Delta Farmland Bat Survey

Connor Hawey

June - July 2023

Photo 1: An audio recorder deployed for bat monitoring in a grassland set-aside, June 2023

Program background

In British Columbia, bats provide an important role in forest, grassland, and agricultural ecosystems. There is a wide diversity of bats across the province and the number of species is greatest in regions at low latitudes and low elevations, such as the lower Fraser River delta (Lausen et al. 2022). There are nine bat species expected to occur within the Fraser River delta. Of these nine, three species are listed as endangered, two are blue-listed in BC, and four are considered secure.

Bats face multiple threats across British Columbia and Canada which are contributing to population declines. White-Nose Syndrome is a deadly disease that has been rapidly spreading throughout bat populations across North America. Although it has not been detected in our region, it has been discovered in bats in the interior of BC and in western Washington. Additional threats to bats include impacts from wind energy, predation from cats, and habitat loss.

Loss of habitat is a main driver of conservation concern shared by bats and other local species-at-risk, including Barn Owls, Barn Swallows, and Great Blue Herons. Habitat loss is a multi-faceted issue referring to loss of areas for breeding, foraging, roosting, and migration.

The Delta Farmland and Wildlife Trust (DFWT) cooperates with farmers in the Fraser River delta by entering into stewardship agreements which create habitat to support species-at-risk. Stewardship agreements include Grassland Set-asides (GLSAs), which are fields that are temporarily removed from agricultural production and planted with a grass for up to four years. Hedgerows are planted along field perimeters and include native trees and shrubs. Following the establishment of these agreements, we conduct research and monitoring to evaluate the impacts of these programs and to determine how well utilized these habitats are by species-at-risk.

The aim of this study was to monitor GLSAs and hedgerows to determine which bat species were present in these habitats. Our goal was to establish baseline data of species presence which can be used to inform future research This is especially important because bat surveys have not previously been conducted by DFWT and very little is known about local bats (Murray 2006).

Methods

Survey methodology was adapted from standardized protocols established by the North American Bat Monitoring Program (NABat) (Loeb et al. 2015). NABat is a continent-wide multi-year research and monitoring effort which collects data from many collaborators to assess population status and trends. Although we did not submit our data to NABat from this study, we appreciate the establishment of consistent and standardized protocols and hope to contribute data in future years. Within the monitoring framework of NABat, we performed both mobile acoustic surveys to survey farmland throughout Delta and stationary point acoustic surveys within GLSAs and hedgerows.

Stationary point acoustic surveys were conducted at 12 grassland set-aside fields and 2 hedgerows in Delta, BC. We deployed AudioMoth 1.2.0 autonomous recording units (ARUs), which are recorders that can passively record audio between 8 and 384 kHz (Hill et al. 2018). AudioMoths were programmed according to a preset configuration file which followed NABat recommended settings (NABat 2023). Sample rate was set to 250 kHz, gain was set to medium, the recording window was set from 19:30 to 5:30, and amplitude-based triggered recordings were set for 2 seconds at frequencies above 16 kHz.

AudioMoths were mounted on a t-post to a height of 1.5m and >100m from the field edge within grassland set-asides and >10m from large sources of clutter (i.e. trees) in hedgerows. The recorders were equipped with three 2,800 mAh rechargeable AA batteries and a SanDisk 128GB SD card. They were heat-sealed within waterproof vacuum bags alongside a 5g pack of desiccant and attached with zip ties to a steel t-post to a height of 1.5m (Rhinehart 2021). Batteries and SD cards were changed every 10 days on times outside of the recording window.

June 1 to July 15 is a period of high bat activity prior to the young becoming volant (Loeb et al. 2015). To maximize the likelihood of detecting local species, we deployed AudioMoths throughout this entire period. Although NABat protocols suggest recording for bat activity for a selection of this window, we were interested in gathering as much information as possible for our baseline surveys.

Mobile acoustic surveys were conducted between July 4 – July 13 within three 10 x 10 km grid cells in the lower Fraser River delta. The grid cells are established by NABat and encompass Canada, the United States and Mexico. Cell 'Ladner' (CA90170) encompassed Westham Island and Ladner, cell 'Tsawwassen' (CA24634) encompassed Tsawwassen, and cell 'Boundary Bay' (CA204858) encompassed portions of east Delta near Boundary Bay.

Mobile acoustic transect surveys are completed in a vehicle travelling at a consistent speed of 32km/h with minimal stopping for between 25-48 km without crossing back on previous paths taken (Loeb et al. 2015). The 'Tsawwassen' route was 30 km long (*Figure 4)* and the 'Ladner' route was 29 km long (*Figure 5*). It was not possible to construct a route which was at least 25 km and did not cross back on itself for the 'Boundary Bay' grid cell, so a 35 km route (*Figure 6)* which did cross back on itself was chosen. As a result, this route was not compliant with standard NABat protocols.

Two surveys were conducted per cell with the second survey occurring no more than 4 days after the first survey. Surveys started 45 minutes after local sunset and continued until the route was completed. Surveys were not completed if there was precipitation or winds above 10 km/h.

We recorded bats using an Echo Meter Touch 2 Pro ultrasonic recorder (Wildlife Acoustics, www.wildlifeacoustics.com). The recorder was attached to the roof of the car above the passenger's side window using a suction cup and pointed towards the back of the car. A USB-C cable was used to connect the recorder to a tablet running Echo Meter Touch application firmware version 2.2.7 and was controlled by the passenger of the car. The Echo Meter Touch application was configured to detect bats specific to British Columbia and all system settings were set to default.

Bat recordings taken during both the stationary point and mobile acoustic surveys were analyzed initially using the automatic identification function of the Kaleidoscope Pro 5.6.3 software (Wildlife Acoustics, www.wildlifeacoustics.com) and followed up with manual verification (Lausen et al. 2022).

Results and Discussion

A total of 6 species were observed across 12 GLSAs, 2 hedgerows, and 3 mobile acoustic survey transect routes. Final verification of species presence by an experienced bat biologist is still required as a last step of bat identification based on spectrogram recordings (Lausen et al. 2022).

The 6 species tentatively detected in descending order of frequency are Little Brown Myotis, Hoary Bat, Silver-haired Bat, Yuma Myotis, California Myotis, and Big Brown Bat. Potential species to occur in the area which were not detected include Townsend's Long-eared Bat, Long-eared Myotis, and Long-legged Bat.

Little Brown Myotis was detected in every GLSA, hedgerow, and mobile acoustic survey route. Hoary Bats and Silver-haired Bats were each detected at 11 out of 12 grassland set-asides, 2 of 2 hedgerows, and 3 of 3 mobile acoustic survey routes.

GLSAs recorded an average 4.4 species present (range: 2-6) and hedgerows recorded an average of 4.5 species present (range: 4-5). The 'Tsawwassen' mobile acoustic survey route recorded 6 species present, 'Ladner' recorded 5 species and 'Boundary Bay' recorded 3 species.

Little Brown Myotis is classified as endangered, and the statuses of Hoary Bat and Silver-haired Bats are under final review by COSEWIC (Lausen et al. 2022). Results from our monitoring indicate that GLSA and hedgerow habitats are regularly being utilized by all three of these species of concern. With this baseline data established, we can establish research questions for future years to assess the habitat use of bats in our area.

Works cited

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Appendix

Sample Spectrograms

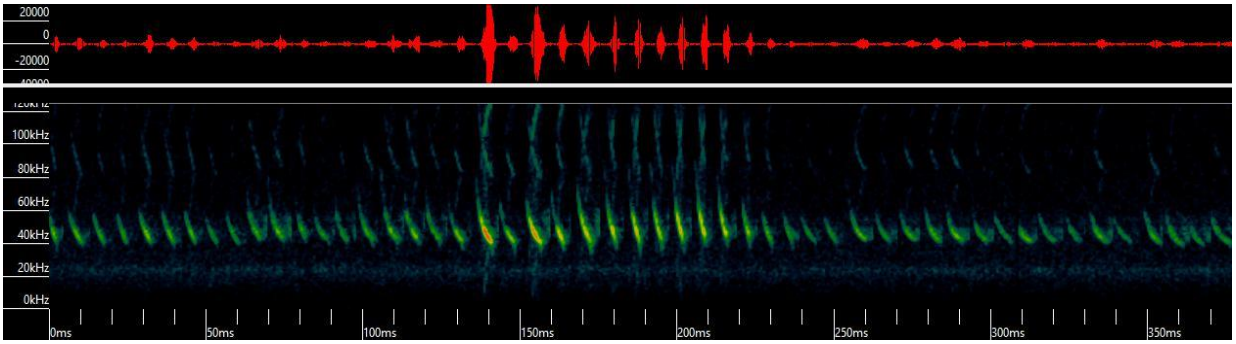

Figure 1: Little Brown Myotis

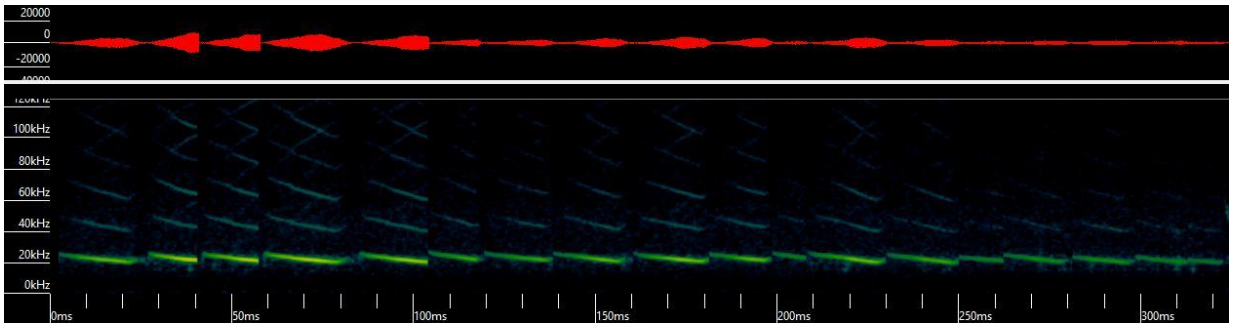

Figure 2: Hoary Bat

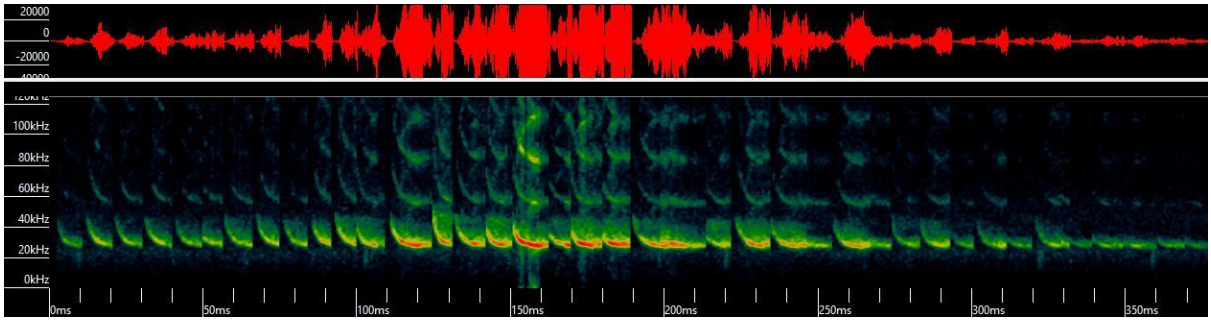

Figure 3: Silver-haired Bat

Survey routes

Figure 4: 'Tsawwassen' mobile acoustic survey route

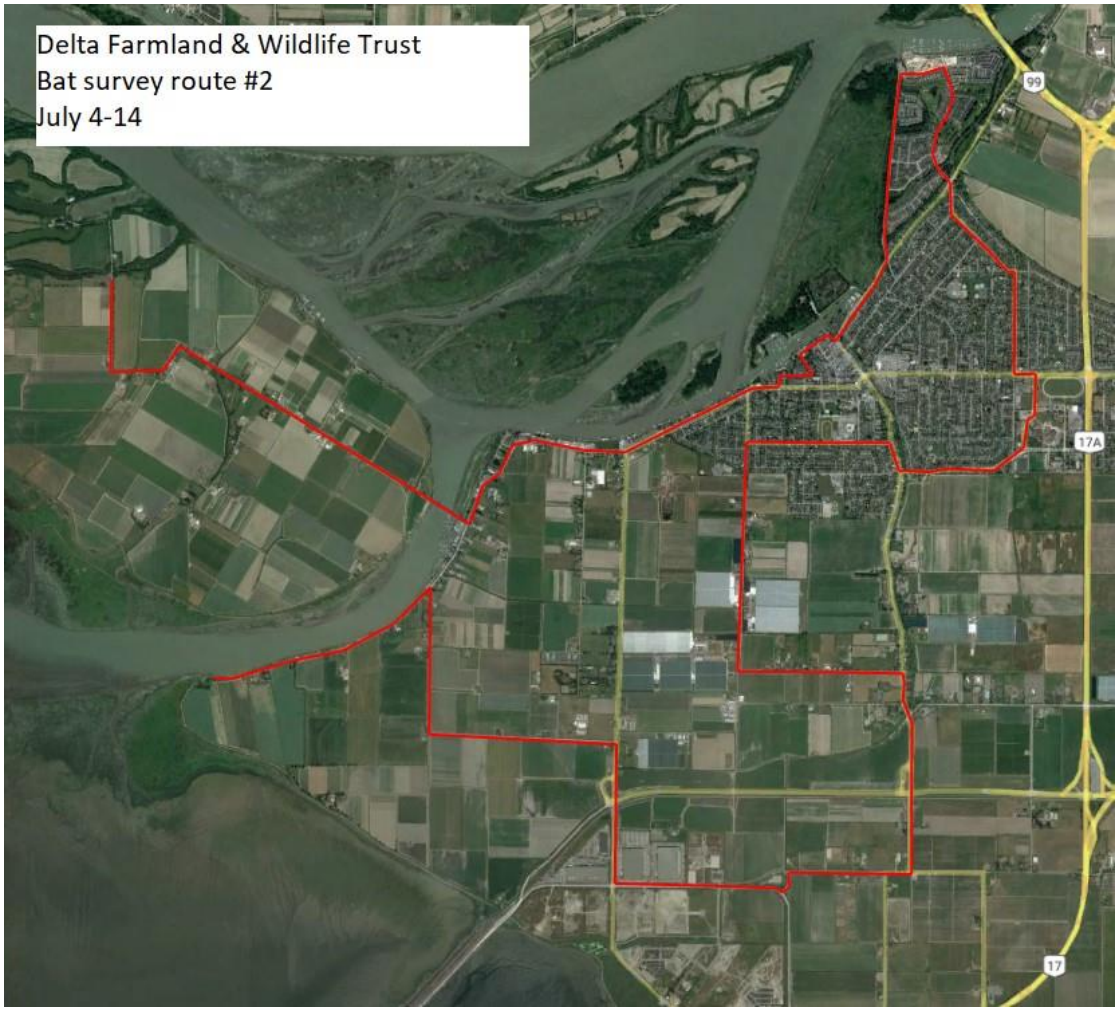

Figure 5: 'Ladner' mobile acoustic survey route

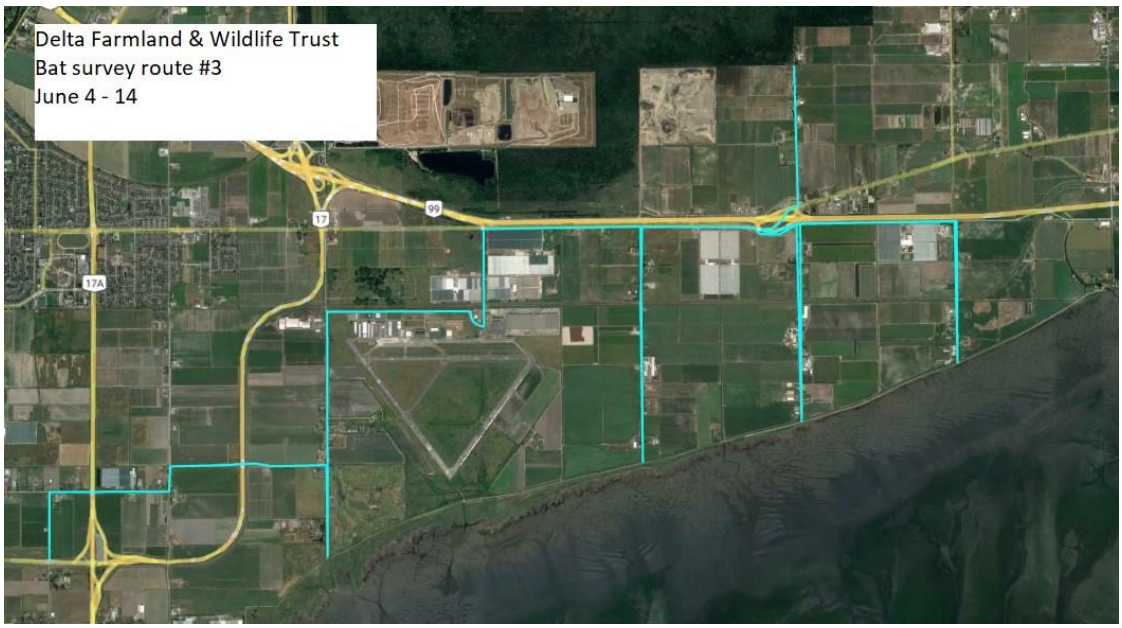

Figure 6: 'Boundary Bay' mobile acoustic survey route