

Cross-biome scale data of summer bird assemblages across various habitat types in Alberta, western Canada

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Abstract: Alberta covers diverse types of ecosystems including boreal forests, Rocky Mountain subalpine forests, as well as temperate grasslands in western Canada. The location of Alberta at the convergence of the Pacific and Central Flyways highlights its importance for bird conservation. However, recent climate change is altering vegetation, reducing wetlands, which can influence habitat niche availability of birds. While there are certain efforts of bird monitoring, public data are often limited to checklists or species presence—community-level datasets of birds collected consistently across biomes is rarely available. Here I conducted large-scale summer surveys of breeding birds across Alberta's six major ecoregions (Northern Rockies conifer forests, Alberta-British Columbia foothills forests, Mid-Canada Boreal Plains forests, Canadian Aspen forests and parklands, Montana Valley and Foothill grasslands, and Northern Shortgrass prairie). These surveys span woodlands, wetlands, grasslands, farmlands, and urban areas, providing a comprehensive bird species inventory. This preliminary dataset establishes a baseline for understanding avian biodiversity across Alberta and supports future research and conservation strategies aimed at mitigating climate-induced habitat changes.

Keywords: agricultural landscape; bird species; farmland, forest habitat; urban greenspace; wetland

Datos a escala de bioma de las comunidades de aves estivales en varios tipos de hábitat en Alberta, oeste de Canadá

Resumen: Alberta, en el oeste de Canadá, abarca diversos tipos de ecosistemas, como bosques boreales, bosques subalpinos de las Montañas Rocosas y praderas templadas. La ubicación de Alberta en la convergencia de las rutas migratorias de Norte América Central y del Pacífico pone de relieve su importancia para la conservación de las aves. Sin embargo, el reciente cambio climático está alterando la vegetación y reduciendo los humedales, lo que puede influir en la disponibilidad de nichos de hábitat para las aves. Aunque existen ciertos esfuerzos de seguimiento de aves, los datos públicos suelen limitarse a listas de control o presencia de especies. Rara vez se dispone de conjuntos de datos de aves a escala de comunidad recopilados de forma coherente en distintos biomas. En este trabajo se presenta una recopilación de registros estivales de aves en las seis principales ecorregiones de Alberta (Northern Rockies conifer forests, Alberta-British Columbia foothills forests, Mid-Canada Boreal Plains forests, Canadian Aspen forests and parklands, Montana Valley and Foothill grasslands, and Northern Shortgrass prairie). Estos estudios abarcan bosques, humedales, praderas, tierras de cultivo y zonas urbanas, proporcionando un inventario completo de especies de aves. Este conjunto de datos establece una base de referencia para comprender la biodiversidad aviar en toda Alberta y sirve de apoyo a futuras estrategias de investigación y conservación destinadas a mitigar los cambios de hábitat inducidos por el cambio climático.

Palabras clave: especies de aves; hábitat forestal; humedales; paisaje agrícola; tierras de cultivo; zonas verdes urbanas

Background and extended summary

Alberta, located in western Canada, holds a rich diversity of ecosystems, including biomes such as Temperate Conifer Forests, Boreal Forests/Taiga, and Temperate Grasslands, Savannas & Shrublands. These biomes support a wide array of species and make substantial contributions to Canada's biodiversity (Stadt et al. 2006; Raven et al. 2022). Within Alberta, regions such as subalpine forests of the Rocky Mountains and temperate foothills, boreal shields, and lowland prairies host a remarkable concentration of contrasting ecoregions. These areas are home to various bird species and provide critical habitats for both migratory and resident avian populations. Particularly, Alberta is uniquely located at the intersection of North America's Pacific Flyway and Central Flyway for migratory birds, lying along the boundaries of these major migration routes (Buhnerkempe et al. 2016; Roberts et al. 2023).

The diversity of Alberta's biomes and ecoregions is shaped by its strong gradients in precipitation and temperature. Many avian species and assemblages depend on or have adapted to the specific climatic and vegetative conditions found in these

environments (McDonald et al. 2005; Smith et al. 2018; Smith et al. 2020). However, being located at high latitudes and in dryland climate zones, Alberta is especially susceptible to rising temperatures and decreasing precipitation. These changes have already begun to alter vegetation composition (Searle and Chen 2017; Hisano et al. 2021), decrease forest stock (Chen and Luo 2015; Hisano et al. 2019; Hisano et al. 2024), and reduce areas of wetlands (Withey and van Kooten 2011), which can influence habitat niche availability of birds in western Canada. Such changes in climate and shifts in ecosystems could impact the quality of habitats and stopover sites for many bird species (Albright et al. 2010; Withey and van Kooten 2011; Cadieux et al. 2020), emphasising the urgency of avian monitoring efforts across various landscapes of Alberta. Although some local organisations, the provincial government, and researchers conduct bird survey or monitoring in Alberta (Prescott and Murphy 1999; Stadt et al. 2006; Boutin et al. 2009; Dale et al. 2009; Sólymos et al. 2015; Charchuk and Bayne 2018; ABMI 2024) much of the raw data remains inaccessible to the public, or it primarily consists of checklist (Cowan 1955; Kondla 1978; Nature Alberta 2019; Hudon et al. 2023), distribution, presence data (Sullivan et al. 2009; University of Alberta Museums et al. 2025), or summarised diversity/uniqueness metrics (ABMI 2024). To my knowledge, community-level bird survey data (e.g., the abundance of multiple species at each site, enabling the examination of composition) from Alberta, collected using consistent methods across biomes, is rarely available to the public—and, if at all, is not easily or readily accessible.

This data article presents the results of summer surveys of birds covering the majority of biomes (from temperate, boreal, to prairies), with six types of ecoregions (Northern Rockies conifer forests, Alberta-British Columbia foothills forests, Mid-Canada Boreal Plains forests, Canadian Aspen forests and parklands, Montana Valley and Foothill grasslands, and Northern Shortgrass prairie; Fig. 1). The study sites also include various habitat types such as woodlands, wetlands, grasslands, farmlands, riparian systems, and urban residential areas and greenspaces to provide a bird species inventory for the province from a comprehensive view. This study provides a baseline dataset that is readily available and usable for future studies on avian communities and monitoring efforts.

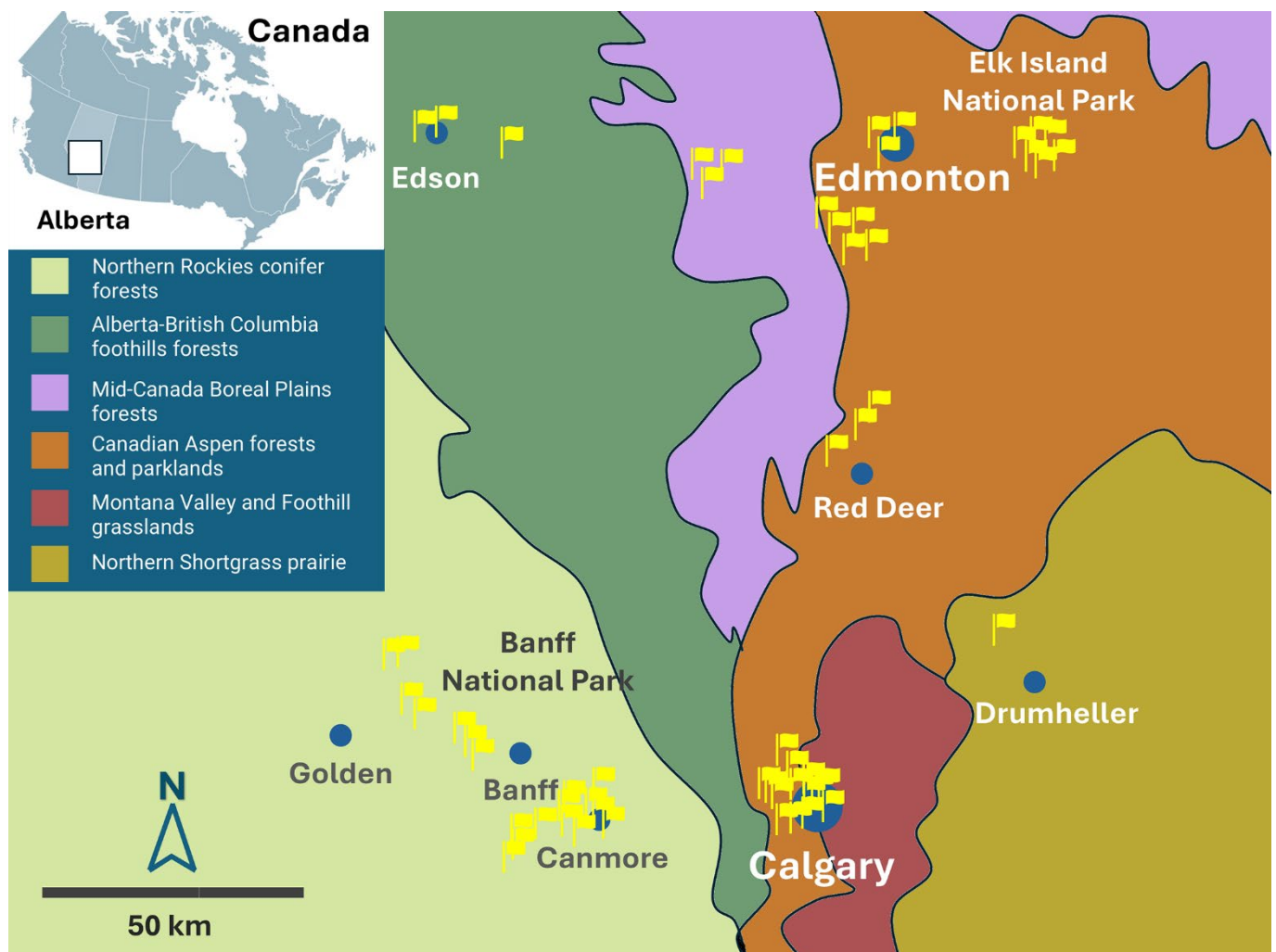


Figure 1. The study area and ecoregions in Central and Southern Alberta, western Canada. Blue circles represent major municipalities, while yellow flags indicate the study sites where point-count surveys were conducted.

Figura 1. Área de estudio y ecorregiones en el centro y sur de Alberta, oeste de Canadá. Los círculos azules representan los principales municipios, mientras que las banderas amarillas indican los sitios de estudio donde se realizaron los censos de puntos.

Material and methods

Study area

Central and Southern Alberta regions, western Canada (51°03'08.8" N–53°40'26.6" N; 112°49'39.1" W–116°10'38.4" W), covering a range of elevations (678–1623 m, above sea level) and biomes/ecoregions (Olson et al. 2001; Dinerstein et al. 2017) (Fig. 1):

- Temperate Conifer Forests (Ecoregions: Northern Rockies conifer forests, Alberta-British Columbia foothills forests);
- Boreal Forests/Taiga (Mid-Canada Boreal Plains forests); and
- Temperate Grasslands, Savannas & Shrublands (Canadian Aspen forests and parklands, Montana Valley and Foothill grasslands, Northern Shortgrass prairie).

This region covers clear gradients of temperature and precipitation, ranging from moist to arid climates [i.e., drylands (Bastin et al. 2017; Hisano et al. 2024)]. Major urban municipalities within the area include Edmonton (mean annual temperature: 3°C, highest monthly mean temperature: 23°C, mean annual precipitation: 438 mm, population: >1M people), Calgary (5°C, 24°C, 410 mm, >1.4M people), Edson (3°C, 23°C, 600 mm, >8K people), and Red Deer (3°C, 23°C, 466 mm, >100K people), Banff (3°C, 25°C, 436 mm, >8K) [climate data are based on the average of 1992–2021 (Time and Date AS 2025)]. The study area also incorporates protected areas of Banff National Park (coniferous forests), Elk Island National Park (deciduous broadleaves forests and wetlands), and Clifford E. Lee Nature Sanctuary (wetlands), alongside human-modified landscapes of farmlands, secondary forests/plantations, urban parks, and residential areas.

Data collection

I conducted point-count surveys (Voříšek et al. 2008) in the study area between July 26th and August 2nd 2024, across the 56 sites randomly established across the study area (51°03'08.8" N–53°40'26.6" N; 112°49'39.1" W–116°10'38.4" W). Each point was spaced at least 300 m apart to avoid cross-plot pseudo-replication. The point-count method involved observing for 10 minutes within a 75-m radius from the centre of each point. As the sole surveyor for the study, I consistently recorded all individuals seen or heard (both songs and calls), including those flying overhead. To prevent duplicate recordings within a plot, I carefully excluded bird individuals that had been observed flying in from a direction that had already been surveyed a few minutes earlier (Deguchi et al. 2020). Surveys were conducted during daylight hours, between sunrise and sunset. The dataset includes information on survey starting times, allowing for consideration of time since sunrise or time before sunset into the statistical modelling framework to address potential biases from time windows (Frutos et al. 2019), if necessary.

The habitat types of the study sites were categorised as Urban (urban park or residential area), Wetland, Farmland (cropland or rangeland), Woodland, Riparian (riverside environment), Grassland, or combinations of these types. Woodlands were further classified as: DEC = deciduous broadleaves (e.g., *Populus*, *Betula*), ESC = early-successional conifers (e.g., *Pinus*), or LSC = late-successional conifers (e.g., *Abies*, *Picea*, *Tsuga*), similar to (Chen and Luo 2015). Biomes and ecoregions of the study sites were assigned based on the literature (Olson et al. 2001; Dinerstein et al. 2017), and the elevation of the study sites was obtained using the *rgbif* package (Chamberlain et al. 2022) in R.

Records and data availability

Taxonomic coverage

The dataset includes 324 individuals of 48 bird species, which belong to 40 genera/23 families/eight orders (Table 1), based on the nomenclature of Chesser et al. (2024).

Data file

The file is archived in an online repository *figshare* (<https://doi.org/10.6084/m9.figshare.28078583.v1>), which is a community-level dataset of bird species for each site, including all the information of study sites, biomes, ecoregions, habitat types, coordinates, elevations, survey dates and time, taxonomy, and individual counts, etc. (Table 2). The datasets are also available in the following APPENDICES in the journal.

APPENDIX 1: "APPENDIX1_Alberta_Avifaunal_Data.csv" (long form dataset)

APPENDIX 2: "APPENDIX2_Wide_Alberta_Avifaunal_Data.csv" (alternative wide-form version of APPENDIX 1)

File format

The data are comma-delimited (UTF-8).

Variable and Unit definitions

See definitions provided in Table 2.

Accessibility

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Table 1. List of bird species observed during summer 2024 by point-count surveys in Central and Southern Alberta, western Canada.

Tabla 1. Lista de especies de aves observadas durante el verano de 2024 mediante censos de puntos en el centro y sur de Alberta, el oeste de Canadá.

Order	Family	Species	Common name
Accipitriformes	Accipitridae	<i>Accipiter cooperii</i>	Cooper's hawk
		<i>Buteo swainsoni</i>	Swainson's hawk
Anseriformes	Anatidae	<i>Anas discors</i>	Blue-winged teal
Charadriiformes	Laridae	<i>Chlidonias niger</i>	Black tern
		<i>Larus delawarensis</i>	Ring-billed gull
		<i>Larus</i> sp.	Gulls sp.
		<i>Sterna forsteri</i>	Forster's tern
	Columbidae	<i>Columba livia</i>	Rock dove
Gruiformes	Rallidae	<i>Fulica americana</i>	American coot
Passeriformes	Bombycillidae	<i>Bombycilla cedrorum</i>	Cedar waxwing
		<i>Bombycilla garrulus</i>	Bohemian waxwing
	Cardinalidae	<i>Piranga ludoviciana</i>	Western tanager
	Cinclidae	<i>Cinclus mexicanus</i>	American dipper
	Corvidae	<i>Corvus brachyrhynchos</i>	American crow
		<i>Corvus corax</i>	Common raven
		<i>Pica hudsonia</i>	Black-billed magpie
	Fringillidae	<i>Haemorhous mexicanus</i>	House finch
		<i>Spinus pinus</i>	Pine siskin
		<i>Spinus tristis</i>	American goldfinch
	Hirundinidae	<i>Hirundo rustica</i>	Barn swallow
		<i>Tachycineta thalassina</i>	Violet-green swallow
	Icteridae	<i>Agelaius phoeniceus</i>	Red-winged blackbird
		<i>Euphagus cyanocephalus</i>	Brewer's blackbird
		<i>Xanthocephalus xanthocephalus</i>	Yellow-headed blackbird
	Paridae	<i>Poecile atricapillus</i>	Black-capped chickadee
	Parulidae	<i>Geothlypis trichas</i>	Common yellowthroat
		<i>Oreothlypis peregrina</i>	Tennessee warbler
	Parulidae	<i>Setophaga coronata</i>	Yellow-rumped warbler
		<i>Setophaga petechia</i>	Yellow warbler
	Passerellidae	<i>Junco hyemalis</i>	Dark-eyed junco
		<i>Melospiza georgiana</i>	Swamp sparrow
		<i>Melospiza melodia</i>	Song sparrow
		<i>Passerculus sandwichensis</i>	Savannah sparrow
		<i>Spizella pallida</i>	Clay-colored sparrow
		<i>Spizella passerina</i>	Chipping sparrow
		<i>Zonotrichia albicollis</i>	White-throated sparrow
		<i>Zonotrichia leucophrys</i>	White-crowned sparrow
	Passeridae	<i>Passer domesticus</i>	House sparrow
	Regulidae	<i>Regulus satrapa</i>	Golden-crowned kinglet
	Troglodytidae	<i>Troglodytes aedon</i>	House wren
	Turdidae	<i>Catharus guttatus</i>	Hermit thrush
		<i>Turdus migratorius</i>	American robin
	Tyrannidae	<i>Tyrannus tyrannus</i>	Eastern kingbird
	Vireonidae	<i>Vireo olivaceus</i>	Red-eyed vireo
Piciformes	Picidae	<i>Colaptes auratus</i>	Northern flicker
		<i>Picoides pubescens</i>	Downy woodpecker
Podicipediformes	Podicipedidae	<i>Podiceps grisegena</i>	Red-necked grebe
		<i>Podilymbus podiceps</i>	Pied-billed grebe

Nomenclature based on [Chesser et al. \(2024\)](#).

Table 2. Column names and definitions of the avifaunal data ([APPENDIX 1](#) and [2](#)).

Tabla 2. Nombres de columnas y definiciones de los datos de avifauna ([APÉNDICES 1 y 2](#)).

Column name	Definition	Unit
SITE_ID	Study sites: Ed1-56	
Region_name	Name of region (municipalities) or location (parks or sanctuaries)	
Biome	Biome based on the World Wildlife Fund (WWF).	
Ecoregion	Ecoregion based on the literature (Olson et al. 2001 ; Dinerstein et al. 2017)	
Habitat_type	Author-defined local-scale habitat type: Urban, Wetland, Farmland, Woodland, Riparian, Grassland	
Forest_type	Forest type: DEC = deciduous broadleaves (e.g., <i>Populus</i> , <i>Betula</i>), ESC = early-successional conifers (<i>Pinus</i>), LSC = late-successional conifers (e.g., <i>Abies</i> , <i>Picea</i> , <i>Tsuga</i>), based on Chen and Luo (2015)	
LAT	Decimal latitude	degree
LONG	Decimal longitude	degree
Elevation	Elevation of study sites, obtained by the <i>rgbif</i> package (Chamberlain et al. 2022) in <i>R</i>	metre (m)
Date_ymd	Survey date	Year/Month/Date
Start_time	Time started the point-count survey (10 minutes long)	24-hour time format
Order	Order to which species belong	
Family	Family to which species belong, based on Chesser et al. (2024)	
Genus	The genus to which species belong	
Latin	Scientific name of species	
Species	Common English name of species	
Counts	Individual counts of each species at each study site	<i>n</i>

Technical validation

The observed bird individuals were taxonomically identified with reference to specialised literature ([Alderfer and Dunn 2017](#)). Provincial and local checklists were also consulted ([Nautre Alberta 2014, 2019](#)), along with online resources such as GBIF (<https://www.gbif.org/>). For vocal identification of bird songs and calls, online sources such as auditorium guides of bird vocalisations ([Weiland 2025](#)) were consulted, supplemented by the Merlin application ([Tembey et al. 2014](#); [Cornell Lab of Ornithology 2025](#)), with visual confirmation whenever possible when the singing bird was also observed. Ornithological nomenclature was verified based on [Chesser et al. \(2024\)](#). The dataset was organised to include not only presence/absence data but also species abundance and will be published in one of the online repositories recommended by the journal.

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The author declares no conflict of interest.

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