# Data Management Plan: Long Point Breeding Bird Project

Author: Joshua K. Pickering (JKP)

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## 1. Introduction

The decline of passerines across North America are at the forefront of conservation science as avian species are key indicators of ecological health and continue to be greatly impacted by ecosystem disturbance, resulting in the loss of suitable nesting and foraging habitats. However, less attention has been paid to the recovery of avian populations and the positive impacts of effective conservation management. One key and often overlooked driver of avian loss is the negative impact of overabundant white-tailed deer. In eastern North America, contemporary deer populations frequently exceed estimates of historical densities (<5 deer/km²), which significantly impacts vegetation communities and the broader ecosystem structure which indirectly impacts breeding birds through a trophic cascade. Similarly, white-tailed deer populations at Long Point, Ontario, Canada were historically overabundant, reaching densities exceeding 25 deer/km² throughout much of the 20th century. In 1991, adaptive deer management efforts at Long Point reduced the population by approximately 85% and subsequent monitoring of avian communities was initiated and has continued for more than 30 years (1991–2021) as part of the Long Point Breeding Bird Census (BBC) project. This research now has a unique opportunity to evaluate the long-term trends and composition of the breeding bird community during a period of adaptive white-tailed deer management. We will assess the question; **how has the abundance and community composition of avian species changed over time during a period of adaptive white-tailed deer management?** We hypothesize that if deer population suppression increases forest structure and diversity within the sub-canopy, then avian abundance, especially shrub-dependent species, will increase over time as a result of their defined functional traits and reflect a more diverse community. By utilizing a 30-year breeding bird territory count dataset to evaluate avian community trends, this research will identify the importance of deer management to support evidence-backed decision making for avian conservation.

## 2. Data Types and Formats

The Long Point BBC project was initiated as a long-term monitoring program in 1991 to sample breeding bird territories by employing territory spot mapping. From 1991 – 2021 (excluding 2013, 2014, and 2020), trained technicians mapped and subsequently summarized observational data of the total number of breeding bird territories for all identified bird species during the breeding period (i.e., June – July) within 15 monitoring sites (range; 7.2 – 14.8 ha) at Long Point, Ontario, Canada. Paper maps which provided the summary data for this research project are maintained in a physical library archive by Birds Canada, but are not managed by the researcher (Joshua K. Pickering; JKP). Data types and formats are based on prior research and therefore provide limited flexibility for justifying choice for each variable and research objective.

The collected dataset contains observational data and associated meta data, including:

Monitoring site data: site name, site code, habitat type, site size, and the site location (latitude, longitude);

Species data: species code, species common name, and the species scientific name;

Territory data: male territory abundance; and

Observer data: initials of surveyor, hours sampled, and the number of site visits conducted

The original digital breeding bird territory count data file is maintained as a Microsoft Excel Worksheet file (i.e., .xlsx file), which includes file tabs labelled ‘Notes’, and ‘Plot Summary’

**Table 1.**

Summary data for breeding bird census territory monitoring at Long Point, Ontario, Canada, from 1991-2021.

|  |  |
| --- | --- |
| Monitoring hours | 4,400.72 |
| Monitoring days (8hrs) | 550.09 |
| Total species territories | 12,913.50 |
| Total species observed | 100 |

## 2.1 Folder Format and Naming Convention Recommendations

When given a prompt of “recommended or useful names for r project file folders” the ChatGPT-generated text indicated that “A well-structured R project folder helps with organization, reproducibility, and collaboration. Here are some **recommended folder names** and their purposes:” (OpenAI, 2025, see text below for fill transcript).

**1. Essential Folders**

**📂 data/**

* **Purpose**: Stores raw datasets (CSV, Excel, JSON, etc.).
* 🔹 Subfolders:
  + data/raw/ → Unmodified, original datasets (read-only).
  + data/processed/ → Cleaned, formatted, or transformed datasets.

**📂 scripts/**

* **Purpose**: Contains all R scripts for analysis and processing.
* 🔹 Subfolders:
  + scripts/01\_import/ → Data import scripts.
  + scripts/02\_cleaning/ → Data cleaning & wrangling.
  + scripts/03\_analysis/ → Main analysis scripts.
  + scripts/04\_visualization/ → Plots and figures.
  + scripts/utility/ → Helper functions, custom R packages.

**📂 results/**

* **Purpose**: Stores output files (tables, figures, statistical results).
* 🔹 Subfolders:
  + results/figures/ → Plots, graphs, visualizations.
  + results/tables/ → CSV or RDS summary tables.

**📂 reports/**

* **Purpose**: Contains reports, markdown documents, or presentations.
* 🔹 Subfolders:
  + reports/rmarkdown/ → .Rmd files for dynamic reports.
  + reports/presentations/ → Slides (.pptx, .html, Quarto files).

**2. Optional but Useful Folders**

**📂 functions/**

* Stores custom R functions (.R files) for reuse.
* Example: functions/helper\_functions.R

**📂 manuscript/**

* Contains manuscript drafts, LaTeX, Word files, or journal submissions.

**📂 shiny\_app/**

* If using **Shiny**, this holds UI/server scripts.

**📂 docs/**

* Documentation files (README.md, references, notes).

**📂 renv/**

* Stores package dependencies (if using {renv} for reproducibility).

**📂 logs/**

* For error logs, batch job outputs, or tracking script runs.

**References**

OpenAI. (2025). ChatGPT (February 11 version) [Large language model]. <https://chat.openai.com/chat>

## 3. Data Collection Methods and Procedures

The monitoring protocol for the collection of breeding bird census territory data was established in 1991 and maintained until 2021 (see Appendix B). Breeding bird territory mapping and data summarization was collected by trained technicians and reviewed for consistency by the same principal investigator (Jon McCracken) for the entirety of the project (1991-2021). Monitoring was conducted at all 15 sites in 1991, 2016, and 2021, while in other years, breeding bird census sites were visited periodically (see Table 2.), limited by funding, access, and staffing shortages.

A site-specific protocol is identified (Appendix B), but in summary, territory mapping requires the observer walk slowly throughout the monitoring plot and to mark a bird species’ precise location on paper maps by noting which stakes you are standing between in the field and record breeding evidence. Summary data of the total number of breeding male territories for each species across sites, and over time were controlled for by site size, sampling period, and reviewed by the same principal investigator from 1991-2021. The specific monitoring protocol, equipment, and associated in-field requirements are identified in the Long Point Bird Observatory Breeding Bird Census Protocol (see Appendix B). Summary

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
| BGGR | X |  |  |  | X |  |  | X |  |  |  |  | X |  |  |  |  | X |  |  | X |  |  |  |  | X |  |  |  |  | X |
| DCJS | X |  |  |  | X |  |  |  | X | X |  |  |  | X |  |  |  |  | X | X |  | X |  |  |  | X |  | X |  |  | X |
| DCSD | X | X |  |  |  | X |  |  |  |  | X |  |  |  |  |  |  | X |  |  |  |  | X |  |  | X |  |  |  |  | X |
| IDSS | X |  | X |  | X |  | X |  |  |  |  |  | X | X |  | X |  | X |  |  | X | X |  |  |  | X |  | X |  |  | X |
| RARO | X | X |  |  |  | X |  |  | X |  | X |  |  |  |  |  |  | X |  | X |  |  |  |  |  | X | X |  | X |  | X |
| ROIS | X | X |  |  |  | X |  |  |  | X | X |  |  |  | X |  |  |  | X | X |  |  |  |  |  | X |  |  | X |  | X |
| ROMF | X |  |  | X |  |  |  |  | X | X |  |  |  | X |  |  |  |  | X | X |  |  |  |  |  | X |  | X |  |  | X |
| ROMS | X |  |  | X |  |  |  | X | X |  |  |  |  | X | X |  |  |  | X | X |  |  |  |  |  | X |  | X | X |  | X |
| ROWB | X |  |  | X |  |  | X |  |  |  |  | X |  |  |  |  |  | X |  |  |  |  | X |  |  | X | X |  | X |  | X |
| ROWP | X |  |  | X |  |  | X |  |  |  |  | X |  |  |  |  |  | X |  |  |  |  |  |  |  | X | X |  | X |  | X |
| SRS1 | X |  | X |  |  |  | X |  |  |  |  | X |  |  |  |  | X |  |  | X |  |  | X |  |  | X |  |  |  |  | X |
| SRS2 | X |  | X |  |  |  | X |  |  |  |  | X |  |  |  |  | X |  |  | X |  |  | X |  |  | X |  |  |  |  | X |
| STDP | X |  | X |  |  |  |  | X |  |  |  |  | X |  |  | X |  |  | X |  | X |  |  |  |  | X |  | X |  |  | X |
| TMSL | X | X |  |  |  | X |  |  |  | X | X |  |  |  | X |  |  |  | X |  |  | X |  |  |  | X | X |  |  |  | X |
| WPWC | X |  | X |  | X |  |  | X |  |  |  | X | X |  |  |  | X |  |  |  |  | X |  |  |  | X | X |  |  |  | X |

**Table 2.**

Monitoring frequency at all 15 breeding bird census territory sites at Long Point, Ontario, Canada, from 1991-2021.

*Note.* Representative site codes are in reference to site names identified as the 15 monitoring sites Bluegrass - Milkweed Grassland (BGGR), Dry Cottonwood - Juniper Savannah (DCJS), Dry Cottonwood Sand Dune (DCSD), Intergrading Dune - Swale Savannah (IDSS), Red Ash - Red Oak Savannah (RARO), Red Oak - Ironwood Savannah (ROIS), Red Oak - Sugar Maple Forest (ROMF), Red Oak - Sugar Maple Savannah (ROMS), Red Oak - White Birch Savannah (ROWB), Red Oak - White Pine Savannah (ROWP), Sedge - Rush Swale #1 (SRS1), Sedge - Rush Swale #2 (SRS2), Sedge - Tamarack Dune Pond (STDP), Tamarack Slough (TMSL), and White Pine - White Cedar Savannah (WPWC).

## 4. Data Storage and Organization

Original digital breeding bird territory count data files (i.e., .xlsx, and .csv files), and associated maps (i.e., .pdf files) are stored and maintained in a cloud-based storage folder as their primary location, owned and managed by Birds Canada. Breeding bird territory count data files specified above have been shared for use in analyses by JKP, Waterloo Wetland Lab, at the University of Waterloo through a *Sponsored Research Agreement (SRA)* (see Appendix A; parts redacted for associated costs and personal information). The subsequent sharing of the data files identifies that data is organized in a standardized Windows folder system. Data is maintained in a University of Waterloo Student OneDrive account file folder (JKP), and is backed-up daily on an external Samsung T7 Shield hard drive.

Files associated with the SRA include a single summary dataset, saved as a Microsoft Excel Worksheet file (i.e., .xlsx file) titled; ‘1965-2021 BBC Stats\_MSWB\_29 Mar\_ 2022.xlsx’. The file is maintained in its original state, saved accordingly, and was subsequently copied and saved as a new flat .csv file, and renamed to reflect consistent file naming convention as specified below:

‘bird\_spterritories\_abund\_1991-2021.csv’.

The file naming convention follows a clear indication of the taxonomic group; bird (representative of the bird species sampled), followed by the short name description of the x-variable; spterritories (representative of species territories, x-variable), followed by the value of the x-variable; abund (representative of the total abundance for a species at a sampling plot in a given year), as well as followed by the sampling years of the dataset; 1991-2021 (representative of the sampling period). Prior breeding bird census monitoring was conducted at Long Point in the 1960s so it is important to specify the sampling period.

## 5. Data Documentation

Due to the nature of the archived dataset, shared through the SRA, specific data documentation is limited to safe and effective management of applicable breeding bird territory data as described above in 2. Data Types and Formats, and Section 4: Data Storage and Organization.

## 6. Data Security and Privacy

Authorized access to original data maintained by Birds Canada, is limited to the permissions of the Director of Strategic Assets staff member at Birds Canada, and is maintained by the Long Point Bird Observatory Supervisor in support of data preservation. Local data files managed by JKP are password protected on both the cloud-based OneDrive file folder, and the physical copy of the external hard drive, which is maintained as the back-up for all data organization and analyses.

Ethical considerations must maintain requirements identified in the SRA, as identified by the researcher (JKP), the University of Waterloo, and Birds Canada. More specifically, no sensitive personal information is included in the associated meta data for surveyors, which only includes a technician’s first initial of their given name, followed by their surname (last name). Specific considerations have also been given to sensitive species data (i.e., species at risk locational information), as identified in the SRA, whereby specific species locations are not provided within the dataset, but given only as a coarse scale site location.

Additional ethical considerations also relate to a conflict of interest declaration, whereby in January 2023, prior to the knowledge of beginning a current PhD degree at the University of Waterloo which began in May 2023, JKP was employed under contract in a full-time (40 hrs per week) biologist position with Birds Canada. This full-time contract was 6-months in length for the period of January 3, 2023 to June 30, 2023. JKP mainly assisted with maintenance and on-the-ground data transfer for the Motus Wildlife Tracking System at remote stations throughout Ontario, and conducted waterfowl monitoring at satellite stations of the Long Point Bird Observatory in Norfolk County, Ontario. Following this full-time contract, JKP was granted a additional short-term extension of work with Birds Canada in a part-time contract (20 hrs per week) position for the period of July 1, 2023, to August 31, 2023 to assist with ongoing maintenance of towers related to the Motus Wildlife Tracking system throughout Ontario, as well as monitoring of Monarch Butterflies and their habitat in key Great Lakes shoreline areas in southern Ontario. The work JKP was hired to assist with during the short contracts with Birds Canada are unique and completely separate from the research, which focuses on breeding bird community temporal and spatial changes at Long Point using a historic dataset collected by Birds Canada staff and volunteers from 1991 – 2021.

## 7. Data Sharing and Accessibility

Data sharing is guided by the SRA, but original data is owned and maintained by Birds Canada, and is accessible upon request, and pending approval of a data sharing agreement. Similarly to terms described in Section 4. Data Storage and Organization, and Section 5. Data Documentation, the restrictions of data sharing are guided by the SRA, but includes the publication and use of all data manipulations and renditions in support of published works associated with the identified research outlined in the SRA. This includes the requirement for publication within some journals which require open access works, data, and archived repositories to be setup. This consideration is guided at a later stage of the research by journal requirements and publication conditions.

Considerations have also been made for promoting accessible language in Canada (i.e., English and French translations for species names), but especially for the identified local Indigenous languages represented in Southern Ontario, Canada. Specific considerations are presented in the unpublished work, organized as an ethical consideration during an invited talk with the Waterloo Wetland Lab in September 2024 (see Appendix D).

# APPENDIX A: SPONSORED RESEARCH AGREEMENT SRA#

Long term avian and plant community changes in Long Point, ON

Between

**University of Waterloo**  
Office of Research

Research Partnerships

200 University Avenue West  
Waterloo, Ontario N2L 3G1   
(hereinafter referred to as the “**University**”)

and

**BIRDS CANADA**

115 Front Rd. PO 160, Port Rowan, ON. N0E1M)  
(hereinafter referred to as the “**Client**”)

**WHEREAS** the University and the Client wish to enter into this agreement to have the University perform the research as set forth in Schedule “A” in accordance with the terms and conditions of this agreement;

**WHEREAS** the University and the Client have agreed to seek matching funding from Mitacs Inc. (“MITACS”) for the research set forth in Schedule “A”, through an application to the MITACS Accelerate program

**NOW THEREFORE** in consideration of the premises and the mutual covenants, terms, conditions and agreements contained herein, and other good and valuable consideration, the sufficiency of which is hereby acknowledged, the parties hereto agree as follows:

1. **– DEFINITIONS**
   1. “**Agreement**” means this Sponsored Research Agreement including all attached schedules, as the same may be supplemented, amended, restated or replaced in writing from time to time;
   2. “**Background Intellectual Property**” means proprietary and/or Confidential Information of the University, the University Research Personnel and Students, or the Client which is disclosed to the other for the purpose of the Research Plan;
   3. “**Client Confidential Information**” means Confidential Information of the Client which has been disclosed by the Client to the University, but not including the Research Results;
   4. “**Confidential Information**” means the specific terms and conditions set forth in this Agreement, the Research Results, and any information, which is disclosed by one party to the other party for the purpose of the Research Plan provided that tangible materials are clearly marked as “Confidential” and any information provided orally or visually is identified as confidential at the time of disclosure, but shall not include information that:
      1. is or becomes generally available to the public other than as a result of any act by a receiving party to this Agreement;
      2. is rightfully received from a third party without similar restriction or without breach of this Agreement;
      3. a receiving party is able to demonstrate, in writing, was known to it on a non-confidential basis; or
      4. was independently developed by a receiving party without the use of any of the Confidential Information.
   5. “**Creators**” means any University Research Personnel and Students who make a creative contribution to the Research Results;
   6. “**Field of Use**” has the meaning set forth in Section 7.3;
   7. “**Negotiation Period**” has the meaning set forth in Section 7.4;
   8. “**Option Period**” has the meaning set forth in Section 7.4;
   9. “**Principal Investigator**” has the meaning set forth in Section 2.2;
   10. “**Research Personnel and Student Agreement**” has the meaning set forth in Section 2.3;
   11. “**Research Plan**” has the meaning set forth in Section 2.1.
   12. “**Research Results**” means the technical information, know-how, copyrights, models, specifications, prototypes or inventions, whether patentable or unpatentable, developed in performance of the Research Plan;
   13. “**University Research Personnel and Students**” means University researchers, including, but not limited to, the Principal Investigator, students, post doctoral fellows, research associates, who participate in the Research Plan.
2. **- OBJECTIVES**
   1. The University shall perform, or procure the performance of, the research plan as set forth in Schedule “A” (the “**Research Plan**”) upon the terms and conditions hereinafter set forth.
   2. The Principal Investigator(s) of the Research Plan shall be Rebecca Rooney of the University’s Department of Biology, and he/she shall be responsible for the technical content of the Research Plan.
   3. Each University Research Personnel and Student shall sign a Research Personnel and Student Agreement as set forth in Schedule “B”.
   4. Notwithstanding Section 2.1 hereof, the Client and the University agree that until such time as all regulatory requirements have been obtained, including all necessary approvals of any regulatory or research ethics board concerned, no work requiring such regulatory or ethics approvals shall commence (excepting any preliminary preparations which are not restricted by such requirements).  For greater certainty, any delay in obtaining such approvals shall not be considered a default or breach by either the Client or the University.
   5. The Client and the University acknowledge that some research, particularly that in the natural sciences and engineering, may be subject to export control laws and regulations of Canada or the U.S.  For example, transmitting the results of, or information about, certain research may require first obtaining an export permit or other authorization.  Certain research may also be subject to regulation by the Controlled Goods Directorate (CGD) of Public Services and Procurement Canada (PSPC), in accordance with the *Defence Production Act* (DPA) and the Controlled Goods Regulations (CGR). Information may be obtained from the CGD Website at: https://www.tpsgc-pwgsc.gc.ca/pmc-cgp/index-eng.html
   6. The Client shall use reasonable efforts to determine whether or not the Research Plan contains or may result in, items subject to these laws and regulations (a “**Controlled Item**”).  In the event that a Controlled Item is identified in the Research Plan, then the Client and the University shall comply with all applicable Canadian and U.S. export control laws and regulations.  In the event that the Client wishes to include a Controlled Item into the Research Plan at any time during the term of this Agreement, then the Client and the University agree as follows:
      1. the Client shall promptly notify the University of the Controlled Item’s classification prior to any shipment or transmission to the University;
      2. the University may, at the University’s sole discretion, accept or reject the delivery of the Controlled Item; and
      3. in the event that the University rejects the delivery of the Controlled Item, such rejection by the University shall not constitute a breach of this Agreement.
3. **- FEES**
   1. In consideration of the University carrying out the Research Plan, if approved by MITACS, the Client shall pay MITACS the sum of \_ ($CDN), plus the applicable HST.  In accordance with the MITACS Accelerate program guidelines, MITACS will forward the funds to the University of Waterloo (Attn: Finance Department, EC5, 200 University Avenue West, Waterloo, Ontario N2L 3G1) once the payment is received from the Client.
   2. In addition, the Client shall pay the University the sum of \_ ($CDN), which amount is inclusive of 10% overhead expenses.
   3. The sum stipulated in Section 3.1 shall be paid by the Client electronically or by cheque made payable to MITACS (Attn: Banking Institute University of Toronto – 522-100 College Street, Toronto, Ontario, M5G 1L5), according to the schedule of payment, payment terms and deadlines defined by MITACS.
   4. The sum stipulated in Section 3.2 shall be paid by the Client electronically or by cheque made payable to the University of Waterloo (Attn: Finance Department, EC5, 200 University Avenue West, Waterloo, Ontario N2L 3G1) within thirty (30) days of receipt of invoice(s) according to the following schedule:
      1. $\_ on signing of agreement in July 2023
      2. $\_ on delivery of a PPT presentation and interim report describing detailed research plans and proposed methods 1 November 2023
      3. $\_ on receipt of a written research thesis and PPT presentation describing the research results and conclusions on 1 May 2027
   5. Invoices to the Client shall be sent by email to \_\_cc;

Interest on overdue accounts will be charged at current bank rates on amounts not paid within thirty (30) days of submission of invoice.

1. The University shall not be obliged to perform any work beyond the Research Plan which would cause the aggregate costs to exceed the amount set forth in Section 3.1.
2. **– RESEARCH RESULTS**
   1. The University, through the Principal Investigator, will provide the Client with any reports specified in Schedule “A” and/or the MITACS guidelines for the program, if applicable to the Research Plan.
3. **- EQUIPMENT**

Unless otherwise agreed upon by the Client and the University in writing, or specifically provided for pursuant to the terms of this Agreement, all equipment and materials purchased by or provided to the University for the carrying out of the Research Plan, shall be, and remain, the property of the University.

1. **- CONFIDENTIALITY**
   1. All Confidential Information will remain the property of its owner or the party that furnished it as the case may be.
   2. For a period of three (3) years from the date of disclosure of Confidential Information, the receiving party agrees to maintain in confidence all Confidential Information disclosed to it with the same degree of care as the receiving party normally takes to preserve its own confidential information of similar grade, but in any event, no less than a reasonable degree of care.
   3. The receiving party may only disclose Confidential Information to persons with a “need to know” who shall be made aware of, and be required to observe and comply with the covenants and obligations contained herein, and the Confidential Information shall only be used for the purpose of the Research Plan.
   4. A receiving party may disclose Confidential Information pursuant to the requirements of a government agency or pursuant to a court order, provided that the receiving party gives the disclosing party sufficient notice to enable it to seek an order limiting or precluding such disclosure.
2. **- INTELLECTUAL PROPERTY**
   1. All aspects and parts of the Background Intellectual Property shall be exclusively owned by its owner and nothing herein shall serve to, or should be construed to transfer any ownership rights whatsoever in the Background Intellectual Property.  Such Background Intellectual Property may be used by the receiving party solely as required to perform that party’s obligations in performing the Research Plan.  The limited, non-transferable license granted herein will automatically terminate upon expiration or termination of this Agreement. Any further use of the Background Intellectual Property shall be on terms and conditions to be agreed upon in writing between the parties.  Background Intellectual Property belonging to the University and the University Research Personnel and Students includes the items listed in Schedule “C”.
   2. All Research Results shall be owned by the University whereby the University will assign its interest in and to the Research Results to the Creator(s), subject to Sections 7.3., and 7.4 below.
   3. The Creator(s) are required to promptly disclose the Research Results to the University and to the Client. The University hereby grants to the Client a fully paid-up, royalty-free, irrevocable, non-exclusive license to use the Research Results in the following field of use: land use planning, lake management, promotions (the “**Field of Use**”).
   4. The University will specifically retain the perpetual and irrevocable right to use the Research Results for continued research and educational purposes without charge, fee, or royalties notwithstanding any other provision of this Agreement.
3. **– PUBLICATION AND DISCLOSURE**
   1. The Client and the University agree that it is part of the University’s function and policies to disseminate information and to make it available for the purpose of scholarship.
   2. At any time during the term of this Agreement, the University will provide the Client with a draft copy of any proposed publication or disclosure of Research Results for its review at least sixty (60) days before submission for publication or disclosure.  Upon the Client’s written request, which shall be received by the University within the same sixty (60) day period, the University will:
      1. delete any Client Confidential Information from the proposed publication or disclosure; or
      2. delay publication, subject to Section 8.3, up to a maximum of sixty (60) additional days for the purposes of filing for intellectual property protection on terms and conditions to be negotiated and agreed upon by the Client and the University.
   3. Notwithstanding any other term or condition of this Agreement, the University retains the right to have any thesis reviewed and defended without delay for the sole purpose of academic evaluation in accordance with the University’s established procedures.  The Client may request that a closed thesis defence is held and that the members of the thesis examination board, including the external examiner(s), be required to sign a non-disclosure agreement.
4. **- INDEMNITY**
   1. Each party agrees to indemnify and save harmless the other party, its affiliates, directors, officers, employees, agents, students and representatives from and against all claims, losses, damages or expenses of any kind (individually a “**Claim**” and collectively the “**Claims**”) by any third party based upon, occasioned by, or attributed to actions, errors, omissions, or negligence of the indemnifying party and its directors, officers, employees, agents or representatives during the performance of this Agreement, except to the extent such Claim(s) are attributable to the negligence or wilful misconduct of the indemnified party.
   2. In addition, the Client hereby agrees to indemnify the University, including its governors, directors, trustees, officers, researchers, employees, students, volunteers and agents against all Claims arising from the use by or through Client of the Research Results, and the design, production, manufacture, sale, use, lease, or promotion of any product, process, service or data developed by the Client, directly or indirectly, through use of the Research Results.
   3. The indemnity in this Article 9 shall not affect or prejudice a party from exercising any other rights it may have under the law.
5. **– REPRESENTATIONS AND WARRANTIES AND LIMITATION OF LIABILITY**
   1. Each party represents and warrants to the other party that it is duly organized, validly existing and in good standing, and it has the right and authority to enter this Agreement and do all acts and things as required or contemplated to be done, observed and performed by it hereunder.
   2. The University, on behalf of itself and the Creators, makes no warranty, express or implied, concerning the Research Results under this Agreement, which are all provided “as is”.  THE UNIVERSITY MAKES NO REPRESENTATIONS AND EXTENDS NO WARRANTIES OF ANY KIND, EITHER EXPRESS OR IMPLIED.  THERE ARE NO EXPRESS OR IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, OR THAT THE USE OF THE RESEARCH RESULTS- WILL NOT INFRINGE ANY PATENT, COPYRIGHT, TRADEMARK OR OTHER- PROPRIETARY RIGHT OF ANY THIRD PARTY.
   3. NEITHER THE CLIENT NOR THE UNIVERSITY WILL BE LIABLE TO THE OTHER FOR ANY CONSEQUENTIAL DAMAGES, LOST PROFITS, LOST SAVINGS, LOSS OF ANTICIPATED REVENUE OR ANY EXEMPLARY, PUNITIVE, SPECIAL OR INDIRECT DAMAGES, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.
6. **- INSURANCE**
   1. Each party shall obtain and maintain comprehensive general liability insurance and any other insurance that a prudent person would deem necessary, in the minimum amount of $2,000,000 with respect to its operations. Such insurance shall contain provisions for cross-liability and severability of interest, and each party shall provide a certificate of insurance as evidence of such coverage if requested by the other party.
7. **– PERMITS AND LICENSES**
   1. For work to be carried out off the University’s premises, the Client shall identify any permits, licenses or other required by any governing authority in relation to any of the work to be performed and agrees to obtain or to assist the University to obtain such permits, licenses or other.
8. **– TERM & TERMINATION**
   1. This Agreement shall come into effect on **1 July 2023**, and unless earlier terminated in accordance with the terms hereof, shall terminate **30 May 2027**.  In the event that the Research Plan is funded in part by any federal or provincial agency or other government institution, including MITACS, the term of this Agreement shall, at a minimum, be equal in duration to the period of the agency award.
   2. This Agreement may be terminated by either party upon sixty (60) days written notice to the other party.
   3. Upon termination of this Agreement by either the Client or the University, the University will be reimbursed by the Client for all costs and non-cancellable commitments incurred by the University in the performance of the Research Plan, such reimbursement not to exceed the total estimated expenses set forth in Section 3.1.
   4. Termination as set forth in this Article 13 shall not relieve any of the parties of any obligations accrued under this Agreement prior to the date of termination.  Each of Articles 5 (Equipment), 6 (Confidentiality), 7 (Intellectual Property), 8 (Publication), 9 (Indemnity), 14 (General Provisions), Sections 10.2 (Disclaimer), 10.3 (Limitation of Liability), 13.3 (Reimbursement for expenses), and 13.4 (Survival) shall survive termination of this Agreement.
9. **– GENERAL PROVISIONS**
   1. The Client shall not use the name, or any variation, adaptation, abbreviation, trademark or other, of the University, nor the name of any member of the University’s staff or governors, in any publicity without the prior written approval of an authorized representative of the University.  Subject to Section 14.2, the University will not use the name of the Client, or any variation, adaptation, abbreviation, trademark or other, nor the name of any employee of the Client, in any publicity without the prior written approval of the Client.
   2. The University may at its own discretion provide a brief listing of this Research Plan as part of any public statement disclosing research taking place at the University.  Such disclosure may include, but is not limited to, the title of the Research Plan, the name of the Client, the name of the Principal Investigator, and the amount of funding.
   3. The parties are independent parties and nothing in this Agreement shall constitute either party as the employer, principal or partner of or joint venturer with the other party.  Neither party has any authority to assume or create any obligation or liability, either express or implied, on behalf of the other.
   4. Any notice pursuant to this Agreement shall be in writing and shall be given by hand delivery or sent by registered mail, courier, email or facsimile addressed to the other party at the address set out below or to such other person or address as the parties may from time-to-time designate in writing delivered pursuant to this notice provision. Any such notices, requests, demands or other communications shall be received and effective:  (a) upon the date of delivery if delivered personally; or (b) on the date of receipt of confirmation by answer-back, in the case of mail, email or facsimile.

**University:**

**Lisa Sergovich**, Grants and Contracts Manager  
Funding Agencies and Non-Profit Sponsors  
University of Waterloo  
Office of Research  
200 University Avenue West  
Waterloo, Ontario N2L 3G1

Phone: 519-888-4567 Ext.360336  
E-mail: lmsergov@uwaterloo.ca

**Client: Birds Canada**

**[Contact Person, \_]**

[Director, Strategic Assets]

1. For this Agreement, neither the Client nor the University shall be liable to the other for any failure or delay in performance by circumstances beyond its control, including but not limited to, acts of God, fire, labour difficulties or governmental action.
2. Unless otherwise specified in this Agreement, this Agreement and the schedules attached hereto shall supersede all documents or agreements, whether written or oral, in respect of the subject matter thereof. For greater clarity, no direct or indirect separate arrangement, whether oral or written, with the Principal Investigator or other person, involving any component of the work to be performed, is permitted unless prior agreement, in writing, is given by the authorized signing authorities of the Client and the University. The Client acknowledges and agrees that the University provides no insurance coverage whatsoever to faculty members or other university persons who may provide direct or independent services relating to this Agreement.
3. The terms herein stipulated may not be modified in any way without the mutual consent of the Client and the University in writing given by their authorized signing authorities.
4. This Agreement shall not be assigned by either the Client or the University without the prior written consent of the other party, such consent not to be unreasonably withheld.  The University and the Client shall not subcontract any work to be performed under this Agreement without the prior written consent of the federal or provincial agency or other government institution, as applicable, and the other party (such consent not to be unreasonably withheld).
5. In the event that a translation of this Agreement is prepared and signed by the Client and the University for the convenience of the Client, this English language version shall be the official version and shall govern if there is a conflict between the two.
6. This Agreement shall be governed by and construed in accordance with the laws of the Province of Ontario and the laws of Canada applicable therein.
7. This Agreement may be executed digitally, and/or electronically, and may be transmitted digitally, and/or electronically, in any number of counterparts, each of which upon execution and delivery shall be considered an original for all purposes; provided, however, all such counterparts shall, together, upon execution and delivery, constitute one and the same instrument.
8. The following appendices are attached to and form part of this Agreement:

Schedule A – Research Plan

Schedule B – Research Personnel and Student Agreement

Schedule C – University Background Intellectual Property

**IN WITNESS WHEREOF** the Client and the University hereto have executed this Agreement in a legally binding manner.

|  |  |  |  |
| --- | --- | --- | --- |
|  | ) ) ) ) ) ) ) ) ) | **UNIVERSITY OF WATERLOO** | |
| Per: |  |
|  | Name: Lisa Sergovich |
|  | Title: Grants and Contracts Manager |
|  | I/We have the authority to bind the corporation  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date |
|  | ) ) ) ) ) ) ) ) | **For the Client:** | |
| Per: |  |
|  | Name: Patrick Nadeau |
|  | Title: President and CEO |
|  | I/We have the authority to bind the corporation  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date |

**Acknowledgment and Consent of Principal Investigator**

I, having read this Agreement, hereby agree to comply with all the terms and conditions contained herein and further agree to ensure that all University Research Personnel and Students who are involved in the Research Plan are informed of their obligations under the provisions of this Agreement and have acknowledged and consented by signature of a Research Personnel and Student Agreement (Schedule B).

|  |  |  |
| --- | --- | --- |
|  | Date: | 19 May 2023 |
| Dr. R.C. Rooney, Associate Professor  Department of Biology   |  |  |  | | --- | --- | --- | |  | Date: |  | |  |  |  | |  |  |
|  |  |  |

**SCHEDULE A**

**RESEARCH PLAN**

**Proposal**

**Introduction**

Title: Long term avian and plant community changes in Long Point, ON

Project start date: June 1, 2023

Project end date: May 30, 2027

**Background**

The Long Point Peninsula is a biodiversity hotspot on the north shore of Lake Erie. It is the site of North America’s oldest bird observatory and an Important Bird Area, World Biosphere Reserve, Key Biodiversity Area, and home to a Ramsar Wetland. Unfortunately, in the 1990s it was recognized that over browsing by white-tailed deer was occurring, altering the tree community demographics and eliminating understory vegetation. This over browsing was attributed to the high density of deer on the peninsula, where predation was limited. A census concluded that the population size of deer was 500 and should be brought down 90% and maintained at 50 deer to limit the impact of browsing on the vegetation.  Subsequently, a deer cull program was implemented to maintain the deer population at 50.  Over the following 30 years, the vegetation recovered, substantiated by a series of long-term monitoring plots surveyed in a shingle design by Birds Canada and the Nature Conservancy of Canada on an approximate 5 year cycle. Additionally, the number of bird territories within each monitoring plot was recorded and mapped; however, the results of this long-term monitoring data have not been analyzed and many of the maps remain undigitized.

Figure 1. The location of the Long Point Peninsula.

Our main goal for this project is to test the hypothesis that the recovery of the vegetation community following implementation of deer population controls has led to increased richness of bird species using the peninsula and a diversification of the functional groups represented by the avian community. In particular, we predict an increase in the number of breeding ground-nesting species and species which glean from the ground or understory.

**Objectives**

Our specific research objectives are to

1) digitize the avian territory maps from the historic long term monitoring data,

2) assess changes in avian diversity and relative abundance of different avian species through time, accounting for variation in lake water levels, climate variables, and vegetation changes,

3) assess changes in the relative abundance of avian functional groups (e.g., classified by habitat use, feeding habit, diet, or body size) in association with changes in the vegetation structure of the long term monitoring plots,  and

4) report on the results to the scientific community and local communities.

**Deliverables and budget**

**Fiscal Year 2023-2024**

|  |  |
| --- | --- |
| Deliverables | Annual Budget |
| Finalized Mitacs Proposal for 3 Accelerate Internships June 2023 |  |
| Research plan and methods 1 November 2023 |  |
| Presentation on first Mitacs Accelerate Internship 31 April 2024 |  |
| Total |  |

**Fiscal Year 2024-2025**

|  |  |
| --- | --- |
| Deliverables | Annual Budget |
| Presentation on second Mitacs Accelerate Internship 31 April 2025 |  |
| Total |  |

**Fiscal Year 2025-2026**

|  |  |
| --- | --- |
| Deliverables | Annual Budget |
| Presentation on third Mitacs Accelerate Internship 31 April 2026 |  |
| Total |  |

**Fiscal Year 2026-2027**

|  |  |
| --- | --- |
| Deliverables | Annual Budget |
| Final student thesis with a minimum 3 manuscript drafts for peer-review 31 April 2027 |  |
| Total |  |

**SCHEDULE B**

**RESEARCH PERSONNEL AND STUDENT AGREEMENT**

**WHEREAS** the University of Waterloo and the Client are parties to a Sponsored Research Agreement number # SRA 087941 to which this Research Personnel and Student Agreement is appended; and

**WHEREAS** the undersigned is associated with the University of Waterloo and will be involved in the Research Plan defined by the Sponsored Research Agreement;

**NOW THEREFORE**, in consideration of information and facilities made available to me in connection with my work in relation to the Research Plan and other valuable consideration, I agree that:

1. **Defined Terms.**  All terms denoted with initial capital letters herein shall have the meanings ascribed to them in the Sponsored Research Agreement.
2. **Reasonable Efforts.** I will use all reasonable efforts to achieve the objectives and deliverables defined in the Article 2 of the Sponsored Research Agreement for those activities in which I am involved.
3. **Research Results** I will co-operate fully and in good faith in discussion and agreement with all conditions regarding Research Results as set forth in Article 7 of the Sponsored Research Agreement.
4. **Confidential Information.**  In accordance with Article 6 of the Sponsored Research Agreement, I will keep confidential all of the Confidential Information that I may receive.
5. **Publications.** I will comply with all publication conditions that are set out in Article 8 of the Sponsored Research Agreement.
6. **Ownership**.  I understand that ownership of and rights to any Research Results shall be determined in accordance with Article 7 of the Sponsored Research Agreement, as per Article 3(A) (third bullet) of the *University of Waterloo Policy #73 (Intellectual Property Rights)*.
7. **Invention Disclosure.**  I shall keep the University and the Principal Investigator fully and promptly informed on an on-going basis of the development of Research Results and shall not take any steps with respect to filing intellectual property protection for any Research Results without prior consultation with the University.
8. **Cooperation in Patent Matters.**  I will cooperate fully in the signing of documents and taking such other steps as may be reasonably requested to obtain and maintain patent and other intellectual property protection for the Research Results relating to the Sponsored Research Agreement and in connection with any infringement action in any way relating to said Research Results, and I will sign all documents and do all things necessary or proper to give effect to this Research Personnel and Student Agreement and any rights granted by the University under the Sponsored Research Agreement.
9. **Acknowledgement.** I have obtained or have been afforded the opportunity to obtain independent legal advice with respect to this Research Personnel and Student Agreement and all documents and transactions related thereto and I fully understand the nature and consequences of this Research Personnel and Student Agreement and all documents and transactions related thereto.

By signing below, I indicate my acceptance of these terms.

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**SCHEDULE C**

**UNIVERSITY BACKGROUND INTELLECTUAL PROPERTY**

# APPENDIX B: LONG POINT BIRD OBSERVATORY BREEDING BIRD CENSUS PROTOCOL

**Breeding Bird Census Protocol**

A logo with a bird in the center

AI-generated content may be incorrect.Summer 2021

***Required reading/review:***

1. Hall 1964 – BBC – Why and How.
2. All BBC instructions, data forms and summary sheets.
3. Example daily field sheets and species sheets

***Visit frequency and conditions:***

Each site must be visited a minimum of 10 times, including one-two evening visits. Morning visits should commence just before sunrise (or as close to that time as possible) and continue until your plot has been thoroughly surveyed. You should be leaving the Tip or Breakwater in the dark most days. You’ll have to adjust your schedule accordingly by going to bed early, or getting into a nap routine. Las siestas son mui importantes. Therefore, you should make every effort to arrive at your plot as close to sunrise as possible. It’s cooler at this time of day, the birds tend to be most active, and the bugs, well the bugs are a problem at any time of day.

Each visit should last around four hours or longer. If all things go well you should be back at one of the research stations by noon. Try to make evening visits similarly long, but make sure you stay late enough to hear EWPW and owls. The only thing that should keep you from visiting your sites are very windy conditions and rain. You can survey in light to moderate winds, depending on the plots, and drizzle. Just because it is windy at the Tip or BW doesn’t mean your plot will be windy – go check if you think there’s any chance you can fit in a survey. Do not survey in lightning. Available survey days will quickly disappear if you don’t take advantage of **every single one of the them** at the beginning. You should not survey the same plot two days in a row, but you can do a morning visit one day and an evening visit that same day, or the next.

***Knowing your plots***

You should get to know your plot as well, or better, than you know the census areas at each station, or your own backyard. Likewise, while in your plot you should know exactly where you are at all times with respect to the grid, or nearest marker, and which way is north. The plots are not that big so it doesn’t take long to learn your way around them – some are harder than others – TMSL, and WPWC. Take the time to get to know your plot and the birds on it – that’s kind of the whole point. **There is no excuse to not knowing where you are at all times.**

***Finding and using all survey stakes:***

Each plot has a 50mx50m grid within. Therefore every 50m in every direction, there should be a stake. Sometimes they are behind trees, or over a hill, fallen over, in water, covered in *Rubus*, but they are there. Mission one is to find and clearly flagging all survey stakes within your plot. You may want to visit each plot in pairs, or small groups the first time to help find and mark each stake. Each stake should be clearly marked with a black permanent marker, or black and white painted sign, with the grid location, eg. B12. That way with binoculars you can look at a stake and know exactly which one it is. Failing that, mark what stake it should be on the flagging tape.

On your very first visit to your plot, your mission, in additional to accurately documenting bird life in the plot, is to find, flag, fix, repair, or take an inventory of what will need to be repaired later. You cannot complete the surveys properly if you don’t know where each stake is.

***Water is no excuse to not access or properly survey a plot. It’s Long Point, you’re going to get wet. If you need or want waders, we can provide them.***

**IMPORTANT\*\*Vegetation Plots\*\*:**

It is important that bird observers **DO NOT** walk through the vegetation monitoring plots.  There are 20 3/4 inch metal rebar stakes marking the permanent vegetation sites in each plot.  From 10 of those sites, annual shrub counts and ground cover measurements are made and it is **important that these sites are not trampled** by birders before the ground vegetation sampling has been completed (in late June to mid July).  The sites for ground vegetation monitoring are 10 of the rebar stakes to which an original wooden post is clamped with hose clamps.  10 m north of those sampling stakes are 2 plastic rods (white PVC 1/2" plumbing pipe (sometimes just one; very occasionally one of the rods is metal).  The vegetation sampling is done by stretching a 10-m line from the rebar to the NW plastic rod and counting all shrub stems within a 1-m distance E of the line and estimating ground cover composition within a 1X1m nested at the north end of the line [a 1X1m square is placed over the two plastic pipes].

Our best advice to those working in the plots is that whenever you see a metal stake, ensure that you stay south of it.  Given the density of vegetation, checking your direction by compass/GPS (and finding your way to and back from some plots) is advisable.

It will also be helpful to the bird surveyors and to others (vegetation surveyors) if any rebar stake found is flagged with bright flagging tape, tied tightly around stake but with 2-3" of tail waving in the breeze.  Please carry PINK or RED flagging tape for this purpose.  If you wish to flag other things (nests, temporary tracks), PLEASE use a different colour (ORANGE OR YELLOW).

Others will be undertaking the first round of vegetation monitoring beginning in late May and will be flagging sampling stakes as they proceed through the plots.

***Survey protocol:***

Once you’re on the plot your entire purpose is to document **IN DETAIL**, the location, behaviour/activity, and movements of every bird within and around your plots. In order to do this properly, you need to know exactly where you are within the grid at all times.

***Mapping territories:***

The BBC is a simplified but effective form of territory mapping. The process should be summarized by an experienced individual in person prior to your own data collection. In general though, you’ll walk slowly around your plot while carrying a map. Each plot is laid out between a series of numbered stakes. When you hear or see a bird, mark its precise location on your map by noting which stakes you are standing between in the field. Make sure you look for breeding evidence: singing males, territorial chases, ***\*counter-singing between neighbouring males*\*,** sex, carrying food or fecal sacks, fledglings, and nests. Make note of all of these things on your datasheet. It’s good old fashioned bird-watching. There is no rush when you’re on a plot. Take your time and do your job properly. Get to know the birds, and spend time with them.

During every visit, visit each of the grid markers to ensure you’ve properly covered the plot. Don’t assume you’re OK, or that you’ve seen everything that there is to be seen. You’re trying to find as many nests, confirming breeding evidence, and defining territories as possible, so do your best to visit each grid point from as many different angles as possible. There are only so many ways that you can visit a plot, but try and rotate your routine. If you start on line A and work clockwise one day, start on line D the next and work counter clockwise the next. The plot will look different from different perspectives and you will encounter different bird life.

***Documenting activity:***

Every time you write a species down on your paper, there should be an activity or label associated with it – presence, singing male (circle), chipping (box), male, female, nest, etc. Aside from nests, COUNTER-SINGING MALES IS BY FAR THE MOST IMPORTANT DATA YOU SHOULD BE COLLECTING AND WRITING DOWN ON EVERY VISIT. Every daily data sheet should be absolutely covered in counter-singing males, and their respective movements. Remember that the whole point of this is to quantify how many territories of each species is present within the plot. This cannot be done without precise documentation of counter-singing birds. It is also important to document birds on the periphery of the plot because some birds will only have half, or a quarter of their territory in the plot, so knowing what and where things are around the plot will help us with interpreting the data later.

***Species at Risk:***

If you encounter any other species of note or interest, reptiles, amphibians, mammals, and plants, please document them as well as possible including coordinates and let the group know. iNaturalist is also a very easy way to track all of these additional sightings.

***Access:***

EVERYONE MUST carry a copy of the National Wildlife Area permit at all times. Keep it in your clipboard and never take it out. You may also wish to carry a digital copy on your phone just in case. Please do not get caught without a permit.

Each plot has some specific access points that will vary from year to year in some cases

**ATVs:** Strong south winds may make ATV’ing on the south shore impossible some days. In that case you can walk to your plots. Do not take the ATV into the water if you can avoid it. Water up to the foot rests is generally fine, water higher than that risks flooding the engine if you don’t know what you’re doing. Do not risk the ATV or your safety. You must wear a helmet when on an ATV or while riding in an ATV trailer – no exceptions. Passengers should only ride in the ATV trailer, not on the bike itself. There is never any reason to go over 30 kph when towing a trailer. Ride only along the water’s edge whenever possible, but don’t get stuck in the mud. The list of ATV considerations is too long to go into here but we will cover that more in detail in person. Just go slow, be safe and don’t risk yourself or the equipment. Always park the ATV on as high ground as possible and as far away from the water line as possible. DO NOT LOSE THE KEY!!! Make sure it has a big piece of flagging tape on it. ATV’s are not to be used on interior trails (Courtright, Squires, or Gravelly Bay Rd.).

***Weather:*** Make sure to collect weather data each day. It often gets forgotten.

***Ticks:***  You will encounter ticks every day! Please read up on tick first aid, identification and Lyme disease. You should be surprised when you DON’T get ticks, so look carefully for them. There is a very limited risk of contracting Lyme disease; if you are vigilant about tick checks and proper removal you will not get it. More information: <https://www.ontario.ca/page/lyme-disease> and <https://canlyme.com/lyme-basics/tick-id/>. Use insect repellent and wear long clothes while in the field. Tucking your pants into your socks or wearing rubber boots will reduce ticks climbing into your clothes. A strip of inside-out duct tape above or below your knee can also catch a lot of the pesky critters. It is your personal responsibility to keep yourself safe.

***Communication:*** Communication is critical. You must communicate to the group when you are leaving for your plot and when you are safely back at the Tip or BW. Please do not forget! We will also need regular updates on how many visits each of you has made to your plots. As always, we need to be the first to know if you find any rare birds. Do not post rare birds or significant wildlife sightings to eBird or OntBirds or to other public forums without checking first. We don’t want anyone illegally trying to visit the NWA to twitch some rarity or search for rare wildlife.

Never travel alone if you can avoid it.

***Equipment:*** Always take with you a compass, GPS with all the appropriate waypoints preloaded, maps of your sites, a permit, clipboard, datasheets, several pens or pencils, a whistle for safety, your phone (waterproofed), insect repellent, water, a snack, unscreen and all appropriate clothing. Lastly, take A LOT of water! Long Point is absolutely amazing, but it can also be hell.

**Daily checkilist:**

* WATER
* Compass
* GPS (ideally with points preloaded)
* Field book/ Clipboard and field sheets + extra sheets
* Pencil/Pen
* Binoculars
* Listening ears
* Observant nest-finding eyes
* Chest waders or rubber boots (if needed)
* Bug dope
* Sun screen and sunglasses
* Hat
* Phone/communication device

**Appendix 1 – Sample Data Sheets**

A piece of paper with writing on it

AI-generated content may be incorrect.  
  
  
  
  
  
  
A paper with writing on it

AI-generated content may be incorrect.  
  
  
  
A white paper with circles and numbers

AI-generated content may be incorrect.  
  
  
  
A drawing of circles and lines

AI-generated content may be incorrect.

# APPENDIX C: DATA MANAGEMENT & MANIPULATION

# Raw Data Manipulation

Author: Joshua K. Pickering

Date Initiated: 2025-01-29 | Last Updated: 2025-02-27

## Breeding Bird Territories

Breeding bird territoriy data of the Long Point Breeding Bird Census (LPBBC) project.

1. Original dataset “1965-2021 BBC Stats\_MSWB\_29 Mar\_ 2022.xlsx” is maintained as a Microsoft Excel file, saved in RProject file ‘Data\_Analysis.RProject’. Data was not manipulated but spreadsheet was subsequently copied and saved as a flat CSV file; “1965-2021 BBC Stats\_MSWB\_29 Mar\_ 2022.csv”.

Data manipulations in Microsoft Excel csv files are as follows:

1. Original data CSV file copied for manipulation in a new file to evaluate a subset of the data (i.e., 1991-2021), and is saved as a flat CSV file; “bird\_spterritories\_abund.csv”
2. Provide consistent text formatting that is font ‘Aptos’, size 11, not bolded.
3. A value ‘2906’ has been added to the line (i.e., Tamarack Slough | 1991 | 8.75 | Middle | 2017 | YSFL | + | 8 | 23.42 | M. Iles), that does not contain a value in the column “Orig Line” that subsequently follows 2905, and precedes 2908.
4. Data from 1965-1990 was removed from the dataset to accommodate research interests in data from 1991-2021, this included the removal of rows identified as 1-349 as noted in the column labelled “Orig Line”.
5. The column labelled “Stage” was also removed from the dataset due to limited research interest and potential for error in oversimplification of complex successional stage definitions (Bradstreet & Pickering, 2022).
6. Added new blank column for column “B” and labelled this column “sitecode”. Added all site codes as an identified in column “sitecode” for each site (e.g., identifier “BGGR” for site “Bluegrass – Milkweed Grassland”) for consistency and efficiency in data analyses from up-to-date sources (Bradstreet & Pickering, 2022; Pickering et al., 2024). Subsequently removed column ‘C’ labelled as “Full Site Name” to limit confusion and remove long format site names.
7. Update of all site sizes according to new measurements (Bradstreet & Pickering, 2022; Pickering et al., 2024), in column ‘D’, labelled “Area (ha) in year”. Subsequently relabelled this column ‘D’ as “sitesize\_ha”
8. Rename column ‘E’ from “Year” to lowercase ‘y’ as “year” for consistency of column labels.
9. Rename column ‘F’ from “Species” to lowercase ‘s’ as “species” for consistency of column labels.
10. Add new column ‘G’ and label as “speciescode”. Subsequently update speciescode column with contemporary 4-letter species codes for bird species (e.g., HOWR, House Wren, is now NHWR, Northern House Wren) and remove column ‘F’ labelled as “species” but keep column labelled “speciescode”, which becomes the new column ‘F’.
11. Rename column ‘G’ from “# Territories” to lowercase ‘t’ and remove ‘#’ to result in the column labelled as “territories” for consistency of column labels.
12. Replace all values ‘+’ in column ‘G’ labelled as “territories” to reflect the value associated with a rare territory as ‘0.25’ (Bradstreet et al., 1991). There was 76 replacements within the dataset.
13. Increase the number of decimals for column ‘G’, labelled as “territories” to 2 decimal places to include all integer values appropriate for data analyses.
14. Created new column ‘A’ and label as “uniqueID”. Populate column with a unique sample id using formula “=F2&"\_"&C2&"\_"&G2” to create a standard identifier that has year, site code (4-letter), and species code (e.g. 1991\_BGGR\_TRES).
15. Subsequently remove column ‘B’ labelled as “Orig Line” to limit confusion and remove a duplication of a unique row identifier.
16. Remove column ‘C’ labelled as “Year at size”, as not necessary for data analyses.
17. Remove columns ‘G’, ‘H’, ‘I’, ‘J’, ‘K’, ‘L’, ‘M’, ‘N’, and ‘O’, labelled as “Number of visits”, “Census hours”, “Author1”, “Author2”, “Author3”, “Author4”, “Author5”, “Author6”, and “Notes” to reduce unnecessary meta data for data analyses.
18. Column headers are as follows:

Column A - uniqueID

Column B - speciescode

Column C - year

Column D - sitesize\_ha

Column E - sitecode

Column F - territories

To conduct analyses with entire presence/absence data, complete autofill of zeros for all 100 species observed over time within the LPBBC dataset for all sites during sampled years. New dataset is maintained as CSV file, saved as “bird\_spterritories\_presabs.csv”.

1. Column headers are as follows:

Column A - uniqueID

Column B - speciescode

Column C - year

Column D - sitecode

Column E - territories

Populate a supporting file with relevant information into a species characteristics description file, saved as “bird\_spcharacteristics.csv”.

Column A - sp\_common\_name\_uppercase\_IBP

Column B - sp\_scientific\_name\_IBP

Column C - 2024\_species\_4code\_IBP

Column D - 2024\_species\_6code\_IBP

Column E - 2021\_species\_4code\_LPBBC

Column F - BOTW\_reference

Column G - sp\_weight\_g

Column H - weight\_reference

Column I - habitat\_guild\_BOTW

Column J - food\_item\_BOTW

Column K - nest\_guild\_BOTW

Column L - forage\_behavior\_BOTW

Column M - conservation\_status\_BOTW

Column N - food\_foraging\_guild\_degraaf

Column O - habitat\_foraging\_guild\_degraaf

Column P - behaviour\_foraging\_guild\_degraaf

Column Q - sp\_common\_name\_uppercase\_NHIC

Column R - sp\_scientific\_name\_NHIC

Column S - sp\_common\_name\_lowercase\_NHIC

Column T - sp\_common\_name\_noun\_NHIC

Column U - sp\_common\_name\_sentence\_NHIC

Column V - sp\_author\_NHIC

Column W - sp\_french\_name\_NHIC

Column X - sp\_common\_name\_AOS

Column Y - sp\_french\_name\_AOS

Column Z - sp\_order\_AOS

Column AA - sp\_family\_AOS

Column AB - sp\_subfamily\_name\_AOS

Column AC - sp\_genus\_AOS

Column AD - sp\_scientific\_name\_AOS

Column AE - status\_introduced\_AOS

Column AF - sp\_common\_name\_PFN

Column AG - sp\_Ojibwe\_name\_PFN

Column AH - sp\_name\_meaning\_PFN

Column AI - sp\_latin\_name\_PFN

Column AJ - Breeding.Biome

Column AK - Winter.Biome

Column AL - Family

Column AM - bird.group

Column AN - Migrate

Column AO - AI

Column AP - native

Column AQ - popest

Column AR - popestlci

Column AS - popestuci

Column AT - first\_year\_popest

Column AU - last\_year\_popest

Column AV - Pop.source

Column AW - Trajectory\_data\_source

Column AX - Trajectory\_firstyear

Column AY - Trajectory\_lastyear

Column AZ - Loss\_med

Column BA - Loss\_lci

Column BB - Loss\_uci

Column BC - Loss\_lqrt

Column BD - Loss\_uqrt

Column BE - PopUsCa

Column BF - PopLC95

Column BG - PopUC95

Column BH - TimeAdj.meanlog

Column BI - TimeAdj.sdlog

Column BJ - Distance Adj.

Column BK - Pair Adj.

Supporting information files are identified and referenced as follows:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Original file name | File type | Description | Reference | Revised file name |
| aaw1313\_data\_s1 | xlsx | Supplementary material for bird species descriptions and continental trends from Rosenberg et al. (2019). | Rosenberg, K. V., Dokter, A. M., Blancher, P. J., Sauer, J. R., Smith, A. C., Smith, P. A., Stanton, J. C., Panjabi, A., Helft, L., Parr, M., & Marra, P. P. (2019). Decline of the North American avifauna. Science, 366(6461), 120–124. <https://doi.org/10.1126/science.aaw1313> | RegionalBirdPopulations\_Rosenberg et al\_2019 |
| BBC BIRDS\_Characteristics\_BI | xlsx |  | Long Point Bird Observatory, 2022 | LocalBirdCharacteristics\_LPBO\_2022 |
| NACC\_list\_species | csv |  | Chesser, R. T., S. M. Billerman, K. J. Burns, C. Cicero, J. L. Dunn, B. E. Hernández-Baños, R. A. Jiménez, Oscar Johnson, A. W. Kratter, N. A. Mason, P. C. Rasmussen, and J. V. Remsen, Jr. 2024. Check-list of North American Birds (online). American Ornithological Society. <https://checklist.americanornithology.org/taxa/> | NorthAmericanBirdSpeciesList\_AOS\_2024 |
| Ontario\_Species\_list | xlsx |  | Natural Heritage Information Center (NHIC). (2024, November 26). Ontario Species list. Ministry of Natural Resources. <https://www.ontario.ca/page/get-natural-heritage-information> | OntarioBirdSpeciesList\_NHIC\_2024 |
|  |  |  |  |  |

Data manipulations in R script files are as follows:

To conduct analyses related to community composition regarding species foraging and nesting guilds, join reference files to territory data files.

## Woody Stem Counts

Woody stem data of the Long Point Breeding Bird Census (LPBBC) project.

1. Original dataset “Appendix\_3\_Woody\_Stems\_Dataset\_1991-2021\_Long\_Point\_Vegetation\_Monitoring\_March\_2022.xlsx” is maintained as a Microsoft Excel file, saved as an RProject file ‘phd\_longpoint\_breedingbirds’. Data was not manipulated but spreadsheet was subsequently copied and saved as a flat CSV file; “1965-2021 BBC Stats\_MSWB\_29 Mar\_ 2022.csv”.

Data manipulations in the Microsoft Excel csv file are as follows:

1. Original data CSV file copied for manipulation in a new file to evaluate a subset of the data (i.e., 1991-2021), and is saved as a flat CSV file; “bird\_spterritories\_abund.csv”
2. Provide consistent text formatting that is font ‘Aptos’, size 11, not bolded.
3. Columns A, B, C & D, labelled “Timeline\_line” “Stage\_code”, “Stage\_name”, “Group\_name” were removed from the dataset due to limited research interest and potential for error in oversimplification of complex successional stage definitions (Bradstreet & Pickering, 2022).
4. Renamed new column ‘A’ without uppercase letters or special characters to “sitecode”. Subsequently removed column ‘B’ labelled as “Site\_name” to limit confusion and remove long format site names.
5. Columns C, D, F, G & H, labelled “Site\_codexPost”, “Date”, “Year”, “Month”, “Day”, “YearXSite\_codeXPost” were removed to not duplicate sample identifiers.
6. Column ‘C’, labelled “Year” was shifted two columns left to represent column ‘A’ and follow prior data layouts for breeding bird territory data.
7. New column ‘C’ labelled “Post” was renamed with all lowercase letters; “post”.
8. Column ‘D’ labelled “Species\_code” was renamed “species\_7code\_NHIC” to follow naming format as used for breeding bird territory data.
9. Created new column ‘A’ and label as “veg\_uniqueID” and populate column with a unique sample id using formula “=F2&"\_"&C2&"\_"&G2” to create a standard identifier that has 4 components; year, site code (4-letter), post, and species code (7-letter). Example is: 1991\_BGGR\_D11\_PRUVIRG).
10. Remove columns ‘K’, ‘L’, ‘M’, & ‘N’, that are labelled; “S-VT\_stemcount”, “Belowbrowse\_stemcount”, “Abovebrowse\_stemcount”, and “S-Sapling\_stemcount
11. Rename columns ‘F’, ‘G’, ‘H’, ‘I’, & ‘J’, that are labelled “Small\_stemcount”, “Medium\_stemcountTall\_stemcount”, “VeryTall\_stemcount”, and “Sapling\_stemcount” to “s\_wdystemcount”, “m\_wdystemcount”, “t\_wdystemcount”, “vt\_wdystemcount”, and “sap\_wdystemcount”, respectively.
12. Rename columns ‘K’ & ‘L’, labelled as “DBH\_measured\_sapling\_m”, and “Height\_calculated\_sapling\_m”, to “sap\_dbh\_m”, and “sap\_height\_m”
13. Remove columns ‘M’, ‘N’, ‘O’, ‘P’, ‘Q’, ‘R’, ‘S’, ‘T’, & ‘U’, that are labelled; “Small\_IRV\_m³”, “Medium\_IRV\_m³”, “Tall\_IRV\_m³”, “VeryTall\_IRV\_m³”, “Sapling\_IRV\_m³”, “S-VT\_IRV\_m³”, “Below\_browse\_IRV”, “Abovebrowse\_IRV\_m³”, and “S-Sapling\_IRV\_\_m³”.
14. Delete all descriptive species characteristics columns ‘M’, ‘N’, ‘O’, ‘P’, ‘Q’, ‘R’, ‘S’, ‘T’, ‘U’, ‘V’, ‘W’, ‘X’, ‘Y’, ‘Z’, ‘AA’, ‘AB’, … ‘BG’ that are labelled as “Species\_scientific”, “Exotic/Native\_status”, “Identified\_synonyms”, “SPECIES\_ELEMENT\_ID ELCODE”, “Species\_scientific”, “AUTHOR”, “ENGLISH\_COMMON\_NAME”, “SUBNATIONAL\_SYNONYMS”, “SUB\_OTHER\_COM\_NAME\_ALL PROVINCIALLY\_TRACKED”, “S\_RANK”, “COSEWIC\_STATUS”, “SARA\_STATUS”, “N\_RANK”, “EXOTIC\_STATUS”, “RESTRICTED\_SPECIES”, “TAXON\_GROUP\_HIGHER”, “TAXON\_GROUP\_LOWER”, “KINGDOM”, “PHYLUM”, “CLASS”, “ORDER”, “FAMILY”, “GENUS”, “S\_RANK\_CHANGE\_DATE”, “S\_RANK\_REVIEW\_DATE”, “S\_RANK\_REASONS”, “SUBNATIONAL\_TAXONOMY\_COMMENTS”, “DISTRIBUTION\_COMMENTS”, “EO\_TRACKING\_COMMENTS”, “COEFF\_CONSERVATISM”, “COEFF\_WETNESS”, “ELEMENT\_GLOBAL\_ID”, “GLOBAL\_SCIENTIFIC\_NAME”, “GNAME\_REF”, “NAME\_IN\_CONCEPT\_REF”, “CONCEPT\_REF\_CODE”, “GLOBAL\_SYNONYMS”, “GLOBAL\_ENGL\_NAME”, “GLOB\_OTHER\_COM\_NAME\_ALL”, “ELEMENT\_NATIONAL\_ID”, “NATIONAL\_SCIENTIFIC\_NAME NATIONAL\_SYNONYMS”, “NATIONAL\_ENGL\_NAME”, and “NATL\_OTHER\_COM\_NAME\_ALL”.
15. Populate all BLANK data with zeros, totalled 10,762 replacements for data in columns ‘F’, ‘G’, ‘H’, ‘I’, ‘J’, ‘K’, and ‘L’, labelled as “s\_wdystemcount”, “m\_wdystemcount”, “t\_wdystemcount”, “vt\_wdystemcount”, “sap\_wdystemcount”, “sap\_dbh\_m”, and “sap\_height\_m”.
16. Sum small, medium, and tall stem counts for all samples and label column “within\_browse”.
17. Sum very tall and sapling stem counts for all samples and label column “above\_browse”.
18. Column headers are as follows:

Column A - veg\_uniqueID

Column B - year

Column C - sitecode

Column D - post

Column E - species\_7code\_NHIC

Column F - s\_wdystemcount

Column G - m\_wdystemcount

Column H - t\_wdystemcount

Column I - vt\_wdystemcount

Column J - sap\_wdystemcount

Column K - sap\_dbh\_m

Column L - sap\_height\_m

Column M - within\_browse

Column N - above\_browse

Supporting information files are identified and referenced as follows:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Original file name | File type | Description | Reference | Revised file name |
| aaw1313\_data\_s1 | xlsx | Supplementary material for bird species descriptions and continental trends from Rosenberg et al. (2019). | Rosenberg, K. V., Dokter, A. M., Blancher, P. J., Sauer, J. R., Smith, A. C., Smith, P. A., Stanton, J. C., Panjabi, A., Helft, L., Parr, M., & Marra, P. P. (2019). Decline of the North American avifauna. Science, 366(6461), 120–124. <https://doi.org/10.1126/science.aaw1313> | RegionalBirdPopulations\_Rosenberg et al\_2019 |
| BBC BIRDS\_Characteristics\_BI | xlsx |  | Long Point Bird Observatory, 2022 | LocalBirdCharacteristics\_LPBO\_2022 |
| NACC\_list\_species | csv |  | Chesser, R. T., S. M. Billerman, K. J. Burns, C. Cicero, J. L. Dunn, B. E. Hernández-Baños, R. A. Jiménez, Oscar Johnson, A. W. Kratter, N. A. Mason, P. C. Rasmussen, and J. V. Remsen, Jr. 2024. Check-list of North American Birds (online). American Ornithological Society. <https://checklist.americanornithology.org/taxa/> | NorthAmericanBirdSpeciesList\_AOS\_2024 |
| Ontario\_Species\_list | xlsx |  | Natural Heritage Information Center (NHIC). (2024, November 26). Ontario Species list. Ministry of Natural Resources. <https://www.ontario.ca/page/get-natural-heritage-information> | OntarioBirdSpeciesList\_NHIC\_2024 |
|  |  |  |  |  |

# APPENDIX D: INDIGENOUS KNOWLEDGE ENGAGEMENT AND CONSIDERATIONS

**Indigenous Engagement & Language**

**Context**

As a non-indigenous Canadian, and natural scientist working primarily in southern Ontario, Canada, I respectfully seek to engage with and develop an understanding of true reconciliation without pursuing self-serving outcomes or putting burden on Indigenous people and their communities. Furthermore, I find it important to acknowledge that feelings of personal discomfort, shame, and guilt are expected, and are often necessary for non-indigenous people taking part in reconciliation (Louie, 2024). Personal guilt or shame may also arise because non-indigenous people are often representatives of ongoing colonial legacies, including those of post-secondary institutions (Louie, 2024). Still, we must avoid misguided efforts to renew our own settler image in reconciliation and instead seek to implement actions of de-colonization in our work (Tuck & Yang, 2012). The pathway from awareness to action during reconciliation should seek to decolonize the work of natural scientists by advocating for Indigenous people. We must share and sometimes relinquish our power and singular Euro-Western voice by promoting diverse voices, perspectives and knowledge sharing activities (Louie, 2024).

In grappling with my own role in reconciliation in recent years I have found myself developing a foundation of knowledge and awareness about Indigenous people through the review of contemporary literature by Louie (2024), Wong et al. (2020), Tuck & Yang (2012) and others, as well as through the examination of seminal reports by the Truth and Reconciliation Commission of Canada (2015), The Royal Commission on Aboriginal Peoples (1996), and Volumes 1a and 1b from the National Inquiry into Missing and Murdered Indigenous Women and Girls (2019). I am also aware that the processes of learning, personal reflection, and recognition of the systems that continue to oppress Indigenous people must be undertaken without colonizing the process of reconciliation itself through appropriation, symbolic tokenism, or expected validation (Wong et al., 2020). My own understanding of Indigenous peoples’ experiences throughout Canada has occurred formally through Indigenous awareness training, research conferences, and Indigenous-led tours of culturally significant artifacts, places, and governance structures. I also recognize that I have participated in many informal engagement opportunities with Indigenous owned companies and collaborative programs promoting Indigenous perspectives in film, music, podcasts, art, and knowledge sharing activities in my daily life.

**Indigenous Languages**

The 10 calls to action to natural scientists working in Canada identified by Wong et al. (2020) are critical for research to engage with reconciliation, yet for my research project, the importance of language and place names, highlighted in Call 6, is of great interest. Language is one of the most important means of sharing cultural practices and maintain learning across generations and in the future (Assembly of First Nations, 2019). Even more so, the meaning of place names and shared knowledge is intertwined with Indigenous peoples’ experience and cannot be disconnected from the meaning of those names that have been passed down through generations of Indigenous knowledge holders (Assembly of First Nations, 2019). Natural scientists may be involved in a broad and diverse landscape of careers, organizations, and formalities in Canada, but can find common ground in enacting what Wong et al. (2020) calls the “new social contract that includes the building blocks of reconciliation into the research process” (p. 780). The role of natural scientists to decentralize Eurocentric and western knowledge by including the worldviews and perspectives of Indigenous people can undoubtedly take shape through the use of Indigenous languages in research, but only “in the correct context and with permission” (Wong et al., 2020, p. 777). Likewise, the greatest concern for this action is the continued colonization and extraction of cultural knowledge and beliefs without benefit to Indigenous people, which can be described as even “more insidious when compared to overt practices of earlier generations” (Louie, 2024, p. 474-475). In this regard, I have sought out knowledge of Indigenous place names and reported species names (and their meanings) for the study area my research takes place in within southern Ontario but have found the process difficult to navigate.

**Action**

In support of taking action beyond education, I found that the knowledge shared through personal experiences as well as interpretation of the *94 Calls to Action* (Truth and Reconciliation Commission of Canada, 2015) by Wong et al. (2020) provides both an important context of the role of natural scientists as well as tangible goals for related work. In my efforts to recognize both the contemporary and historic context of Indigenous peoples’ experience in southern Ontario specifically, I have engaged with and supported cultural learning and events of two local First Nation groups; the Mississaugas of the Credit First Nation (MCFN), and the Six Nations of the Grand River. The traditional language of the MCFN is Ojibwe (Anishinaabemowin) and the Haudenosaunee people of the Six Nations of the Grand River are working to revitalize the six similar Iroquoian (Ogwehoweh) languages they speak; Cayuga, Onondaga, Mohawk, Oneida, Seneca, and Tuscarora (Groat, 2020). Still, the continued decline of the number of Indigenous people that speak their traditional language as their first language has created notable gaps in all identified Indigenous languages in Canada, with all 78 Indigenous languages reported as at risk (Norris, 2010).

Few resources are available online for identifying both the meaning and translation of place names and species names in many Indigenous languages, with fewer sources for those names in Ojibwe. Locally, notable contributions to the regional knowledge of Anishanabee bird names in Anishinaabemowin (Ojibwe language) have been gathered and curated for Ontario by Joseph Pitawanakwat and his organization Creator’s Garden, in a collaborative citizen science based project that partnered with Birds Canada to build up Indigenous bird knowledges in the province (Creator’s Garden, n.d.). This representation of Indigenous languages within scholarly research is greatly limited, especially when considering that the proportion of non-Indigenous people in Canada that have a graduate STEM degree is ten times more than that of an Indigenous person (Wong et al., 2020). If deemed appropriate and acceptable by representatives of the MCFN, it is a key goal of my research to include representative species names and meanings of birds in an effort to share promote the use of the Ojibwe language.

**References**

Assembly of First Nations. (2019). *A Guide to An Act respecting Indigenous languages: A Tool for First Nations Language Revitalization 2019 - 2020*. <https://www.afn.ca/wp-content/uploads/2019/08/Respecting_Languages_Report_ENG.pdf>

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Norris, M. J. (2010). Canada and Greenland. In C. Moseley (Ed.), *Atlas of the World’s Languages in Danger* (3rd ed, pp 113-121). UNESCO.

Truth and Reconciliation Commission of Canada (2015). *94 Calls to Action*. <https://ehprnh2mwo3.exactdn.com/wp-content/uploads/2021/01/Calls_to_Action_English2.pdf>

Wong, C., Ballegooyen, K., Ignace, L., Johnson, M. J. (Gùdia), & Swanson, H. (2020). Towards reconciliation: 10 Calls to Action to natural scientists working in Canada. *FACETS*, *5*(1), 769–783. <https://doi.org/10.1139/facets-2020-0005>