



Chase Caribou Road Restoration Program

Year 1 (2023-2024) Summary Report

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Chase Caribou Road Restoration Program

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Executive Summary

The Chase Caribou Road Restoration Program (CCRRP) is a collaborative initiative led by Tsay Keh Dene Nation and Chu Cho Environmental, with the goal of restoring linear disturbances, primarily forest roadways, within the Chase Caribou herd range. Since the program initiation in 2018, the CCRRP has successfully restored approximately 40 kilometers of roads, including Caribou Flats Road (2019), Lay Creek (2020), Goldway (2021). The restoration of linear features is a recommended recovery action identified in the Federal Recovery Strategy for Southern Mountain Caribou, to make the road or linear features less suitable for predator travel and alternate prey species. As predators are documented using roads and linear features to travel faster and farther compared to in forested areas, the presence of these features on the landscape can increase the predation pressure on caribou.

In 2023, the CCRRP restored an 8.5 kilometer section of road within the Swannell River Valley, in an area that has been identified as low-elevation core habitat for the Chase Caribou and that Tsay Keh Dene Nation has designated as the Wədzih Yinè' (Caribou Song) Indigenous Protected and Conserved Area (IPCA), protecting this area from further industrial developments. We employed both functional and ecological restoration techniques make the road surface more suitable for vegetation establishment, as well as to create physical barriers to predator line-of-sight and movement along the former road surface. As well, we planted the road with tree and woody shrub seedlings to accelerate the recovery of the road to a forested ecosystem.

Additionally, we completed pre-treatment monitoring of the wildlife and vegetation using the road in order to understand how wildlife use of the road changes and how to track vegetation growth and establishment through time following restoration treatments. Follow up monitoring will be completed in future years to track the development of vegetation and to compare pre- and post-treatment wildlife use of the road.

The ultimate goal of this work is to improve habitat within the Chase Caribou herd range in order to support the recovery of this Threatened species.

Acknowledgements

We would like to acknowledge that this work was completed in partnership with Tsay Keh Dene Nation, and field work took place within the territory of Tsay Keh Dene Nation. Thank you to our project partners for their financial support, including: Habitat Conservation Trust Foundation, Environment and Climate Change Canada, Conifex Timber Inc., and the Fish and Wildlife Compensation Program. This report was prepared with financial support of the Fish and Wildlife Compensation Program on behalf of its program partners BC Hydro, the Province of BC, Fisheries and Oceans Canada, First Nations and Public Stakeholders.

1 Introduction

Woodland caribou (*Rangifer tarandus caribou*) are a species of cultural and ecological significance to Tsay Keh Dene Nation, and are an instantly recognizable species associated with the remote, mature forests of the north. Caribou, including the Southern Mountain population that are the focus of this report, require large, intact landscapes across which they complete seasonal migrations between calving grounds, breeding grounds, and in search of sufficient food (COSEWIC 2014; Environment Canada 2014). Elevational connectivity is also important for caribou, as they move from low to high elevations in the mid-winter as snow depth at lower elevations increases the difficulty of movement and foraging, then back to lower elevations for spring green up (COSEWIC 2014). In recent decades, however, extensive changes in land use resulting from both natural (e.g., wildfire, mountain pine beetle) and anthropogenic disturbances (e.g., forest harvest, road building, mineral exploration and mining) have fragmented caribou habitat, disrupted these seasonal movements, and altered predator-prey dynamics for caribou, leading to population declines or even extirpation of herds (Environment Canada 2014; DeMars and Boutin 2018).

In response to caribou population declines, Environment Canada released the Federal Recovery Strategy for the Woodland Caribou, Southern Mountain population which provides broad management strategies and recommended actions designed to meet the recovery goal of achieving self-sustaining populations within all herds within their current distribution (Environment Canada 2014). This recovery strategy for the southern mountain caribou, to which the Chase Herd of caribou belong, recommends several recovery actions for the species, including the urgent action to “undertake coordinated actions to reclaim southern mountain caribou habitat in all currently utilized seasonal ranges through restoration efforts (e.g., restore industrial landscape features such as roads, old seismic lines, pipelines, cut-lines, temporary roads, cleaned areas; reconnect fragmented annual ranges) to make it less suitable for other prey species” (Environment Canada 2014).

Roads and other linear features are specifically identified in the recovery strategy as threats or limitations to caribou recovery (see Table 9 in Environment Canada 2014), as they are known facilitate predator movement, altering predator-prey dynamics for caribou (Dickie et al. 2017; DeMars and Boutin 2018). Within the Chase herd range, wolves and wolverines are identified as the leading causes of predation mortalities for caribou (Sittler et al. 2022); both species are documented using roads and linear corridors for travel within our study area. Previous research has shown evidence that wolves select for and use linear disturbances when they are available on the landscape, and that once on these linear features, wolves move faster and tend to travel greater distances compared to when they are moving through forested habitat, increasing their chance of encountering and preying upon caribou (Dickie et al. 2017). Roads or linear features that span from the low elevation valley bottom to the alpine, such as mineral exploration and mining roads, can be especially problematic for caribou as they facilitate easy wolf access into high elevation areas (Whittington et al. 2011).

1.1 Chase Caribou herd

The Chase Caribou belong to the Northern group of Southern Mountain Caribou and are listed as Threatened on Schedule 1 of the Federal Species at Risk Act and Red Listed in British Columbia (BC CDC 2024). The northern most herd of Southern Mountain Caribou, the Chase Caribou herd is bordered by the Wolverine Caribou herd to the south and the Thutade Caribou herd of Northern Mountain Caribou to the north. The Chase herd range spans approximately 12,465 km², encompassing portions of the Ingenika River, Mesilinka River, Omineca River and Skeena River watersheds.

The Chase herd is currently considered to be stable, with recent survey work yielding a population estimate of 531 individuals (95% CI: 454-682; Anderson and Klaczek 2021); this estimate is similar to the 2019 population estimate for the Chase herd of 572 individuals (95% CI: 518-683; Anderson and Klaczek 2019). Though the population appears to be stable in recent years, the provincial biologists caution that “accelerating landscape change, primarily from industry forest harvest within low-mid elevation forests, across the herd range could change the population trajectory rapidly (Anderson and Klaczek 2021).

Within the Chase herd range, there has been significant disturbance from both natural and anthropogenic disturbances, fragmenting caribou habitats, with an estimated 50.4–50.7% of low elevation core range, 54.1% of matrix range, and 9.5–13.0% of habitat within high elevation core range being disturbed as of 2021 (Bonderud et al., 2024). The Federal Recovery Strategy for the Boreal Caribou identifies that caribou require a minimum of 65% of undisturbed habitat within their range in order to maintain a 60% probability for a population to remain self-sustaining (Environment Canada 2012); while this disturbance threshold was described for boreal caribou, no alternative threshold has been described specific to southern mountain caribou. Based on the findings of Bonderud et al. (2024) and Sittler et al. (2022), low elevation habitats within the Chase range exceeds the 35% disturbance threshold, suggesting the Chase caribou may be at risk of a population decline.

1.1.1 The Chase Caribou Road Restoration Program

In response to the disturbance and predation pressures on the Chase Caribou, Tsay Keh Dene Nation (TKDN) and Chu Cho Environmental (CCE) initiated the Chase Caribou Road Restoration Program (CCRRP) in 2018 with financial support from the Peace Region Fish and Wildlife Compensation Program (PEA-F19-W-2650). The goal of the CCRRP is to restore linear disturbances (i.e., roads) within the Chase Caribou herd range in order to increase the value of the habitat to caribou and reduce the suitability for predator and alternate prey species travel. Since program initiation, the CCRRP has prioritized restoration opportunities and restored approximately 40 kilometers of roads within the Chase Caribou range, including: Caribou Flats Road (2019), Lay Creek (2020), Goldway (2021), and an 8.5 km section forest service road within the Swannell River Valley that was restored during the summer of 2023, the focus on this report. Highlights from the previous work completed as part of the CCRRP can be found on the Chu Cho Environmental YouTube channel (<https://www.youtube.com/@ChuChoEnvironmental>) or by following the links below:

- Chase Caribou Road Restoration Program: https://youtu.be/tvVLogfahAk?si=Gxyzmbh_xsG6boHb

- Monitoring the Goldway Road: <https://youtu.be/6iLBj2szaDk?si=ZRk0EcUpU9ptruw6>
- Restoration of Chuyaza and Swannell Road: <https://www.youtube.com/watch?v=ugthUmPqyTE>

2 Goals and Objectives

As identified above, the goal of the CCRRP is to remove and restore linear corridors (i.e., roads) within the Chase herd range to make the habitat less suitable for predator travel and alternate prey species (i.e., moose). To achieve this, the CCRRP employed both functional and ecological restoration techniques to restore forest roadways in a manner that benefits the Chase Caribou herd. We anticipate that this restoration work will benefit the Chase Caribou in the long-term by directly restoring habitat to a mature conifer forest, reducing habitat fragmentation and through reducing predation pressure by making the road less suitable for predator travel. In the short-term, this work will create physical barriers to limit predator movement and line-of-sight along restored roadways, and create a road surface over which predators will have to move more slowly. Specifically, the 2023 objectives of the CCRRP were:

- Use ecological and functional restoration to restore an 8.5 km section of road at the end of the Swannell Mainline.
- Monitor linear corridor restoration success in a cost-effective manner, using an Unmanned Aerial Vehicle (UAV) at the time of treatment.
- Build capacity within TKDN Lands and Resources department Environmental Monitors to supervise road restoration and utilize UAVs to monitor valued ecosystem components within the Territory.
- Share the results of this work with Tsay Keh Dene Nation citizens during Science Week in March 2024.

2.1 Alignment with action plans

This work directly aligns with the Peace Region Upland Action Plan priority action PEA.UPD.SO4.HB.07 Restore linear corridors-P1: “Implement the recommendations from action #6 to strategically decommission roads and/or support the functional and ecological restoration of linear corridors” (Fish and Wildlife Compensation Program 2020). Additionally, this project also aligns with the Federal Recovery Strategy for southern mountain caribou, specifically the recommended recovery action “undertake coordinated actions to reclaim southern mountain caribou habitat in all currently utilized seasonal ranges through restoration efforts (e.g., restore industrial landscape features such as roads, old seismic lines, pipelines, cut-lines, temporary roads, cleaned areas; reconnect fragmented annual ranges) to make it less suitable for other prey species” (Environment Canada 2014).

3 Study Area

The 2023-2024 CCRRP activities occurred within the Swannell River Valley, a low-elevation valley entirely within the Chase Caribou herd range boundary (

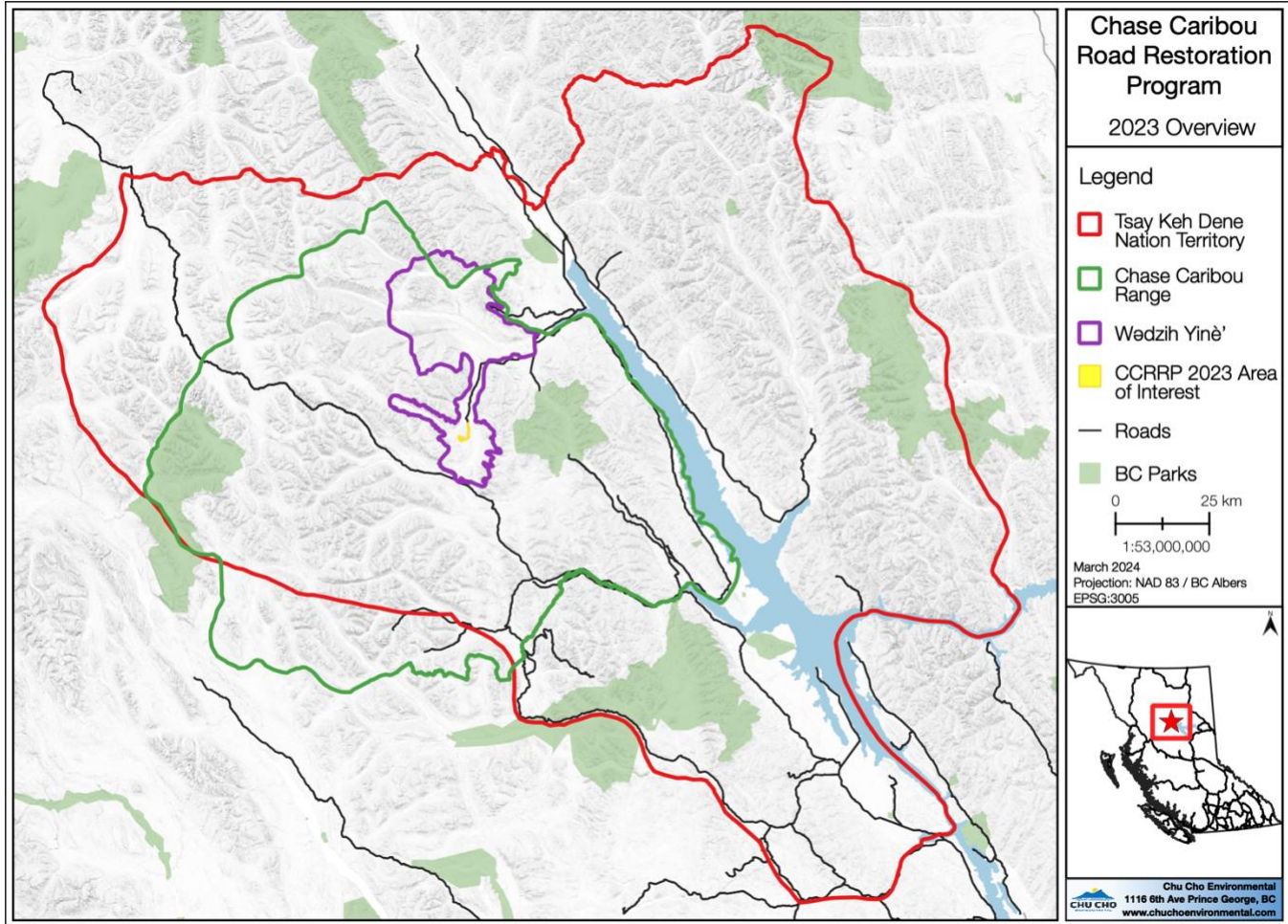


Figure 1). The Swannell River Valley is located 55 km southeast of Tsay Keh Dene, BC, and 190 km northwest of Mackenzie, BC. The identified road section runs entirely through the Chase Caribou range, and connects areas identified as Ungulate Winter Ranges (UWR, u-7-007 and u-7-025).

Draft habitat mapping of core and matrix habitat areas within the Chase Caribou herd range has been completed through the Tsay Keh Dene Nation – Province of British Columbia Environmental Stewardship Initiative, a government-to-government collaboration aimed at developing trusted information and stewardship recommendations for Valued Ecosystem Components, including caribou. Through this habitat mapping work, the Swannell River Valley was identified as an area supporting low elevation core habitat for the Chase Caribou in both the summer and winter seasons. Core habitat refers to areas that contain all resources required to support all life requisites (e.g., food, cover) for caribou during both seasons.

As well, Tsay Keh Dene Nation (TKDN) has established the Wędzih Yinè' (Caribou Song) Indigenous Protected and Conserved Area (IPCA) within the Chase Caribou herd range, which includes the Swannell River Valley, the Ingenika River Valley, and the area around Chuyaza (Helicopter Lakes). The Wędzih Yinè' IPCA is a priority area for restoration efforts as TKDN has reached agreements with forest licensees operating within the Mackenzie Timber Supply Area that they will not operate within the Wędzih Yinè' IPCA. The establishment of Wędzih Yinè' IPCA provides reasonable certainty that the area will remain free from further industrial development (i.e., unlikely that restored roads will be re-activated or new roads will be established within the protected area).

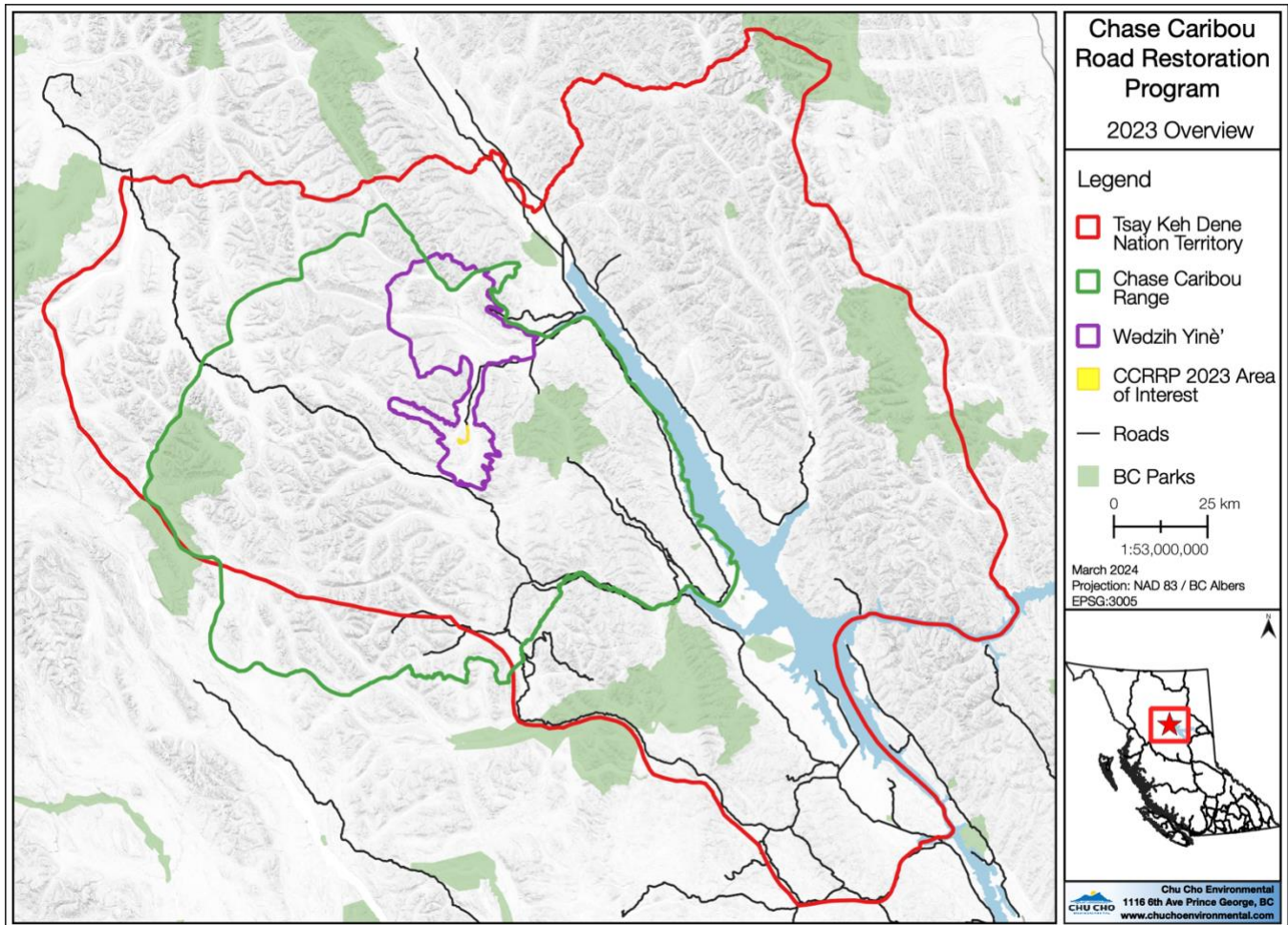


Figure 1. Restoration activities for the 2023-2024 Chase Caribou Road Restoration Program occurred within the Swannell River Valley, which falls entirely within the Wędzih Yinè' Indigenous Protected and Conserved Area and Chase Caribou low elevation core habitat.

4 Methods

4.1 Desktop-based Planning and Prescription Development

In 2019, CCE completed a desktop-based exercise to identify and prioritize roads within the Chase Caribou range as candidates for restoration, based on logistical considerations as well as the ecological benefit to caribou (Chu Cho Environmental LLP 2019). This priority list, along with the establishment of the Wədzih Yinè' IPCA and mapping of Chase range core habitat was used to inform site selection for the 2023 restoration activities. In spring 2022, an 8.5 km section of road commencing at 44 km on the Swannell Forest Service Road was selected as the focal area for 2023 restoration activities, referred to here as the Chuyaza road section. This section of road falls entirely within the Wədzih Yinè' IPCA and within an area identified as low-elevation core habitat for the Chase Caribou, making it a priority road segment for restoration activities.

Following site selection, CCE staff conducted a desktop-based exercise to determine the characteristics of the Chuyaza and Swannell River Valley road segment to be restored, including length, ecosystem type (i.e., biogeoclimatic ecosystem classification (BEC) zone), watercourse crossings present along the road segments to be reclaimed. Additionally, in September 2022 and May 2023, CCE staff completed field visits to the identified road segments to verify the results of the desktop analysis and to identify the locations of culverts along the road segment (Figure 2). This information helped to inform the finalization of the restoration prescription for the road segments to be reclaimed in summer 2023.

Following the field validation work, the restoration prescription was finalized based on the specific conditions present on the ground. The detailed reclamation prescription is provided in Appendix 1: Restoration Prescription, with key concepts described below.

The restoration prescription employed both Ecological and Functional Restoration techniques to make the identified road section less suitable for predator travel and alternate prey species. Ecological Restoration is the process of supporting the recovery of an ecosystem that has been damaged or degraded from disturbance; in this work, ecological restoration was achieved through mechanical site preparations that decompact the soil, create microsites suitable for planting trees and woody shrubs, and promote the regeneration of vegetation on the former road surface. Specific mechanical site preparations to be used are:

- Road surface decompaction using an excavator and bucket.
- Machine screening and rough and loose soil mounding using an excavator with excavator bucket.
- Slash rollback using an excavator with excavator bucket.
- Access management using an excavator with excavator bucket.

Functional restoration of linear features, such as roads, can benefit caribou by making the features less suitable for human or predator movement by promoting the regeneration of a natural forested environment. In this project, functional restoration was achieved through the following techniques:

- Tree felling at strategic locations to reduce predator sight lines.
- Slash rollback.
- Road decompaction.
- Tree planting.

The prescription describes restoration methods to be implemented in three treatment units (TU) along the Chuyaza and Swannell road (Figure 2); full descriptions of these treatment units are provided in Appendix 1. Together, the function and ecological restoration techniques described in the restoration prescription are expected to benefit caribou by:

- Limiting access to the road from both animal predators and motorized vehicles.
- Decreasing predator line-of-sight while on the road to obscure caribou from predators.
- Decrease predator travel speed along the roadway.
- Maintain connectivity within and between caribou ranges.
- Accelerate the revegetation of the road surface by creating microsites and planting with species appropriate for the ecosystem.

4.2 Road Restoration Prescription Implementation

Field work to implement the restoration prescription for the Chuyaza road occurred between September 5-13th, 2023. The implementation was completed by a crew of four, consisting of:

- Equipment Operator: Operated a John Deere 210G excavator to implement earthworks outlined in the restoration prescription.
- Reclamation Supervisor: Worked one-on-one with the machine operator to ensure earthworks were implemented according to the prescription; provided guidance on access management (e.g., cross ditching) and culvert removal.
- Tree planter: Planted all seedlings according to the restoration prescription.
- Monitoring: 1-2 crew members who completed the pre- and post-treatment monitoring using both an unmanned aerial vehicle (UAV) and wildlife cameras.

Restoration work began at the southern extent of the road (i.e., the furthest extent from the Swannell River; Figure 2) and worked towards the Swannell River bridge. Each day, crews worked methodically up the road following the restoration prescription, completing earthworks, access management, and removing culverts as they were encountered; 29 culverts were removed, crushed, and stacked near the Swannell River bridge for removal to a disposal facility in spring 2024. Any road sections where the reclamation supervisor assessed the road surface to be naturally regenerating (i.e., significant tree and shrub growth present on the road surface) were left untreated, unless work was required to remove culverts or re-establish natural drainage. Other than removing culverts along the spur roads branching off the main Chuyaza Road, no restoration treatment was applied to these roads (i.e., TU 4; Figure 2).

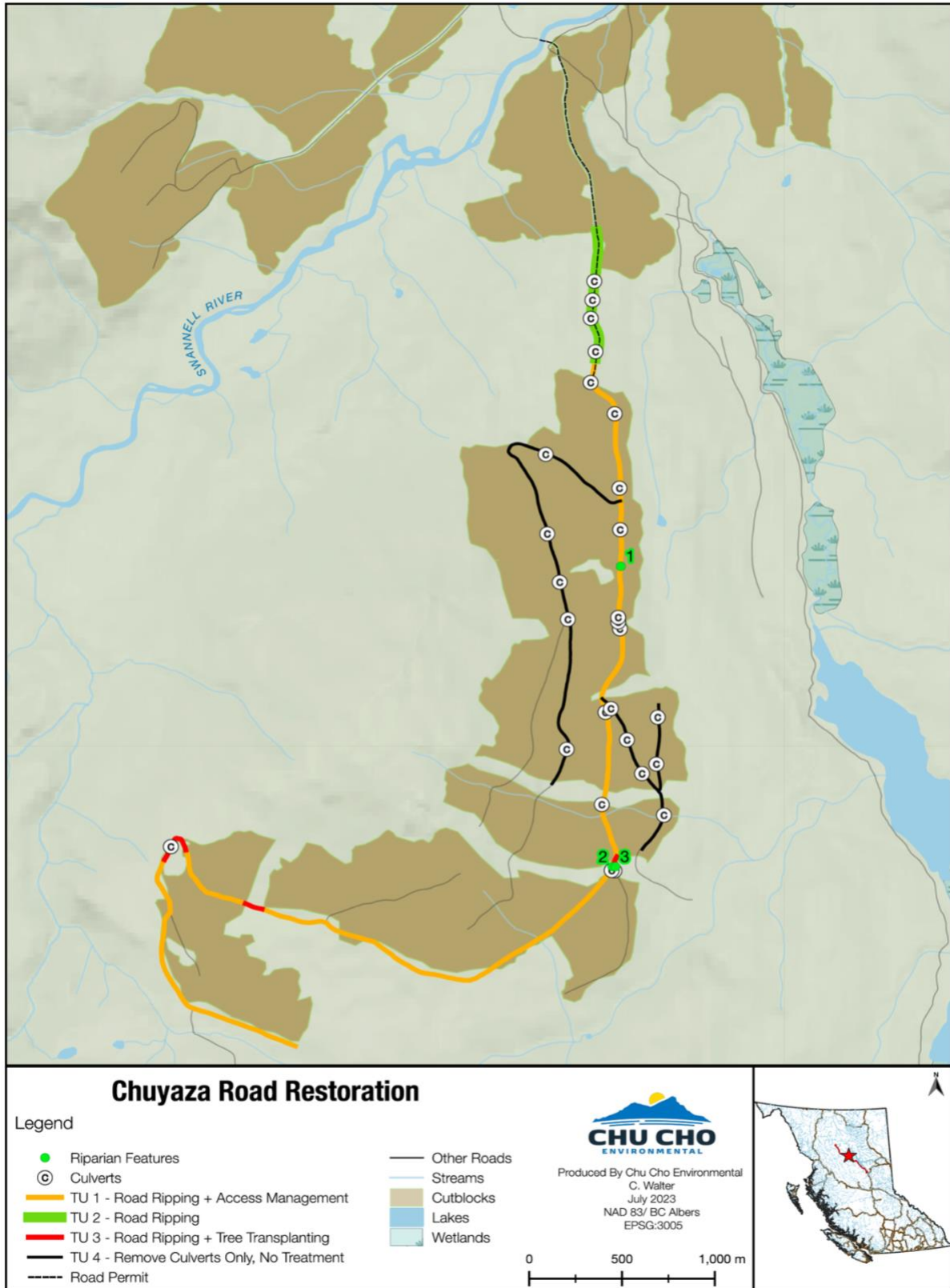


Figure 2. The road restoration prescription, including the treatment units (TU) and culvert locations, used to guide the 2023 Chuyaza Road restoration activities.

4.3 Monitoring Restoration Success

In order to determine, in time, if restoration efforts are successful in the goal of making roads less suitable for predator travel and alternate prey species, it is essential to monitor the restored area and track how the conditions of the area change over time. CCE staff developed specific monitoring metrics for wildlife and vegetation monitoring of the restored road and completed pre-treatment monitoring in the summer of 2023, described below in Section 4.3.1 and Section 4.3.2. As restoration occurs over long timeframes (i.e., years to decades), repeated monitoring of the road is required, both before and after treatment. Monitoring prior to any treatments provides a baseline understanding of the measured conditions present on the road, for example, rates of wildlife use or extent of vegetation cover, against which future (i.e., post-treatment) monitoring can be compared. The goal of the monitoring is to see that, over time, the measured conditions change in such a way that benefits caribou. Initial pre-treatment monitoring was completed in summer 2023, with future monitoring to occur in years 3, 5-8 and 20-30 years after treatment.

4.3.1 Wildlife Monitoring

The wildlife monitoring component of the CCRRP was achieved through use of passive wildlife camera traps deployed along the target road for restoration in order to detect the types of species and rates at which they are using the linear feature both before and after treatment. The wildlife monitoring metrics being used to evaluate project success are provided in Table 1.

Table 1. Wildlife monitoring metrics for the CCRRP monitoring program.

Monitoring Metric	Description	Success Indicator
Detections of Alternate Prey Species	Alternate prey species (i.e., moose) can attract predators to the area, increasing predation pressure on caribou.	Over time, detections of alternate prey species decrease from baseline rate of detections.
Detections of Predators	Predators of caribou, including wolves and wolverines, use roads to access caribou habitat.	Over time, detections of predators of caribou decrease from baseline rate of detections.

On October 16th, 2022, CCE staff deployed six Reconyx Hyperfire2 wildlife cameras along the Chuyaza road and adjacent spur roads to monitor wildlife use of the roads prior to treatment (Figure 3). Additionally, on May 27th, 2023, CCE staff installed one additional camera on a spur road off the Swannell mainline (RR79; Figure 3). Each camera was deployed in a locked box and positioned so that the camera field of view captured the roadway at a height suitable for capturing caribou and other similarly sized species. Crews programmed the cameras to have high sensitivity and, when triggered, to capture three images at one-second intervals; cameras had no delay between triggers. Each camera was equipped with a SanDisk Ultra 120MB/s 32 GB secure digital card to save, store, and transfer collected imagery. All cameras were collected on August 1st, 2023.

Deploying wildlife cameras on the pre-treatment roads allows us to observe the behaviour of wildlife, such as predators and caribou or other ungulate species, enabling us to better understand their patterns of activity along the linear feature. Furthermore, these data will be used as a baseline against which post-treatment wildlife activity can be compared.

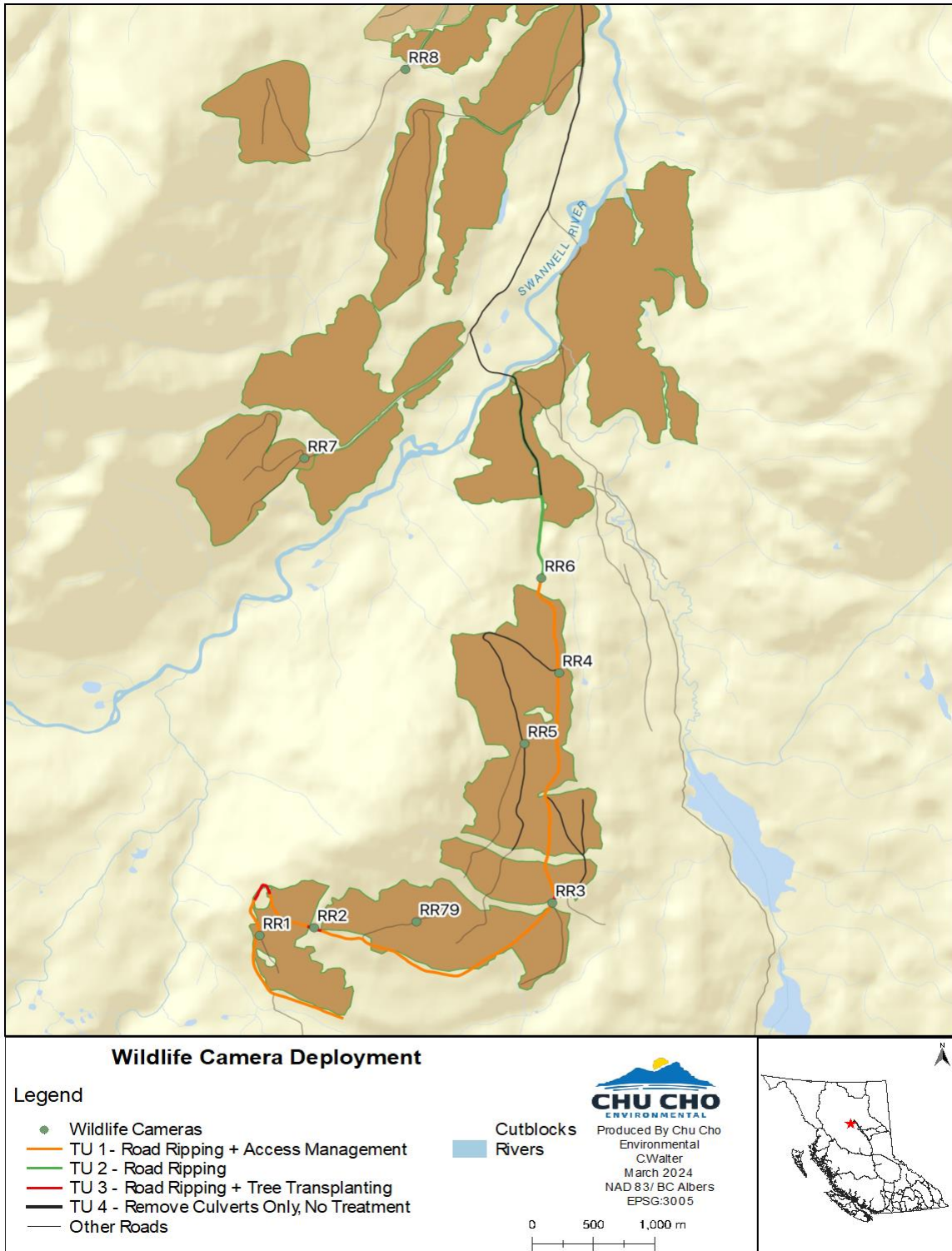


Figure 3. Wildlife camera deployment locations focused primarily along the Chuyaza Road at the end of the Swannell Mainline, with two cameras (RR7 and RR8) positioned on spur roads or roads that are candidates for restoration in future years.

4.3.1.1 Image Analysis

We used the Megadetector program (V5; Beery et al. 2019) for the initial image classification of all captured images; the classifications were then reviewed for accuracy by a human observer. We analyzed wildlife camera data using the Camelot (<https://camelotproject.org/>) desktop application, a free, open-source software for managing camera trap survey data. We identified the species, number of individuals, sex, and life stage of each animal recorded in detection events. We defined independent detections as detections separated by at least 30 minutes, or any event within a 30-minute time period with distinct differences in the sighting fields, such as a different species, sex, or number of individuals from what was previously detected. If sequential detections did not meet these criteria (i.e., if detections were visually the same group composition), they were considered non-independent observations (i.e., only one detection event). We compiled data summaries, including survey information, species independent sightings, animals per day, and summary statistics, including nocturnal detections (n night photos / N photos) and abundance index ($AI = 100 * [\text{independent observations} / \text{elapsed nights}]$).

4.3.2 Vegetation Monitoring

The vegetation monitoring component of the CCRRP was achieved through the collection of high-resolution multispectral drone imagery from which metrics of vegetation health and extent can be derived. By using a drone to collect vegetation data, we were able to gather data over a much larger spatial area than traditional vegetation monitoring methods (e.g., vegetation plots) would using the same amount of field labour. The goal of the vegetation monitoring is to see that, over time, the extent of vegetation cover increases relative to the baseline vegetation cover. The vegetation monitoring metrics being used to evaluate restoration success are provided in Table 2.

Table 2. Vegetation monitoring metrics for the CCRRP monitoring program.

Monitoring Metric	Description	Success Indicator
Vegetation Cover Extent	The total area of the road surface that vegetated.	Over time, the amount of bare ground decreases and the amount of vegetation cover increases relative to the baseline vegetation extent.

*NDVI = Normalized Difference Vegetation Index

We used a DJI Phantom 4 Multispectral (DJI, China) UAV (i.e., drone) to capture imagery of the road sections to be reclaimed, both before and immediately after treatment, in order to characterize the vegetation class and extent present on the road. The Phantom 4 Multispectral UAV collects georeferenced imagery and is equipped with 1 visual light camera and a multispectral camera array with 5 sensors covering blue (B; 450 ± 16 nm), green (G; 560 ± 16 nm), red (R; 650 ± 16 nm), red edge (RE; 730 ± 16 nm), and near-infrared (NIR; 840 ± 26 nm) bands. We used an Emlid Reach RS+ (Emlid, Hungary) GNSS receiver to record high-precision location data; this high-precision location data was used to geocorrect the location data collected by the UAV's onboard GPS unit during image processing.

We used QGIS (v3.22; QGIS.org) to create flight areas for the road; this involved creating a polygon around each section of road to be flown and exporting as a shapefile to be used in the flight planning software DJI GSPPro (<https://www.dji.com/ca/ground-station-pro>). From this flight planning software, we set the flight parameters and controlled the flight. The monitor completing the flights had a valid Transport Canada pilot certificate for Small Remotely Piloted Aircraft System, Visual line-of-sight, meaning that the flight areas were small enough that the monitor was able to maintain visual line-of-sight with the drone at all times during the flight. Only the main Chuyaza Road was flown.

We completed 17 flights for the pre-treatment monitoring; pre-treatment flights occurred concurrently with restoration activities, where monitors flew the pre-treatment road sections ahead of the machine operator. Flights were completed in suitable weather (i.e., not in rain or high winds) and light conditions (i.e., not early morning or late in the day when the sun angle was too low); given these limitations, there were some road sections where the machine operator was able to overtake the drone, resulting in some gaps in the pre-treatment data collection (Figure 4). Post-treatment imagery was collected for the area spanning flights 9-22 to document road condition immediately following restoration treatment.

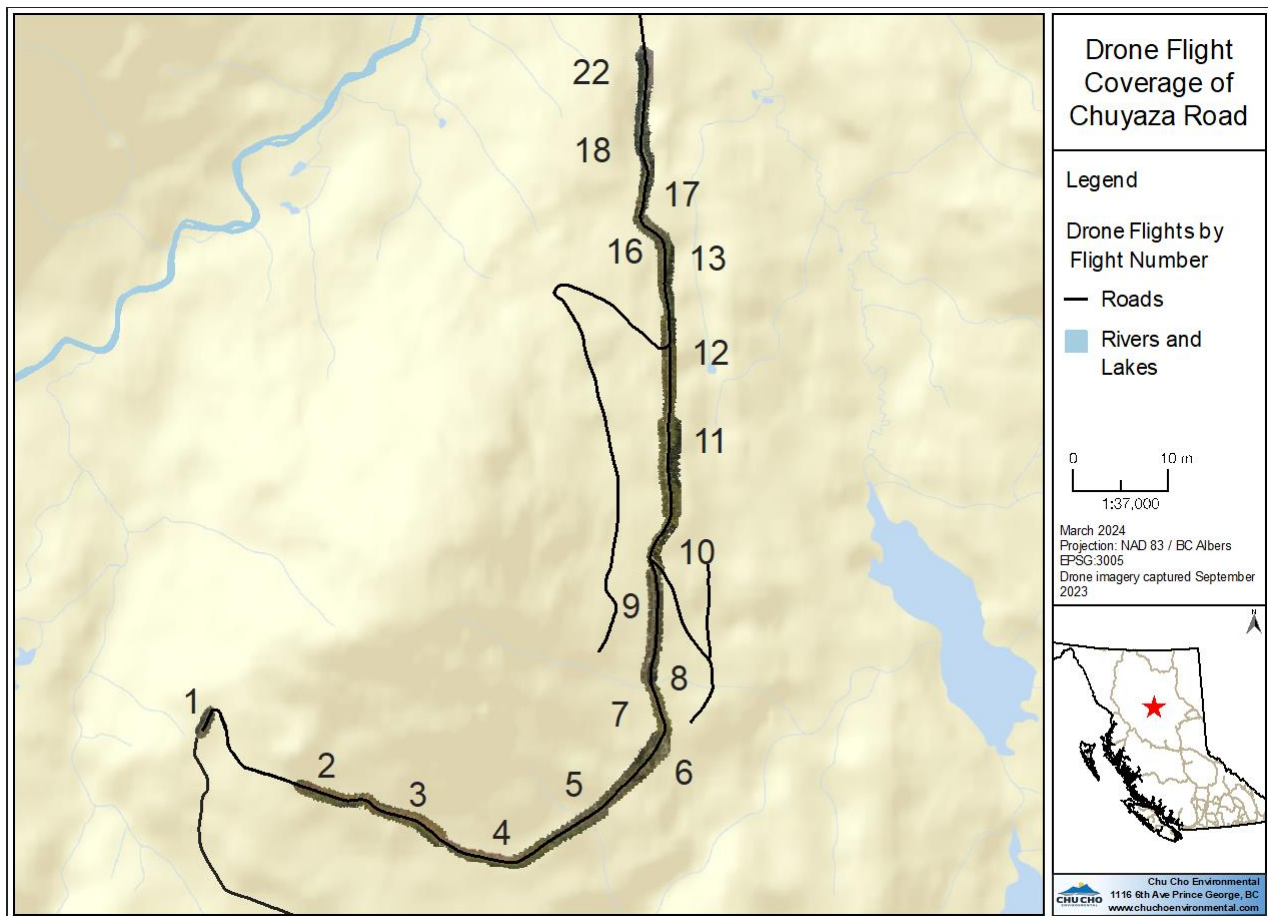


Figure 4. Map of the drone flights by flight number and full extent of drone imagery collected during pre-treatment flights of the Chuyaza road in September 2023.

UAV Data Analysis

All images were downloaded daily and backed up on cloud storage. As the first step in image processing, we completed post-processing kinematic (PPK) correction of image geolocation using REDtoolbox v3.0.19 (REDcatch GmbH, Austria) PPK and geotagging software. We used the photogrammetry software Metashape Professional v1.8.2 (Agisoft, Russia) to complete initial image processing and then completed data analysis using QGIS v3.22 (QGIS.org, 2022). The flight imagery was clipped to a 15 m wide polygon, capturing the road surface and some of the surrounding habitat, before processing. We processed each flight separately, as light conditions and the timing of flights were variable. At this time, only pre-treatment flights were analyzed.

We calculated the Normalized Difference Vegetation Index (NDVI) to evaluate vegetation photosynthetic capacity using the formula:

$$\text{NDVI} = (\text{NIR} - \text{Red}) / (\text{NIR} + \text{Red})$$

NDVI quantifies vegetation health and density based on measuring the difference in how near-infrared (NIR) and red light are reflected and absorbed, respectively. Repeated measurements of NDVI can provide an understanding as to how the health and composition of the vegetation present at a located changes over time. We calculated vegetation classes using NDVI threshold values identified in previous research (Table 3; Hashim et al. 2019).

Table 3. Vegetation classes calculated from NDVI values; modified from Hashim et al. (2019).

Vegetation Class	Code	Description	NDVI Value Range
Non-vegetated	1	Water, rock, and barren soil cover.	-1.0 – 0.2
Low vegetation	2	Grass and shrub cover.	0.201 – 0.5
High vegetation	3	Forest cover, or low vegetation types at high productivity growth stage.	0.501 – 1.0

5 Results and Outcomes

5.1 Functional and Ecological Restoration

Ecological and functional restoration techniques were physically applied to the 8.5 km linear section of the Chuyaza Road in 2023. Assuming a 5 m average roadway width, 4.25 ha was physically treated with ecological and functional restoration treatments aimed at returning the road to the pre-disturbance state. Additionally, 29 culverts were removed during restoration activities. Culverts were removed, crushed, and stacked at near the Swannell River bridge for later removal by Chu Cho Industries during the 2024 season. Restoration proceeded according to the prescription, with no significant deviations or unexpected conditions encountered. Appendix 2 contains select imagery of restoration progress and treatments.

In all, the restoration of the Chuyaza Road contributed to the incremental restoration of the 110,534.8 ha Wədzih Yinè' IPCA, which encompasses the Swannell River valley, and focal area of the CCRRP over the next several years. In all, since 2018 the CCRRP has influenced over 200 million ha, including the areas surrounding the Goldway, Caribou Flats, Lay Creek and Chuyaza Roads. This has contributed to a large road free area in the headwaters of the Sustut, Swannell and Ingenika Rivers.

5.2 Wildlife Monitoring

Seven wildlife cameras were deployed, six operating for 289 days each and the seventh for 66 days. In total, the cameras operated for 1,800 days and 4,942 photos were captured.

We detected a total of 521 independent observations of wildlife during the deployment period, including 10 identified species, 1 unknown bird, and 1 unknown wildlife species (Figure 5). Moose (*Alces alces*) were the most frequently detected species, followed by gray wolf (*Canis lupus*; Figure 5; Table 4). Overall, predators accounted for 49.3% (257 independent observations) of all detections on the pre-treatment road. Predators were detected at a higher frequency than all ungulate species on all cameras except for RR79, located on a spur road off the Swannell Mainline (Figure 6). Caribou were detected at relatively low frequency, accounting for only 3.2% of detection (18 independent observations). Appendix 2 contains select wildlife camera images of detected species.

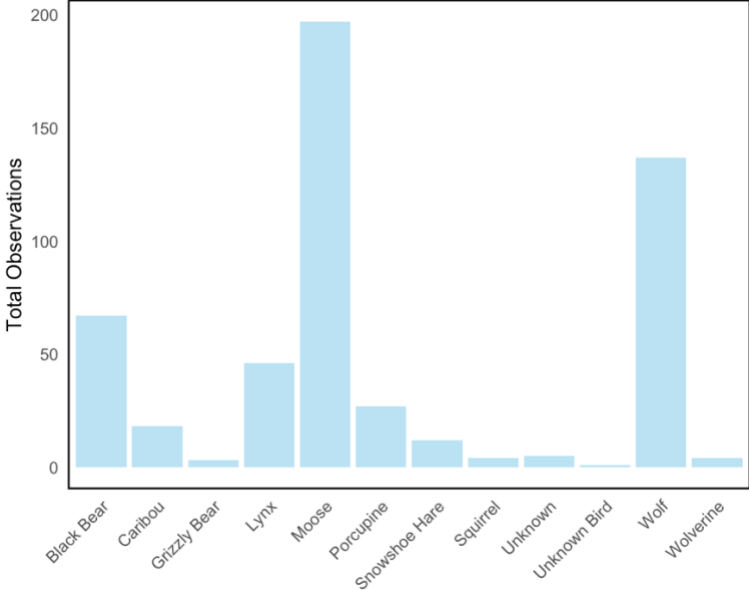


Figure 5. Summary of all independent wildlife detections on wildlife cameras deployed along the Swannell Mainline and associated spur roads, located within the Wędzih Yinè' IPCA.

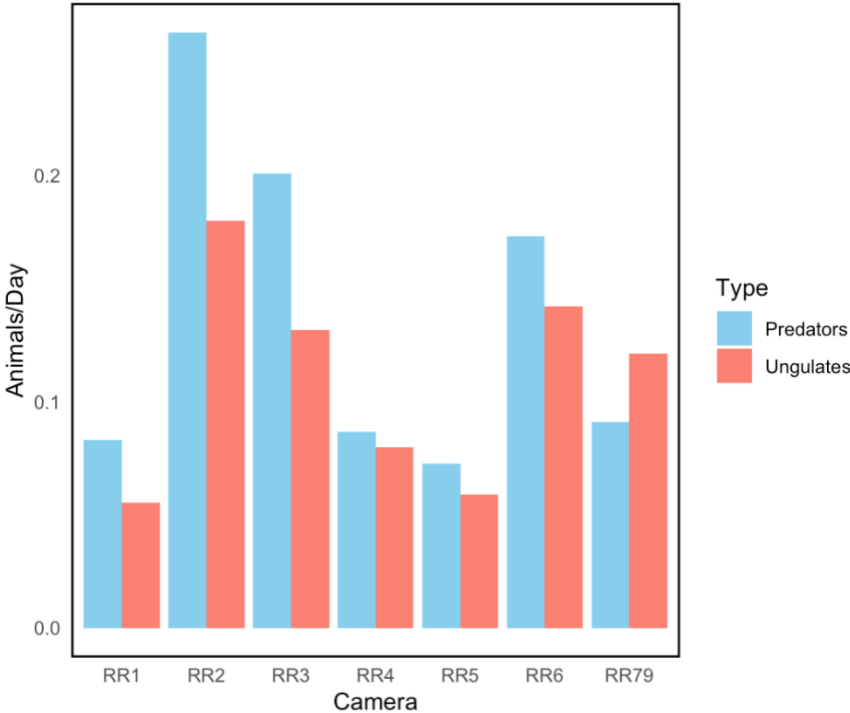


Figure 6. Summary of the average daily predator and ungulate detections at each camera location. Wildlife cameras were deployed along the Swannell Mainline or spur roads off the mainline, located within the Wędzih Yinè' IPCA.

Table 4. Summary statistics for the wildlife detected on each camera deployed along the Chuyaza Road.

Common Name	Scientific Name	Number of Photos	Detections	Nocturnal (%)	Nights Elapsed	Abundance index
Moose	<i>Alces alces</i>	1535	197	66.50	1800	10.944
Wolf	<i>Canis lupus</i>	400	137	52.55	1800	7.611
Porcupine	<i>Erethizon dorsata</i>	82	27	48.15	1800	1.5
Wolverine	<i>Gulo gulo</i>	12	4	50.00	1800	0.222
Lynx	<i>Lynx canadensis</i>	146	46	67.39	1800	2.556
Caribou	<i>Rangifer tarandus</i>	74	18	38.89	1800	1
Squirrel	<i>Tamiasciurus hudsonicus</i>	10	4	0.00	1800	0.222
Snowshoe Hare	<i>Lepus americanus</i>	38	12	100.00	1800	0.667
Black Bear	<i>Ursus americanus</i>	298	67	22.39	1800	3.722
Grizzly Bear	<i>Ursus arctos</i>	12	3	33.33	1800	0.167
Unknown	<i>Unknown spp</i>	18	5	60.00	1800	0.278
Unknown Bird	<i>Unknown bird spp</i>	3	1	0.00	1800	0.056
Total		2628*	521			

*Total number of images of wildlife only; all false triggers and images of humans are removed from total.

5.3 Vegetation Monitoring

The pre-treatment flight area analyzed was 10.65 ha over 17 separate flights (Table 5); this number includes the road surface that was restored as well as a buffer around the road. In general, most of the flight area was covered by high vegetation (i.e., forested) or low vegetation (i.e., grasses and woody shrubs like willow). As this road had previously been deactivated, there was vegetation growing up to or on the road surface, and there were no signs of brushing or other efforts to prevent vegetation encroachment. The most frequently observed low vegetation was willow (*Salix* spp.) as well as fireweed (*Chamaenerion angustifolium*). Only a small proportion of the pre-treatment flight area was classified as non-vegetated; the areas under flight 22 at the commencement of the road was still accessible by light vehicle and therefor was more well-used with a greater non-vegetated area, though the road was deactivated shortly before the transition between flights 22 and 18.

Visual comparison of the road surface and vegetation classification pre- and post-treatment show a clear increase in the amount of non-vegetated area resulting from the earthworks (Figure 7), however this is

expected to decrease through time as the planted vegetation establishes and with the natural ingress of native species from the surrounding environment. Future monitoring will be able to track the changes in the extent of vegetation cover and classification by repeated flights of the same flight areas used in pre-treatment monitoring.

Table 5. Summary of the total flight area and extent of each vegetation class for the 17 pre-treatment drone flights of the Chuyaza road. The percent of each vegetation class is provided in parentheses.

Flight	Total Flight Area (ha)	Non-vegetated (ha)	Low Vegetation (ha)	High Vegetation (ha)
1	0.2532	<0.001 (0.3%)	0.021 (8.4%)	0.231 (91.2%)
2	0.5727	<0.001 (0.2%)	0.069 (12.0%)	0.503 (87.8%)
3	0.8086	0.043 (5.3%)	0.439 (54.3%)	0.327 (40.4%)
4	0.6879	0.008 (1.2%)	0.200 (29.1%)	0.480 (69.7%)
5	0.8831	0.068 (7.6%)	0.400 (45.3%)	0.415 (47.1%)
6	0.8309	0.064 (7.7%)	0.281 (33.8%)	0.486 (58.5%)
7	0.3340	0.018 (5.3%)	0.116 (34.7%)	0.201 (60.0%)
8	0.2827	0.012 (4.1%)	0.090 (31.9%)	0.181 (64.0%)
9	1.0005	0.033 (3.2%)	0.184 (18.4%)	0.784 (78.4%)
10	0.6075	0.006 (0.9%)	0.051 (8.3%)	0.551 (90.7%)
11	0.8581	0.009 (1.0%)	0.226 (26.4%)	0.623 (72.6%)
12	0.8886	0.150 (16.9%)	0.426 (47.9%)	0.313 (35.2%)
13	0.7013	0.016 (2.3%)	0.208 (29.6%)	0.478 (68.1%)
16	0.3407	0.023 (6.8%)	0.129 (37.8%)	0.189 (55.4%)
17	0.4794	0.018 (3.8%)	0.138 (28.8%)	0.323 (67.4%)
18	0.3908	0.005 (1.2%)	0.093 (23.8%)	0.293 (74.9%)
22	0.7332	0.251 (34.2%)	0.233 (31.8%)	0.249 (34.0%)

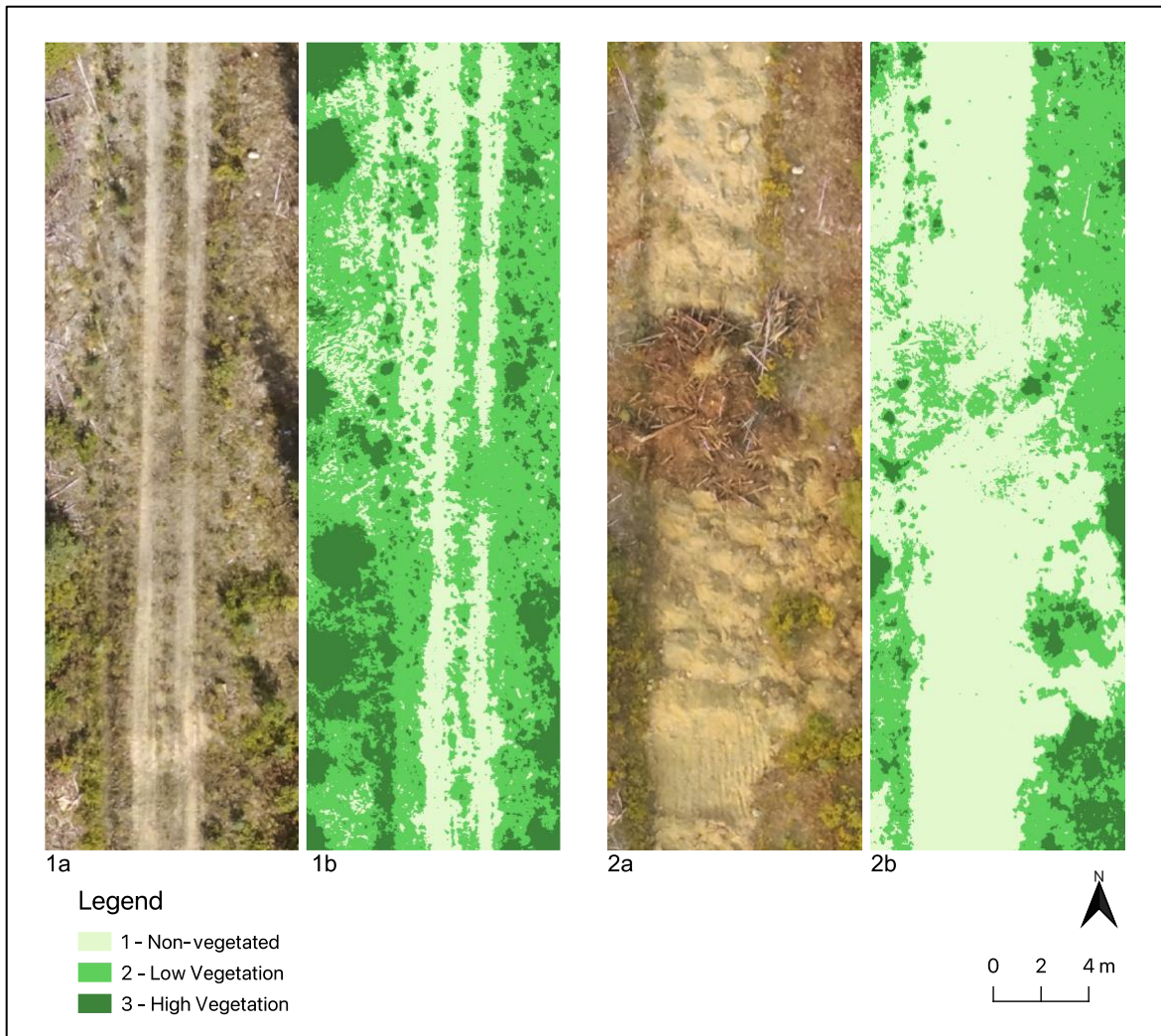


Figure 7. A comparison of a section of flight 12 the Chuyaza road before and after treatment, where: 1a) RGB imagery of the pre-treatment road surface; 1b) classified vegetation cover of the pre-treatment road surface; 2a) RGB imagery of the post-treatment road surface; 2b) classified vegetation cover of the post-treatment road surface.

6 Community Engagement

As a company wholly-owned by Tsay Keh Dene Nation, CCE is committed to engaging with the community and to providing opportunities for meaningful employment and mentoring opportunities to TKDN citizens. Engagement with TKDN citizens about the broader CCRRP occurred in 2018, 2019, 2020, 2021, and 2022. For this 2023-2024 funding specifically, there has been ongoing communications with both TKDN and Conifex Timber Inc. (road tenure holder) throughout the entire project duration. Additional engagement on this project occurred on March 4-8th, 2024 during Science Week in TKD and through a presentation on March 27th to the TKDN Language and Culture Committee in Prince George. Short videos about the CCRRP have been created as a means to further engage with both TKDN and the broader public about road restoration work for caribou, these can be found on the Chu Cho Environmental YouTube channel or by following the links provided in the introduction section of this report.

This project also provided direct employment and mentoring opportunities to TKDN citizens. This work was completed in collaboration with Chu Cho Industries, a business wholly-owned by TKDN, and with TKDN's Lands and Resources Department. Glezhe Nache Consultation, a business owned by a TKDN citizen, was contracted as the reclamation supervisor for this work. 609 Contracting Ltd., a business wholly-owned by a TKDN citizen, was contracted to provide the excavator and implement the earthworks required for the restoration prescription. As well, one TKDN citizen was employed with Chu Cho Environmental on this project; in this role, she was able to learn about drone operation and restoration monitoring methods, working directly with a CCE biologist on the monitoring.

Informal engagement occurred during the restoration field work when several TKDN citizens, including Chief Pierre and an Environmental monitor with TKDN's Lands and Resources Department, visited the work site to view the progress and receive a demonstration of the drone-based vegetation monitoring.

7 Discussion and Recommendations

The restoration of the 8.5 km section of the Chuyaza road is one of many steps that TKDN and Chu Cho Environmental are taking to restore disturbances and improve habitat for the Chase Caribou. The location of this restoration work is entirely within the Wədzih Yinè' IPCA, meaning there is relative certainty that restoration activities will not be disturbed by future industrial development, giving the area the necessary time to regenerate. As the Wədzih Yinè' is a protected area, future road restoration will focus on removing and restoring the remaining roads, including in block roads, to in time decrease the linear disturbances and road density within the protected area. Much of the Wədzih Yinè' is low elevation caribou core habitat in both summer and winter seasons, and decreasing the disturbance within these habitats will benefit the Chase Caribou as, in time, the area becomes less fragmented with fewer linear features that can be used by predators.

Lessons learned and specific recommendations for future CCRRP activities, including:

- **Ecological Restoration:** The Chase Caribou Road Restoration Program will be placing an increased emphasis on the application of both ecological and functional restoration on all road segments moving forward. The process of mechanical site preparation, an ecological restoration technique, decompacts the soil, removing the barrier to seedling establishment; this is necessary to accelerate the return of the forest roadway to a mature forested environment over the long-term. Functional restoration provides a short-term method to reduce predator-prey interactions by breaking up visual line-of-sight and slowing predator movement. Restoration appears to be most effective when these approaches are applied in tandem.
- **Road tenure:** There are still existing administration barriers to completing road restoration on non-tenured roads, which requires a Special Use Permit authorization from the provincial government. There are few barriers to completing restoration in instances where the road tenure holder is supportive of completing road restoration under their existing road tenure. Recommend building and maintaining partnerships with road tenure holders where possible, as there are both fewer administrative barriers to completing the work, and a shared incentive and cost saving opportunities when restoring roads.
- **Legacy infrastructure:** A high number of culverts were encountered as part of this project (29), on both tenured but more frequently on non-tenured sections of the road. While these culverts were removed from our target road segments as part of the 2023 operational work, the transportation of these culverts from the remote Swannell River Valley to a proper transfer station for disposal represents an additional cost for the restoration program, which has been deferred to 2024. Removing this legacy infrastructure on non-tenured roads increases the overall cost per kilometer of these restoration efforts.
- **Drone-based vegetation monitoring:** In 2023, the pre-treatment monitoring occurred concurrently with treatment, with the drone pilot flying sections of the road immediately before mechanical site

preparation. Though this approach does optimize the costs for mobilization, labour, and travel costs to access remote worksites (i.e., treatment and monitoring were completed in one shift; no extra crewmember was required to work with the drone pilot as they were working in proximity to the machine operator and reclamation supervisor), it did present some challenges in collecting pre-treatment data for all road sections. There were periods during the shift where inclement weather (e.g., high winds) prevented drone flight, but through which the machine operator was able to safely work, overtaking the drone and resulting in a section of road where pre-treatment data could not be collected. In future years, where there is sufficient budget, pre-treatment monitoring should be fully completed prior to machinery on site to ensure full road coverage.

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Appendix 1: Restoration Prescription



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Chuyaza Road Restoration Prescription

A Component of the Chase Caribou Road Restoration Program

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Project Overview

Project Identification

PROJECT IDENTIFICATION				
TSA	Forest District	Tenure Holder(s)	Location (Lat., Long.)	Map
Mackenzie	Mackenzie Natural Resource District;	Mineral tenures: N/A Guide outfitter: 710004 Trapline Identifier: TR0740T002 Forest Tenure: Conifex Timber Inc.	56.489834, -125.418086	See Appendix 1 (Detailed Map)
Geographic Location		The road is located at the end of the Swannell mainline, parallel to Chuyaza (Helicopter Lakes). The road restoration point of commencement is at ~44 km on the Swannell Forest Service Road, and the total length of restoration is 8.453 km. The road runs through mapped areas of the Chase Caribou Core habitat and connects areas identified as Ungulate Winter Range (UWR, u-7-007 & u-7-025).		
Road Permit(s)		Client Name(s)	Total Length (m)	Total Area (ha)
Conifex Timber Inc.		Tsay Keh Dene Nation	8,453	3.804

Project Objectives

This Road Restoration Prescription aims to outline the Line Segments of the Swannell mainline in the Chuyaza Conservancy that will be restored.

The Recovery Strategy for the Southern Mountain population of Woodland caribou in Canada provides the following recommendation: “Undertake coordinated actions to reclaim southern mountain caribou habitat in all currently utilized seasonal ranges through restoration efforts (e.g., restore industrial landscape features such as roads, old seismic lines, pipelines, cut-lines, temporary roads, cleared areas; reconnect fragmented annual ranges) to make it less suitable for other prey species.”

This project aims to restore the forest roadway located in Tsay Keh Dene Nation’s Chuyaza Conservancy, to benefit the Chase caribou.

Our project team seeks to make this road network less suitable for alternative prey species and predator travel and to enhance the seasonal caribou range for the Chase caribou. This objective aligns directly with the Federal Recovery Strategy goals for southern mountain caribou. Our team will employ both Ecological and

Functional Restoration techniques to restore the portion the Swannell mainline that falls within the Chuyaza Conservancy.

Ecological Restoration Objectives

Ecological Restoration is defined as the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed.

The Ecological Restoration techniques employed on this project will focus on mechanical site preparation (MSP), to alter the soil conditions and create suitable micro sites for the planting of trees and woody shrubs.

MSP treatments are expected to enhance the establishment, growth and survival of tree species and other target vegetation. Road Ripping, Mounding and Access Management are three types of MSP treatments that will be applied to select Line Segments.

MSP treatments are expected to improve soil infiltration capacity and reduce soil bulk density, while also creating a more favourable seed bed that will accelerate the return of the road to a mature forest environment.

More rapid forest regeneration is expected to help overcome limiting factors for the Threatened Southern Mountain caribou. Specifically, the MSP techniques in this prescription target the following guiding principles to benefit caribou:

- Maintain connectivity within and between caribou ranges.
- Limit motor vehicle access to the road, thus facilitating natural regeneration along the roadway.
- Alter microsite conditions so that it accelerates seedling growth and creates a more favourable site for native seed rain to establish and grow.

MSP will be achieved with the following techniques:

- Road surface decompaction using and excavator and excavator buck.
- Machine screffing and rough and loose soil mounding using and excavator with excavator buck.
- Slash Rollback using an excavator with excavator bucket.
- Access Management using an excavator with excavator bucket.

Functional Restoration Objectives

The objective of Functional Restoration is to recover specific indicators of ecosystem health rather than returning it to the historical composition of the landscape. The Functional Restoration component of the Chuyaza Road restoration will use mechanical intervention to restore historic caribou-predator encounter rates. Reducing predator access to caribou (including the access of humans into caribou habitat) limits disturbance and potentially direct caribou mortality, and can improve individual fitness.

The interventions presented in this prescription for the Chuyaza Road restoration will result in:

- Controlled access to the road surface(s) to manage human access and promote natural revegetation.

- Decreased line-of-sight within the linear feature(s) to create a refuge for caribou from predators and create visual barriers to obscure caribou.
- Decreased predator travel speed on the altered road surface.

Functional restoration of roads for caribou can protect overall ecological integrity by decreasing tread by foot or tire, facilitating more rapid forest regeneration. Ultimately, the goal is to create a functionally restored landscape that can support self-sustaining caribou populations. Functional Restoration will be achieved by implementing the following techniques:

- Tree felling at strategic locations to reduce predator sight lines.
- Slash Rollback.
- Road Decompaction.
- Tree Planting.

Glossary

Access Management – The physical objective of making a road or area impassable to motor vehicles is expected to protect the road from further compaction and protect planted trees while simultaneously enabling environmental recovery. Barriers will include but are not limited to the creation of debris berms, cross ditches, and tree felling.

Ecological restoration - Returning a road or other linear feature to its pre-disturbance composition and structural state.

Functional restoration- Recovering chosen indicators of ecosystem health are the target over returning to the historical composition and structure of the landscape.

Mechanical Site Preparation (MSP) – The physical work to alter soil conditions to favour the establishment, growth and survival of tree species, browse or other target vegetation. In this prescription, MSP includes mounding and ripping.

Slash Rollback – Refers to spreading soil piles or vegetative debris with machinery, often left over from the timber harvest or road building activities, to cover targeted areas of linear disturbance. Slash rollback may hinder vehicle access into and along the roadway, slow predator travel, and shelter tree and vegetation seedlings for optimal regrowth.

Road Ripping – This treatment involves de-compacting the road surface and adjacent areas to enhance subsurface water infiltration by reducing soil bulk density and increasing surface infiltration.

Machine Screefing – The roadbed is disturbed with a machine to reduce compaction by moving rock, soil and woody debris.

Timber Harvesting Land Base – The portion of the Crown Forested Land Base is available for timber harvesting.

Tree Felling – Strategic tree felling uses chainsaws to lay trees across the road surface from alternating opposite directions; unlike 'bending' or 'hinging' trees in which trees are left hanging above the ground surface, tree felling allows the trees to fall to the ground.

Line Segments (LS) – The area to which Functional and Ecological restoration will be applied.

Tree planting – The transplanting of tree seedlings, generally for forestry, land reclamation, or landscaping purposes.

Restoration Prescription

Site Characteristics

SITE CHARACTERISTICS										
Site						Soils				Vegetation
TU*	BEC	Elevation (m)	Road Grade (%)	Side Slope Down %	Side Slope Up %	Aspect	Soil Texture	Coarse Frag. (%)	Organic Materials	Genera
1	ESSFmv	1250 to 1350	3 to 10	-20	+20	S	Medium	20-30	None	<i>Abies lasiocarpa</i> , <i>Picea</i> spp., <i>Pinus contorta</i> , <i>Salix</i> spp., <i>Cornus sericea</i> .
2	ESSFmv	1150	5 to 12	-5	+10	SE	Medium	20-30	None	<i>Abies lasiocarpa</i> , <i>Picea</i> spp., <i>Pinus contorta</i>
3	ESSFmv	1300	5 to 10	-15	+20	SE	Medium	20-30	None	<i>Abies lasiocarpa</i> , <i>Pinus contorta</i> , <i>Salix</i> spp.

*TU = Treatment Unit

Treatment

Treatment Units									
									Planting
Treatment Unit	Treatment Difficulty	Length (m)	Road Width (m)	Area (ha)	Drainage Structures	Riparian Features	Species	SPH	
1	Moderate	7,172.5	4.5	3.23	0	1	<i>Pinus contorta</i> , <i>Alnus</i> spp.	1200	
2	Moderate	909.6	4.5	.40	0	0	<i>Pinus contorta</i> , <i>Alnus</i> spp.	1200	
3	Moderate	372.5	4.5	.17	2	2	<i>Pinus contorta</i> , <i>Alnus</i> spp.	1200	

Treatment Prescriptions	
TU	Prescription
1	Excavator bucket will be used to de-compact the road surface. Available soil material will then be rolled back to increase complexity (i.e., hills and mound, establishment of rough and loose conditions). Slash rollback will be used, to increase habitat complexity through the incorporation of coarse woody debris, and where possible, slash will be rolled piled at a height of 1.5 m to reduce line of site. The mechanical site preparation will then be followed by tree planting of coniferous trees and deciduous shrubs. There are limited opportunities for Tree Felling, and so whole tree/shrub transplantation may be used at strategic locations, along with slash rollback, to decrease line-of-site. A combination of whole tree/shrub transplantation, and slash rollback will be used at intersections with spur roads, to reduce line of site at these intersections.
2	Excavator buck will be used to de-compact the road surface. Available soil material will then be rolled back to increase complexity (i.e., hills and mounds, establishment of rough and loose conditions). Slash rollback will be used, to increase habitat complexity through the incorporation of coarse woody debris, and where possible, slash will be rolled piled at a height of 1.5 m to reduce line of site. The mechanical site preparation will then be followed by tree planting of coniferous trees and deciduous shrubs. Access management treatments will be applied at the road point of commencement. There are opportunities for Tree Felling, or for trees to be pushed over with the excavator. Whole tree/shrub transplantation may also be used, along with slash rollback, to decrease line-of-site. A combination of tree felling, whole tree transplantation, and slash rollback will be used to limit access, and reduce line of site. No live spruce will be felled.
3	Excavator bucket will be used to de-compact the road surface. Available soil material will then be rolled back to increase complexity (i.e., hills and mound, establishment of rough and loose conditions). Slash rollback will be used, to increase habitat complexity through the incorporation of coarse woody debris, and where possible, slash will be rolled piled at a height of 1.5 m to reduce line of site. The mechanical site preparation will then be followed by tree planting of coniferous trees and deciduous shrubs. Dead trees are available for felling, or for pushing over with the machine and pullback. No live spruce will be felled, and opportunities for whole tree/shrub transplantation will be explored, to reduce site lines.
Point 1	Remove culvert (Figure 9), re-contour the natural drainage path, to facilitate and establish natural drainage patterns and stabilize erosion prone areas (Figure 10).
Point 2	This location is downstream of Point 1. Remove the culvert re-contour the natural drainage path, to facilitate and establish natural drainage patterns and stabilize erosion prone areas. This culvert is currently non-functioning, and the road is re-directing water down the ditch line (Figure 11).
Point 3	Seepage area is located above the road. Maintain natural drainage across the road (Figure 12). This may include the establishment of Cross-Ditching (Figure 13) and Waterbars (Figure 14) to intercept water on the road and convey it across and below the road onto stable slopes.

Results and Strategies

VALUES – RESULTS & STRATEGIES			
Result/ Strategy/ Measure	Act/ Reg.	Applicable	How it Applies to the Site
Landscape Biodiversity	FPPR sec. 9 and 14	N	The road does travel through multiple cutblocks, but this prescription does not include forest harvest, cutblock design, road construction, or any other activities typically associated for forestry practices in British Columbia.
Soils	FPPRsec. 5, 12.2, 35 and 36	Y	<p>This prescription does not include forest harvest, cutblock design, road construction, or any other activities typically associated for forestry practices in British Columbia, and is consistent with FPPR sections 5, 12.2, 35 and 36.</p> <p>Areas of compacted soil will be restored in identified TU's, to improve productivity and the hydrologic function of the soil. Treatments will include de-compaction, rollback of soil material, slash rollback, and strategic tree felling.</p> <p>These activities will occur in a way that does not allow sediment to enter a stream, wetland or lake. The area reforested at 1,200 SPH to reduce the likelihood of erosion.</p>
Wildlife and Species at Risk	FPPR sec. 7 FRPA U-7-025 British Columbia Wildlife Act - Section 34 Federal Migratory Birds Convention Act - Section 5(9)	Y	<p>This prescription does not include forest harvest, cutblock design, road construction, or any other activities typically associated for forestry practices in British Columbia.</p> <p>The Chuyaza Road intersects designated Caribou Winter Range for the Chase herd - Ungulate Winter Range – Core Area – Unit No: SA35 and is adjacent to Unit No: 61. The Chase herd of caribou is classified as Southern Mountain Caribou by the Federal Government, a Threatened Species in Canada. This work will be completed in the July 16 – September 14 Low Risk timing window for Northern Caribou.</p>

			<p>In compliance with the BC Wildlife Act and Migratory Birds Convention Act, pre work bird nest surveys will be completed when required, and where trees are being felled.</p> <p>The road does not intersect or run adjacent to a Wildlife Habitat Area, General Wildlife Measure, Wildlife Habitat Feature. The road does intersect Ungulate Winter Range for Caribou.</p>
Northern Caribou Ungulate Winter Range	FRPA U-7-025 FRPA U-7-007	Y	<p>The Chuyaza Road intersects the Northern Caribou High Elevation Winter Range – Ungulate Winter Range Core Area – Unit No: 61 – Chase herd.</p> <p>This work will be completed in the July 16 – September 14 Low Risk timing window for Northern caribou.</p>
Stone Sheep Ungulate Winter Range	FRPA U-7-028	N	The Chuyaza Road does not intersect Stone's Sheep Ungulate Winter Range
Mountain Goat Winter Range	FRPA U-7-030	N	The Chuyaza Road does not intersect or run adjacent to Mountain Goat Ungulate Winter Range.
Water, Fish, Wildlife and Biodiversity within Riparian Areas: General	FPPRsecs. 8, 12.3(1) to(5) and (7)	Y	<p>This prescription does not include forest harvest, cutblock design, road construction, or any other activities typically associated for forestry practices in British Columbia.</p> <p>The road restoration prescription will be carried out, and all stream crossings conducted in accordance with the water Sustainability Act, Section 11 permit approved by a Habitat Officer with the Ministry of Forests, Lands, Natural Resource Operations and Rural Development under the Water Sustainability Act with the Omenica Region.</p>

Water, Fish, Wildlife and Biodiversity within Riparian Areas: Retention of Trees in Riparian Management Zones	FPPR secs. 8, 12.3(3) and (6)	N	This prescription does not include forest harvest, cutblock design, road construction, or any other activities typically associated for forestry practices in British Columbia.
Wildlife and Biodiversity – Landscape Level	FPPR secs. 9 and 12.4	N	This prescription does not include forest harvest, cutblock design, road construction, or any other activities typically associated for forestry practices in British Columbia.
Wildlife and Biodiversity – Stand Level	FPPR secs. 9.1 and 12.5(1)	N	This prescription does not include forest harvest, cutblock design, road construction, or any other activities typically associated for forestry practices in British Columbia.
Retention Areas May Apply to More Than One Cutblock	FPPR secs. 9.1 and 12.5(1)	N	This prescription does not include forest harvest, cutblock design, road construction, or any other activities typically associated for forestry practices in British Columbia.
Restriction on Harvesting Wildlife Tree Retention Areas	FPPR secs. 9.1 and 12.5(2)	N	This prescription does not include forest harvest, cutblock design, road construction, or any other activities typically associated for forestry practices in British Columbia.
Visual Quality	GARsec.7(2) and FPPRsec. 12(7)	N	This prescription does not include forest harvest, cutblock design, road construction, or any other activities typically associated for forestry practices in British Columbia.
Cultural Heritage	FPPR sec. 10	N	This restoration plan is consistent with FPPR Sec. 10. First Nation consultation has not yet been completed, and will be led by the British Columbia District of Mackenzie prior to the work commencing.
Agricultural Development Areas and Settlement Reserve Areas	Land Act sec. 93.4	N	The Chuyaza Road restoration prescription

			does not include lands identified under the Land Act sec. 93.4.
Recreation Site, Recreation Trail or Interpretive Forest Site	FRPA sec. 181	N	This restoration prescription is consistent with FPPR sec. 181 and does not impact areas established or continued under this code. This prescription does not include forest harvest, cutblock design, road construction, or any other activities typically associated for forestry practices in British Columbia.
Invasive Plants	FPPR sec. 17	Y	The Chuyaza Road restoration will be carried out in accordance with FPPR sec. 17. The presence of plants that are invasive plants under the Invasive Plants Regulation, will be documented, and the presence will be communicated to the British Columbia Ministry of Forests, Lands, Natural Resource Operations and Rural Development Regional Invasive Plant Specialist.
Natural Range Barriers	FPPR sec. 18	N	This restoration prescription is consistent with FPPR sec. 18. Additional management considerations are outlined below.

OTHER MANAGEMENT REQUIREMENTS

Species at Risk Databases and Special Notes

The Chase caribou herd is considered by the Federal government of Canada to be part of the Northern ecotype of Southern Mountain caribou, which is listed on Schedule 1 of the Federal Species at Risk Act as ‘Threatened.’ The end of the Swannell mainline extends into an identified migration corridor and core habitat for the chase caribou. In addition, the road overlaps with the Ungulate Winter Range in the conditional harvest zone.

The Recovery Strategy for the Southern Mountain population of caribou (*Rangifer tarandus caribou*) in Canada has identified that “the range of the Southern Mountain Population has shrunk by up to 40% and 13 of 19 herds are declining.” These herds are “threatened by decreasing habitat quantity and quality, harassment, and predation.” If steps are not taken, the Southern Mountain population could become endangered.

The Federal Recovery Strategy for the Southern Mountain caribou provides the following recommendation: “Undertake coordinated actions to reclaim southern mountain caribou habitat in all currently utilized seasonal ranges through restoration efforts (e.g., restore industrial landscape features such as roads, old seismic lines, pipelines, cut-lines, temporary roads, cleared areas; reconnect fragmented annual ranges) to make it less suitable for other prey species.”

Our project team now seeks to restore the section of the Swannell mainline that leads into the Chuyaza Conservancy and make this road network less suitable for alternative prey species, predator travel, and enhance caribou seasonal range. This aligns with the Federal Recovery goals for the southern mountain caribou.

This road restoration prescription does not include any known occurrences of species at risk other than caribou.

First Nations

The restoration of the Chuyaza Road was initiated by Tsay Keh Dene Nation. First Nation consultation was completed by the British Columbia District of Mackenzie prior to work commencing.

Mineral Tenure Holders/Guide Outfitters/ Special Use Permit Holders

The Chuyaza Road does not overlap or provide access to registered Mineral Tenures. Guide outfitters operating in the area will be notified of the work. The road is currently under the Tenure of Conifex Timber Inc., who is partnered on this road restoration project.

Permitting Requirements

The road restoration prescription will be carried out, and all stream crossings conducted in accordance with the Water Sustainability Act.

Under the Section 52 (1)(b) of the Forest and Range Practices Act, a permit was obtained to cut, damage and/or destroy Crown timber for caribou habitat restoration purposes on the Chuyaza Road to the extent described in the permit.

A copy of the permit will be retained on site during works.

Detailed Map

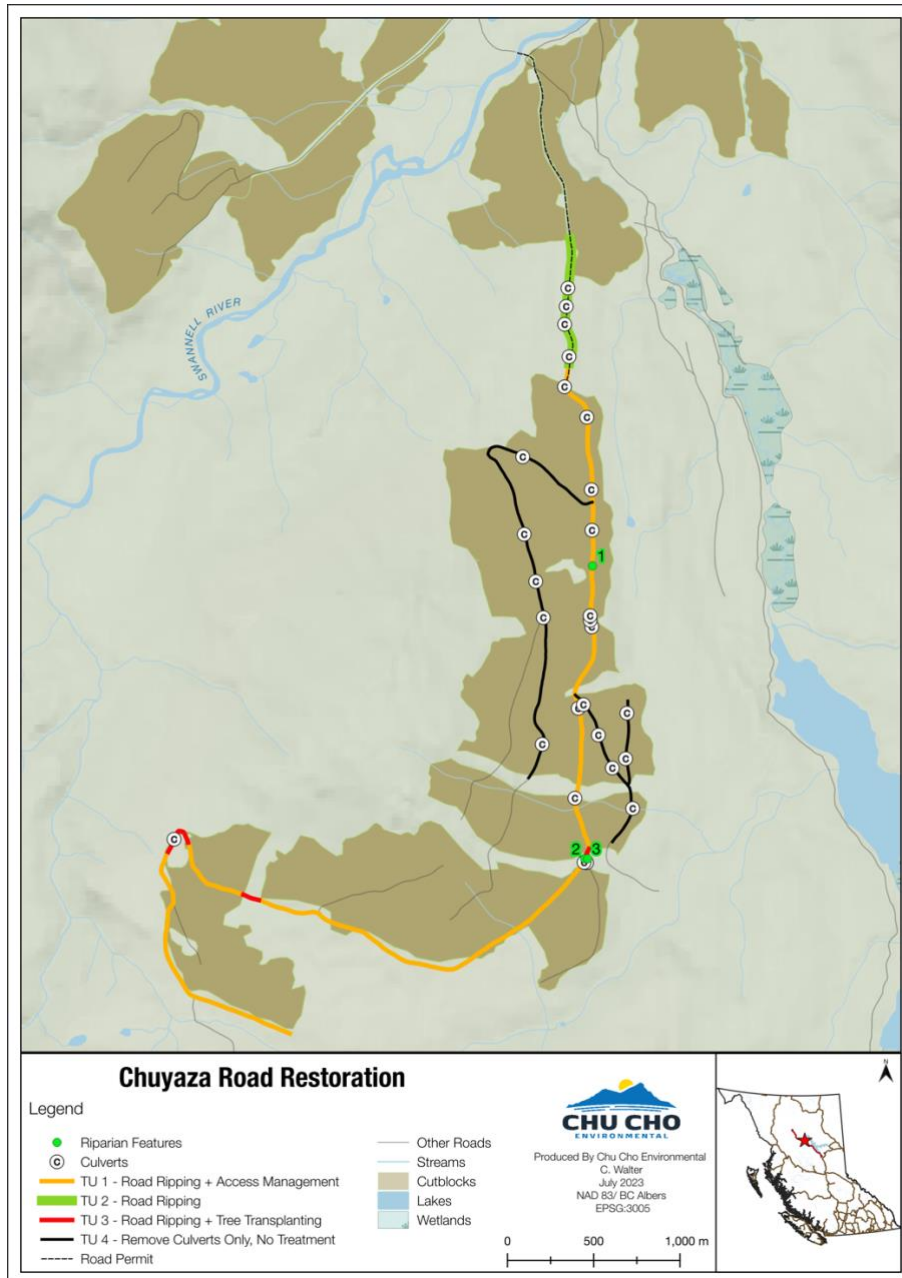


Figure 8. Treatment units along roadway.

Images

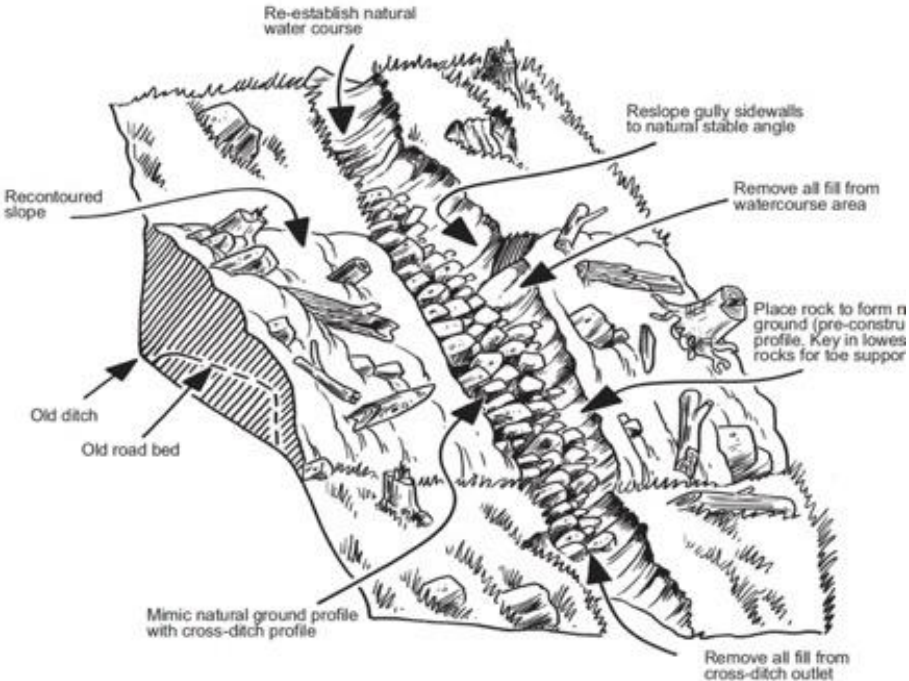


Figure 9. Deactivation with Culvert Removal from BC MFLNRORD (2019).



Figure 10. Photo of point location number 1.



Figure 11. Photo of point location number 2.



Figure 12. Photo of point location 3.

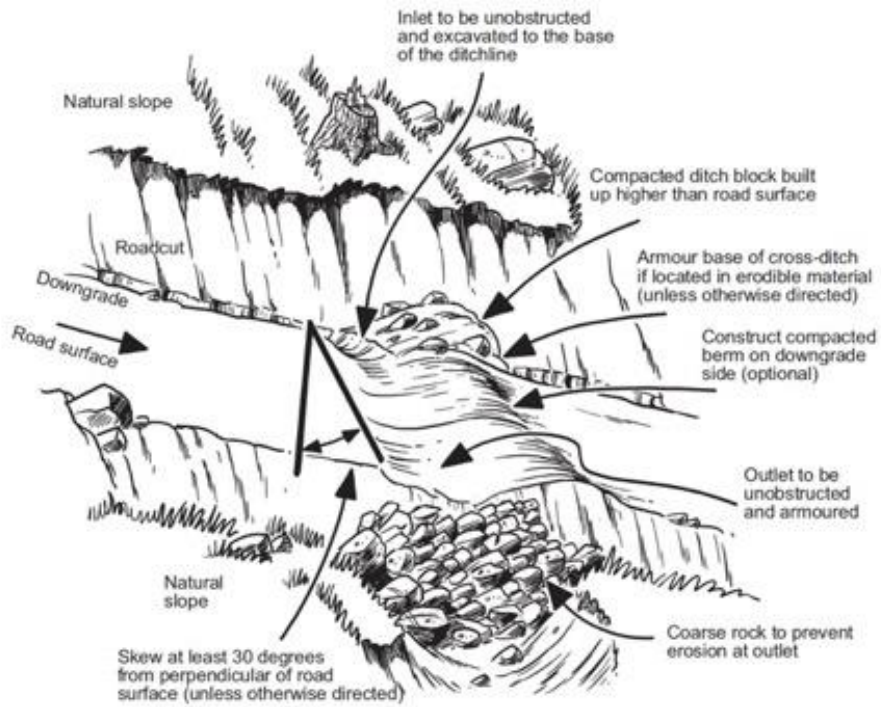


Figure 13. Deactivation with Cross-Ditching from BC MFLNRORD (2019).

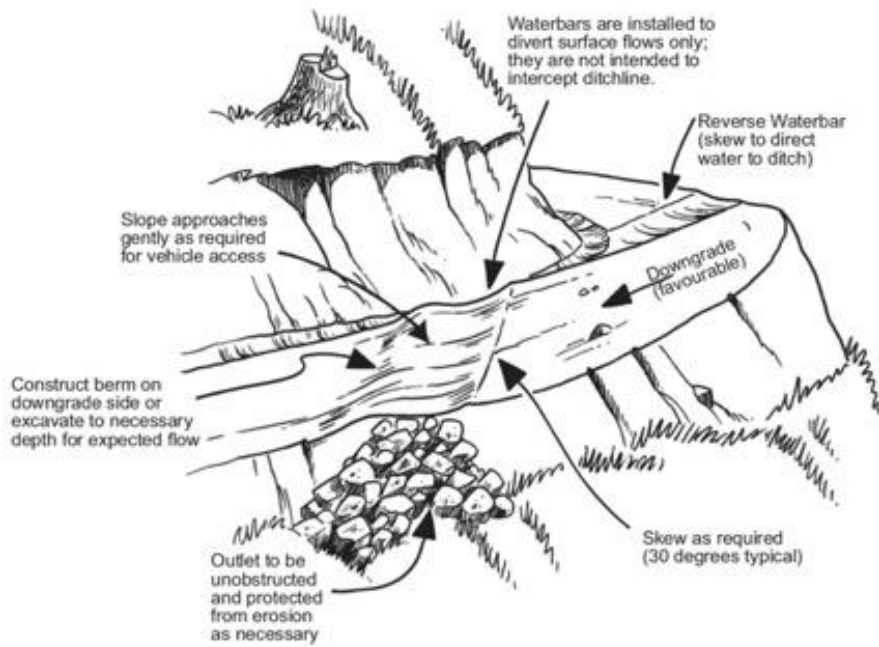


Figure 14. Deactivation with Waterbar from BC MFLNRORD (2019).

References

[BC MFLNRORD] B.C. Ministry of Forests, Lands, Natural Resource Operations and Rural Development. 2019. Engineering Manual. Engineering Branch, Ministry of Forests, Lands, Natural Resource Operations and Rural Development.

Appendix 2: Supplemental Information: Chuyaza Road Restoration and Wildlife Monitoring Highlights

Select Road Restoration Highlights from 2023



Figure 15. An excavator was used to implement ecological and functional restoration of the Chuyaza road. Pictured is the excavator at the end of a day, with treated road behind it and pre-treatment road in front of it.



Figure 16. The excavator de-compacted the road surface and the digging bucket was used to create mounds and depressions (pictured above), as well as deep cross ditching and berms for access management. These Mechanical Site Treatments improve soil infiltration capacity, reduce soil bulk density, and create microsites where seeds and planted species can more easily establish.



Figure 17. Another example of mounding, with some slash rollback picture towards the background of photo.

Wildlife and Vegetation Monitoring

For both vegetation and wildlife monitoring, the goal is to see that, over time, the conditions on the restored road become more suitable for caribou and less suitable for predators or alternate prey species (Table 1, Table 2). For additional wildlife or vegetation monitoring imagery, please contact Sean Rapai, sean@chuchoenvironmental.com.

Select Wildlife Camera Highlights

Below are selected highlights from the wildlife cameras deployed along the pre-treatment road. Camera deployment locations are illustrated in Figure 3.



Figure 18. A caribou using the pre-treatment road within the Chuyaza Conservancy. This road was restored in Summer 2023 and is within the Chase Caribou low elevation core habitat.



Figure 19. A caribou using the road pre-treatment.



Figure 20. Wolverine using the pre-treatment road.



Figure 21. Grizzly bear using the pre-treatment road.



Figure 22. A group of three wolves using the pre-treatment road.



Figure 23. A single wolf using the pre-treatment road.



Figure 17. Lynx using the pre-treatment road.