STATE OF KNOWLEDGE REPORT

Beaver | tsá, amisk

Fort Nelson First Nation

Liard Basin Monitoring Initiative

August 2018

STATE OF KNOWLEDGE REPORT: **BEAVER | TSÁ, AMISK**

Fort Nelson First Nation *Liard Basin Monitoring Initiative*

August 2018

Prepared and authored by Fort Nelson First Nation

Thanks and acknowledgements first go to Fort Nelson First Nation elders, knowledge holders, land users, staff, and leadership who contributed. This report could not have been completed without their support and expert knowledge. Overall, our members are the experts:

> "[w]e are stewards of the lands and our teachings guide the ways we control, manage and protect our territory. The health of the territory relies on our voice and our actions."

Our thanks also go to Natural Resources Canada, which has provided financial support for the Liard Basin Monitoring Initiative through the federal Cumulative Effects Monitoring Initiative.

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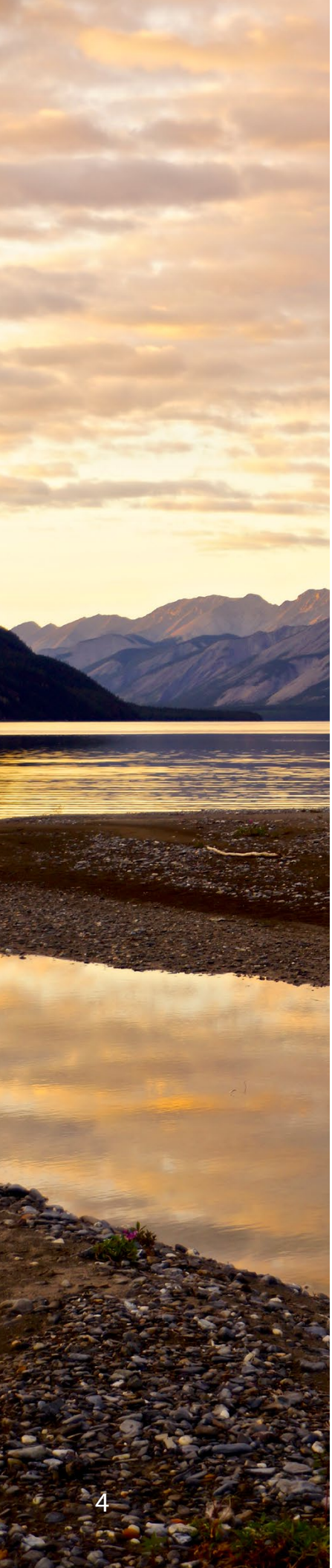
PHOTO: FNFN LANDS DEPARTMENT



About the LBMI and the Beaver State of Knowledge Report

FORT NELSON FIRST NATION (FNFN) MEMBERS are Dené and Cree People of the Land and Rivers, who have lived in north-eastern British Columbia since time immemorial. Our community members have actively retained our traditional culture, including our language and our connection to and knowledge of the land. Community members were and continue to be hunters and gatherers within our traditional territory. FNFN joined Treaty 8 in 1910, an agreement that affirmed FNFN's rights to use our traditional lands and pursue our ways of life.

In 2017, the FNFN Lands and Resources Department, with financial support from Natural Resources Canada, completed Year 1 of the three-year pilot Liard Basin Monitoring Initiative (LBMI). The focus in Year 1 was on identifying priority FNFN values in its traditional territory.

FNFN members identified beaver, known as tsá in the Dené language and amisk in the Cree language, as an important cultural and ecological value. Therefore, it became a subject of the state of knowledge reporting summarized in this document. In Year 1 of the LBMI, existing information on beaver was examined by looking at community information (for example, from prior traditional use and knowledge studies) and publicly available scientific information sources. The status of the population health of beaver, their distribution and preferred habitat, pressures they face, gaps in monitoring information, and management practices, were all subject to the assessment.

The results of this state of knowledge work are provided herein. This report is the first of several FNFN-planned state of knowledge reports on cultural and ecological values in the Liard Basin and FNFN territory. Part of FNFN's mandate as stewards of the land is not merely to collect traditional and scientific knowledge, but to disseminate it in appropriate ways, to inform our decision-making and that of other parties like our Treaty 8 neighbours, industry, and government.

The LBMI is now in Year 3 and monitoring protocols related to beaver management, as well as an FNFN Beaver Management Policy,[1] have been developed and are being finalized and field tested. This document should be treated as a companion to the Beaver Management Policy. Together with industry and other levels of government, FNFN seeks to promote a continued healthy and natural role for tsá /amisk in our territory.

1 This policy is available for all proponents working in FNFN's territory from FNFN Lands.

PHOTO: MUNCHO LAKE, RYAN DICKIE

INTRODUCTION

FNFN'S MEMBERS HAVE a deep connection to the Land and have actively retained our traditional culture. Many generations of FNFN men, women, and children have lived and thrived in the Liard Watershed. Our members have always been, and continue to be, hunters and gatherers from the rich muskeg in the east and the mountains in the west of our territory. Our members' knowledge of their traditional lands developed as generations — for tens of thousands of years — moved around the territory with the seasons and animals that sustained our way of life and livelihood. We are the "People of the Land."

Beaver have always been abundant in FNFN territory, and FNFN members have always hunted and trapped this furbearer for food, cultural, and economic purposes. FNFN members have a close relationship with the beaver that is characterized by respect and gratitude for the cultural and ecological integrity it helps to sustain across the landscape. FNFN members know that beaver represent, support, and indeed, help "engineer" a healthy ecosystem.

FNFN has a commitment and obligation to care for and protect the rights, lands, waters, animals, and whole ecosystem for future FNFN generations. Within this overarching system of stewardship rights and responsibilities, contamination of beaver habitat and beaver health (especially in relation to water quality) has been a subject of concern in recent years. Members of the community have also become concerned about the management of beaver-human conflict since industrial development has increased across our traditional lands. At this time, the management of beaver-human conflict by government and industry often involves lethal methods of beaver removal, which are viewed as both ineffective and culturally inappropriate by FNFN. With these concerns, the increase since the early 2000s in industrial development in the Liard Watershed, and anticipated landscape level effects of climate change, there are legitimate concerns about future conditions for beaver. The need to develop strategies to protect wildlife for current and future generations has become paramount.

Our members' knowledge of their traditional lands developed as generations – for tens of thousands of years – moved around the territory with the seasons and animals that sustained our way of life and livelihood.

PHOTO: FNFN LANDS DEPARTMENT

This document summarizes the findings of recent work by the FNFN Lands and Resources Department related to management planning and state of knowledge reporting for beaver in the Liard Watershed and FNFN territory. FNFN's overall goal is to develop alternative means of wildlife management, as part of a larger discussion on natural resource management with the B.C. government, to maintain healthy populations of key species, including beaver.

The sections that follow outline the cultural and ecological context of beaver and beaver management in FNFN territory, summarizing relevant aspects of beaver ecology, regional beaver habitat suitability, population health and trends, pressures and conflict zones, and beaver management and monitoring principles. Overall, this state of knowledge report provides context for FNFN's vision and requirements for beaver management in FNFN traditional territory.

The sections that follow outline the cultural and ecological context of beaver and beaver management in FNFN territory.

PHOTO: NORTH AMERICAN BEAVER, COURTESY CRYSTAL LUXMORE/ FLICKR CREATIVE COMMONS

Industry proponents should refer to this document as a companion document to the FNFN Beaver Management Policy, which outlines FNFN's tenure-level and project-specific beaver management planning requirements, and is available from FNFN Lands.

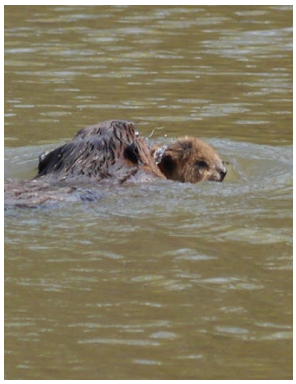
PHOTO: OLD MAN STUBBY – JOSEPH DETTIEH – STRETCHING BEAVER HIDES IN SPRING

FNFN CULTURAL KNOWLEDGE OF BEAVER

THE BEAVER, KNOWN AS TSÁ IN THE DENÉ LANGUAGE, AND AMISK IN CREE, is a culturally important species to the Cree and Dené people of FNFN. FNFN members understand and relate to beaver as similar to themselves, admiring the beaver for its work ethic and intelligence. Beaver plan ahead for the future, gather food, and work tirelessly to reinforce their homes against the winter cold and predators. They also play a positive ecological role in the environments they live in. As "ecosystem engineers," beaver help maintain the integrity of the land, in part through creating valuable wetland and aquatic habitat for other culturally important species (and traditional food animals) such as moose, caribou, and waterfowl. FNFN members have observed that moose, for example, rely on water in beaver-manipulated wetlands for escape terrain, calving and riparian plant foraging. These traits are recognized by FNFN members and reflected in Dené and Cree oral histories that are passed down through generations. For example, in the FNFN story of Yamoria, a Dené culture hero is described as being the most powerful medicine person throughout history, and because of his interest in beaver and their high intelligence, he transformed himself into a beaver and lived with a beaver family through fall and winter (Blondin 2000). Within this story, Yamoria learns how the beaver prepare for the upcoming winter, including making their home safe, teaching their children, and rationing food when supply is low.

Beaver play a key role in the traditional hunting and trapping economy of FNFN, with all parts of the beaver being used for clothing, traditional craft, ceremony, and food — beaver tails, for example, are considered a special delicacy. The spring hunt remains an important annual activity within FNFN that facilitates knowledge sharing and spending time on the land with family. Beaver remains one of the primary furs that are still sold and traded, providing income for FNFN trappers.

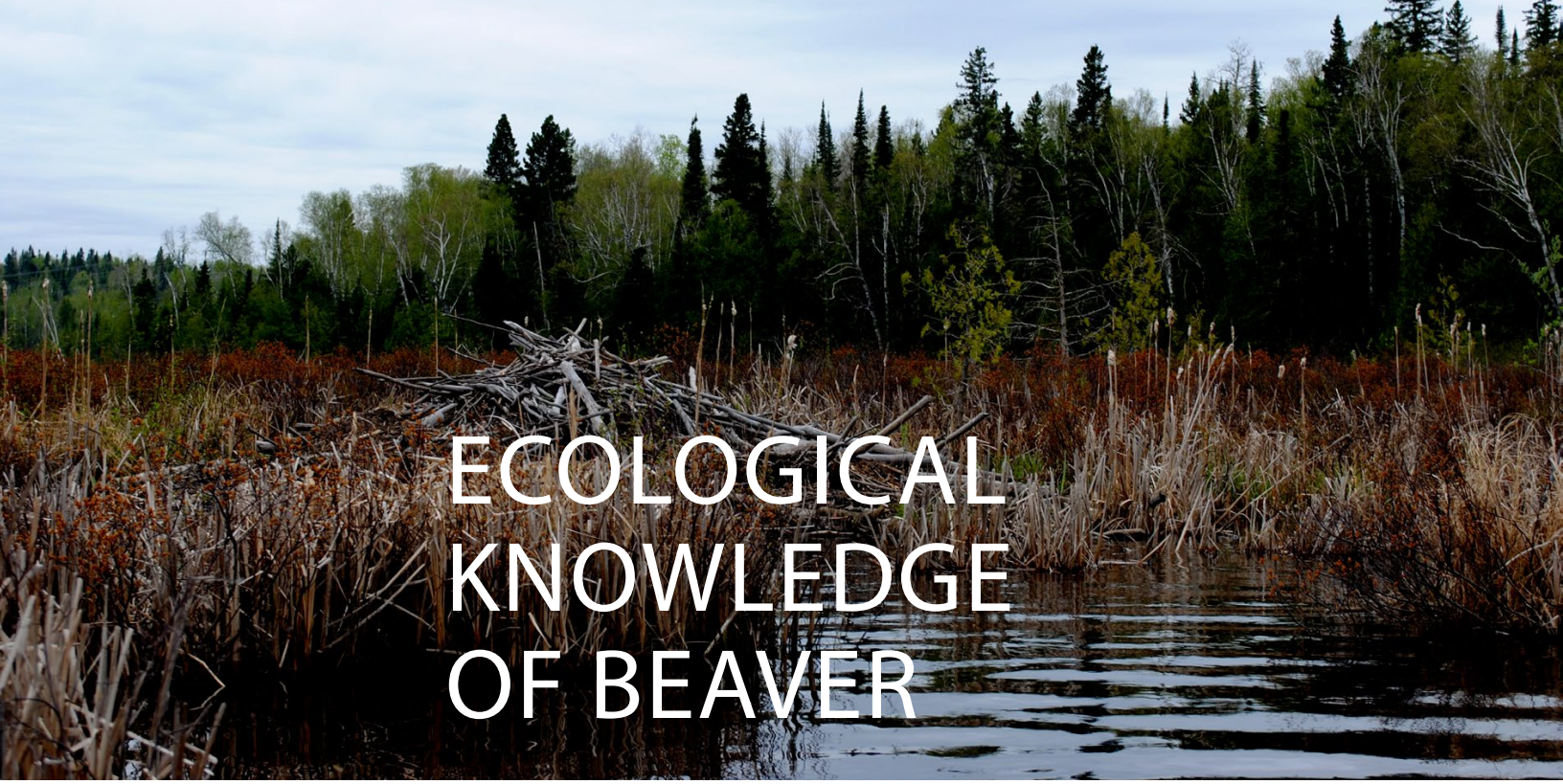
FNFN members have asserted that they wish to see more protection for beaver across FNFN territory to reduce pressure on the ecologically and culturally valuable animal.



In the FNFN story, Yamoria learns how the beaver prepare for the upcoming winter, including making their home safe, teaching their children, and rationing food when supply is low.

TOP PHOTO: RONSAN4D/ISTOCK

PHOTO ABOVE: NORTH AMERICAN BEAVER COURTESY KRISTI/ FLICKR CREATIVE COMMONS



ECOLOGICAL KNOWLEDGE OF BEAVER

"Beaver are important to us not only for our cultural and commercial reasons but also we view them as a very important species on the land and in watercourses. So the health of the land in many ways is — and water is — dependent upon the beaver." (Relaw Project 2017)

PHOTO: NORTH AMERICAN BEAVER DAM, COURTESY MICHELLE LESSY/FLICKR CREATIVE COMMONS

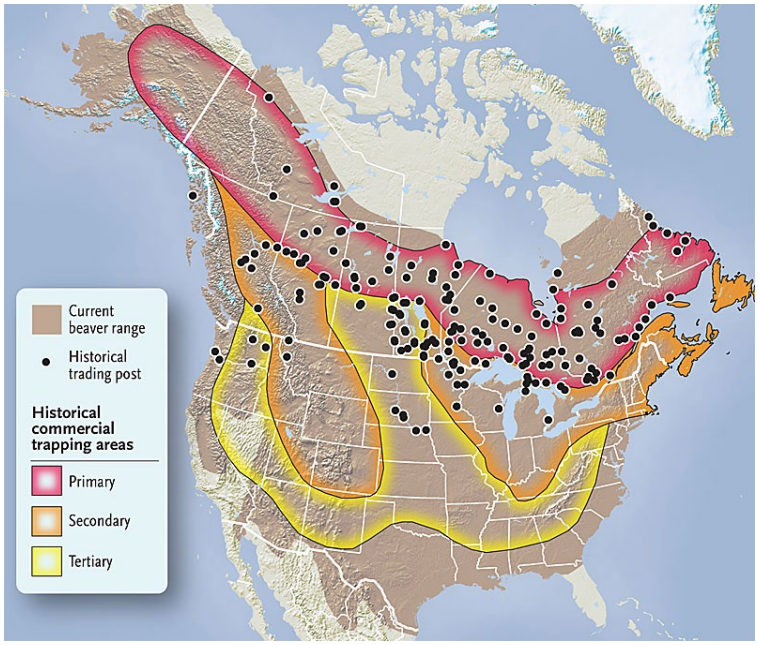
BEAVER ARE THE LARGEST RODENT IN NORTH AMERICA (Baker and Hill 2003), with large webbed hind feet ideal for swimming and dexterous hand-like front paws that allow them to manipulate objects. A massive beaver population decline occurred in North America during the 1700s and 1800s, driven by the fur trade. Populations have recovered, though possibly to a fraction of their former abundance in some areas, and beaver once again occupy much of their historic range (see map opposite) including wetland habitats such as streams, rivers, lakes, sloughs, side channels, backwaters, as well as riparian wetlands in river floodplains, and isolated spring-fed wetlands (Gibson and Olden 2014).

Depending on the habitat type, beaver create bank dens (in rivers and deep lakes) and bank or island lodges (in shallower ponds and wetlands) for shelter from weather and predators (Baker and Hill 2003; Bromley and Hood 2013). By building dams and lodges, beaver have a significant impact on the control of water depth and bank stability across very large areas. Lodges are the primary resources for beaver escape, rest, thermal regulation, and reproduction.

Beaver are a keystone species and "ecosystem engineers" that can enhance water retention capacity at the local and landscape level and create diverse habitats that support high levels of plant, wildlife, and fish biodiversity, both in the water and on land (Jones et al. 1994). In fact, beaver are among few species that can significantly change the geomorphology or shape of the earth's surface, and consequently the hydrogeological characteristics and biotic properties of the landscape (Rosell et al. 2005; Hood and Larson 2015; Westbrook et al. 2006). This modification can be extensive. A study in northeast Alberta found beaver-dug channels extended the wetland perimeter by 578% on average, increasing connectivity with other aquatic habitats and creating new riparian and shallow water habitat (Hood and Larson 2015). Active ponds (including channels) were 59.9% larger than inactive beaver ponds in this landscape, in terms of wetted areas. They also deepened their pond by excavating bottom sediments, creating a complex bathymetric profile to their ponds that persisted long after beaver actively occupied the ponds. These habitat

alterations also affect vegetation, invertebrate, and fish communities, and support habitat needs for other wildlife (Baker and Hill 2003; Collen and Gibson 2001; Hood and Larson 2014).

To create or expand pond habitat, beaver will often build a dam by pushing materials such as sticks, branches, rocks and sediment into a ridge that runs perpendicular to the flow of moving water (Rodvang and Hood 2015). The dam restricts the flow of moving water and increases the water level of the surrounding area (Baker and Hill 2003). Increased water levels provide beaver with protection from predators, easy access to foraging areas, submerged lodge entrances, and a layer of water beneath the ice surface in colder climates. In areas where flowing water is less prevalent, beaver will dig channels and deepen existing wetlands to encourage water capture (Hood and Larson 2015). As keystone species with significant influence within the ecosystems they inhabit, population or local level changes to beaver presence and abundance can have significant cascading effects on the landscape and other species.



As keystone species with significant influence within the ecosystems they inhabit, population or local level changes to beaver presence and abundance can have significant cascading effects on the landscape and other species.

MAP: CANADIAN GEOGRAPHIC, CANADIANGEOGRAPHIC.CA, "RETHINKING THE BEAVER"

Beaver reach sexual maturity between the ages of 18 months to three years of age, and breeding typically takes place in the winter, producing one litter per year in the late spring with an average of two to four kits (Jenkins and Busher 1979). Litter size is influenced by habitat and forage quality, and condition (size) of the mother. Beaver create lifelong pair-bonds, and a beaver colony typically consists of one mating pair, young of the current year (kits), and the young of the previous year (yearlings or juveniles) (Baker and Hill 2003). Juvenile beaver disperse from the colony at approximately two years of age; dispersal is the primary mechanism of population expansion (Baker and Hill 2003). Dispersal rates are generally higher in areas where the habitat is poor. Beaver have also been found to disperse faster in areas where control measures such as trapping/shooting have reduced populations below carrying capacity, which limits the effectiveness of these management activities.

Beaver young (kits and juveniles) have a relatively high survival rate, and adults can live up to 11 years in the natural environment (BCA 2006; Jenkins and Busher 1979). Predation, disease, food availability, and weather conditions are the main natural causes of mortality. Predation by larger mammals such as the grey wolf (Canis lupus) can have a noticeable impact on population size (Baker and Hill 2003). The beaver's other predators include cougar, coyote, bear, lynx, bobcat, and occasionally wolverine, river otter, and mink. Where beaver are unable to store a large enough food cache during the fall due to conditions such as declining habitat or the effects of late fall flooding (Hatler 1988), starvation can be a significant cause of mortality (Baker and Hill 2003). A lack of access to the winter food cache during winter and stress due to adverse winter weather conditions can also cause localized mortality. Beaver are also vulnerable to drowning beneath the ice during weather events such as violent spring break ups or sudden mid-winter snowmelts that rapidly raise water levels in streams (Baker and Hill 2003; Hood et al. 2009).

BEAVERS IN THE LIARD WATERSHED

Beaver are generalist herbivores and have a strong preference for leaves, twigs, and bark of woody plants as well as aquatic and terrestrial herbaceous vegetation. Preferred plant species include aspen, willow, cottonwood, and alder.

PHOTO: NORTH AMERICAN BEAVER, COURTESY JOEL RAMEDY, FLICKR CREATIVE COMMONS

Habitat Suitability

Beaver are generalist herbivores and have a strong preference for leaves, twigs, and bark of woody plants as well as aquatic and terrestrial herbaceous vegetation. Preferred plant species include aspen, willow, cottonwood, and alder.

FNFN members associate beaver with large and small waterbodies, understanding that "anywhere there is water, there is beaver there" (FNFN and Shifting Mosaics Consulting 2017). Beaver prefer sites adjacent to deciduous woody browse, an important forage item and building material (Baker and Hill 2004). Foraging distances are limited to about 100 metres away from water due to predation risk (pers. comm., G. Hood), and steep slopes could pose a barrier due to energetic cost and predation risk. Overall, suitable habitat tends to be defined by the following characteristics:

- Stable aquatic habitat with an adequate water supply;
- A stream channel gradient of less than 15%; and
- Quality food species of adequate quantity (Allen 1983).

Recent studies documenting beaver activity in FNFN territory confirm these habitat preferences in the Liard Watershed, including:

- A 2016 occupied lodge aerial survey (FNFN and Shifting Mosaics Consulting 2017) of 278 kilometres in the Sierra Yoyo Desan (SYD) Road-Elleh Road area; and
- A similar recent study (Tigner 2014) within a 2,037.5 km^2 area near Fort Nelson.

Based on active lodge[1] locations recorded in these studies, FNFN found that beaver prefer streams and lakes over shallow wetlands and muskeg. Publicly available datasets (Agriculture and Agri-Food Canada land cover classification from GeoGratis, and hydrology

1 Active lodges were defined as lodges with visible food caches, and/or signs of lodge maintenance.

and digital elevation model data from Natural Resources Canada), allowed FNFN to map beaver habitat based on typical habitat requirements:

- Within 100 metres of a stream, river, pond, lake, or wetland;
- Including deciduous woody land cover; and
- With slopes rated by steepness from flat (best, 0^0) to very steep ($>15^0$).

Overall, suitable beaver habitat covered 12.4% of the Liard Watershed (see Table 1). The majority of suitable beaver habitat in the Liard Watershed is located in the eastern Taiga Plains.

Table 1. Highly Suitable Beaver Habitat Available in FNFN Territory (150,527 km^2)

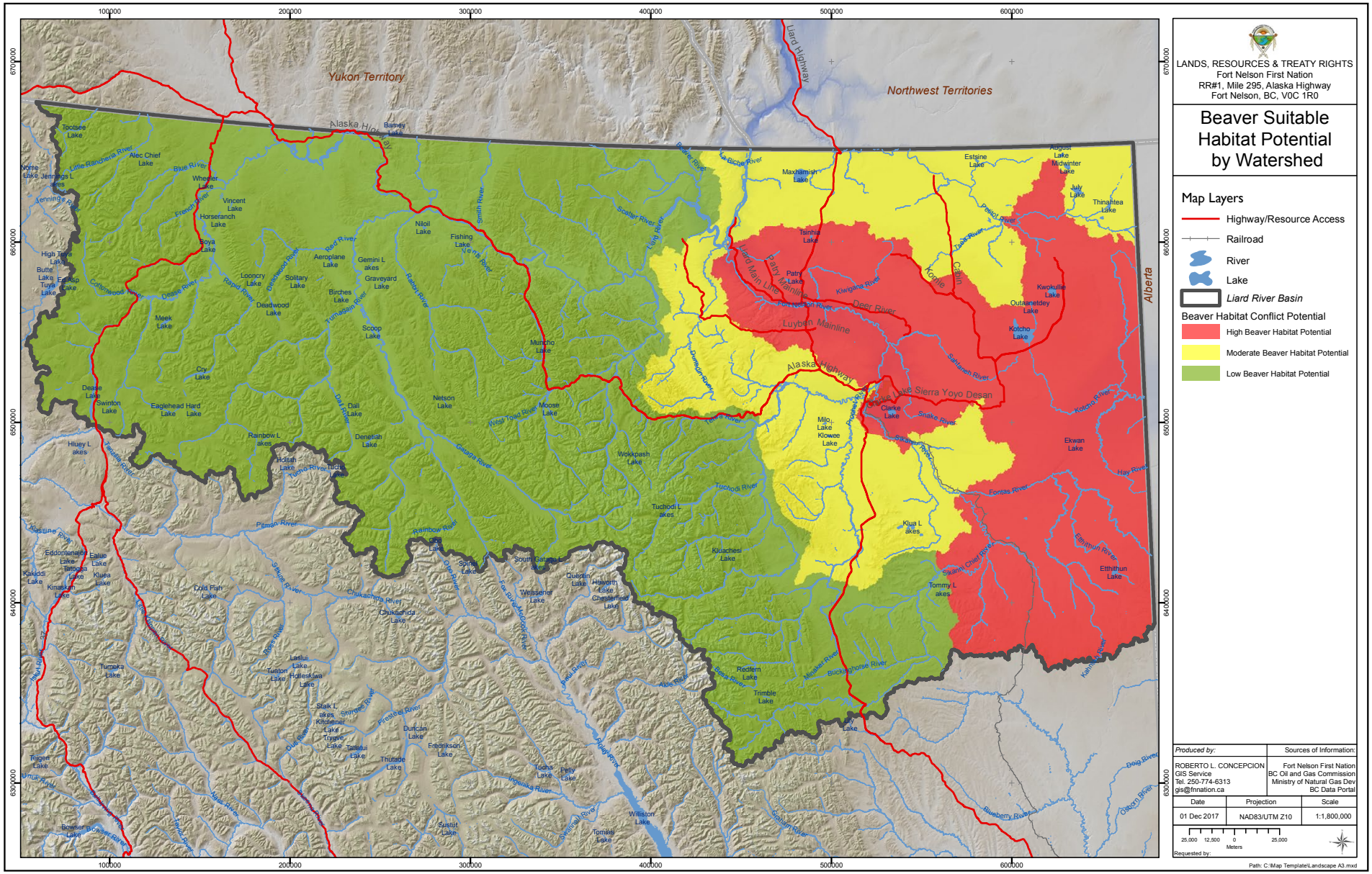
Habitat rating	Habitat type	Area (km^2)	% FNFN study area
Primary (preferred) habitats	Lake	1,100	0.7%
	Stream	5,824	3.9%
	Subtotal	6,924	4.6%
Secondary (less preferred) habitats	River	72	>1%
	Wetland	11,645	7.7%
	Subtotal	11,717	7.8
	Total area	18,641	12.4%

Note: There are some data deficits, most notably along the western portion of the Sierra Yoyo Desan Road (see Map 1 overleaf), that artificially reduce the amount of area estimated to be suitable beaver habitat.

Overall, suitable beaver habitat covered 12.4% of the Liard Watershed (see Table 1). The majority of suitable beaver habitat in the Liard Watershed is located in the eastern Taiga Plains.

PHOTO: NORTH AMERICAN BEAVER, COURTESY TUBAFIL/ FLICKR CREATIVE COMMONS

Map 1. Distribution of Suitable Beaver Habitat in FNFN Territory



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Beaver Suitable Habitat Potential by Watershed

Map Layers

- Highway/Resource Access
- Railroad
- River
- Lake
- *Liard River Basin*

Beaver Habitat Conflict Potential

- High Beaver Habitat Potential
- Moderate Beaver Habitat Potential
- Low Beaver Habitat Potential

Produced by:	Sources of Information:
ROBERTO L. CONCEPCION GIS Service Tel. 250-774-6313 gis@fnnation.ca	Fort Nelson First Nation BC Oil and Gas Commission Ministry of Natural Gas Dev BC Data Portal

Date	Projection	Scale
01 Dec 2017	NAD83/UTM Z10	1:1,800,000

25,000 12,500 0 25,000 Meters

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Table 2 shows the proportion of each sub-watershed in the Liard Watershed that exhibits high beaver habitat suitability.

Suitable beaver habitat is generally associated with the muskeg-dominated Taiga Plains in the eastern portion of FNFN territory. This is significant because it is in these same areas that road-building and other industrial activities that put beaver in conflict with humans have primarily occurred over the past 15 years.

Table 2. FNFN Sub-Watersheds with Suitable Beaver Habitat

#	Watershed name	% of beaver habitat area in watershed
1	Shekilie River	63%
2	Hay River	57%
3	Fontas River	46%
4	Kahntah River	37%
5	Kotcho Lake	37%
6	Lower Fort Nelson River	36%
7	Sahtaneh River	36%
8	Sahdoanah Creek	34%
9	Lower Sikanni Chief River	33%
10	Middle Fort Nelson River	32%
11	Upper Petitot River	23%
12	Tsea River	22%
13	Lower Petitot River	21%
14	Dunedin River	19%
15	Lower Muskwa River	18%
16	Upper Fort Nelson River	18%
17	Lower Prophet River	16%
18	Middle Prophet River	15%
19	Upper Liard River	7%
20	Upper Prophet River	7%
21	Dease Lake	6%
22	Upper Sikanni Chief River	6%
23	Upper Muskwa River	5%
24	Dease River	5%
25	Little Rancheria River	4%
26	Beaver River	4%
27	Blue River	3%
28	Middle Dease River	3%
29	Middle Muskwa River	3%
30	Lower Kechika River	3%
31	Cry Lake	2%
32	Toad River	2%
33	Upper Kechika River	2%
34	Turnagain River	2%
35	Liard River	1%
36	Coal River	1%
37	Gataga River	1%
38	Frog River	1%

Sources: Watershed data from Freshwater Atlas of BC, gov.bc.ca/gov/content/data/geographic-data-services/topographic-data/freshwater; beaver habitat suitability data from Solstice Canada Corp. (2016).

Beaver Population, Population Health and Trends

In general, the overall population of beaver is not thought to be at risk in B.C., or regionally within the Liard Watershed. The current population estimate in B.C. is about 400,000 to 600,000 individuals, and beaver are widely distributed across the Liard Watershed where suitable habitat exists.

Although beaver are not at risk in B.C. as a whole, impacts to their preferred habitat (wetlands) are significant in many areas in B.C. and local change and extirpation has occurred. However, these local effects are not well documented. While many FNFN members feel that local beaver populations are healthy, there is concern about the impacts on local beaver colonies from water withdrawals, from roads changing hydrological systems, and from the wasteful manner in which beaver are trapped and killed to manage their immediate impact on roads and other infrastructure.

Population count data has not been recorded for the Liard Watershed as a whole. Occupied beaver lodge data from an FNFN-commissioned 2014 study[2] identified a density of 0.26 lodges/km^2 (520 lodges in a 2,037.5 km^2 study area in the Taiga Plains/muskeg-dominated portion of FNFN territory). Given the average beaver family size per lodge is two adults with a minimum of two kits, this amounts to approximately one beaver per square kilometre in that large area. This density estimate is likely conservative, given that the average of 0.26 lodges/km^2 is relatively low compared with findings from an extensively studied southern boreal population (Miquelon Lakes study area, east-central Alberta, had an average density of about one occupied lodge/km^2 (G. Hood, pers comm.)).

Despite the lack of a specific population count, it is clear from the available data that FNFN territory, and in particular, the eastern muskeg, is amongst the richest beaver country in B.C.

Pressures and Conflict Zones

The primary pressure on beaver in the Liard Watershed is habitat loss and degradation and human-beaver conflict associated with industrial development. Pollutants released through accidental spills at oil and gas sites can reduce water quality, exposing beaver and other aquatic organisms to contaminants that affect overall ecological health. Water withdrawals by industry are a potential pressure on beaver habitat that has yet to be closely studied.

Beaver habitat is already degraded from forestry activities and fire suppression in the 1970s and 1980s. Clear-cutting and suppressing natural fire processes prevent mixed wood forest regeneration resulting in loss of beaver habitat. Logging in the past has also changed drainage patterns and reduced stream stability, and beaver carrying capacity.

PHOTO COURTESY TONY CYPHERT/FLICKR CREATIVE COMMONS

2 Tigner (2014), as noted in FNFN and Shifting Mosaics Consulting (2016).

The beaver's ability to create and expand wetland habitats often puts them in conflict with humans when this activity floods roads and other infrastructure built through or near waterbodies. Culverts, for example, are an ideal location for damming activities by beaver, particularly for populations that disperse through stream systems. The flooding caused by blocked culverts becomes an ongoing maintenance issue for infrastructure owners, and can become a significant annual cost (Boyles and Savitzky 2008). Beaver foraging of trees and shrubs (for dam and lodge materials, and sustenance) can also damage or remove treed areas used for forestry, recreational or residential purposes. As a result of these interactions, beaver are often seen and managed by government and industry as a nuisance species.

FNFN members strongly disagree with many of the ways beaver are managed in their traditional territory. Specifically, FNFN members have observed and brought forward complaints related to the destruction of beaver (shooting) and beaver dams and lodges by industry workers, broken dams and contaminated ponds as a result of development activity (e.g., in the SYD road area), and evidence of contaminated beaver habitat and beaver (e.g., white fluid in meat) in areas with high densities of gas wells.

FNFN has performed an analysis to quantify the number of potential conflict sites in the Liard Watershed by comparing the datasets for suitable/preferred beaver habitat and existing infrastructure, including linear and built infrastructure, past forest harvest areas, mining activity, oil and gas management areas, and other land uses (e.g., residential, agricultural, commercial recreational). In total, the analysis identified nearly 147,000 potential conflict sites in FNFN territory (Solstice 2016), suggesting beaver management will continue to be a significant issue in the Liard Watershed, especially in the eastern Taiga Plains region.

Map 2 on the following page shows in yellow areas within the Liard watershed where suitable beaver habitat and the areal and linear disturbance (with a 250 metre buffer), overlay one another. Areas in green are suitable beaver habitat that are not at heightened current risk of conflict with industrial activity.

Culverts are an ideal location for damming activities by beaver, particularly for populations that disperse through stream systems. The flooding caused by blocked culverts becomes an ongoing maintenance issue for infrastructure owners, and can become a significant annual cost.

PHOTO ABOVE: STRUCTURE TO PREVENT NORTH AMERICAN BEAVER DAMS ABOVE BY MALCOLM K/FLICKR CREATIVE COMMONS

BELOW: BEAVER AT A POTENTIAL RESTORATION SITE IN NORTHEAST BC, COURTESY S.E.R. LEVERKUS

Map 2. Locations of Heightened Beaver-Industry Conflict Potential

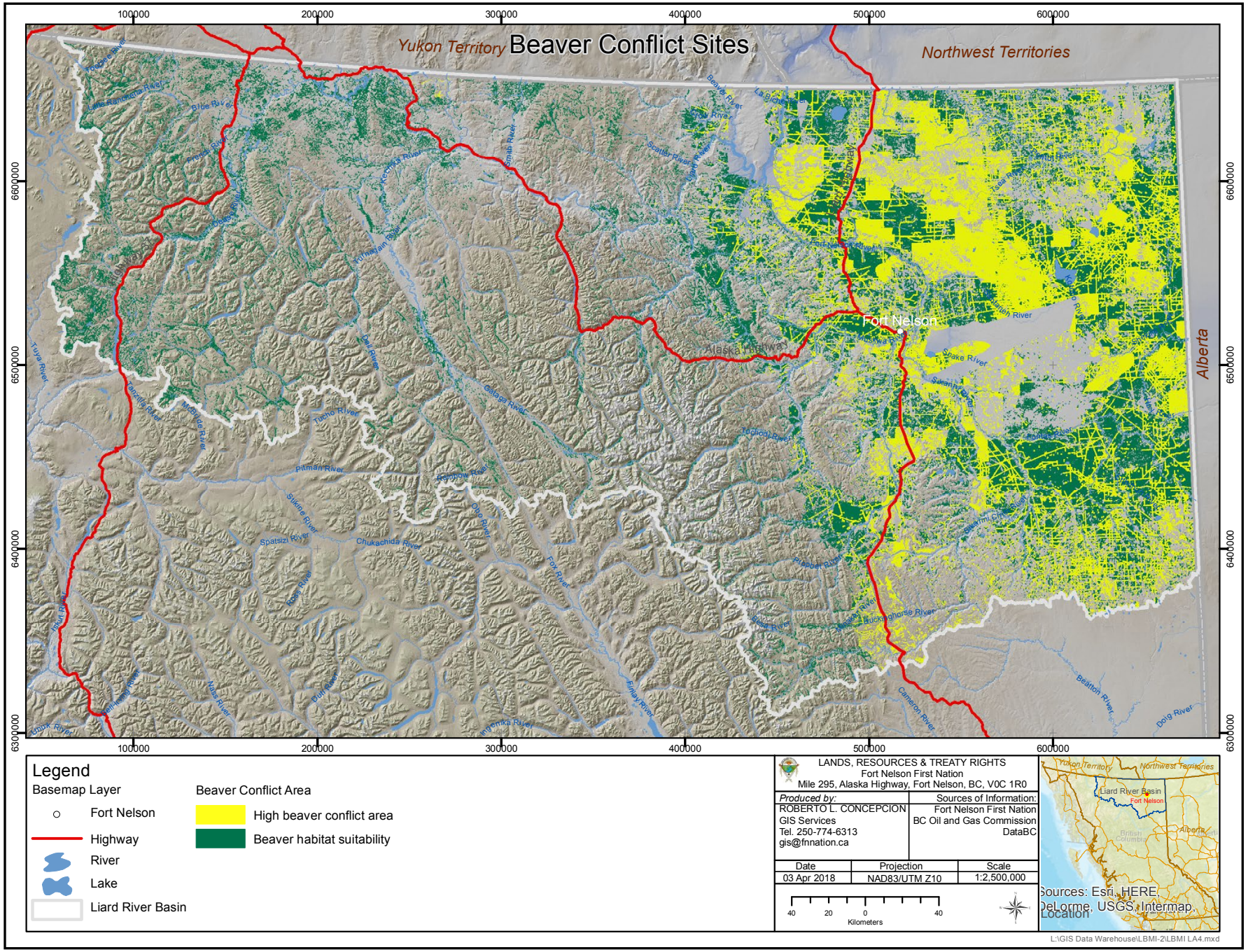


Table 3 below, and Map 3 on page 19, show the FNFN sub-watershed with the highest to lowest risk of beaver-industry conflict, by area.[3]

Table 3. FNFN Sub-Watersheds – Beaver – Industry Conflict Potential Area

Basin name	% high beaver conflict
Sahtaneh River	39.7%
Hay River	31.2%
Shekilie River	30.1%
Sahdoanah River	27.2%
Kiwigana River	26.0%
Upper Kotcho River	22.3%
Capot-Blanc Creek	22.2%
Lower Kotcho River	21.7%
Middle Fort Nelson River	20.0%
Tsea River	15.3%
Kahntah River	14.6%
Fontas River	11.7%
Lower Sikanni Chief River	11.7%
Upper Petitot River	11.1%
Middle Petitot River	10.9%
Lower Petitot River	10.8%
Klua Creek	9.4%
Lower Liard River	8.9%
Lower Fort Nelson River	8.5%
Snake River	8.4%
Middle Prophet River	6.9%
Upper Fort Nelson River	6.6%
Lower Prophet River	6.2%

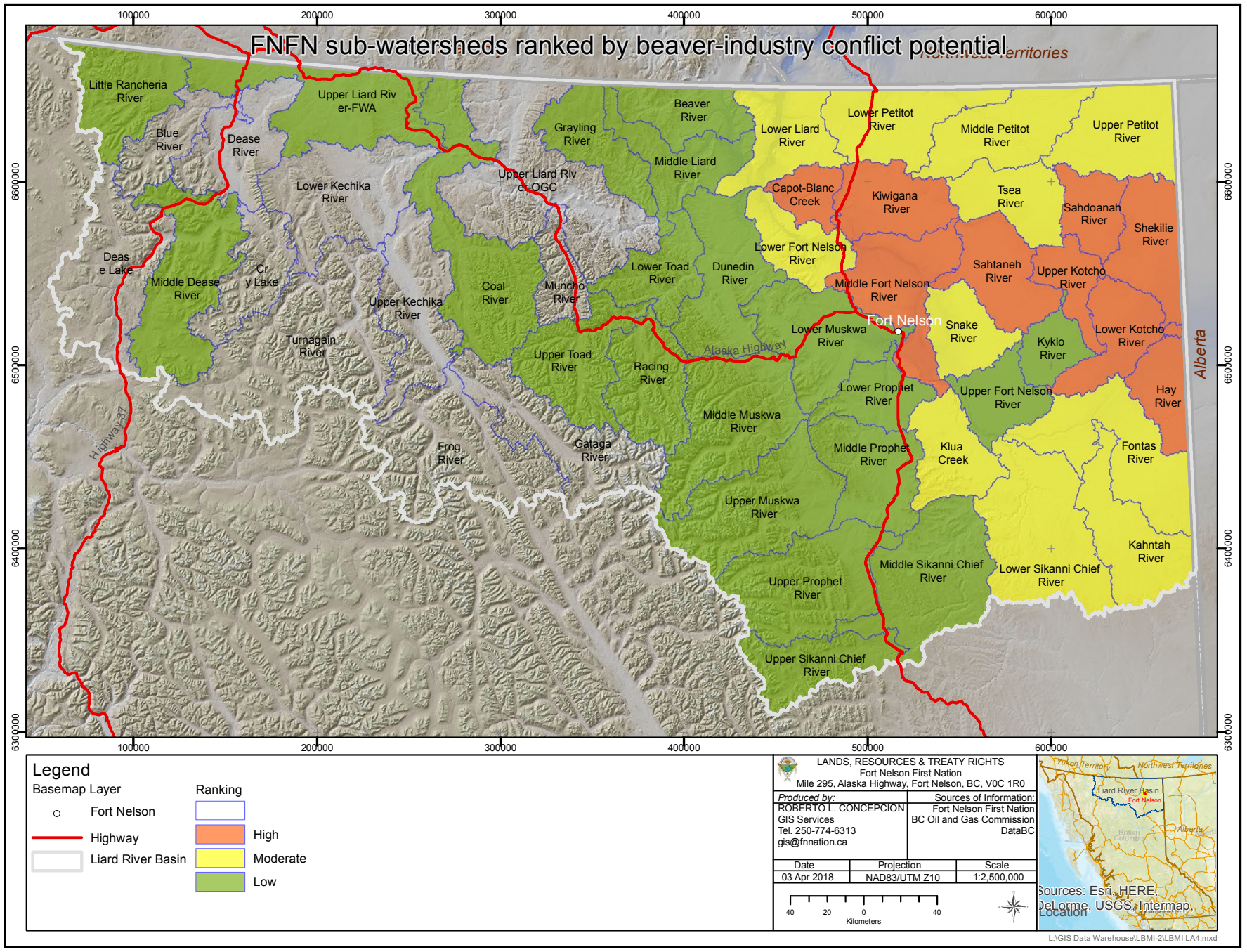
3 In Map 3, no data was available for sub-watersheds that are not colour coded. In addition, beaver habitat suitability data deficits likely lead to underestimation of beaver-industry conflict potential in the Upper Fort Nelson River, Snake River, and Kyklo River sub-watersheds.

PHOTO: FNFN LANDS DEPARTMENT

Table 3 continued

Lower Muskwa River	6.1%
Middle Sikanni Chief River	4.6%
Kyklo River	4.1%
Upper Prophet River	1.9%
Dunedin River	1.8%
Upper Sikanni Chief River	1.1%
Beaver River	0.7%
Upper Muskwa River	0.7%
Middle Muskwa River	0.2%
Middle Liard River	0.2%
Coal River	0.0%
Lower Toad River	0.0%
Upper Liard River-FWA	0.0%
Grayling River	0.0%
Upper Toad River	0.0%
Middle Dease River	0.0%
Little Rancheria River	0.0%
Racing River	0.0%

Map 3. FNFN Sub-watersheds Ranked by Beaver-Industry Conflict Potential



MOVING FORWARD IN BEAVER MANAGEMENT AND MONITORING

Beaver Management

In general, we need to better understand how beaver populations respond to local beaver management in order to develop more effective practices that align with FNFN values.

PHOTO: NORTH AMERICAN BEAVER COURTESY CONRAD KUIPER/FLICKR CREATIVE COMMONS

Beaver management becomes necessary when beaver block or damage human infrastructure during dam-building activity and associated flooding of nearby areas. Industry and government regulators will be expected to refer to the FNFN Beaver Management Policy and engage FNFN Lands Department for detailed information on alternative beaver management options that could be applied in FNFN territory to mitigate or respond to human-beaver conflict in more effective and culturally-appropriate ways, including non-lethal diversions, protection devices, and planning for road construction options.

Beaver Monitoring Needs

In general, we need to better understand how beaver populations respond to local beaver management in order to develop more effective practices that align with FNFN values. FNFN is planning community-led monitoring programs to address current information and monitoring gaps, including collecting data on beaver management from industry, and scheduled and opportunistic application of specific beaver conflict site monitoring protocols. For more information on FNFN beaver monitoring, contact the FNFN Lands Department.

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