

Cumulative Impacts to FMFN#468 Traditional Lands & Lifeways

Shell Jackpine Mine Expansion and Pierre River Mine
Report for Regulatory Hearings

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Prepared for
Fort McMurray First Nation #468

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Table of Contents

Abbreviations	iii
 Introduction & Overview	 1
Figure 1: FMFN #468 Regional Disturbance Study Area.....	2
Methodology & Approach.....	3
Baseline & Background Information	3
Study Areas & Timelines	4
Figure 2: FMFN #468 Focused Disturbance Study Area	5
‘Current’ Traditional Use.....	6
Cultural & Historical Background	8
Fort McMurray First Nation #468	8
Historical Forces & Cultural Interactions.....	10
Existing Effects.....	14
Analysis & Results.....	25
Traditional Lands Alienation	25
Disturbance Analysis.....	26
Figure 3: Disturbance Zones of Influence in the RDSA.....	29
Figure 4: Disturbance Zones of Influence in the FDSA	30
FMFN #468 Traditional Lands & Existing Shell Leases	32
Figure 5: FMFN #468 Traplines in the FDSA	33
Figure 6: FMFN #468 Cabins and Trails in the FDSA.....	34
Figure 7: FMFN #468 Big Game Harvesting in the FDSA	35
Figure 8: Furbearers, Fish and Birds in the FDSA.....	36
Figure 9: Trees, Plants and Berries in the FDSA.....	37
References Cited	38
 Appendix A: Disturbance Analysis Methods	 44

Abbreviations

AANDC	Aboriginal Affairs and Northern Development Canada
ATC	Athabasca Tribal Council
ATV	all-terrain vehicle or 'quad'
FDSA	focused disturbance study area
FMFN #468.....	Fort McMurray First Nation #468
GIS	geographic information systems (computer mapping)
JPMX	Jackpine Mine Expansion
LARP	Lower Athabasca Regional Plan
MOSS	Mineable Oil Sands Strategy
MSES.....	Management and Solutions in Environmental Science (consultants)
NRTA.....	Natural Resources Transfer Agreement
PLAR.....	Public Lands Administration Regulation
PRM	Pierre River Mine
RDSA	regional disturbance study area
Shell	Shell Canada Energy
TARR	Treaty and Aboriginal Rights Research
ZOI	zone of influence

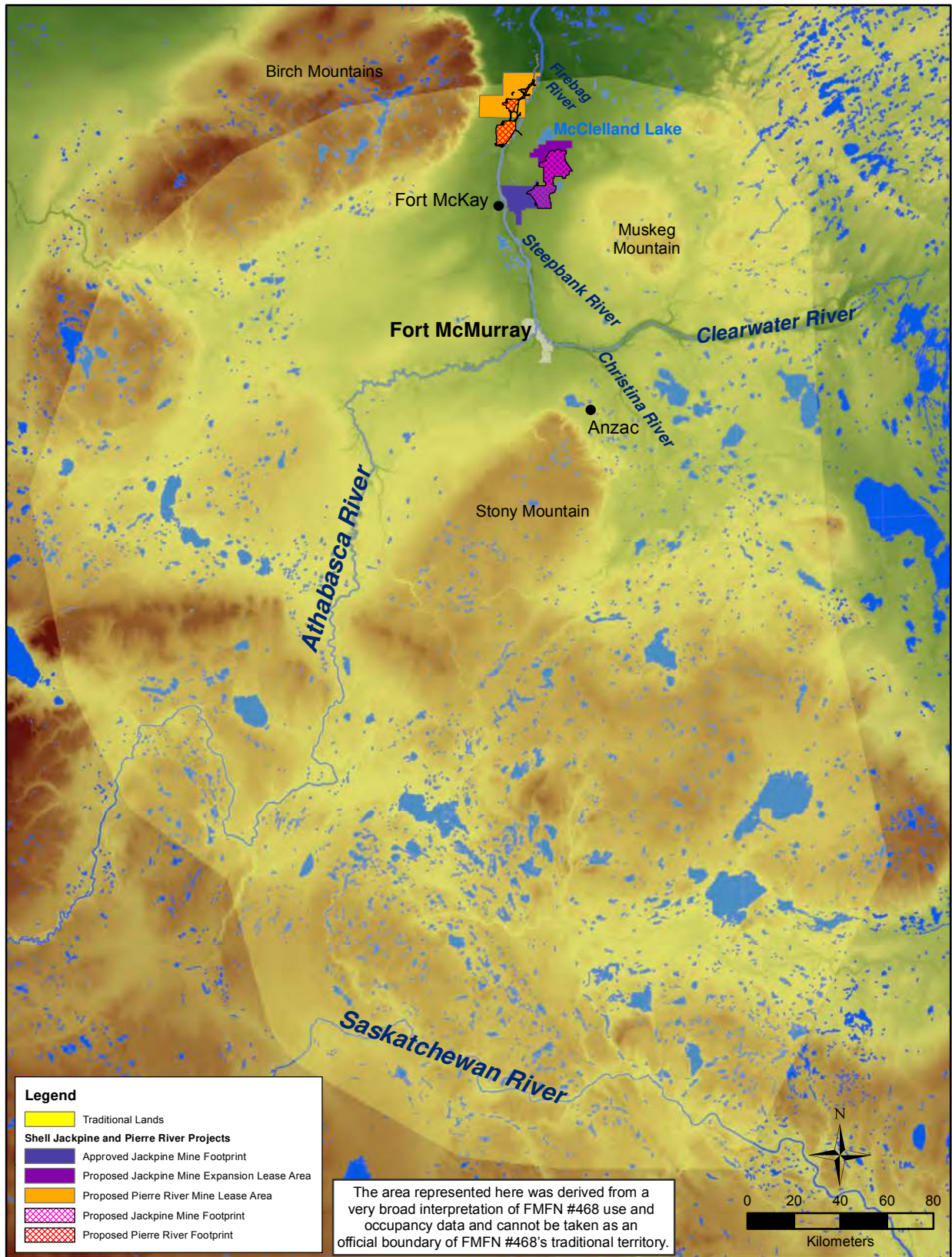
Introduction & Overview

This report was prepared in support of Fort McMurray First Nation #468's (FMFN#468's) participation at the regulatory hearings for Shell Canada Energy's (Shell's) Jackpine Mine Expansion and Pierre River Mine projects. As can be seen in Figure 1, both of the proposed projects are within the northern reaches of FMFN #468's traditional lands.¹ This report provides a description of existing effects and disturbance in FMFN #468's territory, and of how Shell's two proposed developments – the Jackpine Mine Expansion (JPMX) and Pierre River Mine (PRM) – are situated within FMFN #468's known and recorded traditional land use (TLU).

The following sections and information are included in this report:

- A section describing the methodology and approach of the analysis of cumulative impacts to FMFN #468 use and occupancy, as well as background information used for the basis for study area selection.
- A cultural and historical context section that provides an overview of the location of FMFN #468's traditional lands and reserves, some historical context on encroachments in their traditional lands, as well as some information from Elders and other community members on existing cumulative effects in the region. Much of this information was collected during assessment work with the community for a proposed project near Muskeg Tower, east of the JPMX (Labour and Dickson 2012).
- An analysis section, which provides the results of the cumulative effects disturbance analysis conducted by the MSES (Management and Solutions in Environmental Science) consulting team (see Appendix A for methods used in this analysis). This section also contains a qualitative description regarding the extent and depth of land alienation that is being experienced by FMFN #468 members.

¹ Figure 1 does not represent the entire extent of FMFN #468's traditional territory, but rather is an arbitrary boundary created based on existing GIS layers from the Nation's traditional land use study, and was used for purposes of the disturbance analysis. The Methodology & Approach section that follows describes this in more detail.



Fort McMurray No. 468 First Nation

**FMFN #468
Regional Disturbance Study Area**



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Data sources:
GeoBase CDEM 1:250K
FMFN #468 (2006): Nistawayaw

Figure Number

1

Datum

NAD 83

Projection

UTM Zone 12

Date

31 July 2012

Version

2

Drawn

Approved

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Methodology & Approach

The following section describes the origin of the background information being used for analysis, the geographical and temporal study areas selected, as well as some description of the nature of traditional use.

Baseline & Background Information

Much of the information provided in this report is based on previous studies and work. The cultural and historical context information is borrowed from a piece of work that was done for an impact assessment conducted with FMFN #468 members in 2011 and 2012 (Labour and Dickson 2012). The quotes and comments from FMFN #468 members in the Existing Effects section are from that same study. In using information from individual FMFN #468 members, when a transcript was available, the person's quotes are presented in double quotation marks. If the remarks were made during a group meeting that was not transcribed, they are shown in single quotations. If a summary or paraphrase of a member's comment is presented, it is either explained with a note, or presented in the text without quotations.

The traditional use and occupancy information presented in the maps and used for the disturbance analyses is based on a traditional land use study conducted by FMFN #468 in the early 2000s (FMFN #468 2006). Over 30 FMFN #468 members and Elders were interviewed for this study, some of who are no longer able to share their stories and knowledge today. Community members have shared that there are gaps in the information presented in this report. However, it does present a picture of the geographic extent of FMFN #468 use, both in the vicinity of the JPMX and PRM leases, and in the region generally, and illustrates that the project area has recorded use by FMFN#468 members. A more detailed description of this use is provided in the Analysis & Results section.

Apart from two affidavits sworn by FMFN #468 members for the JPMX project (Cheecham 2011, Al.Cree 2011) there has been no further collection of 'current' FMFN #468 traditional use and occupancy information that could be used as a meaningful assessment of potential project effects to FMFN #468 from Shell's proposed projects.

Other information from previously published work was referenced and used as appropriate (e.g., FMFN #468 member affidavits, consultants' reports).

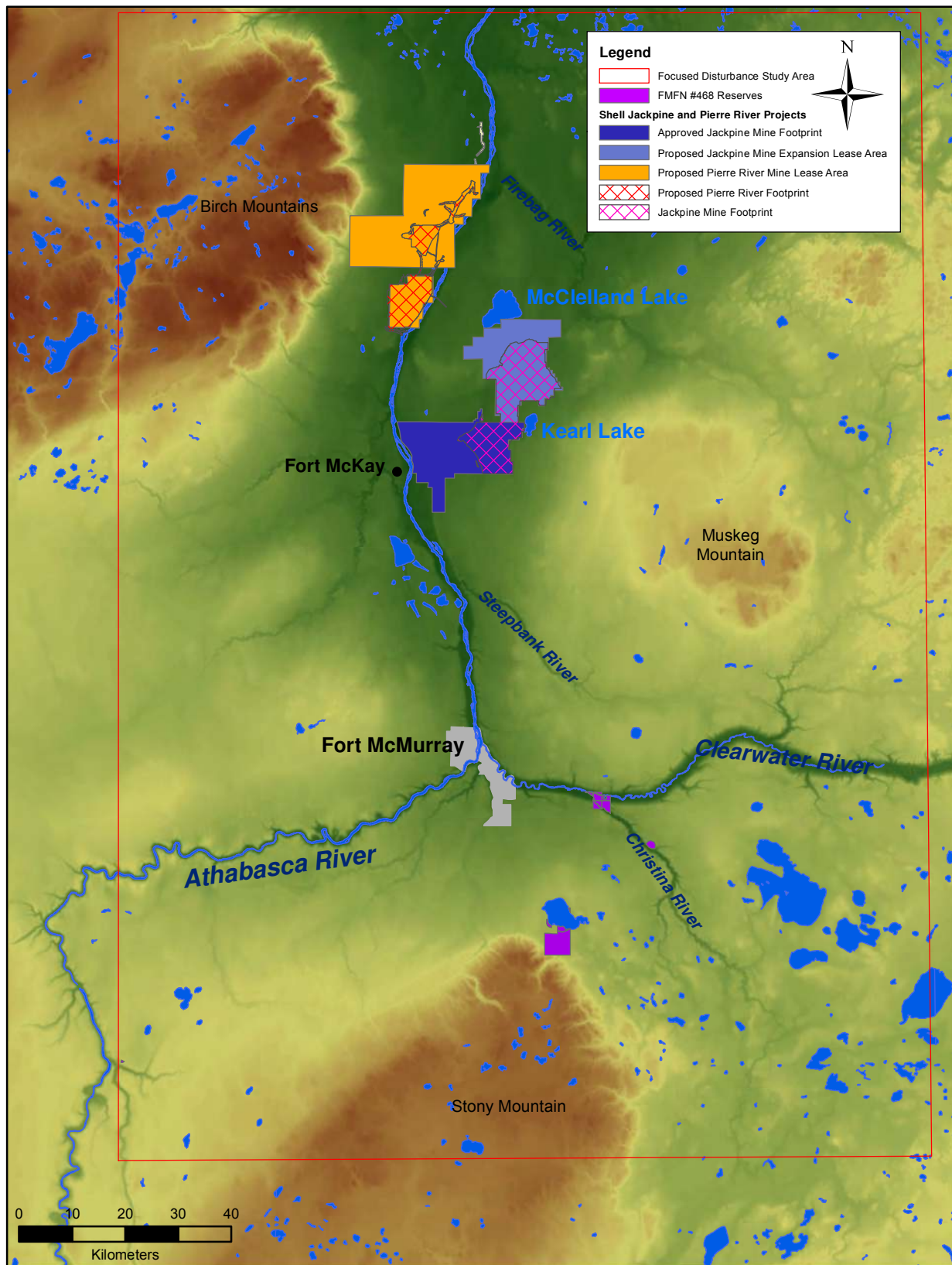
Study Areas & Timelines

A disturbance analysis, based on a ‘focused’ study area and a more regional study was conducted by MSES (see Appendix A for the methods used in this analysis). A description of this analysis is provided in the Analysis & Results section. The regional area selected for disturbance analysis is based on a broad generalization of FMFN #468 ‘traditional lands’. Using the GIS data provided from *Nistawayaw: Where the Rivers Meet* (FMFN #468 2006) maps, a general area encircling use & occupancy sites was used as a polygon to create a ‘regional disturbance study area’ (RDSA, Figure 1).

A second, more focused study area was selected for the examination of FMFN #468 sites in relative proximity to the leases themselves. This more ‘focused disturbance study area’ (FDSA) illustrates FMFN #468 use from the reserves near Gregoire Lake, along the Clearwater River and downstream along the Athabasca River (Figure 2). The Clearwater River watershed is considered a culturally significant area by FMFN #468 peoples (Strom and Labour 2011, Labour and Dickson 2012). The focused study area shows contiguous FMFN #468 harvesting patterns from the Clearwater watershed downstream along the Athabasca to the proposed JPMX and existing Shell leases. The rivers have always been considered as ‘highways’ for northern Native peoples and are critical in their harvesting and other traditional activities (FMFN #468 2006). Maps in the two affidavits collected from FMFN #468 members for the proposed JPMX project present a similar picture of connected use along the river systems downstream near the Shell lease areas (Cheecham 2011, Al.Cree 2011).

Temporal considerations for this report include a concept of ‘current use’ as used by the Alberta government to distinguish ‘historic’ resources from more recent sites. The general cutoff for ‘historic’ in this case is 50 years. Anything (structures specifically) more than 50 years old can be considered ‘historic’, while anything more recent may be considered ‘current’ (Alberta Culture website 2012). While the focus of FMFN #468’s traditional land use study would have been ‘historic’ in this sense, it would have also been within the memory of Elders interviewed within the last eight years, and therefore at least some of the traditional use information collected can be presumed to be ‘current’, and certainly within the timeline of the last 50 years. Consideration of ‘current’ from a cultural or anthropological perspective is also more appropriate to a 50 year timeline. Traditional use, a term loosely used to apply to Aboriginal harvesting on the landscape, incorporates both historic and current use. (See text following for a more indepth description.) Cultural sharing and knowledge transfer can only occur when the knowledge of several generations is involved (generations may be viewed as approximately 25 to 30 years in length). For cultural knowledge to be current, it must be both active and tied to several generations of ancestors.

The term ‘traditional’ can also be problematic because it may be interpreted by some to refer only to past activities. In reality, ‘traditional use’ is as dynamic and ever-evolving as is the knowledge it is based on. Traditional knowledge and use therefore encompass a concept of ‘culture as a continuum’ because they refer to “social attitudes, beliefs, principles, and conventions of behaviour and practice derived from historical experience”, which are also “cumulative and open to change” (Berkes 1999: pgs. 3-8).



Fort McMurray No. 468 First Nation

**FMFN #468
Focused Disturbance Study Area**



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Data sources:
GeoBase CDEM 1:250K
FMFN #468 (2006): Nistawayaw
Atlatlis Crown Reservation (2007)

Figure Number

2

Datum

NAD 83

Projection

UTM Zone 12

Date

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‘Current’ Traditional Use

In the context of better understanding what ‘current’ means from a traditional knowledge and use perspective, a further explanation of ‘traditional use’ is presented below. Much of this text is borrowed from a previously written guidebook for the collection and application of traditional use and knowledge information in impacts assessments (Labour et al. 2005).

Traditional use information can be defined as information about how a culture used (and uses) the land and its resources, and may be presented through a study of trails, placenames, subsistence resource use, sacred and cultural sites, burials, settlements and camps, and other places, uses or knowledge relevant to life on the land. It refers to current use, associated with some historic time depth, of a particular geographic area, as defined by the particular Aboriginal group.

Traditional use by Aboriginal communities represents practices, developed in the pre-contact past, that allow for not only survival, but for cultural growth and development in the regional environment. Many aspects of these practices may have changed through time. Some of the changes were a direct result of prevailing economic conditions, whereas others were related to processes of acculturation. Given the nature and magnitude of acculturation through time (e.g., in Canadian context, fur trade and Christian proselytization), it is necessary to review the historical context for cultural change in order to fully understand traditional use and impacts to traditional practices by proposed developments.

Because it deals with culture and cultural practices and change, traditional use work is anthropological in nature. In this context, archaeological, historical and traditional use sites represent a continuum of the cultural heritage of an Aboriginal community and collectively constitute heritage resources. From a practical and visible perspective, traditional use reflects all aspects of daily activities including the types of locally used resources, as well as the locations in which the resources were procured, processed and used, the associated observances and ceremonies, and the communication routes used to access the resources. Similarly, social interactions and activities, including ceremonial activities, and their locations, and customs affecting and resulting from resource and landscape use constitute a part of traditional use. Because of the ephemeral nature of many of these activities, the associated locations may or may not have tangible remains associated with their use. Traditional use may be ephemeral not only in location, but also in time. Not every site or area is used every year; some sites may be highly significant and only used infrequently or with irregular periodicity.

Physical features or locales and landmarks associated with oral tradition also represent an important facet of traditional use. These sites may or may not have had any associated cultural remains. Camp sites, cabins, traplines, fish processing areas, and other sites that were occupied or used for more extended periods of time represent aspects of traditional use and often have structural and other

feature remains that are evident. Trails, recognized landmarks, sacred areas, and rendezvous locations may have no visible, tangible cultural associations.

It is important to note that although the sites and locations themselves represent important evidence for traditional use activities, the perspectives of the Aboriginal people on the meaning of these sites as expressed in oral tradition are also an essential component of traditional use information. It is often this information, more difficult to obtain, that is most valuable in determining the direction and extent of 'cultural impact' relative to traditional use. The philosophical context for resource use, site use, and site significance, as well as associated customs is of utmost importance in understanding the Aboriginal perspective of their relationship(s) to the land, and the resources and the cultural mechanisms for interacting with nature upon which all relationships and harvesting success and livelihood are based. As such, this connection between culture and environment is one of the key 'relationships' to be addressed in impact assessments.

Cultural & Historical Background

This section contains information on FMFN #468 history, including a brief overview of reserve lands and Treaty 8, of which FMFN #468 is a signatory, as well as a description of some of the historical forces affecting FMFN #468 traditional lands and lifeways.

Fort McMurray First Nation #468

The community that is today known as Fort McMurray First Nation #468 (FMFN #468) has undergone several evolutions. FMFN #468 were part of the 'Cree-Chipewyan Band of Fort McMurray' that originally signed treaty on August 4th, 1899 (FMFN #468 2006, AANDC 2009). Two 'headmen' signed on behalf of the Cree-Chipewyan Band – Adam Boucher and *Seapotakinum* Cree (spelling as per treaty documents). *Seapotakinum* was an ancestor to the Cree people staying along the Clearwater River (Cree 1975, D.Cree 2011). FMFN #468 and Fort McKay First Nation were originally part of the same Band, but split in 1942 (ATC 2009). (Additional information on the history of Cree and Dene peoples of northern Alberta is available in FMFN #468's traditional land use study *Nistawayaw* (2006).)

FMFN #468 History & Ancestry

The family groups that were to become and remain part of FMFN #468 were people living along the Clearwater River, families staying around Willow Lake (now known as Gregoire Lake; also refers to area around Anzac), and a Cheecham family group around Cheecham Lake. Land in the Willow Lake area was opened up for homesteading in the early 1900s; families who settled here included the Cheechams, the Haineaults and the Miltons (FMFN #468 2006).

In his interview for the Treaty and Aboriginal Rights (TARR) project, Elder Joe Cheecham shares that the reserve at Willow Lake was chosen because there was good fishing there (no commercial fishing was to be allowed), it was a good agricultural area, and because of the transportation access provided by the railway (and later, highway) (Cheecham 1975: pg.3). The people who stayed in the Anzac area were of both Cree and Chipewyan heritage. "About half" of the Chipewyan peoples left to go stay in Janvier "a long time ago" (Cheecham 1975: pg.4). Elder Cheecham also explains that "it is said that years ago the Indians" used to stay at a lake known as 'Kinooshayo' [Kiniewshoe] or Jackfish Lake near the provincial boundary (1975: pg.3-4). This lake is thought to be 'Fish Lake' south of Christina Lake (Elders at Cenovus Borealis project follow up meeting; February 9th, 2012).

Families at the forks of the Clearwater and Christina Rivers at the time of treaty were a number of Cree families and Martin siblings (FMFN #468 2006). In an interview conducted in the mid-1970s, Elder Julian Cree explained that Cree peoples along the Clearwater were his relations and that there were four different families living at the Clearwater settlement when treaty was signed. He also noted that people stayed at Christine Lake [sic, Christina River] (Cree 1975). One of the Cree family descendants explained that two different Cree groups shared the area around the forks – the Highbush Cranberry Cree or the Christina River Cree, and the Clearwater River Cree people or Paul Cree Band (D.Cree 2011).

In the late 1960s, the government decided to relocate the Clearwater River Cree people who were staying at 'Cree Crescent' in Waterways (now part of Fort McMurray) to the Anzac reserve. The Clearwater River Cree had always made Waterways and the area where the Clearwater River reserve is located part of their seasonal round (Cree 1975, Au.Cree 2011, D.Cree 2011). This resettlement was not entirely supported by either the people living at Cree Crescent or the people living at Anzac. The Clearwater Cree people consider themselves "separate" from other cultural groups within FMFN #468 and would have preferred to stay along the Clearwater (Cree 1975, D.Cree 2011). In an interview conducted in the 1970s, former Chief Elder Joseph Cheecham explains that the Clearwater peoples "belong here", that is, are part of the FMFN #468 Band and reserve at Anzac, but acknowledges that they would likely have stayed at the Clearwater Reserve had road and bridge access to the reserve been provided (Cheecham 1975).

The government had promised the Paul Cree Band that a road would be built from the Clearwater Reserve to Waterways. That never happened and the settlement at Cree Crescent grew into a more permanent village, with people staying there year-round (FMFN #468 2006, D.Cree 2011, Tremblay 2011). The reasons given for the relocation were never very clear. Some homes were bulldozed or burned while people were in the bush. Trailers were installed and then moved to the Anzac reserve. It appeared that the government was trying to clear the way for development (FMFN #468 2006). Others remember being told that it was determined that this was not a good place to live due to spring flooding, but noted that that had never interfered with their settlement or way of life before (D.Cree 2011, Tremblay 2011). Requests for additional monies for housing the Clearwater River Cree peoples on the Anzac reserve also never materialized (FMFN #468 2006).

FMFN #468 Reserves

Reserves were set aside in the Fort McMurray region in the early part of the 20th century. FMFN #468 reserve locations reflect their diverse heritage and history on the land. The Clearwater Reserve (#175) at the forks of the Christina and Clearwater Rivers is also known as the Paul Cree Band Reserve. Paul Cree was the son of *Seapotawakinum*, the Headman who signed treaty for the Clearwater people (spelling as per *Nistawayaw*). Three other reserves were established – reserves #176, 176a and 176b – on the south and northeast shores of Willow Lake (now called Gregoire Lake) near Anzac (FMFN #468 2006). A fifth reserve, called the Alexis Reserve, located along the Clearwater River due east of Gordon Lake, is known

to FMFN #468 members but does not appear to have been included in the government's records (AANDC 2008, D.Cree 2011).² In a previous study, Elders Bill and Nancy Woodward showed researchers a 1983 Alberta Energy and Natural Resources, Forest Management Unit Map, which shows the Alexis Reserve on the Christina River about eight miles south of the Clearwater Indian Reserve #175 (Desjarlais et al. 1993: pg.16).

Historical Forces & Cultural Interactions

It is difficult, if not impossible, to understand Indian-White relations in any part of Canada today without some understanding of the history of treaties and the government policies that have affected harvesting and other traditional activities. Every interaction between Native and non-Native peoples in Canada today is in some way influenced by this history. This is especially true in northern Alberta where resource development is the driving force. The sections below provide an overview of some of this history as is relevant to FMFN #468.

Treaty 8

FMFN #468 is a signatory to Treaty 8. Oral history and evidence from First Nations peoples throughout Treaty 8 territory is “relatively uniform” in that the act of signing treaty was an agreement to peacefully share the land with white settlers coming into their traditional territories (Stamp, *n.d.*; Flanagan 2000; Fumoleau 2001; Maklem 2007: pg. 152). Many Treaty 8 Nations argue that they signed a ‘nation-to-nation’ agreement that “not only recognized their rights to maintain a traditional way of life without restriction, but that also included rights to education, medical care, tax exemptions, immunity from military conscription and access to land, game and other resources for as long as the sun shines upon those lands” (Treaty 8b website, *n.d.*).

There was never an understanding on the part of First Nations that all lands, except what was to be allotted in reserves, were being ‘surrendered’. This would have been a difficult concept for Aboriginal peoples to understand given their ethic and worldview of ‘ownership’ even if it had been appropriately explained (Fumoleau 2001, pg. xxiii). In fact, Clifford Sifton’s Report of Commissioners admits that, had the negotiators not guaranteed ‘the Indians’ harvesting rights, it is doubtful that First Nations peoples would have signed treaty at all. Today, Treaty 8 First Nations “argue for a ‘spirit and intent’ interpretation of the Treaty relationship that implies greater access to, and control over, lands and resources and a general tax exemption” (Treaty 8a website, *n.d.*).

² This land may have been reserve land taken under the ‘lands in severalty’ clause of Treaty 8, which provided for Band members to have ‘private’ property and may explain why this reserve was known as the ‘Alexis Cree Reserve’ (McCullough, pers. comm. 2012).

During the 1970s, some foundational research on the 'Indian interpretation' of treaty was done. Part of this was Father René Fumoleau's exhaustive work on Treaties 8 and 11 (2004, 1st ed. 1975). Another broad-ranging study that began during this time was the Treaty and Aboriginal Rights Research (TARR) project. Spread across Canada, it covers many different treaties, and is comprised of hundreds of interviews with Elders.

Fumoleau's work established that First Nations' understanding of treaty was basically two-fold. First, that their traditional way of life was to continue as it was, and second, that they were agreeing to peacefully share the land when they signed treaty. Fumoleau presents an example of one of the 46 affidavits that Bishop Gabriel Breynat, a long-time supporter and advocate for the treaty rights of Native peoples in the north, collected in the mid-1930s from witnesses to treaty negotiations. Twenty-one of the affidavits collected were from witnesses to the Treaty 8 negotiations. The affidavits state that the Indians were requesting clarification of treaty text and their understanding that the Crown had promised that:

- The way of life that had been passed on by their ancestors would not be interfered with.
- The "old and destitute would always be taken care of".
- Their livelihood would be protected from "White competition" and that "they would not be prevented from hunting and fishing" (Fumoleau 2004, Appendix II, pg.441).

Transcripts from the TARR work reveal that, similar to Fumoleau's research, the 'Indian Understanding of Treaties' was that "Indian people would be allowed, given the freedom to retain their mode of life..." and "the Indians were promised that they would be free to go wherever they pleased. They understood this to mean that they still owned the land" (Greenwood 1974). First Nations believed that signing treaty was a means of ensuring that there would be no restrictions on their livelihood; they "wanted to maintain their hunting, fishing and trapping to sustain themselves for that was their only means of survival" (Stamp, TARR, *n.d.*). Rather, "the Indians understood that things were to be given to the Indians for allowing the white settlers to move in" (Greenwood 1974).

Elder Julian Cree, a member of FMFN #468, was born in 1890 and was told that people would never have signed treaty without the encouragement of the local priest. He explained that "in those days the Indians were illiterate. They were just going by what they were told" (Cree 1975: pg.5). What oral history records them being told was that, "'There would be no hardship as long as the river flows and sun walks.' That is all they understood. The hunting and fishing would not be disturbed, but it is not that way today" (Cree 1975: pg.5). In his experience, these treaties promises were not kept because, "It is getting so bad now that even if you want to fish you must have a permit" (Cree 1975: pg.3). He adds that, "...when there is sale of land all the money goes to the white man, he really has no right to the land. When you stop and think everybody should benefit from it" (Cree 1975: pg.3).

Another FMFN #468 Elder reiterated how the 'white man [treaty] promises were not kept' (Clark 2011). She cited examples such as the promise that reserves lands would represent 2.5 acres per member, and

the promise that ‘cows and ploughs’ would be provided to help develop the land. In her opinion, FMFN #468 members are ‘losing all our treaty rights’ (Clark 2011).

Development, Newcomers & Government Regulation

Much of northern Alberta had been surveyed for its economic resource potential by the late 1800s (Fumoleau 2004, McCormack 2010). The railway reached the Clearwater River in 1921 (Fumoleau 2004) and Waterways, six miles south of Fort McMurray, four years later (McCormack 2010: pg. 223). Oil exploration and development were taking place in the region as early as the 1920s and 1930s with small-scale projects, but the population of Fort McMurray remained below a few hundred until about the mid-1960s when it reached about 2,000. Highway 63 between Edmonton and Fort McMurray was completed in 1967 (gravel), while Highway 881 through Anzac to Lac La Biche was not completed until about 1985 (FMFN #468 2006, Quintal 2011). This highway runs right through the Gregoire Lake Reserve #176, and presents noise, safety and pollution issues for Band members living there (Quintal 2011).

FMFN #468 Elders speak of the 1960s as a defining time of change in their region. From the 1960s onward, resource exploration and development in the region became the main factor in changes to traditional lifeways (FMFN #468 2006, Dersch and Labour 2007, D.Cree 2011, Jensen 2011, W.Cree 2011). It has resulted in a large population influx to the region and incredible increases in the size of Fort McMurray and other smaller surrounding communities like Anzac. By 2007, Fort McMurray had a ‘permanent population’ of over 62,000 people (Wikipedia 2012).

The growth associated with development in the region has further complicated traditional use activities. Non-Native, ‘recreational’ uses and ‘sport’ hunting are often competitive and non-complementary to traditional activities and harvesting on the land. People attracted to the Fort McMurray area often enjoy the outdoors and can afford the recreational vehicles needed to access the ‘bush’. Such recreational use is often enabled by new access created by cutlines or other clearing such as timber harvesting. Traditional trails and other use areas have been ‘torn up’ by all-terrain vehicles, animals have been ‘scared away’ and berry patches have been eliminated (Au.Cree 2011, Jensen 2011, Wiltzen-Musseau 2011). FMFN #468 Elders have been observing these and other impacts from development and associated recreational use in the region for decades (Bush and Rowell 2000a, b; Bush et al. 2001; Cosijn and Bush 2001). Concern regarding the high potential of encountering recreational users, combined with the drastic decrease in animal and plant species (i.e., harvesting success) has severely curtailed the ability of FMFN #468 members to practice traditional harvesting activities in the region (Au.Cree 2011, Clark 2011, D.Cree 2011, Jensen 2011, Quintal 2011, W.Cree 2011).

Another factor affecting traditional use and harvesting in the last 50 years has been the creation of provincial parks and recreational areas. Alberta started setting up protected areas in the late 1920s, with a real expansion between the 1950s and 1970s, during which time 46 new areas were established (Government of Alberta website 2011b). A number of these protected and recreational areas fall within FMFN #468’s traditional lands – the areas around Whitemud Falls on the Clearwater River and around Gordon Lake (Gypsy Lake Wildland), the Hangingstone and Engstrom Lake Recreational Areas and

protected spaces around Gregoire (Willow) Lake have all been discussed by Elders as areas lost to traditional use (Dersch and Bush 2008, Arthurs 2011, D.Cree 2011, W.Cree 2011). Elders report being prevented from camping or making fires in their traditional areas (Au.Cree 2011, Clark 2011, Cote 2011, D.Cree 2011).

Provincial government development and resource management policies in the region have met with alarm and resistance on the part of Aboriginal peoples. The Mineable Oil Sands Strategy (MOSS) and the Lower Athabasca Regional Plan (LARP) are just two recent examples (Government of Alberta 2005a, b; Dirty Oil Sands News Network website 2011). In the spring of 2011, the Government of Alberta instituted new policies that require land users to apply for permission if they intend to stay in the bush for longer than two weeks. The Public Lands Administration Regulation or PLAR “is a provincial law of general application that applies to all persons including Indians and Métis” (Government of Alberta 2011: pg.2 of 7). Given the extent of encroachment on traditional lands that has already occurred in northern Alberta, Aboriginal peoples in the region have a heightened sensitivity regarding any additional controls that may be placed on their traditional use. PLAR reasserts regulations stated elsewhere in that, “Indians may **not** hunt in provincial parks, recreation areas, ecological reserves and other similar lands where no hunting is allowed. They also may **not** hunt in wildlife sanctuaries, including road corridor wildlife sanctuaries, and must follow laws related to accessing leased public land” (Original emphasis, Government of Alberta 2011: pg. 3 of 7). Furthermore, “An Indian does not have an unrestricted access to fish. All fishing in public waters, including fishing for food by Indians, is subject to regulations, both federal and provincial” (Government of Alberta 2011: pg. 3 of 7). FMFN #468 members have shared their frustration regarding this new regulation and its meaning for their ongoing ability to conduct their traditional activities (Arthurs 2011, D.Cree 2011).

In face of this history of encroachment, FMFN #468 members still continue to demonstrate great resiliency and a strong desire to continue their traditional lifeways. When asked if they are going to keep practicing their harvesting activities, they respond with statements such as, “Oh **yeah**. I’m still going to try as long as I can” (Informant’s emphasis, Au.Cree 2011). Their commitment to their culture and traditional practices is demonstrated by their ongoing efforts to collect and consume traditional foods and medicines. One traditional person spoke of traveling hundreds of miles to get the medicines, materials and foods he needs to conduct his ceremonies (D.Cree 2011). Berry-pickers, too, reported going great distances and expending great effort to try and collect their annual harvest (Jensen 2011, Wiltzen-Musseau 2011). Many shared that they get their traditional foods from elsewhere so that they can be sure that it is safe to eat (Clark 2011, D.Cree 2011, Jensen 2011). It is important to them that they be able to show their grandchildren “how to live in the bush” (Arthurs 2011).

Existing Effects

Existing cumulative impacts in FMFN #468 traditional lands are significant.³ There are many aspects to this. FMFN #468 has become alienated from the use and enjoyment of their traditional areas, lands and foods due to fear of contamination and pollution in the air and water, and in the traditional foods that they harvest, as well as by the removal of traditional areas by oil and gas development, forestry and municipal expansion. Traditional practices are further curbed by competitive recreational use, access barriers, 'protected' areas and government game and firearm regulations. In fact, some members find existing effects to be so overwhelming, they are asking to be relocated. FMFN #468 members have expressed concern for the future of their descendents, in the face of such losses, given that the community's voice is not heard in regulatory and other decision-making arenas, and little or no compensation is ever received. FMFN #468 perspectives on these matters are provided in the following sections.

Loss of Traditional Lands & Access

FMFN #468 members have stated that they already have been so impacted that it is nearly impossible to practice their traditional lifeways in their traditional lands. One Elder explained that, 'We don't have traditional lands. You can't build a cabin anymore. They invaded us. They took all our land' (Clark 2011). FMFN #468 Elders speak of feeling 'crowded' in their own lands. "These plants that are coming in? Me – I feel crowded. Got nothing, crowded here. Squashed in. Nowhere to hunt, nothing.... That's how I feel me anyway" (W.Cree 2011). This Elder described how his traditional hunting areas along the Clearwater have been removed by residential and recreational development. In the area between Waterways, Draper and the ski hill, he used to get 'rabbits, chickens, anything.' Now, "everything [is] all taken away" (W.Cree 2011).

Another member said, "It's sure not like it used to be. That's for sure. I mean we don't expect for things to stay the same all the time. I mean we know there is going to be land clearing and building and stuff. We know that, but not to this extent. This is just gone way beyond too ridiculous. And even when you have a trapline! They just come in there and they take all your trees! And you're just left with bare ground" (Jensen 2011). One Elder commented that "[we used to] exercise and practice our heritage and culture anywhere, but you can't now" (D.Cree 2011).

Barriers to access are also limiting traditional users' ability to practice their traditional activities. Berry patches have been blocked by concrete barricades in many traditional harvesting areas along

³ 'Traditional lands' is the term FMFN #468 members use to describe their homeland and traditional territory (FMFN #468 2006).

Highways 63 and 881, and in other places like Stony Mountain and Cottonwood Creek (Arthurs 2011, Clark 2011, Jensen 2011, Wiltzen-Musseau 2011). In one interview, two Elders discussed the fact that, “You can’t go out. You can’t...they’re shutting down all the little trails” (Arthurs 2011) and, “They’re blocking the roads” (D.Cree 2011). One Elder living in Anzac commented that development there ‘cut off trails’ and ‘everything’ (Wiltzen-Musseau 2011). An Elder and active harvester, who shares a lot of the traditional food he harvests with other community members, remarked that he can no longer access his favourite moose ‘hunting lake’ (Quintal 2011). There was a substantial increase in industrial development and traffic about 10 years ago and since that time people ‘can hardly go in the bush anymore’ (Jensen 2011). Trails, roads and other areas are blocked with ‘No Trespassing’ signs, and people cannot hunt or shoot safely in areas where there may be oil and gas infrastructure or workers (Jensen 2011).

One of the Elders enjoys telling stories of her time on the land. She explained that, “These are the things that my children will never see. The things that I am telling you about. Because they’ll be gone. You know. They’re gone now. At least 60 per cent of that old style living is gone” (Clark 2011). This history can never be reclaimed or restored. The heritage, culture and history of the people is in the land. One FMFN #468 member explained by providing an example:

Well, let’s say this for instance. Take a spot, right here. ... Right there anywhere. And there’s a little camping area there. And that’s where my grandfather had camped, had went fishing there, and had dried meat. He’s got a moose up here and hauled meat. And the family was back at the cabin. And this is where the wolverine see ..., put, he made logs up on top of the trees, so nothing would get it, wolves or nothing. But, yet, wolverine come there and there’s a story behind all of that. You know, something to remember my grandfather by. And the wolverine took that meat. And they hauled it, and then he tracked that wolverine and there’s nowhere anywhere for a long ways, no tracks of that wolverine to drag meat or anything, just his paw marks. How did he take that moose out of there? Right. That kind of a story. Well, in this area, right here, when all that happened. Okay. Now, you mine all that, you scrape all that surface part out. Now you do reclamation on that spot. Is it going to have any significance to me? ... And like I said, when you take, when you do mining there, a lot of my history is taken out of the map. ... It’s part of my culture, my heritage. And if you go there and you scrape all that heritage out of the top, there’s nothing for people, it’s only in the mind now. Right. Just a memory. ... Or in the stories (D.Cree 2011).

Elders expressed the opinion that there should be a moratorium or slowdown in oil and gas development in the region. There are ‘too many companies, going too fast’ (Haineault 2011). This Elder’s suggestion was to, “Save some for the future. Don’t need it all now” (Haineault 2011). One Elder ended her project assessment interview by saying, “I just hope this goes someplace. I hope that people look at it and see how [the] old people feel, about this encroachment. ... Maybe they’ll think, if they realize, they may think, you know, ‘What have we done?’” (Clark 2011). She thinks that a moratorium on development is needed to allow things to recover. She understands, from the various meetings she has

attended, that there is 'enough oil stored up for next 100 years' and feels this should be enough to accommodate a slowdown in development (Clark 2011). She explains why this is so important and yet so difficult to achieve. "There's a limit, you know. Why can't you stop now? You have enough now. Stop for a few years. Make it 20 years. And let everything grow back the way it was. But you can't tell those people that, because greed, money. Everybody wants money. You could just tell them to stop for a few years and let everything get back to normal, or as normal as it could get. But don't dig anymore. Don't get any more oil" (Clark 2011). She added that she has been telling 'them that, for years now' (Clark 2011).

Air & Water Quality & Quantity

FMFN #468 traditional knowledge tells them that the air and water have been contaminated and are no longer safe. (See also the traditional foods section below.) One Elder explained, 'This land provided everything But now we have nothing. You can't even safely have a garden because you don't know if it's safe anymore because of the pollution' (Clark 2011). Others report that local sources of potable water, such as Gregoire Lake, are no longer safe (D.Cree 2011, J.J.Cree 2011, Haineault 2011, Jensen 2011).

One Elder explained how he knew there was something wrong with the water in the 1970s by the appearance of the lakes and the taste of the water. He then started hearing warnings about eating fish and knew for certain that something was wrong with the water (J.J.Cree 2011). At one time, the water in the Clearwater was clear and fresh, and now the water is a different colour, and water levels are lower. A science-based study done for FMFN #468 on the Athabasca River determined that, "From the First Nation's point of view, the flows that the river requires to maintain the practice of Treaty Rights have already surpassed a threshold that threatens the continuation of their culture" (MSES 2009, pg. xi). One Elder attributes these changes to 'all the oil companies and everything' (J.J.Cree 2011). Another explained changes to water quality in his traditional areas in the following manner:

Now I drink that water, I won't live for a month. I'll be poisoned or get cancer or something you know. But at that time, 20 years ago, we used to be able to drink water from all the way around that area. Any creek that comes along there, just, well, you're not gonna look for water when you're thirsty at that time, you come to a creek, well, you drink it, well, nothing happen. Make tea there, anywhere. Fresh water, because there was nothing there. Now, there's plants back, there's creeks coming out all over from that plants. It's gotta' come down somewhere. Stony Mountain, same thing. Plants back there and all the creeks come down this way. Into the lake, Gregoire Lake (Au.Cree 2011).

He added that, "So, you know, like somebody here mentioned yesterday, or day before yesterday, when we had that meeting, we used to be able to drink water wherever we want..." (Au.Cree 2011). His wife finished the statement for him by adding, "Now we can't" (P.Cote 2011).

Air quality is linked to the quality of local water sources and plants that are harvested. One Elder explained that snow water can no longer be used for drinking because of the poor air quality in the region (J.J.Cree 2011). Several FMFN #468 members spoke of 'chemicals' and 'bad smells' in the air (Clark 2011, Jensen 2011, Wiltzen-Musseau 2011). The smells 'got worse' about 10 years ago when there was an increase in 'new sites, more vehicles and more industry' (Jensen 2011). One Elder, who lives in Anzac, spoke of her experience with leukemia and fear that it may have been linked to pollution from oil and gas developments in the area. She commented that she can smell the odour of the plants' air emissions in the mornings and offered that, "I don't like that smell. I know it's in the air. Having a plant right close to Anzac. I don't like that. I don't agree with that" (Wiltzen-Musseau 2011).

Traditional Food Quality & Changes in Animals

A number of FMFN #468 members now get their traditional foods from places far removed from their traditional lands (Clark 2011, D.Cree 2011, Jensen 2011). One Elder, who needs 'clean' food for his ceremonial feasts, explained that he travels to the Rocky Mountains to harvest large animals (D.Cree 2011). He has observed that 'meat doesn't taste as good as back then', and notes that the concern regarding arsenic levels a few years ago made him stop harvesting in his traditional areas (D.Cree 2011).

FMFN #468 members have seen changes to berries and have observed how in areas similar to theirs, such as northern Saskatchewan, where there is little or no air pollution, the berries are still abundant and healthy (D.Cree 2011, Jensen 2011). The blueberries in FMFN #468 traditional areas now are described as 'tiny, hard and wrinkled' whereas they used to be the size of the tip of a person's finger (Jensen 2011). They are all 'dried up' now (J.J.Cree 2011). Blueberry bushes used to grow to two or two and a half feet tall, and now they may grow to six inches high, if they grow at all (Jensen 2011). Berries have been much less abundant since the 1990s, but have been particularly scarce in the last six years (since 2005, Jensen 2011). One Elder commented that she now washes her berries and other plants she gathers due to potential contamination (Clark 2011), while others observed that air pollution has changed the taste of berries (D.Cree 2011, W.Cree 2011). Berries used to taste much sweeter and juicier (Clark 2011, D.Cree 2011). Another Elder commented on impacts to muskeg areas. "Where there's no muskeg," she explained, "There's berries. And then in the muskeg, there's all kinds of other plants, you know. ... So, you get lots of plants, medicinal plants, out of the muskegs. ... So, the muskeg is there too, to help us. And they're drying up our muskegs, and our plants are going you know. They're spraying all our blueberries and all other kinds, saskatoons, raspberries and strawberries – you name it" (Clark 2011).

One member spoke of the changes she has observed in the fish, animals and plants in the region. These changes in food quality have so concerned her family and relatives that they stopped consuming traditional foods harvested from the region about 10 years ago (Jensen 2011). They now only consume fish from Cold Lake or Saskatchewan. Deer and moose meat from around Anzac and Fort McMurray 'taste[s] different', so they now go hunting 'further south' around Athabasca or Lac La Biche (Jensen 2011). She has seen deer meat harvested from animals in the region that is a 'really, really light pink' instead of the normal, red colour of 'healthy meat'. She has also seen rabbits with 'white growths' on

their kidneys and 'discoloured' lungs. This particular change in rabbits she has observed for about six years now. Four years ago, a moose was harvested that had 'white lumps' in its flesh. Officials from Forestry were consulted and people were told they could consume the meat as long as they 'cooked it real good'. They were warned, however, that they should not feed the raw meat to their dogs. The informant did not trust that the meat was safe to eat (Jensen 2011). When FMFN #468 people find tumours like this in the meat, they are sometimes a 'hard growth' and sometimes filled with a 'pus-like' substance, and they do not consume the meat (Jensen 2011).

Another member, an active hunter, reports that he has only once seen a moose that was 'no good' (Quintal 2011). This was in an animal harvested by a friend near Highway 63 about 20 years ago. This animal's heart, liver and kidneys had 'white spots ... all over'. Since that time, he has carefully checked the organs and flesh of any moose that he harvests to be sure that there is 'nothing wrong' (Quintal 2011). The major changes that he has observed has been in animal presence and abundance. He estimates that moose populations have declined to somewhere between a quarter to a half of what they used to be in the 1990s. He sees that 'all these oil companies, all the noises, all the pipelines, all the machinery – the munchers' as having contributed to this decrease in moose populations (Quintal 2011). It used to be that he was so confident of getting a moose that the day before he went hunting he would tell his friend to come by and pick up his meat at a certain time. These days, he is unsuccessful 9 out of 10 times that he goes hunting, even in his 'best spot' (Quintal 2011). Another Elder commented that all sorts of birds – 'ducks, geese, swans, all the birds' - used to fly for 'days and days' over Willow Lake. Now, she estimates, there are probably about half the amount of birds that there used to be, in 'three days...they are gone' (Clark 2011).

A member who lives on the reserve at Willow Lake explained that she knew something was really wrong when she found deformed frogs. She has found frogs with three legs and one eye. She intends to catch some this year and give them to government fishery representatives. She did so five or six years ago, but 'nothing ever came of it' (Jensen 2011). She has also observed frogs with 'pea-sized lumps' on their backs. She has also seen 'white worms stuck to the outside' of fish caught in Willow Lake that sometimes 'go right through' the fish (Jensen 2011). She has been told that this is caused by warmer water temperatures. Others have observed the same phenomenon and report that not only have the worms been on the fish caught in the lake every summer for the last 10 years, but that the fish are now 'soft' (Arthurs 2011) and 'discoloured' (D.Cree 2011).

In a scientific report commissioned by FMFN #468 assessing the impacts to their traditional lifeways on the lower Athabasca, it was found that "community members state that animals and fish currently show signs of reduced health, and their numbers have declined dramatically in areas where they were once abundant" (MSES 2009, pg. A-7). As an Elder explained, there are lots of fish that come up the Clearwater River and spawn in the river near the reserve, but these are unsafe to eat because they come past Suncor and because of the amount of pulp and paper effluent in the big river (Au.Cree 2011). An Elder who grew up on the Clearwater over 70 years ago observed that the biggest jackfish she ever saw was one her father shot with a .22 rifle on the Clearwater about 60 years ago. It was about five feet long

and tasted 'just like meat' (Tremblay 2011). She noted that there are 'no more jackfish' since the temporary bridge was installed across the Clearwater River (Tremblay 2011).

Animals have also been behaving in strange and unusual ways. One person shared that "they're not right anymore" and said that the animals have 'gone nuts' (Jensen 2011). She has seen a wolf who stood right beside the highway in the middle of the afternoon, coyotes who 'come and stand around like dogs', and bears who are 'not scared of anything anymore' and 'come right into your campsite'. She believes that there is 'so much industry in the bush' that the animals are 'all confused' and 'don't know where to go' (Jensen 2011).

FMFN #468 members have also shared their knowledge regarding caribou behaviour and presence. Caribou are now 'spreading all over' because there is 'too much activity' (Au.Cree 2011, Jensen 2011, Quintal 2011). Caribou have been observed at Gregoire Lake (Au.Cree 2011), Mariana Lakes, along Highway 881 (Jensen 2011), and east of Horse River (Quintal 2011). In recent times, their habitat has been known to be between Chipewyan Lakes and the Saskatchewan border, but now their tracks are being seen between Gordon Lake and Whitemud Falls (Au.Cree 2011). It was pointed out how sensitive caribou are to disturbance when they are calving. One Elder stated that the caribou are 'spreading out' because, 'They can't calve anywhere. That's what I see is that they are spreading out, trying to find a place to calve' (Au.Cree 2011). He added that he does not understand how 'they [the government] say they [caribou] are recovering' (Au.Cree 2011).

Recreational Use & Government Regulation

'Recreational' use, such as all-terrain vehicle travel (ATVs or 'quads'), 'wreck berry patches' (Wiltzen-Musseau 2011) and 'scare away animals' (Au.Cree 2011). Recreational quad use is destroying one member's favourite berry patches in the Sand Hills near Whiskey Lake on her son's trapline (Wiltzen-Musseau 2011). This is in an area near where she grew up and where she has picked berries her whole life. In another Elder's favourite hunting area, 'there's quad trails...all the way even up to my Moosum's old trapline...quading all over' (Au.Cree 2011). He finds disturbance everywhere on his family's traditional areas along the Clearwater River. There are 'no animals there' [in disturbed areas], 'not even tracks.' Even the ducks will keep flying over and not stop; the Elder explained, 'they can fly for miles' (Au.Cree 2011).

Competitive use and overcrowding has a negative effect on traditional practices. One Elder described how much she used to enjoy going to get ducks and roasting them outside on a campfire. This simple thing has become very complicated due to low duck populations, the difficulty of finding an area away from others where it is safe to hunt, and then of finding a place where they are permitted to make a fire (Clark 2011). "Fire is life," an Elder explained, 'It makes you feel good any time of day', adding, "They took all that away from us" (Au.Cree 2011). Another Elder noted that they are prevented from camping at their old campsites along the Clearwater River. A 'long time ago, [we] could camp anywhere alongside the river. Now they have campgrounds. ... [we] can walk there, but not camp' (Cote 2011). As indicated previously, camping and staying in the bush has been further complicated by the government's new

Public Lands Act regulations; people have to apply for a permit if they want to 'camp in the bush for more than two weeks' (Arthurs 2011).

Overwhelming Cumulative Effects

The situation in the region is considered so dire that several Elders have expressed a desire to move to a new place where they can practice their traditional lifeways without fear or restriction. One FMFN #468 member stated that there is already so much damage to the environment that it is no longer safe to live in the area. She explains, "I don't know. Sometimes we just feel the damage is done and it's un-repairable. We have to find a new place to live. It's getting ridiculous. And I don't know why all these people are coming here for – they're all going to be sick" (Jensen 2011). Other people describe their traditional home as being 'dead' and want to move to a place where they can practice more of their traditional ways. "It's dead country. You know what I mean. I can't see I'm such a nature-lover, such, ah, into the real Mother Earth, that this is not it. I would like to get back to my roots somewhere else, you know what I mean. Real, virgin, clean country" (Arthurs 2011). Another FMFN #468 Elder explained that she has requested that they be relocated because, "I am worried about it. I am worried about my land, and I'm worried about this reserve. Because it's getting, I can't see **nothing - nothing** coming out of it. Absolutely nothing. They're going to just, plow us down. I asked for, ah, you know, see if they would put us, get us another reserve someplace else, away from the oil country here" (Clark 2011, informant's emphasis).

The desire to be relocated from their traditional lands arose repeatedly. During one meeting, one Elder explained it this way:

When I look at these maps I get so mad. The people don't understand what the Elders feel when they see that it's all been taken away. Now when we find an animal with spots on the liver or scabs on the skin - we won't eat it. When we can't eat it, it's like they've taken our food from our table. It's not fair. It hurts me right here [points to his chest/heart]. When they say that the air at Syncrude and Suncor is fine, I don't believe it. I can smell it - we know that it goes into the water and the land, then the fish and the animals. We used to go to any creek and put a bucket in and make tea. Now I can't do it anymore. My wife and I, we'd like to leave. Move to a place with clean air and water (Au.Cree 2011, from meeting notes).

He is not alone in his desire to move away. He and others feel that the government should give the Band the land and/or resources to be able to relocate (Arthurs 2011, Au.Cree 2011, Clark 2011, Clark 2011). 'There are Elders who would like to be relocated to a safer place. I'd like to know that we could have a piece of land somewhere, and still receive benefits, still be members. Like we could move close to the mountains where the air is clean,' one of the Elders explained (Clark 2011). 'It's like living on a little island,' another added (Arthurs 2011). They recognize that some may wish to stay and maintain their ties to their forefathers, but feel that a move to somewhere less disturbed is the only way that they will be able to continue practicing their traditional ways (Arthurs 2011).

Powerlessness

FMFN #468 members comment repeatedly on the fact that their words and concerns seem to have little effect on government and/or industry decision-making (Arthurs 2011, Au.Cree 2011, Clark 2011, D.Cree 2011, Haineault 2011, Jensen 2011, J.J.Cree 2011, Tremblay 2011, W.Cree 2011). For example, when asked what he would like to say to industry and/or government about what is happening in his traditional lands, one Elder responded, ‘You can’t stop them – can’t do nothing’ (J.J.Cree 2011). As most of the response was given in Cree, the interpreter added, ‘He feels powerless to make any decisions’ (D.Cree 2011). Another Elder simply stated that he “couldn’t say anymore ... [they’re] going to go ahead and do it anyway” (W.Cree 2011). One person shared their view of how forestry companies seem to have more rights to registered trapline areas than the trapline holders themselves: “They’re logging all the traplines and that. I know people there that, their traplines used to be really nice and now they’re just all bare, just drying up and nothing. Horrible. You don’t even have a say. The government will just do whatever they want” (Jensen 2011). An Elder whose trapline was affected by recent development explained that she ‘didn’t feel [she] had any say’, concluding that you “can’t stop progress” (Wiltzen-Musseau 2011). Another, older Elder shared that, “Well, umm, I miss the way I used to live before, you know. I miss all that land where we used to live, across that Christina there. Now they’re going to build a bridge there. I don’t go by that, but what can I do, that’s government. I can’t see anything I can do now” (Tremblay 2011). She discussed this in detail in Cree with the interpreter who added for her, ‘If she had it her way, she would have it left the way it was’ (D.Cree 2011). One Elder openly stated his opinion that the government does not ‘care about us’ and that ‘we should take them to court’ (Au.Cree 2011).

FMFN #468 find that their words and perspectives are not heard or considered. And yet most are still trying to protect and save whatever they can. One Elder shared the following:

If I say something about that, my words are going to wither, eventually they are going to wither into the air, and disappear eventually. Right. I can’t do nothing to stop that, that’s what I’m saying. So, most of the time, if I had a choice, if I can change it, I feel, it’s worth it. It would be worth it for me to say something about it. But, it’s like, my hands are tied, and I can’t – no matter what I’m going to say, it’s not going to change it. But if there is any little bit that I can save there, like ah, any kind of traditional sites, or heritage, or anything that has to do with that, then I would. But other than that, ah, you know, there’s not too much anybody can do. You can’t stop something like that. It’s going to go on anyway. So, you just have to try and make the best of it. The way we have already (D.Cree 2011).

Future Generations

FMFN #468 Elders worry about the fate of future generations. There is no ‘bush life’ left for them to enjoy and no way for the Elders to pass on their knowledge and culture. As one Elder explained, “I wanted to show all my little grandchildren how to live in the bush, just, I’ve been doing that for years. Again, this summer I want to take them out. But what can you do? You can’t go out. You can’t...they’re

shutting down all the little trails. ... You can't just take 'em in the bush and camp..." (Arthurs 2011). She added that she did not 'even want them [grandchildren] around breathing this air' (Arthurs 2011).

Another Elder observed that, while development in the region provides job opportunities, they may not always be the kind of opportunities that provide a stable and sustainable future. For her, the rate and level of industrial development is not necessarily a healthy thing for the youth. She explains:

We're being impacted so much of, the kids are not supposed to be what they are, they're all into all kinds of things, so you worry about them, when they don't, when they don't ... they quit school and then they think because they get a job, and the job don't last, and then they're running around for the rest of their lives. And where does that lead you, you know. You can't go out back to the bush and live out there because there's no way anymore. How can you live in out there in the bush when the oil rig is next door to you? Unless you eat their scrap? That's a hell of a thing to look forward to (Clark 2011).

Insufficient Compensation

FMFN #468 members have stated strongly that levels of 'compensation' – be it at an individual-level for meeting honouraria, or at community-level in terms of benefit agreements – is woefully inadequate for the losses they have experienced and are continuing to experience. The following observations and comments were made during one meeting:

- 'Our traditional lands, we have no rights to them anymore. They're not ours anymore. Tell the truth, we shouldn't call them our traditional lands anymore' (D.Cree 2011).
- 'We have to live with them [industry, companies] and what kind of compensation do we get' (Arthurs 2011)?
- 'If an Elder can't hunt moose or rabbits, how does he get compensated? He needs more than \$300' (D.Cree)!
- 'Compensation is so small. It's not enough to compensate us for what we have lost. We don't have traditional lands. You can't build a cabin anymore. They invaded us. They took all our land' (Clark 2011).
- 'At the beginning, they said we could have the land and we took their religion. Now they took the land and all we have left is their religion' (Arthurs 2011).
- 'United Nations rules says that we're allowed this, this and this, but it's not true here' (D.Cree 2011).
- 'We don't even have free speech anymore' (Clark 2011).
- 'The oil companies move in and environmental companies pay us [to work with them], and we get paid \$300. You can't hunt anymore; you can't even buy a gun for that amount. We're on the

outside, and they're on the inside. All the animals are scared away. A little money once a year can't buy you anything' (D.Cree 2011).

- 'Elders only get \$1,000. The people on reserve who have to take welfare only get \$200. How can you even feed yourself for \$200? All we get is \$300 a few times a year [for interviews]. If we got at least a penny every barrel, that's taken out of our traditional lands, we'd be okay' (Clark 2011).
- 'The oil companies are making billions of dollars. They won't give us one per cent. That proves that we have no traditional lands. They give out the leases without talking to us' (D.Cree 2011).
- 'I am being asked to give information, and I'm getting \$300, but it won't make any difference' (Au.Cree 2011).
- 'Those people by the broken pipeline didn't get anything' (Clark 2011).

FMFN #468 members clearly feel that the losses they have suffered have not been compensated in a meaningful way. The economic boom that the region has experienced as a result of oil and gas development in the last 50 years has been a 'bust' for them.

A FMFN #468 Elder who is very active in her community commented:

There's an awful lot of poverty. ... And then be surrounded by all of this wealth, that's taken out of your land. That was supposed to be half yours. That you never got. So how do we get our half? Where is it? Is it coming or what? I don't think we'll ever get what we were promised. I sure hope somebody tries hard enough to get at least a little bit of it. We don't all have to be, die poor (Clark 2011).

Another Elder observed that while companies are 'sucking oil out from underneath us', FMFN #468 is not receiving any royalties (Haineault 2011). While people see the economic opportunities that industry brings, they do not want to see traditional areas destroyed. One stated, "In a way the plants are, it's spin-off jobs for other people. In a way they're good, but they are going to ruin our traditional, like berry-picking, and that you know. I wouldn't want to go back to the traditional ways; it was a hard life like you know. **But**, I don't want to see anything destroyed" (Wiltzen-Musseau, informant's emphasis).

Another Elder observes that "if you really look at things realistically, all that muskeg takes a 1,000 years to be the way it is" and comments:

I always have a question in the back of my mind ... if my traditional lands are being mined, and they're being ... you know they're going to be doing whatever they're going to do there – is there any compensation for me? You know? And for them [points to Elder], and his children? For, ah, to maintain our culture and traditions? Our heritage (D.Cree 2011)?

There is a strong feeling amongst FMFN #468 community members that there has to be a more equitable way to share the benefits of oil and gas development. One Elder described her meeting with an oil and gas executive in Calgary:

Like I said...go to the great, big highrise in Calgary...and then, he wants me to be impressed by this highrise. I wasn't impressed, because all that money – if it had been split, he might have still had his highrise, but I might'd had a nice house too. That's all I want is a nice house, and nice surroundings. I don't want to open my door and smell oil when I open my door (Clark 2011).

Analysis & Results

As described throughout this report, FMFN #468 has experienced a long history of encroachments on their traditional lands. This experience has, in effect, led to a situation in which they have become 'alienated' from their traditional lands and impeded in the practices of their traditional activities. The following sections provide a description of the alienation that has occurred as a result of existing significant cumulative impacts, a disturbance analysis in both regional and focused study areas, and a description of the types of FMFN #468 traditional use that have been recorded in and around the JPMX and PRM leases.

Traditional Lands Alienation

The history of encroachment on FMFN #468 traditional lands has created a situation in which FMFN #468 members have become 'alienated' from many of their traditional areas. In effect, traditional lands can no longer be used for traditional purposes. In an attempt to capture and describe such losses from a qualitative perspective, a framework of three different types of alienation is provided below. The first and most obvious loss is seen in areas where there is a 'footprint' and vegetation and soils have been removed for development. Examples of these areas include mine sites and residential construction. At the second level are losses where access to, or the availability of, a particular resource or area is impeded. Examples of this type of alienation include berry-harvesting areas that are 'barricaded'; travel routes and trails that have been 'cut off' or made unsafe by low water levels and/or ice conditions; former hunting areas that have become unproductive due to population declines, as well as areas that are so overcrowded that hunting has become either unsafe or unproductive; and recreational or protected areas where traditional types of use are excluded. The third type of alienation occurs when a traditional food or area becomes compromised due to pollution or a severe decline in environmental integrity, and traditional users are forced to avoid it. Examples of this would be avoidance of fishing in or the consumption of fish from Gregoire Lake, or of consuming water from local creeks and lakes traditionally used for drinking water.

In short, there are three layers to traditional lands alienation:

1. Disturbance - surface removal of vegetation and soils, 'footprint' areas.
2. Access and availability - barriers to movement impede access, animal and plant populations have declined to such a level that harvesting is very difficult or impossible, and travel is unsafe due to environmental change or competitive use and overcrowding.

3. Contamination - related to Traditional Knowledge-defined decline in environmental quality; traditional foods no longer safe to consume.

Together, these three types of alienation currently represent significant and overwhelming negative impacts in FMFN #468 traditional lands. The disturbance from a footprint perspective (#1) is demonstrated in the the MSES analysis provided in the following section.

Disturbance Analysis

Based on GIS (geographic information systems) and image data, analyses were conducted to quantify the amount of existing disturbance within the FMFN #468 traditional lands.

Methods

The following sections describe the nature of the GIS data from FMFN #468's 2006 TLOUS *Nistawayaw*, the study areas and disturbance data used, as well as the approach used for the GIS analyses.

Traditional Land Use Data

For these analyses, FMFN #468 TLU GIS features are based on mapping conducted during the *Nistawayaw* study (2006). Features mapped during this study were provided as TLU points and line files in GIS shape format. Some of the lines in the original GIS files are polygon-like 'perimeters' encircling land use areas. These line perimeters were traced and saved within a separate GIS polygon file for use in this analysis. GIS attributes from *Nistawayaw* are organized into two main categories: group and type (Table 1). Our analyses focus on the Group category.

Table 1: GIS Attributes

TLU Group	TLU Type
Berries	Blueberry, bunchberry, chokecherry, cranberry, hazelnut, kinnickinnick, pincherry, raspberry, rose, saskatoon, strawberry
Big Game	Barrenland caribou, bear, deer, moose, salt lick, moose, woodland caribou
Birds	Canada goose, crane, duck, eagle, egg site, grouse, loon, owl, pelican, ptarmigan, swan
Cabins	Cabin
Cultural Icons	Birthing place, cultural site, grave site, historical site
Fish	Chub, goldeye, grayling, jackfish, lingcod, perch, pickerel, sucker, trout, tulaby, whitefish
Furbearers	Beaver, coyote, fisher, fox, lynx, marten, mink, muskrat, porcupine, rabbit, skunk, squirrel, weasel, wolf, wolverine
Placenames	Placename

Trails	Trails, traplines
Trees and Plants	Ratroot, white spruce, willow

Areas of Study

Two areas were chosen for the disturbance study: a regional disturbance study area (RDSA, Figure 1) and a focused disturbance study area (FDSA, Figure 2). The area that surrounds all available FMFN#468 TLU GIS features within Alberta was designated as the RDSA; the RDSA is 130,772 km² in area. The area surrounding the FMFN #468 reserves, the Clearwater River, and Shell's proposed JPMX and PRM projects comprises the FDSA (Figure 2). The selection of this study area is described in more detail in the Study Area & Timelines section. The FDSA is 32,916 km² in size.

Disturbance Data

Methods for creating GIS disturbance features follow an MSES study, described in Appendix A. Industrial surfaces in the study areas were digitized from Landsat TM5 satellite images captured during 2007, 2008, and 2009 (spatial resolution 28.5x28.5m/pixel; scale 1:50,000). Linear disturbances that are visible on the Landsat images and footprints from regulatory applications for planned and approved projects were also included as disturbances.

Zones of Influence

Zones of influence (ZOIs) were created by buffering 250 m around the digital disturbance features. ZOIs represent the areal extent of effects that occur beyond the actual disturbance footprint. These effects include changes in surrounding vegetation, wildlife habitat and traditional use that are due to increased noise, decreased access, weed introduction, changed hydrology, changed wind patterns, increased dust and pollution, to name just a few changes. A distance of 250 m was chosen as appropriate for several reasons. For example, hunting is not permitted within 183 m (200 yards) of any occupied building (ASRD 2008). In addition, moose sign has been found to be reduced within 200 m of roads (Rolley and Keith 1980), caribou avoid industrial features within about 250 m (but avoidance could be greater or smaller for some feature during some seasons, Dyer 2001), and other mammals have been noted to avoid industrial features within this distance (Forman et al. 2003). Birds in woodlands have also been observed to avoid roads, power and seismic lines by up to about 300 m depending on species and ecological context (Kroodsmas 1982, Bayne et al. 2008, Machtans 2006).

Clearly, the ZOI varies widely from species to species, the type of industrial features and related activities, and the ecological context (e.g., reproductive cycle, hunting or predation regimes, habitat structure and quality). However, it appears that, in absence of detailed information on a particular situation, the 250 m distance is a reasonable approximation for a zone within which First Nations cannot effectively exercise their rights.

GIS Analyses

Using ESRI's (a software development company) ArcMap GIS software, the 2008 disturbance layer was overlaid with FMFN #468 TLU points, lines and polygons. Certain features were excluded from the analysis (i.e., placenames). The number of FMFN #468 TLU points and polygons, and the number and length of TLU lines occurring within the 250 m ZOI were calculated for both the RDSA and FDSA. As land use polygons overlap in many areas, these polygons were merged before calculating their total area within the disturbance zone.

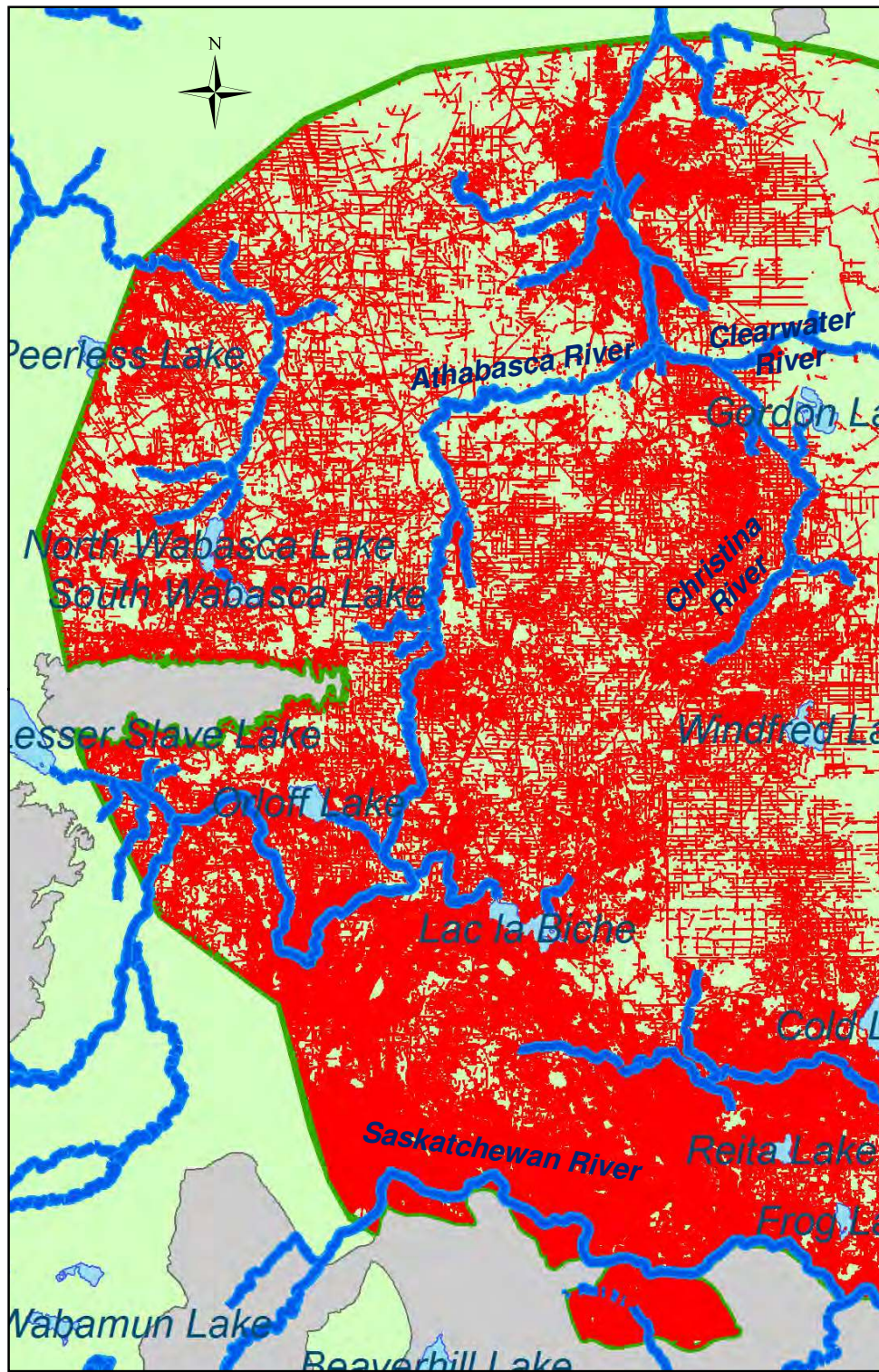
Results

Overall, the ZOIs cover 59,392 ha or 45% of the 13,077,200 ha RDSA and 10,426 ha or 32% of the 3,291,600 ha FDSA. The spatial distribution of disturbance features and ZOIs are illustrated in Figures 3 and 4.

A total of 3,268 TLU points were located within the RDSA. Among all TLU points, 1,487 (46%) were located within the 250 m disturbance ZOI (Table 2). Cultural icons and berry sites have the largest percentage of points falling within the RDSA ZOI areas with 60% and 54%, respectively (Table 2). Similar to the RDSA, 44% of all TLU points were found within FDSA ZOIs, with the highest proportion for cultural icons and berries (Table 2). The least disturbed TLU point feature was fish; close to 30% of fish points were noted in ZOIs for both the RDSA and the FDSA (Table2).

Table 2: FMFN #468 TLU Points within the Disturbance Study Areas

TLU Point Description	TLU Points within the RDSA	TLU Points within the RDSA ZOIs (%)	TLU Points within the FDSA	TLU Points within the FDSA ZOIs (%)
Berries	389	212 (54)	351	183 (52)
Big Game	651	321 (49)	581	279 (48)
Birds	408	168 (41)	391	159 (41)
Cabins and Trails	125	54 (43)	120	49 (41)
Cultural Icons	86	52 (60)	80	48 (60)
Fish	286	86 (30)	269	84 (31)
Furbearers	1320	593 (45)	1216	527 (43)
Trees and Plants	3	1 (33)	3	1 (33)
<i>Grand Total</i>	<i>3268</i>	<i>1487 (46)</i>	<i>3011</i>	<i>1330 (44)</i>



Legend

Green line: FMFN#468 Traditional Lands in Alberta
Red lines: Disturbance Zones of Influence

The area represented here was derived from a very broad interpretation of FMFN #468 use and occupancy data and cannot be taken as an official boundary of FMFN #468's traditional territory.

Fort McMurray No. 468 First Nation

**Disturbance Zones of Influence
in the RDSA**



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Data sources:
MSES Disturbance
Zones of Influence

Figure Number

3

Datum

NAD 83

Projection

UTM Zone 12

Date

13 Aug 2012

Version

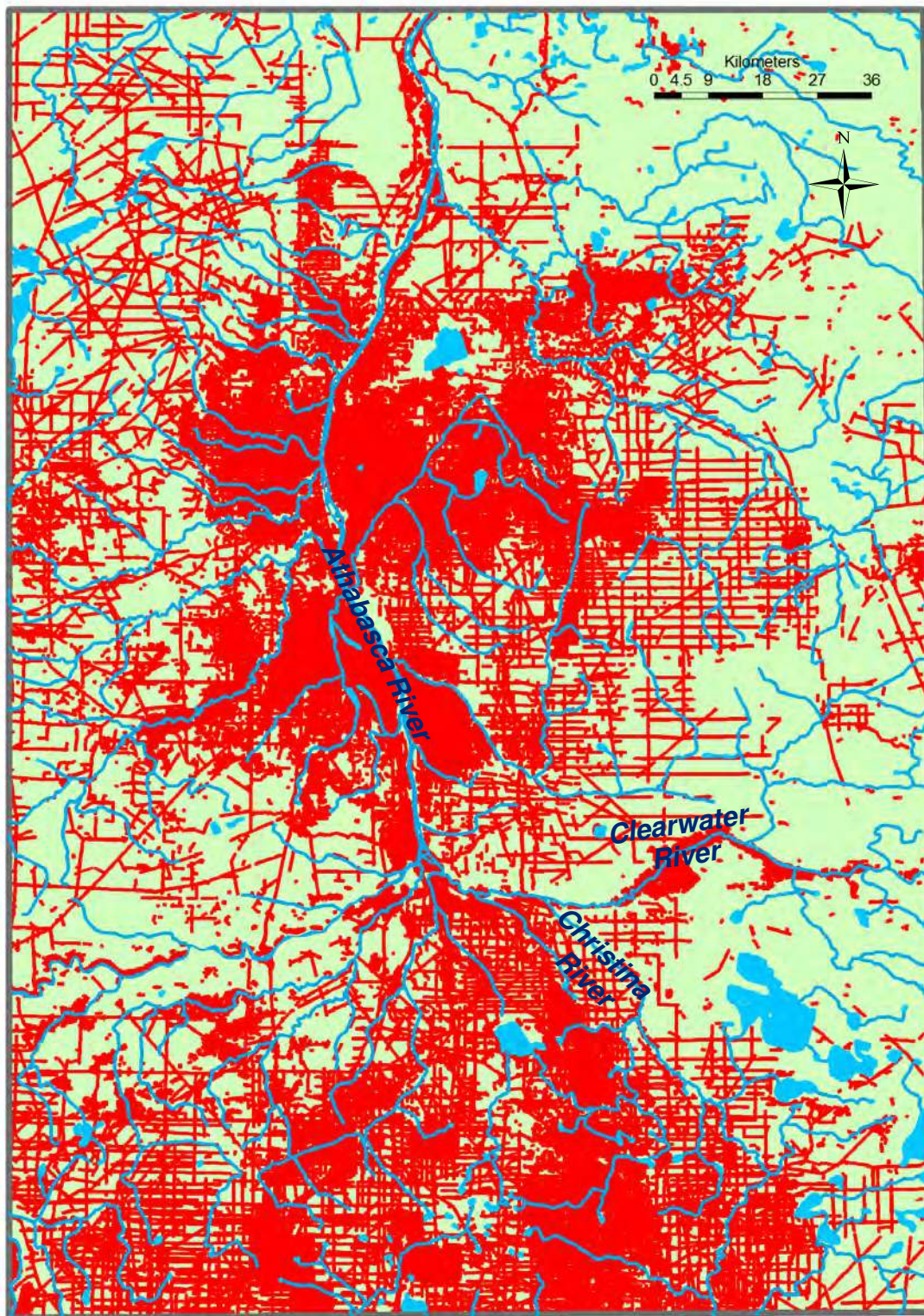
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Legend

Red lines: Disturbance Zones of Influence

Fort McMurray No. 468 First Nation

**Disturbance Zones of Influence
in the FDSA**



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Data sources:
MSES Disturbance
Zones of Influence

Figure Number

4

Datum

NAD 83

Projection

UTM Zone 12

Date

13 Aug 2012

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Within the RDSA, 64 TLU lines have a summed length of 1,293 km (Table 3). Among these 64 TLU lines, 44 (69%) cross or are contained within disturbance RDSA ZOIs. The length of all lines within the RDSA ZOIs amounts to 563 km (43%) (Table 3). The 49 TLU lines that occur within the FDSA are 1,201 km in length (Table 3). The FDSA ZOIs cross or contain 516 km (43%) and 45 (92%) of the TLU lines within the FDSA (Table 3). In both study areas, the greatest percentage of line length fragmentation occurs for birds ($\geq 71\%$); a single bird line is dissected by the ZOI.

Table 3: FMFN #468 TLU Lines within the Disturbance Study Areas

TLU Lines	TLU Line Lengths within the RDSA (kms)	TLU Line Lengths (kms) within the RDSA ZOIs (%)	TLU Lines within the RDSA	TLU lines within the RDSA ZOIs (%)	TLU Line Lengths within the FDSA (kms)	TLU Line Lengths within the FDSA ZOIs (km)	TLU lines within the FDSA	TLU Lines Disturbed within the FDSA ZOIs (%)
Birds	6	4.5 (72)	1	1 (100)	6	4.5 (71)	1	1 (100)
Trails	989	443 (5)	45	30 (67)	910	400 (44)	35	30 (86)
Cultural Icons	10	3 (32)	5	3 (60)	7	3 (46)	3	3 (100)
Traplines	287	112(39)	13	10 (77)	278	108 (39)	10	10 (100)
<i>Grand Total</i>	1293	563 (43)	64	44 (69)	1201	516 (43)	49	45 (92)

Fifty-two per cent (52%) or 6,829,390 ha of the RDSA is comprised of TLU polygons. Within the RDSA, 49% (3,338, 771 ha) of the TLU polygon area (85% of the polygons) are fragmented by ZOIs (Table 4). The percentage of areal disturbance within the RDSA is greatest for cabins and trails (81%; all polygons disturbed) and least for birds (no polygons disturbed) (Table 4).

Within the FDSA, 2,347,214 ha (71%) are comprised of TLU polygons. Of the 55 TLU polygons within the FDSA, 44 (80%) are fragmented by ZOIs, as well as 705,282 ha (30%) of their combined area (Table 4). All cabin and trail polygons were fragmented in the FDSA, with 55% of their area found within FDSA ZOIs (Table 4).

Table 4: FMFN #468 TLU Polygons within the Disturbance Study Areas

TLU Polygons	TLU Polygons (ha) within the RDSA ¹	TLU Polygons (ha) within the RDSA ZOIs (%)	TLU Polygons within the RDSA	TLU Polygons within the RDSA ZOIs (%)	TLU Polygons within the FDSA ¹ (ha)	TLU Polygons (ha) within the FDSA ZOIs (%)	TLU Polygons within the FDSA	TLU Polygons within the FDSA ZOIs (%)
Birds	712	0 (0)	1	0 (0)	712	0	1	0 (0)
Cabins and Trails	274,856	223,843 (81)	5	5 (100)	75,376	41,750 (55)	2	2 (100)
Cultural Icons	3,905	866 (22)	7	3 (43)	3906	824 (21)	7	6 (86)

Traplines	4,524,118	2,455,186 (54)	32	24 (75)	1,497,969	635,819 (42)	26	21 (81)
Trees and Plants	5,289,207	2,751,221 (52)	33	24 (73)	769,251	294,754 (38)	19	15 (79)
<i>Grand Total</i>	10,092,799 ² 6,829,390 ³	5,562,732 ² (54) 3,338,771 ³ (49)	78	66 (85)	2,347,214 ³	705,282 ³ (30)	55	44 (80)

Notes:

1. RDSA is 13,077,200 ha in area; FDSA is 3,291,600 ha.
2. Calculation based on area of individual polygons.
3. Calculation based on area of merged polygons (no overlapping polygons).

FMFN #468 Traditional Lands & Existing Shell Leases

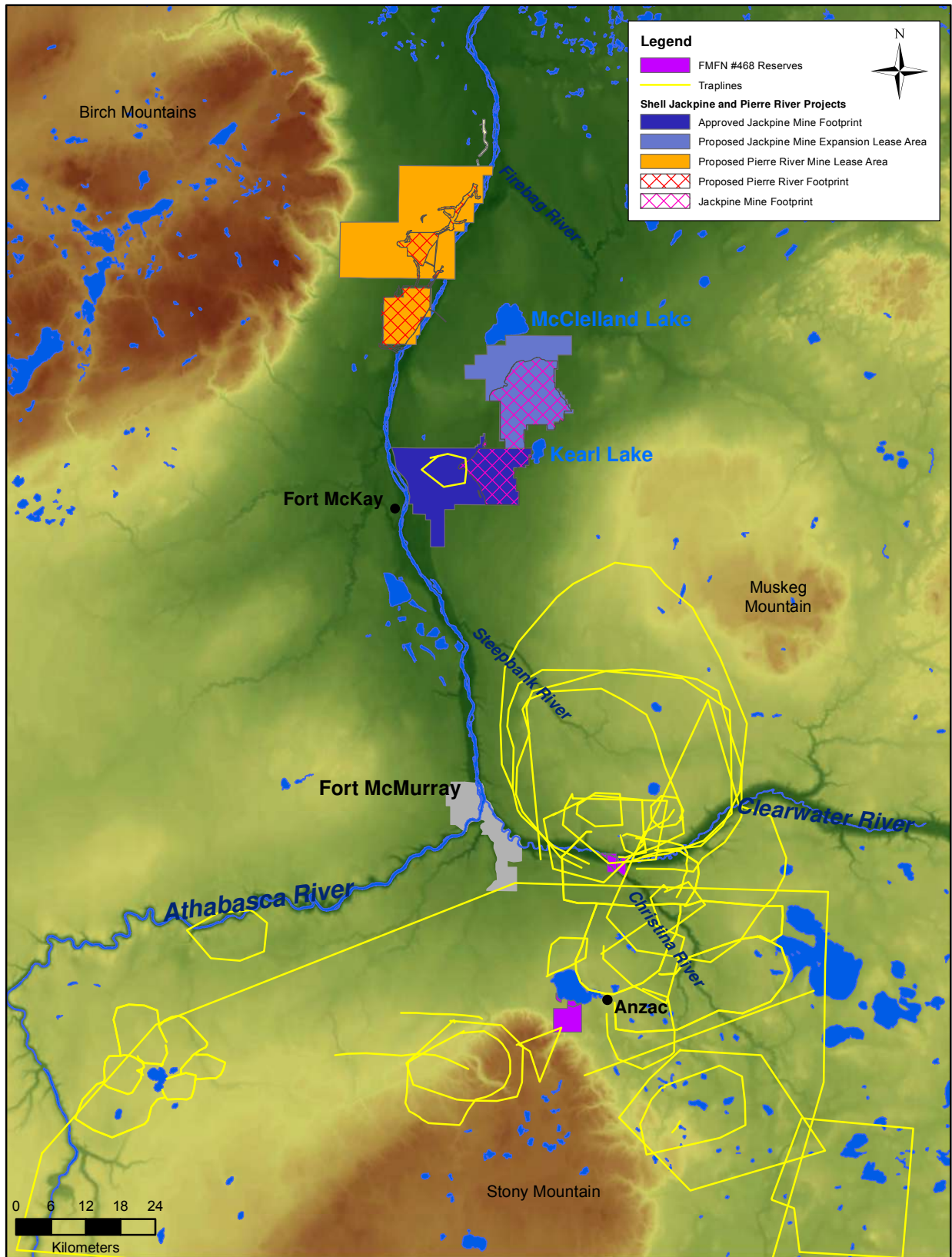
Overlaying Shell project leases on FMFN #468 traditional lands illustrates that approved Shell projects have already impacted FMFN #468 traditional use in the following ways:

- The JPM lease has a FMFN #468 trapping area within its boundaries (Figure 5).
- FMFN #468 traditional use study records a cabin within the JPM lease (Figure 6).
- Big game harvesting sites; berry harvesting areas; and extensive furbearer, fish and bird harvesting areas are all in the approved JPM mine area (Figures 7, 8, and 9).

The proposed JPMX and PRM lease areas are in the vicinity of the following FMFN #468 traditional activities and/or sites:

- Two cabins are recorded an estimated 20 to 30 kilometers south of Shell's leases; a cultural area is recorded just to the south of Fort McKay (Figure 6).
- FMFN #468 has recorded big game harvesting sites north and west of McClelland Lake, just to the north of the JPMX lease (Figure 7).
- Bird harvesting sites between Kearl and McClelland Lakes near to the JPMX area and along the Athabasca River alongside the PRM lease (Figure 8).
- Big game harvesting sites near the PRM footprint (Figure 7).

Evidence presented in the two affidavits from FMFN #468 members who are active harvesters states that they have hunted big game, furbearers, birds and fish, and gathered berries and traditional medicines in the vicinity of both the proposed projects.



Fort McMurray No. 468 First Nation

FMFN #468 Traplines in the Focused Disturbance Area



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Data sources:
GeoBase CDEM 1:250K
FMFN #468 (2006): Nistawayaw
Aitaiis Crown Reservation (2007)

Figure Number

5

Datum

NAD 83

Projection

UTM Zone 12

Date

20 July 2012

Version

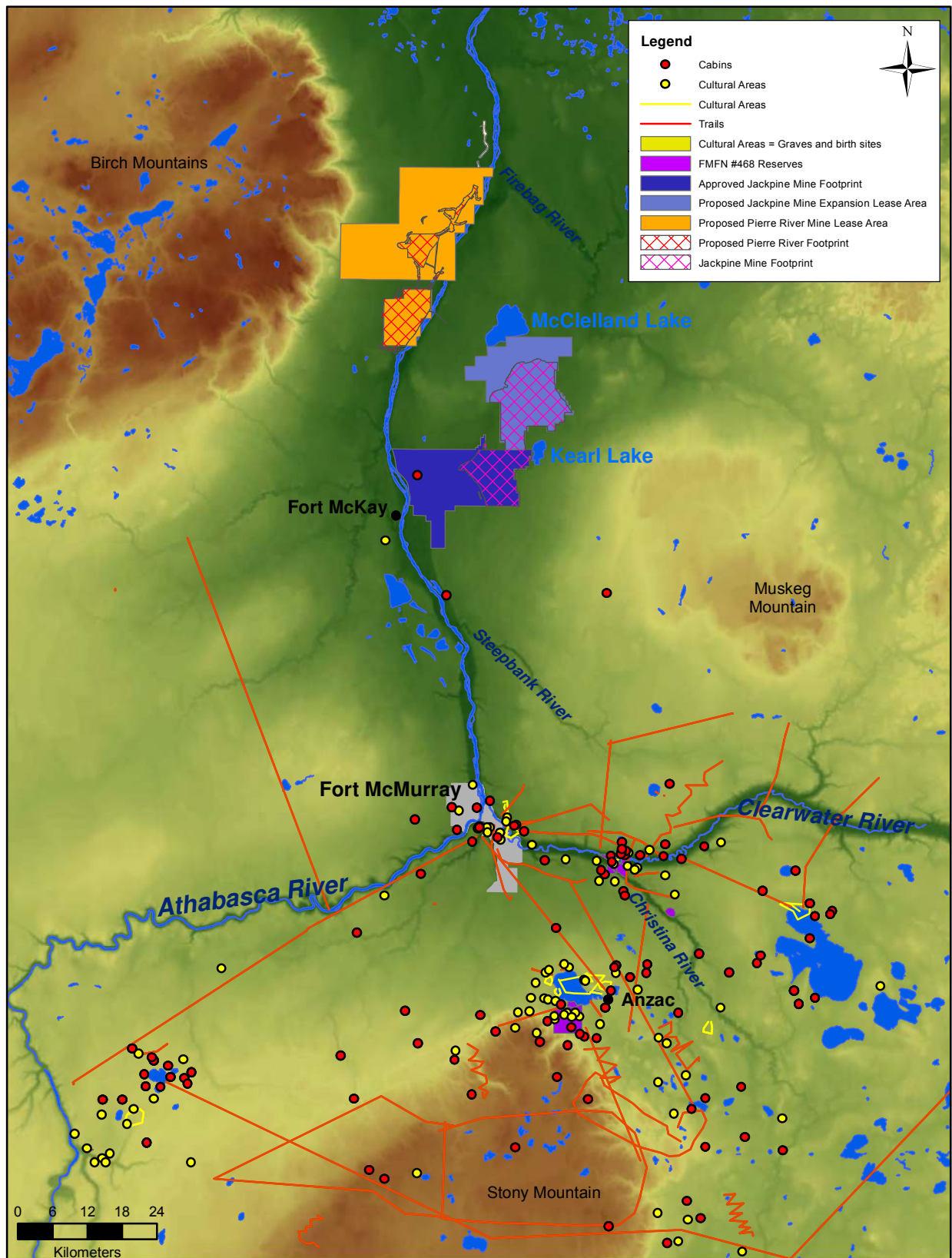
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Fort McMurray No. 468 First Nation

**FMFN#468 Cabins, Trails
and Cultural Sites in the
Focused Disturbance Area**



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Data sources:
GeoBase CDEM 1:250K
FMFN #468 (2006): Nistawayaw
Ahtaiis Crown Reservation (2007)

Figure Number

6

Datum

NAD 83

Projection

UTM Zone 12

Date

20 July 2012

Version

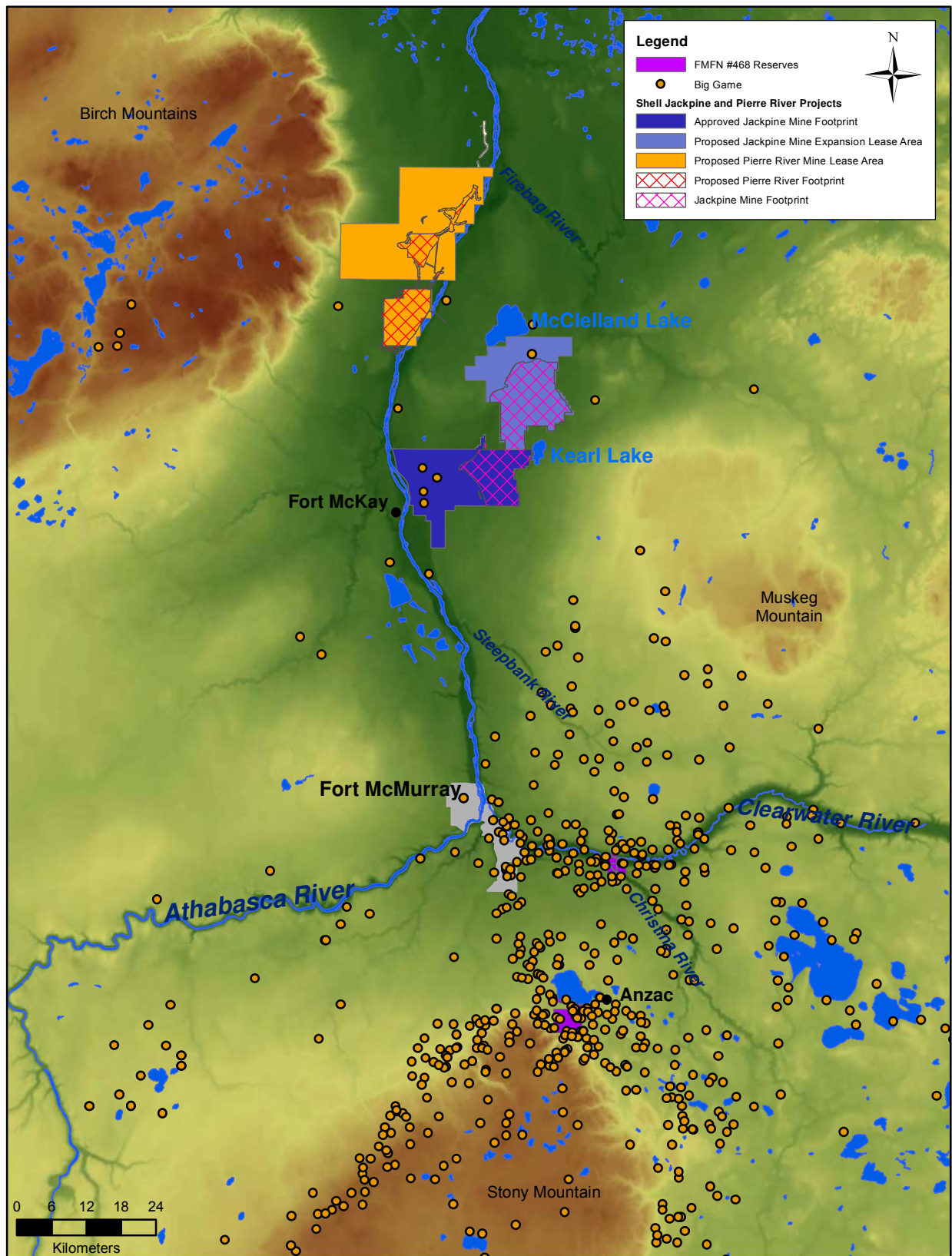
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Fort McMurray No. 468 First Nation

**FMFN #468 Big Game Habitat
and Harvesting in the
Focused Disturbance Area**



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Data sources:
GeoBase CDEM 1:250K
FMFN #468 (2006): Nistawayaw
Athabasca Crown Reservation (2007)

Figure Number

7

Datum

NAD 83

Projection

UTM Zone 12

Date

20 July 2012

Version

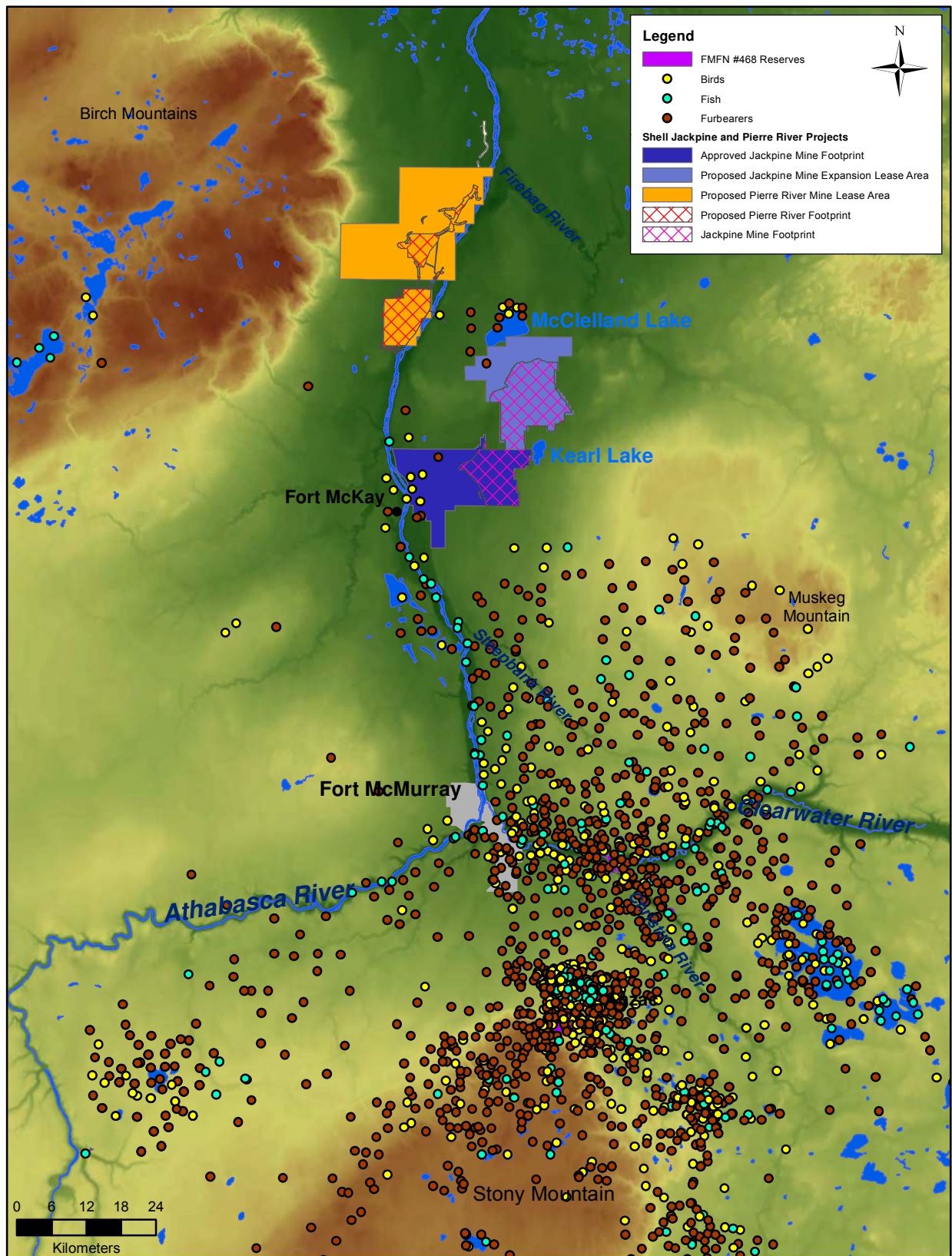
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Fort McMurray No. 468 First Nation

**Furbearers, Fish and Birds
in the Focused Disturbance Area**



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Data sources:
GeoBase CDEM 1:250K
FMFN #468 (2006): Nistawayaw
Athabasca Crown Reservation (2007)

Figure Number

8

Datum

NAD 83

Projection

UTM Zone 12

Date

20 July 2012

Version

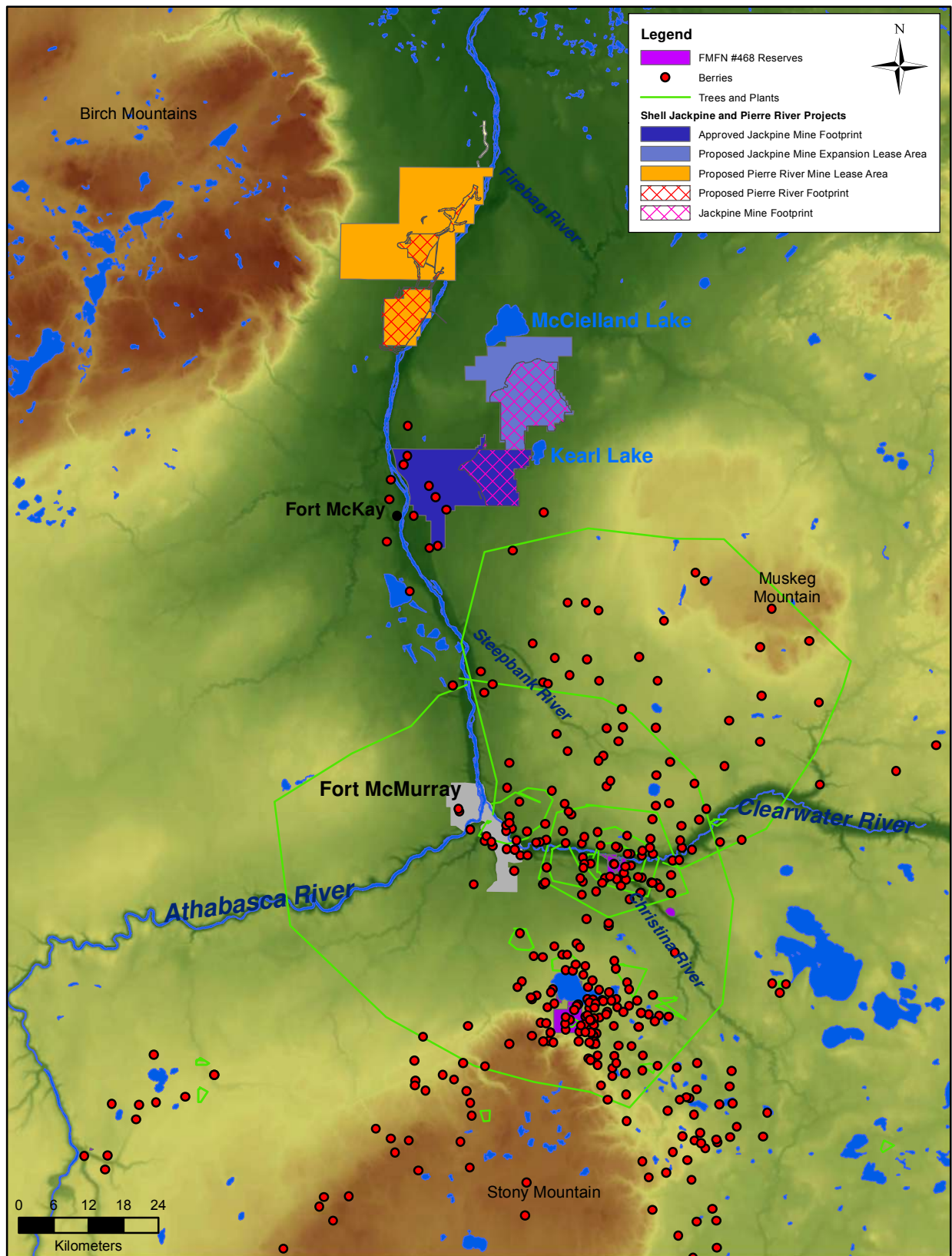
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Fort McMurray No. 468 First Nation

**Trees, Plants and Berries
in the Focused Disturbance Area**



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Data sources:
GeoBase CDEM 1:250K
FMFN #468 (2006): Nistawayaw
Atlas Crown Reservation (2007)

Figure Number

9

Datum

NAD 83

Projection

UTM Zone 12

Date

20 July 2012

Version

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Appendix A:

Disturbance Analysis Methods

A1.0 Change of Land Cover Analysis

Digital change detection based on satellite imagery has been widely used to measure terrestrial land cover change in the context of changing land use (Jensen 2005; Potapov et al. 2011).

We estimated the change in the landscape based on the:

- 1) digitized linear disturbances that are visible on the Landsat5 images at a 1:50,000 scale;
- 2) change analysis of the Landsat images which extracts areas that have been changed between two consecutive images; and
- 3) footprints digitized from regulatory applications for the planned and approved projects that are not yet visible on the most current image.

Linear disturbances that were visible on the Landsat images were digitized and used as a separate layer of lines. We did not have any reliable information on the width of linear disturbances because they do not have a footprint per se, unless they were buffered by 250 m (see below), so as a result, the change analysis only addresses footprints of non-linear developments such as clearings, facilities, mining operations, etc.

The Landsat images used for the analysis north of Fort McMurray were taken in 1992 (June 11), 2002 (May 14) and 2008 (July 25). The image resolution was 30 x 30 m and they were orthorectified using geodetic and elevation control data to correct for positional accuracy and relief displacement. Large blocks of Landsat data were adjusted through a patented procedure that uses pixel correlation to acquire tie-points within the overlap area between adjacent Landsat images (USGS 2008). Ground control points were fixed, and images were projected to the Universal Transverse Mercator map projection. All bands were individually re-sampled, using a nearest neighbour algorithm. The result is a final product with a Root Mean Square Error of better than 50 m in positional accuracy (USGS 2008). To estimate the disturbances other than linear, we performed a change analysis using data processing based on the image algebra method (Wickware and Howarth 1981, Singh 1989, Stanojevic *et al.* 2006).

The image algebra method is a relatively simple change detection technique, also known as the band differencing method. The reasons for using the image algebra method versus other methods, such as classifications are:

- 1) The image algebra method is highly accepted and widely used in the remote sensing research community (Jensen 2005).
- 2) Jensen (1981) and Jensen and Toll (1982) report that this method is among the most accurate change detection algorithms.
- 3) The image algebra method was reported to have an overall accuracy near 90% for standardized differencing (Bauer *et al.* 1994). In the Fort McMurray region, the image algebra method was also found to be near 90% accuracy and is believed to be better than other methods when the focus is quantifying change, without defining the categorical nature (e.g. type of vegetation classes) of the change (Alsadat et al. in press).
- 4) The image algebra method is cost effective as it does not require as much time as image classification methods.
- 5) While classification methods provide information of the categorical nature of the change, these methods are not as effective at detecting anthropogenic change over large areas. Because of its effectiveness, the image algebra method has been used by Global Forest Watch Canada to detect changes in very large regions (Stanojevic et al. 2006).

The image algebra method employs an equation for the differencing of a common band of imagery for two image dates as shown below (Jensen 2005):

$$\Delta BV_{ijk} = BV_{ijk}(1) + BV_{ijk}(2) + c$$

where:

ΔBV_{ijk} = change pixel value

$BV_{ijk}(1)$ = brightness value on date one

$BV_{ijk}(2)$ = brightness value on date one

c = constant

i = line number

j = column number

k = a single band

The image algebra method allows the analysts to define the level of change that they are interested in describing. In our analysis, we specified that the change in pixel value had to be at least 10%. We compared the satellite image from 1992 to the images from 2002, and the image from 2002 to the image from 2008.

The 4th or 5th image bands were used for differencing within the image pairs. These were used to minimize the atmospheric effects on the spectral signature of any given land cover type. A raster file was created based on the output of this image differencing. The output raster file depicted all pixel changes greater than (approximately) 10% between the two dates. In some cases, the bands being compared were evaluated for minor differences in reflectance unrelated to changes in cover type. Discrepancies were treated by evaluating and matching the histograms of the bands used in the analysis. This process aided in the reduction of in-between scene variability as a result of potential differences in atmospheric conditions.

All of the raster files depicting change were compared with the image pairs to ensure that the appropriate data were captured. In order to reduce the data “noise” that resulted from the processing routine, the initial processed data set was re-processed using a filter to eliminate the smaller, scattered clusters of pixels that were less than 0.27 ha in size (3 pixels). Upon visual inspection of the image pairs, the vast majority of these small, scattered clusters of pixels appeared to indicate “natural” and/or phenological changes, such as varying water levels in wetlands and lakes, or varying leaf colour and cover. In some cases, the filter eliminated linear disturbances such as roads, seismic line, etc., but these were manually re-inserted into our “anthropogenically-disturbed” data layer during the visual checking stage.

An unsupervised isodata clustering process was also applied to the image files in order to provide an additional dataset to assist in determining whether specific identified changes were anthropogenically-caused disturbances. Clusters which fell into both classes were identified as “crossovers” and these pixels were subjected to another round of isodata clustering (with a greater number of specified classes) and then classified accordingly. This complementary data layer was especially useful in identifying areas affected by wildfire.

In addition to the classification of pixel clusters in the differencing output raster files, the analyst manually “cleaned” the borders of some of the detected changes. Some of the changes that were eliminated by the “noise” filter that was performed were manually recovered and added back into the data set of anthropogenically-disturbed clusters. The pixels classified as “anthropogenically-disturbed” were used to create a digital disturbance layer.

A1.1 Disturbance Buffer (Zone of Influence)

A disturbance buffer or zone of influence of 250 m around the footprints of developments and the centerlines of linear corridors was arbitrarily applied based on the potential for reduced animal activity and hunting and trapping activity near industrial features. The distance of 250 m was chosen because, for example, hunting is not permitted within 183 m (200 yards) of any occupied building (ASRD 2008). For other examples, moose sign was found to be reduced within 200 m of roads (Rolley and Keith 1980), caribou avoid industrial features within about 250 m (but avoidance could be greater or smaller for some feature during some seasons, Dyer *et al.* 2001), and other mammals have been observed to avoid industrial features within this distance (Forman *et al.* 2003). Birds in woodlands have also been observed

to avoid roads, power lines and seismic lines by up to about 300 m depending on species and ecological context (Kroodsmas 1982, Belisle *et al.* 2001, Machtans 2006).

The zone of influence differs widely between the species, the type of industrial features and related activities, and the ecological context (reproductive cycle, hunting or predation regimes, habitat structure and quality). However, it appears that, in absence of detailed information on any of the situations, the 250 m distance is a reasonable approximation for a zone within which First Nations could not effectively exercise their rights.

A1.2 Atmospheric Correction

The solar spectrum electromagnetic radiation signals that satellites collect are affected by aerosols and gases in the atmosphere. Performing atmospheric correction on the satellite images can account for this modification and lead to improvements in classification and detection, and therefore, atmospheric correction problems have received considerable attention from researchers in remote sensing who have devised a number of solution approaches. Sophisticated approaches are computationally demanding and have only been validated on a very small scale (Tucker and Sellers 1986), and, in fact, some researchers have determined that atmospheric correction is unnecessary in many cases (Tucker *et al.* 2004).

We addressed the issue of atmospheric influence in our study by first creating a cloud-water mask and then performing differencing using only spectral band 4 or 5, because these are less influenced by atmospheric conditions. Other studies also dropped the bands most influenced by atmospheric effects from their analyses (Skole and Tucker 1993, Collins and Woodcock 1994, Foody *et al.* 1996).

A1.3 Approved and Planned Disturbances

In order to estimate the future change of land cover, we added the footprints of proposed, but not yet developed projects in the study area. To do so, we used available maps from regulatory applications that either have been approved or are awaiting regulatory approval. Footprint maps from EIAs were rectified and the planned disturbances from these maps were digitized.

A1.4 Accuracy Analyses

Accuracy assessments determine the quality of the information derived from remotely sensed data (Congalton and Green 1999). We applied both quantitative classification and qualitative positional accuracy assessments.

Quantitative accuracy assessment

Quantitative accuracy assessments attempt to identify and measure remote sensing-based error such as misclassification. Processes that use medium and low resolution images produce larger errors than high resolution images. We compared our data derived from Landsat-5 images with AltaLIS 1:20,000 base map data sets. For the accuracy assessment, we selected a micro study area within the central study area of 5,888 km². (Figure 1). For that area we acquired AltaLIS data from 28 sheets of the National Topographic System (NTS). Each NTS sheet covered 215 km². In the micro study area we compared our Landsat based analyses with disturbance analyses that were enhanced by AltaLIS data.

We were also interested to find out, specifically, which types of linear disturbance features the Landsat based analyses underestimated the most. The detailed break-down is demanding on data and time for processing. Therefore, we selected 4 sample areas for which data were obtained from 4 randomly selected NTS sheets. We compared types of linear disturbance features reported by AltaLIS with our Landsat based analysis by quantifying for each AltaLIS feature type, how much of it was captured by our Landsat based analysis. Table A.1-1 shows that our Landsat image analysis captured nearly all linear corridors indicated by the AltaLIS data, except for seismic line of which we captured only 36% of those indicated by AltaLIS. In other words, Landsat analyses underestimate the amount of disturbance by narrow linear corridors.

Data from AltaLIS were selected as the reference data because of data accuracy, availability and cost. According to AltaLIS, “the 1:20,000 Base Feature data set is the most accurate and detailed of the Base products, and was created to populate GIS applications” (AltaLIS 2008). Although no numerical accuracy assessment is available from AltaLIS, we considered it to be the ultimate mapping tool applied by the Alberta government, and through personal communications with AltaLIS we were assured that the accuracy in digitizing linear features is near 100%, certainly more than 90%. Data resources used by AltaLIS include the provincial 1:20,000 Provincial Digital Mapping Program (accuracy ± 5 m), the Alberta Vegetation Inventory (AVI), and Indian Remote Sensing (IRS) satellite imagery (accuracy ± 25 m). Other data sources include orthophoto imagery, aerial photography, and SPOT imagery (accuracy ± 10 m).

Table A.1-1: A detailed break-down of linear feature type showing the average ($\pm$ standard deviation) linear disturbances recorded in 4 sample areas (NTS sheets) by AltaLIS (a database used by the Alberta Government) and in our Landsat image analysis.

Feature Type	AltaLIS	This Study	Overall Agreement (%)
Seismic line (km)	440.4 $\pm$ 271.2	158.3 $\pm$ 87.0	36
Pipeline (km)	65.7 $\pm$ 53.4	64.3 $\pm$ 51.6	98
Railway (km)	20.3 $\pm$ 0	20.3 $\pm$ 0	100
Road (km)	37.9 $\pm$ 12.9	33.4 $\pm$ 9.3	88

Power line (km)	14.8±2.8	14.8±2.8	100
Total Linear (km)	548.8±223.8	260.0±39.5	47

The second part of the quantitative accuracy assessment was a comparison of our non-linear disturbance to the Alberta Ground Cover Classification (AGCC) data set. The AGCC data used for the accuracy assessment was based on the Landsat images (p041r021 and p042r20) taken in 1998 (Government of Alberta, AGCC meta data). We used only two classes for the comparison of the AGCC data set with our 2002 data set (the closest date in our set to 1998): Class 12 that represents commercial, industrial, and urban development and Class 31 that represents graminoid dominated clear-cuts. According to the AGCC meta data, the accuracy for these classes was nearly 100%. Our mapping of disturbance captured 92% of Class 12. For the graminoid dominated clear-cuts, accuracy was only 48%. However, we found that almost 25% of our disturbances fell within areas that AGCC classified as wetland. We checked 17 of these areas on 1-m resolution air photos and found that in 14 cases (82%), our classification of disturbance was correct. This suggests that our classification is more accurate in distinguishing between wetland and disturbance than the AGCC data set. This is likely because we determined disturbance by a combination of spectral signature and the change from one date to another, whereas the AGCC data is based on a supervised classification of one image date.

Qualitative accuracy assessment

For the qualitative accuracy assessment, we determined whether we correctly assigned disturbed versus undisturbed classes by comparing the class extracted from the imagery with what we saw on the ground. This involved visiting 54 sites, 14 in the south study area and 40 in the central study area, to verify the existence of disturbances detected on the Landsat-5 images. Each of the visited sites was located along major roads, forest roads, trails and the Athabasca River. Only 1 out of 54 sites was misclassified, and the other sites (98%) were correctly classified and corresponded accurately with the mapped disturbance.

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