Moose Monitoring Wildlife Research Permit Application– Additional Information

Note: Because the Wildlife Research Permit application form requests that text sections be limited to < 100 words, more information is provided here, should any Indigenous Government or Indigenous Organizations want to review the proposed project and activities in more detail.

Project Title: Moose range use, demography and habitat use in the Taiga Shield / Lockhart All-Season Road corridor

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Rationale:

Moose are an important food source for resident and Indigenous hunters in the NWT, including the North Slave Region. Harvest pressure on moose may increase as harvest restrictions on caribou continue and new public access through roads increases (e.g., Tłı̨chǫ Highway). The Slave Geological Province (SGP) all-weather road corridor will significantly increase public access to the Taiga Shield ecozone effectively applying more harvest pressure to the moose population there. The impact of this increased public access, disturbance, and potentially year-round harvest opportunities is unknown, but will likely be detrimental to moose without mitigation. Understanding movements of moose in the area, whether resident, seasonally migrant, or dispersing (Stenhouse et al. 1995, Chisholm et al. 2021), will determine how the proposed Lockhart All-Season Road (LASR) project might impact the local population.

The Taiga Shield ecozone comprises the northern limit of moose range, and consequently densities of moose tend to be lower here (about 3.1 to 5.8 moose/100 km^2) than elsewhere (Cluff 2018 & 2021). Humans are not the only predator of moose who will benefit from increased access spatially and temporally to moose habitat. Wolves are notorious for using corridors to increase their travel and encounter rates of their potential prey (Dickie et al. 2017).

Climate change will likely have mixed effects on moose. While more forest fires may increase early successional habitat in which moose can forage, warmer temperatures will also bring in more insect harassment and increased parasites and likely new predators thereby increasing predation risk. Black bears can also be effective predators of moose calves in spring. Currently, black bears conflicting with people in the Yellowknife and Ingraham Trail areas are sometimes relocated to the Taiga Plains ecozone area south/west of Edzo. With the creation of an all-season road beyond Tibbitt Lake (Lockhart All-Season Road), relocation of bears could likely happen there as well.

Productivity of moose such as calving interval and frequency of twinning is unknown but critical for accurate modeling of their population dynamics (Testa 2004). Similarly, adult and calf survival/mortality data are lacking. Tracking of GPS-collared and uniquely marked moose will estimate survival. Cow survival is thought to be the primary driver influencing moose population change (Kuzyk et al. 2018); however, survival of bulls is also of interest given that both NWT Resident and Indigenous hunters can harvest either sex. As home range sizes and habitat selection may differ between sexes (e.g. Olsson et al. 2011, MacCracken et al. 1997), deploying collars on both sexes will provide a more complete understanding of moose habitat selection in the Taiga Shield ecozone. Timely visits of stationary collars will help distinguish predation deaths from other mortality sources. Filling these knowledge gaps will allow modeling of moose population dynamics and inform management decisions such as selective harvest criteria and hunting season lengths.

Creating an all-season road from the end of Highway 4 to Lockhart Lake to replace the winter road that currently exists could result in increased moose harvest. This is simply because the new road will create year-round access to where moose are. However, what is unknown is how significant that increase in harvest will be. Tracking GPS-collared moose will determine the range these moose have, where they interact with the proposed road corridor, any seasonal movements or migration that is occurring (Chisholm et al. 2021), and whether there is any difference in these patterns based on sex. High mobility of moose may naturally mitigate increased mortality from increased road access in a given area.

Demographic results, coupled with abundance estimates from previous regional surveys (2004, 2007, 2012, 2016, 2021) and age structure information obtained from tooth ageing of harvested moose will contribute to population trend analysis and modeling. Another abundance survey for moose in the North Slave Region may take place in winter 2026.

Objectives

The goal of this study is to collect data and information to support the assessment and mitigation of potential impacts on wildlife of an all-season road corridor through the Lockhart All-Season Road (LASR) corridor project area.

Up to 40 collars will be deployed over a 2-year period (20 collars/year) to complete the following objectives:

- Document seasonal movement patterns of moose within the Taiga Shield ecozone and specifically within the Lockhart All-Season Road project corridor area.
- Estimate annual home range sizes of moose.
- Determine seasonal habitat preferences of moose.

- Provide baseline information to assist with assessing the potential impact of the Lockhart All-Season Road project.
- Estimate moose calf survival and recruitment.

Key expected outcomes and deliverable from the project are:

- Maps and animations of collared moose movements
- Annual home range size estimates and home range maps
- Habitat preferences/resource selection functions of collared moose
- Demographic parameters of moose (adult survival rates, calf recruitment rates) for population modeling

Time Period:

Collar deployments will occur in mid-February to late-March 2025 and 2026. An aerial reconnaissance survey will be conducted by fixed-wing in advance of capture operations to assist in locating animals for the capture crew. Calf recruitment surveys will occur in February or March of 2026 and subsequent years to determine survival rates of calves born the previous year. Cows with calves at heal will also be noted during 2025 collar deployment operations. GPS collars will be programmed to release 4.5 years after deployment to provide information from 5 calving seasons.

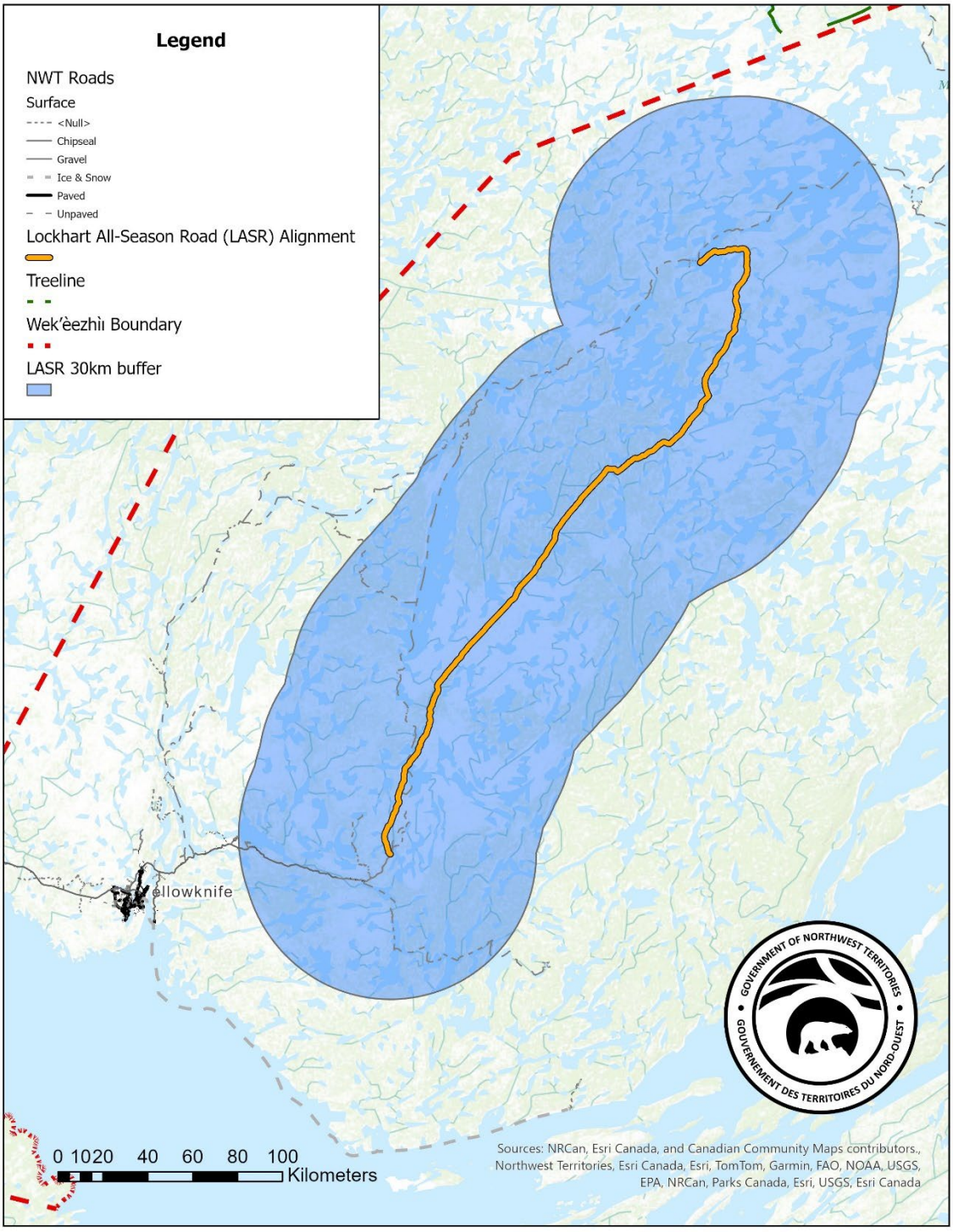

Figure 1. Map of proposed moose movement study area along the Lockhart All-Season Road (LASR) corridor (30 km buffer).

Methods:

We will deploy 40 GPS collars (Telonics TGW-4670-5 for cows and TGW-4677-5 for bulls) on adult moose (30 cows, 10 bulls) over two years to track their movements (therefore 20 moose/year: 15 cows, 5 bulls). Collar deployments will occur in mid-February to late-March 2025 and 2026 within a 30 km buffer centered over the Lockhart All-Season Road corridor. An aerial reconnaissance survey will be conducted by fixed-wing in advance of capture operations to assist in locating animals for the capture crew.

ECC will follow established protocols and the conditions of the NWT Wildlife Care Committee permit for capture and handling of moose during collar deployment. In British Columbia, over 500 adult female moose have been collared since 2012, and we will use the knowledge gained from that program when deploying collars. ECC also contacted biologists at the government of Alaska (D. Thompson and J.Crouse) experienced with collar deployments on bull moose for advice on collar design specifications.

Moose will be darted from a helicopter. An experienced helicopter pilot and dart gunner will be used to conduct the collaring operation. The capture crew (gunner and animal handler) will have experience with chemical immobilization, collecting biological data and deploying collars. We will include a wildlife veterinarian with experience in moose darting procedures as part of the capture/collaring crew.

Aerial pursuit of individual moose will be kept short (<1 min of running), and will be terminated when the target animal show signs of fatigue (stumbling, open mouth breathing). All drug delivery will be done by a team member with current training and experience in wildlife immobilization, or under the direct supervision of experienced personnel. Drugs used will be approved by the Wildlife Care Committee. Following British Columbia, the recommended current immobilization drug is BAM II (a commercially premixed combination of butorphanol, azaperone and medetomidine) reversed with atipamezole and naltrexone. With these drugs, induction is predictable; most moose show effects within 2-3 minutes and are “out” in an average of 6-8 minutes. After the reversal drug is administered most recoveries occur within 4-10 minutes with the moose going from “out” to walking or running away. Animals that have been drugged should not be eaten within 45 days. After 45 days the drug is fully metabolized and no longer present in the animal. All collared moose (or moose that are immobilized but released without being collared, e.g. if the animal is found to be not of the appropriate age class) will be ear tagged with a tag marked “Call before you eat” and an ECC phone number to call for more information.

Once immobilized, the following will be done for each moose:

- The anesthesia will be monitored and vital signs will be assessed throughout the handling period (blood pressure, blood oxygen level, breathing rate, body temperature, reflexes) to determine their level of sedation.

- Supplementary oxygen may be administered.
- Record the collar identification number, ear tag number, capture location (latitude and longitude), duration of chase and handling time, sex, body condition rating, estimated age, animal stress rating, average snow depth and snow condition, and any pertinent information pertaining to observations of the health of the animal.
- Collect blood (approximately 25 mL of blood, typically from the cephalic vein in the foreleg), hair (in coin envelope, pulled from between shoulders), and fecal samples (approximately 50 g of feces (a handful) from the rectum or deposited on the snow).
- Winter tick hair loss will be documented and associated ticks collected.
- Fasten the GPS collar around the neck and place the ear tag in the ear.
- Take digital images of the teeth and the full body of the moose with the collar or ear tag ID clearly visible.

Adult moose will be fitted with a collar (Telonics TGW-4670-5 for cows and and TGW-4677-5 for bulls) that obtains a GPS location every hour for the life of the collar. Location data will be retrieved via satellite uplink every day between March 1-31, and every 2 days for the remainder of the year. The collar will include a pre-programmed drop-off mechanism that will release the collar in September after 4.5 years. A VHF beacon will be included to facilitate reconnaissance tracking and as a backup for collar retrieval. Collars will be teardrop shaped, and collars deployed on bull moose will include expansion belts to allow for neck expansion during the fall rut. Figure 2 provides an example of a similar model of GPS collar with expansion belt deployed on bull caribou. Flights will be conducted in the fall rut period to assess collar fit on bulls, and bull collars will have remotely re-programmable drop-off mechanisms in the event that they need to be released earlier than scheduled. Stationary collars will be visited as soon as possible and a site investigation to confirm a mortality and determine cause of death, if possible.

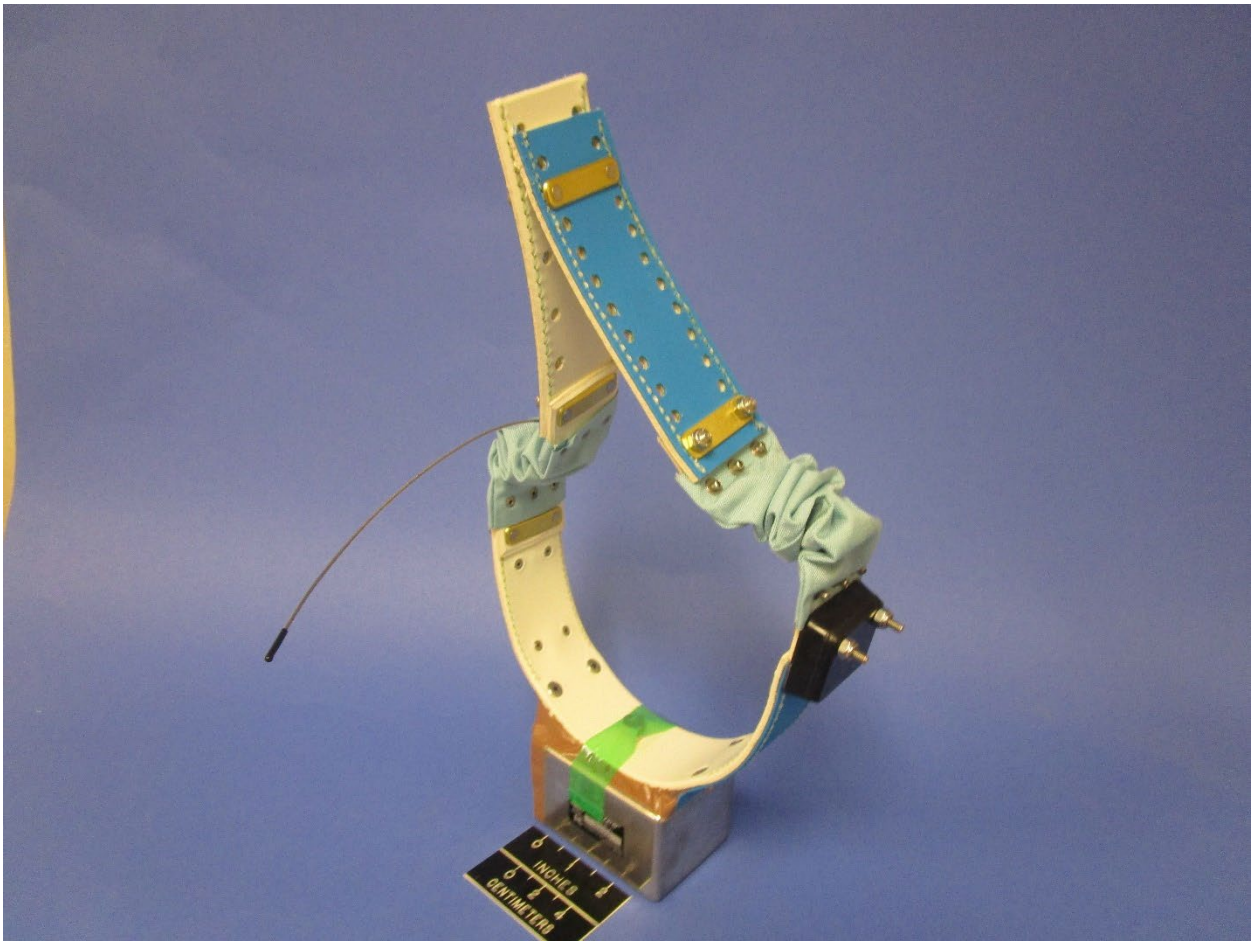

Figure 2. Example of configuration of GPS collars proposed for deployment on bull moose including expansion belts housed in canvas casing (source: Telonics Inc.).

The recovery of the moose following capture will be monitored from a distance until it is moving and the capture crew will leave the area in the helicopter. Post-capture monitoring of the GPS collared animals will be done using satellite-transmitted location data.

Other surveys:

Calf production will be determined by assessing pregnancy rates collected from blood serum during the capture of cows each year of the study and by assessing the movement rates of GPS-collared cows.

Ten-month calf recruitment will be determined from aerial classification surveys in late winter 2026 and onwards (presence of cows with calf at heel will also be recorded during capture operations). The survey will be conducted by helicopter with a crew consisting of a pilot, a navigator and a classifier who will count and classify the number of calves and adults associated with collared moose and other moose observed during the survey. Recruitment will be expressed as the ratio of calves per 100 adult cows.

Mortality investigations will be done whenever possible when a collar becomes stationary.

Data analysis

GPS collar data will be used to obtain descriptive information about moose distribution, movements, areas where moose cross the proposed LASR alignment, habitat use and home range size and configuration. Statistical models of habitat selection and movements by moose will also be developed from GPS location data using methods such as Resource Selection Functions (RSFs) or integrated Step Selection Functions (iSSFs) whereby habitat attributes characterized at observed moose locations or along movement steps (path connecting two successive locations) are compared to those at random locations or along random steps. These habitat selection models will help to identify higher-quality moose habitat that may be impacted by the road, areas and times of year where moose are more likely to interact with or be affected by construction and operation of the LASR, where wildlife-vehicle collisions may be more likely, or where moose may be more vulnerable to harvest.

Annual adult female (cow) survival rates will be calculated using Pollock et al.'s (1989) staggered-entry modification of Kaplan and Meier's (1958) survivorship model. Annual adult female survival rates and late winter calf recruitment rates (calf/cow) ratios will be used to estimate an index of annual population trend using the formula outlined by Hatter and Bergerud (1991). The annual finite rate of population increase (λ) will be determined using a stochastic version of Hatter and Bergerud's 1991 equation (λ =adult female survival/(1-female calf recruitment) following Latham et al. (2010).

Community Consultation

Ongoing consultation with Indigenous Governments (Tłı̨chǫ Government, North Slave Métis Alliance, Yellowknives Dene First Nation, and Lutselk'e Dene First Nation) and the Wek'èezhìı Renewable Resources Board, will continue through this application for a wildlife research permit. GNWT-ECC is happy to meet with these organizations to answer any questions about the permit application that may arise. At the end of each annual cycle of collar deployments / spring composition surveys, a summary report will be provided to each organization listed above.

Opportunities for Local Participation

There will be opportunities for an observer from one of the organizations listed above to participate in the annual spring composition surveys.

Management or Recovery Plans

N/A

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