## Boreal Ecosystem Recovery and Assessment (BERA)

## Project Outline

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| Using spatial *N*-mixture models to relate bird abundance data from acoustic recorders to remote-sensed forest structure data | |
| Lead | Name and affiliation of person primarily responsible: Lionel Leston [BERA, Bioacoustic Unit, University of Alberta] |
| Collaborators | * Gustavo Lopez Quieroz [BERA, University of Calgary] * Mustafizur Rahman [BERA, University of Calgary] * Silvia Alejandra Losada [BERA, University of Calgary] * Erin Bayne [BERA, Bioacoustic Unit, University of Alberta] * Julia Linke [BERA, University of Calgary] |
| Data Requirements | * Avian point count data (provided by the Bioacoustic Unit) * Coarse-scale habitat and footprint data (provided by the Alberta Biodiversity Monitoring Institute) * r.s. Coarse woody debris data (provided by Gustavo Lopez Quieroz [BERA, University of Calgary]) * r.s. Snag data (provided by Mustafizur Rahman [BERA, University of Calgary]) * r.s. Shrub structural (and floristic?) data (provided by Silvia Alejandra Losada [BERA, University of Calgary]) |
| Project Dependencies & Contingency Plans | **Dependencies**:   * Transcription of remaining recordings from Kirby Grid (16 stations) * Habitat and human footprint for Kirby Grid (to be digitized by ABMI) * Remote-sensing layers provided by Gustavo, Mustafiz, and Silvia (Coarse woody debris layer already available, snag data assumed to be ready, awaiting completion of shrub layer(s)   **Contingency Plans**:   * Alternate coarse layers available as rasters (Beaudoin layer) or with permission from Al-Pac, possibly Al-Pac AVI layer from 2016 * Base analyses just on the already transcribed station data (84 stations) * Fine-scale remote-sensing layer alternatives (TBD) |
| Deliverables | * Bulleted list naming deliverables, forms of communication, and due dates: * Model results for 20 species of birds in different guilds (Dec 2019) * Interim report (Dec 2019) * Final report (May 2020) * Published paper (2020-2021) |
| Status | Start date: September 2019  Status: ongoing  Scheduled completion: May 2020 |

## Overview:

Introduction: Energy sector development is increasing at a rapid rate in Alberta’s boreal forests, and there is a large, disproportionate increase in the cumulative length of linear footprint associated with this development, particularly seismic lines. The impact of seismic lines on mammalian species like wolves and woodland caribou is well known, but is less known for other components of boreal forest communities. Regeneration of forests along defunct seismic lines is a priority for reducing negative impacts of energy sector footprint on caribou. We are interested in knowing how boreal birds respond to restoration efforts related to this forest regeneration.

Objectives: To model how abundance of boreal birds (~20 species) varies with fine-scale vegetation structure associated with boreal forest regeneration along/adjacent to energy sector footprint like 2d and 3d seismic lines. We predict that models incorporating additional fine-scale data collected by drones and planes (e.g. coarse woody debris, snags, shrub density) will improve prediction of bird abundance or occupancy relative to models without fine-scale data.

## Study Site(s):

The “Kirby” grid ~45 minutes north of Calling Lake (UTMs: 489525-494943, 6131568-6136993). If similar coarse-scale and fine-scale remote-sensed data are available alongside point count data outside of the Kirby grid in Alberta’s boreal forest region, then a larger study area might be considered.



## Strategy:

September (Received bird data from 84 stations at Kirby grid; coarse woody debris layer)

October (Develop initial model scripts; obtain snag data layer)

November-December (receive remaining remote-sensed layers?)

January-March (initial results obtained; add additional point count data from Kirby grid as recordings are transcribed)

May (final report)

## Storyline:

Boreal forest bird communities are difficult to monitor effectively because much of their habitat is not easily accessible, especially since multiple visits to each survey point are necessary to accurately quantify bird abundance or occupancy as well as habitat features influencing abundance or occupancy. However, quantification of bird and habitat data in remote areas can be achieved efficiently for large numbers of sites by a combination of 1) remote sensing with drones or planes to collect fine-scale habitat data, and 2) use of programmable acoustic recorders or autonomous recording units to collect bird data over multiple recordings in place of human visits. Newer analysis techniques like N-mixture or occupancy models are then well-suited for estimating true abundance or occupancy of bird species at sites from multiple recorded visits while accounting for detection probability of each species on different visits due to weather, time of season and day, and environmental noise.