	50	18	33	12	4		Secure	All
<i>Pileated Woodpecker</i>	30	0	0	25	2		Sensitive	Chinchaga (All)
<i>Purple Finch</i>	0	0	11	0	1		Secure	Chinchaga (Mid)
<i>Rose-breasted Grosbeak</i>	5	0	11	0	2		Secure	Chinchaga (N, Mid)
<i>Red-breasted Nuthatch</i>	10	9	0	38	3		Secure	Chinchaga (All), Caribou Mountains (Mid)
<i>Ruby-crowned Kinglet</i>	50	27	78	62	4		Secure	All
<i>Red Crossbill</i>	0	0	0	6	1		Secure	Chinchaga (Mid)
<i>Red-eyed Vireo</i>	10	9	0	6	3		Secure	Chinchaga (Mid), Caribou Mountains (Mid)
<i>Ring-necked Duck</i>	10	0	0	0	1		Secure	Chinchaga (N, Mid)
<i>Red-necked Grebe</i>	5	0	0	6	2		Secure	Caribou Mountains (S)
<i>Rusty Blackbird</i>	5	0	0	0	1	Special Concern	Sensitive	Caribou Mountains (S)
<i>Ruffed Grouse</i>	25	18	44	25	4		Secure	Chinchaga (All), Caribou Mountains (Mid)
<i>Red-winged Blackbird</i>	10	27	0	12	3		Secure	Chinchaga (Mid, S), Caribou Mountains (Mid)
<i>Savannah Sparrow</i>	10	0	0	12	2		Secure	Caribou Mountains (S)
<i>Sora</i>	20	27	11	12	4		Sensitive	Chinchaga (Mid), Caribou Mountains (S)



Common name	% of Sites				Number of years detected	Federal Status	Provincial Status	Location Detected
	2020	2021	2022	2023				
<i>Solitary Sandpiper</i>	10	9	11	6	4		Secure	Chinchaga (N, S), Caribou Mountains (Mid)
<i>Song Sparrow</i>	5	0	0	0	1		Secure	Caribou Mountains (S)
<i>Spruce Grouse</i>	0	0	22	0	1		Secure	Chinchaga (S), Caribou Mountains (Mid)
<i>Spotted Sandpiper</i>	15	9	11	0	3		Secure	Chinchaga (Mid, S), Caribou Mountains (All)
<i>Sharp-tailed Grouse</i>	10	9	0	6	3		Sensitive	Chinchaga (Mid), Caribou Mountains (S)
<i>Swamp Sparrow</i>	35	0	22	31	3		Secure	All
<i>Swainson's Thrush</i>	75	73	100	75	4		Secure	All
<i>Tennessee Warbler</i>	40	36	89	44	4		Secure	All
<i>Tree Swallow</i>	0	0	11	12	2		Secure	Chinchaga (Mid, S)
<i>Tundra Swan</i>	5	9	0	0	2		Secure	Chinchaga (Mid, S)
<i>Varied Thrush</i>	0	0	0	12	1		Secure	Chinchaga (S)
<i>Warbling Vireo</i>	15	9	22	6	4		Secure	Chinchaga (Mid, S), Caribou Mountains (Mid)
<i>White-crowned Sparrow</i>	10	0	0	19	2		Secure	Caribou Mountains (S)
<i>Western Grebe</i>	0	0	11	0	1	Special Concern	At Risk	Caribou Mountains (Mid)
<i>Western Tanager</i>	10	0	11	6	3		Sensitive	Chinchaga (N), Caribou Mountains (Mid)



Common name	% of Sites				Number of years detected	Federal Status	Provincial Status	Location Detected
	2020	2021	2022	2023				
<i>Wilson's Snipe</i>	60	18	22	56	4		Secure	All
<i>Wilson's Warbler</i>	15	0	0	6	2		Secure	Caribou Mountains (S)
<i>Winter Wren</i>	15	0	11	19	3		Secure	Chinchaga (N, S), Caribou Mountains (Mid)
<i>White-throated Sparrow</i>	55	36	33	56	4		Secure	All
<i>White-winged Crossbill</i>	45	18	78	38	4		Secure	All
<i>Yellow-bellied Flycatcher</i>	20	9	22	12	4		Undetermined	Chinchaga (N, S), Caribou Mountains (Mid)
<i>Yellow-bellied Sapsucker</i>	15	0	0	6	2		Secure	Chinchaga (N, S), Caribou Mountains (Mid)
<i>Yellow Warbler</i>	5	0	0	0	1		Secure	Caribou Mountains (S)
<i>Yellow-rumped Warbler</i>	85	64	100	81	4		Secure	All



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