



S E R N B C



SOCIETY FOR ECOSYSTEM RESTORATION  
IN NORTHERN BRITISH COLUMBIA



## Telkwa Caribou

### Tactical Restoration Plan

29 July 2019

Project No.: 0494183

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29 July 2019

# Telkwa Caribou

## Tactical Restoration Plan

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## EXECUTIVE SUMMARY

### Habitat Restoration for Woodland Caribou Recovery in British Columbia

Habitat restoration is one of the tools available to support caribou recovery and is a recognized component of federal recovery strategies for conservation of Woodland Caribou. Since 2017, the British Columbia (BC) Ministry of Forests, Lands, Natural Resource Operations and Rural Development (MFLNRORD) has been implementing the Provincial Caribou Recovery Program. The Program focuses on a range of recovery actions for BC's caribou, which include integrated planning, habitat management and habitat restoration. In a 2019 agreement with Environment and Climate Change Canada (ECCC), British Columbia (BC) also committed to incrementally increasing southern mountain caribou habitat through habitat restoration. Restoring habitats will support the Province in meeting federal caribou recovery habitat intactness targets. MFLNRORD is currently pursuing habitat restoration as one action in support of the recovery of the Telkwa caribou herd, one of seven local population units (LPUs) in the northern group of the southern mountain national ecological area (SMNEA).

There are two main goals of habitat restoration in caribou ranges:

1. Reduce predator efficiency (e.g., movement, sight lines) and subsequent caribou mortality; and
2. Increase habitat intactness and habitat quality.

These goals may be achieved through a combination of functional and ecological restoration. Functional restoration aims to reduce human and predator use of linear features to reduce predation rates on caribou. Functional restoration may not return a habitat to its pre-disturbance state; however it has an immediate impact on predator efficiency and is relatively cost-effective. Ecological restoration is undertaken to return the habitat and ecological function of disturbed sites to a pre-disturbance state and condition. It is an effective restoration tool for long-term ecological recovery, ultimately resulting in increased habitat intactness. However, it takes longer to achieve reductions in predator efficiency and caribou mortality in the short term as vegetation must establish for the restoration to be an effective barrier.

For habitat restoration activities to make effective use of resources, they must be coordinated, prioritized and implemented to provide the greatest value to caribou. In addition, restoration activities that are informed by the best available local and traditional ecological knowledge – both in terms of caribou habitat use and in relation to human use of the landscape – are more likely to be supported by the local community and successful over the long term.

This tactical restoration plan is the first phase of planning for habitat restoration in the range of the Telkwa caribou herd and provides the framework for delivering coordinated and effective restoration that will benefit caribou.

### Status and Background of the Telkwa Caribou Herd

The Telkwa caribou herd is located in northwestern BC, southwest of the town of Smithers, and is geographically separated from all other LPUs in the northern group of the SMNEA. Long-term population monitoring indicates the Telkwa herd has declined from approximately 270 individuals in the 1960s to approximately 16 individuals in 2013. Although the population increased between 2013 and 2019 to 25 individuals, it remains at risk. The loss and fragmentation of habitat from anthropogenic disturbance, subsequent increases in predators and their primary prey in early seral habitats and increased wolf predation have been identified as factors limiting caribou populations.

In recent years, MFLNRORD has taken actions to limit further habitat disturbance in the Telkwa caribou range. The Wildlife Habitat Area established in 2015 prohibits forest harvest in high elevation habitat and limits the creation of early seral forests and roads in low elevation forests. The implementation of a Motor Vehicle Closure (MVC) in 2018 prohibits motorized vehicle access within critical caribou habitat in the Telkwa Mountains.

## Preliminary Tactical Restoration Plan Overview and Methodology

The vision for this tactical restoration plan was to identify candidate restoration sites that will have positive impacts on long-term recovery of the Telkwa caribou herd and that are collaboratively identified with MFLNRORD, the Office of the Wet'suwet'en and other stakeholders. The specific objectives of the plan were to:

1. Confirm, refine and finalize a comprehensive disturbance mapping layer for the Telkwa herd range using 2019 disturbance mapping, available datasets and imagery;
2. Engage with MFLNRORD and stakeholders to develop mapping products, a comprehensive summary of current and future disturbance features and a communication plan for continued engagement in coordination with other recovery actions;
3. Engage with the Office of the Wet'suwet'en to incorporate knowledge and interests to develop criteria to support selection of priority areas and candidate sites for restoration activities in the Telkwa range;
4. Identify candidate restoration sites within the priority areas for the Telkwa herd range;
5. Develop a preliminary restoration implementation plan with proposed restoration treatments, activities and preliminary prescriptions; and
6. Develop a monitoring plan to assess treatment success and wildlife response to restoration activities that includes the baseline and long-term data collection.

This preliminary tactical restoration plan is bounded by the extent of Wildlife Habitat Area (WHA) 6-333 for Telkwa caribou in the Bulkley and Morice Timber Supply Areas. Disturbances arising from human activities define the scope of potential restoration options within the WHA for this planning project.

The WHA prohibits forest harvesting in high elevation caribou habitat and imposes constraints on forest harvesting to manage caribou habitat in low elevation forest. However, the areas are not part of a provincial park or other protected area and as such remain open to authorizations for land tenure, access and use for industrial purposes. The uncertainty associated with land use means any of the priority areas presented here may need to be altered to accommodate future land use planning and authorizations.

The whole area of the WHA is biologically important to the Telkwa caribou herd. However, the entire WHA was not identified as a priority area for restoration at this time because of ongoing forest harvesting and other activities. These activities made assessing the ongoing use of and potential level of protection for the linear features in this area challenging. If land use activities in the WHA change, then restoration priorities will be re-evaluated.

Within the WHA, a strategic set of biological, land use and environmental criteria informed the identification and prioritization of restoration candidate sites. Linear features were the focus of restoration candidate site selection. These features both reduce habitat intactness and quality and increase predator efficiency. As such, restoring linear features can provide the greatest opportunity for both functional and ecological restoration and the greatest benefit to caribou. These criteria were evaluated using spatial and temporal data sets. This process included the following components:

1. The delineation of restoration polygons identifying areas of high priority for restoration activities, and
2. The classification of linear features as restoration treatment candidates within those polygons.

Restoration polygons were delineated using the following characteristics:

- Caribou utilization determined from radio-collar location and kernel density estimator data;
- Biogeoclimatic zones delimiting high elevation winter range;

- Matrix habitat with the potential to function as low elevation winter or summer range following restoration; and
- Density of anthropogenic disturbance, including cutblocks and linear features (roads, trails, oil and gas right of ways).

Linear features were considered as candidates for restoration treatment if they were:

- Not potentially used for access to current or future resource development activities;
- Outside areas with recent (<40 years) forest harvest or wildfire; and
- Outside areas identified as having medium or high susceptibility to mountain pine beetle.

Following the preliminary identification of restoration candidate sites, information sharing sessions and stakeholder engagement was used to identify areas and sites where restoration may have the support of the Office of the Wet'suwet'en and primary stakeholders.

## Results

Of the linear features within the Telkwa caribou WHA, 188.2 km were identified as potential treatment candidates. Stakeholder input was used to refine the set of treatment candidates to 138.9 km, based on the current exclusion of linear features (roads and trails) with high recreational value and ongoing use.

Treatment candidates were distributed among five polygons, which were delineated to guide prioritization based on caribou utilization, high value caribou habitat, and the density of anthropogenic disturbance. The resulting set of treatment candidates included 29.3 km of priority 1 and 109.6 km of priority 2 restoration sites. Four preliminary treatment prescriptions for restoration candidates were developed based on restoration objectives and ecology (i.e., biogeoclimatic zones).

## Next Steps for Implementation

The implementation of caribou habitat restoration in the Telkwa range will depend on local and provincial capacity. Detailed implementation planning should be undertaken in a subsequent phase of restoration planning. Further engagement with stakeholders and consideration of logistical constraints such as access and resource availability should be used to identify a short list of priority 1 candidate sites that can be the target for stage 1 of implementation.

Once these areas are identified, implementation will require:

1. The development of a detailed implementation plan, including budget and partners, with a defined project scope within the restoration framework;
2. Securing funding based on the stage 1 sites identified;
3. Site level assessments and the development of operational prescriptions;
4. In partnership with the Office of the Wet'suwet'en, conduct an archaeological review of candidate sites to map known archaeological sites and features;
5. Authorizations for restoration activities in the WHA and MVC;
6. Implementation of treatment prescriptions; and
7. Vegetation, access and wildlife response monitoring through a Before-After-Control-Impact study design.

A dedicated project team consisting of a project manager, engagement coordinator and a restoration biologist will be required to implement restoration activities.

## STUDY LIMITATIONS

This plan was prepared using available spatial data that has not been fully groundtruthed. The available spatial data for roads included two layers from the Government of BC: the BC Digital Road Atlas and the Forest Tenure Road Section Lines data sets. These layers were merged with additional features identified and digitized from imagery. The most recent imagery available for this analysis was SPOT Imagery from 2016 (1.5 m resolution), which only provided partial coverage of the study area. Further identification of linear features in the study area may be possible with more recent imagery.

The intent of this plan was to identify candidate restoration sites that will have positive impacts for long-term recovery of the Telkwa caribou herd and that are collaboratively supported by MFLNRORD, the Office of the Wet'suwet'en and other stakeholders. Preliminary engagement and information sharing sessions with stakeholders and the Office of the Wet'suwet'en was conducted for this plan; however, these discussions occurred during a period of consultation for two major resource development projects and for other caribou conservation initiatives in BC. Therefore, there was some uncertainty among stakeholders around the intent of the engagement for this plan.

This plan represents the first phase of restoration planning for the Telkwa caribou herd. Field review of candidate features and detailed landscape level planning with the Office of the Wet'suwet'en and with input from stakeholders is required prior to final site selection and implementation of restoration activities.

The areas discussed in this plan are within a designated Wildlife Habitat Area (WHA 6-333), which prohibits forest harvesting in high elevation caribou habitat and imposes constraints on forest harvesting to manage caribou habitat in low elevation forest. However, the areas are not part of a provincial park or other protected area and as such remain open to authorizations for land tenure, access, and use for industrial purposes. The uncertainty associated with land use means any of the priority areas presented here may need to be altered to accommodate future land use planning and authorizations.



## CONTENTS

<b>EXECUTIVE SUMMARY .....</b>	<b>I</b>
<b>STUDY LIMITATIONS .....</b>	<b>V</b>
<b>ACRONYMS AND ABBREVIATIONS .....</b>	<b>XI</b>
<b>1. INTRODUCTION .....</b>	<b>1-1</b>
1.1 Habitat Restoration for Woodland Caribou Recovery in British Columbia .....	1-1
1.2 Background and Status of the Telkwa Caribou Herd .....	1-2
1.3 Tactical Caribou Habitat Restoration Plan .....	1-4
<b>2. PRELIMINARY TACTICAL RESTORATION PLAN FOR THE TELKWA CARIBOU RANGE – OBJECTIVES .....</b>	<b>2-1</b>
<b>3. METHODS .....</b>	<b>3-1</b>
3.1 Study Area .....	3-1
3.2 Restoration Site Selection and Prioritization Criteria .....	3-1
3.3 Linear Disturbance and Environmental Data .....	3-28
3.4 Restoration Polygons .....	3-28
3.5 Linear Feature Treatment Candidacy .....	3-31
3.6 Stakeholder Engagement .....	3-31
<b>4. RESULTS .....</b>	<b>4-1</b>
4.1 Habitat Intactness and Current Condition of the Telkwa Caribou Range .....	4-1
4.2 Proposed Restoration Candidates .....	4-1
4.2.1 Restoration Polygon 1 .....	4-1
4.2.2 Restoration Polygon 2 .....	4-2
4.2.3 Restoration Polygon 3 .....	4-2
4.2.4 Restoration Polygon 4 .....	4-8
4.2.5 Restoration Polygon 5 .....	4-8
4.3 Stakeholder Engagement .....	4-9
4.4 Restoration Candidates .....	4-10
<b>5. PRELIMINARY TREATMENT PRESCRIPTIONS .....</b>	<b>5-1</b>
5.1 Ecological and Functional Restoration Tools and Options .....	5-1
5.1.1 Mechanical Site Preparation .....	5-1
5.1.2 Seeding and Tree/Shrub Planting .....	5-1
5.1.2.1 Piling or Spreading of Woody Debris .....	5-2
5.1.2.2 Tree Falling .....	5-2
5.1.2.3 Fertilization .....	5-2
5.1.3 Best Management Practices and Guidelines .....	5-2
5.1.3.1 Re-vegetation .....	5-2
5.1.3.2 Forest Health .....	5-2
5.1.3.3 Wildfire Hazard .....	5-3
5.1.3.4 Soils and Erosion Hazard .....	5-3

5.1.3.5	Wildlife .....	5-3
5.1.3.6	Riparian Areas and Stream Crossings .....	5-3
5.2	Preliminary Prescriptions .....	5-3
5.2.1	Treatment Unit A .....	5-4
5.2.2	Treatment Unit B .....	5-4
5.2.3	Treatment Unit C .....	5-4
5.2.4	Treatment Unit D .....	5-4
<b>6.</b>	<b>IMPLEMENTATION PLANNING .....</b>	<b>6-1</b>
6.1	Project Management Team .....	6-1
6.2	Site-level Assessments and Operational Prescriptions .....	6-1
6.3	Authorizations .....	6-2
6.4	Implementation Scheduling .....	6-2
<b>7.</b>	<b>RESTORATION MONITORING .....</b>	<b>7-1</b>
7.1	Vegetation Response Monitoring .....	7-1
7.2	Access and Wildlife Response Monitoring .....	7-1
7.3	Additional Indicators .....	7-2
7.4	Triggers for Adaptive Management .....	7-2
7.5	Monitoring and Reporting Schedule .....	7-2
<b>8.</b>	<b>COMMUNICATION PLAN .....</b>	<b>8-1</b>
<b>9.</b>	<b>NEXT STEPS .....</b>	<b>9-1</b>
<b>10.</b>	<b>SUMMARY .....</b>	<b>10-1</b>
<b>11.</b>	<b>REFERENCES .....</b>	<b>11-1</b>

## APPENDIX A DATA SOURCES SUMMARY

## APPENDIX B STAKEHOLDER ENGAGEMENT INFORMATION PACKAGE

### List of Tables

Table 3.6-1: Engagement Timeline .....	3-32
Table 4.2-1: Characteristics of Candidate Restoration Areas in the Telkwa Caribou Herd Range .....	4-7
Table 4.4-1: Summary of Final Linear Feature Restoration Candidates in the Telkwa Caribou Herd Range .....	4-10
Table 5.2-1: Preliminary Prescriptions for Linear Restoration Treatments .....	5-5
Table 6.1-1: Restoration Implementation Project Team .....	6-1

### List of Figures

Figure 1.2-1: Telkwa Caribou Herd Range .....	1-3
Figure 3.1-1: Telkwa Caribou Wildlife Habitat Area and Ungulate Winter Range .....	3-3
Figure 3.1-2: Biogeoclimatic Ecosystem Classification Zones within the Telkwa Caribou Wildlife Habitat Area .....	3-5

Figure 3.1-3: Parks, Protected Areas, and Old Growth Management Areas around the Telkwa Caribou Wildlife Habitat Area .....	3-7
Figure 3.1-4: Recreational Tenures in the Telkwa Caribou Wildlife Habitat Area .....	3-9
Figure 3.1-5: Traplines in the Telkwa Caribou Wildlife Habitat Area .....	3-11
Figure 3.1-6: Forest Susceptibility to Mountain Pine Beetle in the Telkwa Caribou Wildlife Habitat Area .....	3-13
Figure 3.1-7: Recent Wildfire Areas in the Telkwa Caribou Wildlife Habitat Area .....	3-15
Figure 3.1-8: Active Mineral Claims in the Telkwa Caribou Wildlife Habitat Area .....	3-17
Figure 3.1-9: Forest Harvest Activity in the Telkwa Caribou Wildlife Habitat Area .....	3-19
Figure 3.1-10: Winter Radio Telemetry Locations and Kernel Density Estimators for the Telkwa Caribou Population.....	3-21
Figure 3.1-11: Summer Radio Telemetry Locations and Kernel Density Estimators for the Telkwa Caribou Population.....	3-23
Figure 3.1-12: Telkwa Caribou Movement Paths from Radio Telemetry Data.....	3-25
Figure 3.2-1: Summary of the Restoration Treatment Candidate Identification Process .....	3-27
Figure 3.3-1: Linear Disturbance in the Telkwa Caribou Wildlife Habitat Area .....	3-29
Figure 4.1-1: Habitat Intactness in the Telkwa Caribou Wildlife Habitat Area.....	4-3
Figure 4.2-1: Potential Habitat Restoration Candidates in the Telkwa Caribou Wildlife Habitat Area.....	4-5
Figure 4.4-1: Refined Habitat Restoration Candidates Following Stakeholder Engagement in the Telkwa Caribou Wildlife Habitat Area .....	4-11
Figure 5.2-1: Preliminary Restoration Treatment Units in the Telkwa Caribou Wildlife Habitat Area.....	5-7

## ACRONYMS AND ABBREVIATIONS

BACI	Before-After-Control-Impact study design
BAFA	Boreal Altai Fescue Alpine Unit of the Biogeoclimatic Ecosystem Classification
BAFAun	Boreal Altai Fescue Alpine Unit, Undifferentiated Variant of the Biogeoclimatic Ecosystem Classification
BEC	Biogeoclimatic Ecosystem Classification
BI	Subalpine Fir
CWH	Coastal Western Hemlock Unit of the Biogeoclimatic Ecosystem Classification
EC	Environment Canada
ECCC	Environment and Climate Change Canada
ESSF	Englemann Spruce Subalpine Fir Unit of the Biogeoclimatic Ecosystem Classification
ESSFmc	Englemann Spruce Subalpine Fir Unit, Moist Cold Variant of the Biogeoclimatic Ecosystem Classification
ESSFmcp	Englemann Spruce Subalpine Fir Unit, Moist Cold Parkland Variant of the Biogeoclimatic Ecosystem Classification
ESSFmk	Englemann Spruce Subalpine Fir Unit, Moist Cool Variant of the Biogeoclimatic Ecosystem Classification
FRPA	Forest and Range Practices Act
HESR	High Elevation Summer Range
HEWR	High Elevation Winter Range
KDE	Kernel Density Estimator
LEWR	Low Elevation Winter Range
LPU	Local Population Unit
MFLNRO	Ministry of Forests, Lands, and Natural Resource Operations
MFLNRORD	Ministry of Forests, Lands, Natural Resource Operations, and Rural Development (as of July 2017)
MOE	Ministry of Environment
MPB	Mountain Pine Beetle
MVC	Motor Vehicle Closure
OGMA	Old Growth Management Area
PI	Lodgepole Pine



SARA	<i>Species At Risk Act</i>
SBS	Sub-Boreal Spruce Unit of the Biogeoclimatic Ecosystem Classification
SBSdk	Sub-Boreal Spruce Unit, Dry Cool Variant of the Biogeoclimatic Ecosystem Classification
SBSmc2	Sub-Boreal Spruce Unit, Babine Moist Cold Variant of the Biogeoclimatic Ecosystem Classification
Se	Englemann Spruce
SMNEA	Southern Mountain National Ecological Area
Swx	Hybrid White Spruce
TRAM	Telkwa Mountains Recreation Access Management Advisory Group
UWR	Ungulate Winter Range
WHA	Wildlife Habitat Area

## 1. INTRODUCTION

### 1.1 Habitat Restoration for Woodland Caribou Recovery in British Columbia

Habitat restoration is one of several tools available to support caribou recovery and is a recognized component of federal recovery strategies for conservation of Woodland Caribou (EC 2014). Since 2017, the BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development (MFLNRORD) has been implementing the Provincial Caribou Recovery Program. The Program focuses on a range of recovery actions for BC's caribou, which include integrated planning, habitat protection and management, and habitat restoration (BC MFLNRORD 2018a). In a 2019 agreement with Environment and Climate Change Canada (ECCC), British Columbia also committed to incrementally increasing caribou habitat in the Southern Mountain National Ecological Area (SMNEA) through a range of measures, including habitat restoration. MFLNRORD is currently pursuing habitat restoration as one action in support of the recovery of the Telkwa caribou herd, one of seven local population units (LPUs) in the SMNEA (EC 2014, ECCC 2019, Annex 1). Restoration of habitat in the Telkwa herd range will support the Province in meeting federal caribou recovery habitat intactness targets, which include 65% undisturbed habitat in low elevation winter range and Type 1 matrix range, and minimal disturbance in high elevation winter range (EC 2014).

There are two main goals of habitat restoration in caribou ranges:

1. Reduce predator efficiency (e.g., movement, sight lines) and subsequent caribou mortality; and
2. Increase habitat intactness and habitat quality (Golder 2015).

To achieve these goals, a combination of functional and ecological restoration methods can be used. Functional restoration aims to reduce human and predator use of linear features to reduce predation rates on caribou. Restoration may not return a habitat to its pre-disturbance state; however it has an immediate impact on predator efficiency and can be a more effective use of limited financial resources and personnel capacity. Functional restoration may include tree felling or fencing treatments (DeMars and Benesh 2016). It can also include treatments such as mounding and tree planting that can contribute to ecological restoration (Golder 2015).

Ecological restoration is undertaken to return the habitat and ecological function of disturbed sites to a pre-disturbance state and condition. It is an effective restoration tool for long-term ecological recovery, ultimately resulting in increased habitat intactness. However, it takes longer to achieve reductions in predator efficiency and caribou mortality in the short term as vegetation must establish for the restoration to be an effective barrier. Ecological restoration may be achieved through natural regeneration and treatments such as site preparation can be used to improve soil conditions and facilitate natural vegetation establishment. To accelerate restoration, coarse woody debris may be distributed to improve site conditions and native vegetation may be planted.

The majority of caribou habitat restoration projects currently underway in Canada are located in boreal caribou habitat. The focus of most of these initiatives is to restore linear features (primarily seismic lines and pipelines) associated with oil and gas development (Golder 2017). Habitat restoration activities in high elevation mountain caribou habitat have been limited and have been largely associated with caribou mitigation and monitoring plans for mining operations that have yet to be implemented or are in the early stages (Golder 2017). As a result, the efficacy of habitat restoration for mountain caribou habitat is more uncertain.

For restoration activities to make the best use of limited resources, they must be coordinated and prioritized based on what provides the greatest value to caribou. In addition, restoration activities that are informed by the best available local and traditional ecological knowledge – both in terms of caribou habitat use and in relation to human use of the landscape – are more likely to be supported by the local community and successful over the long term. The purpose of a tactical restoration plan is to synthesize

these sets of information to identify what habitat restoration activities should be undertaken, and where, to provide the greatest benefit to caribou over the long term.

This tactical restoration plan is the first phase of planning for habitat restoration in the range of the Telkwa caribou herd and provides the framework for delivering coordinated and effective restoration that will benefit the Telkwa caribou.

## 1.2 Background and Status of the Telkwa Caribou Herd

The Telkwa caribou herd is classified as threatened under the federal *Species at Risk Act* (SARA). The range of the Telkwa caribou herd is geographically separated from all other LPUs in the northern group of the SMNEA (COSEWIC 2011; EC 2014). The herd is located in northwestern British Columbia (BC), southwest of the towns of Smithers and Telkwa and entirely within the traditional territory of the Wet'suwet'en (Figure 1.2-1). Cichowski (2014) described the range used by the Telkwa herd as including the Telkwa Mountains, Howson Range and Herd Dome. Broadly, the range includes Boreal Altai Fescue Alpine (BAFA), Engelmann Spruce-Subalpine Fir (ESSF), Sub-Boreal Spruce (SBS) and Coastal Western Hemlock (CWH) biogeoclimatic (BEC) zones (Banner et al. 1993).

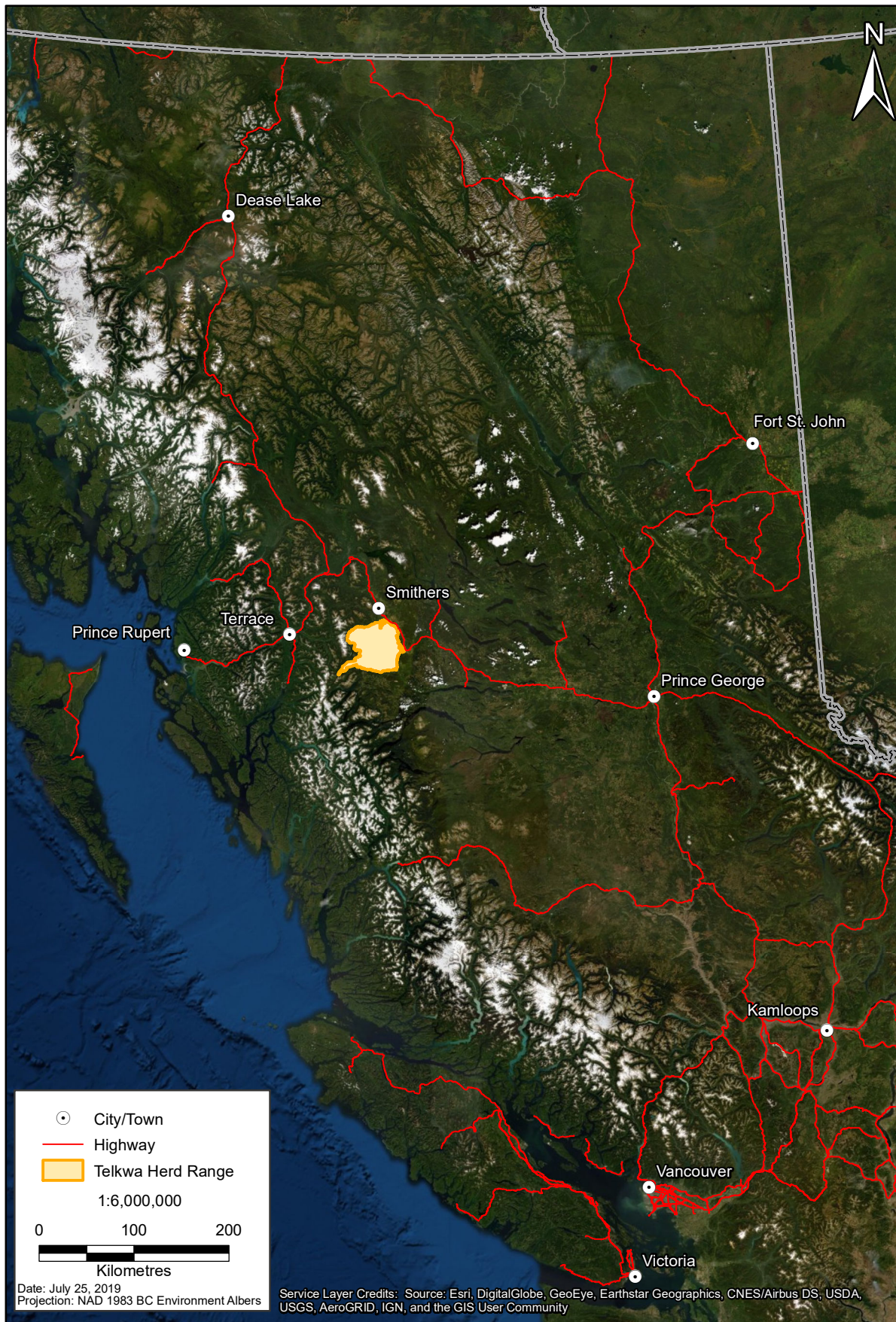
Long-term population monitoring indicates the Telkwa herd has declined from approximately 270 individuals in the 1960s to approximately 16 individuals in 2013 (Cichowski 2014, Grant 2017). During this period of decline, efforts, including herd transplantation, were undertaken to improve the population. Two separate transplants of 12 and 20 animals in 1997 and 1998 respectively were attempted to augment the Telkwa herd (Stronen et al. 2007, Cichowski 2014). The Telkwa population has increased for the last three consecutive years. In the fall of 2018 and late winter of 2019 the herd contained at least 25 individuals including at least 8 calves (Hoffman and Grant 2019a, 2019b). Despite recent increases, the population remains at risk.

Human activity in the Telkwa range includes forest harvesting, coal and mineral exploration and various recreational activities (including hiking, hunting, skiing, and snowmobiling). The dominant industrial activity in the Telkwa range has been forest harvesting, which disturbs caribou habitat by increasing road density and replacing mature forest with early seral stage forests (Grant 2017). The forests in the range have also incurred losses from mountain pine beetle (MPB) outbreaks followed by salvage logging (Grant 2017). The early seral forests that follow commercial forestry operations and MPB outbreaks support higher densities of ungulates (e.g., moose [*Alces alces*] and elk [*Cervus elaphus*]) and consequently higher densities of wolves (*Canis lupus*) and other predators. Wolf predation was considered to be the primary cause of mortality of collared caribou in the Telkwa herd up until 2008 (BC MOE 2009), but more recent data (2008-2019) suggests that collared caribou mortalities can be attributed to a range of factors including other predators (e.g., bears, wolverines), accidents and malnutrition (Grant 2017, Hoffman personal communication, 2019). It is well documented that linear features from forestry or recreation activities increase predation pressure by improving predator travelling efficiency and increasing access from valley bottoms to high elevation summer calving range (Cichowski 2014). Human disturbance associated with recreational activities can cause displacement of caribou, increased stress and reduced feeding (Seip et al. 2007, Lesmerises et al. 2017, Lesmerises et al. 2018). These stresses may contribute to reduced body condition and population level effects if reproductive rates or survival are affected (Powell 2004, Freeman 2008).

In recent years, MFLNRORD has taken actions to manage habitat disturbance in the Telkwa caribou range. In 2015 a Wildlife Habitat Area (WHA 6-333) was established under the Government Action Regulation that provides two levels of habitat protection under the *Forest and Range Practices Act* (FRPA)<sup>1</sup>. First, it establishes a no harvest zone that provides complete protection of high elevation caribou

<sup>1</sup> [http://bvcrb.ca/images/uploads/documents/WHA6-333\\_Final\\_Order.pdf](http://bvcrb.ca/images/uploads/documents/WHA6-333_Final_Order.pdf)





**Figure 1.2-1: Telkwa Caribou Herd Range**



habitat in the BAFA and ESSF BEC zones; and second, it establishes a modified harvest zone that limits the creation of early seral forests and the distribution of roads in surrounding SBS forests. In 2018 MFLNRORD also implemented a Motor Vehicle Closure (MVC) for the Telkwa Mountains Area under the *Wildlife Act*. This closure prohibits all motorized vehicle access within much of the range of the Telkwa caribou in MU6-9. Limited areas remain open in the winter for snowmobile access (Grizzly Plateau: November 1 to April 30; Meat Cache December 15 to April 1; BC MFLNRORD 2018b).

### 1.3 Tactical Caribou Habitat Restoration Plan

This report presents a tactical caribou habitat restoration plan for the Telkwa caribou herd. This preliminary tactical restoration plan is bounded by the extent of Wildlife Habitat Area (WHA) 6-333 for Telkwa caribou in the Bulkley and Morice Timber Supply Areas. Disturbances arising from human activities define the scope of potential restoration options within the WHA for this planning project. The WHA prohibits forest harvesting in high elevation caribou habitat and imposes constraints on forest harvesting to manage caribou habitat in low elevation forest. The WHA is not part of a provincial park or other protected area and as such it remains open to authorizations for land tenure, access and use for industrial purposes. The uncertainty associated with land use means any of the priority areas presented here may need to be altered to accommodate future land use planning and authorizations.

This plan is organized to include:

- the objectives of the preliminary restoration plan;
- methodology used to identify restoration areas and linear feature treatment candidates, and stakeholder engagement;
- results of the spatial analysis to identify the areas of suitable candidate sites and preliminary outcomes of the stakeholder engagement;
- preliminary treatment prescriptions tailored to the BEC zones in identified restoration areas;
- an implementation plan;
- a restoration monitoring plan;
- a communication plan;
- the next steps required to implement restoration under this plan; and
- a summary.

## 2. PRELIMINARY TACTICAL RESTORATION PLAN FOR THE TELKWA CARIBOU RANGE – OBJECTIVES

The vision for this tactical restoration plan was to identify candidate restoration sites that will benefit long-term caribou recovery efforts, and that are collaboratively identified with the MFLNRORD, the Office of the Wet'suwet'en and other stakeholders.

The specific objectives of this project were to:

1. confirm, refine and finalize a comprehensive disturbance mapping layer for the Telkwa herd range using 2019 disturbance mapping, available datasets and imagery;
2. engage with MFLNRORD and stakeholders to develop mapping products, a comprehensive summary of current and future disturbance features and a communication plan for continued engagement in coordination with other recovery actions;
3. engage with the Office of the Wet'suwet'en to incorporate knowledge and interests to develop criteria to support selection of priority areas and candidate sites for restoration activities in the Telkwa range;
4. identify candidate restoration sites within the priority areas for the Telkwa herd range;
5. develop a preliminary restoration implementation plan with proposed restoration treatments, activities and preliminary prescriptions; and
6. develop a monitoring plan to assess treatment success and wildlife response to restoration activities that includes the baseline and long-term data collection.

The approach taken to develop this preliminary tactical restoration plan followed that of other similar plans developed for the Quintette and other South Peace Northern Caribou Ranges (Golder 2017, 2018). Linear features were the focus for restoration candidate site selection in these areas. These features both reduce habitat intactness and quality and increase predator efficiency. As such, restoring linear features can provide the greatest opportunity for both functional and ecological restoration and the greatest benefit to caribou. Forestry cutblocks and wildfire areas were not identified for restoration for the following reasons: forestry cutblocks are required to be reforested by the license holder to silvicultural obligations associated with the licenses. Burned areas should naturally regenerate, and succession can be monitored to determine whether habitat characteristics will support the biophysical attributes associated with critical habitat necessary to caribou recovery (EC 2014).

Candidate restoration features were initially identified and prioritized based on a strategic set of biological, land use and environmental criteria hypothesized to provide the greatest value to caribou and evaluated using spatial land cover and land use data. These candidate features were shared with MFLNRORD, the Office of the Wet'suwet'en and other stakeholders including recreation groups, trapline holders and woodlot license holders. Preliminary input gathered from these information sharing sessions was used to further refine the set of candidates for restoration treatment.

This preliminary tactical restoration plan represents the first phase of restoration planning for the Telkwa caribou herd range. Field review of candidate features and detailed landscape level planning with the Office of the Wet'suwet'en and with input from stakeholders is required prior to implementation of restoration activities.

### 3. METHODS

#### 3.1 Study Area

This preliminary tactical restoration plan is bounded by the extent of Wildlife Habitat Area (WHA) 6-333 for Telkwa caribou in the Bulkley and Morice Timber Supply Areas (229,718 ha; Figure 3.1-1). There are six Biogeoclimatic Ecosystem Classification (BEC) zones and 11 variants located in the WHA (Figure 3.1-2). Boreal Altai Fescue Alpine (BAFA; 22,542 ha) and Engelmann Spruce Sub-alpine Fir (ESSF; 107,208 ha), which have characteristics of high elevation winter and summer ranges (HEWR and HESR, respectively), and Sub-Boreal Spruce (SBS; 97,984 ha), which has characteristics of low elevation winter range (LEWR) and matrix ranges. These units make up the majority (99%) of the WHA. The WHA includes a no-harvest zone (corresponding to the BAFA and ESSF BEC zones) and a management zone, which were used to generally delineate the core and matrix habitats of the Telkwa caribou range.

There are five provincial parks in the region, but none that overlap the WHA. The Tazdli Wyiez Bin/Burnie-Shea Park is located adjacent to the WHA on the west side (Figure 3.1-3). The Morice Ecological Reserve is located in the southeast corner of the WHA. An Old Growth Management Area (OGMA) covers approximately 50,763 ha (Figure 3.1-3) and Ungulate Winter Range (UWR) covers approximately 20,687 ha of the WHA (Figure 3.1-1). There are 12 major creeks/rivers in the WHA, the largest being the Thatuil River. Recreational tenures (Figure 3.1-4) and several traplines (Figure 3.1-5) also overlap the WHA.

Based on the provincial mountain pine beetle catalogue database, 111,859 ha (49 %) of the Telkwa WHA has been affected by mountain pine beetle infestation since 1975. Approximately 7,464 ha (3%) of the Telkwa WHA is rated medium or high susceptibility to MPB infestation (Figure 3.1-6). Wildfire has burned 3,856 ha (2%) of the WHA since 1983 (Figure 3.1-7).

Anthropogenic disturbances in the Telkwa range include forestry, mineral exploration, oil and gas development and recreation. Active mineral claims account for 66,235 ha (29%) of the WHA (Figure 3.1-8) and recent (last 40 years) forest harvesting activity accounts for 38,276 ha (17%) (Figure 3.1-9).

Habitat intactness in the study area was calculated by applying a 500 m buffer to linear disturbance and cutblocks and including recent (<40 years) wildfire disturbed areas, according to the following formula:

$$\text{Intact habitat (ha)} = \text{study area (ha)} - \text{area of linear disturbance with 500m buffer (ha)} \\ - \text{area of cutblocks with 500m buffer (ha)} - \text{recent (<40 years) wildfire area (ha)}.$$

The Telkwa caribou herd has been monitored using radio-telemetry collars since 1997. Under a data sharing agreement, MFLNRORD provided these locations for the years 1986 to 2016 along with kernel density estimators to support the selection of restoration polygons and candidate treatment sites. Both the winter (Figure 3.1-10) and summer (Figure 3.1-11) ranges are concentrated at high elevations on the Telkwa Ranges. Radio-collar locations are concentrated in these areas; however, there are also movements to lower elevation matrix habitat (Figure 3.1-12).

#### 3.2 Restoration Site Selection and Prioritization Criteria

A strategic set of biological, land use and environmental criteria hypothesized to provide the greatest benefit to caribou informed the selection and prioritization of restoration sites through:

1. the delineation of restoration polygons identifying areas of high priority for restoration activities; and
2. the classification of linear features as restoration treatment candidates within those polygons.

These criteria included the following:

- Areas with high caribou use, largely informed from radio-telemetry location data and analysis using kernel density estimators (KDE) and supplemented with historic caribou use information.
- High elevation winter range (HEWR) and high elevation summer range (HESR) defined by the BAFA and ESSFmcp (ESSF moist cold parkland variant) BEC zones. These areas provide the most important habitat to caribou and are prohibited from additional forest harvesting as part of the no-harvest zone of the WHA.
- Existing areas where linear disturbance has occurred (e.g., cutlines, forestry roads and pipeline rights-of-way).
- Linear disturbance features extending from low to high elevation caribou habitat (in the context of predators and predation risk to caribou).
- Low elevation winter range (LEWR). In the Telkwa range, the SBS zone is largely matrix habitat, but has the potential to function as LEWR in some areas. These areas are currently still available for forest harvesting and industrial activity; however forest harvesting must meet seral objectives outlined in the WHA Order that are intended to manage for caribou habitat.
- Provincially designated areas, including the no harvest zone of the WHA and OGMAs, because these areas will be less impacted by future industrial land uses.
- Cutblocks and their known relationship to the presence of moose and other ungulates at low- to mid-elevation caribou habitat (in the context of caribou as alternate prey to wolves that are supported by high numbers of other ungulate prey).
- Areas where restoration of caribou habitat will have an indirect positive benefit to other ecological values (e.g., benefit to other ungulates by reducing predator access along existing linear disturbances).

Areas considered less suitable for restoration candidacy included:

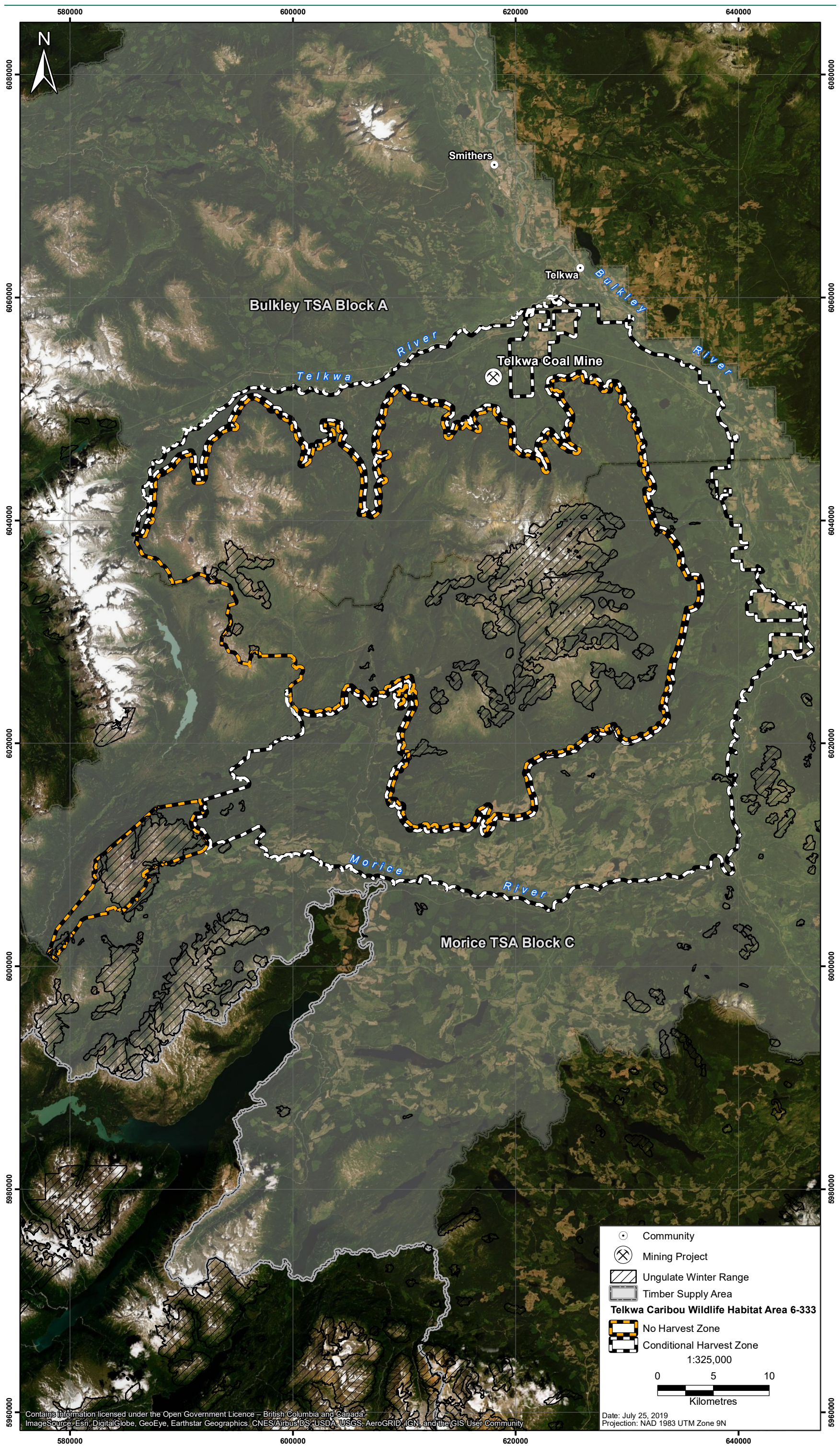
- Areas that overlap with, or are in close proximity to, known proposed developments (including forestry cuts, active mineral claims, mines and oil and gas right of ways).
- Recent <40 year-old wildfire areas (subject to monitoring and adaptive management).
- Areas with a high susceptibility rating to MPB because an MPB outbreak would result in early seral forest and reduce the effectiveness of the restoration.
- Areas with fringe or matrix caribou habitat (low elevation with limited to no current habitat use) adjacent to high density forestry and other land uses (e.g., the SBS zone in the south part of the range).
- Linear features that overlap with current mine and cutblock footprints because it is assumed they will be restored under current permit conditions.

A summary of the approach to identifying and prioritizing restoration sites is presented in Figure 3.2-1.

Following the preliminary identification of restoration sites based on land use and environmental criteria, information sharing and stakeholder engagement was used to identify areas where restoration would have the support of the Office of the Wet'suwet'en and primary stakeholders, as well as areas where it was important to maintain access for recreation and other activities.

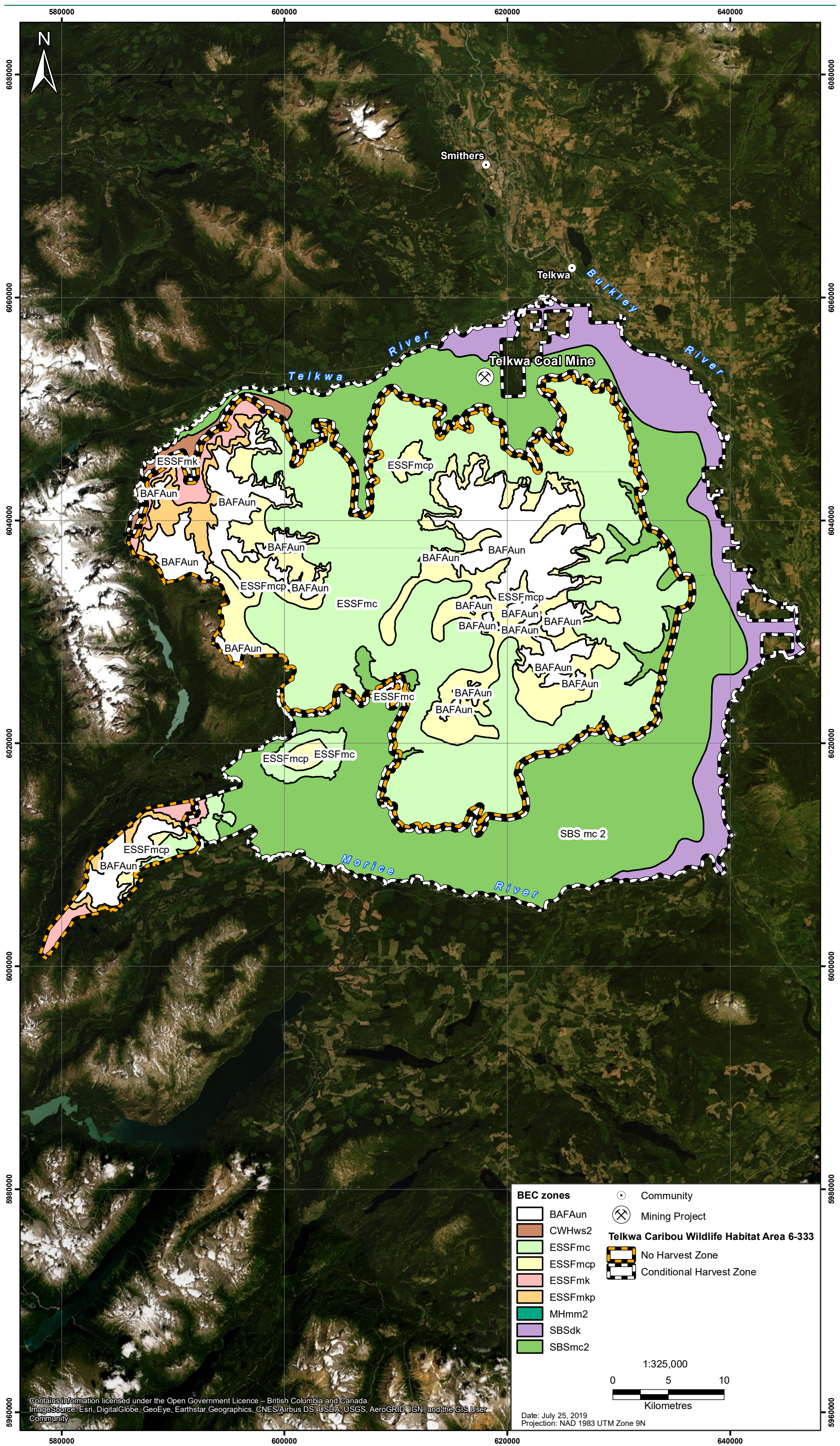
Similar to Golder (2018), future harvest management plans and pending land use authorizations were not considered in this preliminary plan, but need to be considered in future restoration planning.





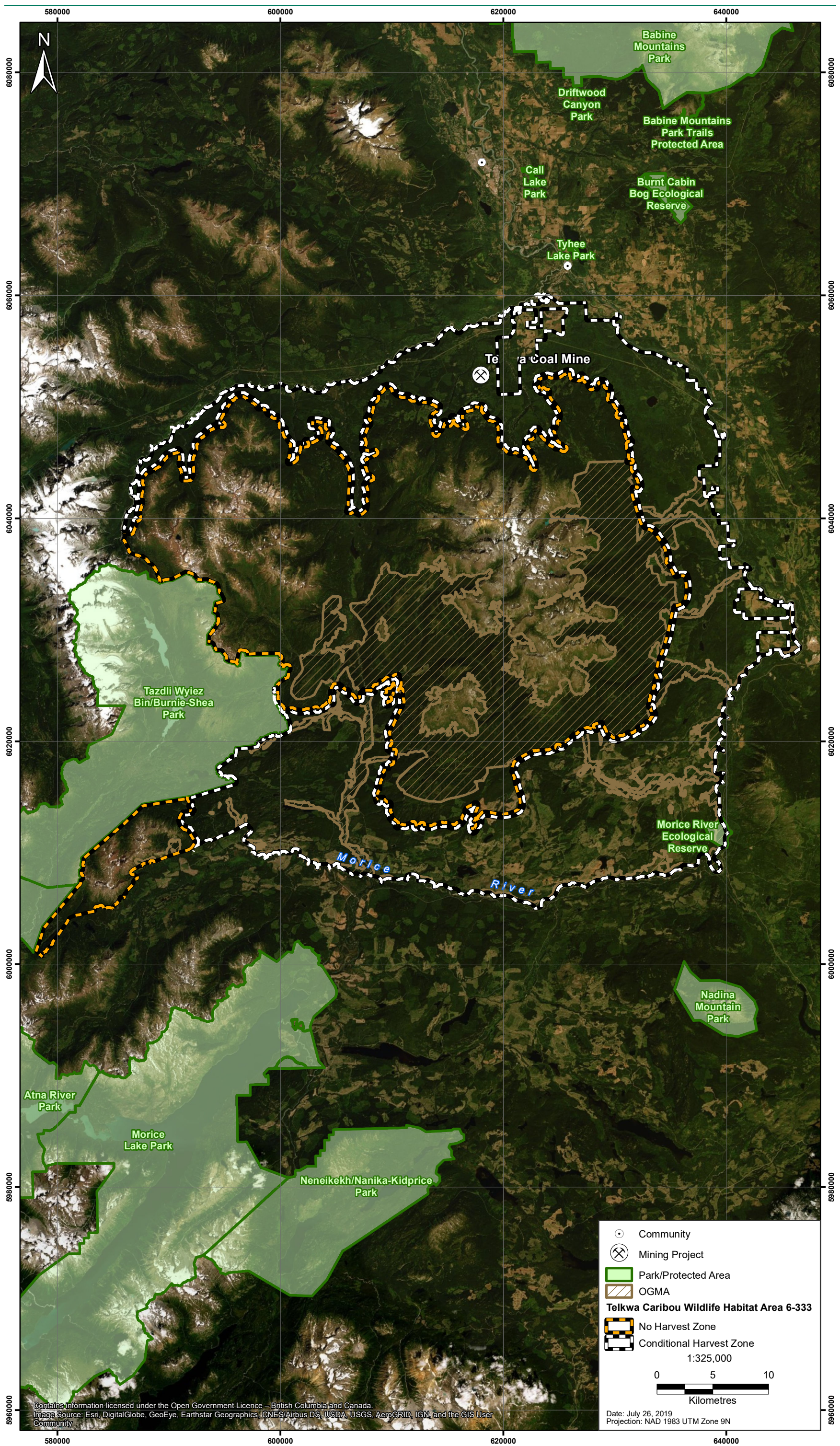
**Figure 3.1-1: Telkwa Caribou Wildlife Habitat Area and Ungulate Winter Range**





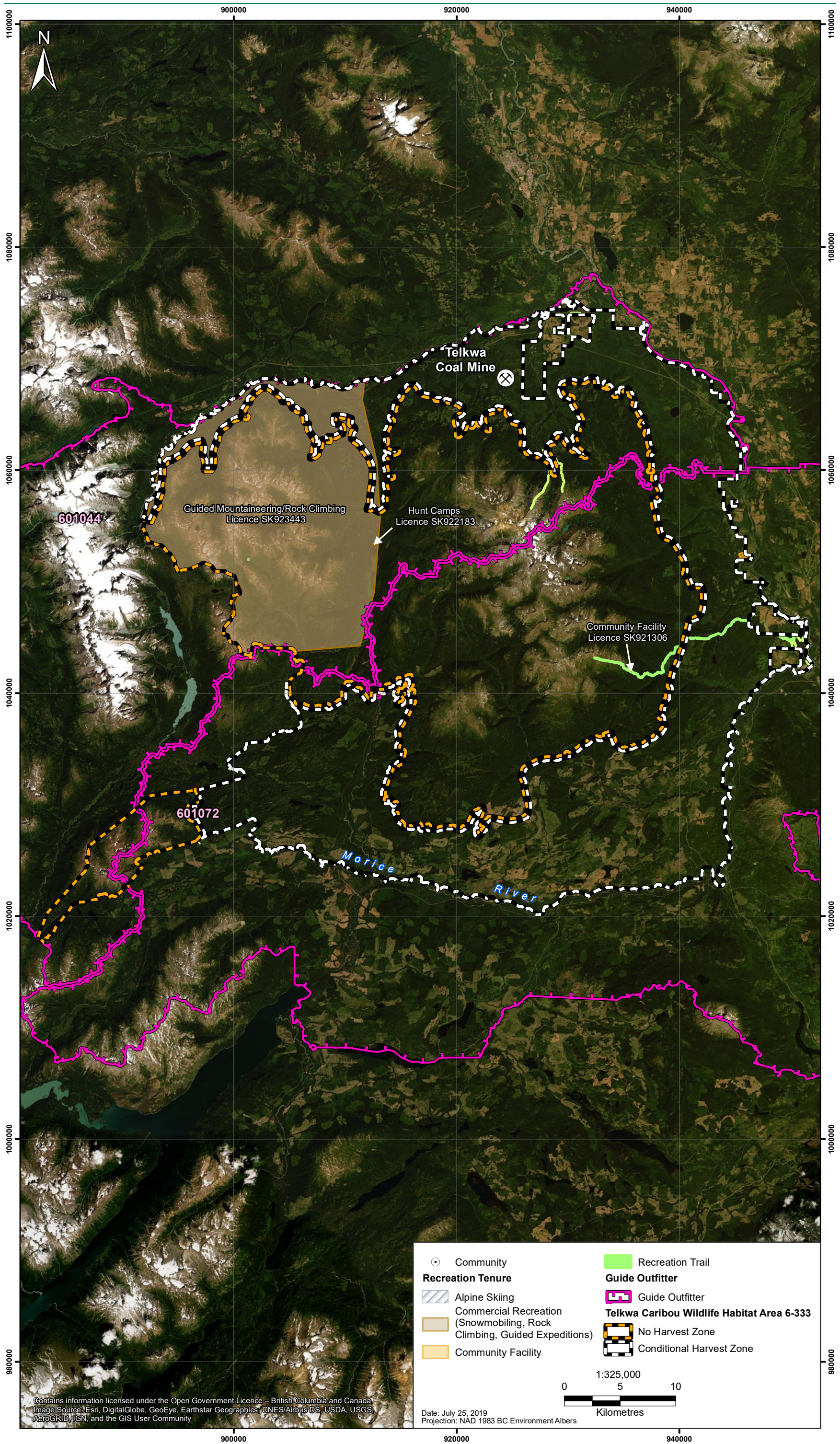
**Figure 3.1-2: Biogeoclimatic Ecosystem Classification Zones within the Telkwa Caribou Wildlife Habitat Area**





**Figure 3.1-3: Parks, Protected Areas, and Old Growth Management Areas around the Telkwa Caribou Wildlife Habitat Area**





**Figure 3.1-4: Recreational Tenures in the Telkwa Caribou Wildlife Habitat Area**



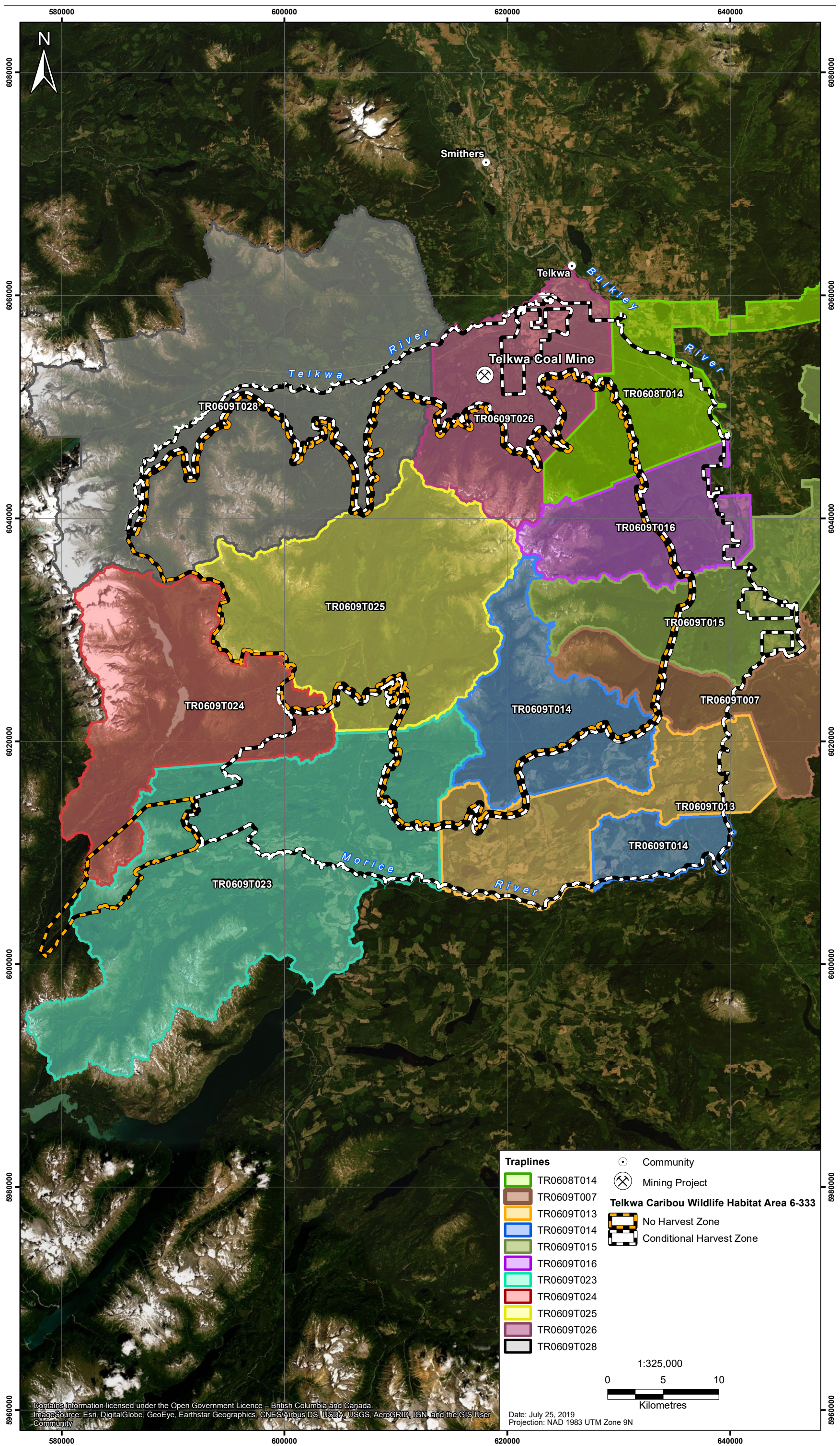


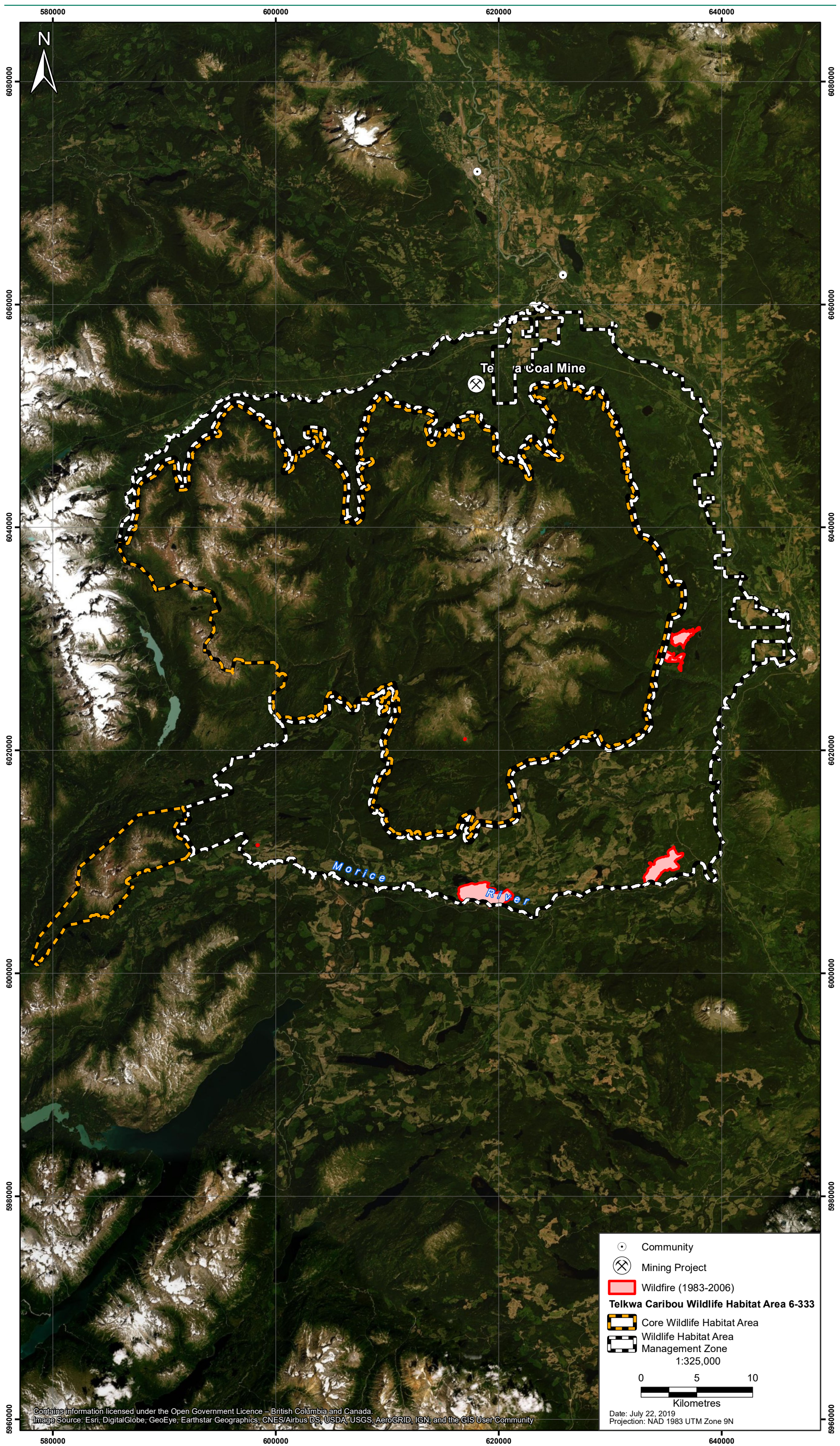
Figure 3.1-5: Traplines in the Telkwa Caribou Wildlife Habitat Area





**Figure 3.1-6: Forest Susceptibility to Mountain Pine Beetle in the Telkwa Caribou Wildlife Habitat Area**





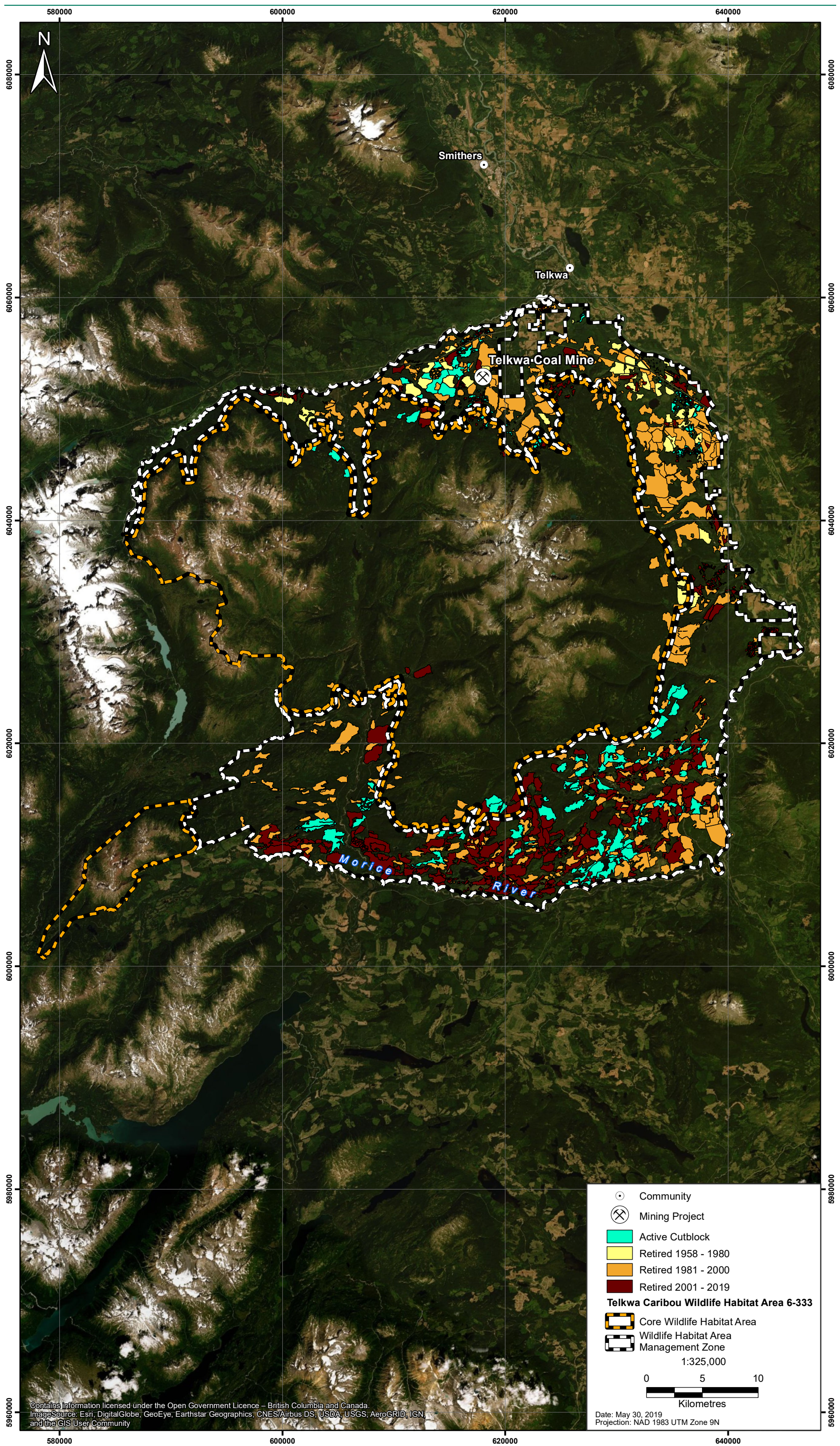
**Figure 3.1-7: Recent Wildfire Areas in the Telkwa Caribou Wildlife Habitat Area**





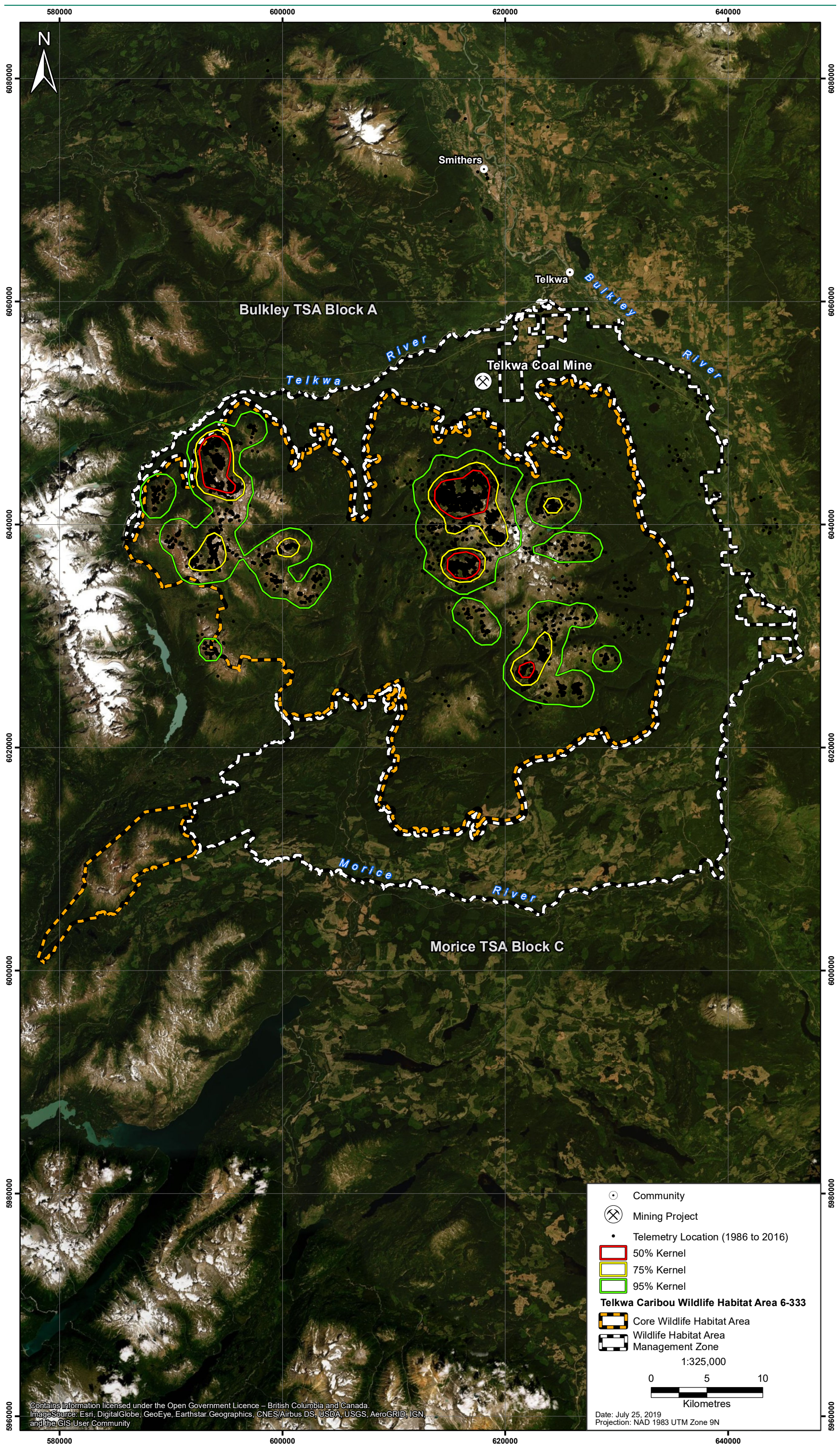
**Figure 3.1-8: Active Mineral Claims in the Telkwa Caribou Wildlife Habitat Area**





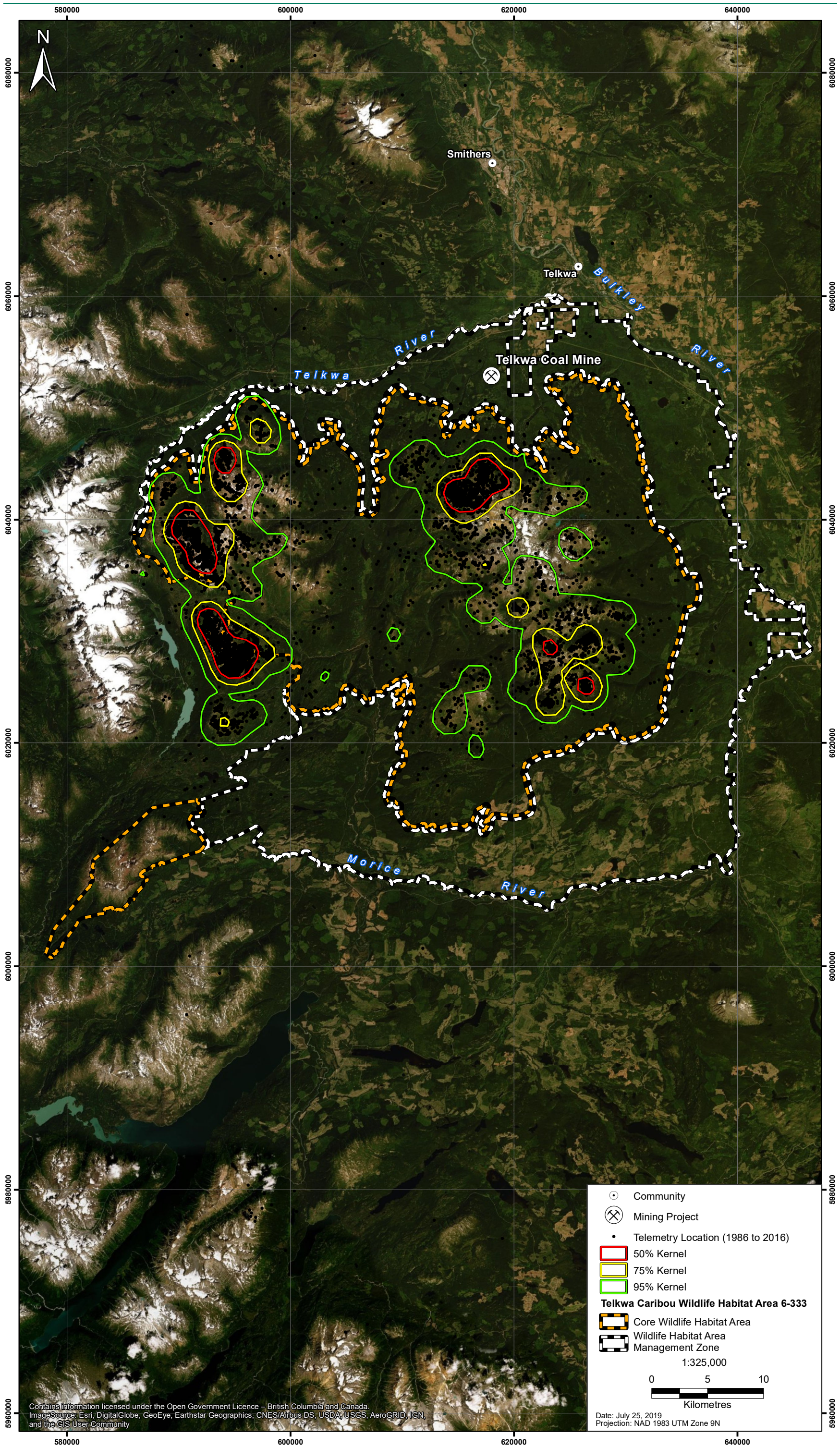
**Figure 3.1-9: Forest Harvest Activity in the Telkwa Caribou Wildlife Habitat Area**





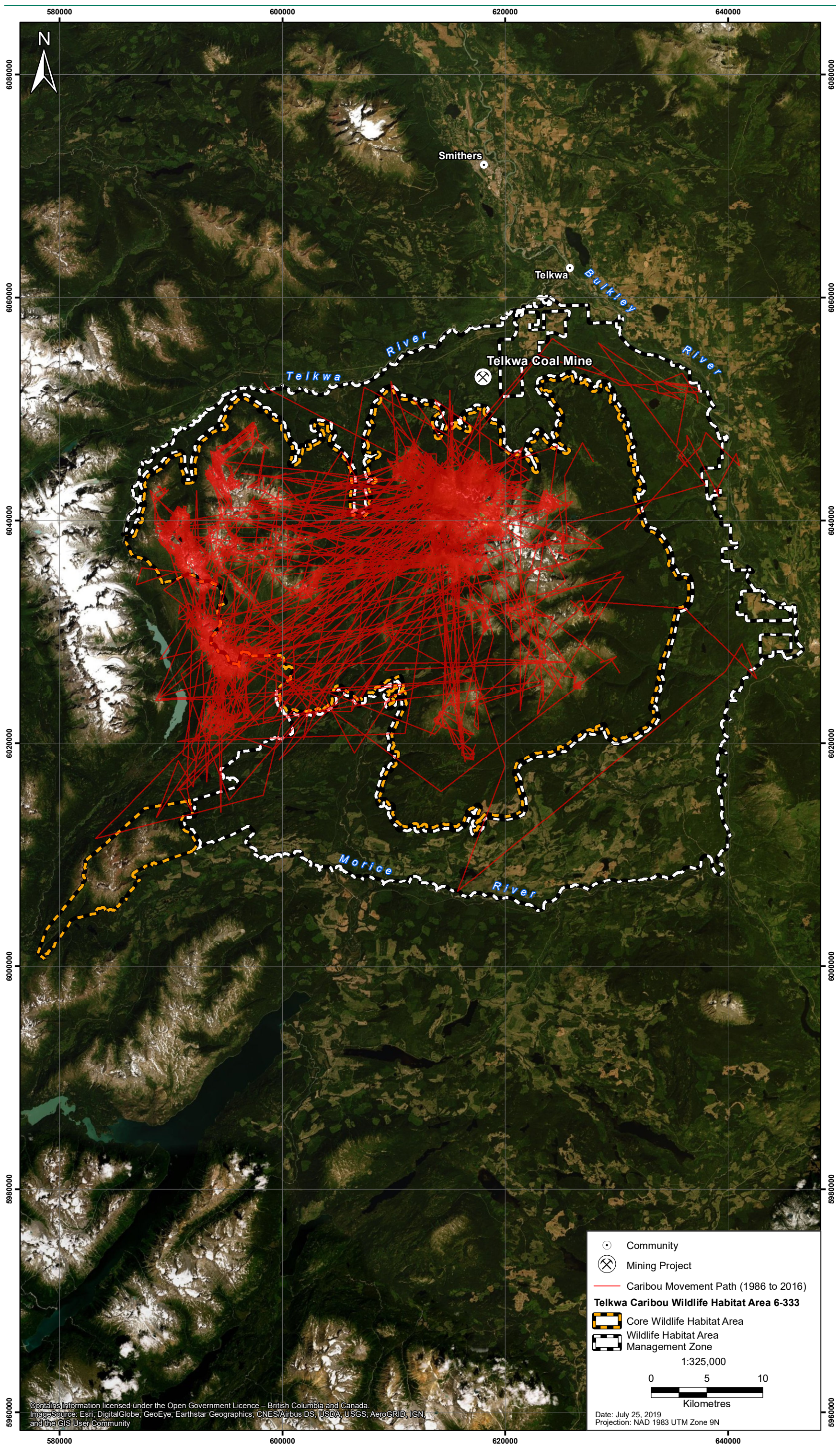
**Figure 3.1-10: Winter Radio Telemetry Locations and Kernel Density Estimators for the Telkwa Caribou Population**





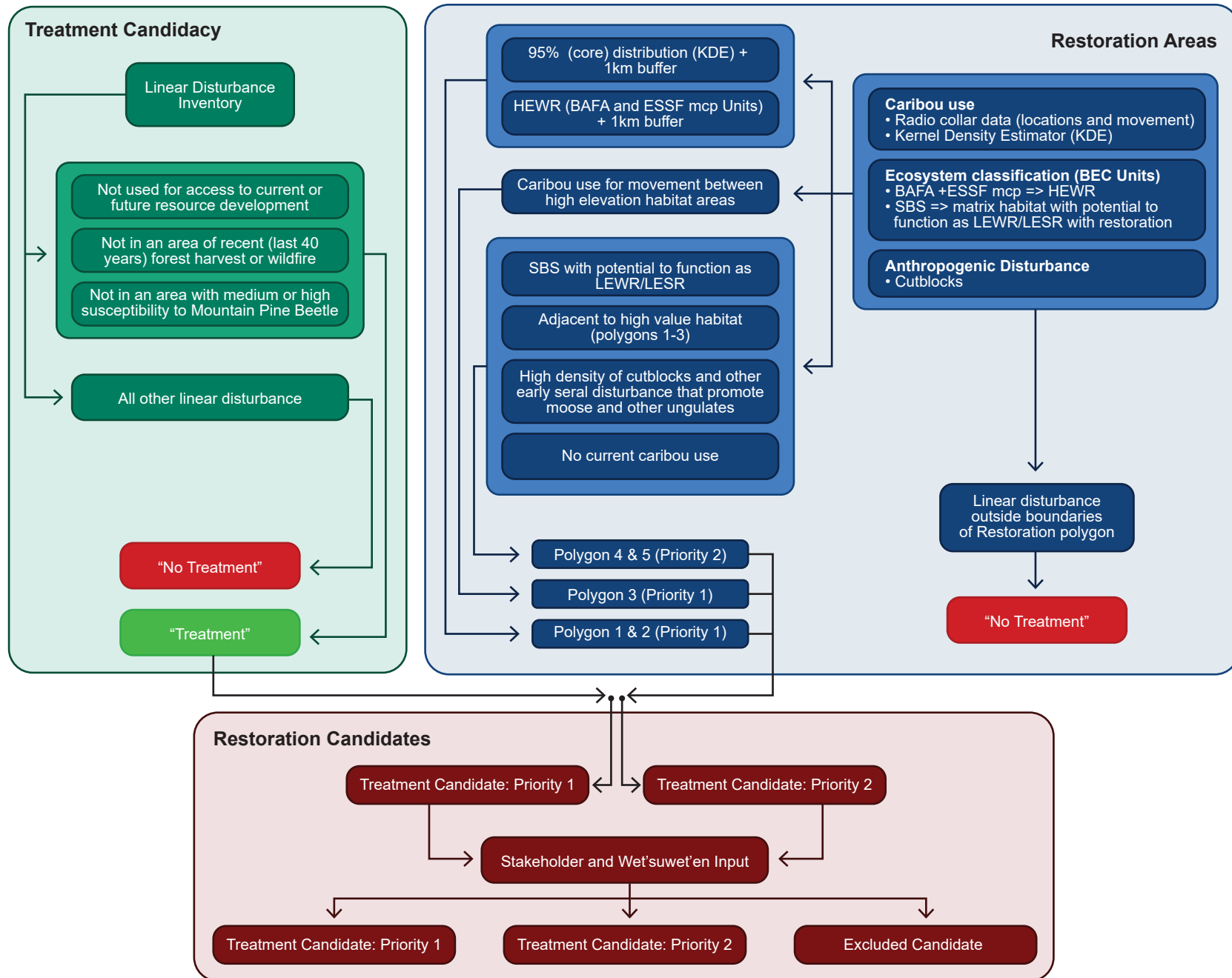
**Figure 3.1-11: Summer Radio Telemetry Locations and Kernel Density Estimators for the Telkwa Caribou Population**





**Figure 3.1-12: Telkwa Caribou Movement Paths from Radio Telemetry Data**





**Figure 3.2-1: Summary of the Restoration Treatment Candidate Identification Process**



### 3.3 Linear Disturbance and Environmental Data

Linear disturbance data considered in this tactical restoration plan included:

- Recreational trails;
- Roads, including forest service roads and mineral exploration roads; and
- Oil and gas rights-of way (Coastal Gas Link; Figure 3.3-1).

Two data sources were used to identify roads in the Telkwa caribou range: the BC Digital Road Atlas and Forest Tenure Road Section Lines (Appendix A). These data sets were merged to ensure complete coverage and compared to satellite imagery (partial coverage of the Telkwa range available to 2016; Appendix A). Features not present in the merged data set identified from satellite imagery were digitized. The acquisition of more recent imagery covering the entire range of the Telkwa herd could be used to identify additional treatment candidates.

Land use activities considered for treatment candidate determination and prioritization include:

- Mineral claims (Figure 3.1-8); and
- Forest harvesting (Figure 3.1-9).

Biological data considered for treatment candidate determination and prioritization include:

- Caribou herd telemetry and 90% kernel density estimator (KDE) data (Figures 3.1-10 to 3.1-12);

Environmental data considered for treatment candidate determination and prioritization include:

- BEC units as proxies for high elevation winter and summer range (BAFA and ESSF zones) and low elevation winter range (the SBS zone has the potential to function as LEWR; Figure 3.1-2);
- WHA (no-harvest and management zones) and UWRs (Figure 3.1-1);
- OGMAs (Figure 3.1-3);
- Wildfires (Figure 3.1-8); and
- MPB susceptibility (Figure 3.1-6).

Data sources are presented in Appendix A.

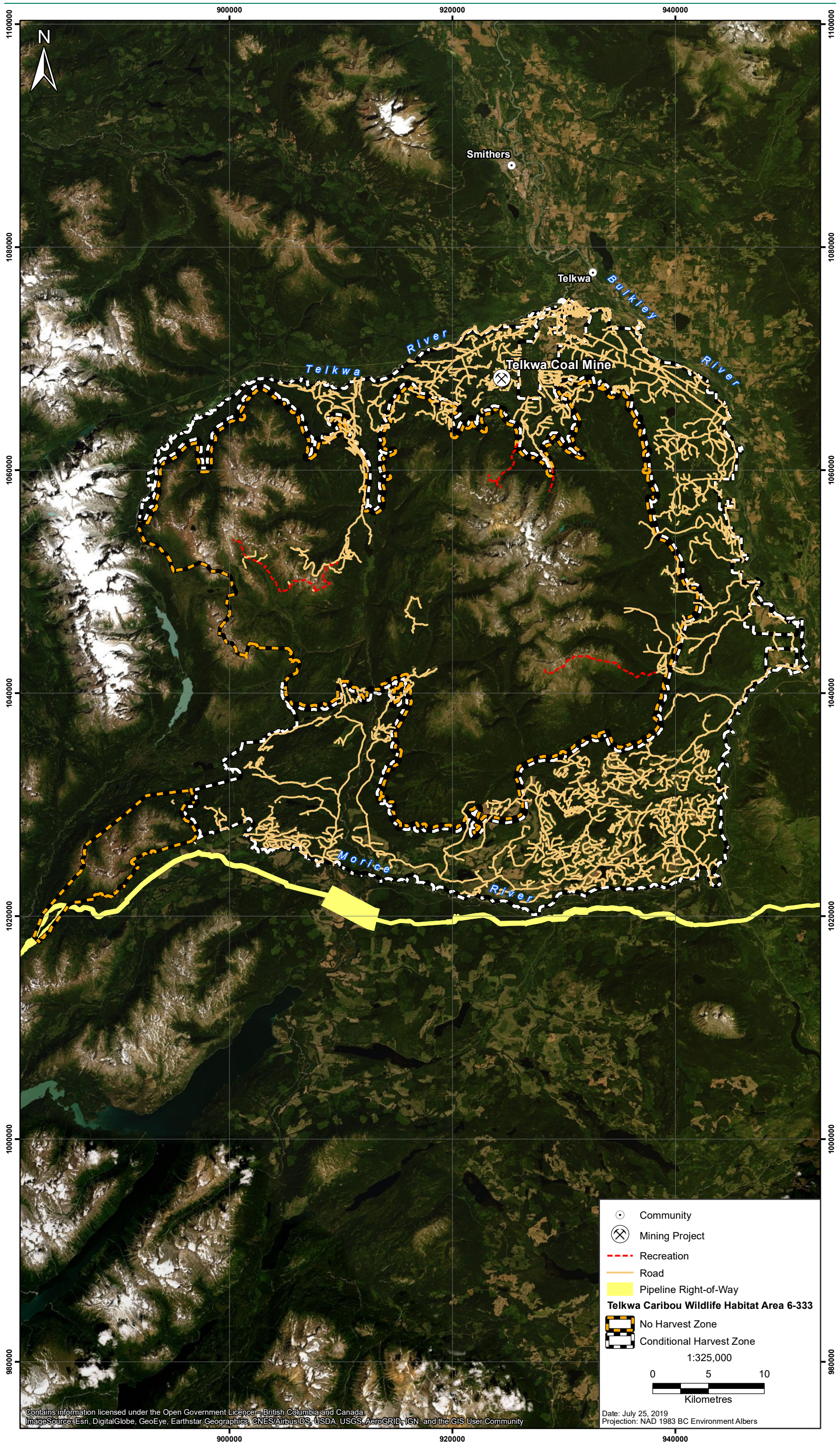
### 3.4 Restoration Polygons

The whole area of the WHA is biologically important to the Telkwa caribou herd. However, the entire WHA was not identified as a priority area for restoration at this time because of ongoing forest harvesting and other activities. These activities made assessing the ongoing use of and potential level of protection for the linear features in this area challenging. If land use activities in the WHA change, then restoration priorities will be re-evaluated.

Within the WHA, restoration polygons were delineated to identify spatial priorities for restoration activities. The following characteristics were used to identify and delineate these restoration areas (Figure 3.2-1):

- Caribou utilization determined from radio-telemetry location and KDE data (Figures 3.1-10 to 3.1-12);
- BEC zones delimiting high elevation winter range (BAFA and ESSFmcp; Figure 3.1-2);
- SBS BEC zone representing matrix habitat with the potential to function as LEWR/LESR following restoration (Figure 3.1-2); and
- Density of anthropogenic disturbance, including cutblocks and linear features (Figures 3.1-9 and 3.3-1).





**Figure 3.3-1: Linear Disturbance in the Telkwa Caribou Wildlife Habitat Area**



A total of five restoration polygons were identified; the detailed descriptions of these polygons are presented in Section 4.2. Two restoration polygons (1 and 2) were delineated by buffering the core (95%) distribution and the boundary of the BAFA and ESSFmcp by 1 km. Following Golder (2018), a 1 km buffer was used to account for linear disturbance outside of the core habitat areas that may impact predator movement into core habitat areas. A third polygon (polygon 3) was delineated based on radio-telemetry location data indicating regular east-west movements by Telkwa caribou across the valley between high elevation ranges. Restoration activities in this area are considered to provide indirect benefits to caribou through managing predator access into core habitat, managing early seral vegetation for primary prey species (e.g., moose) and reducing predator efficiency through the reduction of sight lines and movement corridors. Lastly, two polygons (4 and 5) were delineated in areas that have been used by caribou in the past, but are likely not currently utilized by caribou. These areas are in the SBS BEC zone that has the potential to function as LEWR/LESR with restoration and are adjacent to high value caribou habitat (polygons 1-3). These areas function primarily as matrix habitat (with long-term potential to function as low elevation winter and summer range under a recovery scenario). The role of matrix habitat is to manage predators, specifically wolves at lower density (target of <3 km/1,000 km<sup>2</sup>; EC 2014), with the restoration objective to limit movement and reduce early seral habitat that will benefit primary prey (moose, deer and elk).

### 3.5 Linear Feature Treatment Candidacy

Linear features were classified as either 'no treatment' or 'treatment' candidate based on criteria that reflect the potential value of restoration to caribou (Figure 3.2-1). The following characteristics were used to identify treatment candidates:

- linear features not potentially used for access to current or future resource development activities;
- features outside areas with recent (<40 years) forest harvest or wildfire; and
- features outside areas identified as having medium or high susceptibility to mountain pine beetle.

The resulting set of treatment candidates was further refined following input from the Office of the Wet'suwet'en and stakeholder information sharing and engagement sessions.

### 3.6 Stakeholder Engagement

The Telkwa Mountains are part of the Wet'suwet'en Nation traditional territory. The area is valued for First Nations interests, recreational opportunities and natural resources, including traplines. It is also an important source of income both in terms of natural resources and recreation for the surrounding communities of Houston, Telkwa, and Smithers. Engagement with stakeholders was an integral component of the development of the restoration plan.

With the initial analysis of treatment candidates and restoration priorities in place, an information package consisting of a letter of intent and maps of the proposed treatment candidates was sent to stakeholders on the 25<sup>th</sup> of March 2019 requesting them to review the information and provide ERM with feedback. This information package is presented in Appendix B.

The stakeholders consisted of:

- the Office of the Wet'suwet'en;
- trappers of the Telkwa Mountains;
- woodlot licensees within the WHA;
- town of Smithers;
- town of Telkwa;

- town of Houston; and
- Telkwa Mountains Recreation Access Management Advisory Group (TRAM) members.

In-person meetings were originally planned with the woodlot licensees and TRAM. However, due to time constraints, it was decided that preliminary engagement with these groups would be limited to phone and email comments with additional engagement planned when and if implementation of the restoration plan continues. An information sharing session between MFLNRORD and the Office of the Wet'suwet'en and trapline holders was held on April 29, 2019. The engagement timeline is presented in Table 3.6-1

**Table 3.6-1: Engagement Timeline**

Group	Date	Engagement
Office of the Wet'suwet'en, Woodlot licensees, TRAM	March 25, 2019	Letter of intent and maps of proposed treatment areas
Office of the Wet'suwet'en, Woodlot licensees, TRAM	March 29, 2019	Follow-up email
Office of the Wet'suwet'en (includes trap line holders)	April 29, 2019	Meeting at the ERM Board room

## 4. RESULTS

### 4.1 Habitat Intactness and Current Condition of the Telkwa Caribou Range

Based on the density of linear features, cutblocks and disturbance from wildfires, the Telkwa caribou WHA contains approximately 54% intact habitat. The majority of habitat disturbance has occurred in the low elevation SBS zone, where habitat intactness is 13%, compared to 82% and 96% habitat intactness in the higher elevation ESSF and BAFA zones, respectively (Figure 4.1-1).

The WHA has established targets for the proportion of early seral forests in each BEC zone. For the ESSF and SBSmc polygons, the early seral target is less than 28% of the area younger than 40 years. The current condition for these BEC zones is 3% and 36% of the areas are younger than 40 years, respectively.

The early seral target for the SBSdk zone is less than 39% of the area younger than 40 years. The current condition in the SBSdk zone is 36% of the area is younger than 40 years old (Figure 3.1-9).

Similarly, the WHA has established targets for the proportion of old forest in each BEC zone. In the ESSF and SBSmc zones the old forest target is more than 60% of the area older than 80 years. The current old forest condition in these zones is 97% and 64% of the areas are older than 80 years, respectively. For the SBSdk zone, the target is 45% of the area older than 80 years. The current condition in the SBSdk zone is 62% of the area is older than 80 years (Figure 3.1-9).

### 4.2 Proposed Restoration Candidates

Based on initial disturbance mapping, a total of 188.2 km of linear disturbances within the Telkwa WHA are considered restoration treatment candidates; these are spatially located across five restoration polygons (Figure 4.2-1). Linear features outside of these restoration polygons were considered 'no treatment' candidates because they occur in areas with:

- fringe or matrix caribou habitat (i.e., low elevation habitat disturbed through land use, wildfire or with medium or high MPB susceptibility);
- little current caribou use as determined from radio-telemetry location data and analysis using KDEs; and
- ongoing resource use and industrial activity (forestry and mineral exploration) that made assessing the future use and level of protection of these linear features challenging.

#### 4.2.1 Restoration Polygon 1

Restoration polygon 1 is located on the west side of the WHA and shares a border with Tazdli Wyiez Bin/ Burnie-Shea Park. It captures HEWR and HESR, as well as some UWR (1,341 ha) and OGMA (36 ha; Table 4.2-1). Mineral tenure overlaps with 11,016 ha (38 %) of the polygon. There are 40.6 km of candidate linear features for restoration in this polygon, selected for candidacy due to the potential to minimize access by predators from low elevation areas into high elevation ranges. Roads and trails in this polygon are largely used for recreation, although there is some use related to active mineral claims. This polygon overlaps with a mountaineering tenure, a guide outfitter tenure and three traplines.

Considering the criteria for restoration candidacy (Section 3.2), the characteristics of polygon 1 and associated treatment candidates include:

- areas with high caribou use based on radio-telemetry location data and core range;
- overlap with HEWR and HESR;
- overlap with provincially designated areas (WHA, UWR, OGMA (~ 1%));

- overlap with existing areas where linear disturbance has occurred (roads and trails); and
- extent of linear disturbance features extending from low to high elevation caribou habitat.

The majority of treatment candidates in polygon 1 (34.7 km) are identified as priority 1 restoration candidates because of the high potential value to caribou habitat of restoration of sites within this polygon (Table 4.2-1). A small subset of treatment candidates (5.9 km) in the northeast corner are associated with mineral claims that have recently been renewed but that have uncertain status. These treatment candidates are classified as priority 2 on the basis of the uncertainty of their future use.

#### 4.2.2 *Restoration Polygon 2*

Restoration polygon 2 on the east side of the WHA is the largest of the polygons (51,195 ha) and overlaps large areas of UWR (14,084 ha) and OGMA (20,523 ha; Table 4.2-1). There are 28.8 km of candidate linear features in this restoration polygon, selected for candidacy due to the potential to minimize access by predators from low elevation areas into high elevation ranges. About one third of this polygon overlaps with a mineral claim (18,139 ha). Roads and trails here are largely used by recreational users. Considering the criteria for restoration candidacy (Section 3.2) the characteristics of polygon 2 and the associated treatment candidates include:

- areas with high caribou use based on radio-telemetry location data and core range;
- overlap with HEWR and HESR;
- overlap with provincially designated areas (WHA, UWR, OGMA >30%);
- overlap with existing areas where linear disturbance has occurred (roads and trails); and
- extent of linear disturbance features extending from low to high elevation caribou habitat.

The treatment candidates in polygon 2 are identified as priority 1 restoration candidates because of the high potential value to caribou habitat of restoration of sites within this polygon.

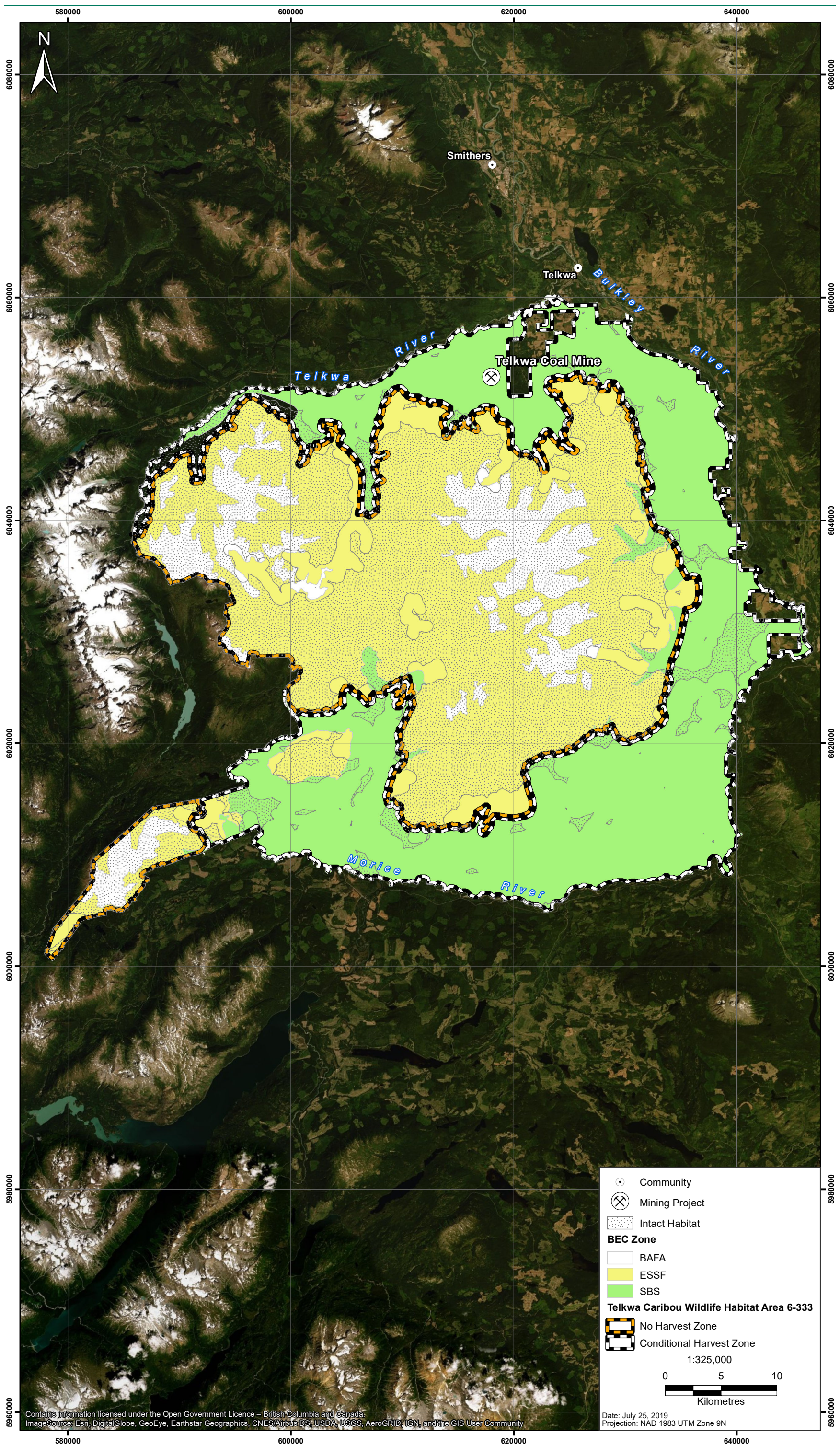
#### 4.2.3 *Restoration Polygon 3*

There are 16.3 km of candidate linear features in this restoration polygon, selected for candidacy to maintain connectivity through this area between high elevation ranges (Table 4.2-1). Considering the criteria for restoration candidacy (Section 3.2), the characteristics of polygon 3 and the associated treatment candidates include:

- areas with high caribou use based on radio-telemetry location data;
- overlap with HEWR and HESR (ESSFmc, which is typically designated as sub-alpine HEWR/HESR, but might be more functionally correct to call LEWR/LESR);
- overlap with provincially designated areas (OGMA ~ 5%);
- overlap with existing areas where linear disturbance has occurred (roads and trails);
- extent of linear disturbance features extending from low to high elevation caribou habitat; and
- extent of cutblocks and presence of moose and other ungulates at low to mid elevation caribou habitat.

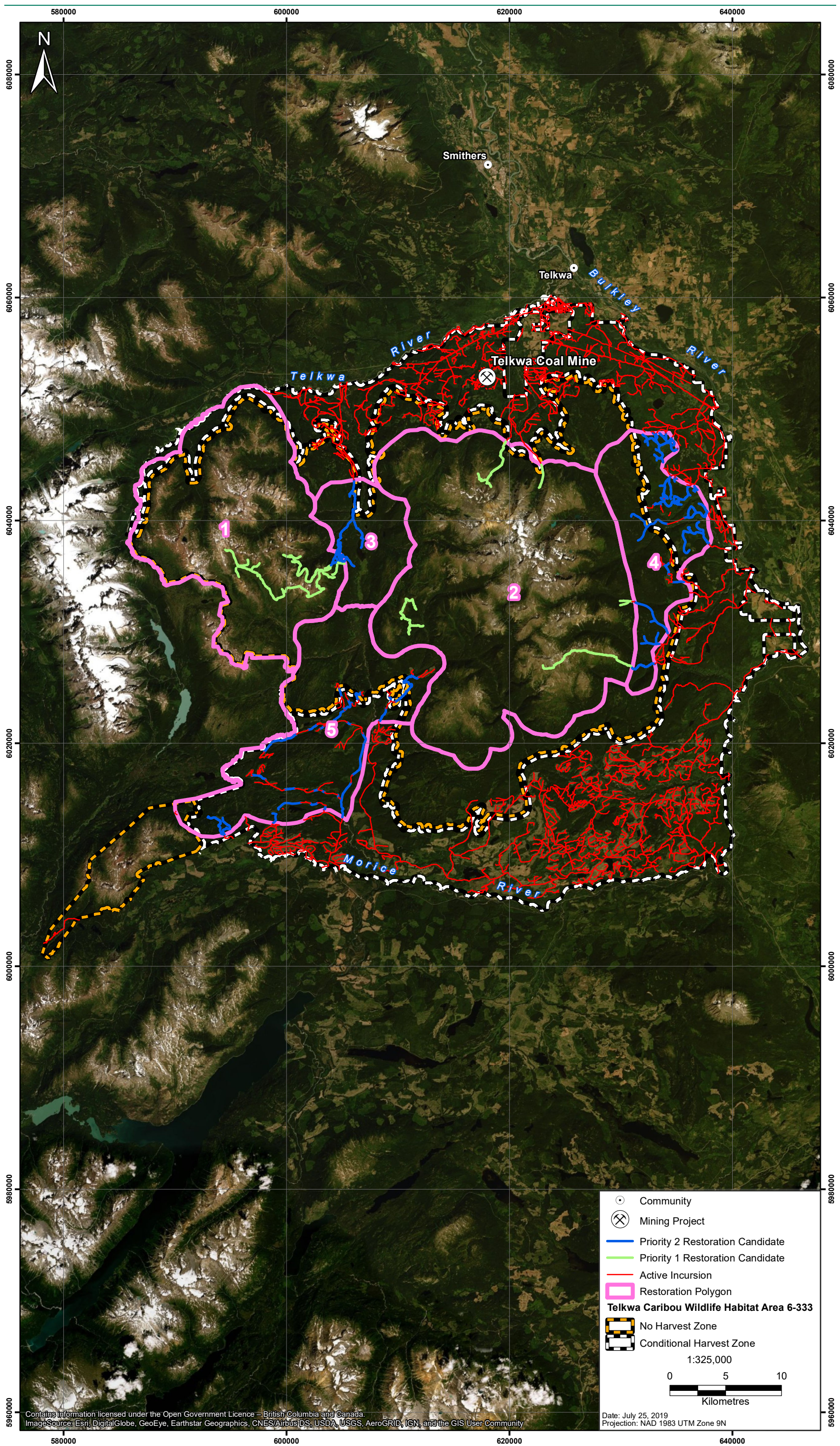
The treatment candidates in polygon 3 could be considered priority 1 sites based on the value their restoration would provide in enhancing habitat connectivity between two high elevation ranges. However, these roads are included as priority 2 sites due to uncertainty around the status of mineral claims that have recently been renewed and that are associated with these roads.





**Figure 4.1-1: Habitat Intactness in the Telkwa Caribou Wildlife Habitat Area**





**Figure 4.2-1: Potential Habitat Restoration Candidates in the Telkwa Caribou Wildlife Habitat Area**



**Table 4.2-1: Characteristics of Candidate Restoration Areas in the Telkwa Caribou Herd Range**

Restoration Polygon		Restoration Candidates (km)	No Treatment (km)	Total Linear Features (km)	Total Area (ha)	Total Linear Density (km/km <sup>2</sup> )	Habitat Intactness* (%)	Overlap with HEWR (ha)	Overlap with LEWR (ha)	Overlap with UWR (ha)	Overlap with OGMA (ha)	Overlap with Recreation Tenure** (ha)	Overlap with Active Mineral Claim (ha)
1	Priority 1	34.7	0.0	34.7	28,851	0.141	90	26,445	715	1,341	36	28,358	11,016
	Priority 2	5.9	0.0	5.9									
	Total	40.6	0.0	40.6									
2	Priority 1	28.8	0.0	28.8	51,195	0.056	94	50,849	346	14,084	20,523	-	18,139
3	Priority 2	16.3	0.0	16.3	6,980	0.234	82	6,573	408	6	417	3,457	3,048
4	Priority 2	63.2	9.4	72.6	12,135	0.598	44	6,139	5,996	341	7,148	-	285
5	Priority 2	39.3	43.7	83.0	21,110	0.393	61	11,520	9,590	193	6,422	1,852	1,112
Total		188.2	53.1	241.3	120,271	0.201		101,526	17,055	15,966	34,545	33,667	33,600

\*Intact habitat (ha) = polygon area (ha) – area of linear disturbance with 500m buffer (ha) – area of cutblocks with 500m buffer (ha) – recent (<40 years) wildfire area (ha).

\*\*Recreation tenures include tenures for guided mountaineering, a hunting camp and a community facility license depicted in Figure 3.1-4. This column does not include recreation trails and access roads.

HEWR = BAFA and ESSF BEC Zones

LEWR = SBS BEC Zone

#### 4.2.4 *Restoration Polygon 4*

Restoration polygon 4 is largely located in the SBS BEC zone and overlaps with OGMA (7,148 ha) and a small mineral claim (285 ha; Table 4.2-1). There are 63.2 km of candidate linear features in this restoration polygon, selected for candidacy to be consistent with habitat management objectives for low elevation/matrix range (EC 2014). Considering the criteria for restoration candidacy (Section 3.2), the characteristics of polygon 4 and the associated treatment candidates include:

- no current caribou use;
- overlap with matrix habitat. However, SBS zone has potential to function as LEWR/LESR;
- overlap with provincially designated areas (OGMAs >30%);
- overlap with existing areas where linear disturbance has occurred (roads and trails);
- extent of linear disturbance features extending from low to high elevation caribou habitat;
- extent of cutblocks and presence of moose and other ungulates at low to mid elevation caribou habitat; and
- areas where restoration of caribou habitat may have an indirect positive benefit to other ecological values (i.e. benefit to other ungulates by reducing predator access along existing linear disturbances).

Treatment candidates in polygon 4 are identified as priority 2 sites.

#### 4.2.5 *Restoration Polygon 5*

Restoration polygon 5 is largely located in the SBS BEC zone with some ESSF and overlaps with OGMA (6,422 ha; Table 4.2-1). There are 39.3 km of candidate linear features in this restoration polygon, selected for candidacy to be consistent with habitat management objectives for low elevation/matrix range (EC 2014). Considering the criteria for restoration candidacy (Section 3.2), the characteristics of polygon 5 and the associated treatment candidates include:

- no current caribou use;
- overlap with matrix habitat. However, SBS zone has potential to function as LEWR/LESR;
- overlap with provincially designated areas (WHA, OGMAs >30%);
- overlap with existing areas where linear disturbance has occurred (roads and trails);
- extent of linear disturbance features extending from low to high elevation caribou habitat;
- extent of cutblocks and presence of moose and other ungulates at low to mid elevation caribou habitat; and
- areas where restoration of caribou habitat may have an indirect positive benefit to other ecological values (i.e., benefit to other ungulates by reducing predator access along existing linear disturbances).

Treatment candidates in polygon 5 were identified as priority 2 sites.

### 4.3 Stakeholder Engagement

The idea of restoration planning was welcomed by the majority of the members of the Office of the Wet'suwet'en and trapline holders who were engaged during this process. This group generally agreed that more discussion would be required to implement the restoration plan.

Based on emails, phone conversation, and an information sharing meeting with these parties several suggestions and comments were received including:

- Concern that the restoration candidates were concentrated in the core, no harvest zone of the WHA and felt that there should be more candidates considered in the conditional harvest zone of the WHA.
- Concern with industrial developments in the Telkwa Mountains, primarily coal mining, road and pipeline development. There was disagreement regarding the methodology used to develop the restoration polygons in that it was interpreted as giving priority to industrial development over caribou. There were also concerns about the legality of the development of roads/ the Coastal Gas pipeline and right of way in the WHA near the Joshua lakes (western Telkwa mountain range near WHA panhandle; Figure 3.3-1).

Woodlots within the WHA are concentrated on the eastern side, primarily around the Grizzly Plateau access trails. Licensees were interested to take part in the discussion as wildlife wellbeing is a pillar of a sustainable forest management plan. The licensees noted that caribou are rarely seen at the base of the Grizzly Plateau trails near their woodlots. They suggested restoration be concentrated at higher altitudes in areas of greatest current caribou use.

TRAM members were receptive of the proposed restoration plan, but generally felt that recreation was already highly restricted on existing trails. TRAM consists of 14 separate stakeholder groups with diverse views on recreation and access management. Similar to the other stakeholder groups, further comments and engagement are expected once the proposed restoration plan is made publicly available

In general, there was concern about the treatment and deactivation of roads that do not fall within core caribou habitat. They found the proposed restoration criteria to be too restrictive and that it could negatively impact the recreational potential of the Houston and Smithers areas. The group unanimously believes that tourism plays a key role in the diversification of the economy of the area.

Members of TRAM would prefer to see restoration focused on areas that are fully within the no harvest zone of the WHA, which is already prohibited from motor vehicle use through a motor vehicle closure. However, they would prefer that restoration activities not occur in three main recreation zones based on the following rationale:

- Starr Basin and Eagle Peak ("Moosekin Johnny West" zone): The Starr Basin and Eagle Peak trails are already regulated for motorized use under the motor vehicle closure. These hard-pack trails/roads should help keep people on the trails where they are supposed to be and minimize the overall footprint of recreation in this zone.
- Moosekin Johnny Lake area: Moosekin Johnny trails are primarily used by the Smithers recreation groups and, similar to the Starr Basin and Eagle Peak trails, serve to minimize the impact of recreational use.
- Telkwa Range east slopes to Grizzly Plateau: Trails leading to the Grizzly Plateau have been operated by the Houston Snowmobile club for nearly thirty years and are under a shared management agreement with MFLNRD. The club has several measures in place to reduce negative impact to wildlife including limited use of trails by motorized vehicles. They have wildlife cameras on trails to monitor wildlife use.

## 4.4 Restoration Candidates

Following stakeholder engagement, the initial treatment candidates and restoration priorities presented in Section 4.1 were refined. A trail in the Starr Basin/Eagle Peak area (Polygon 1), the road to Mooseskin Johnny Lake (Polygon 3), the Hunter Basin road (Polygon 2) and the Grizzly Plateau road (Polygons 2 and 4) were specifically identified as having high recreational value (Figure 4.4-1). These roads, which include 49.3 km of treatment candidates in restoration polygons 1 to 4, were excluded from treatment candidacy because of recreational interests and ongoing use. Specifically this includes:

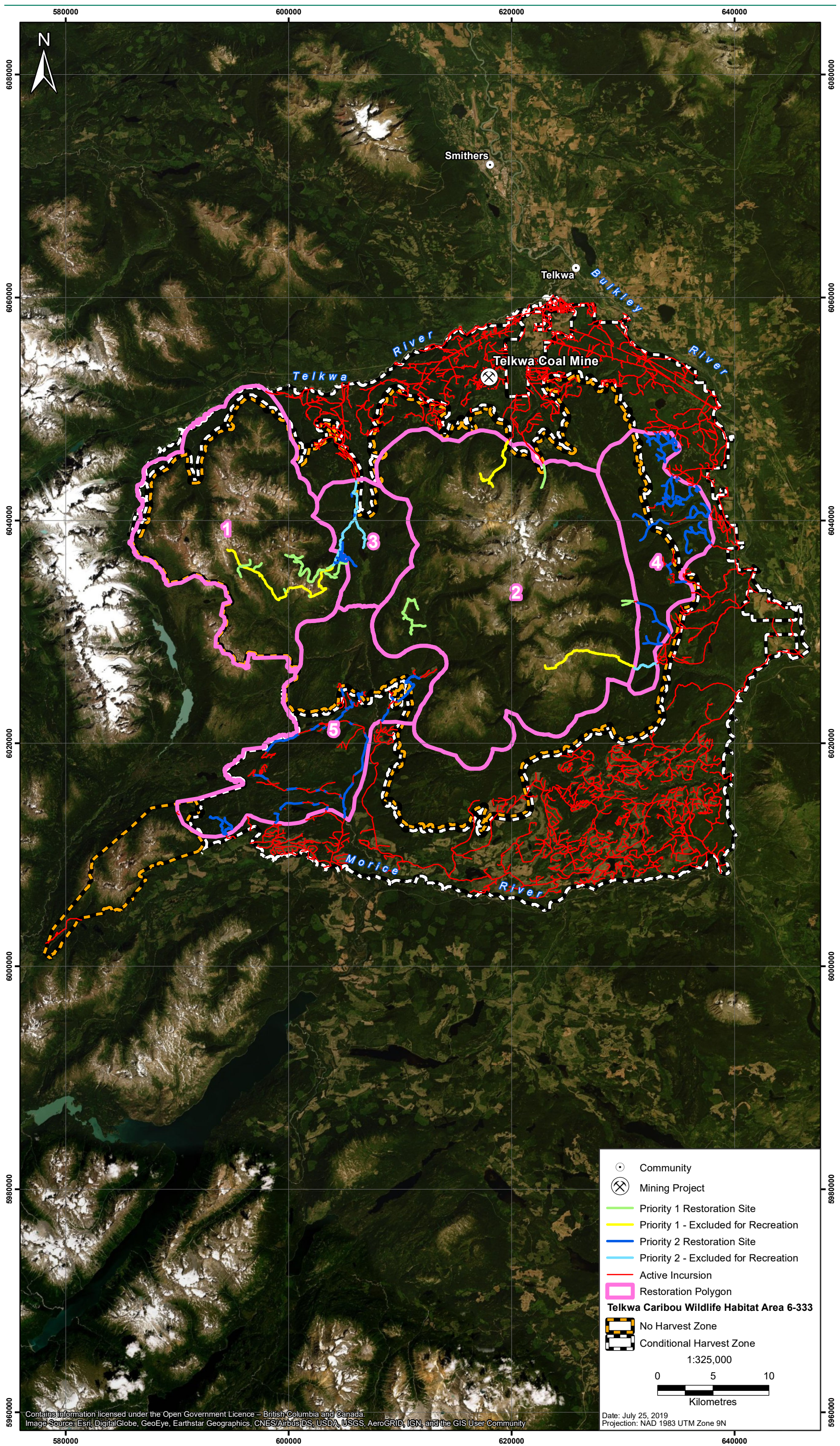
- Polygon 1: 17.2 km priority 1, 1.4 km priority 2;
- Polygon 2: 17.0 km priority 1;
- Polygon 3: 11.2 km priority 2; and
- Polygon 4: 2.5 km priority 2.

The final set of treatment candidates in the WHA included a total of 138.9 km of linear features, distributed among the 5 restoration polygons (Table 4.4-1; Figure 4.4-1).

**Table 4.4-1: Summary of Final Linear Feature Restoration Candidates in the Telkwa Caribou Herd Range**

Restoration Polygon	Priority	Final Restoration Candidates (km)	Excluded Restoration Candidates (km)	No Treatment (km)	Total Linear Features (km)	Total Area (ha)
1	Priority 1	17.5	17.2	0.0	34.7	28,851
	Priority 2	4.5	1.4	0.0	5.9	
	Polygon Total	22	18.6	0.0	40.6	
2	Priority 1	11.8	17.0	0.0	28.8	51,195
3	Priority 2	5.1	11.2	0.0	16.3	6,980
4	Priority 2	60.7	2.5	9.4	72.6	12,135
5	Priority 2	39.3	0.0	43.7	83.0	21,110
<b>Grand Total</b>		<b>138.9</b>	<b>49.3</b>	<b>53.1</b>	<b>241.3</b>	<b>120,271</b>





**Figure 4.4-1: Refined Habitat Restoration Candidates Following Stakeholder Engagement in the Telkwa Caribou Wildlife Area**



## 5. PRELIMINARY TREATMENT PRESCRIPTIONS

Preliminary prescriptions were developed to provide high-level guidance for future operational restoration prescriptions in the Telkwa caribou range. The goal of developing preliminary prescriptions was to characterize the areas recommended for treatment, detail rationales for selection of sites, and describe the types of treatment considered. These preliminary, high-level prescriptions will be refined during the development of operational prescriptions, should the next phase of restoration proceed.

Treatment prescriptions were designed to reduce predator movement from low elevations to high elevations and improve caribou habitat quality and intactness through a combination of short-term functional restoration treatments and long-term ecological treatments that reduce human and predator use of linear corridors. Functional restoration treatments create physical barriers along linear corridors that reduce their use as travel corridors by predators and other ungulates, limit line of sight and restrict vehicle access by humans. Ecological restoration treatments act over the long term to re-create natural coniferous forest on the linear corridors that reduce sensory disturbance of caribou and reduce predation risk by reducing other ungulates and their habitat to pre-disturbance levels. Ecological treatments also improve overall caribou habitat intactness and quality over the long term.

### 5.1 Ecological and Functional Restoration Tools and Options

The following is a summary of the most commonly applied restoration treatments for linear features in caribou habitat, including considerations for their application in the Telkwa range. The tools identified below are similar to those identified in Golder (2015).

#### 5.1.1 *Mechanical Site Preparation*

Mechanical site preparation is required for restoration on compacted sites, including roads and trails, to reduce soil compaction, improve aeration and soil mixing. The linear features identified as restoration candidates in the Telkwa range all likely require some level of mechanical site preparation for this purpose. Various techniques using a bulldozer or excavator can be applied; the intensity of surface disturbance required (depth and density) will depend on site conditions, including the extent of soil compaction. The surface disturbance created through mechanical site preparation also creates microsites suitable for planting.

Mechanical site preparation can also be used to create an uneven surface that can reduce access along linear features. Where access control is desired, mechanical site preparation should aim to create greater relief (high areas and low areas) in the substrate than for addressing soil compaction.

#### 5.1.2 *Seeding and Tree/Shrub Planting*

Tree planting reduces the time for vegetation to establish on restored sites in order to meet ecological and functional restoration objectives. Species and provenance selection should emphasize native species appropriate to the BEC zone and site conditions. Tree planting seed selection should follow the Chief Forester's Standards for Seed Use (BC MFLNRORD 2018c). Specific tree and shrub species and planting density and pattern will depend largely on the restoration objectives and site conditions. Coniferous species are usually the focus for planting because they are more in line in caribou habitat features and they provide a better year-round line of sight break than do deciduous trees. Shrub species may be planted on sites to help achieve vegetation recovery and reduce erosion potential; however, as linear corridors should have sufficient seed source from nearby plants, natural re-vegetation should occur relatively soon after site preparation is complete. Shrub plantings are most appropriate in areas with high soil erosion hazard or adjacent to riparian areas to reduce surface erosion rates.

#### 5.1.2.1 *Piling or Spreading of Woody Debris*

Woody debris can be used to reduce human and predator access and can promote restoration of ecological functions. Woody debris left after tree falling (Section 5.1.1.4) may be used. Alternatively, slash rollback can be used to re-distribute debris from spoil piles created during road construction across the linear feature. Although a more costly option, waste material from cutblocks may also be trucked in. Woody debris should be oriented perpendicular to the linear feature, in particular where access control is the treatment objective. Larger diameter (>12 cm diameter) is preferred as it does not contribute as greatly to fire spread as fine fuels (<12 cm diameter; BC MFLNRO 2012), decays more slowly, and is more effective at restricting access. BC MFLNRO (2012) recommends that woody debris loading does not exceed 99 tons/ha, but larger volumes may be required to adequately restrict access.

#### 5.1.2.2 *Tree Falling*

Tree falling can be accomplished by manually falling trees; this may be a cost-effective method for short segments of linear features in steep terrain where heavy equipment mobilization would not be efficient. However, the use of an excavator to push trees over and create upturned root wads is a safer and more cost effective method for longer linear features that are accessible by heavy equipment. Trees should be distributed perpendicular to the linear corridor. To be effective, trees should cross the entire linear feature and be distributed at 15 to 20 m intervals.

#### 5.1.2.3 *Fertilization*

On sites with very poor to medium soil nutrient regimes, the use of fertilizer should be considered to improve planted tree survival, tree establishment, and to accelerate vegetation growth and reduce restoration timelines. Fertilizer use may include the use of 'tea bags' (a packet of fertilizer dropped in the planting hole) during planting or manual fertilization after or at the time of planting. Multiple applications of fertilizer may be applied to increase growth rates of trees and vegetation and reduce the time to achieve full site occupancy.

### 5.1.3 *Best Management Practices and Guidelines*

During restoration, best management practices must be applied in to avoid or minimize negative impacts on the surrounding environment and associated wildlife species. An implementation plan will need to include environmental mitigation measures and procedures. These may include, but are not limited to, some of the key topics described below.

#### 5.1.3.1 *Re-vegetation*

Re-vegetation measures should employ native species appropriate to the BEC unit and site conditions. Field surveys should be conducted in advance of any restoration treatments to identify existing invasive plant species occurrences. Treatment of any invasive plants should occur prior to restoration treatments as per Invasive Alien Species Council of BC guidelines. Prior to relocation to new work sites, all equipment should be clean of dirt and other possible material that could introduce invasive plant species.

#### 5.1.3.2 *Forest Health*

Spruce beetle (*Dendroctonus rufipennis*) and western balsam bark beetle (*Dryocoetes confuses*) are the primary active forest health agents in the area that may be influenced by treatment activities (i.e., the creation of downed woody debris). The beetles primarily use downed wood as brood material, although spruce beetle will also use tall stumps. Spruce beetle can infest freshly downed woody debris, so falling of spruce to block access should be limited to prevent potential outbreaks. Western balsam bark beetle has lower brood production in downed versus standing trees and may present a lower risk of an outbreak

than spruce beetle. Where tree falling is used for restoration, monitoring of downed trees is recommended to identify forest health agents of concern and implement mitigation measures as required. Mountain pine beetle (*Dendroctonus ponderosae*) is also an active forest health agent in the Telkwa range. However, as this species attacks live trees, it is less likely to be influenced by restoration activities.

#### 5.1.3.3 Wildfire Hazard

While the use of woody debris is important to help improve and maintain habitat features, use of woody debris must conform to the *Wildfire Act* (2004) to ensure fire hazard is mitigated to reduce liability in the case of a wildfire.

#### 5.1.3.4 Soils and Erosion Hazard

To reduce and minimize negative effects associated with soil disturbance, restoration activities and site disturbance should be minimized to the required area and machine operations should be conducted on frozen soil if possible. Re-vegetation and erosion control measures should be implemented as soon as possible after soil disturbance in areas with high erosion potential.

#### 5.1.3.5 Wildlife

Restoration treatments should be conducted during the least-risk timing windows for wildlife species and should be timed to avoid breeding bird seasons (least risk timing window from mid-August to late April). For caribou, the least risk timing window is from July 16 to September 14 (BC MFLNRO 2014).

As mountain caribou habitat use can be variable, a review of recent Telkwa herd radio-telemetry location data should be undertaken during detailed restoration planning to examine the proposed timing window relative to each specific treatment area. Least risk timing windows for birds (mid-August to late April) are designed to avoid the nesting periods. Pre-clearing surveys for nests will be required if work is to proceed outside of the least-risk window. Restoration activities in or near riparian areas may need to consider least risk timing windows for fish, if present.

#### 5.1.3.6 Riparian Areas and Stream Crossings

Work practices should be modified in riparian areas and at stream crossings to restrict machine use, avoid tree falling into or across streams, deposition of debris in stream channels, or disturbance of vegetation along stream banks. Riparian reserve zones and management areas should be identified prior to work and be sufficient size to prevent negative impacts to riparian areas, including wetlands.

### 5.2 Preliminary Prescriptions

High-level preliminary prescriptions were developed based on BEC units (Table 5.2-1; Figure 5.2-1) and incorporate both functional and ecological restoration considerations. Treatment units were distinguished based upon the regional climate of each BEC unit, suitable trees species, and limiting factors such as cold or snow damage that affect tree species selection at a coarse scale. Tree species suitable for each BEC unit were identified using provincial guidance documents. Recommended planting densities are higher than those outlined in provincial guidance documents to reduce predator sight lines and access and contribute to functional restoration. Species and planting densities should be refined based upon specific site conditions during development of operational restoration treatment prescriptions (BC MFLNRD 2019; Banner et al. 1993).

Development of operational prescriptions appropriate to the site level will require additional site level assessment such as mapping of site units (ecosystem types), soil moisture and nutrient regimes, stand composition (e.g., tree species, age, height), and site and soil characteristics. Based on the site level assessments, restoration methods should be refined according to ecological and current site conditions.



Treatment prescriptions may be applied along the entire length of a linear feature, or at intervals, depending on the restoration goal and resourcing. For functional restoration objectives, treatment application, including tree planting, at intervals along a linear feature may be sufficient to limit human access, whereas treatment application along an entire linear feature is more likely to reduce predator access. To achieve ecological restoration objectives, site preparation along the entire length of the feature will promote vegetation recovery by removing the limitation of compacted soils. Vegetation recovery will be further promoted through tree planting and fertilization, where applicable, along the entire length of the feature.

### 5.2.1 Treatment Unit A

Treatment Unit A is within the ESSFmc (38.5 ha) and includes both priority 1 and 2 treatment candidates in all restoration polygons (Table 5.2-1; Figure 5.2-1). This treatment unit includes linear corridors that link low elevation and high elevation habitat. Treatment of this unit should focus on reducing access along linear corridors and decreasing site lines using a combination of ecological and functional treatment types including: mechanical site preparation to reduce soil compaction and provide access control, scattering of woody debris, tree falling and planting. Recommended tree species for planting include subalpine fir (*Abies lasiocarpa* – BI), Engelmann's Spruce (*Picea engelmannii* – Se) and lodgepole pine (*Pinus contorta* – PI) with a minimum density of 3,000 stems per hectare (SPH). Hand applications of fertilizer may be used on a site-specific basis to improve tree establishment and growth.

### 5.2.2 Treatment Unit B

Treatment Unit B is within the ESSFmcp (parkland; 15.7 ha), located above the ESSFmc and below the BAFAun (Table 5.2-1; Figure 5.2-1) and includes treatment candidates in restoration polygons 1 and 2. The treatment unit is within the parkland and consists of treed areas and open meadows. Where linear corridors occur in densely treed areas, treatments should consist of mechanical site preparation to reduce soil compaction and provide access control, scattering of woody debris, tree falling and planting. In more open areas, treatment should be restricted to mounding, scattering woody debris, and planting to restrict human and predator access and break sight lines. As this unit occurs at higher elevations, tree species should include BI and Se at a minimum density of 3,000 SPH and may include application of fertilizer as the time of planting (Table 5.2-1; Figure 5.2-1).

### 5.2.3 Treatment Unit C

Treatment Unit C is located in the SBSdk in polygon 4 (1.8 ha; Table 5.2-1; Figure 5.2-1). As this treatment unit is at lower elevation, restoration should focus on reducing access by humans and predators. Treatment should consist of a combination of ecological and functional treatment types including: mechanical site preparation to reduce soil compaction and provide access control, scattering of woody debris, tree falling and planting. Tree species recommended for planting include PI and a component of hybrid White Spruce (*Picea glauca x engelmannii* – Sxw) with a minimum density of 4,000 SPH. Hand applications of fertilizer may be used on a site specific basis to improve tree establishment and growth.

### 5.2.4 Treatment Unit D

Treatment Unit D is located in the SBSmc2 within polygons 4 and 5 (81.8 ha; Table 5.2-1; Figure 5.2-1). This treatment unit will be similar to Treatment Unit C except that BI should also be planted on appropriate sites with PI and Sxw being the primary tree species used.

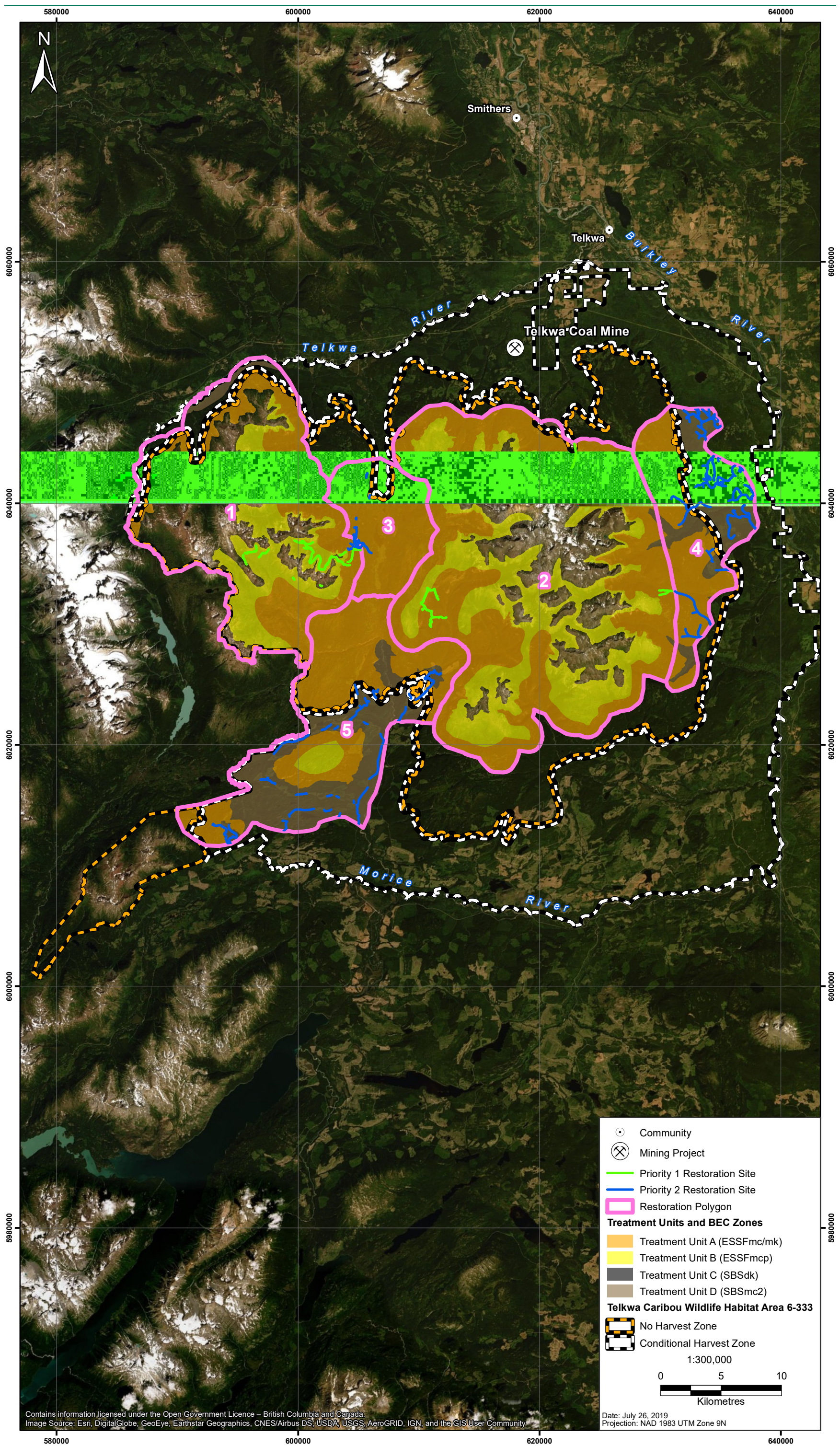
No treatment is recommended in the BAFAun as this BEC unit is not treed and access controls in the lower elevation treatment units should reduce access by humans and predators to these areas.

Table 5.2-1: Preliminary Prescriptions for Linear Restoration Treatments

Treatment Unit	BGC Unit	Polygon	Priority	Area (ha) <sup>1</sup>	Treatment Type	Limiting Factors	Mechanical Site Preparation Rationale	Tree Felling	Woody Debris (m³/ha)	Tree Species	Minimum Density (sph)	Fertilization	TU Area (ha) <sup>1</sup>
A	ESSFmc	1	1	2.5	Ecological/ Functional	None	Access Control, Site Lines, Soil Compaction	20 m interval	75-100	Bl, Se (Pl)	3000	Based on Site Review	38.4
		1	2	4.5									
		2	1	10.0									
		3	2	5.1									
		4	2	12.1									
	ESSFmc/ ESSFmk	5	2	4.2									
B	ESSFmcp	1	1	13.9	Ecological/ Functional	Cold/snow damage	Access Control, Site Lines, Soil Compaction	20 m interval in densely treed areas	0-75	Bl, Se	3000	Based on Site Review	15.8
		2	1	1.9									
C	SBSdk	4	2	1.8	Ecological/ Functional	None	Access Control, Site Lines, Soil Compaction	20 m interval	75-100	Pl(Sxw)	4000	Based on Site Review	1.8
D	SBSmc2	4	2	46.8	Ecological/ Functional	None	Access Control, Site Lines, Soil Compaction, Planting	20 m interval	75-100	Pl, Sxw (Bl)	4000	Based on Site Review	81.8
		5	2	35.0									
No Treatment	BAFAun	1	1	1.1	No Treatment	Cold, Wind – snow exposure							0.0
Total				138.9									137.8

<sup>1</sup> The assumed road width is 10 m therefore road area in hectares is equal to road length in kilometers.





**Figure 5.2-1: Preliminary Restoration Treatment Units in the Telkwa Caribou Wildlife Habitat Area**



## 6. IMPLEMENTATION PLANNING

The implementation of caribou habitat restoration in the Telkwa range will depend on local and provincial capacity. Detailed implementation planning should be undertaken in a subsequent phase of restoration planning. Treatment candidates identified in this tactical plan should be further refined and prioritized for restoration through ongoing engagement with stakeholders and the Office of the Wet'suwet'en. Logistical considerations, including ease of access for restoration, resource availability and permit requirements will also inform treatment candidate prioritization. Once stage 1 implementation areas have been identified, an implementation plan that includes the following elements should be developed for each area:

- site level assessments and development of operational prescriptions (Section 6.1);
- authorizations (Section 6.2);
- implementation schedule (Section 6.3); and
- vegetation, access, and wildlife response monitoring plans (Section 7).

### 6.1 Project Management Team

The implementation of restoration activities will require a dedicated project team. Table 6.1-1 outlines roles and duties for a project management team to coordinate restoration activities.

**Table 6.1-1: Restoration Implementation Project Team**

Role	Duties
Project Manger	<ul style="list-style-type: none"><li>■ Provide project oversight and coordination</li><li>■ Identify funding sources and manage budget</li><li>■ Lead project team in identifying and prioritizing implementation areas</li><li>■ Coordinate authorizations for implementation</li><li>■ Coordinate implementation schedule</li><li>■ Engage the Office of the Wet'suwet'en, staff, and/or subcontractors to undertake restoration activities</li></ul>
Engagement Coordinator	<ul style="list-style-type: none"><li>■ Facilitate information sharing and engagement with stakeholders and the Office of the Wet'suwet'en to identify implementation areas and restoration priorities and communicate project progress at key milestones.</li></ul>
Restoration Biologist	<ul style="list-style-type: none"><li>■ Provide ongoing input into identification and prioritization of implementation areas</li><li>■ Coordinate site-level assessments and development of operational prescriptions at identified implementation areas, engaging subcontractors as needed</li><li>■ Monitor restoration implementation activities, engaging subcontractors as needed</li><li>■ Refine and finalize site-specific restoration monitoring plans, engaging subcontractors as needed for monitoring activities</li></ul>

### 6.2 Site-level Assessments and Operational Prescriptions

Site level assessments will confirm a site's suitability for restoration, identify any constraints to restoration activities, and develop site-specific operational restoration prescriptions based on the preliminary prescriptions described in Section 5.2.

Recent, detailed imagery should be used to initially confirm a site's suitability for restoration and plan groundtruthing and field data collection, including the identification of access constraints (e.g., unmaintained watercourse crossings). An archaeological review of the candidate sites should also be completed in

partnership with the Office of the Wet'suwet'en to map known archaeological sites and features and incorporate these into the field plan prior to restoration works.

During fieldwork, linear corridors in the preliminary prescriptions should be assessed to determine their suitability for restoration. Data required for prescription development include ecological classification, site and soil characteristics, stand data, access, and treatment options as identified in the field. Information from the site-level assessments should be used to group restoration sites into treatment units that have similar ecological conditions, restoration objectives, and treatment prescriptions. As part of the development of operational prescriptions, appropriate seed and seedling sources should be identified.

Prior to restoration treatment, long-term monitoring plots should be established at treatment sites to monitor pre- and post-treatment conditions and assess treatment efficacy (Section 7).

### **6.3 Authorizations**

Restoration of linear features not under an existing permit may require authorization (a Forest License to Cut) from MFLNRORD under FRPA. In addition, authorization will be required for restoration activities using motorized vehicles in the motor vehicle closure area. Restoration of treatment candidates will occur within a designated Wildlife Habitat Area (WHA 6-333) therefore all restoration activities must be consistent with the prescribed General Wildlife Measures for the WHA or an exemption under the Government Action Regulation may be required.

### **6.4 Implementation Scheduling**

Authorizations should be initiated a minimum of 6 months in advance of planned restoration. Further discussions with MFLNRORD during the next phase of implementation planning will be required to confirm the authorization timeline.

The timing of restoration work should consider least risk timing windows for wildlife (Section 5.1.3.5). Stakeholder activity schedules can also be incorporated into implementation scheduling to minimize disruption to recreation, forestry, trapping or other activities.



## 7. RESTORATION MONITORING

Restoration monitoring is required to determine the efficacy of restoration treatments and to identify if additional restoration activities are required to meet treatment goals. A detailed monitoring plan should be prepared as part of implementation planning. The efficacy of restoration treatments in achieving both functional and ecological restoration goals should be evaluated. Where possible, monitoring should follow a Before-After-Control-Impact (BACI) design, where monitoring points are established and data are collected on control sites and restoration sites both before and after the implementation of treatments. Where ecological thresholds are available, monitoring should occur to detect changes relative to those thresholds.

In addition, larger range-scale range monitoring should be completed to assess how restoration activities are contributing to the intactness of the Telkwa range, relative to federal recovery targets (EC 2014). This may be completed by reclassifying existing digitized linear features as they are determined to be restored based on field data collection and recalculating habitat intactness. High resolution satellite imagery may also be used to evaluate changes in habitat intactness.

### 7.1 Vegetation Response Monitoring

Monitoring restoration treatments where trees or shrubs are planted will evaluate progress towards achieving both functional and ecological restoration goals. In a BACI monitoring framework, reference plots should be established in nearby undisturbed forest (natural vegetation control) and untreated linear features (disturbed control) with similar site characteristics to the treatment site. The goal of vegetation monitoring is to assess whether vegetation establishment and growth is on a trajectory towards the characteristics of an undisturbed site. In addition, vegetation monitoring includes identification of invasive species establishment to support adaptive management.

Indicators to assess re-vegetation should include:

- stem density and percent cover of targeted tree species;
- seedling leader growth;
- establishment and growth of natural regeneration;
- lines of sight (where reducing lines of sight was a treatment objective); and
- invasive species occurrences.

### 7.2 Access and Wildlife Response Monitoring

Access monitoring should be used to assess human and wildlife use of restoration sites to evaluate progress towards functional restoration. In a BACI monitoring framework, reference plots should be established in nearby untreated linear features (disturbed control) with similar site characteristics to the treatment site. Pre-treatment monitoring of access on both control and treatment corridors will be important as linear corridor closures can be expected to result in increased use of remaining (control) corridors.

Visual inspection during fieldwork will identify signs of human use (e.g., vehicle tracks), which can be then used to determine if access controls have been successful or additional treatment is required. In addition, human use of restoration sites may also be evaluated using trail cameras installed for wildlife monitoring purposes (Section 7.3).

Wildlife response to treatments can be monitored through a variety of approaches that can assess both functional and ecological restoration. The simplest means of monitoring functional restoration is through visual inspection for evidence of predator and primary prey (moose, deer, elk) use of a treatment site (e.g., tracks, scat). Wildlife response to treatments can also be assessed through the use of

remote-triggered cameras (camera trapping) installed prior to restoration treatment. Other wildlife monitoring may include the use of telemetry to track movements and resource selection of caribou, predators, and other ungulates. As distribution of moose and other ungulates is an important factor in caribou ecology, ungulate winter surveys will provide important information on changes in their distributions and densities. Over the long term, data from camera trapping, winter surveys, and telemetry can be used to assess the efficacy of the treatment in achieving the goal of ecological restoration.

### 7.3 Additional Indicators

Field assessments of treatment sites may include monitoring of additional indicators that can be used to identify whether adaptive management is required. These include the following parameters:

- erosion activity on sites with steep slopes and/or fine substrate;
- presence and/or abundance of forest health agents of concern (spruce beetle and western balsam bark beetle), at sites where risk factors are present (e.g., downed coarse woody debris); and
- fuel loading to assess wildfire risk.

### 7.4 Triggers for Adaptive Management

Monitoring may provide evidence that applied restoration treatments are not meeting either functional (in the short-term) or ecological (in the long-term) goals, or it might indicate another unanticipated or undesired conditions at a treatment site. An adaptive management approach should be used to identify and respond to these conditions at already treated sites and modify future treatment approaches to improve restoration effectiveness. In the short term, triggers for adaptive management may include the following conditions:

- unmitigated human access, where restricting human access was a restoration goal;
- increasing densities of other ungulate species in restored areas, where their reduction was a restoration goal;
- uncontrolled soil erosion;
- the presence of invasive plants in a treated area;
- a forest health concern; or
- unacceptable fire risk due to fuel loading.

Over the long term, monitoring should be used to assess progress towards a goal of ecological restoration. Adaptive management triggers should include results from vegetation or wildlife response monitoring that are not consistent with that goal. For example inadequate vegetation recovery or a vegetation recovery trajectory that is not consistent with the surrounding undisturbed vegetation could be a trigger for adaptive management. The triggers related to wildlife responses will depend on the details of the monitoring programs in place.

### 7.5 Monitoring and Reporting Schedule

Monitoring should be initiated a minimum of one year prior to the implementation of restoration treatments, and continued during the growing season of the first year after treatment and then on the fifth, tenth, and fifteenth years to document treatment effectiveness, adapt treatments as required, and inform future restoration treatment prescription development.

Reporting should follow the same schedule as monitoring and should include all monitoring results to date, a summary of any adaptive management actions and recommendations for the development of future treatment prescriptions.

## 8. COMMUNICATION PLAN

Ongoing engagement with stakeholders and the Office of the Wet'suwet'en is essential for the successful implementation of this tactical restoration plan. The project management team (Section 6.1) includes an engagement coordinator who will lead and be accountable for communication efforts with stakeholders and the Office of the Wet'suwet'en.

Implementing this tactical restoration plan requires that the treatment candidates identified in this plan are further refined and prioritized with input from stakeholders and the Office of the Wet'suwet'en.

The objective of this process will be to identify specific sites at which to implement restoration works during stage 1. Specific communication and engagement tasks during this phase include the following:

- Distribute this report to the Office of the Wet'suwet'en and all stakeholders who were contacted during the development of this tactical restoration plan.
- Conduct focused meetings with each stakeholder group. Following each meeting, a summary will be provided back to the participants. Additional phone calls and/or meetings may be required to gather input from interested stakeholders not able to attend the focused meetings.
- A working database of interested stakeholders (groups and individuals) will be maintained to ensure effective ongoing communication.
- Provide feedback to the stakeholder groups regarding planning, priorities and implementation of restoration works.

Key milestones for communication include the following:

- Securing funding.
- Scheduling of restoration activities (stakeholder activity schedules will be incorporated into implementation scheduling where practical to minimize disruption to recreation, forestry, trapping or other activities).
- Opportunities to bid on contracts related to restoration activities.
- Opportunities for volunteers.
- The initiation of monitoring.
- The initiation of restoration works.
- The completion of restoration works.
- Updates on restoration effectiveness monitoring.



## 9. NEXT STEPS

The implementation of caribou habitat restoration in the Telkwa range will depend on local and provincial capacity. Detailed implementation planning should be undertaken in a subsequent phase of restoration planning. Further engagement with stakeholders, as outlined in Section 8, and consideration of logistical constraints such as access and resource availability should be used to identify a short list of priority candidate sites that can be the target for stage 1 of implementation.

Once these areas are identified, implementation will require:

1. The development of a detailed implementation plan, including budget and partners, with a defined project scope within the restoration framework.
2. Securing funding based on the stage 1 sites identified.
3. Site level assessments and the development of operational prescriptions.
4. In partnership with the Office of the Wet'suwet'en, an archaeological review of candidate sites to map known archaeological sites and features.
5. Authorizations for restoration activities in the WHA and MVC.
6. Implementation of treatment prescriptions.
7. Vegetation, access, and wildlife response monitoring through a Before-After-Control-Impact study design (Section 7).

A dedicated project team consisting of a project manager, engagement coordinator and a restoration biologist will be required to implement restoration activities.

## 10. SUMMARY

This tactical restoration plan is the first phase of planning for habitat restoration in the range of the Telkwa caribou herd. Of the linear features within the Telkwa caribou WHA, 188.2 km were identified as potential treatment candidates, which was refined to 138.9 km following stakeholder input. Treatment candidates were distributed among five restoration polygons to guide prioritization and were delineated based on caribou utilization, high value caribou habitat, and the density of anthropogenic disturbance (specifically linear features and forest harvesting). The resulting set of treatment candidates included 29.3 priority 1 and 109.6 priority 2 restoration sites. Preliminary treatment prescriptions were developed for candidate linear features based on biogeoclimatic subzones.

Stakeholder engagement included communications with the Office of the Wet'suwet'en, trappers, woodlot licensees, and recreational users (through TRAM). There were time constraints to conducting thorough stakeholder engagement, but these can be addressed through follow up engagement as the implementation of this plan proceeds, as outlined in the communication plan in Section 8. Additional engagement is strongly recommended to minimize the social risks to the project due to real or perceived inadequate engagement.

Implementing restoration activities will require the identification of stage 1 implementation areas based on further engagement with stakeholders and considering logistical constraints such as access and resource availability. Once stage 1 implementation areas are identified, detailed site-level assessments will be required for the development of operational prescriptions. Restoration activities should be complemented by effectiveness monitoring that will help inform adaptive management of restored sites.



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## APPENDIX A      DATA SOURCES SUMMARY

## Appendix A: Data Sources Summary

**Table A-1: Summary of Linear Disturbance Data Considered in the Tactical Restoration Plan for the Telkwa Caribou Herd**

Disturbance Feature	Data Set	Data Source	URL
Roads	BC Digital Road Atlas	Government of BC	<a href="https://catalogue.data.gov.bc.ca/dataset/digital-road-atlas-dra-master-partially-attributed-roads">https://catalogue.data.gov.bc.ca/dataset/digital-road-atlas-dra-master-partially-attributed-roads</a>
	Forest Tenure Road Section Lines -	Government of BC	<a href="https://catalogue.data.gov.bc.ca/dataset/forest-tenure-road-section-lines">https://catalogue.data.gov.bc.ca/dataset/forest-tenure-road-section-lines</a>
	Imagery	MFLNRORD SPOT Imagery Service (2016)	WMS service at <a href="http://geocloud.blackbridge.com/service">http://geocloud.blackbridge.com/service</a>
		ESRI Imagery Basemap Service (2009-14)	<a href="https://www.arcgis.com/home/item.html?id=10df2279f9684e4a9f6a7f08febac2a9">https://www.arcgis.com/home/item.html?id=10df2279f9684e4a9f6a7f08febac2a9</a>
		Google Earth (2002-05)	Access via Google Earth Pro
Recreation	Recreation Lines	Government of BC	<a href="https://catalogue.data.gov.bc.ca/dataset/recreation-line">https://catalogue.data.gov.bc.ca/dataset/recreation-line</a>
Oil and Gas Rights-of-Way	TANTALIS – Crown Tenures	Government of BC	<a href="https://catalogue.data.gov.bc.ca/dataset/tantalis-crown-tenures">https://catalogue.data.gov.bc.ca/dataset/tantalis-crown-tenures</a>

**Table A-2: Summary of Land Use Data Considered in the Tactical Restoration Plan for the Telkwa Caribou Herd**

Land Use	Data Set	Data Source	URL
Forest Harvest (Cutblocks <40 years)	Reporting Silviculture Updates and Land Status Tracking System (RESULTS)	<a href="#">DataBC</a>	<a href="https://catalogue.data.gov.bc.ca/dataset/results-openings-svw">https://catalogue.data.gov.bc.ca/dataset/results-openings-svw</a>
Mineral Tenures	Mineral, Placer, and Coal Tenures	DataBC	<a href="https://catalogue.data.gov.bc.ca/dataset/mta-mineral-placer-and-coal-tenure-spatial-view">https://catalogue.data.gov.bc.ca/dataset/mta-mineral-placer-and-coal-tenure-spatial-view</a>



**Table A-3: Summary of Environmental Data Considered in the Tactical Restoration Plan for the Telkwa Caribou Herd**

Environmental Data	Data Set	Data Source	URL
Biogeoclimatic Ecosystem Classifications Zones	Biogeoclimatic Ecosystem Classification Map	Government of BC	<a href="https://www.for.gov.bc.ca/hre/becweb/">https://www.for.gov.bc.ca/hre/becweb/</a>
Wildlife Habitat Areas	Wildlife Habitat Areas	Government of BC	<a href="https://catalogue.data.gov.bc.ca/dataset/wildlife-habitat-areas-approved">https://catalogue.data.gov.bc.ca/dataset/wildlife-habitat-areas-approved</a>
Ungulate Winter Range	Ungulate Winter Range	Government of BC	<a href="https://catalogue.data.gov.bc.ca/dataset/ungulate-winter-range-approved">https://catalogue.data.gov.bc.ca/dataset/ungulate-winter-range-approved</a>
Parks, Protected Areas	Parks and Protected Areas	Government of BC	<a href="https://catalogue.data.gov.bc.ca/dataset/bc-parks-ecological-reserves-and-protected-areas">https://catalogue.data.gov.bc.ca/dataset/bc-parks-ecological-reserves-and-protected-areas</a>
Old Growth Management Areas	Old Growth Management Areas	Government of BC	<a href="https://catalogue.data.gov.bc.ca/dataset/old-growth-management-areas-legal-current">https://catalogue.data.gov.bc.ca/dataset/old-growth-management-areas-legal-current</a>
Recent Forest Fires (<40 years)	Fire Perimeters	Government of BC	<a href="https://catalogue.data.gov.bc.ca/dataset/fire-perimeters-historical">https://catalogue.data.gov.bc.ca/dataset/fire-perimeters-historical</a>
Mountain Pine Beetle Susceptibility	Bark Beetle Susceptibility Rating - Morice and Bulkely Timber Supply Areas	Government of BC	<a href="https://catalogue.data.gov.bc.ca/dataset/bark-beetle-susceptibility-rating">https://catalogue.data.gov.bc.ca/dataset/bark-beetle-susceptibility-rating</a>
Caribou Telemetry Data (1986-2016)		MFLNRORD	Provided in spatial data transmission from MFLNRORD to ERM
Caribou Kernel Density Data		MFLNRORD	Provided in spatial data transmission from MFLNRORD to ERM

## **APPENDIX B      STAKEHOLDER ENGAGEMENT INFORMATION PACKAGE**





25 March 2019

**Subject: Telkwa Caribou Tactical Restoration Plan**

To Whom it May Concern:

The Ministry of Forests, Lands, and Natural Resource Operations and Rural Development (FLNRORD; the Ministry) and the Society for Ecosystem Restoration in Northern BC (SERNbc) are working in the Skeena region to develop ecosystem restoration projects designed to restore critical habitat for caribou.

The Ministry and SERNbc have engaged ERM Consultants Canada Ltd. (ERM) to develop the Telkwa Caribou Tactical Restoration Plan. The goal of this project is to develop a tactical restoration plan for priority areas within the Telkwa herd range. This plan will identify and focus restoration activities in priority landscapes that have been impacted by human activity (such as roads, trails...) and contain or provide access to high-value caribou habitat.

More specifically, the project will:

- Confirm, verify, and refine a comprehensive disturbance map for priority areas building upon recent disturbance mapping, available datasets, and other available imagery;
- Engage with The Office of the Wet'suwet'en, the Province and stakeholders to identify current and future disturbance features and appropriate restoration treatments that are informed by traditional ecological knowledge. This may occur in coordination with other recovery program elements.
- Identify tactical restoration opportunities and appropriate treatment and protection options;
- Consider all opportunities to support caribou habitat restoration in a coordinated way;
- Develop preliminary implementation plans for confirmed candidate sites; and
- Develop a monitoring plan for the collection of baseline data to assess treatment success and wildlife response to restoration treatments.

ERM will be contacting representatives of groups and/or individuals with interests in the Telkwa Mountains area and will make available an information package via email (or mail) for review and comment. The information package will contain an overview map of the restoration zones identified within the priority areas of the Telkwa caribou herd range, and close-up maps of each restoration zone projected onto high-resolution satellite imagery.

With the help of maps of the proposed restoration zones, we are asking all the representatives to review and send feedback via email to [Jean-Yves.Landry@erm.com](mailto:Jean-Yves.Landry@erm.com), by post or in person to:

ERM C/O Jean-Yves Landry  
3790 Alfred Ave,  
Smithers, BC  
V0J 2N2

As the project is designed to take advantage of funding made available only until the end of March 2019 by the Caribou Habitat Restoration Fund, we ask all parties to send their feedback before the

31<sup>st</sup> of March. We understand that this short timeline may be problematic for some groups and we will endeavour to incorporate responses and concerns received after the proposed target date.

Once the materials are reviewed by all parties, and feedback is received and compiled, a meeting will be organized to discuss and determine how best to collaborate so that all interests are appropriately represented within the Telkwa Caribou Tactical Restoration Plan.

Proposed engagement schedule:

<b>Schedule</b>	<b>Target Date</b>
Expression of interest by groups/individuals	March 31 <sup>st</sup> 2019
Responses and concerns received and compiled	April 12 <sup>th</sup> 2019
Public Meeting	April 30 <sup>th</sup> 2019

This project is supported by the Caribou Habitat Restoration Fund, and administered by the Habitat Conservation Trust Fund.

If you need more information or have any questions about this project, please contact Jean-Yves Landry by email [Jean-Yves.Landry@erm.com](mailto:Jean-Yves.Landry@erm.com) or by phone 250-877-7838.

Yours sincerely,



Wade Brunham  
Partner  
ERM Consultants Canada Ltd.  
[Wade.Brunham@erm.com](mailto:Wade.Brunham@erm.com)  
250-877-8125



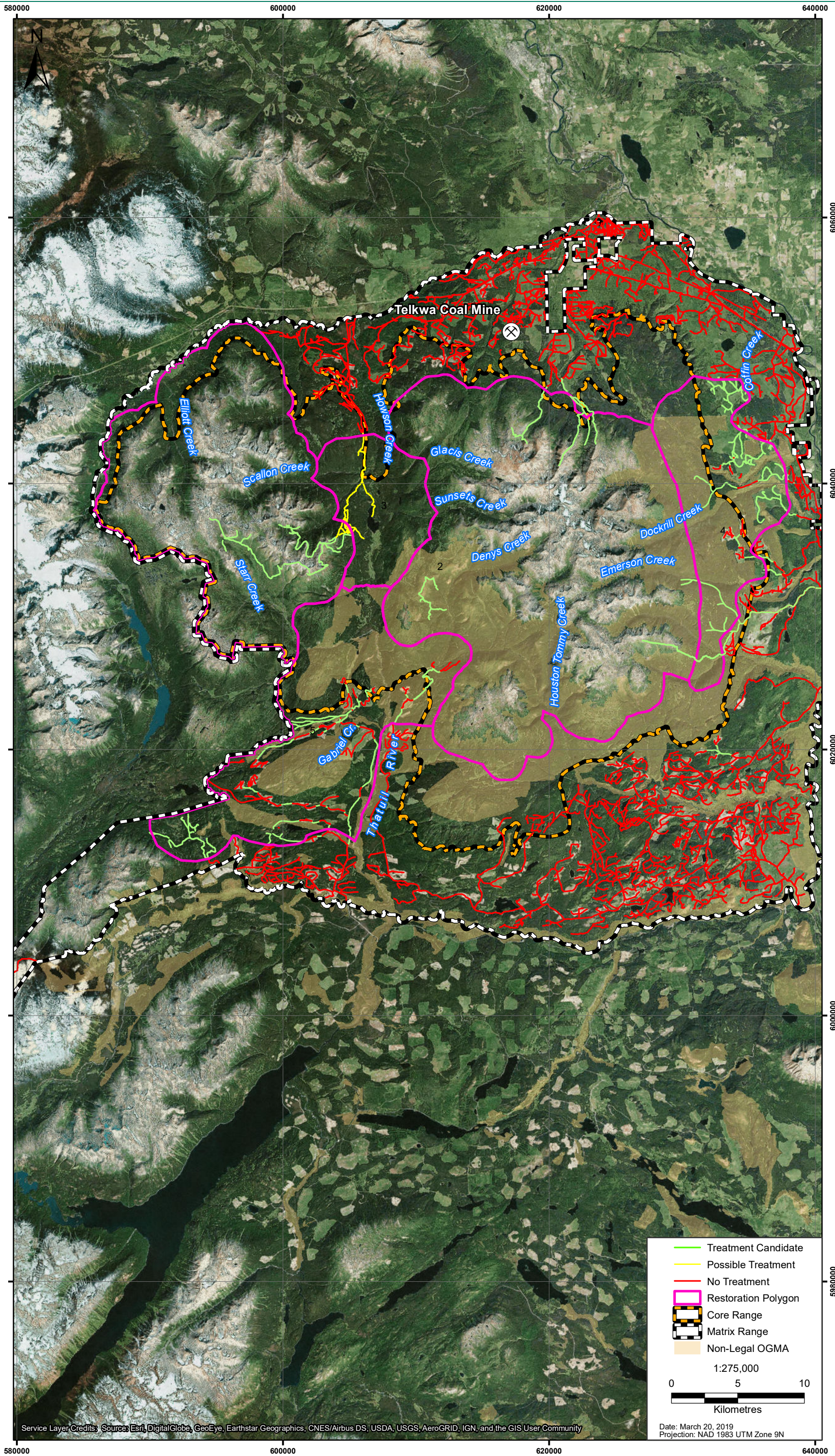


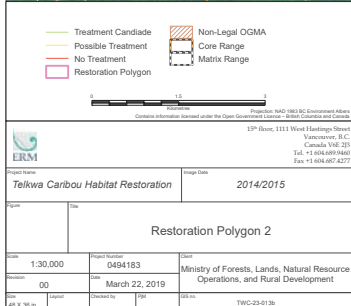
Figure 1: Preliminary Restoration Polygons



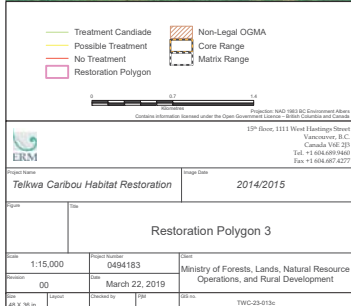


<p>— Treatment Candidate</p> <p>— Possible Treatment</p> <p>— No Treatment</p> <p>— Restoration Polygon</p>		<p>Non-Legal OGMA</p> <p>Core Range</p> <p>Matrix Range</p>	
<p>Scale: 1:25,000</p> <p>Projection: NAD 83 UTM Zone 18N</p> <p>Coordinate Information Derived from the Open Government Canada, British Columbia and Canada</p> <p>ESR Inc., 1111 West Hastings Street, Vancouver, B.C. Canada V6E 2B9 Tel: +1 (604) 681-1440 Fax: +1 (604) 687-4277</p>			
<p><b>Telikwa Caribou Habitat Restoration</b></p>		<p><b>2014/2015</b></p>	
<p><b>Restoration Polygon 1</b></p>			
Scale	1:25,000	Project Number	0494183
Author	00	Date	March 22, 2019
Drawn by	001	Check by	001
File Name	TREC-23-013a		





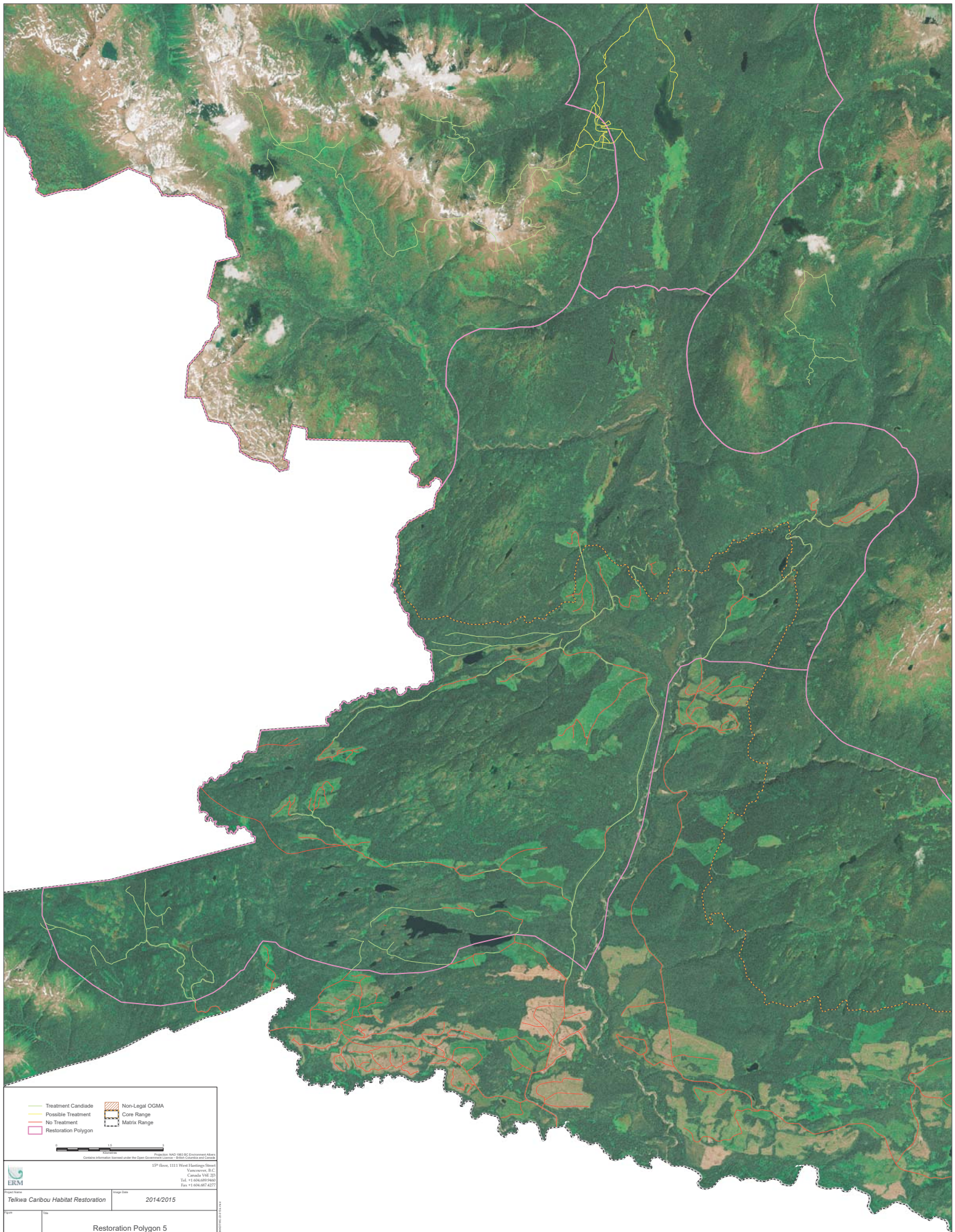












Treatment Candidate

Possible Treatment

No Treatment

Restoration Polygon

Non-Legal OGMA

Core Range

Matrix Range

0 0.5 1.0

Kilometers

ERM

ERM

Environmental Resources Management

Project Name: Telikwa Caribou Habitat Restoration

Project Number: 0494183

Client: Ministry of Forests, Lands, Natural Resource Operations, and Rural Development

Scale: 1:30,000

Date: March 22, 2019

Drawn by: [Name]

Map Date: 2014/2015

Map Title: Restoration Polygon 5

Scale: 1:30,000

Date: March 22, 2019

Drawn by: [Name]

Map Date: 2014/2015

Map Title: Restoration Polygon 5

Map Date: 2014/2015



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