North American Bat Monitoring Program in British Columbia

Kootenay Connect 2020 Species Detection Summary

Year 2 Final Report

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Executive Summary

We deployed acoustic bat detectors in 2020 in six North American Bat Monitoring (NABat) grid cells in the Kootenay Connect wetland corridors. We added a new NABat grid cell in the Bonanza Marsh corridor as part of the Kootenay Connect funding. Thanks to partner funding, we also established two new grid cells in the Columbia Wetland corridor. In the Bonanza / Summit Lake area we recorded 9 species of bats. We recorded 12 species cumulatively across all Kootenay Connect grid cells. Bat echolocation calls can be similar among species with overlapping body sizes and/or niches, and as such, identification to the level of species must always be interpreted cautiously, with the rate of false positives being highly variable among species. The goal for assessing trends in diversity and relative abundance is to obtain at least five years of data for each cell to account for annual variation.

Introduction

Species at Risk: There are two federally Endangered bat species in the Columbia Basin – northern myotis and little brown myotis (ECCC 2018).

NABat: The North American Bat Monitoring (NABat) monitoring program was designed to obtain a broad-scale assessment of changes in species diversity and relative abundance across the continent over the long term.

For years, biologists across North America have stressed the importance of collecting baseline data on bat populations and habitat, especially in advance of a virulent disease like WNS. The North American Bat Monitoring (NABat; Loeb et al. 2015) program is a multi-agency initiative designed by US and Canadian biologists and statisticians, coordinated continentally by the US Geological Survey (USGS) and implemented in British Columbia by Wildlife Conservation Society Canada. The goal is to increase baseline monitoring, facilitating diversity and relative abundance trend analyses. In areas such as BC where WNS has not yet been found, NABat data will help to prepare provinces for the arrival of the disease, support effective conservation decision making, and better secure our knowledge of diversity and relative abundance of local bat populations in advance of infection. NABat monitoring in BC should enable rapid disease detection, track disease spread, and quantify the impact of the disease on bat populations. Additional benefits of gathering these data include development of fine-scale habitat associations to inform land conservation and management actions, support for Conservation Data Centre status assessments, clarification of species range maps and baseline location data to support improved environmental assessments and best practices for management. While WCS Canada's current NABat efforts are important for the continentally-scaled monitoring effort, more intensive sampling will be needed to detect small-scale trends for provincial scale assessment. As the BC NABat program expands, monitoring of additional grid cells will improve the detail and accuracy of our estimates and trend analysis, which will also provide greater confidence that we can appropriately detect overall and species-specific impacts of WNS if it spreads into BC.

As NABat is a long-term monitoring program, consistent data collection over an extended time period is critically important. The continental monitoring protocol suggests that sites should be monitored each year for at least 5 years in order to provide adequate data for trend analyses, and especially for detection of WNS, as the disease-causing fungus, *Pseudogymnoascus destructans (Pd)* spreads across North America. We are developing a monitoring framework with baseline data robust to yearly variation, which will be required for disease surveillance and detecting changes in bat communities over time. These are necessary starting points for the mitigation of WNS impacts and eventual recovery of affected bat populations.

Acoustic Monitoring Methods

While NABat monitoring incorporates multiple types of data, acoustic data are the main focus of this report. Annual collection of acoustic recordings incorporates both stationary and mobile bat detectors (Lausen and Craig 2017). The sounds recorded by these detectors are used to identify the species of bat and estimate both species diversity and relative species abundance (Lausen et al. 2017). Monitoring sites are delineated using the BC portion of the North America 10x10 km grid system, which was derived

from a random-tessellation stratified (GRTS) survey design algorithm (Loeb et al. 2015). BC contains a total of 10,146 grid cells. All new participants select the grid cell with the lowest ID in their area that contains sufficiently accessible bat habitat. New grid cells in 2020 were located in strategically selected locations where sampling efforts were low, or in key regions of interest to increase sample size. We continue to explore avenues to establish new NABat grid cells in northern BC to address the remaining sampling gap.

Each grid cell contains 2 to 4 stationary bat detectors, deployed for 7 nights. Stationary bat detectors are recording devices equipped with ultrasound microphones that record bat activity within a roughly 50m radius of the microphone. Within a grid cell, detectors are deployed in different quadrants and as many habitat types as possible. Commuting areas, where bats are likely to pass through but not remain in the area are preferentially selected. Stationary detectors are programmed to autonomously begin monitoring each night 30 minutes before sunset and end 30 minutes after sunrise. Wherever possible, a 30 to 45 km mobile transect is also plotted within each grid cell. Two replicate transects are driven 30 minutes after sunset during the same week that stationary detectors are deployed. Vehicles with a bat detector's ultrasound microphone mounted on the roof are driven along a relatively linear path at 30 km per hour (slightly faster than many bat species would fly). With the assumption that each bat recording on the transect represents a different individual, a rough approximation of relative species abundance can be calculated from these files. Ambient temperature and relative humidity logging devices are also deployed in each grid cell to collect data on ambient conditions that can be related to nightly activity. If no temperature probe can be deployed, or if the devices fail, hourly temperature and humidity records are collected from a nearby weather station. In 2020, all detectors were deployed between late May to early July. This time period was selected to collect data after migratory species had returned to the area and before the young began to fly on their own. For cells that were established prior to 2020, detectors were deployed during roughly the same week as previous years of monitoring.

All 2020 stationary and transect data were processed through auto identification (auto ID) software (Kaleidoscope Pro and Sonobat) using settings outlined in the NABat procedure (Lausen et al. 2017). This software provides a good first-pass identification and helps eliminate most of the recordings that just contain noise from rain, insects, or other animals. Pre-set species lists were used to identify likely candidate species for auto ID based on the geographic location of each grid cell. Expert analysts then examined each high quality bat file to correct or confirm all IDs.

We summarized and interpreted our results using a 5-minute activity index calculated using the following formula:

$$P_s = 100 * \left(\frac{n_s}{N}\right)$$

Where n_s = number of 5-minute activity intervals with at least one recording identified as species "s"

N = Total sum of all species' 5-minute activity intervals

P_s = species "s" relative activity percentage

This means for example that if two recordings (files) of Little-Brown Myotis were identified within a five-minute period, it would only be counted as a single presence record for that species in that short time period. If little brown myotis was detected in all five minute periods of an 8-hour night, then the maximum activity index value would be reported for that night – 96 occurrences. This procedure is intended to minimize the likelihood that individual bats are reported in the results multiple times, thereby improving the effectiveness of passive data as an estimate of relative species activity. If detectors are placed in foraging zones or too close to roosts, however, bats may circle around those areas for an extended period of time and thus a single individual may still be counted in multiple five-minute intervals.

Summary of 2020 NABat Data

The data summarized in this report represent the fifth year of NABat activities in BC, summer 2020. With the continuing efforts of our NABat volunteers and grid cell leaders, we surveyed 51 grid cells in 8 different ecoprovinces across British Columbia in 2020 (Figure 1). Three existing grid cells were not monitored in 2020 due to logistical difficulties of deploying detectors during the COVID-19 pandemic. Most detectors from cells established in previous years recorded similar numbers of raw files per night, though minor deviations, likely due to weather and stochasticity are apparent. In total we collected and completed auto-ID and expert manual analysis of roughly 200,000 recordings of bats.

Here we summarize results from the 6 cells within the Kootenay Connect region. Two cells are located in the Columbia valley (Spillimacheen and Nicholson; Figure 2), two cells are located in the Slocan valley (Bonanza Marsh and Summit Lake; Figure 3), one cell is located in the Creston Valley (Figure 4), and the remaining cell encompasses the area surrounding the city of Kimberley (Figure 5). Across all 6 Kootenay Connect sites, we detected evidence of 12 species of bats: big brown bat, Californian myotis, eastern red bat, fringed bat, hoary bat, little brown bat, long-eared bat, long-legged bat, silver-haired bat, Townsend's big-eared bat, western small-footed bat, and Yuma myotis (Tables 1-6).

Big brown bat, Californian myotis, hoary bat, little brown myotis, long-eared bat, long-legged myotis, and silver-haired bat were detected at all 6 grid cells. Little brown myotis and/or silver-haired bats often contributed the largest portion of activity at each cell. These two species are often the most active species in many of our monitored cells throughout the province.

Eastern red bats were conclusively detected at Creston, Kimberley, Spillimacheen and Nicholson. Both Creston and Kimberley have often recorded activity from this species, while the two new cells at Spillimacheen and Nicholson constitute new detections. Eastern red bat has long been suspected as present in Bonanza Marsh based on anecdotal records, and although there were recordings in 2020 and previous years that are similar to this species, no conclusive recordings were made.

The Creston cell also detected activity from fringed myotis, consistent with previous years of monitoring. In contrast, the Kimberley site has previously recorded small levels of fringed bat activity, but none was detected in 2020.

Western small-footed myotis activity was only detected in Creston and Kimberley, similar to previous years. This is consistent with where there is suitable xeric habitat.

Townsend's big-eared bat was only recorded in Creston, Kimberley and Summit Lake. This species has also been detected previously in Bonanza Marsh, but no definitive recordings were collected this year. Yuma myotis appeared at Summit Lake, Bonanza Marsh, and Creston as expected.

The new cell at Spillimacheen unexpectedly collected a single recording of Yuma myotis. This was somewhat unexpected as this species was not known previously from that area of the East Kootenay (nearest East Kootenay record is Elko).

While we did not detect any northern myotis in the 6 Kootenay Connect grid cells, this species has been detected in other grid cells in the Columbia Basin. Capture of this species has occurred less than 60 km to the north of the Summit Lake / Bonanza Marsh grid cells. This species is acoustically one of the quietest bat species, and produces high frequency calls that do not travel as far as lower frequency calls produced by larger bats. As such, we expect this species always to be under-represented in all acoustic surveys. Its echolocation calls are often lumped in with other species of myotis bats due to their similarities in frequencies, therefore, the presence of this species often cannot be confirmed with acoustics alone.

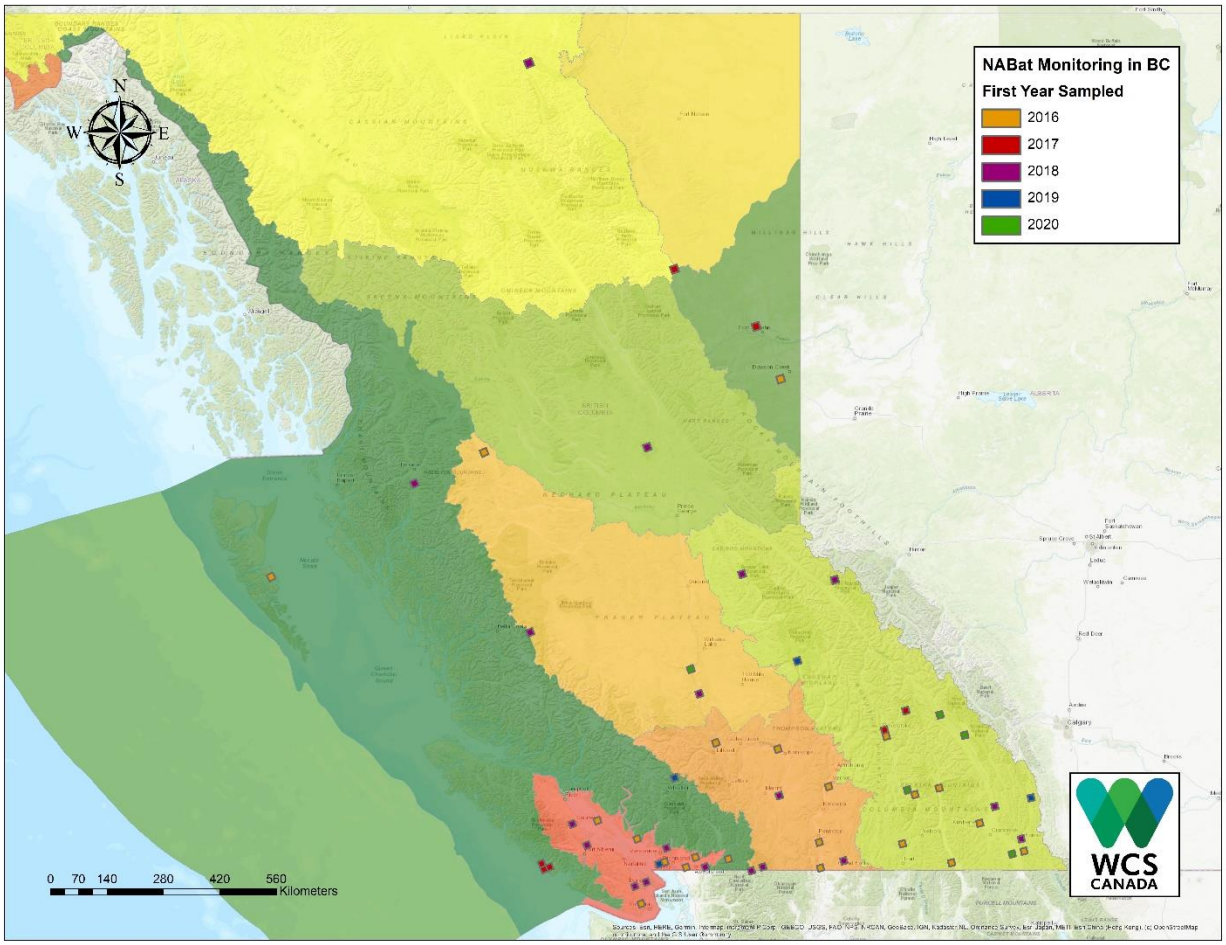

Figure 1. 1:5,800,000 scale map of British Columbia demonstrating locations of NABat 2016 - 2020 surveying efforts. Each square contains 2 to 4 stationary detectors and up to 2 driving transect replicates.

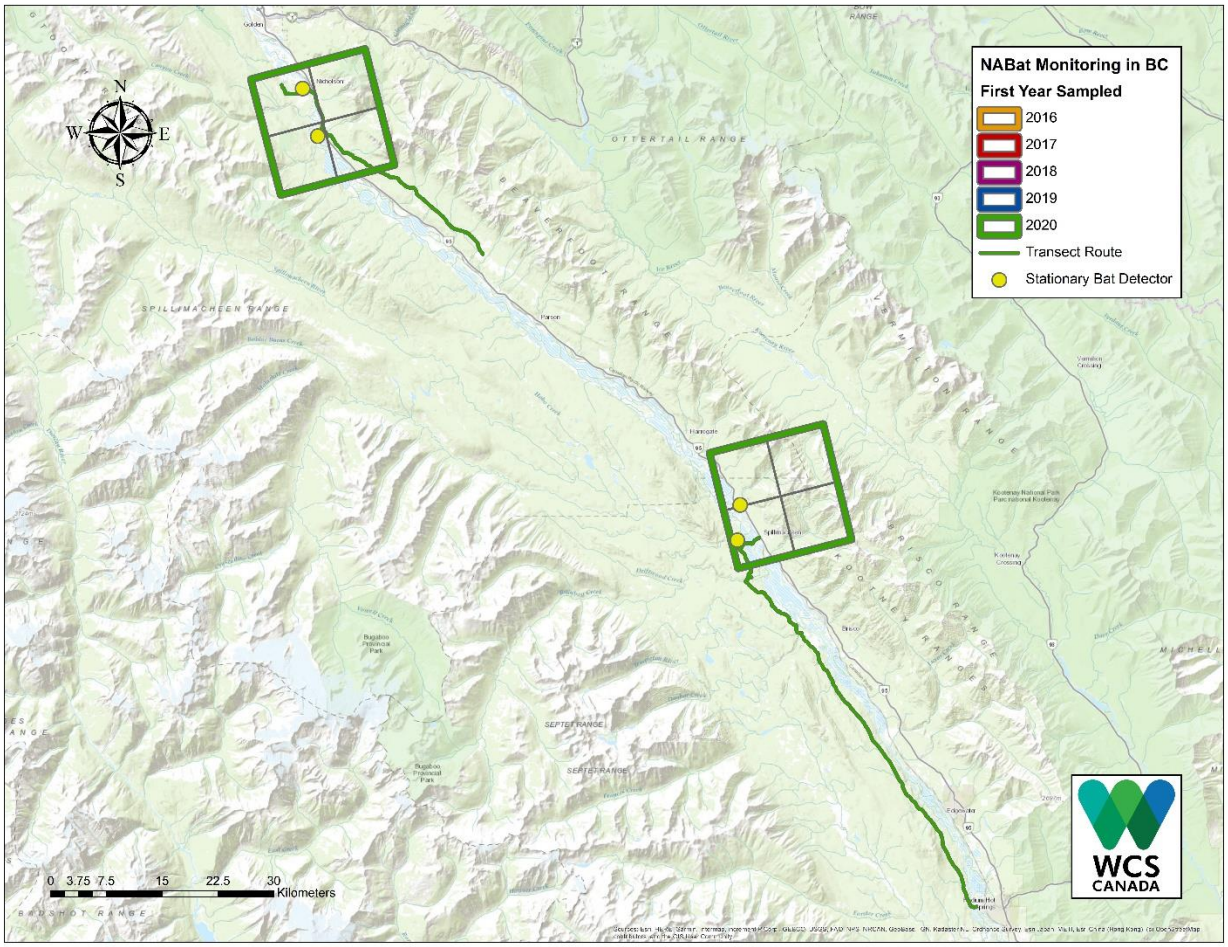

Figure 2. Nicholson and Spillimacheen grid cell outlines, detector coordinates and transect routes monitored during 2020.

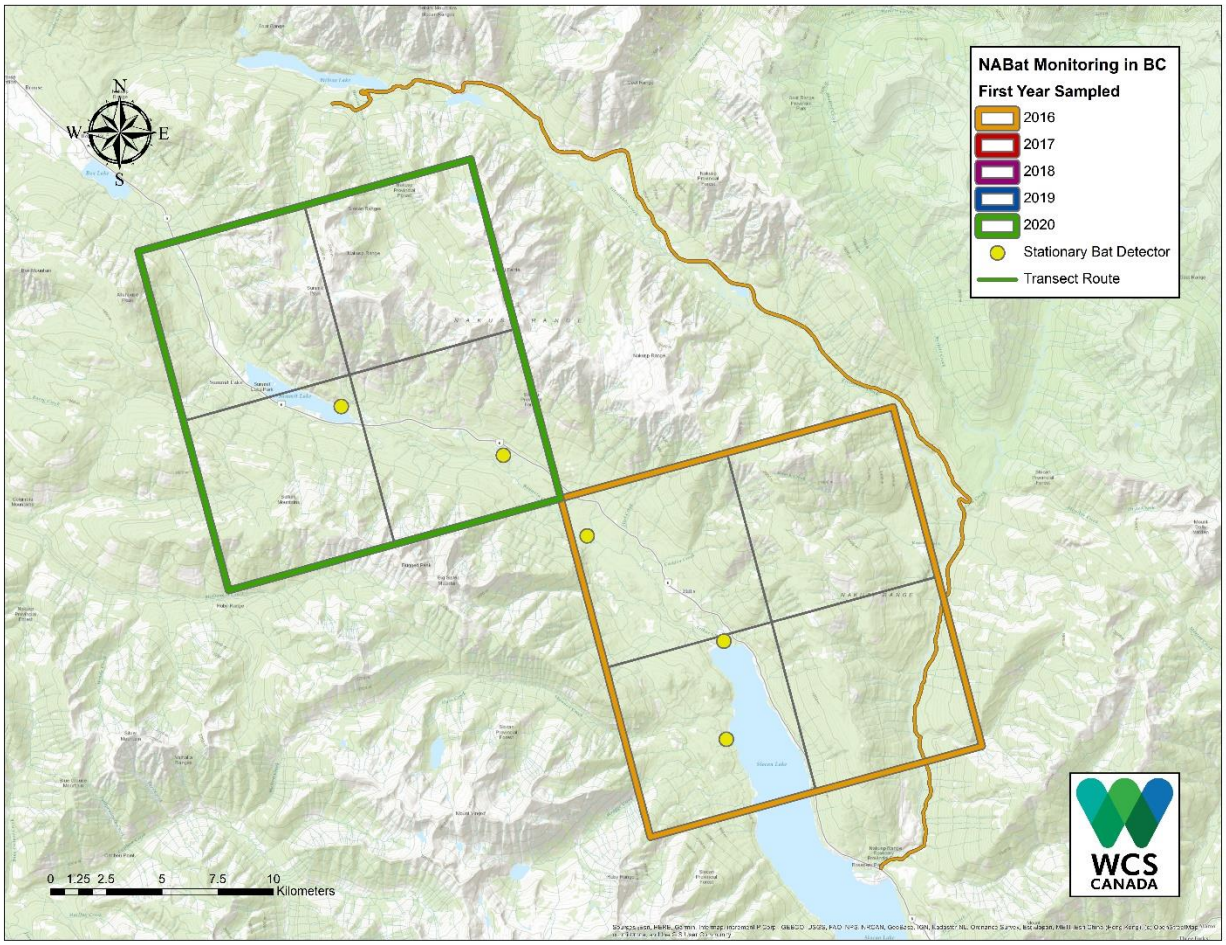

Figure 3. Bonanza Marsh and Summit Lake grid cell outlines, detector coordinates and transect route monitored during 2020.

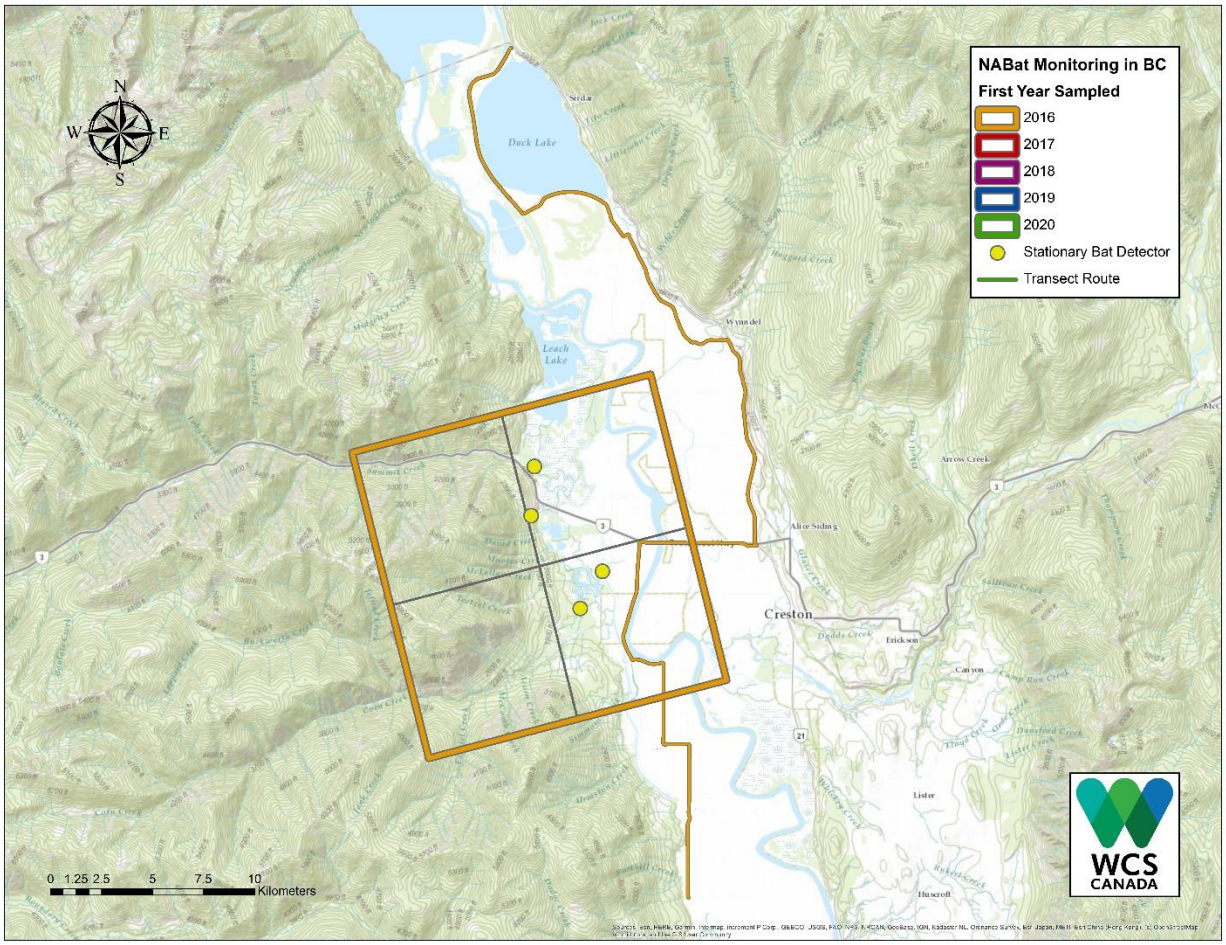

Figure 4. Creston grid cell outline, detector coordinates and transect route monitored during 2020.

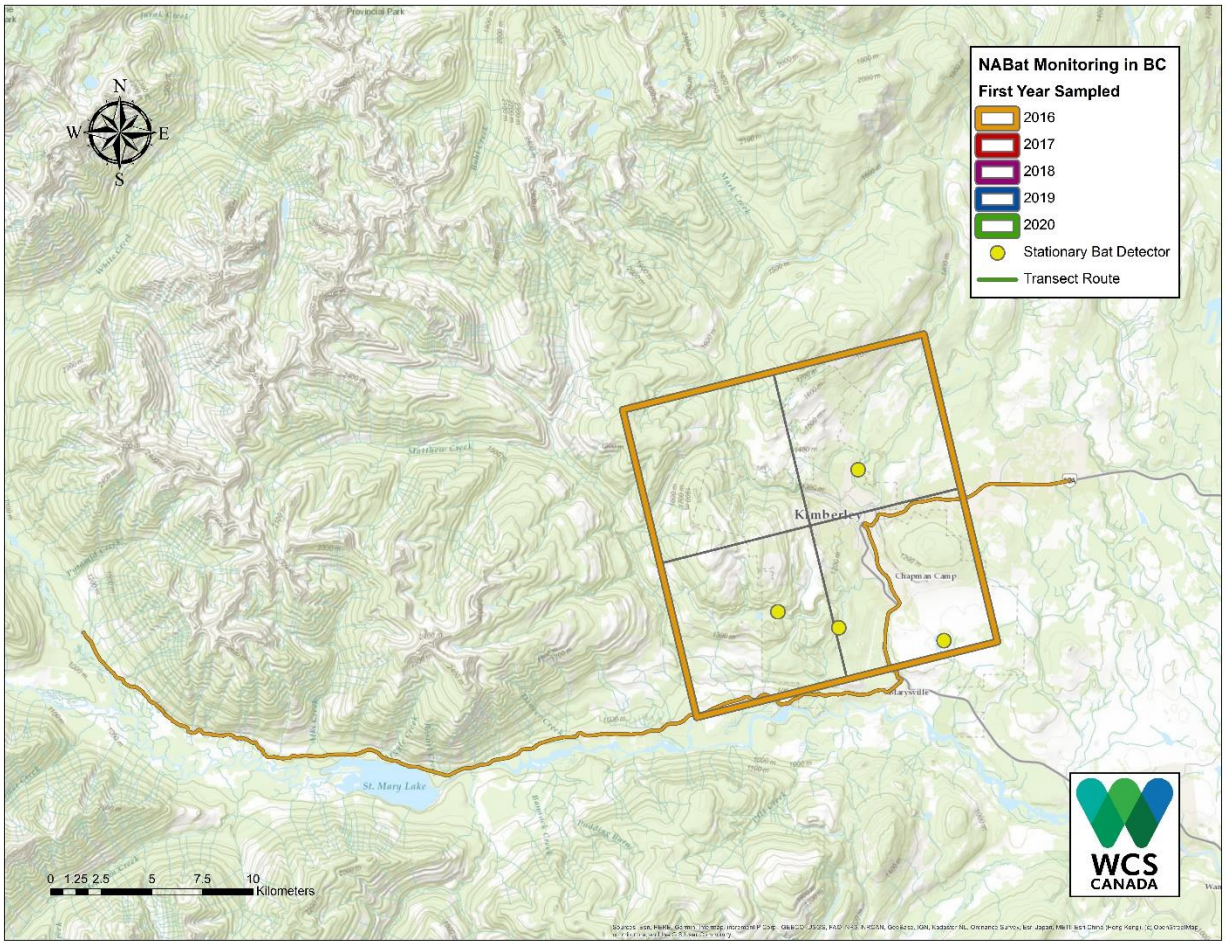

Figure 5. Kimberley grid cell outline, detector coordinates and transect route monitored during 2020.

Table 1. Nicholson grid cell 2020 species ID results summed up by 5-minute activity index following manual analysis. Percentages in brackets indicate species activity proportions ±SE for each detector. See Appendix S1 for couplet species label definitions.

	NW	*SW*	*Transects*
Big Brown Bat	51 (12.1%±0.6)	2 (2.2%±0.2)	0
EPFULACI	66 (15.6%±0.7)	5 (5.6%±0.5)	0
EPFULACILANO	32 (7.6%±0.3)	5 (5.6%±0.5)	0
EPFULANO	61 (14.5%±0.7)	1 (1.1%±0.0)	2 (66.7%±38.2)
EPFUMYEV	4 (0.9%±0.0)	1 (1.1%±0.0)	0
Eastern red bat	2 (0.5%±0.0)	0	0
LABOMYLU	29 (6.9%±0.3)	35 (39.3%±4.1)	1 (33.3%±18.9)
LABOMYYU	1 (0.2%±0.0)	0	0
Hoary bat	32 (7.6%±0.3)	0	0
Silver-haired bat	8 (1.9%±0.1)	1 (1.1%±0.0)	0
Californian myotis	3 (0.7%±0.0)	1 (1.1%±0.0)	0
MYCAMYYU	6 (1.4%±0.0)	1 (1.1%±0.0)	0
Long-eared myotis	1 (0.2%±0.0)	0	0
Little brown myotis	111 (26.3%±1.3)	29 (32.6%±3.4)	0
Long-legged myotis	15 (3.6%±0.1)	8 (9.0%±0.9)	0
Unknown Bat	172	120	3

Table 2. Spillimacheen grid cell 2020 species ID results summed up by 5-minute activity index following manual analysis. Percentages in brackets indicate species activity proportions ±SE for each detector. See Appendix S1 for couplet species label definitions.

	NW	*SW*	*Transects*
Big brown bat	7 (3.6%±0.2)	5 (5.0%±0.4)	4 (23.5%±5.6)
EPFULACI	7 (3.6%±0.2)	6 (5.9%±0.5)	0
EPFULANO	12 (6.2%±0.4)	3 (3.0%±0.2)	7 (41.2%±9.9)
EPFUMYEV	4 (2.1%±0.1)	0	0
Eastern red bat	5 (2.6%±0.1)	1 (1.0%±0.0)	0
LABOMYLU	31 (16.0%±1.1)	23 (22.8%±2.2)	2 (11.8%±2.7)
Hoary bat	2 (1.0%±0.0)	2 (2.0%±0.1)	0
Silver-haired bat	4 (2.1%±0.1)	0	1 (5.9%±1.3)
Californian myotis	1 (0.5%±0.0)	1 (1.0%±0.0)	0
MYCAMYYU	2 (1.0%±0.0)	2 (2.0%±0.1)	0
Long-eared myotis	8 (4.1%±0.3)	2 (2.0%±0.1)	0
Little brown myotis	104 (53.6%±3.8)	54 (53.5%±5.3)	3 (17.6%±4.1)
Long-legged myotis	6 (3.1%±0.2)	2 (2.0%±0.1)	0
Yuma myotis	1 (0.5%±0.0)	0	0
Unknown Bat	72	142	11

Table 3. Bonanza Marsh 2020 grid cell species ID results summed up by 5-minute activity index following manual analysis. Percentages in brackets indicate species activity proportions ±SE for each detector. See Appendix S1 for couplet species label definitions. *Western small-footed Myotis (MYCI) is included here as an acoustic possibility although the habitat is not considered likely to support this species.

	NW	*SW*	*SW2*	*Transect*
Big brown bat	0	1 (0.3%±0.0)	0	1 (3.4%±0.5)
EPFULACI	2 (3.2%±0.3)	4 (1.1%±0.0)	1 (1.8%±0.2)	0
EPFULANO	1 (1.6%±0.1)	35 (9.8%±0.5)	15 (26.8%±3.5)	7 (24.1%±4.4)
*LABOMYCI**	1 (1.6%±0.1)	0	0	0
LABOMYLU	15 (24.2%±3.0)	7 (2.0%±0.0)	1 (1.8%±0.2)	0
Hoary bat	3 (4.8%±0.5)	11 (3.1%±0.1)	1 (1.8%±0.2)	0
Silver-haired bat	1 (1.6%±0.1)	25 (7.0%±0.3)	21 (37.5%±4.9)	2 (6.9%±1.2)
Californian myotis	3 (4.8%±0.5)	20 (5.6%±0.3)	1 (1.8%±0.2)	0
MYCAMYLU	1 (1.6%±0.1)	0	0	0
MYCAMYYU	14 (22.6%±2.8)	188 (52.7%±2.8)	2 (3.6%±0.4)	1 (3.4%±0.5)
MYCIMYLU	0	1 (0.3%±0.0)	0	0
MYCIMYVO	0	1 (0.3%±0.0)	0	0
Long-eared myotis	1 (1.6%±0.1)	1 (0.3%±0.0)	0	0
MYEVMYTH	1 (1.6%±0.1)	17 (4.8%±0.2)	0	2 (6.9%±1.2)
Little brown myotis	2 (3.2%±0.3)	7 (2.0%±0.1)	1 (1.8%±0.2)	2 (6.9%±1.2)
*MYLUMYCI**	9 (14.5%±1.8)	16 (4.5%±0.2)	0	0
MYLUMYVO	7 (11.3%±1.4)	21 (5.9%±0.3)	13 (23.2%±3.0)	14 (48.3%±8.9)

Long-legged myotis	0	1 (0.3%±0.0)	0	0
Yuma myotis	1 (1.6%±0.1)	1 (0.3%±0.0)	0	0
Unknown Bat	124	420	49	26

Table 4. Summit Lake 2020 grid cell species ID results summed up by 5-minute activity index following manual analysis. Percentages in brackets indicate species activity proportions ±SE for each detector. See Appendix S1 for couplet species label definitions.

	SE	*SW*
Townsend's big-eared bat	1 (2.4%±0.3)	0
COTOMYEV	0	7 (0.7%±0.0)
COTOMYTH	0	1 (0.1%±0.0)
Big brown bat	0	14 (1.4%±0.0)
EPFULACI	0	4 (0.4%±0.0)
EPFULANO	2 (4.8%±0.7)	41 (4.0%±0.1)
LABOMYLU	2 (4.8%±0.7)	32 (3.1%±0.1)
Hoary bat	0	1 (0.1%±0.0)
Silver-haired bat	17 (40.5%±6.2)	59 (5.8%±0.2)
Californian myotis	0	101 (9.9%±0.3)
MYCAMYYU	1 (2.4%±0.3)	157 (15.4%±0.5)
MYCIMYLU	3 (7.1%±1.0)	52 (5.1%±0.1)
Long-eared myotis	5 (11.9%±1.8)	47 (4.6%±0.1)
MYEVMYSE	0	1 (0.1%±0.0)
Little brown myotis	3 (7.1%±1.0)	295 (28.9%±0.9)
MYLUMYVO	6 (14.3%±2.1)	89 (8.7%±0.3)
Long-legged myotis	2 (4.8%±0.7)	43 (4.2%±0.1)
Yuma myotis	0	75 (7.4%±0.2)
Unknown Bat	2	246

Table 5. Creston grid cell 2020 species ID results summed up by 5-minute activity index following manual analysis. Percentages in brackets indicate species activity proportions ±SE for each detector. See Appendix S1 for couplet species label definitions.

	NW1	*NW2*	*SW1*	*SW2*	*Transect*
Townsend's big-eared bat	5 (0.8%±0.0)	0	0	0	0
Big brown bat	17 (2.8%±0.1)	0	0	2 (28.6%±10.6)	6 (5.8%±0.4)
EPFULACI	6 (1.0%±0.0)	0	0	0	5 (4.8%±0.4)
EPFULANO	42 (7.0%±0.3)	2 (8.7%±1.7)	0	3 (42.9%±16.0)	14 (13.3%±1.2)
LABOMYLU	20 (3.4%±0.1)	0	0	0	5 (4.8%±0.4)
Hoary bat	11 (1.8%±0.0)	0	0	0	2 (1.9%±0.1)
LACILANO	1 (0.2%±0.0)	0	0	0	0
Silver-haired bat	25 (4.2%±0.2)	4 (17.4%±3.5)	0	2 (28.6%±10.6)	7 (6.7%±0.6)
Californian myotis	8 (1.3%±0.0)	2 (8.7%±1.7)	6 (54.5%±16.3)	0	6 (5.7%±0.5)
MYCAMYYU	83 (13.9%±0.5)	3 (13.0%±2.6)	2 (18.2%±5.3)	0	13 (12.4%±1.2)
Western small-footed myotis	8 (1.3%±0.0)	1 (4.3%±0.8)	0	0	2 (1.9%±0.1)
Long-eared myotis	2 (0.3%±0.0)	0	0	0	0
Little brown myotis	150 (25.1%±1.0)	4 (17.4%±3.5)	1 (9.1%±2.6)	0	19 (18.1%±1.7)
MYLUMYVO	163 (27.3%±1.1)	3 (13.0%±2.6)	0	0	17 (16.2%±1.5)
Fringed myotis	15 (2.5%±0.1)	0	0	0	1 (1.0%±0.0)
Long-eared myotis	0	0	0	0	1 (1.0%±0.0)
Yuma myotis	40 (6.7%±0.3)	4 (17.4%±3.5)	2 (18.2%±5.3)	0	7 (6.7%±0.6)
Unknown Bat	50	1	0	1	16

Table 6. Kimberley grid cell 2020 species ID results summed up by 5-minute activity index following manual analysis. Percentages in brackets indicate species activity proportions ±SE for each detector. See Appendix S1 for couplet species label definitions.

	NE	*SW1*	*SW2*	*Transects*
Townsend's big-eared bat	0	11 (5.1%±0.3)	10 (2.3%±0.1)	0
COTOMYEV	1 (3.0%±0.4)	15 (6.9%±0.4)	12 (2.7%±0.1)	0
COTOMYTH	0	2 (0.9%±0.0)	1 (0.2%±0.0)	0
Big brown bat	7 (21.2%±3.6)	11 (5.1%±0.3)	18 (4.1%±0.2)	0
EPFULACI	0	6 (2.8%±0.2)	4 (0.9%±0.0)	0
EPFULANO	5 (15.2%±2.6)	17 (7.8%±0.5)	15 (3.4%±0.1)	3 (30.0%±9.3)
Eastern red bat	0	2 (0.9%±0.0)	1 (0.2%±0.0)	0
LABOMYLU	0	10 (4.6%±0.3)	24 (5.4%±0.2)	0
Hoary bat	0	0	1 (0.2%±0.0)	0
Silver-haired bat	2 (6.1%±1.0)	13 (6.0%±0.4)	31 (7.0%±0.3)	1 (10.0%±3.0)
Californian myotis	0	9 (4.1%±0.2)	36 (8.1%±0.4)	1 (10.0%±3.0)
MYCAMYYU	2 (6.1%±1.0)	18 (8.3%±0.5)	28 (6.3%±0.3)	0
Western small-footed myotis	0	1 (0.5%±0.0)	6 (1.4%±0.0)	0
Long-eared myotis	10 (30.3%±5.2)	42 (19.4%±1.3)	65 (14.7%±0.7)	1 (10.0%±3.0)
MYEVMYTH	0	0	3 (0.7%±0.0)	0
Little brown myotis	3 (9.1%±1.5)	32 (14.7%±1.0)	103 (23.3%±1.1)	2 (20.0%±6.2)
MYLUMYVO	3 (9.1%±1.5)	23 (10.6%±0.7)	60 (13.6%±0.6)	1 (10.0%±3.0)
Long-legged myotis	0	3 (1.4%±0.1)	24 (5.4%±0.2)	1 (10.0%±3.0)
Unknown Bat	11	17	36	7

White-Nose Syndrome

White-nose Syndrome (WNS) is a deadly fungal disease that kills bats while they hibernate. This fungal disease has resulted in mass mortality events in excess of 95% in eastern North America's bat hibernacula (USFWS 2019), effectively devastating bat populations in the eastern provinces and states since it was discovered in New York State in 2006 (USFWS 2016). WNS has spread at a steady pace westward across North America until March 2016, when it made a major leap and was discovered spreading throughout the state of Washington. Recent estimates suggest the fungus may have been introduced to Washington in 2014 (Roossinck 2020), two years prior to its detection in the area. Similarly, viral genetic analyses (Thapa et al. 2016; M. Roossinck 2020) the invasive fungal introduction occurred in eastern North America an estimated 7 years prior to its 2006 discovery due to the mass mortality. In the west we are beginning to detect the first observable bat declines in the Washington county where WNS was initially detected (Tobin 2020), consistent with the 6 to 8 year time-lag between introduction and mass mortality observed in the east. As of summer 2020, WNS has been detected further north and east in Washington near Lake Chelan State Park (WDFW 2020), its spread into the Columbia River Basin is now opening up many possible routes of transmission into BC.

Looking Forward

In the upcoming 2021 monitoring season, we are continuing to increase our provincial sample size to fill in gaps in historical records of BC and under-sampled regions. We will deploy detectors in new grid cells in selected areas, with additional support from our ever expanding network of working partners, landowners, volunteers, and trained grid leaders. As we establish baseline abundance and distribution through continued monitoring of new and existing grid cells, we are building a record of yearly variation and will be well-poised to detect the spread of WNS in bats across the province and quantify its impact. How each bat species in BC will be differentially affected by WNS is currently unknown. However, as WNS appears in BC, NABat monitoring may be our best method for widespread assessment of what species are being most affected. The baseline monitoring data collected here will also provide context for evaluating mitigation and recovery strategies. By identifying when, where, and what species are most affected by WNS' spread, we can then act to protect critical habitat for the most impacted species to help facilitate species recovery in the long-term.

In the Kootenay Connect areas in particular, the multi-year sampling in each cell varies widely (1 – 5 years of monitoring). As cells acquire 5 years of monitoring, species-specific trends can be assessed (diversity and relative abundance).

Appendix S1. Glossary of information describing common group labels of species.

Label	*Species*	*Description*
Unknown Bat	All species	**Poor quality recording:** Possible species ID includes the set of species shown, where appropriate. Differentiating to species-level not possible usually due to too few pulses.
COTOMYEV	Possible Townsend's big-eared bat or long-eared myotis	**Species Couplets:** Possible recording of either species. These pairs of species are acoustically very similar, and some recordings contain no characteristics to differentiate between the two.
COTOMYTH	Possible Townsend's big-eared bat or fringed myotis	
EPFULACI	Possible big brown bat or hoary bat	
EPFULANO	Possible big brown bat or silver-haired bat	
EPFUMYEV	Possible big brown bat or long-eared myotis	
LABOMYCI	Possible eastern red bat or western small-footed myotis	
LABOMYLU	Possible eastern red bat or little brown myotis	
LABOMYYU	Possible eastern red bat or Yuma myotis	
LACILANO	Possible hoary bat or silver-haired bat	
MYCAMYLU	Possible Californian myotis or little brown myotis	
MYCAMYYU	Possible Californian Myotis or Yuma myotis	
MYCIMYLU	Possible western small-footed myotis or little brown myotis	
MYCIMYVO	Possible western small-footed myotis or long-legged myotis	
MYEVMYSE	Possible long-eared myotis or northern myotis	
MYEVMYTH	Possible long-eared myotis or fringed myotis	
MYLUMYCI	Possible little brown myotis or western small-footed myotis	
MYLUMYVO	Possible little brown myotis or long-legged myotis	

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