



Kluane First Nation Forest Resources Management Plan

FULL REPORT | MARCH 2022

Kluane First Nation Forest Resources Management Plan

MARCH 2022

**PRESENTED TO
KLUANE FIRST NATION**



**PREPARED BY
FORTITUDE CONSULTING**



**Fortitude
Consulting**

www.fortitudeconsulting.ca

Table of Contents

1. INTRODUCTION

Purpose	1
Vision	3
The People	3
Traditional Knowledge	4
Planning Area	4
Planning Area Description	4
Land and Topography	4
Hydrology	4
Climate.....	5
Permafrost	5
Soils	5
Forests	5

2. FOREST PLANNING PROCESS AND CONTEXT

Plan Preparation	7
Community Engagement	8
Legislative Context and Governance	11
Kluane First Nation Lands and Natural Resources Act	11
Kluane First Nation Community Land Use Plan and Regulations	12
Kluane First Nation Final Agreement	12
Yukon Forest Resources Act	12
Regional Planning Context	13
Yukon Government Forest Resources Management Planning.....	13
Timber Harvest Plans	13
Regional Land Use Planning	14
Kluane National Park and Reserve Management Plan.....	14

3. FOREST PLANNING AREA

Area Identification	15
Data Collection	16
Table 1. FRMP Zones, Woodlots, Volumes, Areas and Descriptions.....	17
Zones	19
Figure 1. Map of Community Harvest Zones. Northwest Planning Area ..	21
Figure 2. Map of Community Harvest Zones. Southeast Planning Area ..	23

4. STRATEGIC DIRECTION ON KEY ISSUES

Focal Wildlife Species	26
Känäy (Moose)	26
Mäy (Sheep)	27
Säl (Gopher)	27
Mäzi (Caribou)	28
Shär Sháv (Grizzly bear).....	29
Nädäy (Lynx)	30
Bison.....	30
Forest Birds	31
Mbet (Trout and other Fish Species)	32
Forest Health	33
Salvage Harvest	34
Fire Management	35
Forest Fire.....	35
Intentional Burning.....	35
Kluane National Park and Reserve Wildfire Risk	35
Climate Change	37
Forest Research	39
Silviculture	41
Forestry Economy	42
Traditional Uses and Economy	43
Woody Biomass	44
Trapping	45
Tourism and Viewscapes	45
Mining	46
Riparian Areas and Wetlands	46
Access	47
Cumulative Effects	48

5. INDICATOR AND MONITORING FRAMEWORK

Measuring Sustainable Forest Management.....	49
Baseline Report.....	50
Table 2: Sustainable Forest Management Criteria and Indicators	51

6. PLAN IMPLEMENTATION AND REVIEW

Roles and Responsibilities	53
The Department of Lands, Heritage and Resources.....	54
The Forest Resources Management Committee	55
The Lands Committee	55
Plan Implementation Priorities	56
Monitoring.....	56
Future Forest Management Planning	56
Adaptive Management	56

7. APPENDICES

Appendix A – References.....	58
Appendix B – Tree Height Data.....	62

8. MAPS

Woodlots for Individuals, Elders and Commercial Firewood Harvest

Figure 3. Map 1 – Community Harvest Zone: Burwash Flats & S-Corner ...	64
Figure 4. Map 2 – Community Harvest Zone: Duke Meadows	65
Figure 5. Map 3 – Community Harvest Zone: Goose Bay	66
Figure 6. Map 4 – Commercial Harvest Zone: Cultus Bay.....	67
Figure 7. Map 5 – Commercial Harvest Zone: Fuelbreak Woodlot + Thorsen Bay.....	68

Sawlogs

Figure 8. Sawlog Potential Harvest: Northwest Kluane Lake	69
Figure 9. Sawlog Potential Harvest: North Shore Kluane Lake	71

ABOVE Data

Figure 10. Forestry Planning Settlement Parcels with ABoVE (Satellite LiDAR) Data.....	73
---	----

A Quick Guide to the KFN FRMP

1	Introduction	This section contains background information on the FRMP and why it was developed. There are descriptions of the people, the land, the water, the climate and forests.
2	Forest Planning Process And Context	This describes relevant laws and plans, it also explains the steps taken to develop the FRMP and the community engagement along the way. Other relevant planning processes are also referenced, like Yukon Government forestry plans and federal plans, and how they relate to the FRMP.
3	Forest Planning Area	This section describes the different areas of focus in the plan and why they were selected for the FRMP. This section is helpful to understand the Community Zone and the Commercial Zone and the woodlots identified. The woodlots were mostly selected for good access to areas with firewood potential. There are also useful overview maps in this section.
4	Strategic Direction On Key Issues	This section is one of the most important. There are descriptions of key issues such as animals, fish, access (trails), traditional use, climate change, research, and the opportunities for a local forestry economy. There is also direction, or guidance, on how to approach managing these issues in the context of forestry. Best practices on how to avoid and minimize negative impacts are included.
5	Indicator And Monitoring Framework	This section contains the five areas of sustainable forest management that are measured over time. Biological Diversity, Ecosystem Health and Productivity, Soil and Water Resources, Socio-Economic Benefits and Community Sustainability (traditional economy/life) are listed. By measuring these indicators, there is a framework to evaluate the impacts of forestry.
6	Plan Implementation And Review	This section lays out the future of the FRMP once it is in place. There is a description of roles and responsibilities and what are the priorities to focus on for implementing the plan.
7	Appendices	Appendix A – References. This contains a list of the different sources of information used. Appendix B – Tree Height Data. This contains a table showing data comparing the tree heights provided by satellite LiDAR compared to measurements taken in the field.
8	Maps	These maps contain more detail than the overview maps in Section 3. The woodlots are displayed in more detail, including where the access is. There are maps for Elders Woodlots, the Individual Woodlots and the Commercial Woodlots. There is also a map of the ABoVE Data.



Foreward

I would like to commend the Forest Resources Management Committee, Kluane First Nation citizens and elders for their dedication to this project. The development of a Forest Resources Management Plan is not a straightforward task. It is a complex initiative and one that requires perseverance and dedication. This Plan represents the interests of KFN to carry out forest harvesting on our settlement land. Development of this plan allows KFN to exercise rights and autonomy over our natural resources through self-government. By identifying timber opportunities we improve access to firewood and to timber for other purposes. The Plan will serve as a tool to support our community in achieving sustainable forest management long into the future. Sustainability and community wellbeing is at the core of our values as a community and integral to all of our land planning and natural resources projects.

Kluane First Nation has proactively developed this plan in an effort to remain consistent with the *Yukon Forest Resources Act*. This will allow for a more efficient and timely planning process for a regional Forest Resource Management Plan. I also wish to thank the Committee for their work in various forestry initiatives that have helped to build capacity within our community to use our forest resources in ways that benefit our people. The sawmill workshops and log cabin building workshops are examples of these. I look forward to the implementation of this Plan and seeing the results well into the future.

Chief Dickson

December 2021

ACKNOWLEDGMENTS

The Kluane First Nation Forest Resources Management Committee wishes to acknowledge the contribution made by KFN Citizens, community members, by the LRH Department, Yukon Government and Canada and all those involved in the development of this Plan. Photography credits for photos used in this report include: Finella Pescott, Adam Humphrey, Alistair Maitland, Kate Ballegooyen, Lance Goodwin.

1



INTRODUCTION

PURPOSE

Strategic forest management planning is a necessary first step towards a balanced and integrated approach to forest management that must be sustainable if different interests and goals are to be accommodated and respected. This plan is intended to provide a clear framework and practical guidance for Kluane First Nation Citizens and employees to protect and integrate ecological, traditional, resource, heritage and other community values.

This forest resources management plan is a response to some serious challenges associated with forest management in the Kluane Region, including:

- Forest fire risk and an increased local awareness of fire risk;
- A wide-ranging spruce bark beetle infestation that represents an extreme ecosystem event with wide-ranging social, economic and environmental significance;
- Decisions related to the most appropriate uses of forest lands;
- The absence of modern systematic regional forest management planning in the Yukon;
- The need for reliable woody biomass feedstock for biomass boilers.



The development of the Kluane First Nation Forest Resources Management Plan (FRMP) is in response to an identified need to carry out more strategic forest management within the planning area and Traditional Territory. Kluane First Nation maintains a long standing relationship with forests and forest resources. The need for forests to provide heat and shelter persists today. Guidance on various aspects of forest management (timing, access and forest health, for example) provide different actors (community members, woodcutters, governance and decision-makers) with the framework to carry out sustainable forest management.

Within the broader context of First Nations' participation in forest management across Canada, this Plan is part of a trend of exercising Indigenous rights and autonomy over natural resources. Government (federal, territorial and provincial) and industry interests have dominated the forest sector causing Indigenous Peoples to be excluded from benefits and decision-making (Lawler and Bullock 2019). The Yukon's Umbrella Final Agreement (UFA) provides for a relatively unique governance landscape within Canada. KFN's unique Final Agreement (modeled on the UFA) provides a framework for the management of forest resources on Settlement Land and and for developing forestry-related legislation. These Agreements allow for the incorporation of First Nation values into forest resources management. The development and implementation of this Plan is also an act of increasing the potential for resource benefits and autonomy, which can contribute to dismantling the paradigm of government and industry-centric forest resource use. Community-led forest management has shown to increase conservation objectives as well as benefits for local users, as seen in Community Forests worldwide.

This plan serves KFN Government, KFN Citizens, and the public by providing clarity on planning for KFN's forests within the 10 Settlement Land parcels identified. All future forest resources use decisions within the KFN Forest Resources Management Plan area must be consistent with the objectives articulated in this plan.



VISION

It is the intent of Kluane First Nation to carry out sustainable forest management that balances the environmental, social, cultural and economic values that forests provide. The Kluane First Nation Forest Resources Management Plan will serve as an instrument of that intent by providing guidance and direction on forest resources management activities in the planning area.

GOALS

The goals of the Forest Resources Management Plan originate from the Kluane First Nation Community Land Use Plan and demonstrate the importance of a sustainable and resilient way of living. The following three goals underpin the intent of this Forest Resources Management Plan:

- Sustain the traditional values and cultural presence of Kluane First Nation;
- Build and support the economic self-sufficiency of Kluane First Nation; and
- Enhance community-based resources within Kluane First Nation.

THE PEOPLE

The *Lhù'ààn Mân'* (Kluane Lake) area is the traditional territory of the *Lù'àn Măn Ku Dăn* (the Kluane Lake People) and has been from time immemorial. The Nation extends northeast from *Lhù'ààn Mân'* to the Nisling and Ruby mountain ranges and southwest from *Lhù'ààn Mân'* to the St Elias Range. The majority of the First Nation

people from this area identify themselves as descendants of Southern Tutchone people and follow a matriarchal moiety system of two clans, *Khanjet* (Crow Clan) or *Āgunda* (Wolf Clan). The predominant language is Southern Tutchone.

The community of Burwash Landing, located between the shore of *Lhù'ààn Mân'* and the Alaska Highway, is where most Kluane First Nation people live in the area and is where the Kluane First Nation Government is based. Burwash Landing was settled at the beginning of the twentieth century when a trading post was established by the Jacquot brothers. Prior to the trading post, the people of the area used the Burwash Landing location as a summer camp as Kluane First Nation people did not traditionally live in year-round settlements. They relocated with the seasons and changes in hunting, fishing and land use for subsistence¹. KFN signed their Final Agreement in 2003 and govern over 900 km² of Settlement Lands. There are 250 citizens across Canada with approximately 100 people living in Burwash Landing.

¹ Adapted from www.kfn.ca/about-kfn and the Community Land Use Plan.

TRADITIONAL KNOWLEDGE

Traditional Knowledge and practice is vital to Kluane First Nation people. Many members of the community use Traditional Knowledge through hunting, trapping and gathering. Traditional Knowledge and cultural values will be incorporated into the Forest Resources Management Plan alongside modern approaches to forest management and planning. Forest resources management that identifies opportunities to complement livelihood opportunities with Traditional Knowledge will be a valuable approach that can serve Kluane First Nation people as well as the forest and boreal ecosystem in the planning area. Traditional Knowledge was gathered through engagement with elders and community members.

PLANNING AREA

Kluane First Nation has a total of 913 square kilometers of land selected through the land claims process. Through this treaty negotiation process, a suite of land parcels were selected for either Category A or Category B Settlement Lands¹. The treaty process culminated in the Kluane First Nation Final Agreement and Kluane First Nation Self-Government Agreement. These Agreements provide for the governance and responsibility of the natural resources of these lands.

From the 97 land parcels that KFN maintains jurisdiction over, the FRMP Committee selected 10 parcels to be included within the FRMP (see Table 1). The selection is based on parcel features such as existing access, site productivity and salvage potential. The selection process was conducted by the Forest Resources Management Committee through site visits, desktop exercises, community engagement and the Phase II Land Use Plan.

¹ Category A Settlement Land refers to the ownership of surface and sub-surface rights. Category B Settlement Lands refers to the ownership of surface rights only.

PLANNING AREA DESCRIPTION

LAND AND TOPOGRAPHY

The planning area lies within the Shakwak Trench, a broad northwest-trending valley separating the high mountains of the Kluane and St. Elias ranges from the rolling terrain of the Ruby Range and Yukon Plateau to the northeast. The land parcels addressed in the plan are located on flat to gently sloping terrain on the west, north and east sides of *Lhù'ààn Mân'*. These parcels range in elevation from 780 to 850 metres above sea level and fall within the Ruby Ranges Boreal Cordillera Ecozone. The landscape within the planning area was glaciated many times during the past 3 million years and forested valley bottoms are commonly underlain by thick glacial sediments.

HYDROLOGY

The planning area falls within the Bering Sea watershed of which *Lhù'ààn Mân'* is a central feature. *Lhù'ààn Mân'* is the largest lake in the Yukon; it is 81 kilometers long and has an average depth of 31 metres. Streams draining the St Elias Mountains are primary sources of water for *Lhù'ààn Mân'*. Until 2016, 'A'ąy Chù' (Slims River), derived from meltwater off the Kaskawulsh Glacier, was the primary source of inflow into *Lhù'ààn Mân'*. Glacier recession in 2016 redirected the primary flow of meltwater to the Alsek River drainage and resulted in a dramatic reduction of flow in 'A'ąy Chù'. A subsequent drop in lake level of *Lhù'ààn Mân'* has been sustained at 1-2 metres below earlier levels. The medium and long term impacts of the drop in water levels are not fully understood. Other tributaries to *Lhù'ààn Mân'* from the front range of the St Elias Mountains have a relatively high average flow from glacial meltwater (YEWG 2004).

CLIMATE

The Yukon climate is classified as subarctic continental. Large fluctuations in temperature occur daily and seasonally (YEWG 2004). The Pacific Ocean has a significant influence on the climate of the Yukon and the planning area is no exception. The Pacific Ocean is approximately 200 kilometers away and provides the majority of moisture to the Yukon. The planning area is heavily influenced by the St Elias Range and contributes to a complex climate. The St Elias-Coastal Mountains form a barrier for much of the precipitation and the Ruby Ranges, for example, are relatively dry as a result. While precipitation is high within the St Elias-Coast Mountains the average annual precipitation, which is mostly snow, decreases rapidly to the north and east of this ecozone to approximately 300mm.

The prevailing wind is southerly in direction and typically blows from the *Á'äy Chù* valley. These winds are generally moderate but can be strong. Wind impacts planning area parcels particularly on the north and east sides of the lake; winds bring both a drier climate and glacial silt deposits to these areas.

PERMAFROST

The planning area is affected by discontinuous permafrost in many low-lying and poorly drained areas. Continuous permafrost prevails on the west side of the lake and on north and east-facing slopes. Permafrost thickness is variable and can be more than 15 metres. Around Burwash Landing, permafrost up to 18 metres in thickness was recorded in the 1980s (YEWG 2004). Field work (Biggs pers. comm. 2020) indicates a direct correlation between the reduced presence of permafrost on minor hills and increased productivity of white spruce. Black spruce is more tolerant of poorly drained soils associated with permafrost and can be an indicator of permafrost.

SOILS

The soils adjacent to *Lhù'ààn Mân'* are typically Eutric Brunisols and Turbic Cryosols. Turbic Cryosols are commonly associated with permafrost terrain and lower productivity forests. A notable feature of the soils in this region are high silt contents derived from windblown silt (loess). Modern loess deposition continues today from the *'A'äy Chù'* delta and has been shown to increase vegetation growth (Laxton *et. al.* 1996). Volcanic ash is also commonly present at or near the top of soil profiles and occurs as a variably thick (1cm to more than 30 cm) bed of white, grey and black pumice. Known as the White River Ash, this tephra deposit is the result of eruptions of Mt. Churchill-Bona ~1,200 years ago and covers a large area of western and central Yukon.

FORESTS

The planning area contains mostly pure stands of white spruce (*Picea glauca*) with an average height of 13.8 meters. Mixed white spruce and trembling aspen are less common. The understory composition of *ts'ú* (white spruce) stands varies depending on site moisture and aspect. Drier sites contain *nièghru* (soapberry) and grass, for example. Labrador tea, mossberry and shrub birch are associated with moister sites. Trembling aspen is present in mixed *ts'ú* (white spruce) forest. Pure stands of aspen can be found on south facing slopes on the east side of *Lhù'ààn Mân'*. North of the lake black spruce occurs where drainage is poor. Pockets of birch can be found at various sites in the planning area. Balsam poplar is found close to waterbodies and dry, gravel stream beds. The range of white spruce in sub-alpine areas is generally limited to a treeline extent of 1,400 m (Danby 2003).

The planning area has been subject to two major natural disturbances: a fire close to Burwash Landing in 1999 and a spruce bark beetle outbreak largely on the east side of *Lhù'ààn Mân'* that peaked around 2004. The outbreak has resulted in up to 90% mortality in some stands. The spruce bark beetle naturally occurs within the boreal forest, however, the most recent outbreak is unprecedented in terms of extent and severity. Field observations suggest that recently felled live ('green') trees are susceptible to localized spruce bark beetle infestations.

The regeneration of white spruce in areas affected by natural disturbances is uncertain. A regeneration delay in Yukon boreal forests of 20 years or more is not uncommon and the *Jèdàlì Tl'äw Káy* (Duke Meadows) north of Burwash Landing is an example of this. While the beetle infestation has impacted overall stand height and age class, Campbell *et. al.* (2019) observed a higher than expected resilience in beetle-affected spruce in the planning area. This was shown in the increased growth of surviving trees and by the abundance of spruce saplings in the heavily beetle-affected areas.

However, ecological monitoring within Kluane National Park and Reserve indicate that snowshoe hare browse of spruce saplings in some areas has resulted in up to 30% mortality (Wong 2017). There is indication that regeneration of white spruce is not occurring at high enough levels to achieve the past basal area (Wong 2017).

The Porsild spruce (*Picea glauca var. porsildii*) is scattered within the planning area and pre-dates the common white spruce as it was present in Beringia. The Porsild spruce is similar in appearance to the common

white spruce except for a number of minor differences, particularly bark texture, colour and the presence of resin blisters. It is worth mentioning that Savidge (2014) observed no evidence of the Porsild spruce to be affected by insect mortality in the Kluane area. It has been speculated that the more resinous Porsild spruce is better adapted to respond to spruce bark beetle attacks and was therefore resistant to the most recent epidemic (Savidge 2014).

There is evidence of culturally modified trees within KFN traditional territory. In particular, *adze* cut stumps that pre-date contact with European settlers can be found in the area. An *adze* is a stone axe used to fell trees. Other examples of traditional and cultural forest management practices include intentional burning to improve game habitat.

2

FOREST PLANNING PROCESS AND CONTEXT

PLAN PREPARATION

The impetus to develop the Forest Resources Management Plans was in response to an identified lack of planning in the area that was leading to conflict. Accessible, local firewood supply appeared to be dwindling. The need to determine a sustainable firewood supply for the medium and long term was identified. From the outset, a major information gap was identified. The default forest vegetation inventory for the Yukon was based from aerial imagery acquired around 1983. Not only was this key information outdated but it did not include two major natural disturbances: the fire of 1999 around Burwash Landing and the spruce bark beetle outbreak (c. 2004). Efforts to update the inventory data set brought in new information from Yukon Government, a BC consulting firm and the NASA ABoVE program. Preliminary field work was carried out during the 2018 field season and more focused field-based information gathering took place in June and July 2019. Work in developing the plan was overseen by the Department of Lands, Heritage, and Resources (LRH). Forest management consultant Finella Pescott of Fortitude Consulting conducted field work, drafted the FRMP and related documents, participated in the Forest Resource Management Committee, coordinated capacity building workshops (sawmilling and log cabin building) and supported community engagement. A Forest Resources Management Committee was established to provide guidance on the development and review of the plan. Members were appointed by Chief and Council:

- Kate Ballegooyen, Natural Resources Manager, LRH Dept. (2018-2021)
- Rachael Thom, A/Natural Resources Manager, LRH Dept. (2019-2020)
- Adam Humphrey, Lands Planner, LRH Dept. (2018-2020)
- Joe Bruneau, DKRRC Member (2018-2021)
- Sian Williams, DKRRC Member (2018-2020)
- Heather Johnson (2018-2019)
- Jared Dulac (2019-2021)
- Rob Bouvier (2020-2021).

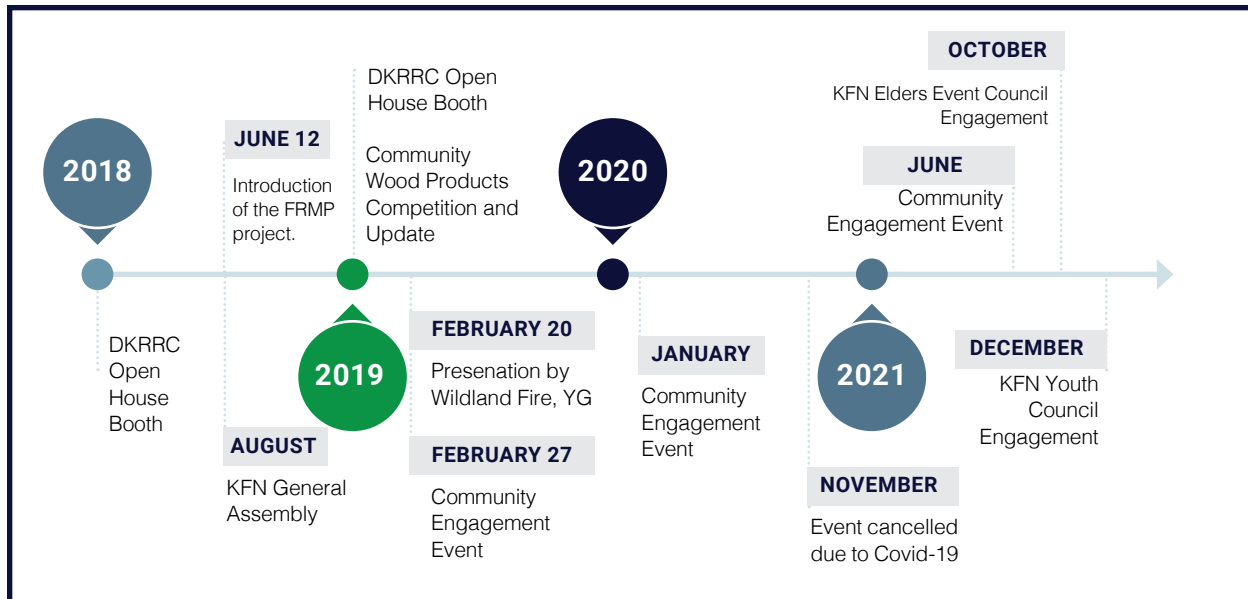
Membership also overlaps with the Dan Keyi Renewable Resources Council (DKRRC). A number of agencies and experts provided inputs into the development of the plan; these include:

- **Yukon Government**
 - » Forest Management Branch which provided extensive support with timber cruising, silviculture advice and field work.
 - » Wildland Fire Management provided advice and support for fire risk planning in the area, including two community engagement sessions held in Burwash Landing.
 - » Dept. of Environment (Haines Junction office)

- **Parks Canada** – Provided ecological monitoring data related to forest management;
- **Natural Resources Canada**
 - » Canadian Forest Service – Provided a review of climate change content and mainstreaming climate change considerations;
 - » CERRC Program, Natural Resources Canada – provided generous funding to support the development of the FRMP and related activities, such as training opportunities in the community.
- **Kluane Lake Research Station** – Alice Kenney provided an academic review of wildlife research content.
- **US NASA ABoVE program** – Provided ICESat2 dataset that was used to obtain up-to-date average canopy tree heights and topography. The University of Calgary provided technical assistance in deriving data in a useable format for planning purposes.

COMMUNITY ENGAGEMENT

A number of events took place that afforded an opportunity to present to KFN citizens on updates and status of plan development as well as targeted engagement events. These were valuable in obtaining input from the community. Feedback was provided on forest values and traditional uses including trapping and non-timber forest products along with identification of productive forest area, areas with greatest fire risk and other values. A summary of these events is listed as follows:

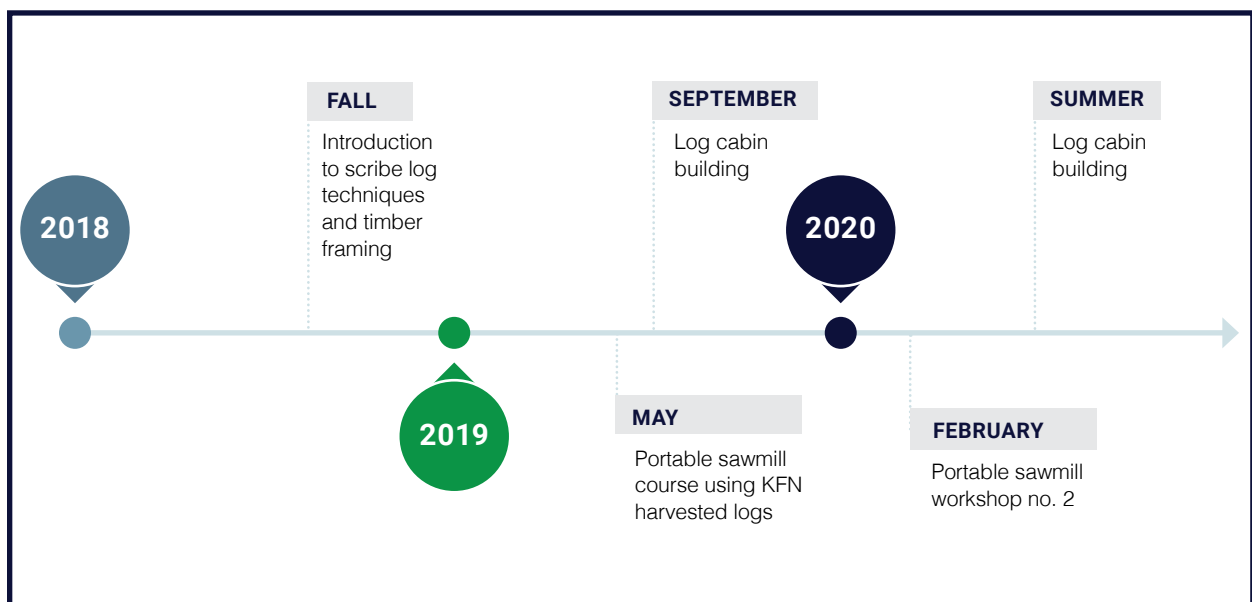


- June 2018 – Community engagement event. Introduction of the FRMP project; targeted discussion in focus groups, particularly on areas to harvest and where not to harvest. Community members discussed a range of topics: forestry training, woodlot planning, firewood, traplines, biomass, Känäy (Moose) habitat, willows, regeneration and sustainability and Säl (Gopher) habitat.
- 2018 – DKRRC Open House booth
- August 2018 – KFN General Assembly. Presentation and community discussion about planning and forestry issues.
- February 2019 – Presentation by Yukon Government Wildland Fire at a Community event followed by discussion of wildfire risk, planning and management options.
- February 2019 – Community engagement event. Presentation followed by participants taking part in discussions in small focus groups including a mapping exercise. Interviews took place at the event and participants answered a series of targeted questions related to the FRMP.
- 2019 – DKRRC Open House booth
- 2019 – Community Wood Products Competition and update
- January 2020 – Community engagement event – presentation of the draft plan;
- November 2020 – A community engagement event to review the plan was cancelled due to the Covid-19 pandemic.
- June 2021 – KFN Community engagement event that includes review of the draft FRMP, maps and its key elements and a review of the new forestry draft permit.
- October 2021 – KFN Elders Council engagement.
- December 2021 – KFN Youth Council engagement.

Regular updates were provided to the DKRRC, to the Lands Committee and the Elders Council.

A number of workshops to build capacity for using local forest resources for construction took place concurrently to the development of the FRMP. The workshops targeted the younger generation of KFN citizens to expose them to the skills and techniques to build cabins in different styles and to mill rough lumber using portable sawmills. The workshops complimented and built on the existing skills of cabin building in the community using local, sustainable materials. They also served to foster independence and resilience in construction as well as highlighting the potential for economic and employment opportunities. The following workshops took place:

- Fall 2018 – Introduction to scribe log techniques and timber framing (2 days at KFN Harvest Camp)
- May 2019 – Portable sawmilling using KFN harvested logs (one week at Burwash Landing)
- September 2019 – Log cabin building (two weeks at the Nànaajê' camp)
- February 2020 – Portable sawmill workshop no. 2 (one week at Burwash Landing)
- Summer 2020 – Log cabin building (one month at the Nànaajê' camp)



LEGISLATIVE AND GOVERNANCE CONTEXT

The KFN Lands, Resources and Heritage (LRH) Department works towards developing ‘a healthy and sustainable community rooted in ... traditions and culture’³. This mandate is carried out through the implementation of the Lands and Natural Resources Act and Regulations, the KFN Final Agreement and other land use plans and policies. KFN has a number of laws, policies and plans to support management of lands and resources, these are available online or upon request to the LRH Department:

- *Lands and Natural Resources Act, 2012-01*
- *Tenure Regulation, 2012-01*
- *Land Management Policy, 2013-03*
- *Traditional Knowledge Policy, 2012 (draft)*
- *Phase 1 Community Land Use Plan, 2012-07*
- *Community Land Use Regulation, 2012-07*
- *Phase 2 Land Use Plan, 2016*

Below is an overview of key aspects of selected documents.

KLUANE FIRST NATION LANDS AND NATURAL RESOURCES ACT

The *KFN Lands and Natural Resources Act* and *Tenure Regulation* provides the legal framework for managing KFN land, including the types of leases, licenses and permits that can be issued. These Guiding Principles are of particular relevance to the Forest Resources Management Plan:

- (b) *The ecological and environmental integrity of our Settlement Land and Resources will be protected for our future generations.*
- (e) *The KFN will give preference to applications made by Citizens for use or occupation of Settlement Land or the use or possession of Resources over other applications made by persons who are not Citizens.*

KLUANE FIRST NATION COMMUNITY LAND USE PLAN AND REGULATIONS

The Phase 2 Land Use Plan (2012) was developed to direct and guide decision making on different types of development on KFN settlement land. The Plan received its mandate from the KFN Lands and Natural Resources Act (S.16) and further direction from the Regulations. There are three phases of land use planning for KFN Settlement Lands. Phase 1 encompasses planning on Settlement Lands closer to the community and Phase 2 to the remaining area. Phase 3 is intended to cover the joint regional planning process.

Consistency between both the FRMP and the Phase 2 Land Use Plan is important. If any discrepancy should arise between the two plans, the FRMP is subordinate to the Land Use Plan and the CLUP. The CLUP includes some zones where forest harvesting is an allowable activity, including the 'Natural Open Space' Zone with a 30% Development Limit.

There are synergies with the Energy Infrastructure component of the Community Land Use Plan and Energy Plan and the development of the Forest Resources Management Plan with regards to future supply of fuelwood (feedstock) to the biomass boilers.

KLUANE FIRST NATION FINAL AGREEMENT

The Kluane First Nation Final Agreement was completed in 2003 and is the result of land claims negotiations between KFN, the Canadian Government and the Yukon Territorial Government. The Umbrella Final Agreement served as a framework for Yukon First Nations and Governments in their negotiations to conclude Yukon First Nation Final Agreements. The KFN Final Agreement contains a number of directives that have relevance for the FRMP, which are referred to throughout this plan. In particular, 17.5.2 states that:

A Yukon First Nation may prepare, approve and implement plans for Forest Resources Management on its Settlement Land.

YUKON FOREST RESOURCES ACT

The *Yukon Forest Resources Act* (FRA) came into effect in 2011 and was the first successor legislation developed in the Yukon post-devolution (the transfer of a host of government responsibilities from the Federal to the Territorial Government). The FRA is modern legislation that directs a broad range of forest management activities including the development of Forest Resources Management Plans (on traditional territory), forest tenure (mostly permits for commercial and non-commercial timber harvest), forest health, the development of forest roads and how offences are dealt with. It should be noted that Yukon Final Agreements prevail over the FRA (S.4).

REGIONAL PLANNING CONTEXT

There are a number of formal planning initiatives in the region that have relevance to this plan. It is the intent of this plan to be consistent with existing and future plans as much as is feasible.

YUKON GOVERNMENT FOREST RESOURCES MANAGEMENT PLANNING

Yukon Government follows a forest management regime under the *Forest Resources Act* (FRA) and the Umbrella Final Agreement (Chapter 17). The FRA provides a legislative framework for the development of forest resources management plans on Traditional Territories and for lower level plans (such as Timber Harvest Plans for commercial harvesting). There are currently four approved Forest Resources Management Plans (FRMPs) across the Yukon. In the absence of a FRMP for the whole KFN Traditional Territory, KFN's LRH Department saw an opportunity and need to develop a FRMP on selected KFN settlement land with the intent that this Plan may be incorporated into a broader FRMP when that occasion presents itself. Efforts to remain consistent with the Yukon Forest Resources Act have been made to allow for a more efficient and timely planning process of a future regional FRMP. The Champagne and Aishihik Strategic Forest Management Plan and Integrated Landscape Plan (2005) covers the Traditional Territory of Champagne and Aishihik First Nations (CAFN). Yukon Government and CAFN jointly developed the FRMP and follow an Implementation Agreement that assigns roles and responsibilities for implementation of the Plan. The CAFN FRMP benefits from an updated forest inventory and classification (c. 2013) followed by a Timber Supply Analysis and Annual Allowable Cut determination⁴. These up-to-date, comprehensive planning tools may benefit KFN particularly if the opportunity arises to use the forest inventory dataset. Forest health monitoring is also a high priority for the CAFN FRMP and of benefit to KFN.

TIMBER HARVEST PLANS

There is currently one Timber Harvest Plan within the planning area: the Kluane Lake East Timber Harvest Plan (2013) which covers an area of 127 ha (FMB 2013). For other areas within KFN Traditional Territory that have forestry potential, KFN has the option to develop Timber Harvest Plans. Opportunities may exist to coordinate new Timber Harvest Plans adjacent to forestry parcels within this Plan. This could benefit KFN and the wider community, particularly where access development is concerned.

⁴ At the time of printing in March 2022, the updated vegetation inventory for the Champagne Aishihik Traditional Territory was completed in 2013, the Timber Supply Analysis was completed in 2019 and the Annual Allowable Cut is yet to be determined.

REGIONAL LAND USE PLANNING

Regional land use plans are designed to identify which land uses may or may not occur in a given area in order to provide clarity for land users and land managers. Under Chapter 11 of the Final Agreements, the Land Use Planning Council was established to support the Yukon Government and Yukon First Nations in developing regional land use plans, including the establishment of regional planning commissions. There are three Regional Land Use Plans in the Yukon at different stages of completion. At present, there is no formal indication that a Regional Land Use Plan will be developed in the near future for the Kluane Region.

KLUANE NATIONAL PARK AND RESERVE

Kluane National Park and Reserve (KNPR), lying to the south and west of *Lhù'ààn Mân'* is an important part of the forest ecosystem. Key management factors within the Park that concern the FRMP planning area are the extent of the spruce beetle outbreak, altered fuel complexes and the associated risk of fire.

Prior to becoming a Game Sanctuary (and later a National Park) in 1943, the Park was an important area for traditional activities for Kluane First Nation. The establishment of the Game Sanctuary, along with other federal policies, resulted in displacement of KFN people (and Champagne and Aishihik First Nations) for 50 years. The result was a loss of traditional use and connection to the area within the Park boundary. This period of history and the absence of traditional use may have contributed to the current poor health of forests in KNPR.

Today, the Park is cooperatively managed by Parks Canada, Kluane First Nation and Champagne and Aishihik First Nations. The Kluane National Park and Reserve Management Plan (2010)⁵ guides the work of the Kluane Park Management Board, of which the two First Nations and Parks Canada are members.

An ongoing ecological monitoring program within the Park includes a forest ecosystem health and productivity component which contributes to the knowledge base for decision making for the KFN FRMP. There are 50 ecological permanent sample plots within the Park (20 are within KFN Traditional Territory) which are periodically monitored (approximately every five years) for ecological markers such as the abundance and dynamics of coarse woody debris (CWD) and tree growth and regeneration.

5 An updated KNPR Management Plan is forthcoming as of writing in March 2022.



3

FOREST PLANNING AREA

AREA IDENTIFICATION

The planning area is comprised of 10 KFN settlement parcels (shown on Figure 10) that were selected by the Forest Management Committee based on the following criteria:

- Identification of forestry potential in the Phase II Land Use Plan;
- Known forest resources and productive sites;
- Proximity to Burwash Landing and existing and potential access;
- Community direction and input.

Because the existing forest inventory information did not include major natural disturbances such as the spruce beetle outbreak, timber cruising was undertaken in the summer of 2019 to define potential woodlot boundaries and collect relevant forestry data. The 2019 cruise data was supplemented by data collected by the YG Forest Management Branch in December 2018 and by NASA's Arctic Boreal Vulnerability Experiment (ABOVE) Field Campaign. These data were used to further refine forest areas within the settlement parcels. Ultimately, sixteen individual woodlots were identified for zoning based on their inventoried forest resources. Woodlot locations and attributes are described in Table 1 on page 17.

DATA COLLECTION

NASA launched the Ice, Cloud and land Elevation Satellites (ICESat-1 and 2) in 2003 and 2018 which enabled elevation measurements using LiDAR technology. For the purposes of this Forest Resources Management Plan, the ICESat-2 data acquired for canopy heights was interpreted by the Arctic Institute of North America (AINA), University of Calgary in order to corroborate ('groundtruth') the tree heights gathered during the 2019 field season through timber cruising. Tree height is an important indicator of site productivity and can direct planners to where to target harvesting. A comparison of the tree height data from ICESat-2 and the field data can be found in Table 3 in Appendix B. A map of the planning area with two ICESat-2 identified productive parcels (R13A and R2B) can be found in Figure 10 at the end of the document.

These polygons have an average tree height of 13.8 meters. From these polygons, a small number were short-listed as candidate woodlots largely based on volume and access. Some woodlots are made up of a number of polygons combined. Table 1, on the next page, lists these polygons and woodlots and includes the volume for each one, the area and a short description, such as access.



TABLE 1. FRMP ZONES, WOODLOTS, VOLUMES, AREAS AND DESCRIPTIONS

	PARCEL	POLYGON	ZONE	WOODLOT TYPE	NAME	M ³ /HA	AREA/HA	NOTES
1	R-47A	K17	Community Harvest	Individual	Burwash Flats	150	22.8	<ul style="list-style-type: none"> • These planning polygons have the highest concentrations of dead standing trees. • These fuelwood planning polygons have existing all season access (gravel roads, skid trails, and landings). • They have some level of active or historic firewood cutting and gathering. • Are in close proximity to Burwash Landing
2	R-47A	K18	Community Harvest	Individual	Burwash Flats	150	6.8	
3	R-47A	K19	Community Harvest	Individual	Burwash Flats	150	6.2	
4	R-47A	K20	Community Harvest	Individual	Burwash Flats	150	1	
5	R-47A	K21	Community Harvest	Individual	Burwash Flats	150	6.8	
6	R-47A	K48	Community Harvest	Elders	S Corner	190	7.6	Excellent access available from the old Alaska Hwy.
7	R-47A	K49	Community Harvest	Elders	S Corner	190	1.4	Excellent access available from the old Alaska Hwy.
8	R-47A	K25	Community Harvest	Individual	The Duke	150	6.1	Reasonable access behind Duke meadows.
9	R-47A	K26	Community Harvest	Individual	The Duke	150	9.1	Reasonable access behind Duke meadows.
10	R46A	K42	Community Harvest	Individual	The Duke	150	1	Access may be from the Duke or a back trail from Burwash.
11	R29B	K27	Community Harvest	Individual	Goose Bay	350	32	High volumes with reasonable highway access.
12	R29B	K28	Community Harvest	Individual	Goose Bay	350	18.9	High volumes with reasonable highway access.
13	R3A	K33	Commercial	Firewood	Thorsen Bay	175	115	Access may be from the Cultus Bay road or the lake.
14	R3A	K29	Commercial	Firewood	Cultus Bay	300	9	Good access from the Cultus Bay Rd. Very high volumes of standing dead. Mechanical harvest safest and most efficient.
15	R3A	K30	Commercial	Firewood	Cultus Bay	300	8.5	Good access from the Cultus Bay Rd. Very high volumes of standing dead. Mechanical harvest safest and most efficient.
16	R3A	K31	Commercial	Firewood	Cultus Bay	300	7	Good access from the Cultus Bay Rd. Very high volumes of standing dead. Mechanical harvest safest and most efficient.

THIS PAGE IS INTENTIONALLY LEFT BLANK

ZONES

The planning area is divided into two zones, each with different types of harvesting and objectives. Refer to Figures 1 and 2 for an overview of which areas are allocated to which zone. Figures 3-7 at the end of the document show the woodlots within these zones in more detail. As with all forested landscapes, forest cover is dynamic over time. Changes to the state of the forest due to events such as wildfire will impact forest management planning. Flexibility is necessary in directing where harvest should take place as needed based on natural disturbance events, climate change and shifts in land management priorities. Opportunities for plan review are described in more detail in Section 6 'Plan Implementation and Review'.

ZONE 1) COMMUNITY HARVEST

- **Elders Woodlot**

Criteria: Easiest highway access, close proximity to Burwash.

Description: Treatment involves harvesting and stacking into lengths and piled, ready for hauling.

- **Individual Woodlots**

Criteria: Easy highway access, close proximity to Burwash.

Description: Focus is on firewood harvest. At the request from individuals, or families, these areas can be assigned or lottery drawn, as determined by LRH. Individuals are responsible for maintaining their woodlots. Sawlog harvest is available at request from LRH based on sawlog data.

ZONE 2) COMMERCIAL HARVEST

- **Firewood Woodlots**

Criteria: Areas selected for commercial scale firewood harvest, including areas where mechanical salvage of beetle kill is appropriate (*ie.* heavy equipment).

- **Sawlog Woodlots**

Criteria: These are areas identified for premium sawlog potential and include larger diameter trees for cabin logs.

- **Fuelbreak Woodlots**

Criteria: These are areas that can be harvested to serve as a fuelbreak to assist in protecting community assets (*ie.* Burwash Landing, camps or cabins).

**THIS PAGE IS
INTENTIONALLY LEFT
BLANK**

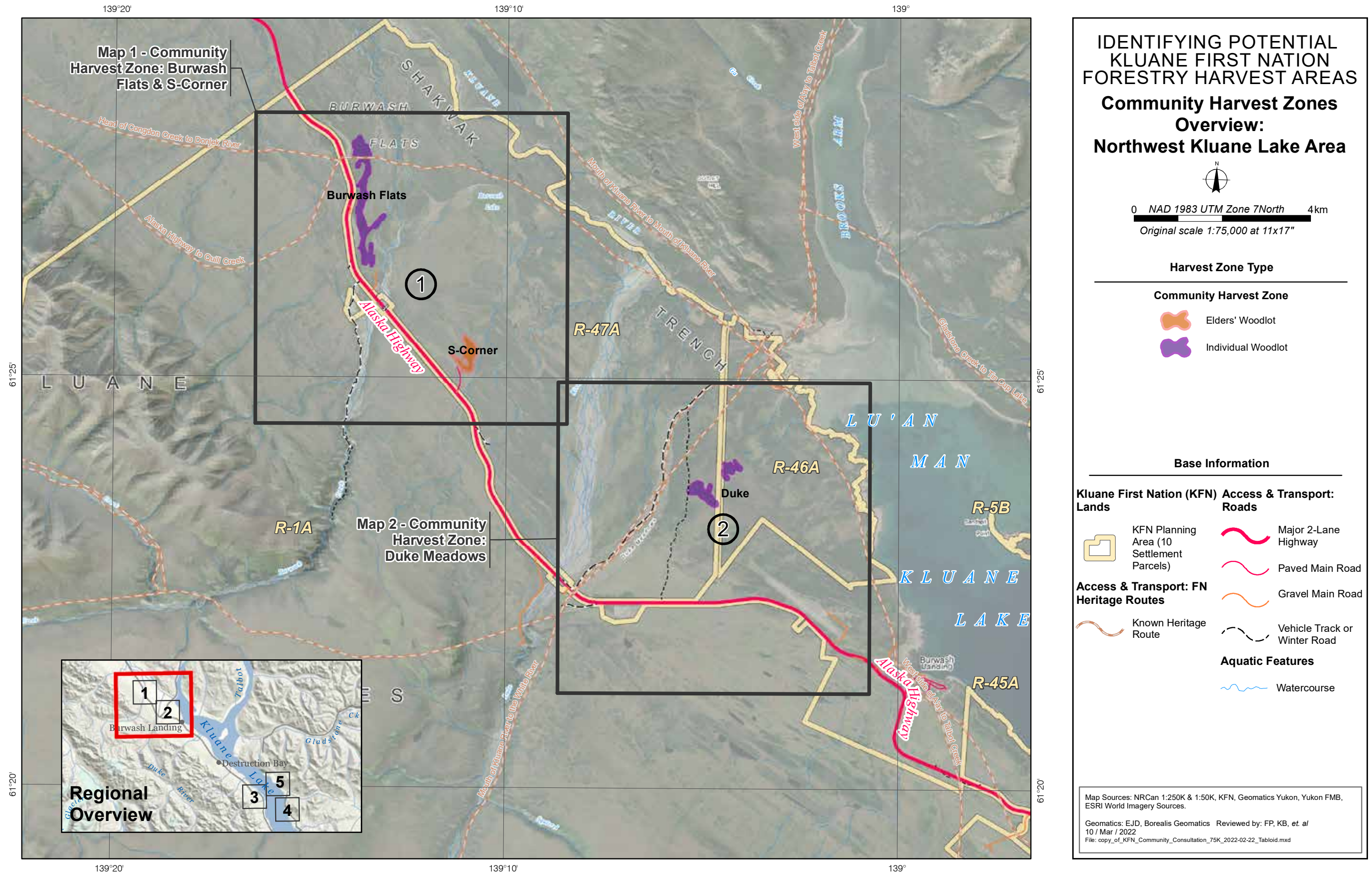


FIGURE 1. MAP OF COMMUNITY HARVEST ZONES OVERVIEW: NORTHWEST KLUANE LAKE AREA

THIS PAGE IS INTENTIONALLY LEFT BLANK

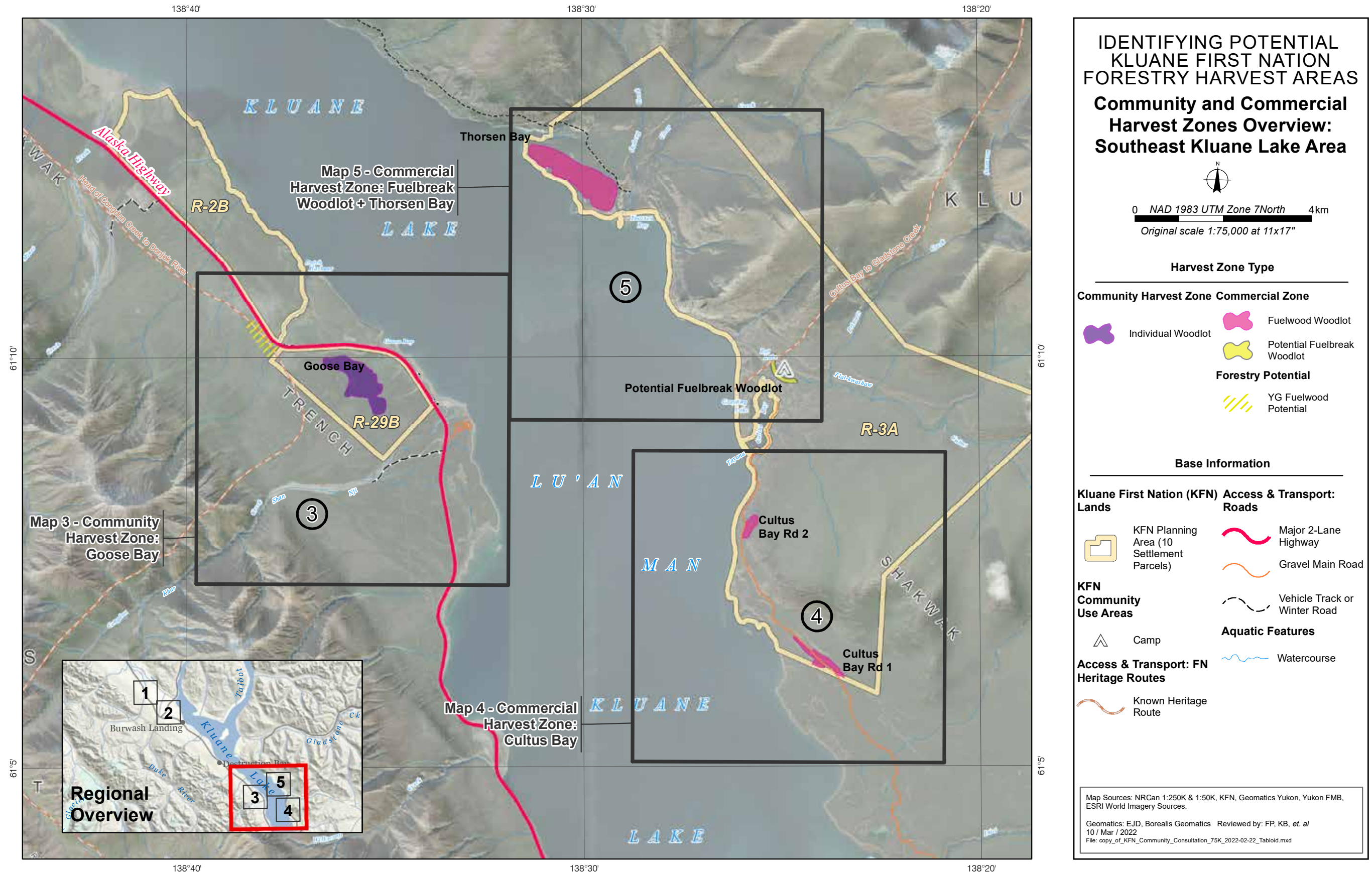


FIGURE 2. MAP OF COMMUNITY AND COMMERCIAL HARVEST ZONES: SOUTHEAST KLUANE LAKE AREA

THIS PAGE IS INTENTIONALLY LEFT BLANK



4

STRATEGIC DIRECTION ON KEY ISSUES

The following section focuses on key issues identified during plan development. A summary of key issues is provided followed by Strategic Directions that give guidance and direction on timber harvest planning. Most key issues focus on particular wildlife species of concern or values of interest to Kluane First Nation.

Kluane First Nation Land Use Plan:

"Preservation of healthy fish and wildlife populations was a fundamental consideration in KFN's approach to land claim negotiations. It was reflected in specific land selections as well as many of the terms, conditions, and structures that were subsequently put in place. ...

Kluane First Nation works to improve wildlife populations in decline, particularly, kånäy (moose), mäzi (caribou), and mäy (sheep). Sustaining healthy wildlife populations involves the protection of key habitat, protection from over-harvesting, and continued population monitoring."

FOCAL WILDLIFE SPECIES

KÄNÄY (MOOSE)

Känäy use a diversity of habitat types and take advantage of openings and forest cover (particularly in winter) and riparian areas, such as wetlands. More so than most other animals, *känäy* take advantage of younger forests⁶ and browse on the higher abundance of willow that occurs in new openings following disturbance. *Känäy* is an important animal for local subsistence hunting.

Strategic Direction

- Consider calving and winter range areas when managing for timber harvesting to maintain function of these key habitats. Known calving and winter habitats should be identified and mapped to assist with planning.
- Support a diversity of *känäy* habitat across the landscape and manage for multiple age classes, including young seral stages.
- Consider new road development and the construction of temporary or permanent roads and trails within the context of potential hunting pressure.

FROM THE KFN COMMUNITY LAND USE PLAN

Duke *känäy* (moose) numbers have been on the decline in recent years, and management strategies to conserve populations in this area are highly important for KFN Citizens, who hunt *känäy* in *Shär Ndü Chù* (Duke River) area. The *Shär Ndü Chù* *känäy* population is considered a concern since the population is well below historic levels.

6 Also known as 'early successional' forests.

MÄY (DALL SHEEP)

Mäy winter range is a critical habitat within KFN Traditional Territory. Winter habitat for *mäy* generally consists of snow-free, wind-swept, and south-facing slopes.

Mäy are present in areas adjacent to three parcels within the planning area. *Mäy* habitat is typically at higher elevations than where forest harvesting takes place and therefore harvesting is unlikely to have a negative impact on the local *mäy* population. *Mäy* are sensitive to the higher decibels of some aircraft.

Strategic Direction

- Consideration should be given to transient *mäy* on or adjacent to the Cultus Bay road when accessing forestry operations in the area.
- In general, proponents of new developments should avoid sensitive *mäy* habitats and key areas, particularly within critical winter range habitat as well as lambing and rutting habitats and mineral lick locations.
- Yukon Government has recommended a 1 kilometre no-disturbance buffer during critical seasonal periods and habitats for *mäy*.



Photo Credit: Bernard Spragg

SÄL (GOPHER OR ARCTIC GROUND SQUIRREL)

Säl hunting is a traditional pursuit of cultural importance for Kluane First Nation. A decline in the *säl* population has been observed in the *Jèdàlj Tl'äw Käy* (Duke Meadows) area along with a decline in one of gophers' food source, sage (*Artemis spp.*). This is consistent with a general decline in *säl* populations across Yukon. Ground squirrels have declined to zero within the Kluane boreal forest in areas where they were once common (Werner and Krebs 2015). They exist now in the alpine, where they are abundant, and along highways, airstrips, and in areas inhabited by people. This reduction of *säl* population has been attributed to avian and coyote predation, rather than food shortage or fires (Werner *et. al.* 2015; Werner *et. al.* 2016).

Säl typically occur in the arctic and in alpine habitat. The Kluane region is a key area where *säl* occupy meadows and open areas within the

boreal forest (Wheeler and Hik 2012). The *säl* population is heavily influenced by the snowshoe hare cycle. Gophers' selection of burrows also impact their survival; burrows in open areas where predators are visible enhances the likelihood of survival (Karels and Boonstra 1999). The shrubification of *Jèdàlj Tl'äw Käy* (Duke Meadows) may impact the distribution of gophers. More research to better understand *säl* decline and the relationship with the adjacent forested area is warranted.



Strategic Direction

- Forest management and planning should incorporate the maintenance and enhancement of *Säl* (gopher) habitat where possible.
- Explore ways to fill the knowledge gaps in the decline in grassland habitat for gophers as it relates to timber harvesting and the role of fire.

CASE STUDY: JÈDÀ LJ TL'ÄW / DUKE MEADOWS

Jèdàlj Tl'äw (Duke Meadows) is an area north of Burwash Landing that has and continues to be used for a number of traditional activities, including gopher hunting. A decline in gophers at the site has been observed for approximately two decades. What used to be open grasslands are now dominated by willow and other vegetation. Gophers went locally extinct (extirpated) at Duke Meadows, as recorded in 2006. A reintroduction was trialed in 2008 and 2009 (Krebs, C. 2009) and 2013 (Werner *et. al.* 2015) with limited success.

MÄZI (CARIBOU)

Mäzi (Northern Mountain Woodland Caribou) were listed in 2002 as a Species of Special Concern under the Species at Risk Act (2002). A Management Plan for the Northern Mountain Population of Woodland Caribou (*Rangifer tarandus*) in Canada was developed by Environment Canada in 2012. It identified the current level of predation as high and suggested that natural habitat loss will increase over the next five years. Impacts are expected on the relatively small population of *mäzi* in KFN's Traditional Territory.

Two herds of *mäzi* are present within KFN Traditional Territory. The Kluane herd, at approximately 350 animals, is one of the smallest herds in the Yukon. The Kluane herd migrates between *Shär Ndü*

Chù (Duke River) and Mile 1120 of the Alaska Highway in the fall and spring. The Chisana herd is also small and occupies habitat in the northwest part of KFN's Traditional Territory.

Current management strategies for this herd include protecting known mineral licks, restricting proposed land use activities within sensitive seasonal activity periods (calving, wintering and rutting), and ensuring significant portions of *māzi* habitat remains protected from development. KFN has also asked its citizens not to harvest *māzi*.

Strategic Direction

- In 2019, Kluane *māzi* habitat is most at threat near the proposed Nickel Creek Platinum project west of R-49B, in addition to within R-1A and R-49B. Any proposed wood harvesting requires consideration of possible impacts to *māzi* from proposed land use activities. Human activities like snowmobiles and aircraft may be a major disturbance to *māzi* populations.

SHĀR SHĀW (GRIZZLY BEAR)

Shār shāw is known as an indicator or 'keystone' species. As an apex predator it has a significant influence on other species and its ecosystem. The Kluane Region is host to approximately 200 individual grizzly bears (Drukis 2017). The species can be considered iconic for the region and draws visitors to view *shār shāw* in their natural environment. However, bear mortality is high with the increase in human-bear conflicts. The local *shār shāw* population may be increasingly vulnerable as a result of climate change. Observed later snowfall and changes in food source abundance and distribution are likely to result in negative impacts. The development of new roads and trails can provide greater access for hunting pressure of grizzly bears.

Strategic Direction

- Determine an appropriate buffer for all bear dens, both inactive and active, when planning forestry activities.
- Avoid habitat fragmentation for *shār shāw* and consider the negative impacts of hunting pressure when planning new forest harvesting areas. Increasing awareness of known bear migration corridors, such as Congdon Creek and Dutch Harbour, can assist in maintaining habitat connectivity.

NÀDÄY (LYNX)

Nàdäy populations are closely tied to that of snowshoe hares and have developed specialised hunting skills for preying on hares (Krebs *et. al.* 2001). Snowshoe hares have a 10 year population cycle and *nàdäy* abundance closely follows this cycle. *Nàdäy* have the ability to hunt in more habitats and in areas with higher snow cover because of their low foot load ratio compared to coyotes, their main competitor (Murray *et. al.* 1994).

Nàdäy make use of both mature and younger white spruce forest. Snowshoe hares populate the sites approximately 10-15 years after forest harvesting.

Strategic Direction

- Plan areas for harvest that incorporate maintaining habitat for snowshoe hares.

BISON

Wood bison were reintroduced into the area in the late 1980s following extermination ~350 years earlier. Wood Bison have become an alternative game source as the herd expands into KFN Traditional Territory. Wood bison require forested areas with access to open areas for grazing.

Strategic Direction

- Consider new road development and the construction of temporary or permanent roads and trails within the context of potential hunting opportunities. Align the management of access in the area with hunting priorities.

FOREST BIRDS

The boreal forest in the Kluane area is host to a number of bird species that rely on the forest for nesting, foraging and other habitat requirements, both seasonally and year-round. Birds, like mammal species, have habitat preferences such as differently aged forests and particular forest structure. For example, the Northern Goshawk (*Accipiter gentilis*) breeds in older forests whereas the Boreal Owl (*Aegolius funereus*) will nest in older stands of mixed forests but can also nest in younger forests.

Kluane hosts six species of grouse. Historically, spruce grouse have been associated with mature forest. Females will also select areas that are regenerating from forest harvesting (Dunham 2016). Sharp-tailed grouse are listed as a Vulnerable Species in Yukon (YG 2015). There are pockets of sharp-tailed grouse habitat in the *Shār Nuh Chù'* (Duke River) area and close to Burwash Landing. Habitat is typically open 'parkland' habitats; grasslands, subalpine meadows and open muskeg (YG 2015). The lekking period for grouse is April to early-May and the nesting period follows until approximately mid-June (S. Taylor pers. comm.). Forest harvesting is not active during this period.

There are limited pockets of wetlands within the planning area. Geese, ducks and swans use wetlands in the Shakwak trench for nesting and migrating birds make use of the wetlands while travelling to breeding grounds (YEWG 2004).

Strategic Direction:

- Maintain a mosaic of forest age classes to accommodate varying needs of birds that depend on the Kluane boreal forest.
- Plan for a range in cut blocks sizes and shapes to accommodate birds that are edge specialists and those that prefer interior forests.
- Develop minimum buffers for raptor nests and for any identified sharp-tailed grouse within a harvest area.
- Observe any known requirements for breeding and nesting times, especially for migratory birds, this may include the retention of dead trees for birds that nest in cavities.



Photo Credit: Greg Schechter

MBET (TROUT AND OTHER FISH SPECIES)

Fish play an important role in the planning area. *Lhù'ààn Mân'* (Kluane Lake) contains *mbet* (lake trout), *thè* (chum salmon), Arctic grayling, pike and whitefish. *Mbet*, in particular, is an important food source for local people. Historically, a commercial *mbet* fishery was operational. *Thè* and whitefish were harvested as dog food when dog teams were more prevalent. Today, *Lhù'ààn Mân'* is frequently visited for subsistence and recreational fishing with some local fish guiding also taking place.

A fish habitat of particular importance is *Lhù'ààn Tǎgà'* (Kluane River) where the *thè* (chum salmon) spawn and support a range of mammals and birds that feast on the chum. Areas identified for groundwater discharge on the shore of *Lhù'ààn Mân'* also provide spawning habitat.

Any negative impacts from forestry are typically from harvesting or road building too close to a fish bearing water body (stream, river or lake). Soil disturbance too close to a fish bearing water body can raise the temperature of the water and de-oxygenate it.

Strategic Direction:

- Ensure riparian buffers are observed in all areas within proximity to *Lhù'ààn Mân'* (Kluane Lake), *Lhù'ààn Tǎgà'* (Kluane River), the *Shǎr Nuh Chù'* (Duke River) and any fish bearing streams. Buffers are listed in the terms and conditions of the Forest Resources Permits.
- Restrict any crossing of a fish-bearing stream. Forest harvesting and road construction must not impact water quality in fish bearing water bodies.



Photo Credit: Yukon Government

FOREST HEALTH

The health of forest resources is critical to their function so that they may optimally provide environmental, economic and social values and services. There are a range of factors that can negatively impact forest health, namely pests and diseases but also drought, wildfire damage, animal browsing, and increasingly, climate change. Understanding these forest health factors is an important component of sustainable forest management.

The Yukon Government has a Forest Health Monitoring Strategy across all of the Yukon. The Strategy monitors forest health concerns and evaluates if management responses are needed. There are five forest health zones in the Yukon and the planning area falls within Zone 2. This zone was surveyed in 2010/2011, in 2016 and 2019. A beetle trapping program around Haines Junction in 2021 indicated a decline in the presence of the spruce bark beetle. The adjacent Kluane National Park is surveyed at least biannually in collaboration with the Canadian Forest Service for forest health.

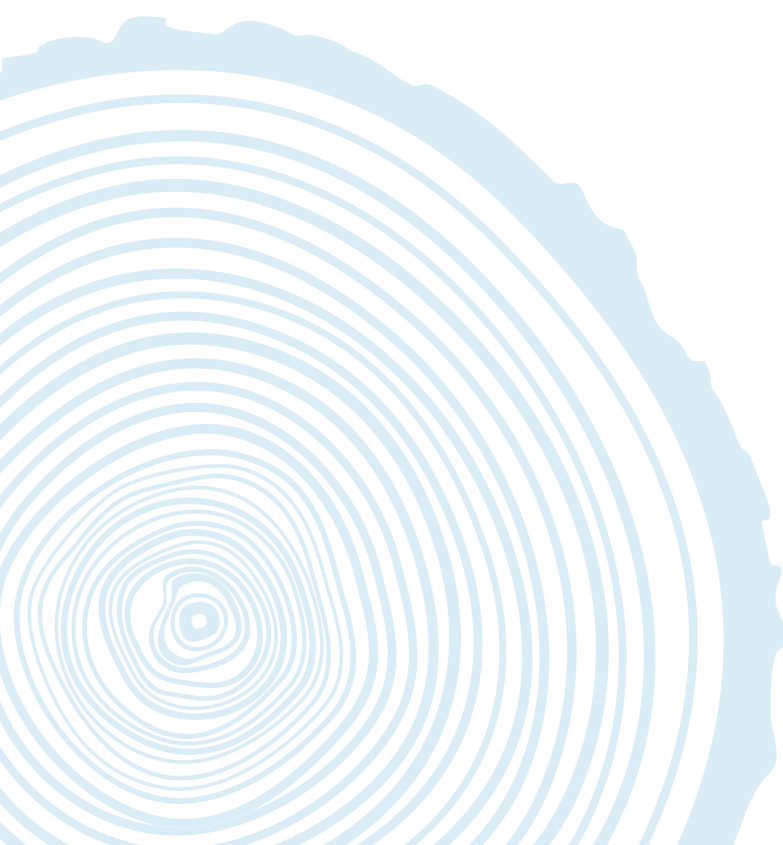
In 2009, 10 primary forest health concerns were identified by the Forest Management Branch. Those in bold most affect or could potentially affect the planning area:

- 1. Spruce bark beetle;**
2. Northern spruce engraver;
3. Western balsam bark beetle;
4. Budworms;
5. Larch sawfly;
- 6. Large aspen tortrix;**
7. Aspen serpentine leafminer;
8. Pine needle cast;
9. Mountain pine beetle;
- 10. Tree dieback (aspen).**

In the event of a pest or disease threat on KFN settlement land, the KFN Final Agreement states that both the KFN Government and Yukon Government will take action to address the problem that they may agree on (17.7.3). The KFN Final Agreement also makes reference to the consultation requirements for the application of pesticides and herbicides.

Strategic Direction:

- Monitor any forest health concerns and report to LHR and the Forest Management Branch (YG);
- Collaborate with partners where possible on ecological monitoring in the local area.



SALVAGE HARVEST

Salvage harvest typically involves timber harvesting that targets dead trees killed by natural disturbance. Two natural disturbances have affected forests in the planning area. A fire that burned in proximity to Burwash Landing in 1999 covered an area of 3,098 ha. A spruce bark beetle outbreak, largely on the east side of *Lhù'ààn Mân'* (Kluane Lake), is part of a regional outbreak that covers an area of 220,000 ha. Parcels adjacent to *Thè Chù'* (Gladstone Creek) and *Tayāna* (Cultus Bay) are particularly affected with up to 80% spruce tree mortality as a result of the infestation. Much of the affected stands contain timber for firewood, and to a lesser extent for sawlogs and cabin logs. The 'shelf life' for standing dead spruce as firewood in Yukon's dry climate is approximately 15 years depending on various environmental factors. The spruce bark beetle outbreak peaked around 2004 and the opportunity to harvest the timber is decreasing as trees are succumbing to rot and blowdown. This is particularly the case in the Cultus and Gladstone parcels. An increased fire risk is associated with extensive tree mortality and is a key consideration when planning for salvage harvest. Targeting the beetle-killed stands for timber harvesting provides an opportunity to use the resource prior to natural decay while simultaneously reducing fire risk. Salvage harvest can also refer to the harvest of trees cut incidentally to serve another primary activity.



Strategic Direction

- Plan for salvage harvesting when environmentally, socially and economically appropriate.
- Identify areas most vulnerable to windthrow for salvage opportunities, particularly when located near values at risk. Spruce beetle-killed trees have become highly susceptible to windthrow in some areas, resulting in a safety hazard and increased fire risk once the trees are downed.
- Before planning new areas for harvest, identify areas for incidentally cut trees (such as agriculture, mining, new infrastructure and residential development).
- Collaborate with relevant agencies responsible for controlled burning on salvage opportunities.
- Ensure minimum coarse woody debris (volume and types) is retained to support nutrient cycling and habitat function, including the retention of large, dead trees for nesting.

FIRE MANAGEMENT

FOREST FIRE

Fires play a key role in boreal forest ecosystems and forest regeneration. Fires that replace entire forest stands are common in the boreal forest, however, forest fire intervals and cycles are highly variable within the planning area. The St Elias Mountains contribute to a rain and lightning shadow in the planning area. Reduced lightning frequency may contribute to longer intervals between fires. Within the Shakwak Trench, some locations have escaped fire for a considerable period whereas others have burned often. These locations can be characterised by aspect; forests on steep, northern and eastern slopes have longer fire intervals and grow to a more mature age. Conversely, southern and western slopes experience a higher fire frequency (Francis 1996). This heterogeneity in fires means that the fire cycle and frequency are more difficult to characterize in general terms and figures (Francis 1996).

A fire adjacent to the community of Burwash Landing occurred in 1999, burning an area of 3,098 hectares. A major fire has not burned in the Shakwak Trench since 1929 (Francis 1996). The fire return interval for the Shakwak Trench is approximately 300 years.

INTENTIONAL BURNING

There are various sources of evidence that point to the practice of intentional burning by ancestors of Kluane First Nation. It is understood that this was primarily done to improve habitat for certain game species in order to enhance hunting opportunities. There is Traditional Knowledge among elders of these burning practices.

KLUANE NATIONAL PARK AND RESERVE WILDFIRE RISK

Policies of wildfire suppression and the banning of traditional activities upon establishment of the Game Sanctuary have likely contributed to a deficit of wildfire on the landscape in Kluane NPR. Based on historic fire activity it is expected that 100-550 hectares should have burned per year, however, only 380 hectares has burned within the last 50 years (KNP Ecological Monitoring Program). Approximately 44% of mature spruce trees within attacked spruce leading stands were killed by spruce bark beetle in the most recent epidemic. The lack of fire on the landscape (and lack of associated mosaic of age classes) likely contributed to the favourable conditions for which the spruce bark beetle flourished in.

At the time of writing, Parks Canada is drafting a Wildfire Management Plan for Kluane NPR which will provide strategic direction on fire management activities within the park.

Strategic Direction:

- Incorporate the maintenance of a mosaic of forest age classes at a landscape level in forest and fire management practices. In recognition of the important role of fire in the boreal ecosystem, allow fires to occur naturally where possible.
- Recognize the integral relationship between forest and fire management and pursue opportunities to incorporate mutual planning when feasible. Prioritise areas for timber and firewood harvest where fire risk is highest for communities and property.
- Review opportunities to implement controlled burns in order to reduce fire risk where compatible with social values and community priorities.
- Implement fuel reduction treatments as identified, such as the Potential Fuelbreak Woodlot at the Cultus Bay Camp.⁷
- Collaborate with other agencies (such as Yukon Government, Parks Canada and other Yukon First Nations) in improving fire management practices and preparedness that benefit people and the environment.

⁷ The Fuelbreak Woodlot at Cultus Bay (Fig. 7) is proposed to reduce the risk of fire to the camp. There has not been field verification of the boundary of this woodlot. Similar Fuelbreak Woodlots may be proposed in the future.



CLIMATE CHANGE

Climate change is one of the most significant contemporary issues facing Indigenous and northern communities across Canada. The effects of climate change are amplified in arctic and sub-arctic regions and climate change impacts are already being experienced in *Lù'àn Mǎn Keyi* (Burwash Landing). For the period 1951-1980, the annual average temperature rose 1.2°C and under a high emissions scenario, is projected to rise to 2.3°C for the period 2070-2100 (www.climatedata.ca).

Climate change is a complex topic and its influence on forests is only partially understood. The most significant and well-understood impacts include increased average temperatures, changes in precipitation (both rainfall and snowfall), more extreme weather events such as drought and floods, an increase in forest fire frequency and intensity, and an increase in pest and disease outbreaks. While some effects of climate change are considered advantageous for productivity, such as faster tree growth due to a higher volume of carbon dioxide in the atmosphere and wetter summers, the overall effects are anticipated to be negative. That is, while tree growth is expected to be faster, this benefit is expected to be outweighed by the negative influences of climate change. The changing climate will result in changes to forest regeneration, productivity, and resilience to pests and diseases.

Several climate change impacts have already been experienced by forest in the planning area. The spruce bark beetle outbreak is largely attributed to climate change as beetle larvae are not winter-killed to the degree they were historically under colder temperatures. Forest health is also impacted by warmer and drier conditions. Trembling aspen dieback and aspen serpentine leafminer are present in the planning area and may increase as warm and dry conditions persist (2019 EMR Forest Health Report).



Warmer temperatures and increased snow cover will also affect permafrost. Disturbing or removing vegetation can reduce shading of the ground and increase snow accumulation, both of which make permafrost more susceptible to thaw and degradation. Thawing permafrost results in the release of methane (as well as carbon dioxide), which is a more persistent and harmful greenhouse gas than carbon dioxide. Processes such as thawing permafrost, intense forest fires, and pest outbreaks can be significant contributors to climate change. This is known as a positive feedback loop.

The dynamics of forest carbon involve complex release, transfer and sequestration processes. The net balance of these carbon dynamics determines whether a forest is a 'sink' or a 'source' of carbon. Forests are best known for their role in sequestering carbon and producing oxygen. During photosynthesis, trees take carbon dioxide from the atmosphere, convert the carbon to sugars and then store the carbon in wood. Under this scenario, most forests are classified as a carbon 'sink'. Increasingly, however, forests are becoming a source of carbon. Natural disturbances such as more frequent fires and spruce beetle outbreaks that release more carbon dioxide than the forest is able to absorb, for example, become a 'source' of carbon. A resilient forest landscape will include a variety of forest ages and tree species to help mitigate this issue. Mature forests are more susceptible to being a source of forest carbon.

Strategic Direction:

- Minimize activities in areas with underlain by permafrost. Consider limiting forest harvesting and road building in areas underlain by permafrost and terrain (such as northern slopes) to winter only.
- Avoid developing ruts in ATV trails that can contribute to permafrost thaw and ground subsidence.
- Support climate change research as it relates to forest management, including to better understand the impacts of dust deposits.
- Investigate prescribed burning methods for addressing the accumulation of fuel loads. More intense fires that can occur through higher fuel loads can result in higher release of carbon dioxide and can negatively impact the carbon sequestration potential of regenerating forests.
- Maintain a mosaic of forest ages across the landscape to build resilience to natural disturbances and to promote carbon sequestration.

FOREST RESEARCH

The role of forest research in the sustainable management of boreal forests is significant. There remains much to be learned about topics such as forest stand dynamics, tree responses to drought and climate change, habitat requirements for flora biota, and forest resilience to disturbances (natural and human-caused). Forest management can only be as effective as the information available to managers at a given time. Both traditional and science-based research offer different ways of knowing that support better and informed decision making about forest management.

Forest research in and adjacent to the planning area includes:

- The Canadian Forest Service (CFS) has worked on a long term data set, originating in the 1980s that looks at the natural disturbance history of spruce trees and how they respond. The CFS has a number of permanent sample plots (PSPs) in the planning area that are remeasured periodically, mostly to look at trends in growth and yield.
- Parks Canada carries out ecological monitoring in Kluane National Park. The monitoring framework has five indicators for the forest ecosystem (*kānāy* (moose) forest breeding birds, area burned, forest structure and forest composition) from 50 permanent sample plots.
- There are a number of universities that participate in long term research in the area including the Arctic Institute of North America's Kluane Lake Research Station (est. 1961). The station has carried out relevant research in the areas of geology, biology, botany, zoology, hydrology, climatology, physiology, and archaeology.
- The Kluane Ecological Monitoring Program (KEMP), led by University of British Columbia professor and ecologist Charley Krebs, began in 1973 and monitors a range of health indicators and trends in the boreal ecosystem.

Strategic Direction:

- Continue to identify research priorities that are mutually beneficial to the local and scientific communities.
- Review opportunities to build the capacity of KFN citizens in conducting forest-related research.
- Collaborate with partners, agencies and other governments on forest research opportunities.
- Draw on existing literature when possible that is relevant to local forest resources management planning.

**KEY RECOMMENDATIONS that followed the
KLUANE LAKE RESEARCH SUMMIT in May 2018:**

- Engage in cross-cultural learning;
- Develop an introductory course (*i.e.* KFN 101) for researchers;
- Increase communication and opportunities for interaction between researchers and community members;
- Researchers can benefit from more time spent with community members;
- Work towards making existing knowledge, data, information more accessible to the community;
- Work on mutually beneficial research projects;
- Kluane First Nation should develop policies and guidelines for research with traditional knowledge; and
- Research should continue to include traditional knowledge.



SILVICULTURE

Silviculture refers to the activities associated with the preparation, growth and quality of forests. Most silviculture activities relate to the regeneration of forests and include:

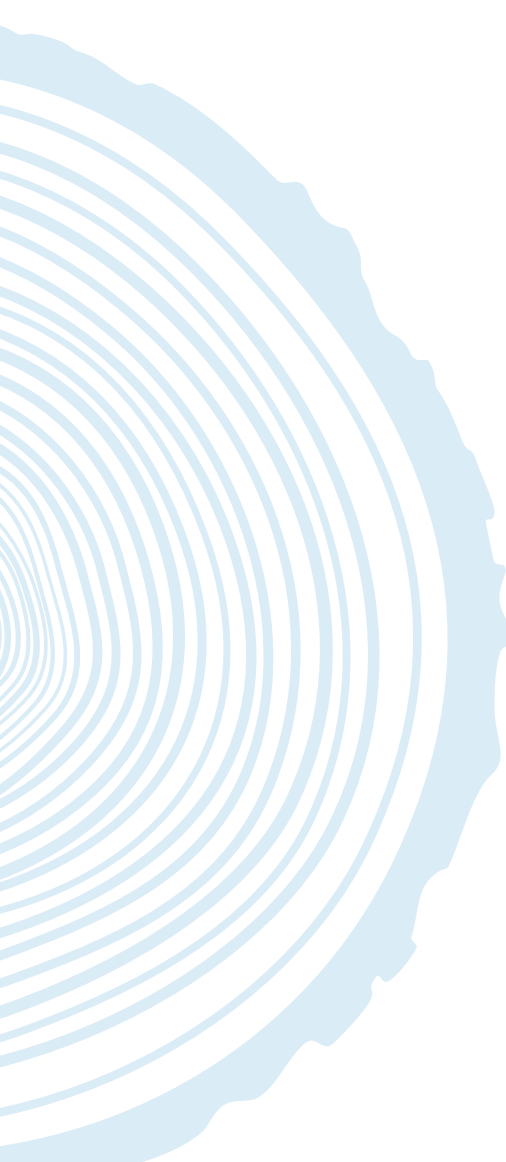
- Site preparation to optimize regeneration success;
- Reforestation through natural regeneration or tree planting.
- Carrying out surveys to assess appropriate stocking (density of trees in a given area and composition). If a stand of trees post-harvest is understocked then infill planting can take place;
- Cone or seed collection for future planting if required.

Silviculture treatments can be designed to serve a number of objectives such as enhancing animal habitat or forest health. It can also be used to reduce the risk of wildfire. For example, plantings of aspen and birch in the place of white spruce close to Yukon communities reduces the fire risk as deciduous trees are less flammable than coniferous ones.

In the KFN Final Agreement, there is a Special Provision that the Yukon Government must make efforts to contract KFN citizens in silviculture-related contracts within KFN Traditional Territory.

Strategic Direction

- Identify silviculture priorities for the planning area, in particular, for monitoring stocking rates in harvested areas and for regeneration methods post-harvest.
- Review opportunities for building capacity of KFN citizens to carry out silviculture.
- Consider the sensitivity of regenerating white spruce in beetle outbreak-affected stands. Seedlings, saplings in beetle-affected forest are particularly vulnerable to disturbance, such as damage from forest harvesting (falling, skidding, burn piles and machine damage).



FORESTRY ECONOMY

BUILDING A SUSTAINABLE LOCAL FOREST SECTOR

The opportunities that local forest resources can provide to the local community are invaluable. The forest within the planning area can provide logs for community use in cabin logs and in local housing construction. The use of logs from well-managed forests contributes to the resilience and independence of the community, particularly when the use of local logs displaces the reliance of imported wood products. Expanding the existing skill-sets of KFN citizens to harvest and process trees supports this objective.

Beyond meeting the needs of the community for wood products, there is opportunity for participating in broader markets. There is a local demand for rough cut lumber. Value-added and well-marketed niche products also have potential in broader markets.

Forest management can also be a source of local employment. For example, planning out areas to be harvested, carrying out silviculture and monitoring forest health can all contribute to employment. The requirement for Yukon Government to include KFN in forestry contracts could further support the growth of a local forest sector:

KFN Final Agreement

17.14.2.3 Government shall include Kluane First Nation in any invitational tender for contracts associated with Forest Resources Management within the Traditional Territory of Kluane First Nation.

Strategic Direction

- Continue to explore opportunities to strengthen and build skills that support a dynamic and community-focused forestry economy (such as forest harvesting, log building, small-scale sawmilling).
- Review opportunities for value-added and niche product development.
- Continue ongoing assessment of KFN community needs and the potential within the forest economy to meet those needs.



TRADITIONAL USES AND ECONOMY

KFN culture and community well-being are linked to the sustained health of the traditional economy. KFN citizens spend a great deal of time on the land participating in subsistence activities such as hunting, fishing, and plant harvesting. For KFN *A Shāw* (Elders) and other members, wood harvesting can be an important means of offsetting the high costs of heat and fuel. Many of KFN's land selections were prioritized due to their importance as traditional hunting, fishing, and gathering sites and they continue to be used for subsistence purposes by KFN citizens.

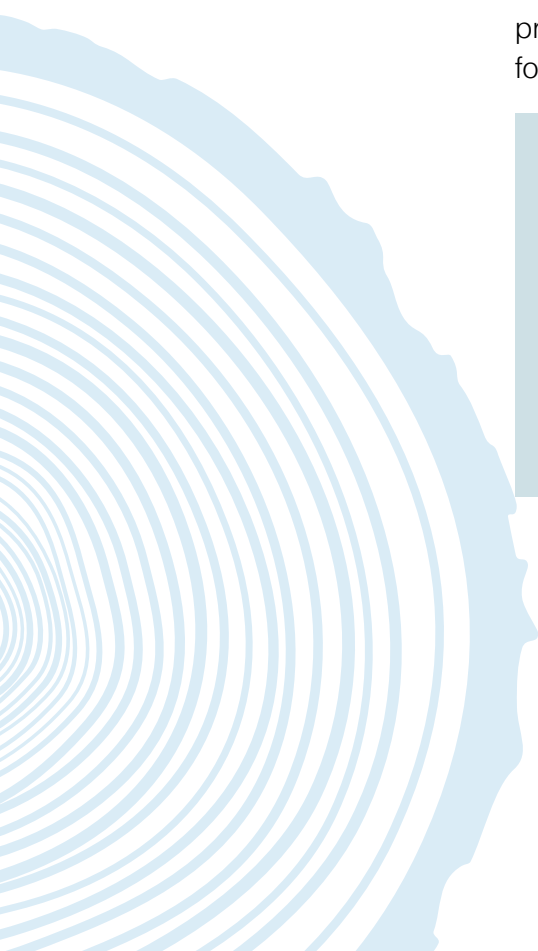
Commercial trapping is also an important aspect of the traditional economy. There are several Registered Trapping Concessions within KFN Traditional Territory that are held by KFN citizens and groups. Trapping remains a supplementary economic activity.

KFN must remain aware of possible land use conflicts between traditional economic activities and industrial and personal harvesting land uses, as well as those between traditional economic activities and wildlife conservation initiatives not led by KFN.

The traditional use of forests and forest resources comprises a number of other activities and values. Non-timber forest products are a source of food, shelter and income, for example. The planning area contains berries, mushrooms, bark, spruce pitch among other non-timber forest products. Forests also provide significant cultural and spiritual values for KFN citizens.

Strategic Direction

- Continue to identify and map areas of importance for non-timber forest products for the purposes of planning and maintaining these resources.
- Consider the potential contribution of the non-timber forest product market to local income opportunities.

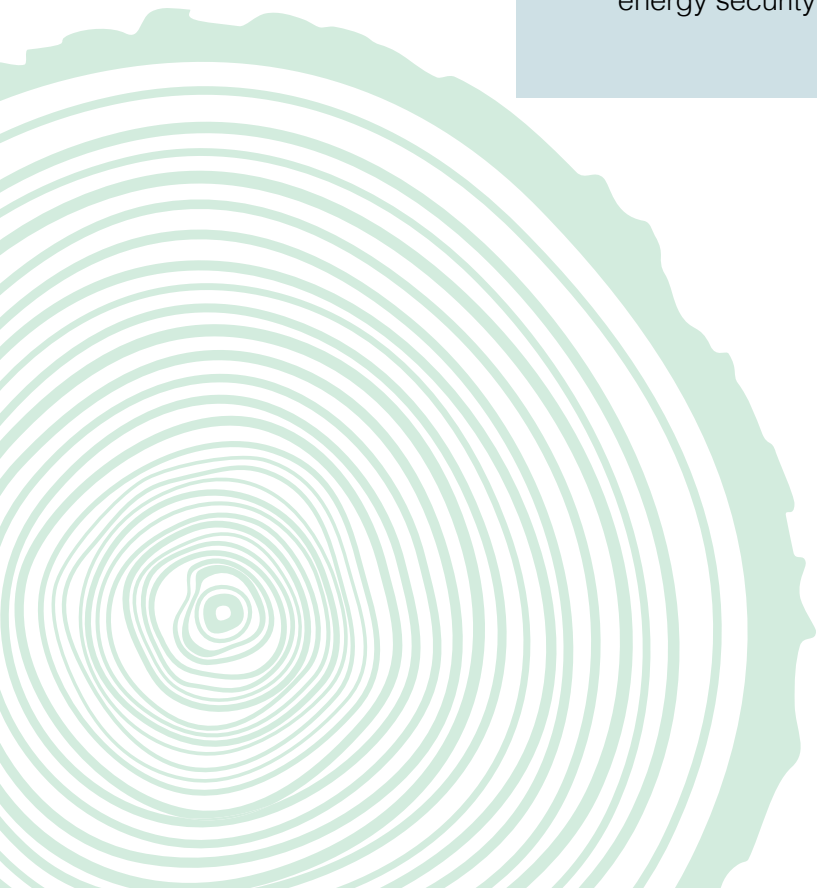


WOODY BIOMASS

Kluane First Nation has experience using advanced wood technology (biomass for heat) that spans two decades. This is more experience than any other Yukon community. Following the fire of 1999 and the resulting supply increase of feedstock, a chip boiler was installed in 2000. The boiler was fed by wood chips that KFN produced. The boiler operated until 2017 and was replaced with a cordwood boiler the same year. Aligned with priorities for the sustainable use of energy that reduces diesel consumption, and to support local employment opportunities, Kluane First Nation is continuing to explore the use of woody biomass to meet community heating needs. A recent study evaluating renewable energy heating options makes a number of recommendations on moving forward with an efficient biomass (chip) boiler district heating system (CBER 2021).

Strategic Direction

- Prioritize areas for harvest that incorporate feedstock for biomass boilers, including smaller diameter logs. Large diameter logs can be targeted for local sawlog use.
- Continue to develop a community forest sector that builds on existing capacity and employment opportunities and energy security.



TRAPPING

There are 7 active traplines within the planning area. Forestry activities may impact the trapping of fur bearing mammals in different ways. Marten, for example, benefit from the different structural habitats created post-disturbance. To minimize any negative impacts that forestry operations may have on trapping, particularly during the winter trapping season, communication between trappers and harvesters is encouraged. Identification of planned trapline routes will serve to minimize conflicts with trapping and forestry activities.

Strategic Direction

- Clear and early communication with active trappers will promote awareness of the timing and spatial needs of both trapping and forestry activities.

TOURISM AND VIEWSCAPES

There are locations in and adjacent to the planning area that serve as popular recreation and tourism destination sites. These sites are accessed and viewed from the Alaska Highway, Cultus Bay Rd and *Lhù'ààn Mân'* (Kluane Lake). Soldier Summit and Thachäl Däl are popular hiking trails within Kluane National Park that offers scenic views across *Lhù'ààn Mân'*.

Viewscapes refer to the visual quality of a landscape and are important from both a recreation and tourism perspective. Views are a value to be considered when planning for timber harvesting, including their contribution to social and economic benefits. A decrease in viewscapes value can impact the quality of recreation and tourism. Hiking, glacier flight tours and outfitting are popular tourism activities in the area.

Strategic Direction

- Minimize visual impacts of timber harvesting on popular recreation areas by maintaining a buffer of trees between operations and visual sight lines.

MINING

The draft Greater Kluane Regional Land Use Plan indicates that high mining potential occurs in the Kluane Ranges southwest of the Denali Fault/Shakwak Trench. Deposits of copper, nickel, platinum, palladium, rhodium, cobalt, quartz, silver, and gold can be found. Placer gold mining has been active in the region in numerous streams including Burwash Creek, Gladstone Creek and Ruby Creek. Mineral exploration and development activities may impact forest management in the area.

Strategic Direction

- Minimize the development of new road infrastructure where possible; use existing roads and trails for forestry and mining where possible.
- Make use of forest resources that are identified to be removed for planned mining activities to maximize efficient utilization.

RIPARIAN AREAS AND WETLANDS

Streams, lakes and wetlands play an important role for forest ecosystems by maintaining water quality. These areas also provide habitat for a large number of birds, insects and aquatic plants and animals.

A buffer between forest harvesting activities (including road building) and riparian areas and wetlands will support the maintenance and healthy function of these areas. Leaving trees close to riparian areas helps to stabilize the soil (and prevent erosion) and provides shade and habitat for fish. Sediment from loose soil can negatively impact fish habitat including by raising temperatures in streams.

CASE STUDY

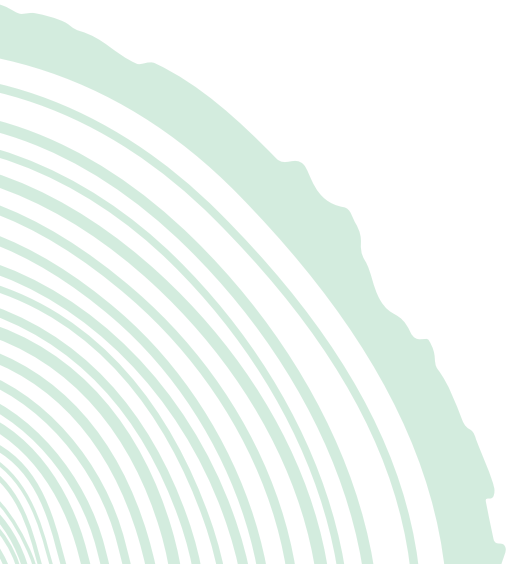
John wants to avoid negative impacts from his logging operation on a nearby creek that contains grayling. He knows that loose soil (sediment) from his activities could run into the creek if he harvests too close to the creek, especially on steeper grades. Even though there are bigger trees closest to the creek, John will avoid this area for harvest because of the potential for erosion and sediment load in the nearby creek.

ACCESS

Road development is a necessary activity for forestry operations. Improper road construction and use have environmental impacts such as erosion and soil compaction. New roads can also provide access for hunting and other activities ancillary to forestry that consequently contribute to the cumulative impacts of human development within a landscape. Winter use of roads and trails can minimize the impact to soils.

Strategic Direction

- Access to forestry operations may be limited under wet conditions to avoid negative impacts to road conditions. Seasonal shutdowns may be enforced dependent on conditions.
- Minimize new road development and make use of the existing road and trail network where possible.
- Refer to the Yukon Forest Resource Roads standards and guidelines for sound practices for road building and use.
- No new roads for the purposes of forestry are to be developed without permission from the Department of Lands, Resources and Heritage.
- Consider decommissioning of forestry roads after operations are complete to prevent further road use.
- Monitor invasive species that may appear as a result of access development.
- Develop an access management plan as part of FRMP implementation.



CUMULATIVE EFFECTS

Cumulative effects are changes to the environment caused by the combined impact of past, present and future human activities and natural processes. These changes can range over time and space and from multiple and cumulative sources with varying intensity.

Many developments and human activities can contribute to environmental change including mining, forestry, road building, vehicle (and aircraft) and equipment use, hunting, housing developments, and recreational and traditional activities. Road building is a particularly impactful activity as it contributes to habitat fragmentation and increased hunting opportunities. These pressures can manifest in the natural environment in different ways including a reduction in the reproductive success of mammals (Drukis 2017).

Strategic Direction

- In all forest management and planning, consider adjacent land based activities (past, present and future) that may compound forest harvesting, particularly road building.
- Consider the barriers that Drukis (2017) identifies in addressing cumulative effects: data research, monitoring, capacity and time limits, political challenges and the regional land use planning context.





5

INDICATOR AND MONITORING FRAMEWORK

MEASURING SUSTAINABLE FOREST MANAGEMENT

The four criteria for measuring sustainable forest management that apply to the planning area are:

1. Conserve biological diversity;
2. Maintain forest ecosystem health and productivity;
3. Conserve and maintain soil and water resources;
4. Maintain and enhance multiple socio-economic benefits and community well-being.

These criteria serve as a framework to measure forest values that should be enhanced or sustained. The indicators that are associated with each criteria are used to assess the state of forests and measure change over time (Canadian Council of Forest Ministers 2003). This framework is recognised internationally as a tool for measuring sustainable forest management. Criteria represent values to sustain or enhance and the corresponding indicators are used to measure the extent to which those values are sustained or enhanced.

Most importantly, indicators are a key component of any monitoring program. Using traditional and scientific knowledge, indicators can identify when improvement is needed. In order to be most effective, the indicators⁸ should be:

- Meaningful: clearly relevant and provide important information about the values identified in a criteria;
- Measurable: based on easily obtainable information that can be measured over time to observe trends;
- Cost effective: financially feasible to collect the data required to report on the indicator;
- Understandable: readily understood by the community and others;
- Connected to forestry: relevant to forest management in the planning area.

BASELINE REPORT

An important component of a Monitoring Program involves developing a baseline report that pulls together an overview of the status of forest management at the beginning of FRMP implementation. By measuring the initial status, these measures can be used to compare any changes in forest management, for better or worse. The list of indicators that follows in Table 2 is intended to be adapted as required.



⁸ Indicator measures are adapted from the Yukon Government's Dawson Forest Resources Management Plan 2013 by the KFN Forestry Committee.

TABLE 2: SUSTAINABLE FOREST MANAGEMENT CRITERIA AND INDICATORS

CRITERIA	VALUES	INDICATOR	
Criteria A: Conserve Biological Diversity	Ecosystem Diversity	<ul style="list-style-type: none"> • Forest area, by type and age class*; • Fragmentation 	
	Species Diversity	<ul style="list-style-type: none"> • Species distribution and population. • Conservation status of species at risk; 	
	Genetic Diversity	<ul style="list-style-type: none"> • Genetic origin and diversity of seed/cones used in reforestation. Collect local cones in mast years. 	
Criteria B: Maintain Forest Ecosystem Health and Productivity	Maintain and Enhance Ecosystem Condition, Productivity and Natural Processes	<ul style="list-style-type: none"> • Incidence of forest health concerns, including insect and disease outbreaks. • Area of forest health concerns. • Forest Age Class and Distribution • Presence of medicinal and edible plants. 	
	Climatic changes in the FRMP planning area*; <ul style="list-style-type: none"> • Rate of change • Extent of impacts 	<ul style="list-style-type: none"> • Shrubification 	
	Maintain and Enhance Ecosystem Resilience	<ul style="list-style-type: none"> • Number and extent of wildfires and extent of fire suppression. 	
Criteria C: Conserve and Maintain Soil and Water Resources	Soil	<ul style="list-style-type: none"> • Amount of area affected by timber harvesting with significant soil and/or permafrost disturbance. • More precipitation resulting in higher risk for erosion. • Volume of coarse woody debris in timber harvest relative to natural forest. 	
		Water	<ul style="list-style-type: none"> • Shifting water bodies over time (ie. Burwash Creek). Monitor this issue with regards to forestry planning and operations. • Water quality measures; • Area reported to have stream bank erosion as a result of timber harvesting.
	Criteria D: Maintain and Enhance Multiple Socio-Economic Benefits and Community Well Being	Timber Resources	<ul style="list-style-type: none"> • Number of locally-owned operations; • Forest area by timber tenure (permits)*; • Number of portable sawmills in operation; • Number of new local log cabins; • Volume of wood salvaged from forest harvesting for incidental harvest, such as placer mining, gravel pit clearing; • Volume of timber harvested incidentally through other authorizations? (ie. mining, and YESAB recommendations).
			Non-Timber Resources
<ul style="list-style-type: none"> • Area of timber tenure (permits) on KFN settlement land; • Status of traditional economic activity opportunities including fishing, hunting and gathering. 			
<ul style="list-style-type: none"> • Financial resources available annually for training and capacity building in the forestry sector; • Number of forestry-related education and training opportunities available and number of participants; 			
<ul style="list-style-type: none"> • Number of KFN members employed in the forestry sector. 			

THIS PAGE IS INTENTIONALLY LEFT BLANK



6

PLAN IMPLEMENTATION AND REVIEW

The development of a Forest Resources Management Plan can be considered the first phase in strategic landscape planning. This plan is a flexible document adaptable to changes in forest management priorities. This first version of this plan considers a ten-year outlook, and recommends a review and revision process after five years. Implementation is critical to a plan's effectiveness.

ROLES AND RESPONSIBILITIES

THE DEPARTMENT OF LANDS, RESOURCES AND HERITAGE

The Department of Lands, Resources and Heritage (LRH) has taken the lead role within the KFN Government in developing the Forest Resources Management Plan and associated capacity building training. Relevant to this Plan, LRH is responsible for:

- FRMP Implementation, including:
 - » Facilitating the Wildlife Monitor program to incorporate Forest Monitoring;
 - » Carry out a baseline monitoring report as per Criteria and Indicators;
 - » Engaging with the community to bring awareness to and provide input into the FRMP;
 - » Implementing a complimentary Forest Tenure process (permitting) for community and commercial use.
- Liaising with, and receiving direction from, Council on matters relating to this Plan;
- Communicating with external partners such as Yukon Government and Parks Canada on issues relating to forest and fire management;
- Continue to expand on KFN's existing skillset that promotes the sustainable local use of forest resources for community benefit, including ecosystem monitoring, site planning, tree harvesting and hauling, log building, sawmilling, carpentry and non-timber forest product development.

THE FOREST RESOURCES MANAGEMENT COMMITTEE

The Forest Resources Management Committee members are appointed by Council and adhere to a Terms of Reference. Committee members are typically comprised of LRH staff and community members. In alignment with the Goals of this Plan, the Committee is largely responsible for:

- Forest resources management planning, at the landscape and the site level, including issues such as priority areas for harvest and access.
- Supporting LRH in FRMP Implementation, particularly with respect to:
 - » Forest ecosystem monitoring;
 - » Facilitating community engagement events as required;
- Review of the FRMP in 5 years after approval.

THE LANDS COMMITTEE

Lands Committee members are appointed by Council and adhere to a terms of reference. Members are given 3 year terms. The role of the Lands Committee is to:

- Advise the LRH Department and make recommendations as required regarding applications for dispositions of Settlement Land;
- In conjunction with the LRH Department and as required, review and make recommendations on land issues relevant to Kluane First Nation in general.

With regard to the FRMP, the Lands Committee will play a supporting role in reviewing land use issues that may arise through the implementation of the Plan. The Committee will review the Plan and take it into account when meeting on issues of concern to the Plan within KFN Traditional Territory.

PLAN IMPLEMENTATION PRIORITIES

MONITORING

There are a number of aspects of plan management and implementation that would benefit from active monitoring, particularly in the areas of forest health and silviculture (*i.e.* tree regeneration). The criteria and indicators listed in Table 2 lay out a framework of meaningful monitoring of the use of forest resources, the impact that harvesting has on the local environment, and the benefits for the local community. Key to a functioning monitoring program is establishing a baseline as a reference point. This should be carried out soon after the FRMP is approved and implementation begins.

FUTURE FOREST MANAGEMENT PLANNING

There may be compelling reasons for Kluane First Nation to expand the planning area to include additional settlement parcels as the demand warrants. The parcel selection contained in the planning area should serve the needs of the community for the medium to long term horizon (5-20 years). However, the establishment of new camps, or the occurrence of natural disturbance in the area, particularly fire, are some examples of the potential need to include additional parcels in the FRMP. The Kluane First Nation FRMP was developed to facilitate the incorporation of many planning elements into a regional FRMP that includes the entire Traditional Territory of KFN. The development of such a plan would support a local bioeconomy, including commercial opportunities for KFN citizens.

ADAPTIVE MANAGEMENT

Forests are not static. They are inherently complex and dynamic and an adaptive approach to managing them is necessary for long-term planning, particularly in consideration of anticipated changes in climate. This approach to management also recognises the gaps in knowledge and understanding that can be improved on over time. Adaptive management can mean adjusting as new information is received. The Indicators and Monitoring Framework is therefore an important component of plan implementation. Monitoring, evaluating and adjusting management techniques and priorities is a continual process.



Appendices

Appendix A - References

Bigsby, A. Personal communication. August 6, 2019.

Calmels, F. and Roy, L-P. Personal communication. January 29, 2020.

Campbell, E.M, Antos, J.A., van Akker, L. 2019. Resilience of southern Yukon boreal forests to spruce beetle outbreaks. *Forest Ecology and Management*. 433: 52-63.

Canadian Biomass Energy Research Ltd. 2021. Burwash Landing Renewable Energy Options Assessment. Prepared with ENVINT Consulting.

Canadian Council of Forest Ministers (CCFM). 2003. Defining Sustainable Forest Management in Canada: Criteria and Indicators 2003. Canadian Council of Forest Ministers. Ottawa.

Canadian Wildlife Service. Environment Canada. 2017. Yukon Species at Risk.

Dän Keyi Renewable Resources Council and Kluane First Nation. 2018. Kluane Lake Research Summit May 4 & 5, 2018. Summary Report.

Danby, R. 2003. A Multiscale Study of Tree-Line Dynamics in Southwestern Yukon. *Arctic*. 54 (4): 427-436.

Danby, RK. and Hik, DS. 2007. Variability, contingency and rapid change in recent subarctic alpine tree line dynamics. *Journal of Ecology*. 95: 352-363.

Dunham, Stephen W. 2016. Spruce Grouse Habitat Ecology in Maine's Commercially Managed Acadian Forest. *Electronic Theses and Dissertations*. 2474.

Drukis, S. 2017. Thesis: Wildlife in Cumulative Effects Assessment: Assessing Needs and Processes in Southwest Yukon.

Forest Management Branch. 2005. Champagne and Aishihik Traditional Territory Strategic Forest Management Plan. Dept. Energy, Mines and Resources, Yukon Government.

Forest Management Branch. 2013. Dawson Forest Resources Management Plan. Dept. Energy, Mines and Resources, Yukon Government.

Forest Management Branch. 2013. Kluane Lake East Timber Harvest Plan. Dept. Energy, Mines and Resources, Yukon Government.

Forest Management Branch. Forest Health Pamphlet no. 19. Dept. Energy, Mines and Resources, Yukon Government.

Forest Management Branch. 2015. Yukon Forestry Handbook. Dept. Energy, Mines and Resources, Yukon Government.

Forest Management Branch. 2020. Forest Health Report 2019. Dept. Energy, Mines and Resources, Yukon Government.

Francis, S.R. 1996. Linking Landscape Pattern and Forest Disturbance: Fire History of the Shakwak Trench, Southwest Yukon Territory. Masters Thesis. Dept. of Botany, University of Alberta.

Garbutt, R., Hawkes, B. Allen, E. 2006. Spruce Beetle and the Forests of the Southwest Yukon. Canadian Forest Service. Natural Resources Canada. Pacific Forestry Centre. Information Report BC-X-406.

Forest Resources Act, SY 2008, c.15.

Forest Resources Regulation, YOIC 2010/171.

Gill, C. 2005. Sharp-tailed Grouse *Tympanuchus phasianellus columbianus* subspecies. Forsite.

Karels, T.J. and Boonstra, R. 1999. The impact of predation on burrow use by arctic ground squirrels in the boreal forest. Proc. Royal Society Lond. 266(1433):2117-23.

Kluane First Nation and Canada. 2003. Kluane First Nation Final Agreement.

Kluane First Nation and Canada. 2003. The Kluane First Nation Self-Government Agreement.

Kluane First Nation. 2012. *Lands and Natural Resources Act*.

Kluane First Nation. 2012. Community Land Use Plan. Prepared by KP Environmental.

Kluane First Nation. 2013. *Tenure Regulation. Lands and Natural Resources Act*.

Kluane First Nation. 2013. Land Management Policy.

Kluane First Nation. 2015. Nän/Land Use Plan Phase II. Prepared by Peetom, K. and Rempel, K.

Krebs, C.J., Boonstra, R., Boutin, S., and Sinclair, A.R.E. 2001. What drives the 10-year cycle of snowshoe hares? BioScience. 51(1) 25-35.

Krebs, C.J., Hofer, E., O'Donoghue, M., Loewen, V., Jung, T., Gilbert, S., Oakley, M., Taylor, S., Pretzlaw, T., Larocque, L., Boonstra, R., Boutin, S., and Kenney, A.J., 2010. The Community Ecological Monitoring Program Annual Report 2009.

Krebs, C.J., LaMontagne, J.M. Kenney, A.J. and Boutin, S. 2012. Climatic determinants of white spruce cone crops in the boreal forest of southwestern Yukon. *Botany*. 90 (2): 113-119.

Lawler, J.H. and Bullock, R.C.L. 2019. Indigenous control and benefits through small-scale forestry: a multi-case analysis of outcomes. *Can. J. For. Res.* 49: 404–413. NRC Research Press.

Laxton, N.F., Burn, C.R. and Smith, C.A.S., 1996. Productivity of loessal grasslands in the Kluane Lake region, Yukon Territory and the Beringian 'production paradox.' *Arctic*. 49:129-140.

Murray, D.L. Boutin, S. and O'Donoghue, M. 1994. Winter habitat selection by lynx and coyotes in relation to snowshoe hare abundance. *Canadian Journal of Zoology*. 72 (8): 1444-1451.

Northern Climate ExChange, 2013. Burwash Landing and Destruction Bay Landscape Hazards: Geological Mapping for Climate Change Adaptation Planning. Yukon Research Centre, Yukon College.

Parks Canada. 2010. Kluane National Park and Reserve of Canada Management Plan.

Sankar, R. D., Murray, M. S., Penn, H and Paulson, M. 2021. Canopy/Terrain Height for Kluane First Nation using ICESat-2 data. Arctic Institute of North America, University of Calgary.

Savidge, R.A. 2013. Porsild Spruce in Canada. *The Forestry Chronicle*. 89 (1): 24-31.

Savidge, R.A. 2014. Porsild Spruce in Canada – an update. *The Forestry Chronicle*. 90 (1): 105-107.

Smith, C.A.S., Meikle, J.C., and Roots, C.F. (editors), 2004. Ecoregions of the Yukon Territory: Biophysical properties of Yukon landscapes. Agriculture and Agri-Food Canada, OARC Technical Bulletin No. 04-01, Summerland, British Columbia.

Streicker, J. 2016. Yukon Climate Change Indicators and Key Findings 2015. Yukon College, Northern Climate Exchange.

Taylor, B., Kremsater, L. and Ellis, R. 1997. Adaptive Management of Forests in British Columbia. Forest Practices Branch, Ministry of Forests, BC.

Taylor, S., Personal communication. April 7, 2020.

Werner, J.R., Gillis, E.A., Boonstra, R., and Krebs, C.J. 2016. You can hide but you can't run:

apparent competition, predator responses and the decline of Arctic ground squirrels in boreal forests of the southwest Yukon. PeerJ 4: e2303.

Werner, J. R., Krebs, Charles J., Donker, Scott A., Boonstra, Rudy, and Sheriff, Michael J. 2015. Arctic ground squirrel population collapse in the boreal forests of the Southern Yukon. Wildlife Research. CSIRO Publishing.

Werner, J.R., C.J. Krebs, S.A. Donker, & M.J. Sheriff. 2015. Forest or meadow: the consequences of habitat for the condition of female arctic ground squirrels (*Urocitellus parryii plesius*). Canadian Journal of Zoology. 93: 791-797.

Wheeler H.C., and Hik D.S. 2012. Arctic ground squirrels *Urocitellus parryii* as drivers and indicators of change in northern ecosystems. Mammal Review 43:238–255.

Wong, C. 2014. Parks Canada. Protocols for Monitoring Spruce-dominated Forests in Kluane National Park and Reserve. V.4.

Wong, C. 2017. Parks Canada. Status of Ecological Integrity in Kluane National Park and Reserve 2017 Technical Compendium to the State of the Park Report. V. 2.0.

Wong, C., Personal communication. March 26, 2020.

www.climatedata.ca (accessed December 17, 2019).

Yukon Government. 2015. Yukon Animals of Conservation Concern – Birds. Dept. Environment.

Yukon River Inter-Tribal Watershed Council. 2013. Integrating Indigenous Knowledge & Public Health Concerns into a Community Contaminant & Climate Change Monitoring Program 2012-2013.

Appendix B – Tree Height Data

Table 3 below lists the ICESat-2 data of tree (canopy) heights collected via satellite lidar between February 7 2019 and May, 6, 2020 in comparison with the 2019 field data. This information is mapped spatially in Figure 10.

TABLE 3. A COMPARISON OF THE TREE HEIGHT DATA FROM ICESAT-2 AND 2009 TIMBER CRUISE (FIELD) DATA.

PARCEL		AVERAGE TREE HEIGHT (M)	
		Field Data 2019	NASA ICE-Sat2 Data 2019 + 2020
1	R1A	13.28	10.2
2	R2B	14.4	13.98
3	R3A	12.78	10.57
4	5B*	20.15	6.59
5	R13A	13	14.39
6	R18B	12.9	10.47
7	R29B	17.5	16.52
8	R45A	NA	9.78
9	46A	12.1	10.34
10	R47A	16.65	11.74

*One limitation of the ICESat-2 data is that it cannot distinguish between species and will capture canopy heights of the tallest vegetation in its path, including willow, for example. Given that the field data targeted merchantable white spruce trees, it is reasonable to assume that for parcel 5B, the field data has the correct tree height.



Maps

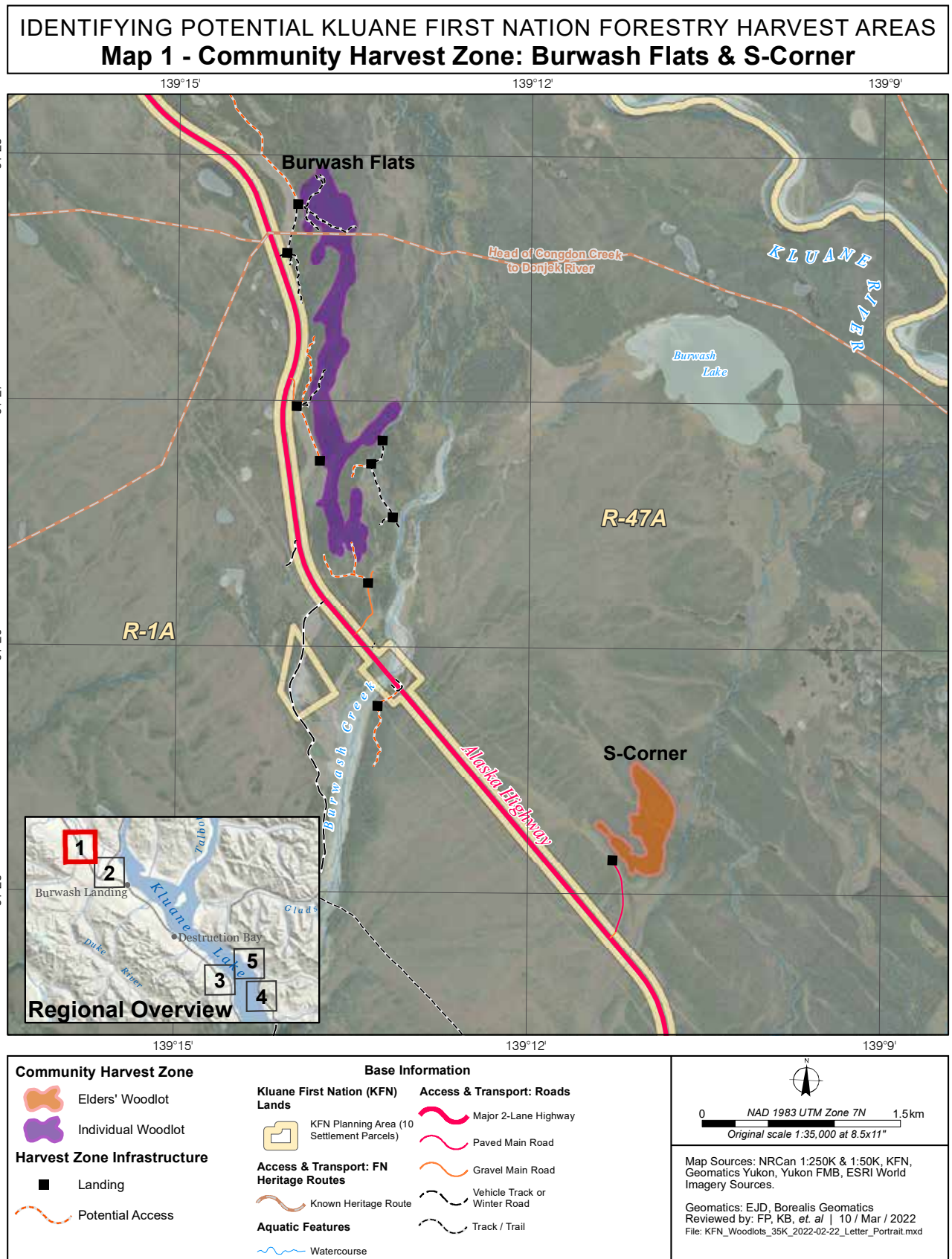
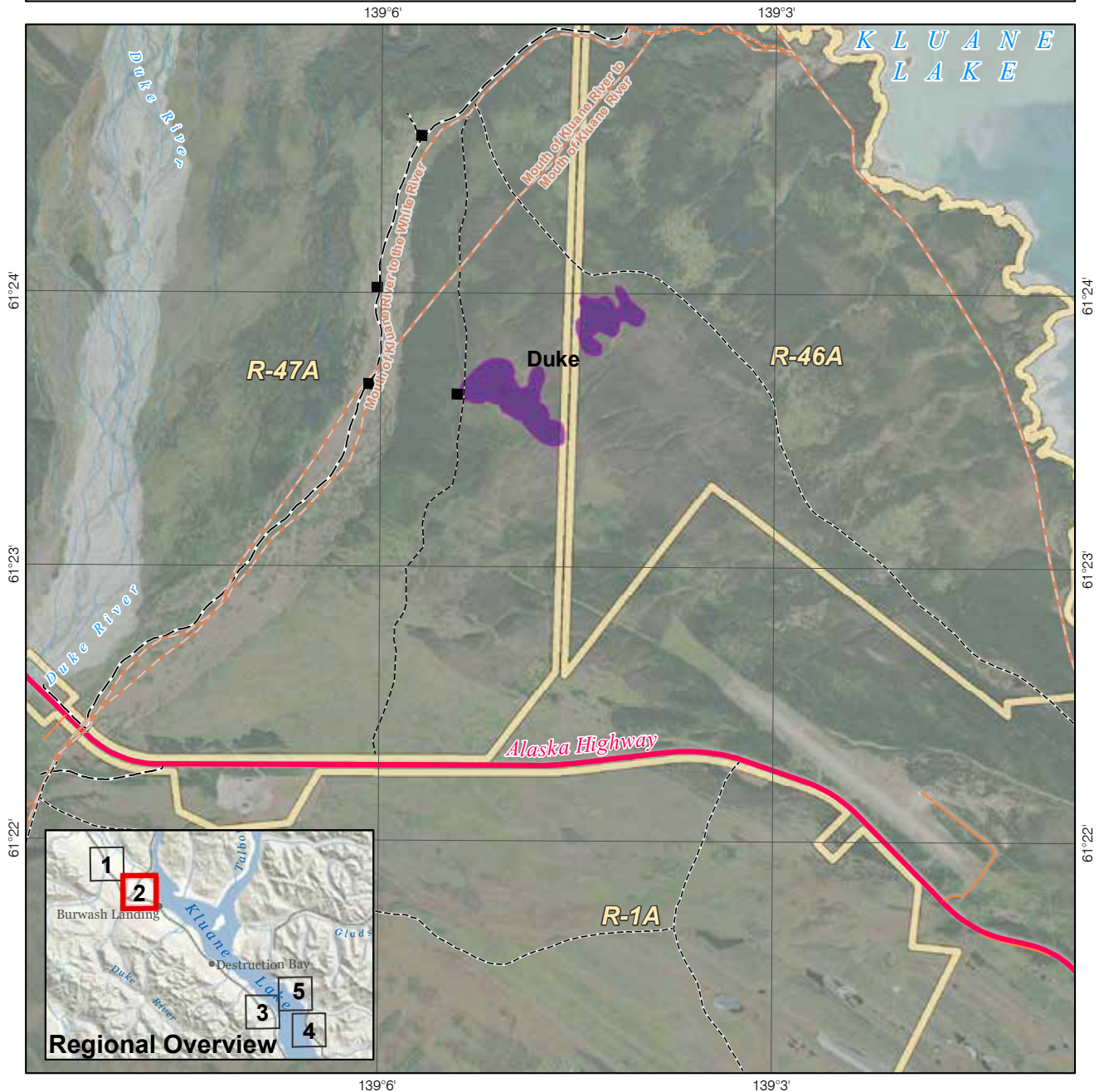


FIGURE 3. MAP OF COMMUNITY HARVEST ZONE: BURWASH FLATS AND S-CORNER

IDENTIFYING POTENTIAL KLUANE FIRST NATION FORESTRY HARVEST AREAS
Map 2 - Community Harvest Zone: Duke Meadows

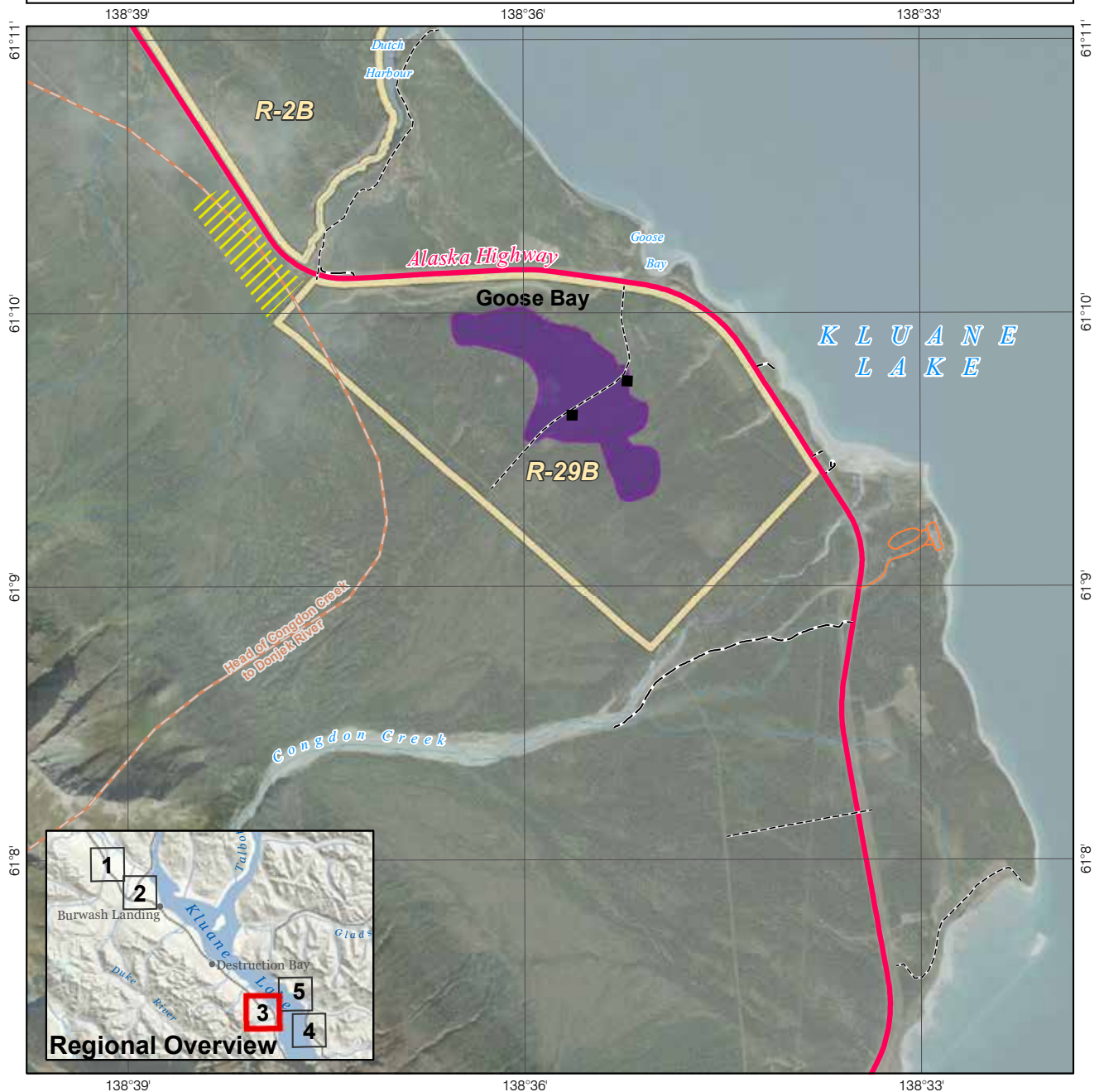


<p>Community Harvest Zone</p> <p> Individual Woodlot</p> <p>Harvest Zone Infrastructure</p> <p> Landing</p>	<p>Base Information</p> <p>Kluane First Nation (KFN) Lands</p> <p> KFN Planning Area (10 Settlement Parcels)</p> <p>Access & Transport: FN Heritage Routes</p> <p> Known Heritage Route</p> <p>Aquatic Features</p> <p> Watercourse</p> <p>Access & Transport: Roads</p> <p> Major 2-Lane Highway</p> <p> Gravel Main Road</p> <p> Vehicle Track or Winter Road</p> <p> Track / Trail</p>	<p></p> <p>0 1.5 km NAD 1983 UTM Zone 7N Original scale 1:35,000 at 8.5x11"</p> <p>Map Sources: NRCan 1:250K & 1:50K, KFN, Geomatics Yukon, Yukon FMB, ESRI World Imagery Sources.</p> <p>Geomatics: EJD, Borealis Geomatics Reviewed by: FP, KB, et. al 10 / Mar / 2022 File: KFN_Woodlots_35K_2022-02-22_Letter_Portrait.mxd</p>
---	--	--

FIGURE 4. MAP OF COMMUNITY HARVEST ZONE: DUKE MEADOWS

IDENTIFYING POTENTIAL KLUANE FIRST NATION FORESTRY HARVEST AREAS

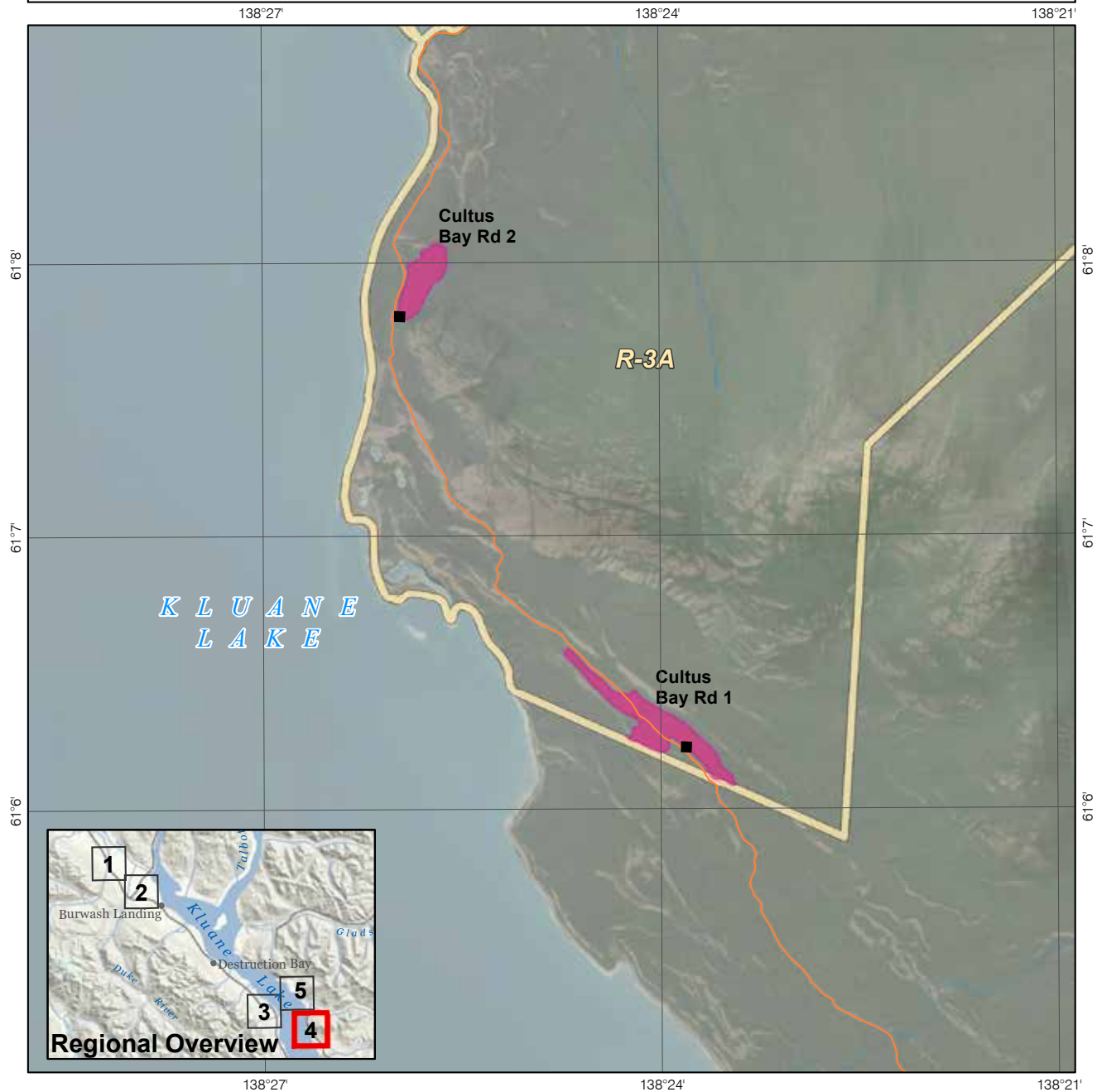
Map 3 - Community Harvest Zone: Goose Bay



<p>Community Harvest Zone</p> <ul style="list-style-type: none"> Individual Woodlot <p>Forestry Potential</p> <ul style="list-style-type: none"> YG Fuelwood Potential <p>Harvest Zone Infrastructure</p> <ul style="list-style-type: none"> Landing 	<p style="text-align: center;">Base Information</p> <p>Kluane First Nation (KFN) Lands</p> <ul style="list-style-type: none"> KFN Planning Area (10 Settlement Parcels) <p>Access & Transport: FN Heritage Routes</p> <ul style="list-style-type: none"> Known Heritage Route <p>Aquatic Features</p> <ul style="list-style-type: none"> Watercourse 	<p style="text-align: center;">Access & Transport: Roads</p> <ul style="list-style-type: none"> Major 2-Lane Highway Gravel Main Road Vehicle Track or Winter Road Track / Trail
		<p style="margin: 0;">N</p> <p style="margin: 0;">0 1.5km</p> <p style="margin: 0; font-size: small;">NAD 1983 UTM Zone 7N Original scale 1:35,000 at 8.5x11"</p>
<p>Map Sources: NRCAN 1:250K & 1:50K, KFN, Geomatics Yukon, Yukon FMB, ESRI World Imagery Sources.</p> <p>Geomatics: EJD, Borealis Geomatics Reviewed by: FP, KB, et. al 10 / Mar / 2022 File: KFN_Woodlots_35K_2022-02-22_Letter_Portrait.mxd</p>		

FIGURE 5. MAP OF COMMUNITY HARVEST ZONE: GOOSE BAY

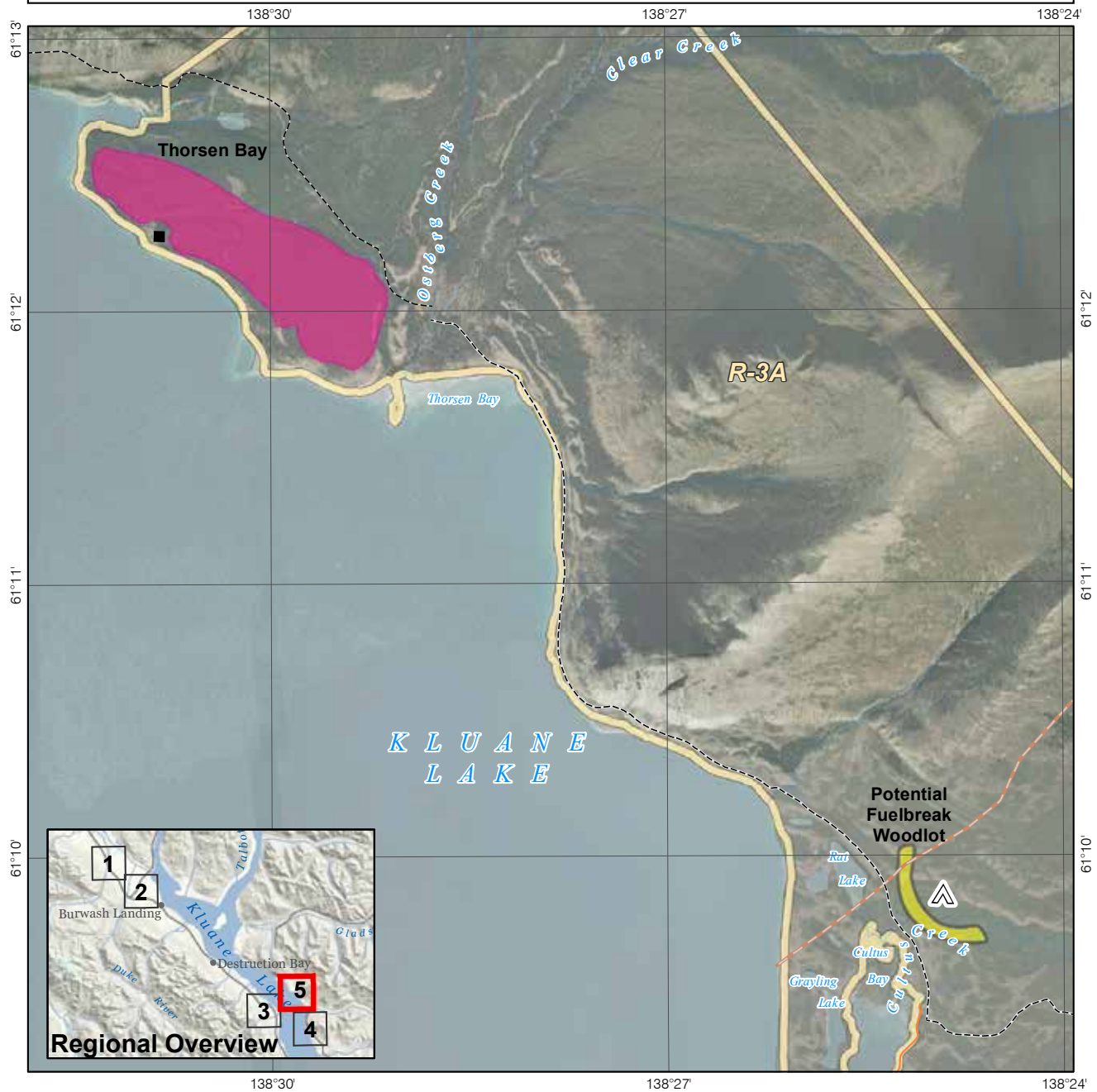
IDENTIFYING POTENTIAL KLUANE FIRST NATION FORESTRY HARVEST AREAS
Map 4 - Commercial Harvest Zone: Cultus Bay



<p>Commercial Zone</p> <p> Fuelwood Woodlot</p> <p>Harvest Zone Infrastructure</p> <p> Landing</p>	<p>Base Information</p> <p>Kluane First Nation (KFN) Lands</p> <p> KFN Planning Area (10 Settlement Parcels)</p> <p>Aquatic Features</p> <p> Watercourse</p> <p>Access & Transport: Roads</p> <p> Gravel Main Road</p>	<p></p> <p>0 1.5km NAD 1983 UTM Zone 7N Original scale 1:35,000 at 8.5x11"</p> <p>Map Sources: NRCan 1:250K & 1:50K, KFN, Geomatics Yukon, Yukon FMB, ESRI World Imagery Sources.</p> <p>Geomatics: E.J.D. Borealis Geomatics Reviewed by: FP, KB, et. al 10 / Mar / 2022 File: KFN_Woodlots_35K_2022-02-22_Letter_Portrait.mxd</p>
--	--	--

FIGURE 6. MAP OF COMMUNITY HARVEST ZONE: CULTUS BAY

IDENTIFYING POTENTIAL KLUANE FIRST NATION FORESTRY HARVEST AREAS
Map 5 - Commercial Harvest Zone: Fuelbreak Woodlot + Thorsen Bay



<p>Commercial Zone</p> <ul style="list-style-type: none"> Fuelwood Woodlot Potential Fuelbreak Woodlot <p>Harvest Zone Infrastructure</p> <ul style="list-style-type: none"> Landing 	<p>Kluane First Nation (KFN) Lands</p> <ul style="list-style-type: none"> KFN Planning Area (10 Settlement Parcels) <p>Access & Transport: FN Heritage Routes</p> <ul style="list-style-type: none"> Known Heritage Route <p>Aquatic Features</p> <ul style="list-style-type: none"> Watercourse 	<p>Base Information</p> <p>KFN Community Use Areas</p> <ul style="list-style-type: none"> Camp <p>Access & Transport: Roads</p> <ul style="list-style-type: none"> Gravel Main Road Track / Trail 	<p style="text-align: center;">N</p> <p style="text-align: center;">0 1.5km NAD 1983 UTM Zone 7N Original scale 1:35,000 at 8.5x11"</p> <p>Map Sources: NRCan 1:250K & 1:50K, KFN, Geomatics Yukon, Yukon FMB, ESRI World Imagery Sources.</p> <p>Geomatics: E.J.D. Borealis Geomatics Reviewed by: FP, KB, et. al 10 / Mar / 2022 File: KFN_Woodlots_35K_2022-02-22_Letter_Portrait.mxd</p>
--	---	--	---

FIGURE 7. MAP OF COMMUNITY HARVEST ZONE: FUELBREAK WOODLOT + THORSEN BAY

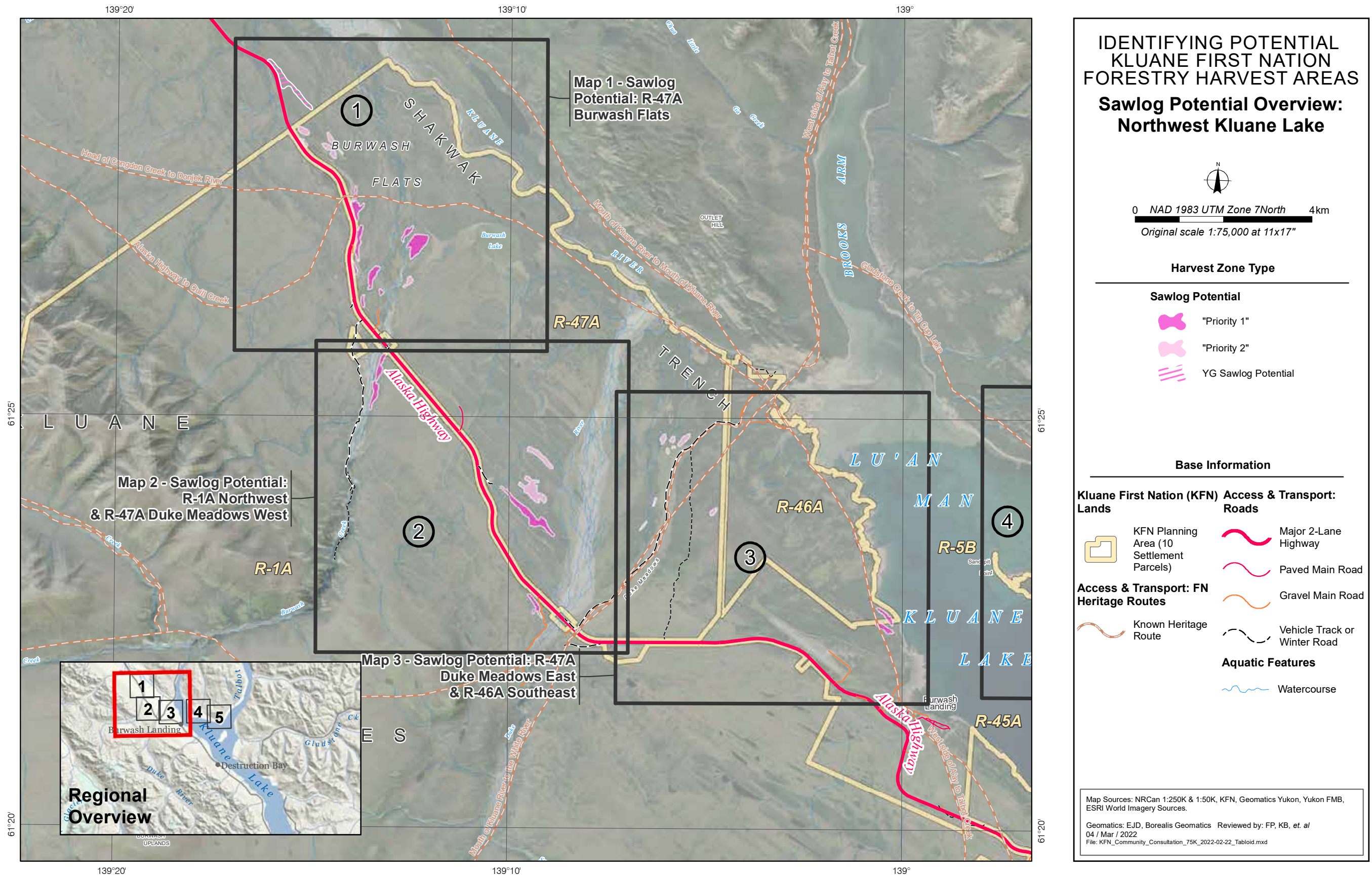
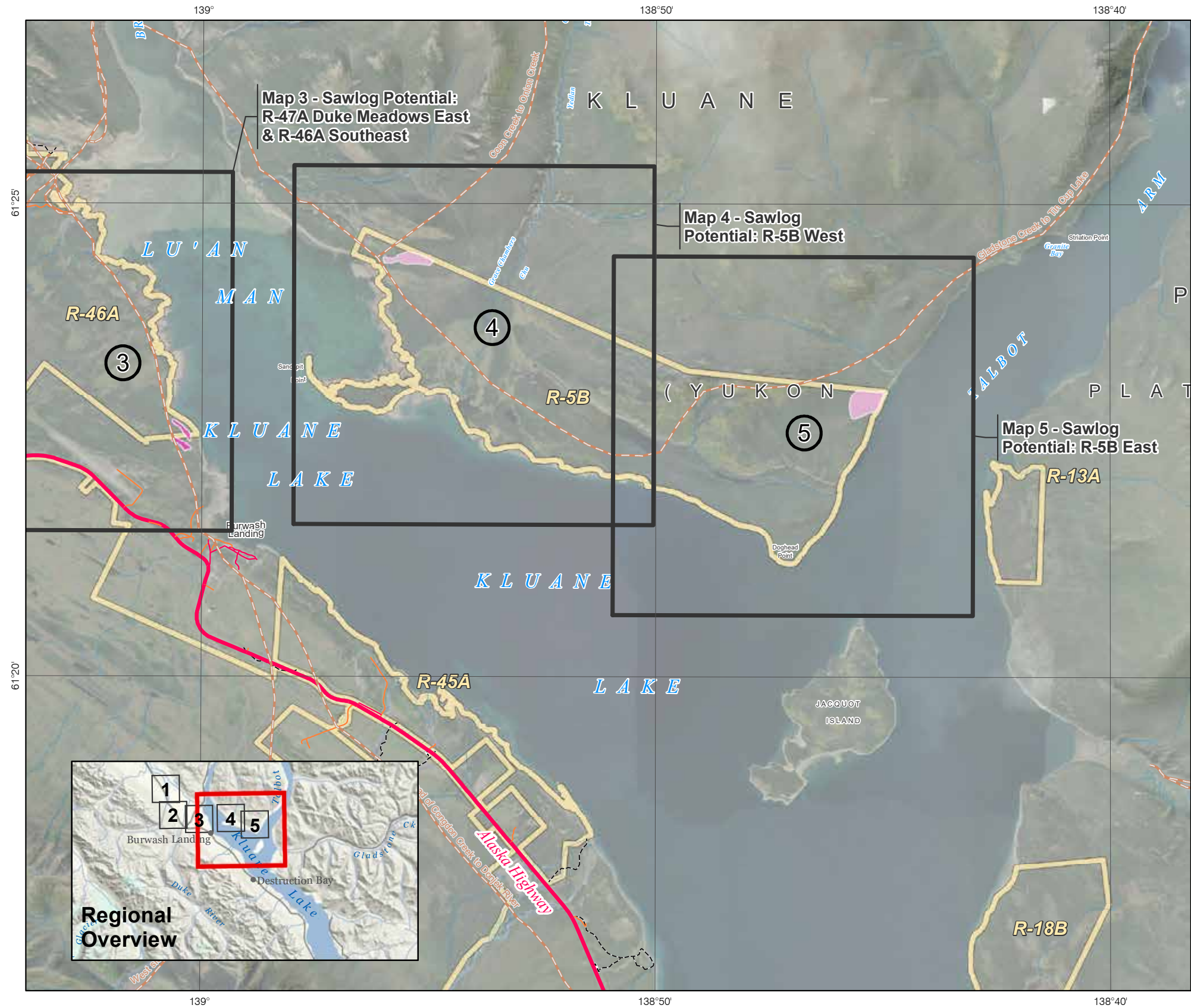


FIGURE 8. MAP OF SAWLOG POTENTIAL HARVEST: NORTHWEST KLUANE LAKE

THIS PAGE IS INTENTIONALLY LEFT BLANK



IDENTIFYING POTENTIAL KLUANE FIRST NATION FORESTRY HARVEST AREAS

Sawlog Potential Overview: Northeast Kluane Lake

0 4km
 NAD 1983 UTM Zone 7North
 Original scale 1:75,000 at 11x17"

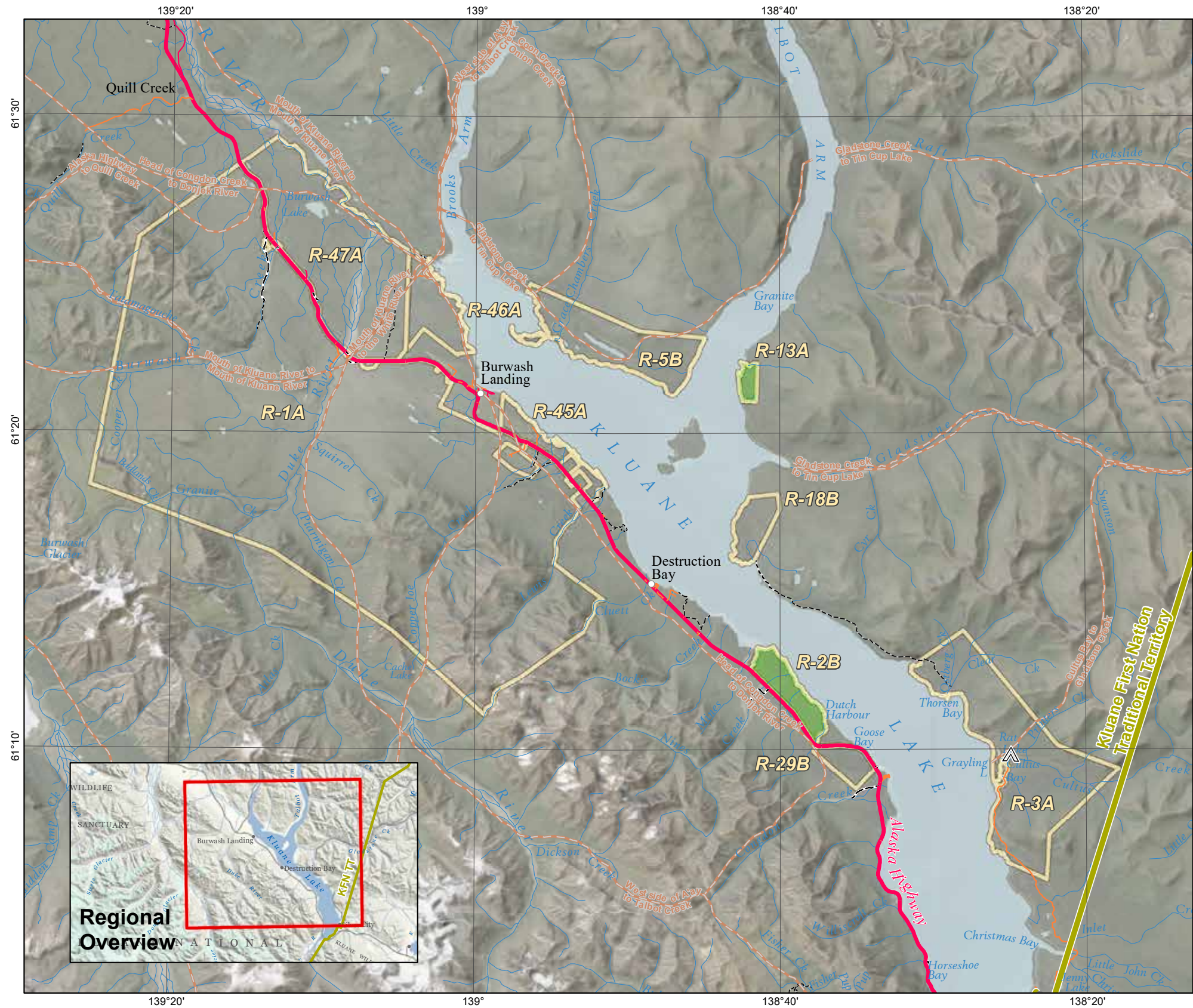
Harvest Zone Type	
Sawlog Potential	
	"Priority 1"
	"Priority 2"
Base Information	
Kluane First Nation (KFN) Lands KFN Planning Area (10 Settlement Parcels)	Access & Transport: Roads Major 2-Lane Highway Paved Main Road Gravel Main Road Vehicle Track or Winter Road
Access & Transport: FN Heritage Routes Known Heritage Route	Aquatic Features Watercourse

Map Sources: NRCan 1:250K & 1:50K, KFN, Geomatics Yukon, Yukon FMB, ESRI World Imagery Sources.

Geomatics: EJD, Borealis Geomatics Reviewed by: FP, KB, et. al
 04 / Mar / 2022
 File: KFN_Community_Consultation_75K_2022-02-22_Tableid.mxd

FIGURE 9. MAP OF SAWLOG POTENTIAL HARVEST: NORTHEAST KLUANE LAKE

THIS PAGE IS INTENTIONALLY LEFT BLANK



IDENTIFYING POTENTIAL KLUANE FIRST NATION FORESTRY HARVEST AREAS

Forestry Planning Settlement Parcels with ABoVE Data

0 NAD 1983 UTM Zone 7North 12km
 Original scale 1:225,000 at 11x17"

Base Information

Forestry Potential

- ABoVE Data (2 Parcels)

Kluane First Nation (KFN) Lands

- KFN Planning Area (10 Settlement Parcels)
- Kluane First Nation Traditional Territory

KFN Community Use Areas

- Camp

Access & Transport: FN Heritage Routes

- Known Heritage Route

Access & Transport: Roads

- Major 2-Lane Highway
- Paved Main Road
- Gravel Main Road
- Vehicle Track or Winter Road

Aquatic Features

- Watercourse
- Waterbody

Map Sources: NRCan 1:250K & 1:50K, KFN, Geomatics Yukon, ESRI World Imagery Sources.

Geomatics: EJD, Borealis Geomatics. Reviewed by: FP; KB; et. al.
 21 / Mar / 2022
 File: KFN_ABoVE_Settlement_Parcels_225K_2022-03-04_Tableid_RGB.mxd

FIGURE 10. FORESTRY PLANNING SETTLEMENT PARCELS WITH ABoVE DATA

THIS PAGE IS INTENTIONALLY LEFT BLANK